



BUILDING A SUSTAINABLE FUTURE

Realising United Nations Sustainable Development Goals through Higher Education Institutions



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Association of Indian Universities New Delhi





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New Delhi



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March, 2023

The document, ***Building a Sustainable Future: Realising United Nations Sustainable Development Goals Through Higher Education Institutions'*** is based on extensive discussions during AIU Zonal and National Vice Chancellors' Meets and the inputs from the Officials of UNESCO, NITI Ayog, and Officers of Central and State Governments, Vice Chancellors, Industry Personnel, and various other experts. This final document constitutes of base content material collected from various websites of UNESCO, NITI Ayog, the Government of India, and various other websites used verbatim at many places, with the purpose to develop this document and for wider dissemination of the material.

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Preface

The concept of the Sustainable Development Goals (SDGs) was developed at the United Nations Conference on Sustainable Development in Rio de Janeiro in 2012. The objective was to produce a set of universal goals that meet the urgent environmental, political, and economic challenges facing our world. The United Nations SDGs are a collection of 17 interlinked global goals. Based on the quantum of achievements in realizing the SDGs, the countries are ranked by the United Nations. India was placed at 120th rank in Sustainable Development Report-2021. This instigated urgent action from all sectors of the country. Due to their unique position in society, Higher Educational Institutions (HEIs) have immense scope and potential to contribute towards achieving all the 17 SDGs and thereby accomplishing the 2030 agenda. Rather, realizing the SDGs without the involvement of the higher education sector is quite an impossible task.

HEIs are townships and hubs for igniting young minds through education, innovation, and research. Each HEI can play a significant role in the effective implementation of SDGs in their respective regions and inspire society. The Association of Indian Universities (AIU) which represents 932 plus Indian HEIs has been spearheading the campaign to implement all 17 UN SDGs in the country by organizing Vice Chancellors' Meets at five zonal levels and one at the national level on the theme '*Realizing Sustainable Development Goals through Higher Education Institutions*' during 2021-22.

The Book in hand, '*Building a Sustainable Future: Realising United Nations Sustainable Development Goals Through Higher Education Institutions*' that has been prepared jointly by AIU and Shoolini University, Solan is the outcome of wide-ranging deliberations held in all five zonal Meets and one National Meet of Vice Chancellors conducted on specific and inter-related SDGs with inputs from the experts from United Nations, NITI Ayog, Government, Regulatory Bodies, and Universities. It is a *blueprint for higher education institutions to achieve a better and more sustainable future for all*.

The AIU and Shoolini University constituted an Advisory Committee and a Steering Committee to prepare this document. We, the Chairperson and Co-Chairperson of the Steering Committee extend sincere gratitude to Prof Atul Khosla, Vice Chancellor, Shoolini University, and Vice Chairman of the Steering Committee for his continuous support and contribution towards this Book. Incessant efforts of Prof. Shyam Singh Chandel, Director, Centre of Excellence in Energy Science and Technology (CEEST), Shoolini University & Chief Editor of the Document, Dr. Sistla Rama Devi Pani, Editor, University News, Association of Indian Universities & the Editor of the Document and Prof. Kesari Singh, Dean of Undergraduate Studies, Shoolini University & the Editor of the document are gratefully acknowledged. We appreciate the CEEST core editorial team and 17 SDG teams constituting over 50 researchers of Shoolini University who played a vital role in preparing this well-researched document.

We place on record our Special Thanks to the United Nations and the Government of India for their support and cooperation.

In the spirit of collaborative efforts from all HEIs for realising the 2030 Agenda, we are pleased to present this Book. We hope that this will serve as the base document for the implementation of SDGs and we are confident that the HEIs will do their utmost to realise a sustainable future for all.



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1 NO POVERTY



2 ZERO HUNGER



3 GOOD HEALTH AND WELL-BEING



4 QUALITY EDUCATION



5 GENDER EQUALITY



6 CLEAN WATER AND SANITATION



7 AFFORDABLE AND CLEAN ENERGY



8 DECENT WORK AND ECONOMIC GROWTH



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



10 REDUCED INEQUALITIES



11 SUSTAINABLE CITIES AND COMMUNITIES



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



14 LIFE BELOW WATER



15 LIFE ON LAND



16 PEACE, JUSTICE AND STRONG INSTITUTIONS



17 PARTNERSHIPS FOR THE GOALS



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Executive Summary

The adverse impact of global warming has already started affecting our lives in many ways. Melting of glaciers, an increase of water levels in oceans and seas, visible changes in weather patterns, impact on agriculture, genetic disorders, and increasing pollution levels are some of the indicators of the coming catastrophe unless we gear up to meet the challenges now. It is our bounden duty to act as guardians and leave it a habitable place to live in for our future generations. Keeping this in mind, the United Nations came out with Sustainable Development Goals (SDGs) in 2015 to instill global action to end poverty, protect the environment, and bring peace and prosperity to all people by 2030. All the 17 SDGs are interrelated and contribute to bringing humankind on a path to sustainable living and eco-friendly economic development through various social, economic, and environmental policy measures. Central and state governments, public and private enterprises, large institutions, professional organizations, etc. are expected to contribute in their ways to meet the SDGs. They can play an exemplary role in realizing the SDGs in their respective regions and inspire society at large to follow the same.

The Association of Indian Universities (AIU), one of the premier higher education institutions in India plays a vital role in shaping Indian higher education by being a research-based policy advice institution to the Government of India. The AIU convenes the annual Vice Chancellors' Meets at Zonal and National levels to discuss various issues related to higher education. These Meets are important platforms not only to discuss the significant issues of higher education but also to play a catalytic role in finding solutions for different problems of higher education through collective wisdom. Furthermore, AIU carries forward the voice of the participating leaders of higher education to appropriate agencies and authorities for their dispensation. Every year a specific theme of topical significance for the higher education community is taken up for discussion. In view of the significance and urgent need to sensitize one and all, the theme '*Realising SDGs through HEIs*' was identified for all the VC Meets held during the session 2021-22.

The North Zone Vice Chancellors Meet of AIU was hosted by Shoolini University, Solan. Following the North Zone Vice Chancellors Meet, AIU partnered with Shoolini University to develop and provide a report containing key recommendations pertaining to HEIs, Government, and regulatory bodies which will act as a reference guide for the successful implementation of SDGs in India.

Subsequently, the AIU along with Shoolini University has developed this detailed Book titled '*Building a Sustainable Future: Realising United Nations Sustainable Development Goals Through Higher Education Institutions*' based on the Vice Chancellors' Meets organized by AIU at East, West, South, and Central zones, and the National level. This aims to provide key recommendations to HEIs, government, and regulatory bodies and act as motivators to accelerate the implementation of SDGs in India and the world. Each of the 17 Chapters with the recommendations and implementation plans has been peer-reviewed by two to three national and global experts. Each Chapter is structured as a Chapter Summary, National and International Status of implementation of SDG, Recommendations for HEIs along with suggested Research Areas for further studies, and Key Recommendations for Government and Regulatory bodies, followed by overall summary recommendations and Implementation Plan with Performance Indicators. Some of the key recommendations are presented here.

Key Recommendations

The recommendations in the Report have been classified into three main categories namely, Recommendations to be implemented in Higher Education Institutions; Recommendations involving Research at HEIs; Recommendations for Government and Regulatory bodies.



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Recommendations to be Implemented in Higher Education Institutions

1. Each HEI is to create specific and detailed 5–10-year targets and implementation plans for each SDG and develop policies and a governance structure for effective implementation.
2. HEIs to incorporate SDGs-related courses, curriculum, and awareness programmes including specific degrees, diplomas, majors, minors, and electives.
3. HEIs should start monitoring their carbon footprint and adopt sustainable policies and clean technologies to become carbon-neutral campuses by 2030. HEIs to propagate these learnings to 8-10 nearby towns and villages to help them become carbon neutral.
4. HEIs to build MOOCs in vernacular and local languages for the community, towards realization of SDGs.
5. Each HEI shall monitor food wastage on their campus and develop strategies to reach zero food-waste levels.
6. HEIs to give preference to local producers and manpower. This shall include all services and products to be consumed by HEIs.
7. HEIs to build dedicated infrastructure for yoga, meditation, and counselling to boost the physical and mental health of students, faculty, and the local community.
8. Every HEI to provide flexibilities in terms of time and location of work (Work from Home) for employees and ensure employment of 50 per cent plus women in leadership roles.
9. Each HEI should aim to meet 100 per cent of its water and energy needs through initiatives such as water recycling, solar energy production, rainwater harvesting, and optimal consumption of these resources.
10. HEIs to adopt at least ten large Panchayats in the community and get progressive volunteers from such Panchayats trained on sustainable earning opportunities such as eco-tourism, rural tourism, progressive farming, etc.
11. HEIs to allow and encourage the local community to use their campus infrastructures such as the library, Wi-Fi, and other learning and innovation resources.
12. Buildings in the HEI campuses should be designed and built using eco-friendly and energy-efficient materials with passive solar technologies for thermal comfort and reducing energy consumption.
13. HEIs to institute a Zero Tolerance policy towards bribery and corruption at all levels within the institution.
14. Implementation of SDGs should become a key strategic goal for the HEI senior management and monitored regularly.
15. HEIs to create multidisciplinary teams of policy analysts, social and natural scientists, and engineers to help develop, monitor, and implement government and regulatory policies related to SDGs.
16. HEIs should encourage research on issues relating to SDGs including national and international collaborations.
17. HEIs should create awareness of SDGs on the campuses amongst students and faculty.
18. HEIs should conduct impact studies of the government initiations towards the implementation of SDGs.



Recommendations Involving Research at HEIs

1. Each HEI should establish a Centre of Excellence/ Department for Research, Teaching, and Implementation of SDGs. In addition, each SDG shall have one faculty member responsible for its realization.
2. HEIs to allocate a minimum of 10% of their total annual budget towards research in SDG-related areas.
3. HEIs should align some doctoral and research activities to SDGs.
4. HEIs to create multidisciplinary teams constituting policy analysts, social and natural scientists, engineers, and other experts relevant to each research project so that the research becomes useful from all dimensions.
5. HEIs to identify, document, and undertake research related to traditional sustainable techniques and technologies of local and nearby communities.
6. HEIs to explore possibilities for SDGs-related research funding, from global agencies.
7. Each HEI needs to promote, fund, seed and incubate at least five SDGs-related entrepreneurial ventures among students, faculty, and local communities.
8. HEIs to engage with local under-represented communities for social research and their upliftment.
9. HEIs to develop Proof of Concepts for solving SDGs-related issues such as energy and water conservation.
10. HEIs to carry out research, document, sustain and preserve local genetic pools including plant genetics, animal genetics, cultural heritage, etc.
11. HEIs to identify at least three key SDG areas of focus based on internal expertise and needs of the local community.

Recommendations for Government and Regulatory Bodies

1. Government to create an SDGs-related ranking framework for HEIs of India in line with Times Higher Education (THE) Impact Rankings. In addition, SDGs-related efforts should also be included in other ranking and accreditation frameworks such as National Institute Ranking Framework (NIRF) & NAAC.
2. Government and other apex agencies to create a dedicated research funding pool to further research related to SDGs and allocate funding to HEIs based on SDG Rankings.
3. For SDGs-related research, government and regulatory bodies should facilitate a consortium of institutions in each state/ region for sharing infrastructure, equipment, and best practices for SDGs-related research.
4. Regulatory bodies to foster the design and approval of degrees and diplomas related to SDGs.
5. Government bodies to leverage the expertise of HEIs for significant SDG-related projects through structured consultation and research projects.



6. Funding for procurement of eco-friendly infrastructure conducive to realization of SDGs in HEIs should come under priority sector lending by banks.
7. Government to mandate a minimum of 10% of existing CSR allocation of corporates to HEIs for SDG-related infrastructure development and initiatives.
8. The initiatives of the HEIs towards the implementation of SDGs should be rewarded by incentivizing the HEIs in turn of NAAC rating and NIRF ranking.
9. Government to allocate projects to HEIs for impact analysis of various schemes and projects relating to SDGs.

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Conflict of Interest: The base content for this document has been collected from the websites of UNESCO, NITI Ayog, the Government of India, and various other websites with the purpose to construct the document on the base and also for wider dissemination of the material



Introduction

The Association of Indian Universities (AIU) is one of the premier apex higher education institutions of the country established in 1925. It is a research-based policy advice institution to the Government of India in the field of Higher Education, Sports, and Culture. Since its inception, it has been playing a vital role in shaping Indian higher education. Most importantly, AIU is vested with the power of according equivalence to Degrees/Qualifications offered by the universities across the world with those offered in India. Being an apex institution, it constitutes an integral part of all major decision-making committees and commissions in the country. As a representative body of Indian universities, it facilitates cooperation and coordination among Indian universities and liaises between the universities and the Government (Central as well as the State) and National and International bodies of higher education in other countries in matters of common interest. Whereas all the Indian universities benefit from its contribution, at present it has a membership of about 932 universities including 14 overseas universities from other countries viz. Bhutan, UAE, Kazakhstan, Mauritius, Malaysia, and Nepal, as Associate Members.

The Vision of AIU is to emerge as a dynamic service and advisory apex organization in India by undertaking such initiatives and programmes which could strengthen and popularize Indian higher education as the leading-edge system in the world and promote greater national and international collaboration in Higher Education, Research and Extension, Sports, Youth, and Cultural Activities.

Its mission is to promote and represent the higher education system and Indian Universities through strong liaison with the government National/International organizations of higher education, and sister associations the world over and establish liaison between/among universities through active support, cooperation and coordination among the member universities and all its stakeholders for quality education, research and other academics and extension activities.

AIU has always been in the glory as a culturally and intellectually rich organization and is led by eminent Senior Vice Chancellors of the country. Dr. Sarvepalli Radhakrishnan, Dr Zakir Hussain, Dr. Syama Prasad Mukherjee, Dr. A L Mudaliar, Dr Akbar Hydary, Prof A C Woolner, Pandit Amarnath Jha, Sir Maurice Gwyer, Dr K L Shrimali, Prof Shiv Mangal Singh ‘Suman’, Prof M S Gore, Prof M S Adiseshiah, Prof M S Valiathan were among some of the stalwarts who served AIU as its Presidents.

AIU is a think tank body and has a dynamic and vibrant academic wing established under the aegis of the Ministry of Education, and Government to provide an intellectual forum for academics and experts to work towards the development of Indian higher education. Its Important activities are to conduct such programmes that would help to improve standards of instruction, examination, research, internationalization, scholarly publications, library organization, governance, administration and management of higher education, and most importantly capacity building in higher education. The regular academic activities include conducting Research Studies,



organizing capacity-building programmes, publications, consultancy, and creating databases and portals to provide support to the academic community and students on various dimensions of higher education.

As a think tank body, AIU is assumed with the responsibility of providing concerted support of the Indian Higher Education fraternity to the Government of India in addressing all crucial issues of national and global importance. To garner consensus and collective wisdom on various issues related to higher education and also other national and global issues seeking the support of the higher education system, AIU convenes the Meets of Vice Chancellors at the Zonal and National levels every year. India is a country with a large geographical area, for ease of reaching out, AIU has grouped the member HEIs into 5 zones—East, West, North, South, and Central. Each zone is constituted of HEIs located in 5-6 States grouped in that Zone. Thus annually, 5 zonal and one national Meets of the Vice Chancellors are organized. These Meets are important platforms not only to discuss the significant issues of higher education but also to play a catalytic role in finding solutions for different problems and carry forward the voice of the participating leaders of higher education to appropriate agencies and authorities for their dispensation.

The fact that India is placed at 120th rank in the Sustainable Development Report—2021 instigated AIU to take some urgent action in this regard and support the Government of India in realizing the 2030 Agenda of the United Nations. Due to their unique position in society, the HEIs have immense scope and potential to contribute towards achieving all the 17 SDGs and thereby accomplishing the 2030 agenda. It was observed that in India, there is a lot of tacit contribution of HEIs towards realizing SDGs but there is no data on classified efforts of HEIs on the same. In the Impact Ranking of Times Higher Education which assesses universities with reference to their contribution to realizing UN SDGs, only 2 public universities and 9 private universities could find a place. This again compelled AIU to think about whether the Indian Higher Education Institutions are responsible enough in their approach towards sustainability in delivering education. Most importantly, it makes us ponder why we are not able to tap the potential of HEIs in achieving SDGs. To apprise the Indian HEIs about their role, and to reinforce them to take up the task of accomplishing SDGs as their prime responsibility, AIU as a representative body of HEIs in India organized all the Zonal and National Vice Chancellors Meets in 2021-22 on the theme ‘Realising Sustainable Development Goals through Higher Education Institutions’. In each Zonal Meet, a set of 4 closely related SDGs were discussed and in the Annual Meet, all the 17 SDGs were taken up for discussion.

The Annual Vice Chancellors’ Meet was held during 23-25, March 2022 in partnership with UNESCO which was graced by the Hon’ble Vice President of India, Shri Venkaiah Naidu as Chief Guest. Hon’ble Governor of Karnataka, Shri Thaawar Chand Gehlot, and Shri T S Tirumurti, Permanent Representative of India to the United Nations also graced the event as Special Guests. Several experts from the United Nations, Officers from various Ministries, Officers of NITI Aayog, the Government of India, Vice Chancellors of various Indian Universities, and experts from NGOs and Industries participated in all the zonal and national Meets.

At the Annual Meet, there was a unanimous declaration by the Vice Chancellors with regard to the role of Indian HEIs to support the Government of India in accomplishing the UN SDG Agenda 2030 which was named as ‘Mysore Declaration on Realizing United Nations Agenda 2030 through HEIs’.





SDG-1: End Poverty in All Its Forms Everywhere

Summary

SDG-1 is defined as “End poverty in all its forms everywhere” and has five clear targets to be achieved by 2030. The UN mission is to ensure that all men and women have equal rights to economic resources, and no one suffers for the lack of financial security. Resources need to be mobilized with care and distributed equitably throughout the world. This chapter outlines the context and the UN SDG mission with reference to poverty. It traces the efforts world-wide to eradicate this malaise, and the steps taken in India; how far they are successful; and future course of action to achieve SDG-1 targets. Finally, it suggests ways and means by which Higher Education Institutions (HEIs) can contribute to society and make a concerted effort to eradicate poverty. HEIs have the advantage of learned faculty and younger, energetic students to work among poor. HEIs can play an important role in eradicating poverty through innovation, education, research and entrepreneurship for the economic upliftment of the poor sections of the society.

Key Recommendations to Achieve SDG-1

- HEIs to give preference to local produce and manpower for all services and products to be consumed by HEIs.
- HEIs to engage with local under-represented communities for social research and their economic upliftment.
- HEIs should organise financial literacy programmes for rural literate and illiterate people and make them aware about schemes like Jan Dhan Yojana, etc.
- HEIs should give more focus on people, process and technology, and concentrate more education of rural youth for developing employability and entrepreneurship skills.
- HEIs should develop new affordable daily use devices for low-income communities.
- Develop and implement rapid and sustained economic growth policies and programmes, in areas such as health, education, nutrition and sanitation, allowing the poor to participate and contribute to the growth.
- Organize community-based social outreach programmes and volunteer in various extension activities that help to explore social issues, promote equity and social justice, educate and work towards economic empowerment.

1. Context and Current Status of SDG-1

1.1 The Context and Status

What is poverty? A poor person is one who is deprived of the financial and material means to meet the bare necessities of life. As one of the world’s most apparent and widespread social problems, poverty is also one of the most difficult to wipe out. Social hierarchy has been divided into two groups: the wealthy and the poor, the haves and the have-nots. The less fortunate are forced to



endure deplorable living circumstances in which they lack approach to basic necessities such as clean water, sanitation, food, and jobs. Over the last few decades, governments and humanitarian groups have implemented a variety of strategies aimed at eradicating poverty.

When it comes to poverty, children are the most affected. Poverty-stricken families are unable to provide a healthy environment for their children, and as a result, the cycle of poverty continues. Being impoverished has a devastating effect on both the person and the nation as a whole. Children from low-income families develop into adults who are less productive than they should be, earn less money, and make fewer beneficial contributions to the economy and society. Poor growing conditions have a negative impact on cognitive development, educational attainment, dependency on public assistance, and the likelihood of a criminal lifestyle, which in turn raises the likelihood of imprisonment. As a result, these youngsters are deprived of a healthy and nurturing environment wherein they can develop physically, intellectually, and emotionally. Struggling for the necessities of life consumes all their time and energies, leaving hardly any scope for intellectual growth.



Figure 1: SDG-1 Current Status

Source: <https://unstats.un.org/sdgs/report/2021/>

Why do we need to eliminate poverty? What are the long-term effects of living in a poor locality? These are the questions that a civilized society needs to ponder. Getting rid of poverty is the greatest



task that the human race has in its quest for peace, joy, and fulfilment. Poverty has enormous social, economic, and psychological impact on whole society. The Children's Défense Fund in its Report clearly shows that poverty affects both children and adults equally. When children continue to grow in the state of poverty, they may not turn out to be potential adults with capabilities to earn and thus remain in poverty in their adulthood also. Consequently, the entire society suffers, employers and businesses may not get good workforce, consumers pay more, hospitals and health insurers spend more on preventable illnesses, teachers spend more time on remediation and special education, citizens are less safe on the streets, government pays to shelter homes and homeless families, and judges are engaged in dealing with more cases of criminal and domestic violence. Poverty impacts us all, individually, and socially.

In 1990, three-quarters of the world's population was impoverished; by 2015, that figure has fallen to 10%. However, change was gradual, and the COVID-19 pandemic erased years of progress in the fight against poverty. Economic repercussions of global pandemic are expected to increase global poverty by half a billion people, or 8% of the world's Global poverty has grown for the first time in 30 years (Guterres, 2020). While significant progress has been achieved in eradicating extreme poverty, it remains a substantial problem in the least developed countries, tiny island states, some middle-income countries, and countries that are currently or have recently been in conflict or a post-conflict environment. Over 700 million people (or 10% of the world's population) continue to struggle to meet their most basic needs, such as health care and education, as well as access to safe drinking water and sanitation. In Sub-Saharan Africa, the vast majority of people live on less than \$1.90 a day. The poverty rate in rural areas is more than three times higher than in urban areas (17.2% vs. 5.2%) (United Nations, 2019).

1.2 United Nations Sustainable Development Goal 1 Targets

The first of the SDG targets identified by the United Nations is to eradicate poverty in all its manifestations. Poverty, which the UN describes as not just a Human Rights issue affecting hunger but also as a lack of opportunity, limited access to key services, and social engagement. To achieve SDG-1, five targets have been defined along with indicators to measure the achievement of the targets. These targets are listed as follows:

Target 1.1: By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than \$1.25 a day.

Target 1.2: By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions.

Target 1.3: Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable.

Target 1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance.

Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters.

Target 1.a: Ensure significant mobilization of resources from a variety of sources, including through enhanced development cooperation, in order to provide adequate and predictable means for developing countries, in particular least developed countries, to implement programmes and policies to end poverty in all its dimensions.

Target 1.b: Create sound policy frameworks at the national, regional and international levels, based on pro-poor and gender-sensitive development strategies, to support accelerated investment in poverty eradication actions.



1.3 Summary of Progress on SDG-1 Implementation Globally

The United Nations has made extraordinary efforts to assist the impoverished and destitute. The 2030 Agenda for Sustainable Development, which was accepted by all United Nations Member States in 2015, establishes a framework for human and environmental well-being. This plan has 17 Sustainable Development Goals (SDGs), which serve as an urgent call to action for all countries to collaborate globally. The 2030 Agenda for Sustainable Development's fundamental purpose is to eradicate poverty in all of its manifestations worldwide. The pandemic, COVID-19, has increased worldwide poverty by up to 8% of the world's population, despite the fact that pre-pandemic international poverty rates have been cut in half since 2000.

The Secretary-UN General's COVID-19 Response and Recovery Fund was established by the United Nations in April 2020 as a framework for an urgent socioeconomic response to COVID-19. As part of the UN COVID-19 Response and Recovery Fund, the UN wants to help the poorest nations affected by the epidemic, as well as the most vulnerable populations. Leading female UN officials gathered under the auspices of Deputy Secretary-General Amina Mohammed, have asked for full financing of the UN Response and Recovery Fund as well as support for the UN roadmap for social and economic recovery.

Although significant progress had been achieved in reducing poverty in several Eastern and Southern Asian nations before the outbreak of COVID-19, up to 42% of people in Sub-Saharan Africa remained impoverished. Developed nations, too, became vulnerable to the financial repercussions caused due to epidemic. According to the United Nations Development Program (UNDP), impoverished countries will suffer an estimated \$220 billion in economic losses, and 55% of the global population will not access any form of social assistance (United Nations, 2019). This would harm the educational and human rights institutions of many countries and their basic food supplies.

Having a job does not ensure a reasonable standard of life for employees. It is estimated that 8 percent of the world's employed population and their families were living in severe poverty in 2018. The decrease of poverty necessitates that all children and other vulnerable groups have access to social protection. Baseline forecasts predicted that 6 per cent of the world population will still be living in extreme poverty in 2030, well short of the goal of eliminating poverty by then. Over 70 million people are at risk of falling into extreme poverty as a result of the pandemic. Poverty and hardship can have a long-lasting impact on a children's mental and physical health. Roughly 55% of the world's population – about 4 billion people at the time – did not get any social protection in 2016, according to the United Nations. This is a large number that needs to be curtailed.

Focusing on the elimination of global poverty, the General Assembly, at its seventy-second session, resolved to announce the Third United Nations Decade for the Eradication of Poverty (2018–2027). An overarching goal of this Decade is to keep the momentum going that was built up under UN Decade II for the Eradication of Poverty (2008–2017). Internationally approved development goals, including the Sustainable Development Goals, will also be supported by the Third Decade.

After the Asian Financial Crisis of the late 1990s, global severe poverty was affected in 2020 for the first time by the coronavirus disease 2019 (COVID-19) pandemic. Because of the problem, disaster preparedness and social safety nets are more critical than ever. In response to the pandemic, several countries have implemented regulations to reduce their country's catastrophic risk. Still, more efforts are needed on all fronts to guarantee that the most vulnerable are protected. Prior to the COVID-19 pandemic, the proportion of the global population living in extreme poverty had decreased from 10% in 2015 to 9.3% in 2017. This translates into a decrease of 741 million people living on less than \$1.90 per day to 689 million. However, the rate of decline dropped to less than half a percentage point per year between 2015 and 2017, down from one percentage point per year between 1990 and 2015. The pandemic has retarded this progress and exacerbated the dangers of conflict and climate change. According to estimates, the global poor would expand by between 119



million and 124 million people by 2020, with 60 percent residing in Southern Asia. The effects of the pandemic will be long-lasting. According to current forecasts, the global poverty rate will be 7% (about 600 million people) in 2030, falling short of the aim of eradicating poverty.

According to a recently released UNESCO document, education is essential for escaping chronic poverty and preventing poverty from passing down through the generations. Low-income countries have a greater rate of return than high-income countries. There is a greater return on investment in primary education than in secondary school. Everyday workers may expect to see a 10 percent improvement in their pay after only one year of schooling. Food security arrangements are also influenced by education. Primary education in 13 nations was studied in 1980 in research that is still widely cited today. It discovered that four years of schooling resulted in an 8.7 percent yearly increase in productivity (Lockheed, Jamison, and Lau, 1980). Education can be a powerful catalyst in the fight to eradicate severe poverty in a long-term and sustainable manner.

In order to eliminate poverty, the city of Ijebu-Ode launched the Urban Poverty and City Consultation Process Programme. When the initiative started in 1998, almost 90 percent of the population lived below the poverty level of USD 1 per day. The scheme (originally established by DPC, Development Policy Centre, Ibadan, Nigeria, and backed by UN Habitat Urban Management Programme) aimed at raising inhabitants' income, by delivering vocational education and micro-credits. The key part of the initiative was to launch a city consultation process, engaging national, regional, municipal authorities, and other relevant stakeholders. The Ijebu-Ode Development Board IDB was created to increase the community's trust in the plan and offer supervision.

The IDB collected and administered finances, issued micro-credits, and coordinated vocational training. These initiatives considerably decreased poverty. Through micro-financing and new productive activities, more than 8,000 employments were generated. Cooperatives, based on sustainable scientific technology and indigenous practitioner knowledge, for producing crops, small animals, and fish were developed. Funds received by IDB helped to renovate the municipal hospital. The programme achieved considerable success in poverty reduction and employment. Furthermore, it succeeded in building a participatory culture via the process of public municipal dialogue and strengthened collaboration between different parties.

1.4 Initiatives and Achievements of Indian Government on SDG-1

There is solid evidence that India's rapid growth after 1991's economic reforms has resulted in a major reduction in poverty. In the post-reform era, poverty has decreased across all economic, social, and religious categories on a national and state level. Sustaining growth (6.2% from 1993-94 to 2003-04 and 8.3% from 2004-05 to 2011-12) has provided productive employment and contributed to the increase in salaries and remuneration, thereby benefiting the poor. Additionally, it expanded the government's revenue stream, allowing it to maintain a high level of social investment and therefore tripling the direct effect of growth on poverty.

Numerous large-scale anti-poverty initiatives have been undertaken. For example, the Mahatma Gandhi National Rural Employment Guarantee Act generated approximately 2 billion person-days of employment in 2016-17 alone, primarily for the poorest members of society. Additionally, attempts to provide pensions and insurance to unorganized sector workers, widows, and the differently-abled have been established. Over 130 million people have benefited from these programmes by purchasing life and accident insurance. Efforts are also being made to ensure universal access to essential services. To meet the goal of universal housing, direct financial support is being expanded to low-income households. In rural areas, about 3.21 million dwellings were created as part of this plan. Additional efforts are being made to ensure that women and children have equal access to education, healthcare, and food security. Sanitation and access to safe drinking water are also significant concerns. Roughly 77.5 percent of rural households obtain 40 liters of potable water per day. Currently, 18.9 percent of the population is protected. Since 2005-2006, just 29.1 percent



of rural households have had access to upgraded sanitary facilities. The *Pradhan Mantri Ujjwala Yojana* has provided Liquefied Petroleum Gas (LPG) to nearly 22 million households as clean cooking fuel. Families having access to clean energy increased from 25.5% in 2005-06 to 43.8% in 2015-16. Advancements in food and nutrition security have been made. Stunting among children under the age of five years reduced from 48.4 percent in 2005-06 to 38.4 percent in 2015-16 due to better nutrition. Over the same period, underweight children dropped from 42.5% to 35.7%.

However, the staggering number of stunted and underweight children continues to be significant. Numerous schemes are being implemented to remedy this. For example, approximately 800 million people in India are covered by the Public Distribution System, which provides food grains at inexpensive costs. The Mid-Day-Meal Programme feeds 100 million students in primary schools with nutritious cooked meals. Additionally, administration of food distribution is being reinforced through the digitization of ration cards and the establishment of an online complaints process. Sustainable and climate-adaptive agriculture has been bolstered by efforts such as organic farming promotion and the distribution of 62 million Soil Health Cards to farmers and a thorough plan is being launched with the goal of tripling the income of farmers .

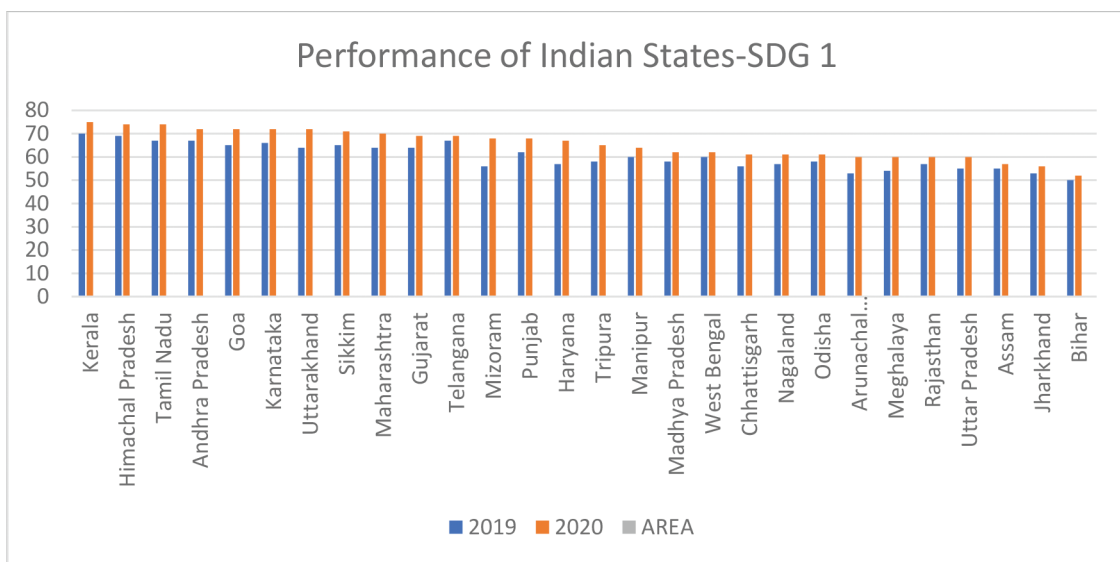


Figure 2: Performance of Indian States in SDG-1

Source: <https://sdgindiaindex.niti.gov.in/#/ranking>

Poverty is more than just lack of money and means to get over the long haul. Malnutrition, lack of access to critical services, social exclusion, and a lack of participation in decision-making are just a few examples of poverty’s many manifestations. With an estimated 400 million Indians living in urban slums by 2030, the population of these areas is likely to soar. Poverty, inequality, and rapid urbanization in India must all be addressed if the Sustainable Development Goals are to be achieved.

1.5 HEIs Status: Role of Higher Educational Institutions and Status of Adoption of SDG-1

The future of higher education is dependent on the mission and dedication of institutions that have achieved a wonderful balance between the welfare state model and the cost-sharing model. Taking morally from the wealthy and affluent in order to help others who are less fortunate is not simply a fairy tale or mythical concept. Affluent students from over the world might be attracted to private institutions which can provide them with the greatest educational and living experience at the most inexpensive price. Some of the income thus generated may be used for the benefit of the economically challenged, creating self-help centres to make them financially independent. Community service



through the NSS or other such volunteer groups would go a long way in creating an awareness for the need of economic parity and also generating funds through charitable events from time to time. It is essential that value education is imparted at all levels, so the right kind of values are instilled in the younger generation so that consumerism gives way to compassion and greed to kindness. Mere charity is not enough; the effort should be to empower and enable the have-nots. In this direction, institutions may encourage project work, research studies, and practical hands-on aid to nearby villages, smaller settlements, and the socially backward classes. It is critical that higher education providers throughout the spectrum strike a balance between teaching, research, and community engagement in order to combat poverty. There is a danger in going too far in any or all of these directions, so a balance has to be maintained.

The right to education must be universal and without discrimination for everyone to live a better life. One of the primary reasons of poverty in emerging countries is the high percentage of the population that is not properly educated. High poverty rates and limited infrastructure, particularly in rural areas, exacerbate the difficulty of accessing basic education. As a result, the potential of children to develop their abilities and better their standard of living is diminished, perpetuating the vicious circle of poverty. Education is a critical aspect of a society's growth of human capital and the well-being of its population. By enhancing the quality of school instruction and increasing student access to it, perfect conditions for the development of cognitive competency are created. The poorest families are those with the shortest life expectancies, the highest frequency of health issues, exceptionally high maternal mortality rates, and the lowest nutrition levels. Many parents in the world's poorest countries want to provide their children an education, despite the hardships they face. We should offer a high-quality educational experience and the possibilities that follow. As a result, we owe them school and educational facilities that meets their expectations, and the opportunities that follow the completion of education. Education directed at disadvantaged and underprivileged populations will undermine many of the systemic reasons that have slowed the growth of poor communities. Education can help prevent poverty from being passed down through generations. Additionally, education has been shown to have a positive effect on health, nutrition, economic development, and environmental protection. Food insecurity and poor nutrition are, no doubt, the result of poverty and unfair resource distribution, but they are also the result of a lack of information about production methods and nutritional facts. Children who are ill or hungry will not attend school - or their performance will be hampered because of their poor health and nutrition. Many children in underdeveloped nations are born with serious nutritional and cognitive deficiencies. According to estimates, up to one-eighth of all infants born in poor nations are malnourished, and 47% of children in low-income countries remain malnourished until they reach the age of five. Malnutrition in childhood impairs the children's physical and cognitive capacity, as well as non-cognitive characteristics such as motivation and persistence. Through basic education, marginalised groups get a better understanding of health and improve their ability to protect themselves and their children from disease. The health of children and adolescents improves when their parents are educated. This boosts their chances of acquiring education and benefiting from it. It is critical to remember that advancements in one area benefit multiple others, and we must always seek the most beneficial synergy. There is a massive gap in policy and objective congruence between the SDGs that Indian universities have contributed to and those that they have not. However, awareness appears to be rising with one of India's private universities, OP Jindal Global University releasing its 'Sustainable Development Report 2021,' which outlines the University's achievements and commitment to fully implementing key SDGs on campus. Similarly, a number of other universities have begun projects that emphasise work relating to the SDGs but this is not enough. More effort needs to go into such work. All HEIs must perform an in-depth self-assessment of their current sustainable practises and commit to implementing the SDGs through a documented policy and set of targets.

The University Grants Commission (UGC) had set a goal of increasing the Gross Enrolment Ratio (GER) in higher education to 30% by 2020, up from the earlier 25.4 percent. "The objectives include regular curriculum revision with clearly-defined learning outcomes and soft skills, enabling



the youth to secure employment/self-employment, developing social-industry connections, ensuring the availability of motivated teachers, and establishing accreditation to ensure qualitative self-improvement in HEI." The National Education Policy (NEP) 2020 focuses on a system of education rooted in Indian culture that directly contributes to the sustainable transformation of India, or Bharat, into an equitable and vibrant knowledge society by offering high-quality education to all and therefore developing India into a global knowledge superpower.

One of the fastest methods for HEIs to start their journey towards the SDG implementation is by creating Massive Open Online Courses (MOOCs). There are several HEIs, universities and UN sponsored platforms that have already initiated MOOCs that focus on SDG-1. Some of these are listed in Table 1.

Table 1: Some of the MOOCs Related to SDG-1 Offered by Various HEI

SDG Target	Course	Platform	Sponsor
End Poverty	From Poverty to Prosperity: Understanding Economic Development	edX	University of Oxford
Global Poverty	The Challenges of Global Poverty	edX	Massachusetts Institute of Technology
Inequality	America's Poverty and Inequality Course	edX	Stanford University
Social Exclusion	Human Rights, Human Wrongs: Challenging Poverty, Vulnerability and Social Exclusion	edX	SDG Academy
SDG 1	Understanding and Solving Poverty and Inequality	Future Learn	University of York

Education is frequently referred to as the great equaliser: it has the potential to connect a family to the employment, resources, and skills they require to not only survive, but prosper. Access to a high-quality primary education and supportive services for children is a globally recognised solution to the poverty cycle. This is partly because it also addresses a slew of other factors that contribute to the vulnerability of the community (figure 3).



Figure 3: The Impact of Education on Poverty

2. Recommended Actions for HEIs for Achievement of SDG-1

Those in positions of leadership in education must ensure that institutions of higher education play a significant role in citizen empowerment and poverty eradication by: (a) acting as socially responsible institutions; (b) educating their faculty and students in the values, knowledge, and attitudes associated with the concept of a decent society founded on human dignity and basic

social justice, both nationally and internationally; and (c) preparing students for careers. To create a new vision for university education in the twenty-first century, we must evaluate the following scenarios: pedagogy and curriculum, research, social responsibility, institutional governance, and the physical and sociocultural surroundings in which institutions of higher education function. For example, Walker (2012a) has worked on the formation of a professional committed to the common good and the design of curricular dimensions (2012b), as well as the specific list of capabilities he considers to be measurable objectives in university curricula (2006), Nussbaum, 2002, Nussbaum, 2006 on capability building for democratic citizenship, and Boni, McDonald, and Peris (2012) on cosmopolitan qualities.

Table 2: Minimal Recommended Actions for The HEIs for Implementation of SDG-1

Minimal Recommended Actions for HEIs	
	<ul style="list-style-type: none"> Provide policymakers with the knowledge and tools to enable them to evaluate the effects of policy decisions on people's livelihoods.
	<ul style="list-style-type: none"> Involve multidisciplinary and multinational team of policy analysts, social and natural scientists and engineers for having a participatory and holistic approach to formally evaluating ecosystem services and poverty in the context of the wide range of changes that are occurring
	<ul style="list-style-type: none"> Prepare students to be socially responsible citizens committed towards poverty alleviation
	<ul style="list-style-type: none"> Organize various community-based social outreach programmes and volunteer in various extension activities that help to explore social issues, promote equity and social justice, educate and work towards economic empowerment.
	<ul style="list-style-type: none"> Support the local community by purchasing food at farmers markets and make sustainable, nutritious food choices by purchasing from sustainable businesses that support and work toward zero hunger
	<ul style="list-style-type: none"> HEIs should provide support structures for students living in poverty, such as scholarships and assistance packages.
	<ul style="list-style-type: none"> Sensitizing the students about poverty, its ramifications and remedies through special classes, social media and mobilizing the students.
	<ul style="list-style-type: none"> Developing the habit of Philanthropy by campaigning the concept 'Charity before Luxury' among the faculty and students so that they spare some money for charity purposes before spending on any luxury item.
	<ul style="list-style-type: none"> Undertaking the activities like financial literacy, community orientation towards poverty, etc. under the community engagement dimensions.

In terms of research, from a development standpoint, it may be prudent to reconsider scientific research and knowledge transfer, the fundamental values that justify individual and collective well-being, citizen participation, citizen empowerment, and sustainability, all of which are connected to the university's social responsibility. In terms of university governance, it is worthwhile to examine the institution's internal decision-making processes, which we refer to as democratic procedures, as well as the types of policies that affect internal university actors, such as teacher selection and training procedures, student admission processes, and the performance of Higher Education managers or executives, as well as policies that affect external agents, such as other public or private organisations, civil society, etc.



Figure 4: What HEIs Can Do

Specifically, institutions of higher education can contribute towards the implementation of SDG 1 in the following manner:

A. Self-help and Awareness Drives

Imparting knowledge about waste management.
Helping in rain water harvesting and spreading awareness of the importance of conserving water.
Adopting a few of the neediest nearby villages and undertaking the task of their economic upliftment.
Imparting awareness regarding child vaccination which most of the rural population either ignores or are ignorant of.
Organizing sports event s which would include people and youngsters from the nearby villages and holding tournaments for them, thereby helping them in staying motivated.
Imparting knowledge about basic banking opening accounts, FDs, utilization of money etc.
Making the women aware of their basic rights through Women’s Cell. Higher Education Institutes can send experts to visit underprivileged households and listen to the problems of the women. They can help them to speak out about their problems, and also help them seek justice through the correct medium.

Figure 5: Self-help and Awareness Drives

B. Community Engagement Activities

- Recruiting peons, sweepers, gardeners, security and drivers from the adopted/nearby villages.
- Organizing blood donation camps.
- Eye check-up camps.
- Vaccine drives.
- Planting trees not just for shade but also fruit-bearing trees.
- Granting scholarships to bright students with an economically weak background.
- Conducting activities like essay writing, drawing competitions, dance and singing competition, etc., and nurturing the talents of gifted students.
- Making available safe drinking water.

Figure 6: Community Engagement Activities

C. Encouraging Women Initiatives

- Organizing short-term vocational courses for women such as cookery, stitching, knitting, embroidery, pottery, beautician, etc, to enable them to earn money and contribute towards the income of the household.
- Running Nursery Teachers' Training courses for the literate women. This can enable them to get decent well-paid jobs.
- Encouraging the Tiffin system. Women can cook meals and deliver to the students and faculty of the institute.
- Teaching them to create vermicompost.
- Installing bio gas plants.
- Teaching them how to sell their products online.
- Teaching them to use internet and social media to promote their hidden talents.

Figure 7: Encouraging Women Initiatives

D. Implementation Strategies for HEIs to Realize SDGs

Institutions of Higher Education have the advantage of being custodians of knowledge that can improve the lives of all who aspire for a better living. They also have the infrastructure and the manpower to make a difference to society. With time they may grow and evolve into self-contained university townships that steadily reach out to wider segments of society, helping the less privileged attain a better lifestyle through the dissemination of information, advice, and other help in various ways – providing them jobs and regular pay hikes, enabling and empowering them to enhance their economic status as well as their aspirations. Education does not simply



mean getting a degree which may not be worth the paper it is printed on unless it is used for the good of others. It means being a useful citizen of the world, capable of contributing to the welfare of mankind, doing one's share to make the world a better place to live in. This is what institutions of higher education need to keep in focus. Teaching and research should be done in a way that is both sustainable and effective in order to reduce poverty and boost development along utilitarian lines. The attainment of knowledge is the most effective defence against poverty, social isolation, and inequity. As Nelson Mandela said, "Education is the most potent weapon you can employ to change the world." Step by step integration process of SDGs in HEI system is depicted in Figure-8.

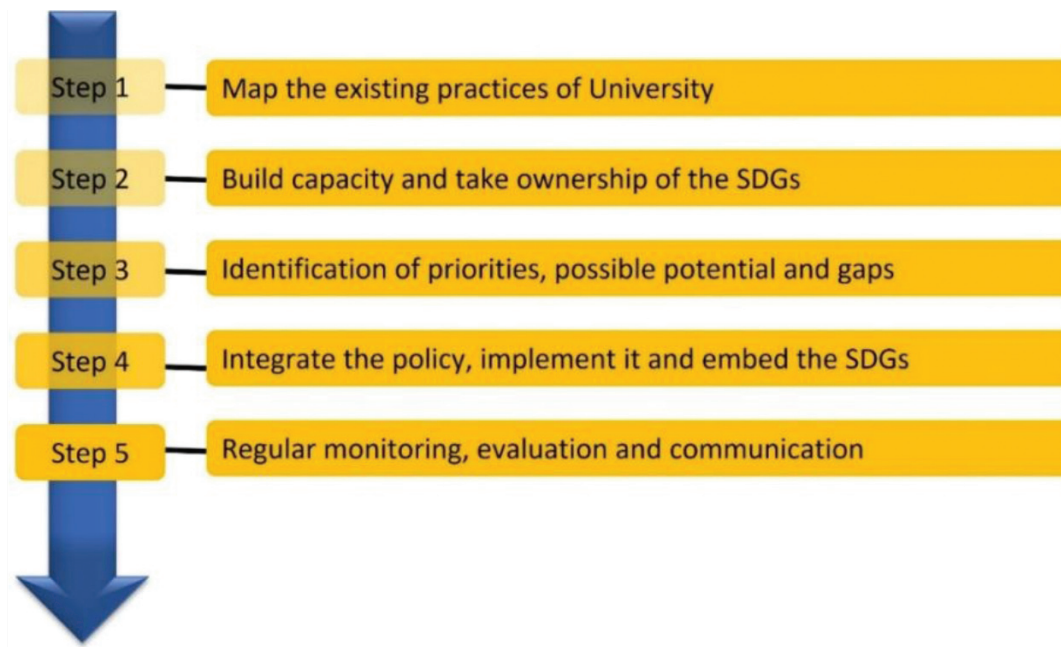


Figure 8: Step-by-Step Integration Process of SDGs in HEIs

2.1. Role of Technology in Achieving the SDG-1

Technology and innovation are critical for achieving Sustainable Development Goals and the 2030 Agenda (SDGs). Technology may be used to identify impediments to development and give solutions for sustainable development at all levels, from the local to the global. Further, to assist evidence-based sustainable development, policy design, implementation, follow-up, and assessment, the science-policy interface has become an increasingly significant component of the UN system. It has also played a key role in recognising growing needs, creating connections across theme issues, and developing solutions to overcome challenges and roadblocks. ICT (Information and Communication Technology) allows millions of individuals to enhance their productivity and have better means of income and livelihood by delivering fast and accurate information to empower the hitherto deprived sections of society and providing equal access to economic resources. It encourages work and financial inclusion by providing services like mobile banking and micro crediting, as well as offering small producers and their products access to markets. Hence, it is imperative that technology be used for the betterment of humankind and to alleviate poverty everywhere.

3. Proposed Research Agenda for HEIs and Governmental Bodies

Table 3: Main Research Areas and Actions that can be Followed for SDG-1 Implementation

Research area	SDG-1 Target	Need of Research	Key Activities / Actions
Food production	No poverty	Enhancing agricultural productivity vis a vis income	Identify innovative techniques for productivity in agriculture to increase income
Marketing of surplus	Eradicate extreme poverty	Improving the income of growers, the sale of surplus food grown in urban and peri-urban areas has the potential to create jobs	Delineate the supply chain, linkage to direct markets
Government schemes	Implement nationally appropriate social protection systems	Identifying the key areas for improving social protection schemes	Improve access to social protection schemes via technology
Ensuring equal rights, and access to technology	Equal rights to ownership, basic services, technology, and economic resources	How to provide seamless access to technology at a lower cost to everyone	- Enhance coverage - Identifying hotspots

4. Recommendations for Government and Regulatory Bodies for Achievement of SDG-1

4.1. Recommendations for Government Agencies

Table 4: Minimal Recommended Actions for Government/Policy Makers

SDG 1 Target	Minimal Recommended Actions for Government Agencies/Policy Makers
End Poverty	Develop and implement rapid and sustained economic growth policies and programmes, in areas such as health, education, nutrition and sanitation, allowing the poor to participate and contribute to the growth.
Access to resources and amenities	Improve access of water and other natural resources. Most of the rural poor depend on agriculture or other natural resources for their livelihood. It is therefore, necessary that they have more equitable access to those resources, so they are better able to manage their resources.
Social Protection	Progressively developing social protection systems to support those who cannot support themselves
End poverty	Empower people living in poverty by involving them in the development and implementation of plans and programmes to reduce and eradicate poverty. Their involvement ensures that programmes reflect those things that are important to them.

4.2. Recommendations for Regulatory Agencies

Some recommended actions for regulatory bodies for SDG-1 achievement are listed as follows:

- 1) Regulatory bodies like NAAC, UGC etc., should incorporate SDG-1 related course package, both at graduate and postgraduate level and allocate special funding for the same.
- 2) Design/approve all India level specialized tests for entry into the HEIs offering the sustainability-oriented curriculums.
- 3) Conduct audits to monitor the quality and thoroughness of education and research in HEIs offering specialized courses and degrees related to SDG-1 and other SDGs.



5. Conclusions Along With Prioritization of the Initiatives Recommended

SDG-1 is defined as "End poverty in all its manifestations everywhere." This goal contains five distinct targets that need to be accomplished by the year 2030. The objective of the United Nations is to ensure that all people, regardless of gender, have equal rights to economic resources and that no one is forced to suffer as a result of insufficient financial security. The world's resources need to be gathered together with caution and then dispersed fairly across the globe. This chapter provides an overview of the situation as well as the mission of the United Nations in relation to poverty. It chronicles the efforts being made all over the world to eradicate this ailment, the many initiatives taken in India, how far they have been successful, and what more has to be done. Last but not least, it recommends ways and means by which institutions of higher education might contribute to society by making a concentrated effort to alleviate poverty. The younger generation, which is full of vitality and enthusiasm to make a difference in the world, tends to populate universities, which is a benefit for these institutions. It is possible to harness their vigour in order to make a difference and help reduce the harshness of life for those in more disadvantaged areas of society. Recommendations are as follows:

- Develop and implement rapid and sustained economic growth policies and programmes, in areas such as health, education, nutrition and sanitation, allowing the poor to participate and contribute to the growth.
- HEIs to provide policymakers with the knowledge and tools to enable them to evaluate the effects of policy decisions on people's livelihoods.
- Involve multidisciplinary and multinational team of policy analysts, social and natural scientists and engineers for having a participatory and holistic approach to formally evaluating ecosystem services and poverty in the context of the wide range of changes that are occurring
- Preparing students to be socially responsible citizens committed towards poverty alleviation
- Improve access of water and other natural resources. Most of the rural poor depend on agriculture or other natural resources for their livelihood. It is therefore, necessary that they have more equitable access to those resources, so that they are able to manage their livelihood in a better way.
- Progressively developing social protection systems to support those who cannot support themselves
- Empower people living in poverty by involving them in the development and implementation of plans and programmes to reduce and eradicate poverty. Their involvement ensures that programmes reflect those things that are important to them.
- Government should improve the existing policies and focus on natural resources conservation and distribution, social protection systems for the poor, training and involvement of the poor in government programmes.
- Regulatory agencies should ensure importance and priority be given to SDG-1 in regulatory course curriculum in the HEIs and also design special courses and tests for the same. Monitoring of the SDG related courses through special cell is likely to increase the rate of adoption by various HEIs.

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SDG-2: End Hunger, Achieve Food Security and Improved Nutrition and Promote Sustainable Agriculture

Summary

SDG-2 targets achieving zero hunger and ending all forms of malnutrition by 2030 under the paradoxical situation of mismatch of food availability and lack of access to food to millions across the globe. Addressing this issue requires concerted actions at local, national, and global level. There is a strong interest in SDGs across the globe as is evident from new partnerships and networks between national, state governments, universities, and global agencies. Several UN agencies like FAO, WHO, WTO, UNEP, and UNICEF are the custodian agencies for various targets of SDG-2. India, with its vast agricultural policy formulation, research, development, and programme implementation network, have initiated several policies and programs on a mission mode to address SDG-2. Institutes of higher education, research and development need to play faster and smarter roles of the scale of Green Revolution to address the issue of zero hunger, malnutrition, and sustainable agriculture.

In this chapter, 5 broad areas for research and 40 implementation strategies for the HEIs, and 31 policy recommendations for government and 4 recommendations for regulatory bodies to achieve the SDG-2 targets are presented. Apart from a literature review, examples, and detailed case studies of SDG-2 implementation in action are provided. In the present scenario, to achieve or attain the targets of Zero Hunger, it is necessary to promote sustainable food production systems and resilient agricultural practices; and providing equal access to land, technology, and markets to boost agricultural productivity. The HEIs and Government can also play an important role in achieving the targets of SDG-2 with innovative research on malnutrition and implementing government policies at the ground level.

Key Recommendations to Achieve SDG-2

- Each HEI should monitor, document and disseminate the data on food wastage in its campus and develop strategies to reach zero food wastage.
- Research and development efforts for quality improvements in food crops, climate-smart farming technologies, promoting the production and extension of the portfolio of biofortified food crops, improving the farm productivity, devising models for promoting Hi-tech and High-density farming for round-the-year cash-flow.
- Train farmers for value addition and post-harvest management of agricultural produce, especially, highly perishable products.
- Encourage private parties (including religious/philanthropic bodies) to participate in feeding vulnerable sections of the society on a voluntary basis and incentivize agricultural practices for soil organic carbon enhancement (through public or private efforts).





- Expand and strengthen partnerships and collaborations with international agencies and HEIs to address the issue of sustainable food systems, Agri-trade, and climate change.
- There is a need for strategic planning for improving agricultural higher education to attract more youth to come forward to take courses in agriculture and serve in the fields. professionally trained and educated farmers will bring impact achieving SDG-2 in multifarious ways.
- Undertake more research studies to optimise Indian agriculture with the resources available in the country. For example, producing more crops with less use of water; effective storage techniques, etc.
- Government should find effective ways of food storage and transportation to minimise the loss of food products in storage.
- Providing sustainable, nutritious and affordable food choices on campus and continuously conducting eat right campaign.
- Facilitating food production on campus
- Offering fresh food markets on campus
- Introducing measures to reduce food waste on campus

The Context and Current Status of SDG-2

1.1 The Context and the Current Status

Hunger and malnutrition are problems that influence all forms of developmental activities – the essence is very aptly captured in the old Hindi saying “bhooke bhajan na hoye Gopala”. An estimated 2.37 billion people are unable to eat a healthy balanced diet on a regular basis while about 810 million people worldwide are estimated to be undernourished. Further, about 22 percent of children of age 5 and below are stunted worldwide. The task to end all forms of hunger and malnutrition by 2030 thus, is a challenging one, and the COVID-19 pandemic has added further challenges (FAO, 2021).

1.2 United Nations Sustainable Development Goal-2 Targets

To achieve SDG-2, the following targets have been defined along with 13 indicators to measure the achievement under the targets. The following are the 13 indicators along with the targets:

Table 1: SDG-2 Targets and Indicators

SDG targets	Indicators
1. 1. 1 Target 2.1	2.1.1 Prevalence of undernourishment
1. 1. 2 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious, and sufficient food all year round.	2.1.2 Prevalence of food insecurity
1. 1. 3 Target 2.2: By 2030, end all forms of malnutrition, including achieving by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women, and older persons.	2.2.1 Prevalence of childhood stunting 2.2.2 Prevalence of childhood malnutrition (wasting and Overweight)
1. 1. 4 Target 2.3: By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists, and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment.	2.3.1 Production per labour unit 2.3.2 Income of small-scale food producers





<p>1. 1. 5 Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.</p>	<p>2.4.1 Sustainable food production</p>
<p>1. 1. 6 Target 2.5: By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed.</p>	<p>2.5.1 Genetic resources in conservation facilities 2.5.2 Local breed at risk of extinction</p>
<p>1. 1. 7 Target 2.a: Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries.</p>	<p>2.A.1 Agriculture orientation index 2.A.2 Official flow to agriculture</p>
<p>1. 1. 8 Target 2.b: Correct and prevent trade restrictions and distortions in world agricultural markets, including through the parallel elimination of all forms of agricultural export subsidies and all export measures with equivalent effect, in accordance with the mandate of the Doha Development Round.</p>	<p>2.B.1 Agricultural export subsidies</p>
<p>1. 1. 9 Target 2.c: Adopt measures to ensure the proper functioning of food commodity markets and their derivatives and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility.</p>	<p>2.C.1 Food Price anomalies</p>

Different agencies of the United Nations are involved in policy making, and furtherance of policy objectives at regional and country level through several programmes. Some of the UN agencies are custodian agencies for different targets of SDG2 while others are actively involved in contributing towards meeting the targets of the goal. Some case studies on implementation of SDG-2 are provided in Annexure-1.

Food and Agriculture Organization is a custodian UN agency for 21 indicators for SDGs and a contributing agency for four more. Similarly, United Nations Children’s Fund, WHO, UNEP, and Organization for Economic Cooperation and Development, United Nations World Trade Organization are other custodian agencies for different indicators of SDG-2. It is important to address food trade restrictions for making food available to people in different regions and WTO works to correct and prevent trade restrictions and distortions in world agricultural markets; and reports annually to the UN’s High-level Political Forum (HLPF) on WTO efforts to achieve tradespecific targets in the SDGs.

There are advocacy hubs established for different SDGs including UN SDG-2 Advocacy Hub that coordinates global campaigning and advocates to achieve targets of SDG-2. Other initiatives of the UN are setting up the SDG Fund, as UN development cooperation mechanism which is involved in implementing Agenda 2030. Importantly, for SDG-2 the United Nations World Food programme (UNWFP) is the world’s largest humanitarian organization addressing hunger and promoting food 21

security. UN Women works for advancing gender and climate-smart agricultural policies and to stop hunger by supporting women’s role in food security as the cornerstones of food production and utilization. Further, UNAI Hub - the United Nations Academic Impact Hub - has also started SDG hub for focused attention on SDGs. Initiatives and Achievements of Indian Government in SDG-2



India has taken several initiatives on a mission mode to address the targets of food security and nutrition, which are important components of SDG-2. Apart from different initiatives, the government launched the National Nutrition Strategy in September 2017 which is a major step towards addressing malnutrition and hunger in a sustainable way. As a part of the strategy, the flagship initiative of POSHAN Abhiyan for holistic nourishment aims at reducing the level of stunting, under nutrition, anaemia, and low birth weight babies by 2022. India is one of the countries that volunteered to take part in Voluntary National Review (VNR) of the progress in SDGs at the high-level political forum in 2017.

Several other programmes are also being run on a mission mode to address the issue of zero hunger and malnutrition. The National Mission on Sustainable Agriculture (NMSA) is a comprehensive scheme with four major components viz. (i) rainfed area development programme, (ii) on-farm water management programme, (iii) soil health management programme, and (iv) climate change and sustainable agriculture monitoring and networking programme. Some of the programmes under the mission are soil health card scheme, Paramparaghat Krishi Vikas Yojna, Pradhan Mantri Krishi Sinchai Yojna, etc. In fact, the mission to make agriculture sustainable started in 2013 but the renewed focus is to promote location-specific Integrated/ Composite farming systems to make agriculture more productive, sustainable, remunerative, and climate resilient. Emphasis is on 'water use efficiency' - using suitable soil and moisture conservation strategies to conserve natural resources, and to maximize the use of water resources through efficient water management for 'more crop per drop', nutrient management, and livelihood diversification. Table 2 & 3 shows the performance of states and UT's on SDG-2 indicators.

Table 2: Performance of states and UTs on indicators of SDG-2

Sr. No	SDG-2 Indicators	Indicator Value (Range)	High Performer States/UTs
1.	Percentage of beneficiaries covered under National Food Security Act (NFSA), 2013	19-100	Arunachal Pradesh, Kerala
2.	Percentage of children under five years who are underweight	0-43	Chandigarh, Lakshadweep
3.	Percentage of children under five years who are stunted	0-42	Chandigarh, Lakshadweep
4.	Percentage of pregnant women who are anaemic	0-68	Chandigarh, Daman & Diu
5.	Percentage of adolescents who are anaemic	0-46	Chandigarh, Lakshadweep
6.	Rice and wheat produced annually per unit area (Kg/ha)	0-4974	Chandigarh, Punjab
7.	Gross Value Added (constant prices) in agriculture per worker (in Lakhs/worker)	0-4	Goa, Chandigarh

*(Data Source: NITI Aayog, 2021)



Table 3: Status of States and UTs on Indicators of SDG-2

Sr. N	Performance Level	States/UTs (No.)	SDG-2 Index score (range)	High Performer States/ UTs (Top two)
1	Aspirant (0-49)	14	19-46	West Bengal, Gujrat
2.	Performer (50-64)	12	50-64	Nagaland, Delhi
3.	Front Runner (65-99)	11	66-97	Chandigarh, Kerala
4.	Overall Average	-	47	-

*(Data Source: NITI Aayog, 2021)

National Food Security Mission works to fulfil the goal of providing food to all – which is also a legal entitlement of the people. Under the targeted public distribution system (PDS) subsidized food is provided to underprivileged people through a food distribution network, even to remote areas of the country. Another significant attempt at making India malnutrition-free is being made through the Mission for Integrated Development of Horticulture and National Nutrition Mission. This is a multi-ministerial convergence mission to improve the nutritional status of children, adolescent girls, pregnant women, and lactating mothers in a time bound manner. Further, the ‘midday meal scheme’ is a big step forward to tackle the problem of malnutrition among school going children. \

With an aim to maintain farmers’ production and incomes, incentives under different schemes encouraging resource use efficiency, providing subsidies on seed, fertilizers, chemicals and machinery, particularly high-tech farm equipment, and promoting protected cultivation are being provided. The Minimum Support Price (MSP) for different crops is announced by the government on year-to-year basis to support farmers’ income. Further, sub-markets in hinterlands are being promoted with appropriate development of associated infrastructure like roads, market structure etc. Another important initiative is E-NAM, an electronic trading portal, to network the existing APMCs to create a unified national market for agricultural commodities. National Mission on Agriculture Extension and Technology takes care of dissemination of modern production, protection, and marketing technology and information to the farmers.

India already has several initiatives, policies, and programmes those can effectively help in realizing the goal of ending hunger (SDG-2). Other focused programmes include the National Scheme for Welfare of Fishermen, National Livestock Mission and National Programme for Bovine and Dairy Development, *Pradhan Mantri Fasal Bima Yojana*, *Gramin Bhandaran Yojna*, Micro Irrigation Fund (MIF), etc. Regular monitoring of the progress made under different targets of SDG-2 is carried. Some such examples of various schemes/initiatives/ programmes have been summarized in Table 4. The NITI Aayog has carried out detailed mapping of all 17 SDGs and 169 targets to nodal central Ministries, centrally sponsored schemes, and major government initiatives. The Parliament also organizes Forums to develop policy and action perspectives on elimination of poverty, address issues arising out of climate change, etc.

Table 4: Summary of various schemes/initiatives/programmes initiated by the Government of India.

SDG Target	Centrally Sponsored Schemes
2.1 to 2.4	DAC&FW National Food Security Mission (NFSM), MIDH, NMOOP, NMAET- National Mission on Agriculture Extension and Technology (SAME, SMSP, SMAM, SMPP), Rashtriya Krishi Vikas Yojana (RKVY)
2.4	National Mission for sustainable Agriculture (Rainfed Area development RAD, SHM, PKVY, SMAF-Sub Mission on Agro-forestry) <i>Pradhan Mantri Krishi Sinchai Yojna (PMKSY)</i>

2.1 to 2.5	DADF <i>National Livestock Mission (NLM) (Core)</i> Livestock Health and Disease Control (Core) National Food Security Act Mid-Day Meal Scheme <i>Rashtriya Gokul Mission</i>
2.1 to 2.4	Other Public Distribution System (PDS) National Nutrition Mission (Core) National Food Security Act Mid-day Meal Scheme
2c	e-NAM and other market interventions

1.4 HEIs Status: Role of Higher Educational Institutions and Status of Adoption of SDG- 2

Global concerns for success of the efforts made on SDGs is resulting into new partnerships and networks between national governments, local governments, non-governmental organizations (NGOs), international non-governmental organizations (INGOs), universities and policy forums. For example, UNESCO has partnership with the University of Bergen in Norway to establish the Global Independent Expert Group on the Universities for the 2030 Agenda (EGU-2030), where the International Science Council and International Association of Universities (IAU) are also supporting partners. The EGU-2030 is mandated to propose guidelines on the role of universities in contributing towards SDGs, via knowledge development, research, and education strategies.

In India, several farm universities and other specialized universities are supplementing the efforts of the government to end hunger and achieve food security. Universities can contribute towards government efforts through education and research to achieve sustainability in agriculture. One of the fastest methods for HEIs to start their journey towards the SDG implementation is by creating Massive Open Online Courses (MOOCs). There are several universities and UN sponsored platforms that have already initiated MOOCs that focus on various SDGs. Some of these are listed in Table-5. Some of the actions/ programmes that HEIs/ universities, especially specialized farm universities, can take are listed as under:

Table 5: Some of the MOOCs related to SDG-2 offered by various HEIs

Course Title	SDG Focus	Platform	Sponsor
Sustainable Food Security: Food Access	SDG-2	edX	Wageningen University & Research
Zero Hunger and SDG 3: Good Health and Well-being for People	SDG 2 and SDG 3	Coursera	Erasmus University Rotterdam
Sustainable Food Systems: A Mediterranean Perspective	SDG2	edX	SDG Academy
Sustainable Food Systems: The value of systems thinking	SDG 2	edX	Wageningen University & Research
Sustainable Food Security: Food Access	SDG 2	edX	Wageningen University & Research
Feeding a hungry planet: Agriculture, Nutrition and Sustainability	SDG 2	edX	SDG Academy
Future Food: Sustainable Food Systems for the 21st Century	Generic	Future Learn	University of Exeter

Unravelling solutions for Future Food problems (Coursera)	Generic	MOOC	Universiteit Utrecht
A Nutritional Approach to Agriculture and Food Security	SDG 2	Future Learn	University of Leeds
Sustainable Global Food Systems	SDG2	edX	University of Edinburgh
Designing Multidimensional poverty index		MOOCS	University of Oxford, UNDP
Measuring sustainable development	Generic		SDG academy
Understanding poverty and inequality	Generic		SDG academy
Feeding a hungry planet	SDG2	MOOCS	SDG academy
Climate Change: the Science and Global Impact	SDG2	MOOCS	SDG academy
SDG Indicator 2.1.1 – Prevalence of Undernourishment (PoU)	SDG2	MOOCS	UNSDG: Learn

2. Recommended Actions for HEIs for Achievement of SDG-2

- To focus on making agriculture productive, attractive, and sustainable through innovative, scientific and climate smart technologies. This would require professionalizing farming to attract both talent and capital.
- Emphasize and work for creating conducive policy climate for collaboration at different levels for food security through establishment of advocacy hub for different targets of Goal-2.
- Active association with different UN agencies through appropriate processes to improve efficacy of the efforts made to meet SDG targets in different regions. This could be through national or regional focused member-based associations – such as the ACTS - Australasian Campuses towards Sustainability, Environmental Association for Universities and Colleges (EAUC), and Association for the Advancement of Sustainability in Higher Education (AASHE), etc.

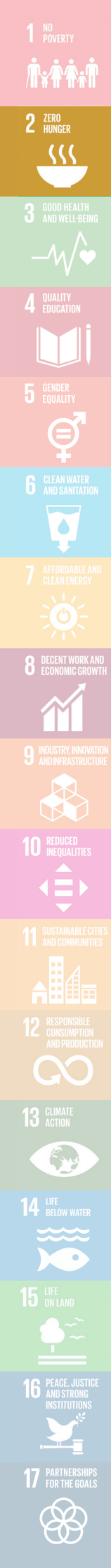
Create SDG-2 Advocacy Hubs

HEIs can commission special studies, both in scientific and socio-cultural domain, on the ways to address SDG targets to help the policy makers to address the issues in a better way. Such advocacy hubs, through larger international collaboration, can be effective voices against using food as weapon/diplomatic policy tool by many governments. Further, the Table-6 describes the minimal recommended actions for the HEIs for implementation of SDG-2.

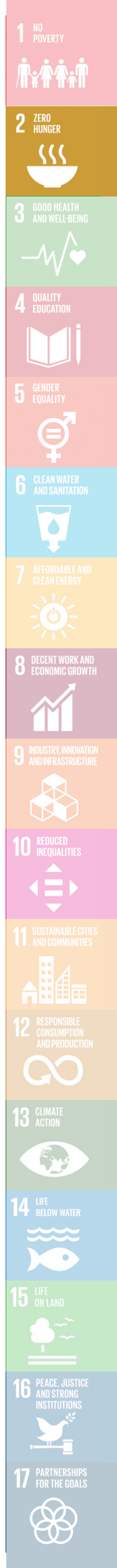


Table 6: Minimal recommended actions for the HEIs for implementation of SDG-2

SDG-2 Target	Recommended actions for HEIs
2.1	<ol style="list-style-type: none"> Promote student volunteering activities that address food security issues through student groups involved in awareness creation, hygienic collection, and distribution of surplus food from hostels, hotels, and other such places for distribution among the vulnerable section of the society. This could be done in a collaborative mode with other HEIS/ local bodies. Develop exchange relationships with regional universities for providing training on addressing the food security issues and conducting awareness programmes at the field level related to different central and state government initiatives like PDS, Midday Meal (MDM), etc. to minimize hunger and malnourishment. Conduct training programmes for awareness creation and for promoting greenhouses so that the farmers can set up these facilities at their own level to grow offseason crops for year-round availability of agri-produce. Continuous research & development efforts for quality improvements in food crops. Also, HEIs can take up research to increase shelf-life of different foods, especially perishables. Introduce measures to reduce food waste on the campus and at the community level on the lines of save food campaigns. The issue of hunger, apart from economic and physical access constraints, also has socio-cultural dimensions. As effective change agents, HEIs can play a significant role via educational campaigns, particularly on the importance of rethinking on socio-cultural taboos that result in food wastage in many socio-religious gatherings. We need to work for creating a climate where the prevalence of hunger in the neighbourhood is a common shame. HEIs can contribute through intensive collaborative research efforts to help reduce the post-harvest losses of agricultural produce, which at present are high in the range of 30- 40% for different agri-produce. Research and development contribution to improve processing (especially primary processing), and supply chain management in agriculture would contribute significantly towards meeting SDG-2 targets. HEIs especially agri-HEIs can emphasize to incorporate target-wise action plans for sustainable food systems in curricula for actions at local level to achieve the larger goal of zero hunger and malnutrition.
2.2	<ol style="list-style-type: none"> HEIs, especially agriculture, medical, and biotechnology, should undertake comprehensive research & development, and extension oriented projects to promote the production and extension of the portfolio of biofortified food crops. Biofortification is one of the most inexpensive means to take care of micronutrients (like iron and zinc) deficiency. Promote back yard supplementary agri-enterprises like poultry farming, mushroom cultivation etc. among the unemployed rural youth to lessen the protein deficiency. Promote/ strengthen the schemes like mid-day meals, creches, etc. on campuses, with appropriate modifications/ partnerships. HEIs should develop and provide package of practices for commercial cultivation of underutilized and indigenous crops, which are highly nutritious and rich in bioactive compounds A consortium of HEIs of a region should have a standardized mechanism for sustainable management for achieving different targets of SDGs. A given HEI can focus on select SDGs depending upon the strength of the HEI. Institution-level committees can be established to monitor progress and further suggest actions to empower faculty, staff, and students to be change agents and drivers of sustainable innovations in agriculture.



<p>2.3</p>	<ol style="list-style-type: none"> 1. Research on developing climate-smart farming technologies, with a focus on small-scale food producers. 2. HEIs should work to improve energy efficiency in agriculture which would lead to increased food production, increased incomes and increased food and nutritional security also. 3. Organize intensive village awareness campaigns to promote crop/ variety/ enterprise diversification, especially among small farmers for income improvement and income stability. 4. Develop ergonomically efficient farm machineries especially designed for the small-scale and topographically distinctly located farmers and since a fair share of manual labour in farming comes from women, any improvements in this regard will be of immense help to them. 5. HEIs should take steps to train farmers for value addition and post-harvest management of agricultural produce especially highly perishable products such as horticultural commodities. 6. HEIs should make research and development efforts for devising models for promoting Hi-tech and High-density farming for round – the - year cash-flow in farming.
<p>2.4</p>	<ol style="list-style-type: none"> 1. HEIs should work to develop the database on different ecological, economic, social, and climatic parameters for regional sustainable agricultural land use planning. 2. Promote organic and natural farming through standardized trainings and awareness modules, and through the introduction of the material in course curricula. 3. Help sustain the small-scale grower communities by developing partnerships with cooperatives and producer organizations and thus enhancing the resilience of these farmers to cope with adverse conditions. 4. Strive for investment in research and development of sustainable agricultural technologies through university-industry collaboration. 5. Agri-HEIs in particular should use their resources in appropriate manner to promote the implementation of conservation agriculture to preserve ecosystem. For this, HEIs can have different formal and informal clubs/groups working with farmers through KVKs, programmes like Lab-to-Land etc. Other HEIs can have collaboration with agri-HEIs for the purpose and also include in curricula the material about the same. 6. Comprehensive studies on water harvesting and soil conservation techniques should be taken to cope with extreme weather problems. All HEIs should work on rainwater harvesting to have a scale impact. 7. Zone-wise standardization of techniques like laser guided land leveller and MIS (microirrigation systems) using AI will promote optimum water use. 8. Expand and strengthen partnerships and collaboration with international agencies and HEIs to address the issue of sustainable food systems, agri-trade, and climate change. 9. Emphasize development of climate smart crops in research programmes to cope with different stresses and develop suitable zone-specific crop diversification models 10. HEIs should focus on improving the farm productivity to narrow down the gaps in farm productivities across region. Also, should focus on narrowing the gaps between the farm productivities of progressive farmers and other farmers in the region. 11. HEIs need to plan long term experiments on the suitability of farming systems (including crops, livestock, forest trees etc.) in different agroclimatic conditions to attempt optimal resource use efficiency.



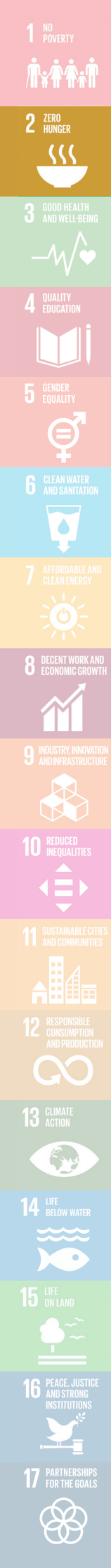
2.5	<ol style="list-style-type: none"> 1. HEIs should focus on preservation of agricultural genetic resources for their special role on food security. There is a need for comprehensive survey and documentation exercise that HEIs can take in a collaboration mode. 2. Survey and Documentation of Indigenous Technical Knowledge (ITK) and Indigenous Agricultural Practices (IAPs) found suitable in sustainable agriculture should be taken up and also patented. 3. Agricultural, Biotechnology and medical HEIs, in particular, should endeavour to establish gene banks for food and other crops, including conservation of their wild relatives. 4. HEIs should make efforts to sensitize farmers about unique traits of indigenous breeds of different animals for their conservation and use in further development. 5. HEIs should undertake the targeted selection and further development of superior germplasm for its conservation and use in further development. 6. HEIs can focus on training of farmers for quality seed production and motivate them towards maintaining the genetic diversity of these crops.
2(a)-2(c)	<ol style="list-style-type: none"> 1. Extension wings of Agri-HEIs need to be strengthened both in lines of human resources and other facilities. These wings also need to incorporate more technology including AI for efficient dissemination of information. 2. HEIs should strive for long-term research and development partnerships with foreign universities and UN and other international institutional agencies for the flow of funds, sharing of technology and information. 3. HEIs should take up comprehensive research on international agri-trade to come out with policy paper to better understand how trade distributions can be addressed at the policy and at implementation level keeping in mind the interest of own farmers. 4. Awareness campaigns on various applications (apps) for market information 5. Conducting research studies aimed at enhancing transparency in traceability of commodities in agricultural supply chain.

3. Proposed Research Agenda for HEIs and Governmental Bodies

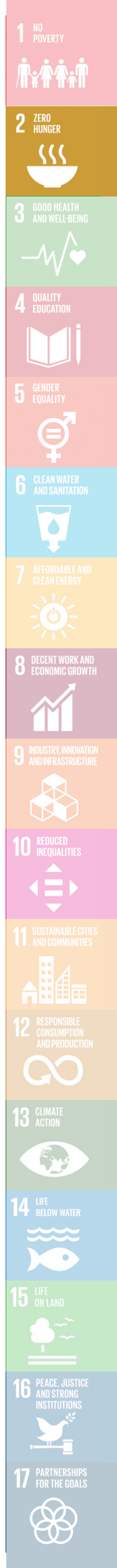
Table 7: Main Research Areas and Actions that can be followed for SDG-2 implementation

Research area	SDG 2 Target	Need of Research	Key Activities / Actions
Food Security	2.1	Coping up with the issues of food insecurity and sustainable development perspective necessitates understanding relationships between technical, environmental, economic and social dimensions related to food production, availability, quality and access.	<ul style="list-style-type: none"> Sensitize people against food wastage by forming faculty and students' groups in HEIS. Modernize hostel kitchens to improve energy use efficiency and make concerted efforts for using technology for hygienic handling of surplus hostel food for distribution among the targeted people. Encourage farmers to go for protected cultivation for sustained production. Intensive research on refinement of structure, layout and material used in polyhouses to withstand wind pressure to avoid heavy damages to the structures to promote year-round production. While HEIS can take up research on these aspects, government agencies need to incentivize adoption of such new technologies. HEIS to take actions at research & development and extension level to reduce post-harvest losses of agriproduce. Research on extending shelf-life of the products would need to be encouraged. Government can expedite the creation of suitable and adequate food storage, and processing facilities, including through greater involvement of private sector. Encourage private parties (including religious/philanthropic bodies) to participate in identifying and taking care of food needs of vulnerable sections of the society on a voluntary basis. Encourage private sector investment in supply chain management of fresh and processed agri-produce. Monitor various food distribution schemes to ensure adherence to quality norms and to check pilferage. A check on diversion of agricultural lands to other uses to be considered in planning process, as far as practical

Crop Biofortification	2.2	<p>Biofortification is an effective tool to reduce micronutrient malnutrition. Biofortification thus complements fortification and supplementation programmes, which are most effective in centralized urban areas and then spread to rural areas.</p>	<ul style="list-style-type: none"> • Agri-HEIs should prioritize research on biofortified crops, and also develop package of practices for commercial cultivation of underutilized indigenous crops. • In the light of climate change scenario, further research on developing high yielding, short duration, and drought resistance varieties is needed. • Promote diversification of crops/varieties/ animal breeds for improved and stable farm incomes. • Incentivize pulses production to feed plant protein in vulnerable situations. • Encourage progressive/ innovating farmers to play a role in hand-holding others to promote innovative and remunerative in their vicinity. • Encourage youth to take up activities like poultry farming, mushroom cultivation to alleviate protein deficiency.
Value addition and postharvest management	2.3	<p>Post-harvest management and value-addition are essential components of agricultural production for reducing postharvest losses, meeting consumer demands, preserving nutritional quality, optimizing byproduct utilization, and creating job opportunities</p>	<ul style="list-style-type: none"> • Research on developing and standardizing zonewise climate-smart farming systems and technologies for high value commercial crops. • Trainings on home scale primary processing/ preservation for value addition and post-harvest management of agricultural produce. • Provide easy access to agri-services through the strengthening of the KVK network and further promote agri-clinics in the private sector to cater to varied needs of information, consultancy, farm inputs, processing, and marketing etc. • Strengthen agri-clinics, agro-advisory services, KVKs to provide trainings and production, value addition, marketing of the produce.



<p>Water harvesting and soil conservation</p>	<p>2.4</p>	<p>Soil erosion is one of the most serious threats to soil and water resources among the various degradation processes. Soil erosion is accelerated by intensive agricultural practices. Similarly, increased groundwater exploitation resulted in groundwater depletion. As a result, holistic management of soil and water resources is critical for agricultural sustainability as well as natural ecosystem protection</p>	<ul style="list-style-type: none"> • Generate sound database on different ecological, economic, social, and climatic parameters for regional land use planning, water, and soil conservation. • Research on organic and natural farming for assessing production and soil conservation potential. Agri-HEIS to promote implementation of conservation agriculture to preserve ecosystem. • Encourage resource pooling by farmers, especially small and marginal farmers to enhance their resilience to cope with adverse farming conditions. • Focus on agri-engineering to develop ergonomically efficient farm machineries and equipment, especially for the small-scale and topographically difficult areas. • HEIs to enlist private investment in research & development of sustainable agricultural technologies with a focus on water conservation and its efficient use. • Incentivize agricultural practices for enhancement of soil organic carbon. • Dedicated timebound research & development studies on rainwater harvesting and for using AI for water use efficiency. • Emphasize development of climate smart crops in research programmes to cope with different stresses and develop suitable zone-specific crop diversification models. • Promote rainwater harvesting through different micro and macro watershed programmes.
<p>Crop gene bank preservation</p>	<p>2.5</p>	<p>Due to changing farming systems, as farmers experiment with and adopt new crops and varieties, this narrowing of crop diversity at both the species and genetic levels has implications for the global agri-food system's productivity, stability and resilience.</p>	<ul style="list-style-type: none"> • Preservation of agricultural genetic resources by comprehensive survey and documentation exercises. • Carrying out R& D for conservation of wild relatives of crops. • Endeavor to establish gene banks for crops and animals for their conservation and use in further development • HEIS should undertake the targeted selection and further development of superior germplasm for its conservation and use in further development. • Work for branding and getting IPRs for different agri-resources, including commonly used wild resources. FPOs can play a role in this regard.



4. Recommendations for Government and Regulatory Bodies for Achievement of SDG-2

4.1 Recommendations for Government Agencies

The Key action points for Govt/policy makers for effective implementation SDG-2 are given in table 8:

Table 8: Minimal Recommended actions for Government/Policy makers

SDG-2 Target	Minimal Recommended actions for Government/Policy makers
2.1	<ol style="list-style-type: none"> 1. There is a need to update information on the actual number of people in vulnerable situation facing hunger. This will help in clear identification of such families and areas for better planning for mitigating the situation. 2. Introduce measures to reduce food waste. A high amount of food production goes waste because of unscientific harvesting, packing and paucity of storage facilities, particularly for perishable produce. 3. Incentivize flow of private sector investments in food processing and efficient supplychain management. 4. Encourage farmers to go for protected cultivation for sustained production. 5. Promote backyard/ rural poultry farming, especially among the unemployed rural youth to lessen the protein deficiency. 6. Strengthen and enlarge the scope of schemes like POSHAN and Saksham Aanganwadi. 7. Encourage private parties (including religious/philanthropic bodies) to participate in feeding vulnerable sections of the society on a voluntary basis.
2.2	<ol style="list-style-type: none"> 1. There is a need to emphasize and incentivize production of biofortified crops. 2. Increase allocation towards fortified mid-day meal, take home ration, hot cooked food to children and mothers in creches and hospitals for prevention and control of micronutrient deficiencies. 3. Govt bodies should conduct the awareness programmes regarding malnutrition 4. Increase the area under high yielding and short duration varieties to increase the food grain production. 5. Encourage raising of high yielding animal breeds to increase milk/meat/egg production for food security. 6. Strengthen schemes like Pradhan Mantri Kisan SAMPADA Yojana (Scheme for AgroMarine Processing and Development of Agro-Processing Clusters) to provide big boost to the growth of food processing sector in the country for generating better returns to farmers, creating employment opportunities especially in the rural areas, reducing waste of agricultural produce, increasing processing level and enhancing the export of processed foods. 7. Incentivize pulses production to feed plant protein in vulnerable situations.

<p>2.3</p>	<ol style="list-style-type: none"> 1. Create a comprehensive data base on different indicators of SDG (on the lines of Cost of Cultivation Schemes/AERCs) to have a clear picture for better planning to achieve the goal. Identified HEIS can work as nodal agency for the same and associated Govt agencies /Departments can share the relevant data with these nodal agencies. 2. Provide easy access to agri-services through the strengthening of the KVK network and further promote agri-clinics in the private sector to cater to varied needs of information, consultancy, farm inputs etc. 3. The system of e-NAM needs to be strengthened for providing equal market opportunities to marginal and small farmers as well. Supply chain for agro-produce, especially for perishables like fruit and vegetables, needs scientific and capital-intensive interventions to strengthen the same. 4. Promote value addition and branding of farm produce. While large scale private sector participation would be needed and should be encouraged, primary and small-scale processing units can also be run and/or owned by FPOs to create stakes and improve farmers' incomes. 5. There is a need to promote crop and farm enterprise diversification. Research and extension wings of Agriculture Universities (AUs) need to be further strengthened to work on these lines in a mission mode.
<p>2.4</p>	<ol style="list-style-type: none"> 1. Concentrate on professionalizing agriculture to enlist participation of youth. This would require scaling up of the use of technology, including AI, for optimum use to resources, especially water. 2. Promote rainwater harvesting through different micro and macro watershed programmes. Most of agriculture in the country is highly dependent on rains and augmenting irrigation potential is crucial for improving the productivity and for sustainable farming. 3. Many crops (saffron, kalajeera, apple, cardamom etc) grown in the country are dependent on the stability of their production niches. Development actions and climate change are adversely impacting such micro niches and efforts need to be made through research in HEIs to understand and suggest niche stabilization measures; for which HEIs need to be funded on long term basis. 4. There is an urgent need to promote soil organic carbon (SOC) as our soils are largely deficient in SOC, particularly in the top plough layer. Programmes to promote green manuring, vermicomposting, and use of farm biowaste for manures needs to get further attention in planning process. 5. Consolidation of farm landholdings to make them economically viable should be targeted on a priority. Fragmented holdings are taking the toll of efficiency in production and marketing. Additional emphasis is thus needed on checking fragmentation of land holdings and/or operating these holdings on cooperative or in some other ways of land polling. In this regard, changes in land lease procedures (as also suggested by NITI Aayog) may be helpful in this regard. 6. There is a need to strengthen agri- and other HEIS to promote research on sustainable agriculture and the extension wings of the Govt and that of agri-HEIs need to be strengthened further to bridge the gap between the farm productivities of progressive and other farmers. 7. Check diversion of agriculturally suitable lands for non-agriculture uses. Development planners need to take this into consideration as often agriculturally suitable land is often acquired for industrial/other physical development activities. This also adversely impacts the productivity of remaining surrounding agriculture areas in the vicinity of acquired lands. 8. International partnership and collaboration in food production systems, trade, health services, and climate change research should be encouraged by the government.

2.5	<ol style="list-style-type: none"> Country has taken up the task of establishment of gene banks of crops and domesticated animals. Yet there is a need to further strengthen this program to expand the coverage, including the conservation of wild relatives of different crops. An intensive survey of local farming systems, with sizeable component of traditional crops and livestock, need to be conducted to supplement the efforts made in development of gene banks. Indigenous farmers utilizing such crops and animals can be associated to promote the efforts of maintaining genetic diversity. Documentation of Indigenous Technical Knowledge (ITK) and Indigenous Agricultural Practices (IAPs) of the traditional sustainable farming for their patenting. Incentivize agricultural practices for soil organic carbon enhancement (through public or private efforts).
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4.2 Recommendations for Regulatory Bodies

The regulatory bodies like ICAR, Veterinary Council of India, UGC, etc. should encourage HEIS (especially Agri-HEIs) to modify the course curricula and their teaching, research, and extension education approach to develop SDG-2 sensitive future professionals.

Specific action points for key regulatory bodies are identified as follows:

- ICAR should emphasize on AUs to mandatorily incorporate SDG2 related course package, both at graduate and postgraduate level; and such HEIs should be compensated through additional funding.
- Design/approve all India level specialized tests for entry into the HEIs offering the sustainability-oriented curriculums. Also, include sustainability and SDG related questions in existing tests like ICAR-NET etc.
- Conduct audits to monitor the quality and thoroughness of education and research in HEIs offering specialized courses and degrees related to SDGs and sustainability.
- Make recommendations to the central and state governments to bring about positive changes in higher education with reference to sustainability and SDGs for better awareness and for the generation of adequate number of future professionals who are specialized in the field.

5. Conclusion Along with Prioritization of the Initiatives Recommended

Promoting sustainable food production systems and resilient agricultural practices, providing equal access to land, technology, and markets to boost agricultural productivity are the need of the hour to attain Zero Hunger. Some of the important recommendations are:

1. HEIs must conduct focused research and projects concerning SDG-2, especially in areas of biodiversity, gene collection banks, refining of traditional technologies etc.
2. Government should encourage international partnership and collaboration in food production systems, trade, health services, and climate change research.
3. The Government should encourage crop and farm enterprise diversification. Further, the Research and extension wings of AUs need to be further strengthened to work on these lines in a mission mode.
4. The HEIs that demonstrate high level of excellence in imparting education related to sustainability and research must be rewarded by the government so that others also follow.
5. HEIs, especially agri-HEIs, must start working for the achievement of SDG-2 by offering graduate and postgraduate level courses and MOOCs related to the same.



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Annexure -1: Case Studies

- World Food Programme in Haiti

World Food Programme (WFP) school feeding programme is considered to be the largest food Safety net in the country. Every school day, WFP delivers hot meals to close to 300,000 children each day across more than 1,000 Schools, mainly public, throughout the country. AFP is working with the Government to develop a nationally owned school feeding program. An important milestone was reached in 2016 with the signature of the first National School Feeding Policy, Drafted in collaboration with WFP.

- World Food Programme in Angola

World Food Program works with various government entities to reduce vitamin and mineral deficiencies in the Angolan population and prevent stunting among under 2 through food fortification, and production of specialized nutritious foods. In line with the recently signed MoU, WFP Angola will support provincial authorities of Luanda to improve quality and coverage of the services for screening, detection, treatment and prevention of acute malnutrition among children under 5 years old.

- World Food Programme in Syria



WFP provides lifesaving food to 4.8 million people each month across all 14 governates of Syria. This includes distributing emergency food assistance to families in Northwest Syria to help them to meet their immediate needs in times of crisis.

- World Food Programme in Uganada

WFP provides cash/food assistance to meet the food and nutrition needs of over one million refugees as well as Ugandans affected by recurring climate shocks. Upon arrival, refugees receive high-energy biscuits at the border and hot meals in transit centers. They are then registered to receive cash or food as they settle down and are allocated with land. WFP works with partners to promote early transition from food assistance to self-reliance.

- In 2015, the GSMA Mobile for Development utility program awarded Sun Culture a grant to design and scale solar-powered irrigation systems that make it cheaper and easier for farmers in Kenya to grow high-value fresh fruits and vegetables. The Rain Maker is a solarpowered irrigation system aimed at smallholder farmers, utilizing pay-as-you-go technology to ensure affordability, and therefore extending access to water pumping solutions to underserved communities in the developing world, starting with Kenya.

- Share The Meal is one of 15 ideas for a better world in 2015.” (WIRED Germany) United Nations World Food Programme: “Share the Meal has the potential to revolutionize the fight against hunger. “With just a tap on your smartphone, you can feed a hungry child.

We call this “to share the meal”. The app allows you to help children wherever you are and whenever you wish – while you’re enjoying dinner with your friends or during your lunch break at work.

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SDG-3: Ensure Healthy Lives and Promote Well-being for All at All Ages

Summary

SDG-3 encompasses much more than the promotion, development, and protection of health. This objective on health and well-being is deeply intertwined with all other objectives and therefore achieving SDG-3 will have a significant impact on massive influence on fulfilling other target goals or objectives and vice-versa. The 2030 Agenda recognizes the importance of good health to long-term development and the interdependence of the two. Widening economic and social inequalities, rapid growth of urbanization, climatic and environmental threats on the current overload of HIV and other infectious illnesses, and evolving issues and challenges e.g., non-communicable diseases are all taken into account. COVID-19, has caused a worldwide health catastrophe, causing human misery, and toppling global economy. It also asks for a stronger emphasis on mental health concerns. This necessitates universal health coverage, including protection against financial risk, access to excellent necessary health care services, and safe, effective, quality, and affordable medicines. The present document is focused on recommendations to HEIs, government and regulatory agencies in order to achieve the targets of SDG-3 in India.

Key Recommendations to Achieve SDG-3

- HEIs to build dedicated infrastructure for yoga, meditation, and counselling to boost the physical and mental health of students, faculty, and the local community.
- The Government must promote the establishment of Health and Wellness Centres in states across the country and the scheme “*Mission Vikas Pariwar*” must target the entire country.
- Government should spend more on health education as there is a deficit of doctors in the country moreover as per data, 60 lakhs of students want to become doctors every year but seats are only 85000 so more seats be created in medical colleges.
- Medical education is expensive in private colleges in India and is unaffordable for the common man and government medical colleges are limited. There is a need to strike a balance and create more seats at affordable expenses for eligible students. We need to work on innovative models so that we can provide good medical education to our students and good medical facilities for the people.
- HEIs must have a mandatory monitoring system to check drug addiction among the youth.
- Organize internship program for all medical HEI students at the PHCs level and medical HEIs must also establish special training centres to train Anganwadi workers.
- Promote collaboration of HEIs with pharmaceutical industries to develop and manufacture medicines and boost traditional medicine CAMS (Complimentary Alternative Medicine System) in addition to promoting ethnographic research.



Context and Current Status of SDG-3

1.1 The Context and Current Status

Poor health constitutes suffering and deprivation of the most basic amenities and opportunities. Over the years, tremendous progress has been made in extending life expectancy and reducing some of the leading causes of infant and maternal mortality. Despite this worldwide development, there is still a growing proportion of infant death in Sub-Sahara Africa and South Asia. Although the prevalence of major infectious illnesses such as HIV/AIDS, malaria, and tuberculosis has decreased globally since the year 2000, the threat of these and new pandemics in the future remains in many parts of the world. Globally, tremendous progress has been made in developing new therapies, vaccines, and other healthcare technologies for better health and well being, but universal, affordable access to healthcare remains a barrier. Disease not only affects an individual's well-being, but also places a strain on family and public resources, degrades societies, and wastes potential. Consequently, people's health and well-being of all ages are one of the central issues for sustainable development. Protection from disease is the basic essential fundamental need to survive, enabling everyone and strengthening economic growth and success.

SDG-3 commits the international community to a global effort to eliminate disease, better treatment, and healthcare, and address new and emerging health issues. To improve public policy initiatives, it advocates for more innovation and study in these areas. A holistic approach to better health will necessitate universal access to healthcare and the inexpensive provision of drugs and vaccines. It also emphasizes the importance of refocusing on mental health issues. Suicide is the second prominent cause of global mortality among people between the ages of 19 to 25. Furthermore, because health and well-being are intimately related to the quality of our environment, SDG-3 aims to significantly reduce the morbidity and mortality caused by air, water, and soil pollution [1].

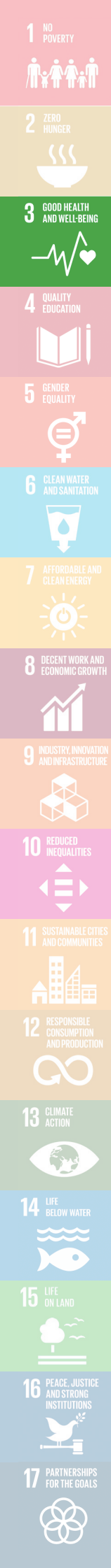
1.2 United Nations Sustainable Development Goal 3 Targets

To achieve SDG-3, ten targets have been defined along with indicators to measure the achievement of the targets. These targets are listed in Table 1.

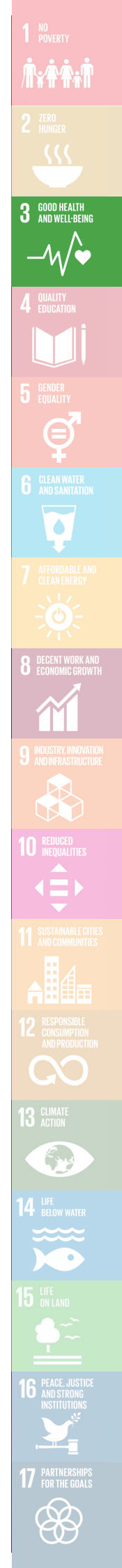
Table 1: UN Targets and **Indicators** for SDG-3 (Good Health and Wellbeing)

3.1	By 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births. Indicators: 3.1.1 Maternal mortality ratio 3.1.2 Proportion of births attended by skilled health personnel
3.2	By 2030, end preventable deaths of neonatal and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births. Indicators: 3.2.1 Under-five mortality rate 3.2.2 Neonatal mortality rate
3.3	By 2030, end the epidemics of AIDS, tuberculosis, malaria, and neglected tropical diseases and combat hepatitis, water-borne diseases, and other communicable diseases. Indicators: 3.3.1 Number of new HIV infections per 1,000 uninfected populations, by sex, age, and key populations 3.3.2 Tuberculosis incidence per 1,000 population 3.3.3 Malaria incidence per 1,000 population 3.3.4 Hepatitis B incidence per 100,000 population 3.3.5 Number of people requiring interventions against neglected tropical diseases





<p>3.4</p>	<p>By 2030, reduce by one-third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being.</p> <p>Indicators:</p> <p>3.4.1 Mortality rate attributed to cardiovascular disease, cancer, diabetes, or chronic respiratory disease</p> <p>3.4.2 Suicide mortality rate</p>
<p>3.5</p>	<p>Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol.</p> <p>Indicators:</p> <p>3.5.1 Coverage of treatment interventions (pharmacological, psychosocial and rehabilitation, and aftercare services) for substance use disorders</p> <p>3.5.2 Harmful use of alcohol, defined according to the national context as alcohol per capita consumption (aged 15 years and older) within a calendar year in litres of pure alcohol</p>
<p>3.6</p>	<p>By 2020, halve the number of global deaths and injuries from road traffic accidents.</p> <p>Indicators:</p> <p>3.6.1 Death rate due to road traffic injuries</p>
<p>3.7</p>	<p>By 2030, ensure universal access to sexual and reproductive health-care services, including family planning, information and education, and the integration of reproductive health into national strategies and programs.</p> <p>Indicators:</p> <p>3.7.1 Proportion of women of reproductive age (aged 15-49 years) who have their need for family planning satisfied with modern methods</p> <p>3.7.2 Adolescent birth rate (aged 10-14 years; aged 15-19 years) per 1,000 women in that age group</p>
<p>3.8</p>	<p>Achieve universal health coverage, including financial risk protection, access to quality essential health-care services, and access to safe, effective, quality, and affordable essential medicines and vaccines for all.</p> <p>Indicators:</p> <p>3.8.1 Coverage of essential health services (defined as the average coverage of essential services based on tracer interventions that include reproductive, maternal, neonatal, and child health, infectious diseases, non-communicable diseases, and service capacity and access, among the general and the most disadvantaged population)</p> <p>3.8.2 Proportion of the population with large household expenditures on health as a share of total household expenditure or income</p>
<p>3.9</p>	<p>By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water, and soil pollution and contamination.</p> <p>Indicators:</p> <p>3.9.1 Mortality rate attributed to household and ambient air pollution</p> <p>3.9.2 Mortality rate attributed to unsafe water, unsafe sanitation, and lack of hygiene (exposure to unsafe Water, Sanitation, and Hygiene for All (WASH) services)</p> <p>3.9.3 Mortality rate attributed to unintentional poisoning</p>
<p>3.A</p>	<p>Strengthen the implementation of the World Health Organization Framework Convention on Tobacco Control in all countries, as appropriate.</p> <p>Indicators:</p> <p>3.A.1 Age-standardized prevalence of current tobacco use among persons aged 15 years and older</p>



3. B	<p>Support the research and development of vaccines and medicines for the communicable and non-communicable diseases that primarily affect developing countries, and provide access to affordable essential medicines and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health, which affirms the right of developing countries to use to the full the provisions in the Agreement on Trade-Related Aspects of Intellectual Property Rights regarding flexibilities to protect public health, and, in particular, provide access to medicines for all.</p> <p>Indicators:</p> <p>3.B.1 Proportion of the target population covered by all vaccines included in their national program 3.B.2 Total net official development assistance to medical research and basic health sectors 3.B.3 Proportion of health facilities that have a core set of relevant essential medicines available and affordable on a sustainable basis</p>
3. C	<p>Substantially increase health financing and the recruitment, development, training, and retention of the health workforce in developing countries, especially in the least developed countries and small island developing States</p> <p>Indicators:</p> <p>3.C.1 Health worker density and distribution</p>
3. D	<p>Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction, and management of national and global health risks</p> <p>Indicators:</p> <p>3.D.1 International Health Regulations (IHR) capacity and health emergency preparedness 3.D.2 Percentage of bloodstream infections due to selected antimicrobial-resistant organisms</p>

1.3 Summary of Progress on SDG-3 Implementation Globally

Sustainable development necessitates the adoption of healthy lifestyles and the promotion of well-being by people of all ages. COVID-19 had inflicted immense human misery, damaging the global economy, and disrupting the lives of billions of people worldwide.

Before the pandemic, the health of millions of individuals had greatly improved. Significant progress has been achieved in terms of increasing life expectancy and lowering some of the primary causes of infant and maternal mortality. However, more work is required to entirely eradicate a range of diseases as well as address a variety of persistent and emerging health difficulties. Significant progress may be achieved in saving the lives of millions of people by focusing on more effective healthcare funding, improved sanitation, and hygiene, and expanded access to physicians.

COVID-19 and other health emergencies represent a global threat, emphasizing the importance of being prepared. The United Nations Development Programme noted significant variations in countries' ability to cope with and recover from the COVID-19 issue. The lessons learnt from the pandemic demands new and strong measures concerning public health preparedness not only for developing countries but also for the already developed countries.

Child Health [2]

- An estimated 6.2 million children and adolescents under the age of 15 died in 2018, the majority from preventable causes. 5.3 million of these fatalities happened in the first five years of life, with over half occurring in the first month.
- Despite substantial progress worldwide, an increasing proportion of infant mortality is in Sub-Saharan Africa and Southern Asia. In these regions, four out of every five infant deaths occur below the age of five.



- Compared to high-income nations, Sub-Saharan African children are 15 times more likely to die before the age of five.
- Malnourished children, especially those with severe acute malnutrition, are at increased risk of dying from common childhood illnesses such as diarrhea, pneumonia, and malaria. Diet-related factors contribute to about 45% of deaths in children under the age of five.

Maternal Health [3]

- More than 40% of all nations have less than 10 medical physicians per 10,000 people; more than 55% have fewer than 40 nursing and midwifery workers per 10,000 people.
- Maternal mortality has decreased by almost two-thirds in Eastern Asia, Northern Africa, and Southern Asia.
- It is estimated that 810 women died per day in 2017 from avoidable causes connected to pregnancy and delivery.
- Low and lower-middle-income countries account for 94% of all maternal mortality.
- Young teenagers (ages 10-14) are at a greater risk of pregnancy problems and mortality than other women.
- However, in underdeveloped countries, the maternal mortality ratio – the proportion of moms who do not survive delivery compared to those who do – is high.

HIV/AIDS, Malaria, and Other Diseases [4-7]

- In 2019, 38 million people worldwide were infected with HIV, 25.4 million individuals received antiretroviral treatment, 1.7 million persons were newly infected with HIV, and 690,000 individuals died as a result of AIDS-related diseases.
- Since the beginning of the pandemic, 75.7 million individuals have gotten infected with HIV.
- Since the beginning of the pandemic, 32.7 million individuals have died as a result of AIDS-related diseases.
- Tuberculosis is still the primary cause of mortality among HIV-positive patients, accounting for around one-third of all AIDS-related fatalities.
- Adolescent girls and young women endure gender-based inequality, marginalization, discrimination, and violence across the world, putting them at a higher risk of contracting HIV.
- HIV is the top cause of mortality in women of reproductive age across the world.
- AIDS is currently Africa’s biggest cause of mortality among teenagers (ages 10–19) and the world’s second-highest cause of death among adolescents.
- Between 2000 and 2015, almost 6.2 million malaria fatalities were avoided, particularly among children under the age of five in Sub-Saharan Africa. The global malaria incidence rate has decreased by an estimated 37%, while fatality rates have decreased by 58%.

14 Initiatives and Achievements of the Indian Government on SDG-3

Ten national-level indicators have been selected to assess India’s progress toward SDG-3. These indicators reflect eight of the thirteen SDG objectives stated in this goal for the year 2030. These indicators were chosen based on data available at the subnational level and to guarantee consistency between States and UTs. The sections that follow provide the composite scores of the states and UTs on this Goal. It also provides a breakdown of the states and territories by indicator.

The SDG Index Score for Goal 3 varies from 59 to 86 for states and from 68 to 90 for UTs. Among the States and UTs, Gujarat and Delhi are the best performers. Twenty-one states and all UTs earned a spot in the ‘Front Runners’ category (score range between 65 and 99, including both). There were no aspirants from any state or territory (with an Index score less than 50). Tables 2a and 2b display the SDG-3 scores for India and the various states/union territories respectively [8-12].



Table 2a: Progress of SDG-3 in India in Terms of Targets and Achievements

Area	Percentage of children in the age group 9-11 months fully immunized	Monthly per capita out-of-pocket expenditure on health as a share of Monthly Per capita Consumption Expenditure (MPCE)	Percentage of institutional deliveries out of the total deliveries reported	The total case notification rate of tuberculosis	HIV incidence rate	Suicide rate	The death rate due to road traffic accidents	Maternal mortality ratio	Under 5 mortality rate	Total physicians nurses and midwives
Target	100	7.83	100	242	0	3.5	5.81	70	25	45
India	91	13	94.4	177	0.05	10.4	11.56	113	36	36.84

Source: NITI Aayog, 2020

Among 28 states of India, only Kerala scored less in 2020 as compared to 2019 as per NITI Aayog Report, 2020 and performance of remaining states was good. The overall score for SDG-3 in 2020 is 74 while in 2019 the score was 61. It means that India performed well to achieve Goal 3. Figure 1 shows the two years performance of the Indian States i.e. in 2019 and 2020.

Table 2b: State-wise Performance of SDG-3

S.N.	Category	States and UTs (shown in alphabetical order)
1	Front Runner	Andaman and Nicobar Islands, Andhra Pradesh, Bihar, Chandigarh, Dadra and Nagar Haveli, Daman and Diu, Delhi, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Karnataka, Kerala, Ladakh, Lakshadweep, Maharashtra, Manipur, Meghalaya, Mizoram, Odisha, Puducherry, Punjab, Rajasthan, Tamil Nadu, Telangana, Tripura, Uttarakhand, West Bengal
2	Performer	Arunachal Pradesh, Assam, Chhattisgarh, Madhya Pradesh, Nagaland, Sikkim, Uttar Pradesh
3	Aspirant	---

Source: NITI Aayog, 2020

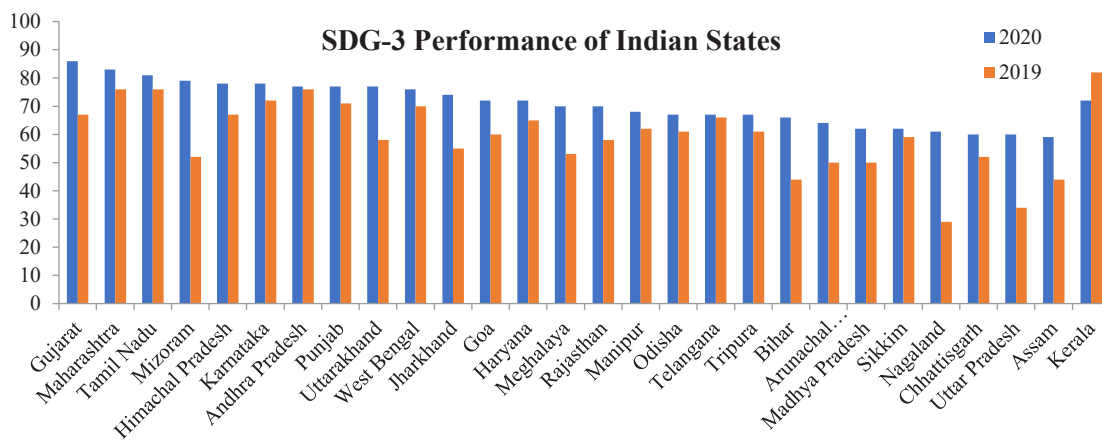


Figure 1: SDG-3 Scores: States & UTs (Source: NITI Aayog Report, 2020)

Some specific actions taken by some Indian States are given as follows:

1. **Kerala** has taken the lead by introducing *Aardram*, a strategy to overhaul the public health system and provide more patient-friendly services. In addition to health promotion and prevention, there is an emphasis on strengthening secondary and postsecondary education facilities. As part of the concept, each location will have at least one hospital capable of providing super speciality services.
2. **Tamil Nadu** has made great improvement, despite spending only about 1% of its GDP on health. A well-functioning network of primary health care clinics with monthly performance monitoring, a speedy scale-up of the immunization program, a consistent supply of critical pharmaceuticals, and a successful community health worker scheme have all contributed to the achievements.
3. **ASHA Soft:** A System of Online Monitoring and Payment In Rajasthan, a web-based program has been introduced to guarantee that community health workers are paid on time and in a transparent manner. The initiative has been rolled out across all districts in the state covering 4,700 community health workers. The software has also improved the entry of beneficiary data in the Pregnancy & Child Tracking Systems.

1.4.1 Reduce Maternal Mortality

Currently, the Maternal Mortality Ratio (MMR) is 113 per 1,00,000 live births, which goals 3.1 aim to decline to 70 by 2030. Kerala, Maharashtra, Tamil Nadu, Telangana, and Andhra Pradesh have achieved this goal with 43, 46, 60, 63, and 65 MMR respectively. Assam has the worst MMR with 215 per 1,00,000 live births.

Schemes and Initiatives

- National Health Mission
- Human Resources for Health & Medical Education
- National AYUSH Mission
- Pradhan Mantri Matru Vandana Yojana (PMMVY)
- Umbrella ICDS

1.4.2 End All Preventable Deaths Under 5 Years of Age

For every thousand live births in India, 36 children die before completing 5 years of age, according to SRS Bulletin 2016-18. Global target 3.2 aims to bring it down to 25 per 1,000 live births. Kerala, Tamil Nadu, Maharashtra, Punjab, and Himachal Pradesh, among the States, have already achieved this target. The highest Under-five Mortality Rate is in Madhya Pradesh at 56 per 1,000 live births.

Schemes and Initiatives

- National Health Mission
- Mission Indra Dhanush
- National AYUSH Mission
- Umbrella ICDS

1.4.3 Fight Communicable Diseases

Tuberculosis Notification: Notification of cases of infectious diseases is a critical step in controlling and preventing the spread of communicable diseases. India notified 2.4 million cases of TB in 2019. About 177 cases of tuberculosis were reported per 1,00,000 persons in the country. With 255 cases per



1,00,000 population, Haryana has the highest notification rate amongst States, while Tripura, with 70 cases, has the lowest notification rate. Chandigarh and Delhi lead the country on TB notifications per 1,00,000 population with the highest reported notification rate of 606 and 575, respectively.

HIV Incidence: HIV incidence per 1,000 uninfected people is expected to fall from 0.07 in 2017 to 0.05 in 2019. In 2019, Mizoram had the highest HIV incidence per 1,000 uninfected people (1.18), followed by Nagaland (0.73) and Manipur (0.34). With HIV incidence rates of 0.02, Himachal Pradesh, Karnataka, and Kerala are the closest to meeting the worldwide aim of zero HIV incidence. Jammu and Kashmir and Ladakh top the UTs in terms of HIV incidence, with rates as low as 0.02 per 1,000 uninfected persons.

Schemes and Initiatives

- NHM - Flexible Pool for Communicable Diseases
- National AIDS Control Programme
- National AYUSH Mission
- Swachh Bharat Mission (SBM) – Rural
- National Rural Drinking Water program
- Swachh Bharat Mission (SBM) – Rural
- Atal Mission for Rejuvenation and Urban Transformation (AMRUT)
- Shyama Prasad Mukherjee RURBAN Mission
- Pradhan Mantri Ujjwala Yojana
- Pradhan Mantri Kisan SAMPADA Yojana
- Special Central Assistance to Tribal Sub Scheme
- Umbrella Programme for Development of Scheduled Tribes

1.4.4 Reduce Mortality from Non-Communicable Diseases and Promote Mental Health

Noncommunicable Diseases (NCDs) kill 41 million people each year, accounting for 71% of all deaths globally. Every year, more than 15 million individuals between the ages of 30 and 69 die from an NCD, with low- and middle-income nations accounting for 85 percent of these “premature” deaths. Cardiovascular disease is the most frequent NCD, killing 17.9 million people each year, followed by cancer (9.3 million), respiratory illnesses (4.1 million), and diabetes (1.5 million). These four disease categories account for more than 80% of all premature NCD deaths.

Schemes and Initiatives

- NHM- Flexible Pool for Non-communicable Diseases, Injury, and Trauma
- NHM-Human Resources for Health & Medical Education
- NHM-Strengthening of State Drug Regulatory System
- National AYUSH Mission
- Special Central Assistance to Tribal Sub Scheme
- Umbrella Programme for Development of Scheduled Tribes

1.4.5 Prevent and Treat Substance Abuse

Four years after the SDGs entered into force, progress toward the health-related SDGs in the European area can now be reviewed. These regions minimal progress towards alcohol consumption, smoking, child overweight, and suicide mortality. For each of these concerns, we evaluate current policies, ongoing challenges, and prospective remedies. From the viewpoint of the European Public Association (EUPHA), we highlight the potential contribution of civil society groups to attaining the health-related SDGs.

Schemes and Initiatives

- Scheme for Prevention of Alcoholism and Substance (Drugs) Abuse
- National AYUSH Mission
- Police Infrastructure (Narcotics Control Bureau, etc.)

1.4.6 Reduce Road Injuries and Deaths

Deaths Due to Road Traffic Accidents

According to the Accidental Deaths and Suicides in India Report, 11.56 people per 100,000 perished in road traffic incidents in 2019. Goa recorded the highest death rate of 19.38, while Nagaland recorded the lowest death rate of 1.02. Manipur, Meghalaya, Mizoram, and Nagaland among the States and Andaman & Nicobar Islands and Lakshadweep among the UTs have achieved the target.

Schemes and Initiatives

- Road Safety Schemes (Publicity and awareness generation, NHARSS-National Highways Accident Relief Service Project, Institute of Driving Training and Research, etc.)

1.4.7 Universal Access to Sexual and Reproductive Care, Family Planning and Education

The World Health Assembly WHA57.12 resolution established the WHO Global Reproductive Health Strategy. This resolution urged the Member States, as a matter of urgency, “to make reproductive and sexual health an integral part of national planning and budgeting to strengthen the capacity of health systems to achieve universal access to sexual and reproductive health care and to ensure that all aspects of reproductive and sexual health are included within national monitoring and reporting of progress towards the attainment of the development goals of the United Nations Millennium Declaration”.

Schemes and Initiatives

- National Health Mission (RCH Flexible Pool)
- National AYUSH Mission
- Umbrella ICDS

1.4.8 Achieve Universal Health Coverage

Immunization Coverage in Children

In India, between April 2019 and March 2020, 91 percent of an infant aged 9 to 1 month were fully immunized (One dose of BCG, three doses of DPT, and OPV, and one dose of measles vaccine), according to the Routine Immunization Programme Dashboard (Health Management Information System). The national target is to increase it to reach 100 percent. The goal has been met in Maharashtra, Jammu & Kashmir, & Ladakh. Nagaland and Puducherry have the lowest immunization coverage in the country, at 54 percent.

Schemes and Initiatives

- National Health Protection Scheme (Ayushman Bharat)
- National AIDS Control Programme
- Medical treatment of Central Government Health Scheme and state Government Health Scheme
- NHM-Human Resources for Health & Medical Education



- Umbrella Programme for Development of STs & Minorities
- Umbrella Programme for Development of Minorities
- Jan Aushudhi Scheme

1.4.9 Reduce Illnesses and Death from Hazardous Chemicals and Pollution

Exposure to hazardous chemicals is one of the major risk factors for public health identified in the United Nations' 17 Sustainable Development Goals.

Schemes and Initiatives

- Environment Protection, Management and Sustainable Development (Pollution Abatement)
- National River Conservation Programme
- Research & Development and Implementation of National Water Mission

The Description of Some Selected Missions

1. **National Health Mission:** The National Health Mission (NHM) encompasses its two Sub-Missions, the National Rural Health Mission (NRHM) and the newly launched National Urban Health Mission (NUHM). NHM aims to attain universal access to equitable, affordable, and quality health care services, accountable and responsive to people's needs, with effective inter-sectoral convergent action to address the wider social determinants of health. The main programmatic components include Health System Strengthening in rural and urban areas Reproductive-Maternal, Neonatal-Child and Adolescent Health (RMNCH+A), and Communicable and Non-communicable Diseases.
2. **Human Resource and Capacity Development:** Human Resource Management (HRM) deals with procurement, development, compensation, maintenance, and utilization of human resources. Human resources development plans to achieve priority health program goals.
3. **National AYUSH Mission (NAM):** The primary objective of NAM is to promote AYUSH Medical Systems through cost-effective AYUSH Services, strengthening educational systems, and facilitating the enforcement of quality control of Ayurveda, Siddha, and Unani & Homeopathy (ASU&H Drugs), and sustainable availability of ASU & H raw materials. In the country, there are presently 0.8 million registered AYUSH practitioners who practice traditional Indian medicine in addition to contemporary treatment. With 3,277 hospitals and 24,289 dispensaries, AYUSH has a large infrastructure. Several state-level initiatives to link AYUSH with healthcare activities have also been launched. In Tamil Nadu, for example, a pilot project to give AYUSH services as part of the feeding scheme was launched. The initiative yielded excellent effects, such as lower baby and maternal death rates, as well as reduced anaemia among girls.
4. **Umbrella Programme for Development of STs and Minorities:** The main objective is to increase their access to education, health, housing, and other services.
5. **Road Safety Schemes:** The government has strengthened its efforts to raise public knowledge about the many components of road safety, the social and economic consequences of road accidents, and what has to be done to combat the growing threat of road accidents. This will enable and empower many stakeholders to play an important role in enhancing road safety.
6. **National AIDS Control Programme:** To halt and reverse India's HIV/AIDS epidemic spread, National AIDS Control Programme Phase III was launched. During this phase, the National AIDS Control Organisation will strengthen capacity, formulate policy, and guide implementation to enable a decentralized response focused on local needs.



1.5 Higher Education Institutions (HEIs) Status: Role of HEIs and Status of Adoption of SDG-3

In order to encourage global health and well-being, through HEI, the University Grants Commission (UGC) has taken several initiatives which have been implemented in HEIs in India. Every year on June 21, Indian HEIs observe the International Day of Yoga (IDY), where the commission has urged them to participate in the 45 minutes of Common Yoga Protocol (CYP). All HEIs asked students and faculty members to attend the day virtually and follow all COVID-19 protocols and guidelines. During COVID-19, the UGC asked the varsities to perform Yoga with the theme “Be with Yoga, be at home” for building immunity and relief from stress.

The Ministry of Ayush has launched a smartphone application called ‘Namaste Yoga’ in collaboration with the Morarji Desai National Institute of Yoga to promote yoga across all strata of society. From June 14 to June 21, a series of ten episodes on various elements of CYP was broadcast on DD India at 7 p.m. as an information platform (for a week).

Under the Ministry of AYUSH, Naturopathy and Yoga are recognized as an Indian system of medicine. In recent years, this system is seeing constant growth in its following worldwide. For encouraging good health and well-being, the University Grants Commission, with the approval of the Central Government, has add-on the following additional degrees: Master of Ayurved in Medicine and Surgery (MSAM), Bachelor of Ayurved in Pharmacy (B.Pharm Ayu.), and Bachelor of Ayurved in Naturopathy (B.Nat. Ayu.).

To address the issue of high concentrations of arsenic and other chemicals found in groundwater and the associated rise in cancer and cardiovascular disease, the Department of Earth and Environmental Sciences of The University of Manchester, has shown the importance of rice as an exposure route for inorganic arsenic where microbes promote its release from materials such as sand and silt. This research led to recommendations focusing on rice selection and preparation techniques, highlighting the dangers of groundwater irrigation.

A team from the University of Manchester trained local health workers in Indonesia on cardiovascular disease, risk factors, and the technical use of an app called SMART health, benefiting 48,000 people.

One of the fastest methods for HEI to start its journey toward SDG implementation is creating Massive Open Online Courses (MOOCs). Several universities and UN-sponsored platforms have already initiated MOOCs that focus on various SDGs. Some of these are listed in Table-3.

Table 3: MOOCs Related to SDGs Offered by Various HEI and the UN

Course Title	SDG Focus	Platform	Sponsor
Driving Business Toward Sustainable Development Goals	Generic	Coursera	Erasmus University Rotterdam
Introduction to Yoga and Physiology	Generic	Coursera	New York University
Health Society and Wellness in Covid-19 Times	SDG-3	Coursera	University of Colorado, Boulder
The Science of Well Being	SDG-3	Coursera	Yale University
Mindfulness and Well Being	SDG-3	Coursera	Rice University
Age of Sustainable Development	Generic	Edx	SDG Academy
Sustainability and Development	Generic	Future Learn	Hanken School of Economics



The Challenges and Global Health	SDG-3	Coursera	Duke University
Health and Society	SDG-3	edx	Harvard University
Global Public Health	SDG-3	edx	SDG Academy
An Introduction to global health	SDG-3	edx	Karolinska Institutet
Global Health: An Interdisciplinary Overview	SDG-3	Coursera	University of Geneva
Urbanization and Health: Promoting Sustainable Solutions	SDG-3	Coursera	University of Copenhagen
Global Health and Humanitarianism	SDG-3	Coursera	University of Manchester
Foundations of public health practice: Behaviour and behavior change	SDG-3	Coursera	Imperial College London
Public health perspectives on sustainable diets	SDG-3	Coursera	Johns Hopkins University

The United Nations' new 2030 Agenda for Sustainable Development stresses the necessity of an effective education response in the transition to sustainability. One of the 17 Sustainable Development Goals (SDGs) i.e. education, is clearly stated as a stand-alone aim. Since education can contribute to all the goals many education-related targets are included in other SDGs. Education for Sustainable Development (ESD) must be used to facilitate the transition to sustainability at all levels of education, from preschool to lifelong learning. The growing popularity of Massive Open Online Courses (MOOCs), which have attracted a lot of public attention and provide numerous novel teaching and learning alternatives has opened new opportunities in this area.

Its central question is: How can the global economy continue to grow socially and environmentally sustainable? Various universities throughout the world have contributed directly or indirectly to the achievement of the various SDGs by raising awareness through online platforms. Such educational endeavours will result in holistic and transformative learning that addresses learning content and outcomes, pedagogy, and the learning environment. This could be a problem- and action-oriented approach to learning, as well as inter- and transdisciplinary approaches. The main goal of such an initiative is to look into the sustainability-related content that must be incorporated into higher education curricula.

2 Recommended Actions for HEIs for the Achievement of SDG-3

Higher education institutions play a critical role in developing more sustainable societies and establishing new paradigms since they educate and train decision-makers. They have the mission of promoting development through research and teaching, disseminating new knowledge and insight to their students, and developing their skills as educational institutions.

Sustainable development education strives to help everyone acquire the values, competencies, skills, and knowledge necessary to contribute to building and establishing a more sustainable society. This entails adapting educational materials to address global and local concerns. It must also promote teaching methods that allow students to acquire skills like interdisciplinary thinking, integrated planning, understanding complexity, cooperating with others in decision-making processes, and participating in local, national, and global processes that lead to sustainable development.

Academics and policymakers consider HEIs to enable organizations' effective, sustainable transition. Furthermore, HEIs are also strategic stakeholders in achieving the SDGs through their



initiatives. Implementing entrepreneurial ecosystems that are inspired by sustainable principles requires the development of common strategies and synergies with HEIs.

Based on the international and national status of SDG-3, the key action points for HEIs for effective implementation of SDG-3 are as follows in Table 4.

Table 4: Minimal Recommended Actions for the HEIs for Implementation of SDG-3

SDG-3 Targets	Minimal Recommended Actions for HEIs
3.1	<ul style="list-style-type: none"> • Create an Extension Cell at HEIs for awareness of local communities. • Medical HEIs to organize internship programs for students at the PHCs level. • Promote maternal health awareness programs through Anganwadi workers. • Medical HEIs to train Anganwadi workers.
3.2	<ul style="list-style-type: none"> • HEIs to participate in forming an inspection team at the village level in all Anganwadi Centres.
3.3	<ul style="list-style-type: none"> • HEIs to conduct awareness programs for testing and vaccination for the Human Papillomavirus Virus. Providing access to affordable health and well-being services on campus. • Providing well-being programs for staff and students to reduce the incidence of diseases and promote mental health. • Implementing 'Eat Right Policies' on campuses. • Ensuring appropriate practices are in place for dealing with hazardous substances.
3.4	<ul style="list-style-type: none"> • Establish Health Centres/Yoga Centres/<i>Vyayam Shala</i>/Gym. • Promote physical activities in adolescents and youth. • Establish programs to reduce frustration, guilt, and depression and boost Hopefulness, self-confidence, social awareness, optimistic attitude, and emotional quotient. (Example: Yoga Meditation & Counselling centres at each school & HEIs to boost Physical & Mental health). • Take initiatives for character-building programs & value-based education.
3.5	<ul style="list-style-type: none"> • To organize mass awareness programs based on drug addiction and its harmful effects on health. • Police patrolling and surprise checking to the hostels are mandatory at all HEIs. • Counseling cells must be available in HEIs for providing regular socio-psychological and spiritual counseling to stop drug addiction • A collaborative effort must be done by HEIs with the nearest psychotherapy centers and medical health care centers. • Identification and monitoring of drug addiction cases and socio-psychological research must be part of HEIs.
3.6	<ul style="list-style-type: none"> • Training of students in Emergency First Aid procedures. • Introduce Road safety training programs.
3.7	<ul style="list-style-type: none"> • Provide services for female sexual and reproductive health care.
3.8	<ul style="list-style-type: none"> • Provide free health cover for its employees.
3.9	<ul style="list-style-type: none"> • Implement 'Swachh Bharat Mission' in each degree program as Social activity. • All HEIs must follow a proper chemical waste disposal system. Hazardous chemicals are to be disposed of according to Environment, Health, and Safety (EH & S) guidelines.

3 Proposed Research Agenda for HEIs and Governmental Bodies

The review of past studies and respective linkages with the SDG-3 targets have led to several key research areas that HEIs must undertake. It is recommended that undergraduate and postgraduate level courses be redesigned according to the SDG. Proposed areas of research are highlighted in table-5.

Table-5: Main Research Areas and Models that can be Followed for SDG-3 Implementation

Fields	Key Activities
Policy and plans	Design and implement plans and policies: <ul style="list-style-type: none"> To improve maternal and newborn health and prevent stillbirths. To prevent the spread of communicable diseases like AIDS, tuberculosis, malaria, hepatitis, and water-borne diseases. To prevent mortality from non-communicable diseases through and promote mental health and well-being. Strengthening the prevention and treatment of alcoholism and narcotic drug abuse.
Response and resilience	Design a preparedness and response plan, and have a coordinated mechanism for its implementation, ensuring procurement of emergency supplies, and monitoring survival and health outcomes.
Investments	Allocate sufficient domestic and international resources: <ul style="list-style-type: none"> To strengthen the health systems. To strengthen the research funding infrastructure for AIDS, tuberculosis, substance abuse, etc.
Quality of care	Implement the WHO standards for respectful, effective patient care, and have a system for learning from experience.
Health workforce	Design and implement strategies and increase the number, distribution, mentoring, and retention of personnel for maternal and new born health, AIDS, malaria, tuberculosis, drug addiction, etc.
Medical commodities and technologies	Ensure timely procurement, equitable distribution, access, appropriate use, and maintenance of essential medical commodities e.g., quality essential healthcare services and access to safe, effective, quality, and affordable essential medicines and vaccines.
Data for action	Routinely tracking, collecting, and using data: <ul style="list-style-type: none"> to monitor neonatal mortality and stillbirths. to monitor the spread of communicable & non-communicable diseases.
Research and innovation	Encourage Collaborative research for holistic health and well-being to promote ancient Indian or alternative medication
Accountability	Design and implement accountability mechanisms to improve health outcomes, including coordination of stakeholders and processes to count and review deaths and promote a shift in potentially harmful social norms.

4 Recommendations for Government and Regulatory Bodies for the Achievement of SDG-3

4.1 Recommendations for Government

Table 6: Minimal Recommended Actions for Government/Policy-makers

SDG-3 Targets	Minimal Recommended Actions for Government/Policy-makers
3.1	<ul style="list-style-type: none"> Establish a maternity wing in all Primary Health Care hospitals. Organize internship program for all medical students at the PHC level. Promote maternal health awareness programs through Anganwadi workers. Medical HEIs to train Anganwadi workers.
3.2	<ul style="list-style-type: none"> Fix one day every week for the distribution of Anganwadi nutrition. Link the distribution of nutrition with the Aadhar number. Establish an inspection team at the village level in all Anganwadi centres by local people. Organize frequent inspections at Hospitals & PHCs to check sanitation facilities, clean air & safe drinking water will have to be insured.
3.3	<ul style="list-style-type: none"> Awareness programs for testing and vaccination for the Human Papillomavirus Virus with the help of HEIs.
3.4	<ul style="list-style-type: none"> Establish Health Centers/Yoga Centres/<i>Vyayam-shala</i>/Gym at each Society/Colony/Gram Panchayat level. Government should spend more on health education as there is a deficit of doctors in the country moreover as per data, 60 lakhs of students want to become doctors every year but seats are only 85000 so more seats be created in medical colleges. Medical education is expensive in private colleges in India and is unaffordable for the common man and government medical colleges are limited. There is a need to strike a balance and create more seats at affordable expenses for eligible students. We need to work on innovative models so that we can provide good medical education to our students and good medical facilities for the people. Organize health awareness programs, including health check-ups at community centres in urban areas and gram panchayat levels in rural areas. Promote a healthy lifestyle based on Indian traditional Culture. (Yoga, Ayurveda & Naturopathy). Promote physical activities in adolescents and youth. Establish programs to reduce frustration, guilt, and depression and boost hopefulness, self-confidence, social awareness, optimistic attitude, and emotional quotient. (Example: Yoga Meditation & Counselling centres at each school & HEIs to boost Physical & Mental health). Take initiatives for character-building programs & value-based education.
3.5	<ul style="list-style-type: none"> Organize mass awareness programs based on drug addiction and its harmful effects on health. Mandatory Police patrolling and surprise checking to the hostels. Direct control, monitoring, and surprise inspections of de-addiction/ rehabilitation centres by a high-level government medical agency for their proper functioning.
3.6	<ul style="list-style-type: none"> Train HEI students in Emergency First Aid Procedures. Training programs for road safety must be introduced in HEIs.
3.7	<ul style="list-style-type: none"> Implement Mission Vikas Parivar to the entire country with the help of student volunteers. Provide services for female sexual and reproductive health care at HEIs

3.8	<ul style="list-style-type: none"> • Make health insurance mandatory for the citizens. • Charges of Health Insurance depend on the slab of tax payees. • Free health insurance for BPL and low-income citizens. • Pathological services at each medical & paramedical HEIs.
3.9	<ul style="list-style-type: none"> • Replace commercialized products packed in polythene bags/containers must be by biodegradable material. • Implement 'Swachh Bharat Mission' in each degree program as a social activity. • Establish chemical treatment plants at every HEI. • Promote Yagya/Yajna Therapy to reduce the level of air pollution.
3A	<ul style="list-style-type: none"> • Allocate state-wise projects to HEIs for the implementation of the WHO's framework.
3B	<ul style="list-style-type: none"> • Promote collaboration of HEIs with pharmaceutical industries to develop and manufacture medicines. • Boost traditional medicine CAMS (Complimentary alternative medicine System) to reduce the demand for modern medicine. • Create more projects for the development of essential medicines. • Promote ethnographic research to explore the hidden science of traditional medicine.
3C	<ul style="list-style-type: none"> • Boost medical C and placement systems in medical programs. • Increase Health-related programs in V and offer fellowships to the scholars pursuing these programs. • Add ethnographic research to the course curriculum and train professionals to promote the same. • Increase health funding.
3D	<ul style="list-style-type: none"> • Technology transfer from the developed countries to the developing countries to be facilitated by the Government to manage global health risks.

4.2 Recommendations for Regulatory Bodies

The regulatory bodies like UGC, AICTE, ICMR, ICAR, NAAC, etc., and research funding agencies like the Department of Science & Technology, Council of Scientific Research (CSIR), Ministry of Health & Family Welfare, Ministry of AYUSH, and Councils, shall facilitate in fostering and developing quality research, the educational curriculum in the training of future professionals in the field of sustainable development including SDG-3.

Specific immediate action points for key regulatory bodies are identified in table-7.

Table 7: Minimal Recommended Actions for Regulatory Bodies

SDG-3 Programs in HEIs	Scrutinize and approve graduate and postgraduate degrees and courses related to the SDG-3. Concerned regulatory bodies must also introduce a short-term compact course on SDG-3 at HEIs on a mandatory basis.
Research program on SDG-3	The research focused on addressing the SDGs is needed by the global community. The Doctorate (Ph.D.) in Sustainable Development would help find ways to integrate practical and policy processes and outcomes required to achieve the SDG-3. Addressing barriers to achieving the SDG-3 will be a fundamental part of the Doctorate.
Encouraging cross-faculty and interdisciplinary collaboration on specific areas of SDG-3	Interdisciplinary and Inter-university collaboration on the SDGs can bring diverse perspectives to finding solutions and synergies between the 17 SDGs.

SDG-3 related Workshops and conferences in the university	Organizing workshops and seminars is a great platform to promote collaboration, exchange learning, and develop shared research across different areas of SDG-3.
Funding to the HEIs	Disburse special funds to the HEIs offering quality education in sustainability and SDGs for further research and growth in the area.
Design all India Level tests based on SDG-3:	Design/approve all India level specialized tests for entry into the HEIs offering the developed sustainability curriculums. Also include sustainability and SDG-related questions in existing tests like UGC-NET, UPSC, CGL, BPO, etc.
Conduct Audits to monitor the quality of research on SDG-3	Conduct audits to monitor the quality and thoroughness of education and research in the HEIs offering specialized courses and degrees related to SDG-3.
Make recommendations to the central and state governments	Make recommendations to the central and state governments to bring about positive changes in higher education concerning sustainability and SDGs for better awareness and the generation of an adequate number of future professionals specializing in the field

5 Conclusions Along With the Prioritization of the Initiatives Recommended

The immediate focus of attention on the sustainable development of humanity is of the utmost importance not only at the government level but at every level of the social hierarchy. Research shows that HEIs are among the key facilitators in the effective design and implementation of sustainable development goals formulated by the United Nations at a global level and for the benefit of all nations. Since HEIs are repositories of knowledge and train young minds, the idea of sustainable development must be embedded herein so that the responsibility of achieving the SDGs is felt at the individual level.

The participation of science, policy, industry, and society is one of the most effective ways to achieve innovation, growth, societal development, and sustainability goals. SDG-3 directly aims at ensuring healthy lives and promoting well-being for all at all ages”, underpinned by 13 targets that cover a wide spectrum of WHO’s work.

The Sustainable Development Goals (SDGs) aim to be relevant to all countries – poor, affluent, and middle-income – to order to increase prosperity while safeguarding the environment and combating climate change. They have a major emphasis on equity to meet the needs of women, children, and the economically poor section of the society in particular, so that “No One is Left Behind”. Overall, we conclude with a summary of the main recommendations as follows:

To achieve SDG-3, the Government and regulatory bodies must target each social platform and its respective solutions. Herewith few recommendations are mentioned for the Government, Regulatory Bodies, and HEIs to achieve the targets for SDG-3.

1. Involve medical HEIs to improve maternal health in urban and rural areas. Link the Anganwadi nutrition distribution process with the biometric system of UIDAI (Aadhar no.) to ensure transparency. Medical HEIs must train Anganwadi workers.
2. Government must make health insurance mandatory for the citizens. The health insurance charges must be as per the annual income, with lower-income and BPL people getting free health coverage.



3. The scheme “*Mission Vikas Pariwar*” must target the entire country. HEIs must provide free services for female sexual and reproductive health.
4. HEIs must provide lab testing services, vaccinations, and awareness programs for communicable diseases and their treatments.
5. HEIs must implement the “*Swachh Bharat Mission*” in each degree program as a part of social activity.
6. Government must mandate the availability of sufficient numbers of dustbins in cities and towns through their respective Municipal Corporation/ Nagar Nigam. Commercialized products packed in polythene bags/ containers must be replaced by biodegradable packaging material.
7. Yoga must be a mandatory subject at Schools from class 1 to class 12th and NEP Yoga/ Meditation must be part of foundation papers (Mandatory).
8. The Government must promote the establishment of ‘Health Wellness Centres’ in states across the country. Schools and HEIs must start Yoga, meditation, and counselling centres to boost the physical and mental health of the students.
9. Government must initiate startup/open schemes targeting individuals prone to commit suicide due to financial reasons. Make bank loans easy for startups with subsidies and low-interest rates.
10. Government must link all vaccination with Aadhar, as done in the case of COVID-19 vaccination.
11. HEIs must have mandatory police beat at the campus/hostels to control drug addictions in youth.
12. HEIs must promote health-related programs and offer fellowships to the scholars pursuing these programs.

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SDG-4: Ensure Inclusive and Equitable Quality Education and Promote Lifelong Learning Opportunities for All

Summary

This chapter focuses on the SDG-4 which is to “ensure inclusive and equitable quality education and promote lifelong learning opportunities for all” and has ten clear targets to be achieved by 2030. The chapter presents a brief overview of the global as well as Indian status with regards to achievements related to the goal as well as some initiatives taken by Indian HEIS so far. It also talks about the focus on SDG-4 in reference to the New Education Policy in India. The chapter also includes specific recommendations for HEIs, who can be the champions and custodians of all SDGs. The recommendations for follow-up by government and regulatory bodies are also given..

Key Recommendation to Achieve SDG-4

- HEIs to incorporate SDGs-related courses, curriculum, and awareness programmes including specific degrees, diplomas, majors, minors, and electives.
- HEIs to build MOOCs in vernacular and local languages for the students of HEI, staff, community, and the surrounding villages.
- Set up literacy centres and preschools on the university campuses and undertake literacy programmes and preschool education programmes for the population around the university.
- Each HEI should establish a Centre of Excellence/ Department for research, teaching, and implementation of SDGs. In addition, each SDG should have one faculty coordinator.
- HEIs are to allocate a minimum of 10% of their total annual budget towards research in SDG-related areas and should aim to align every doctoral and research activity to SDGs.
- Government to create 3-5 new institutions of the national importance of the size and scale of IITs focussed on SDGs.
- Government and regulatory bodies should facilitate a consortium of institutions in each state/ region for sharing infrastructure, equipment, and best practices for SDGs-related activities and research.
- HEIs should make efforts to address the foundational questions of quality, accessibility, equality, equity, and accountability in the context of the present education system in India with urgent effect and in the right spirit to provide facilities that promote and encourage inclusivity and quality in education.
- Supporting vulnerable and disadvantaged people including persons with disabilities, indigenous peoples, and people experiencing financial difficulty to access and participate fully in education and also providing programmes to enhance literacy and education in communities and schools in the local area and beyond the HEIs
- The HEIs of eminence in SDG 4 should help other institutions in innovation to impart quality education and achieve SDG 4 targets .



- Regulatory and accreditation bodies must ensure Quality Education by implementing environment improvement measures, green campus, waste management, rainwater harvesting, and sewage disposal systems for all.
- Research Parks, in the form of knowledge hubs should be established in HEIs for monitoring measured outputs in education, research, technology and innovations and conduct events like Anveshan initiated by Association of Indian Universities and Hackathons initiated by AICTE to involve students in coming up with solutions to the problems embedded in the SDG4..
- HEIs should adopt a multidisciplinary and interdisciplinary approach to the curriculum and promote Indianness of education and the Indian knowledge system which has proven its worth in the protection of the environment.
- The translation of course books or text material on SDGs into 12 regional Indian languages should be on high priority, and courses on SDGs and Environment should be made mandatory for all students for getting the degree.
- HEIs must have the flexibility to experiment and move towards dynamism through synergy to achieve SDGs by engaging staff and students in all sustainable campus activities.
- HEIs should maintain and implement clean and smart campuses to encourage students towards environmental cleanliness and sustainable solutions to the same.
- HEIs should promote a sustainable lifestyle through the academic syllabus, co-curricular activities, and research activities and students' engagement to generate awareness about sustainable lifestyles.
- HEIs should align employment, training, and regulation policies to be consistent with commitments to equity and access strategies and targets.
- Providing appropriately positioned and supported scholarship and financial assistance schemes for students in need.
- Supporting creativity and innovation through a culture of acceptable risk-taking, providing the appropriate space and process for ideas to flourish.
- Monitoring employment outcomes and academic workload management.

1 Context and Current Status of SDG-4

1.1 The Context and Current Status

To end poverty, safeguard the Earth, and promote human peace and prosperity by 2030, the Sustainable Development Goals (SDGs) are a collection of 17 goals. They equip students of all ages with the knowledge, skills, values, and attitudes necessary to confront interconnected global concerns such as climate change, environmental degradation, biodiversity loss, inequality, and poverty.

Education is a human right that promotes peace and progress. Education is required to achieve every goal in the 2030 Agenda. 262 million kids are out of school today. 60% of students do not learn fundamental literacy and numeracy after multiple years of schooling. 750 million adults are illiterate, causing poverty and exclusion.

In addition to governments, the 2030 Agenda is a universal and community commitment to ensure quality education. Achieving educational goals and building systems that are inclusive, equitable, and relevant to all learners requires political will and global/regional collaboration from all governments, civil society, the commercial sector, and youth.



1.2 United Nations Sustainable Development Goal 4 Targets

To achieve SDG-4, 10 targets which include Seven targets and three means of implementation have been defined along with indicators to measure the achievement of the targets. These targets are listed as follows:

- 4.1 By 2030, ensure that all girls and boys complete free, equitable, and quality primary and secondary education leading to relevant and effective learning outcomes.
 - 4.2 By 2030, ensure that all girls and boys have access to quality early childhood development, care, and pre-primary education so that they are ready for primary education.
 - 4.3 By 2030, ensure equal access for all women and men to affordable and quality technical, vocational, and tertiary education, including university.
 - 4.4 By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs, and entrepreneurship.
 - 4.5 By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples, and children in vulnerable situations.
 - 4.6 By 2030, ensure that all youth and a substantial proportion of adults, both men, and women, achieve literacy and numeracy.
 - 4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development.
- 4.A Build and upgrade education facilities that are child, disability, and gender-sensitive and provide safe, nonviolent, inclusive, and effective learning environments for all.
- 4.B By 2030, substantially expand globally the number of scholarships available to developing countries, least developed countries, small island developing states, and African countries, for enrolment in higher education, including vocational training and information and communications technology, technical, engineering, and scientific Programmes, in developed countries and other developing countries.
- 4.C By 2030, substantially increase the supply of qualified teachers, including through international co-operation for teacher training in developing countries, especially least developed countries and small island developing states.

1.3 Summary of Progress on SDG-4 Globally

The enrolment in schools for pre-primary, primary, and secondary education today is higher than ever before but that does not translate into learning always. The lack of basic facilities like sanitation, teachers, and infrastructure makes actual learning hard to achieve. Children coming to school from poor backgrounds with a lack of support for their learning at home do not help either. Despite the literacy rates going up, these challenges of learning remain in many developing countries. Despite the enactment of RTE millions of children are still not attending school in India.

To meet these challenges and motivated by significant achievements in expanding access to education, UNESCO together with other agencies at World Education Forum 2015, adopted the Incheon Declaration for Education 2030 which sets out a new vision for education for the next fifteen years, which is as follows:



- To ensure the provision of 12 years of free, publicly funded, equitable quality primary and secondary education, of which at least nine years are compulsory, leading to relevant learning outcomes.
- To encourage the provision of at least one year of free and compulsory quality pre-primary education and that all children have access to quality early childhood development, care, and education.
- To provide meaningful education and training opportunities for the large population of out-of-school children and adolescents, who require immediate, targeted, and sustained action to ensure that all children are in school.
- Inclusion and Equity in and through education are the cornerstones of a transformative education agenda
- Importance of gender equality in achieving education for all.
- Quality education and improving learning outcomes
- To provide lifelong learning opportunities for all and at all levels in all settings.

We cannot ignore the impact COVID-19 has had on the quality of education at all levels. According to the *UN's Report E/2021/58*, the impact of COVID-19 on schooling is a “generational catastrophe”. The report further states– “Even before the onset of the pandemic, achieving SDG-4 targets was tough, and the pandemic has further slowed down the progress. Being out of school has affected not only the well-being of students but also have long term impacts. A huge decrease from 54.5 % to 45.25 % in the proficiency levels for grades one to eight across the world can be seen. If we particularly consider the Central and Southeast Asian region having around 34 million children, the reading proficiency has fallen by more than 10 percent from 47.8 percent to 36.0 percent.”

Primary School completion rates though have progressed from 2010 to 2019 globally from 82 percent to 85 percent, and secondary completion rates from 46 percent to 53 percent, regional disparities still exist and are still big. For example, early childhood education in the Sub-Saharan region is only 43 percent as compared to 96 percent in Latin American countries.

Data from 2016 to 2019 show that, globally, 78.0 percent of primary schools lacked access to basic drinking water or single-sex toilets, 65.0 percent are having handwashing facilities, and only 40.0 percent have internet and computer facilities. Upgrading facilities, removing these disparities, and improving education quality remain challenges. The SDG-4, if achieved, by 2030 will mean a more educated, more equal, and more future-ready world.

1.4 Initiatives and Achievements of the Indian Government on SDG-4

Hon’ble Prime Minister and other senior Ministers have often stated their support for the 2030 Agenda, including the SDGs. Achieving the SDGs will depend on India’s national development goals and its “development with all, and for all” policy initiatives for inclusive development. To quote Hon’ble Prime Minister, “These goals represent our developing awareness of the social, economic and environmental links that shape our existence.”

The NITI Aayog’s SDG India Index Report shows that while India’s overall score rose from 60 in 2019-20 to 66 in 2020-21, its performance in SDG has slipped from 58 to 57 points. Since 2018, the NITI Aayog’s SDG India Index has tracked the progress of states and union territories towards achieving the SDGs.

A glance at the performance of various states concerning SDG-4 indicates that Chandigarh, Delhi, Himachal Pradesh, and Goa are the best performers as per NITI Aayog’s 2021 report. Assam, Bihar, and Arunachal Pradesh were identified as the worst-performing states. Seventeen states are performing below the national average.

1.4.1 Initiatives of the Indian Government to Realise SDGs

Table 1. Indian Government Initiatives to Realise SDGs

Programmes	Description
Early Reading, Writing and Math Comprehension Programme	A nationwide sub-program of the <i>Sarva Shiksha Abhiyan</i> (SSA) to ensure quality in the foundational years in school, i.e., classes I and II for reading, writing, and math skills development.
<i>Beti Bachao, Beti Padhao</i> - (Save Girl Child, Educate Girl Child)	In 2015, the Government of India began one of the most ambitious flagship Programmes to address the issue of declining Child Sex Ratio (CSR) in 100 gender crucial districts across all States and Union Territories (UTs) as a pilot with at least one district per state.
<i>Rashtriya Avishkar Abhiyan</i>	A new program, the <i>Rashtriya Avishkar Abhiyan</i> (RAA), has been established to improve math and science instruction in upper primary levels with children of the age group 6-18 years.
<i>Saransh</i>	It is a project by the CBSE that allows schools to use an online self-review tool to find areas for improvement in students, teachers, and curriculum and then take steps to make changes by comparing their results to those of other schools.
<i>Shaala Siddhi</i>	‘Self-assessment of all schools and External Evaluation of sample schools’ is an initiative of National Institute of Educational Planning and Administration (NIEPA) aims to enable all schools to self-evaluate their performance and monitor their strengths and areas of improvement by comparison. <i>Shala Darpan</i> provides services based on School Management Systems to the students, parents, and communities.
<i>E-Pathshala</i>	This online platform showcases and distributes digital textbooks, learning resources like audio, video, periodicals, and other print and non-print materials for its stakeholders -students, teachers, educators, researchers, and parents.
<i>Adharlink</i>	All school-going children in the age group of 5-18 years in the country are being covered under Aadhar which would also be used to track school dropouts, and academic achievement, and to ensure that incentives are paid to them in cash or kind under various state-sponsored schemes are delivered in a timely fashion.
<i>Swachh Vidyalaya</i>	To meet the <i>Swachh Bharat Mission's</i> deadline of August 15 th , 2015, the Government has created the <i>Swachh Vidyalaya</i> project. 417,796 toilet blocks were built or rendered functional in 2,61400 schools by the states and UTs within the time frame.

1.4.2 India’s Progress Against SDG-4 Concerning National Education Policy

Even though 2020 was a year of resilience, the Indian government opted to make a bold and transformational statement with the announcement of the National Education Policy – 2020 (NEP-2020). The NEP-2020 delivered a much-needed transformation in education.

The policy modifies early childhood care and education, focusing on the preschool years. The concept is neatly coupled with reforms in school curricula and practice. With a focus on multilingualism and the power of language, the strategy proposes considerable improvements. The NEP-2020 provides several entry and exit points for students, allowing them to better exploit their educational level and career readiness, and allowing India to better utilize its demographic dividend. Policies and Programmes initiated by the Government of India aligning with each indicator of SDG-4 are highlighted as follows:



Table 2: Programmes and Policy Initiatives of the Government of India

SDG-4 Target	Program Name	Description
4.2	Equal access to quality pre-primary education	The NEP's major win is that it prioritizes children of 3-6 years. This will give a much-needed boost to <i>Anganwadi</i> education. There is also a new Gender Inclusion Fund for schools and support for disability schooling.
4.3	Equal Access to Affordable Technical and Vocational Education	The NEP recommends imparting vocational education and technical skills like coding as early as the 6 th standard. The Ministry of Education (MoE) is also establishing a National Education Technology Forum to foster technology and knowledge sharing.
4.4	Increase the number of people with relevant skills for employment and entrepreneurship.	The former 10+2 model has been replaced with 5+3+3+4 in secondary and higher education. Student signalling abilities will improve as a result of many exit points for higher education. Most developed countries do this. To transfer and count academic credits towards a final degree, an academic bank of credit is set up digitally.
4.5	Eliminate Discrimination in Education	MoE & UGC are taking several affirmative actions to eliminate different forms of discrimination. NEP proposes to bridge the Digital Divide by creating a new unit focused on Internet-based e-learning, infrastructure, and capacity building. The policy seeks to get around the infrastructural shortages relating to electricity and internet capacity.
4.6	Universal Literacy and Numeracy	<p>The Government of India has launched a new centrally-sponsored scheme, the 'New India Literacy Programme' for the period during FYs 2022-2027 to cover all the aspects of literacy and 'Education for All' to align with National Education Policy –2020.</p> <p>To achieve basic literacy and numeracy skills, the Ministry of Education launched the National Initiative for Proficiency in Reading with Understanding and Numeracy (NIPUN) Bharat in July 2021 as a national mission to enable all children at the end of Class III to attain foundational skills by the year 2026-2027. As a step towards strengthening efforts for foundational literacy and numeracy (FLN), a large-scale foundational learning study (FLS) has been undertaken jointly by the ministry and NCERT in March 2022.</p>

Achievements of the Government of India on SDG-8

In 2020, only ten states have performed very well against SDG-4. Other states are left behind with a small margin compared to achievements in 2019. Figure 1 and 2 shows the improved and dropped performance of different states in India.

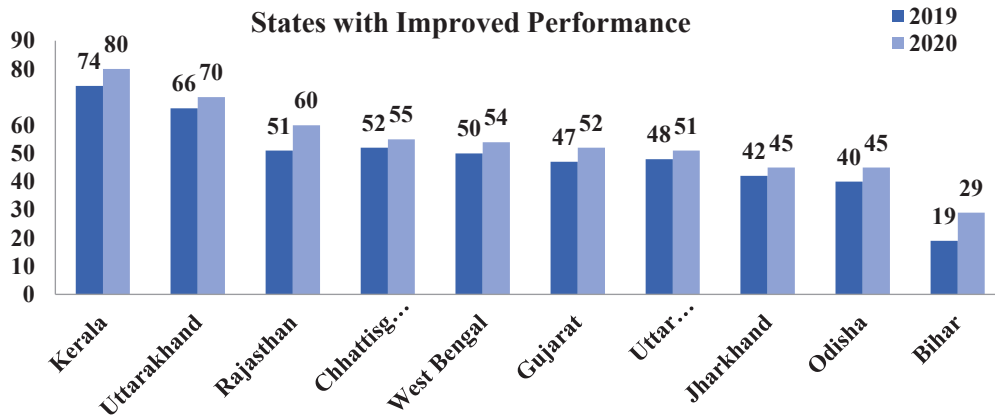


Figure 1: Improved Performance of Indian States

Source- NITI Aayog Annual Report, 2020, <https://sdgindiaindex.niti.gov.in/#/ranking>

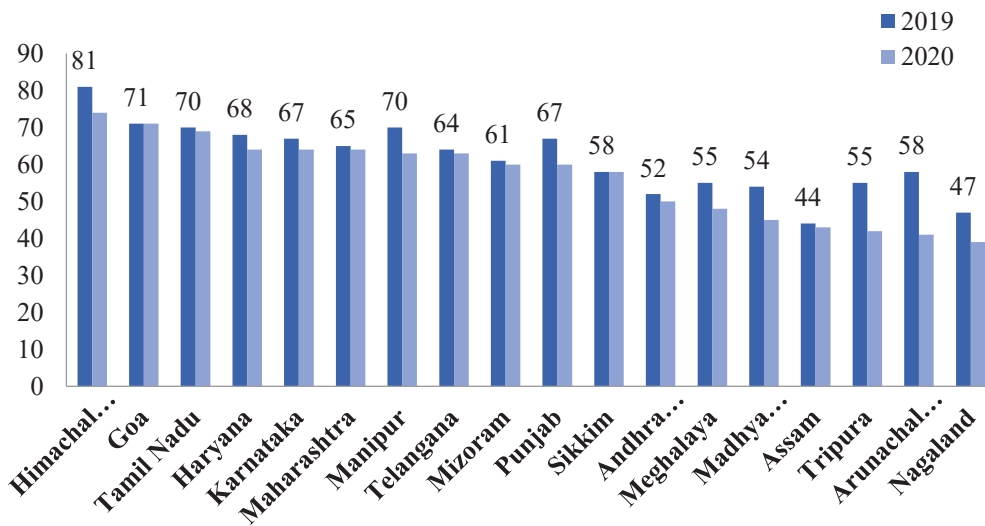


Figure 2: Dropped Performance of Indian States

Source- NITI Aayog Annual Report, 2020
<https://sdgindiaindex.niti.gov.in/#/ranking>

India's education system has progressed dramatically since its independence. Currently, India has one of the world's largest education systems, with over 38.5 million pupils. However, according to "Educational Statistics at a Glance (ESAG) 2018", the focus on primary education has resulted in an increased Gross Enrolment Ratio across social and gender groups (GER). Female enrolment has increased at the secondary level, and girls' GER has surpassed boys'. But at higher education level the number of girls is 18.2 million, which is lower than boys (19.2 million). There is a social divide in higher education enrolment rates. Most students do not continue their education after high school. Despite ambitious education initiatives and extensive debates, the results are mixed. The following are the major flaws in the Indian education system:

- Inconsistent quality with some islands of excellence and others of mediocre or poor standards.
- Focus is more on inputs rather than learning outcomes.
- Issues with teachers like teacher shortages, incompetency and skill gaps in teachers, deficiencies in teacher training, etc.
- Curriculum not focusing on developing employability and entrepreneurship skills of students.

1.5 Roles and Responsibilities of HEIs towards Implementing SDG-4

The SDG Fund sees HEIs playing at least three key roles in fulfilling the 2030 Agenda for Sustainable Development viz. Human capital development in the context of the SDGs, Research, and Implementing SDGs in their own institutions.

Under Human Capital Development in the context of the SDGs, the HEIs can embed the SDGs across the disciplines to educate and train the students. Can create awareness in their students on the social, economic, and environmental implications of their future, career, professions and jobs.

Research is the special responsibility of the university. Through Research the Researchers can find out the approaches that are more effective in the process of achieving SDGs and create a better understanding of the interlinkages and correlations among different goals. Action-oriented research, with an understanding of its different users, can be taken up.

As far as the implementation of SDGs in their own Institutions is concerned, universities can play an important role as multi-stakeholder partnerships for realising the SDGs. For non-university students, MOOCs and other hybrid training methods can be created. A list of MOOCs aligned with SDG-4 is given in Table 3.

Table 3: List of MOOCs Aligned to SDG-4

Course Title	Platform	Sponsor
Leading Educational Innovation and Improvement Program	EDX	University of Michigan
Positive Behaviour Support for Young Children Learns the evidence-based models to promote social-emotional development for young children.	EDX	University of Washington
The Smithsonian Science Education Centre’s The Science of Teaching Science	EDX	Smithsonian Institute
Teaching character and creating positive classrooms	Coursera	Relay Graduate School of Education
New Learning – principles and patterns of pedagogy	Coursera	University of Illinois
Advanced Instructional Methods	Swayam	NITTTR
Development of education in India	Swayam	CEC
Innovative strategies for teaching and learning	Swayam	CEC

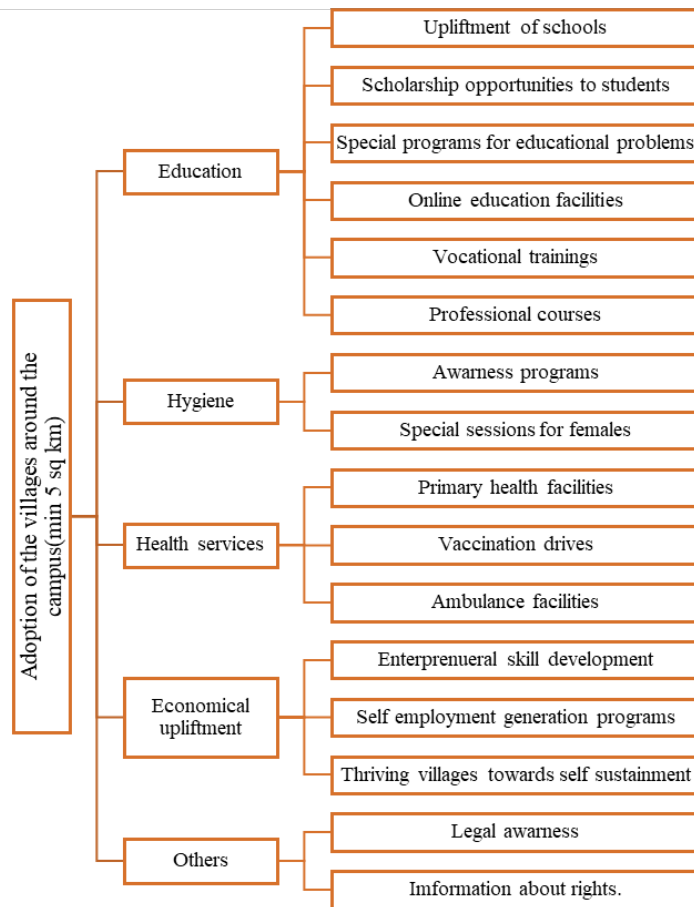
2 Recommended Actions for HEIs for the Achievement of SDG-4

Hub and Spoke model, where a university becomes the custodian of SDGs for its surrounding areas can become an ideal template to be followed by all HEIs in the country. For this purpose, the University adopts a specified area of about 5km² around its location and takes full responsibility for the achievement of SDGs in that area and community. This concept is illustrated in figure 3.





Figure 3: Role of HEIs as Training Hubs for SDGs



Based on this model, the following are some recommendations for HEIs for the fulfilment of SDG-4 Targets:

Table 4: Minimal Recommended Actions for the HEIs for Implementation of SDG-4

SDG-4 Target	Minimal Recommended Actions for HEIs
4.1	<ul style="list-style-type: none"> Adopting schools in neighbouring areas and monitoring school attendance, and dropout rates Creating awareness in the community about the importance of education as well as available facilities already provided by the government Training of schoolteachers through special Programmes to teach creatively Facilitate and create a fun learning environment for children through activities like the painting of walls, creation of a library, etc.
4.2	<ul style="list-style-type: none"> Opening of creches and pre-schools in the university not just for staff members but also for the surrounding villages and community Provide transport for pick and drop of children of neighbouring areas to the creches and pre-schools HEIs with existing teacher education Programmes can design and distribute learning material for pre-primary teachers Certificate courses for pre-primary educators Preparing students as volunteers to teach pre-primary children in creches or pre-primary sections of nearby schools

4.3	<ul style="list-style-type: none"> • Explore all delivery modes of knowledge content including online • Using HEI infrastructure in evenings and holidays for conducting Programmes for the adult learner • Providing vocational training at subsidized rates for adult learners
4.4	<ul style="list-style-type: none"> • Creation of Vocational and Technical training centres in the universities • Provide upskilling opportunities for vocational and technical skills certifications • Entrepreneurial incubator and accelerator centres to promote local entrepreneurs • Focusing on personality development and communication skills of students
4.5	<ul style="list-style-type: none"> • Connecting with local NGOs working with vulnerable and minority groups and partnering with them for academic delivery, and curriculum design • Providing infrastructure aligned with special needs students • Using the online and digital modes of delivery for the education of disabled people who are unable to attend classes physically • Academic support for special needs students- e.g., Providing textbooks in braille, conducting oral examinations instead of written ones, providing writers, adopting flexible timings, etc. • Providing special vocational courses that ensure gainful employment of special needs students • Organize medical camps in the campuses from time to time.
4.6	<ul style="list-style-type: none"> • Supporting government and non-governmental agencies involved in adult literacy Programmes • Student volunteers for teaching adult learners in the vicinity • Organizing special training Programmes for use of technology • Use of online delivery to provide adults with an opportunity to learn in the comfort of their homes
4.7	<ul style="list-style-type: none"> • Using diversity as a resource for teaching • Aligning curriculum to concepts of sustainability, tolerance, equality, and diversity • Conducting regular awareness and sensitization seminars for students and the community
4. A	<ul style="list-style-type: none"> • Conduct regular safety audits of campuses, and hostels to ensure both physical and psychological safety of vulnerable groups • Ensure that infrastructure has provisions for specially-abled people • Have special policies to include and support marginalized groups through special admission drives
4. B	<ul style="list-style-type: none"> • Scholarship and exchange Programmes in collaboration with embassies and universities in developing nations • Building joint projects and research collaborations with regional as well as international HEIs
4. C	<ul style="list-style-type: none"> • Establishing a learning support centre that among other things focuses on internal as well as external faculty development Programmes

3 Proposed Research Agenda for HEIs and Governmental Bodies

To comprehend the complexity of education quality and establish management approaches to achieve it, it is important to examine the various models of teaching and research.

Table 5. Main **Research Areas** and **Actions** that can be Followed for **SDG-4 Implementation**.

Model	Area of focus	Key Research Activities
The goal and specification model	In this model, educational quality is defined as the attainment of specified objectives and adherence to prescribed guidelines.	Institutional objectives, standards, and specifications in the listed program plans e.g. academic achievements, attendance rate, dropout rate, etc.
The resource-input model	Providing the institution with high-quality resources and insights.	Intake of students, recruitment of suitable staff, facilities, and equipment, financial support from alumni, parents, and sponsorship
The process model	Smooth and healthy internal process and fruitful learning experiences.	leadership, decision making, teaching efficacy, teaching method, learning attitudes, attendance rat.
The satisfaction model	Satisfaction of all-powerful constituencies.	Students, teachers, parents, administrators, the education authority, the management committee, and alumni, among others, are satisfied with the educational system.
The legitimacy model	Achievement of an education institution's legitimate position or reputation.	Public relations, marketing, public image, reputation, stature in the community, evidence of accountability, and so forth.
The absence of the model of a problem	Absence of problems and troubles in institution.	Absence of conflicts, dysfunctions, difficulties, defects, weakness, troubles, etc.
The organizational learning model	Adoption of environmental changes and internal barriers continuous improvement.	External needs and changes awareness, internal process monitoring, program evaluation, development planning, and staff development are just a few examples.

4 Recommendations for Government and Regulatory Bodies for the Achievement of SDG-4

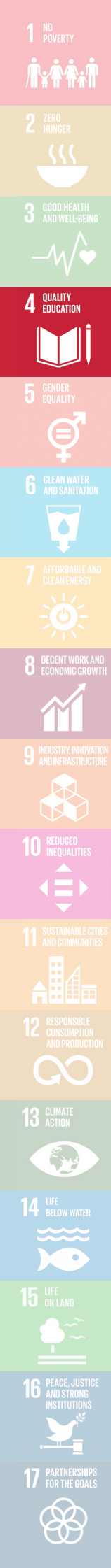
Government can play a vital role in the implementation of the rules and regulations. Key action points for policymakers for effective implementation of SDG-4 are given as follows:

4.1 Recommendations for Government Agencies

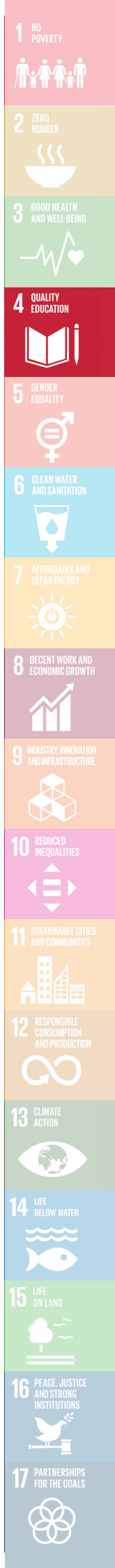
Table-6. Minimal **Recommended Actions** for the Government **Agencies** for **Implementation** of SDG-4

Targets	Minimal Recommended Actions for Government Agencies/Policymakers
4.1	<ul style="list-style-type: none"> To review the success of schemes like <i>Padhe Bharat</i>, <i>Badhe Bharat</i> and implement more such schemes Ensuring time-to-time review of curriculum at all levels of education through specially constituted committees to make education more relevant, state of the art, and oriented towards SDGs Ensure that RTE policy is implemented properly across the country. Involving parents, community, and youth in management and decision-making for HEIs Early education should be provided in the mother tongue Alternate methods like homeschooling should be legalized to provide education to children who are unable to go to school Development of a more comprehensive assessment system to assess learning outcomes with a focus on formative assessment





4.2	<ul style="list-style-type: none"> Increasing funding for the implementation of pre-primary education Ensuring awareness and publicity through slogans and campaigns like <i>Beti Padhao</i>, <i>Beti Bachao</i>, and <i>Meri Beti Mera Abhiman</i> to take education to the grass root levels Organising awareness campaigns at the grassroots level to encourage parents to send their children to pre-primary schools so that children with disabilities can be identified early Pre-primary education efforts should be in sync with the efforts of other departments working in the area of early childhood care. E.g., Food and Nutrition, Health and Family Welfare, Social Welfare, Human Rights, Women and Child Welfare, etc. Providing better facilities and benefits to personnel working in ECCE (early childhood care and education)
4.3	<ul style="list-style-type: none"> Setting Up Digital Universities and Distance Learning Institutions that have a wider reach for imparting education Ensuring that teachers imparting technical and vocational skills are of the highest professional level Continuing Professional Development of Teachers be ensured through orientation programmes, refresher courses, Faculty Development Programmes, MOOCs and other courses. Credit transfers between recognized tertiary educational institutions should be facilitated Ensure flexible learning pathways through Multiple Entry and Exit systems, Dual Degrees, etc., for aspirants to return to academia Facilitating and motivating people to pursue education through bridge courses, career guidance and counselling services, etc., Launch special skill-based courses for women and disadvantaged groups
4.4	<ul style="list-style-type: none"> Monitoring of secondary completion rates Creating a national benchmark of skills through a standardized assessment Engaging HEIs in revamping of curriculum to make it more relevant and in line with market requirements Facilitate Academia-Industry collaboration to align education and skills required for employment Making Entrepreneurship a component in all subjects for all programmes in HEIs Offering financial support and mentoring for new entrepreneurial ventures in HEIs
4.5	<ul style="list-style-type: none"> Develop indicators to measure progress towards equality Identify global and local barriers that keep vulnerable children and youth out of education programmes and design interventions to overcome these Mandate special scholarship programmes and enrolment criteria in educational institutes to ensure the inclusion of females, disadvantaged and vulnerable groups. Social Awareness Campaigns for removing biases of society on gender-based roles
4.6	<ul style="list-style-type: none"> Use of digital technology to educate adults and youth in remote areas Providing grants to HEIs for conducting evening classes for adults and illiterate youth of neighbouring communities. Design Programmes based on their needs and their previous knowledge, with special emphasis on culture, language, and economics and special attention to women and vulnerable groups
4.7	<ul style="list-style-type: none"> Relook at the definition of literacy-going beyond simple reading, and writing to include basic maths skills, awareness of sustainability, tolerance, appreciation of diversity Lauding efforts of inclusion and diversity through special awards and grants for educational institutions Raising awareness about human rights and including materials about different world cultures in schools and HEIS



4. A	<ul style="list-style-type: none"> • Issue national guidelines for minimum infrastructure requirements for schools, colleges, and HEIs keeping in mind the requirements of special and vulnerable groups • Teachers with special training to deal with students with special needs to be made mandatory in all education institutes • Special grants for conducting awareness programmes for students and staff to make them aware and sensitive about the special needs of children and adults. • Make efforts to create Safe Campuses by setting up an effective Internal Complaints Cell, undertaking Gender Audit from time to time and preparing teams of Gender Champions. • Making it mandatory to provide amenities for special needs students
4. B	<ul style="list-style-type: none"> • Conduct student exchange Programmes with developing, developed as well as least developed countries. • Encouraging special programmes and increasing scholarships for students enrolling in the HEIs of developing nations and least developed nations. • Conducting Joint Degree Programmes of universities in India and other collaborating countries.
4. C	<ul style="list-style-type: none"> • Having a central agency that ensures continuing education, FDPs, refresher courses, etc. • Sending teachers for training to different states in India and overseas countries which have achieved considerable success in realising SDGs • Develop a good feedback system to encourage best practices in teaching and professional development of teachers • Special training of teachers to upgrade technical and online teaching skills • Encourage secondment of teachers as well as faculty with other countries

4.2 Recommendations for Regulatory Bodies

The regulatory and accrediting bodies like UGC, AICTE, NAAC, NBA, NIRF, etc., can facilitate the development of quality research, and educational curricula in the training of future professionals in the field of sustainable development including SDG-4. Specific recommendations for these bodies include the following:

- Inclusion of achievement of SDGs as criteria for national rankings of HEIs
- Review and upgrade curriculum frequently at both school and higher education levels to make it more relevant and useful.
- Involvement of youth and parents in policymaking
- Building a consortium of universities for SDGs where different clusters of universities collaborate on specific SDGs
- Faculty and administrator development and training to sensitize and equip them with knowledge about SDGs and how to achieve them
- Encouraging self-paced learning by use of MOOCs to bring in inclusivity and increase the reach of education

5 Conclusion Along With Prioritization of the Initiatives Recommended

The UN SDG-4 helps us look beyond the obvious and the traditional when it comes to education. Education is about raising a sensitive and aware next-generation who is equipped with the right skills not just to earn their livelihood but also to make this world a better place to live.

Keeping this in mind, we propose the following recommendations for HEIs, government, policymakers, and regulatory bodies to achieve the targets of SDG-4 by 2030.



1. **Expand the Ambit of Literacy:** New and broader dimensions of literacy to be introduced which include equipping learners with social, cultural and environmental awareness; the skills that guarantee employment, and the ability to operate basic technology.
2. **Add SDG to University Rankings:** Linking SDGs to the ranking system of higher education is the quickest and surest way to align HEIs with the SDG.
3. **The Consortium of Universities Aligned on Different Goals:** Bringing together universities and building collaborative groups aligned to specific SDGs. This will make achieving SDGs a collective responsibility.
4. **Hub and Spoke Model:** Universities may act as custodians of SDGs by locating themselves in the center and steering the activities for achieving SDGs in the surrounding communities in the form of hub and spokes.
5. **Use of Digital Technology:** Digital technology should be put to full use to increase reach and improve quality.
6. **Aligning Curriculum to SDGs:** Best practices of all countries for realising SDGs to be made a part of the curriculum.
7. **Aggressive Monitoring:** Breaking down SDG goals into time-bound yearly, 3-yearly goals and actively reviewing the achievements of these.

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5 GENDER EQUALITY



SDG-5: Achieve Gender Equality and Empower All Women and Girls

Summary

The UN-SDG-5 addresses the issues of gender inequality and violence, and lays down the importance of gender equality not just as a fundamental human right but also as being beneficial for humanity at large. The aims of SDG-5 include elimination of discrimination, violence (trafficking and sexual exploitation), harmful practices (child marriage, forced marriage, genital mutilation) against women, access to reproductive and sexual health, as well as reproductive rights, and access to equal opportunities in leadership and decision-making roles. HEIs have an important role to play in achieving SDG-5. Some of the steps which HEIs can take in this regard include scholarships for women to pursue higher studies, business incubation centres in HEIs to instill skills among girl students and women for enhancing self-employability. HEIs must plan the scope for flexi-timing, and mandatory child-care centres at workplaces. The Indian government has taken several initiatives like National Rural Health Mission, Janani Suraksha Yojana, Beti Bachao Beti Padhao, etc. with respect to achieving women empowerment. However, we are far from achieving some of SDG-5 targets at present and need to take many more initiatives to realise it. This chapter presents the status of progress by different countries in achieving this goal and presents recommendations on actions to be taken by the Government, HEIs and Higher Education Regulatory bodies.

Key Recommendations to Achieve SDG-5

- HEIs should implement workplace gender equity strategies to improve the representation to at least 50 percent women in university leadership positions and senior academic roles.
- HEIs should ensure facilities like clean restrooms or e-toilets with sanitary napkins vending machines, creches, centres for old family dependents (elderly or parents) female common rooms, childcare centres, and ample lighting on the campus.
- HEIs should provide workplace time flexibility to women employees so as to adjust with their other responsibilities.
- HEIs should ensure adequate women security, helpline, surveillance, and transport facility for the evening and shift workers.
- HEIs must implement the Government of India guidelines and the University Grants Commission on POSH Act and Internal Complaints Cell.
- Regulatory Bodies must provide orientation on POSH Act and training workshops to the Internal complaints cell.
- Government must formulate and strictly implement policies to address violence against girls and women in the family or public environment, molestation, trafficking, sexual exploitation, etc.
- HEIs must orient their students, faculty as well as the community around, particularly people from rural and lower socio-economic strata about the inevitable role of women in



continuing humanity on this planet and also about the policies of the Government of India on violence against women in the family or public environment, molestation, trafficking, sexual exploitation, etc.

- Participating in national campaigns for preventing violence against women and committing to report on the number of sexual assaults that have taken place at the institution.
- Regulatory Bodies need to create a policy for gender audits in the HEIs to assess their performance in addressing the issues of employment and service conditions of women, female students, and transgenders.
- A mandatory incorporation of equal female members in the quorum of each expert or selection committee meeting must be implemented by Central or State Government or public or private sector agencies.
- Schemes to ensure women access to higher education such as scholarship, mentoring, and other schemes.

1 Context and Current Status of the SDG-5

1.1 The Context and Status

Sustainable United Nations’ Development Goal-5 addresses the issue of gender equality and women empowerment. It states that “gender equality is not only a fundamental human right but a necessary foundation for a peaceful and sustainable world. Equal access to education, decent work, and representation in political and economic decision-making processes are not only rights women should have, but they also benefit humanity at large”. SDG-5 aims at eliminating all kinds of discrimination and violence against girls/women everywhere and encourages undertaking reforms to provide equal opportunities and access to resources and property ownership to women. Goal 5 also commits to achieving the targets by eliminating violence against trafficking, sexual abuse, harmful practices including forced early childhood marriages and genital mutilation in females, lack of effective involvement in decision making, lack of equal opportunities in leadership, and the gender pay gap.

1.2 United Nations Sustainable Development Goal 5 Targets

SDG-5 has nine targets and 14 indicators that need to be to be achieved. Table 1 provides a list of SDG-5 targets and indicators.

Table 1: SDG-5 Targets and Indicators of SDG 5

Target	Indicators
5.1 End all forms of discrimination against girls and women everywhere around the world	5.1.1 Whether or not legal frameworks are in place to promote, enforce and monitor equality and non-discrimination on the basis of sex
5.2 Eliminate all forms of violence against girls and women in public and private places; violence includes trafficking and sexual exploitations.	5.2.1 Proportion of ever-partnered women and girls aged 15 years and older subjected to physical, sexual or psychological violence by a current or former intimate partner in the previous 12 months, by form of violence and by age
	5.2.2 Proportion of women and girls aged 15 years and older subjected to sexual violence by persons other than an intimate partner in the previous 12 months, by age and place of occurrence



<p>5.3 Eliminate harmful practices including child marriage, forced and early marriages, as well as female genital mutilation.</p>	<p>5.3.1 Proportion of women aged 20-24 years who were married or in a union before age 15 and before age 18</p>
<p>5.4 Recognize and value domestic work and unpaid care through the provision of public services, and social protection policies, as well as through the promotion of shared responsibility within the household and the family.</p>	<p>5.3.2 Proportion of girls and women aged 15-49 years who have undergone female genital mutilation/cutting, by age</p>
<p>5.5 Ensure effective and complete participation, and equal opportunities in leadership at all levels of decision-making in public, economic and political life.</p>	<p>5.4.1 Proportion of time spent on unpaid domestic and care work, by sex, age and location</p>
<p>5.6 Ensure universal access to reproductive and sexual health, and reproductive rights as laid down in the “Program of Action of the International Conference on Population and Development,” the “Beijing Platform for Action” and the outcome documents of their review conferences.</p>	<p>5.5.1 Proportion of seats held by women in (a) national parliaments and (b) local governments</p> <p>5.5.2 Proportion of women in managerial positions</p>
<p>5.a Undertake reforms to provide women with equal rights to economic resources, access to ownership and control over land and other forms of property (inheritance, financial services, and natural resources), as per the national laws.</p>	<p>5.6.1 Proportion of women aged 15-49 years who make their own informed decisions regarding sexual relations, contraceptive use, and reproductive health care</p> <p>5.6.2 Number of countries with laws and regulations that guarantee women aged 15-49 years access to sexual and reproductive health care, information, and education</p>
<p>5.b Enhance use of enabling technology, particularly information technology and communications technology, to promote women empowerment.</p>	<p>5.a.1 Proportion of total agricultural population with ownership or secure rights over agricultural land, by sex; and (b) share of women among owners or rights-bearers of agricultural land, by type of tenure</p> <p>5.a.2 Proportion of countries where the legal framework (including customary law) guarantees women’s equal rights to land ownership and/or control</p>
<p>5.c Strengthen and adopt policies and enforceable legislation to promote gender equality, and women and girl empowerment at all levels.</p>	<p>5.b.1 Proportion of individuals who own a mobile telephone, by sex</p> <p>5.c.1 Proportion of countries with systems to track and make public allocations for gender equality and women’s empowerment</p>

Source: <https://www.SDG-5data.org/>

Women’s empowerment and gender equality have caught the attention of academics, feminists, policymakers, and governments across the globe. The Global Gender Report 2017 stated that the constitution of women is half of the world’s population, but they are deprived of access to the same level of participation in education, health assistance, economy, earning, and decision-making power.

1.3 Summary of Progress on SDG-5 Implementation Globally

UNESCO laid stress on the importance of education to achieve the targets of SDG-5. It stated that “the quality, gender-sensitive education encourages the participation of women and girls in all political, economic and public spheres by making sure they are heard and have real opportunities to fully participate. Furthermore, it contributes to putting an end to practices and traditions that impair the physical, mental and sexual health of women and girls.



Table 2: UNESCO Policy Recommendations on SDG-5

UNESCO Policy Recommendations on SDG-5	
Support the education of girls and women	Through women’s empowerment and their participation in science, media, and culture and combating violence in all its forms against women.
Education of women and girls	Through global partnerships for educating girls and women and combating gender-based violence.
Increase women participation	Participation in STI through STEM and Gender Advancement (SAGA).
Increase Gender equality	Through increasing participation of women in ocean science, disaster risk reduction (including Tsunamis), and in ocean-related climate change efforts, promoting women in cultural life, and in the media.
Support women empowerment and gender equality	Through capacity building, research, advocacy, policy advice, and collaborative frameworks.
Generate transformative social change	Through empowering women as creators and producers of cultural goods and services and through supporting them by safeguarding of cultural heritage and their participation in cultural life.
Improve access to information for women	By fostering gender equality in media organizations and do away with gender stereotypes in media content, and by empowering women with ICT skills.

Source: (<https://en.unesco.org/creativity/sites/creativity/files/247785en.pdf>)

The Best Countries to be a Woman in 2021 are Norway, Finland, Iceland, Denmark, Luxembourg, Switzerland, Sweden, Austria, United Kingdom, and the Netherlands (www.globalcitizen.org). Guidelines regarding education regulation to promote gender equality in some of these European countries are as follows:

Gender Equality Acts and Frameworks in Various European Countries

Gender Equality Act, 1978, Norway, promotes equal status between the genders to improve the position of women in society. Males and females are given equal rights and opportunities in education, employment, and cultural and professional advancement. Article 6 under this act defines those women and men in the country have equal rights to education. Women and men should be considered by the employer on equal terms regarding training, further education and in granting leave of absence in connection with education etc. Regarding admission to educational institutions, guidelines regarding gender equality need to be implemented. Article 7 under this act defines that in schools and other educational institutions, the teaching aids used shall be based on gender equality.

The Finnish Government is dedicated to promoting gender equality in all its decision-making. The Finnish Equality Act is implemented throughout the country to promote gender equality and to prevent gender-based discrimination, gender identity or expression of gender. The gender equality unit of the Ministry of Social Affairs and Health (MSAH) prepares and implements the Finnish Government’s gender equality policy and develops gender equality legislation. The action plan is focused on monitoring and supporting the efforts made by universities to promote gender equality and integrate a gender dimension into research policy. Recently, MSAH’s 2020-2023 action plan addresses higher education institutions (HEIs) and the research and innovation sector through two explicit actions, with the Ministry of Education and Culture (MEC) publishing two related reports. The 2020 “Report on the promotion of gender equality and non-discrimination in higher education institutions” recognised universities’ shortcomings and obligations to progress action plans related to gender equality. The Act on Gender Equality indulges Finnish universities to implement a gender

equality plan (GEP) and to update that plan every two years based on an assessment of previous actions. For women researchers in HEIs, awards and grants include the L'Oréal Finland for Women in Science Fellowship (awarded to one person in alternate years) and small grants for women doctoral students awarded by the Women's Science Foundation (awarded to several people in alternate years).

Apart from a few subsections, the Equality Act (2010) governs equality throughout the United Kingdom except in Northern Ireland. The Equality Act 2010 (Specific Duties) (Scotland) Regulations 2012 establishes equality law in Scotland. Age, Gender Reassignment, Disability, Marriage and Civil Partnership, Pregnancy and Maternity, Race, Religion or Belief (including no belief), Sex and Sexual Orientation are nine protected characteristics under the Equality Act (2010), which replaced numerous prior equalities legislation and Acts. All UK government departments, higher education institutions, agencies, and research organisations, as well as the Education Funding Councils of England, Scotland, and Wales, are covered by the Equality Act. Section 75 of the Northern Ireland Act 1998, as well as the Sex Discrimination (Northern Ireland) Order 1976, are the key equality laws of Northern Ireland. The Order outlaws sex-based discrimination and harassment and require public bodies to promote equality of opportunity for men and women in general. All higher education institutions and research organisations are subject to the Public Sector Equality Duty, which was established under the 2010 Equality Act. It requires these bodies to eradicate discrimination, harassment, and victimisation of people because of their protected characteristics; promote equality of opportunity, and encourage good relations among people in setting such a workplace.

The Research Excellence Framework (REF) is a criterion for determining the quality of research in all disciplines conducted by UK higher education institutions to be eligible for public research funding. The Higher Education Funding Council for England (HEFCE), the Scottish Funding Council (SFC), the Higher Education Funding Council for Wales (HEFCW), Department for Employment and Learning (DEL) and Northern Ireland conducted the collaborative inaugural REF evaluation in 2014. Each institute making REF submissions is assessed on a number of equality and diversity criteria, including gender equality. Each REF-submitting institute is required to create, publish, and implement a code of practice for fair and transparent staff selection. Institutes submit their codes of practice for examination by the REF Equality and Diversity Advisory Panel as part of the REF assessment process. The Equality Challenge Unit (ECU) delivers and manages the Athena SWAN Charter and Awards, which are aimed at higher education institutions. The Athena SWAN Charter is a set of ten important principles that higher education institutions must include in their policies, procedures, action plans, and culture. Charter members are eligible to apply for gold, silver, and bronze Athena SWAN awards at the institutional and departmental levels. Each award has a three-year validity period. In 2015, the Charter broadened its scope from its original focus on STEM to include work in the arts, humanities, social sciences, business, and law (AHSSBL), as well as all higher education professional and support roles, not just academic roles, and to promote equality and support for trans staff and students (European Institute for Gender Equality).

According to UNICEF data, the following countries have no laws or policies on women's education: Afghanistan, Syria, Yemen, Pakistan, Iraq, South Sudan, Chad, DR Congo, Sudan, and Sierra Leone.

1.4 Initiatives and Achievements of the Indian Government in SDG-5

In the Indian context, gender uniformity at the primary education level is on track to achieve uniformity at all levels of education. Higher education at the degree level is the pivot around which gender equality and empowerment revolve because of the role it plays in maximizing critical thinking and research orientation. The following section presents the assessment of various

states and Union Territories (UTs) in terms of SDG-5 as captured by NITI Aayog (2021). Figure 1 highlights the composite scores of the States and UTs on SDG-5 and the breakdown of the States and UTs by indicator.

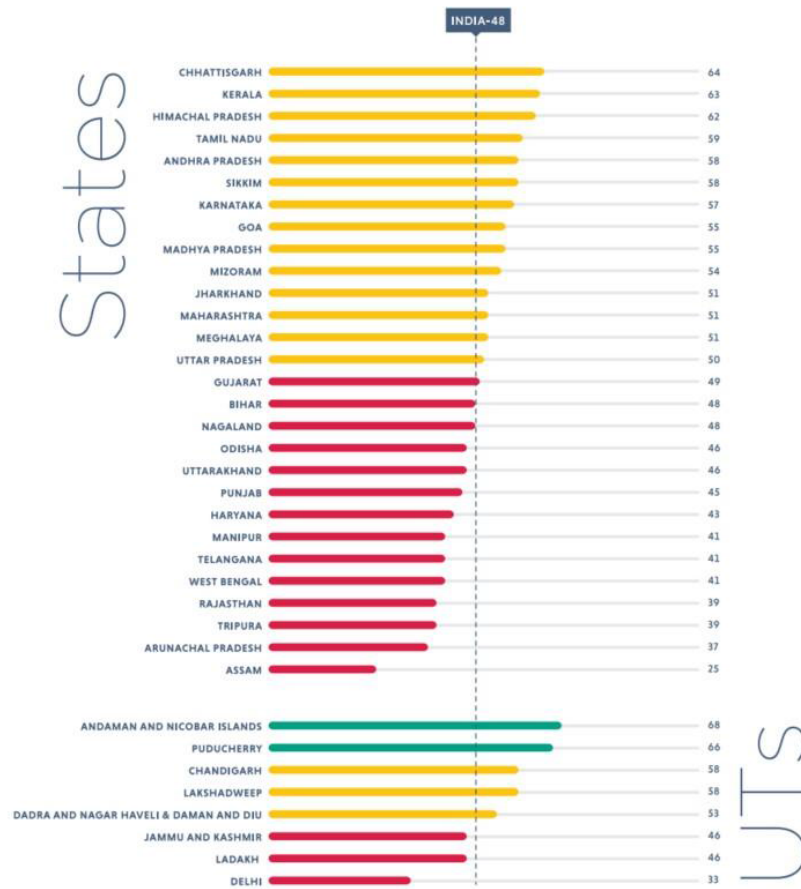


Figure 1: SDG-5 Index Score of States/UTs

Chhattisgarh and Andaman and the Nicobar Islands are observed to be the top players among all States and UTs respectively.

1.4.1 All India Council for Technical Education (AICTE)

All India Council for Technical Education (AICTE) promotes gender equality in technical institutions in India to inspire girl students. As per the regulatory guidelines, AICTE approved institutions across India should conduct the following activities during the academic year to ensure equality, women empowerment, removing stereotypes and awareness on gender bias and harmony.

1.4.1.a Awards for Girl Students (Recognition or Cash Prize)

Medhavi Chhatra Award is given to the student who scores highest in the 1st, 2nd and 3rd year of her degree respectively. Udyamita Award is given for performance in entrepreneurship. Kala Shresthi Award is given to a student showing extraordinary performance in dance, and arts. A student with exceptional performance in music is awarded Mira Bai Award. For excellent sports performance, Ojaswi Award is given. Nivida Award is for performing exceptional work in social services. Navonmesha Award is given to the student who comes up with novel ideas in technology and innovation.



1.4.1.b Awards for Women Faculty and Staff Members (Recognition or Cash Prize)

Woman faculty who enhances skills among students and with the best student feedback is awarded with *Maa Saraswati Award*.

1.4.2 AICTE Lilavati Award-2020

In 2020, AICTE instituted **Lilavati Award**, based on the theme ‘Women Empowerment’ which was awarded to recognize efforts being made by AICTE-approved institutions to treat women with ‘equality and fairness’ in all spheres of their lives.

Recently, AICTE signed a Memorandum of Understanding with ‘*Aspire for Her*’ (Consultancy Private Limited Management) on 31st October 2021 with the vision to enable a future-ready workforce with a focus on women’s empowerment. ‘*Aspire for Her*’ strategic collaboration is in the field of supporting diversity and inclusion initiatives of progressive, forward-looking organizations and institutions. The company supports organizations and institutions to understand and improve diversity in terms of gender and all other forms. ‘*Aspire for Her*’ and AICTE’s collaboration will enable India’s onward trajectory exponentially towards achieving the Sustainable Development Goals with special emphasis on quality education, gender equality, decent work, economic growth, and reduced inequalities.

1.4.3 National Assessment and Accreditation Council (NAAC)

Gender equity is one of the major criteria in the Self-Study Report (SSR) of NAAC, for which each applicant is required to upload data and supporting documents regarding gender equity. Gender equity programmes run by the applicant in the institution for consecutive five years are taken into count for grading.

1.4.4 University Grants Commission- India

Universities and colleges which come under the UGC’s jurisdiction have been directed to immediately follow guidelines to endorse gender equality. A letter to the universities from the UGC states “To increase the outreach for creating an environment that fosters equal treatment, the government of India envisages engagement of ‘gender champions’ in all educational institutions across the country.” “Gender champions are envisaged as responsible leaders who will facilitate an enabling environment within their academic institutions where girls are treated with dignity and respect”.

1.5 HEIs Status: Role of Higher Educational Institutions and Status of Adoption of SDG-5

The role of Higher Education Institutions (HEIs), in recent years, in the attainment of these goals has been the focal point of discussion across the world. SDGs are focused on three dimensions: social, economic, and ecological, therefore to “end poverty, protect the planet, and ensure prosperity for all.” One of the United Nation’s reports asserts that gender inequality is persistent worldwide thereby depriving women of their basic rights and opportunities in higher education. Higher Education forms an integral part of all Sustainable Development Goals as education is a conduit for the reformation of human capital through knowledge and skill development for individuals to better equip themselves with competencies to face the challenges of life. Higher education has a positive relationship with gender equality and women empowerment in terms of reducing economic dependency, boosting self-confidence, self-esteem, self-efficacy, critical thinking, leadership qualities, and the ability to make rational decisions. Hence, it is the responsibility of the institutions to not only train future world leaders but to also reduce the gender gap, foster the inclusion of



women in their programs, design leadership models that are gender-inclusive, and provide equal career opportunities (Nilsson, 2018). This puts a great obligation and responsibility on HEIs to contribute towards the accomplishment of sustainable development goals, including gender equality and women empowerment. Some of the ways of achieving this can be the following:

- i) Firstly, HEIs must revisit their policies to create an enabling environment for girls to continue in higher education. Secondly, the right to education must cover higher education as an important component. In other words, the right to free higher education can promote retention and graduation from courses. Third and more importantly, equal access to career and skill opportunities for girls can boost the upcoming youth to consider higher education as a reachable destination despite persisting poverty of all sorts.
- ii) HEIs are implementing what is termed “feminist strategic alliances” to build gender-blind knowledge, skills, and competencies (Bustelo 2017; Mazur 2017). However, HEIs must be mandated by regulations from central governments to implement gender equality action plans (Verge, Ferrer-Fons, and González (2018). Though, the implementation is very poor despite the regulations and policy provisions.
- iii) Another issue in gender equality revolves around women’s leadership. As per the recent Times Higher Education (THE) World University Rankings 2021, only 20 percent of the top 200 HEIs are led by women the world over. The statistics on women’s leadership in India is also not very encouraging. Less than 7 percent of the Vice Chancellors in India are women that too because of the mandate that the post of Vice Chancellor is to be held by a woman in women-only Universities.
- iv) Times Higher Education World University Rankings under SDG-5 also rank the institutions on various parameters such as “research on the study of gender, their policies on gender equality and their commitment to recruiting and promoting women”. Low participation of Indian Institutions in this category emulates the prevailing gaps in society and raises a concern that unless Indian Higher Education Institutions imbibe the responsibility of contributing towards gender equality, it will become increasingly difficult for India to have gender-inclusive growth.

The institutions/ universities have put efforts under case studies in the direction mentioned below:

1. University of Bologna (UNIBO): To enhance gender equality, UNIBO has in place the following initiatives as per its Gender Equality Annual Reports:
 - PLOTINA: Promoting Gender Balance and Inclusion in Research, Innovation and Training.
 - GEMMA European Mundus Master’s Degree in Women’s and Gender Studies MeTRa Centre.
 - UNESP - São Paulo State University, Brazil: The Gender and Race Research Group, Lecture cycle, Cine debates, Training courses, Courses, Reading beyond the page.
2. Assam Don Bosco University Centre of Community Development Initiatives include tutorial classes, short-term skill development, international volunteer exchange programs, community counselling cells, and crisis response teams.
 - Other educational institutions that have taken significant measures towards implementation of SDG-5 include McMaster University, Canada; Open University of Catalunya (UOC), Spain; University of Vechta, Germany; Inter-American Organization for Higher Education (IOHE), Canada; American International University Bangladesh (AIUB); Birla Institute of Management Technology, India; Makerere University, Uganda; and Antonio Nariño University (UAN).

The Standing Committee on Gender Equity/ implementation Equality’s arm at University Grants Commission (UGC), Sri Lanka is the Centre for Gender Equity/Equality (CGEE). The Standing Committee is the standard-setter, policymaker, regulator, and arbitrator for the UGC policy on gender equity and equality in Sri Lankan universities. A director and administrative staff lead the Centre for Gender Equity/Equality, which reports to the Standing Committee.

The Centre for Gender Equity/Equality is based on a dual conception of gender equity and equality. This means that in conversations and conceptualizations regarding gender, both the similarities and differences in men’s and women’s life experiences are taken into account. (<https://eugc.ac.lk/cgee/policies.html>).



Example Case: Council of University of Colombo

Sexual harassment is a crime, and Section 3.5 of the Penal Code Amendment (1995) expressly prohibits it. The University of Colombo strives to create a sexual harassment-free learning environment in the workplace. As a result, the University community aims to not tolerate acts of sexual harassment and takes disciplinary action against anyone who engages in such behaviour. Retaliation against someone who has filed a sexual harassment complaint or against others who help with the investigation of a sexual harassment complaint is also the subject of disciplinary action. This sexual harassment policy applies to all University employees and the code successfully governs staff-student relationships.

Example Case: University of Jaffna

The University adopts a gender-responsive research environment that improves understanding of national development issues and impacts positively the lives of men and women. To achieve this objective University of Jaffna uses the following directives:

- i) Design and implement a gender-focused research skills training programme for all employees.
- ii) Develop guidelines to guarantee that gender analysis is incorporated into all research processes and discoveries, irrespective of discipline.
- iii) Design and implement an affirmative action programme to encourage female employees to participate in the workplace, with special budget allocations to support their societal roles.
- iv) Increase the number of places where worldwide standards for gender-focused research and publishing are disseminated.
- v) Encourage more operational research in sexual and gender-based violence (SGBV) to lead to evidence-based programming and service delivery.
- vi) Facilitate the identification of SGBV research capabilities and needs, as well as the development of an SGBV research agenda.
- vii) Encourage research methods and approaches that are sensitive to SGBV survivors and lead to SGBV eradication measures.

Table-3: Some of the MOOCs Related to SDG-5 Offered by Various HEI and the UN

SDG Target	Course	Platform	Sponsor
1	Gender equality and sexual diversity	Udemy	Diego Portales University, Chile, South America
2	International women's health and human rights	Coursera	Stanford University
3	Queering Identities: LGBTQ + Sexuality and gender identity	Coursera	University of Colorado System
4	Gender and sexuality: Diversity and inclusion in the workplace	Coursera	University of Toronto
5	Gender analytics for innovation	Coursera	University of Toronto
6	Confronting gender-based violence: Global lessons for healthcare workers	Coursera	Johns Hopkins University
7	Impact measurement and management for the SDGs	Coursera	Duke University
8	Gender, family and social change in contemporary south Korea	Coursera	Yonsei University

2 Recommended Actions for HEIs for Achievement of SDG-5

Higher Education Institutions are directly responsible for addressing the issues of women's empowerment and gender equality through education, research, and community engagement.

2.1 Access to Higher Education

1. Schemes to ensure women's access to higher education such as scholarships, mentoring, and other schemes.
2. Outreach activities to encourage women in underrepresented subjects like STEM (Science, Technology, Engineering, and Mathematics).
3. Collaboration with other institutions, community groups, government, or NGOs in regional or national campaigns.
4. Universities can encourage self-employability by starting incubation centres for women.

2.2 Teaching and Learning

1. Addition of a course on gender issues in the curriculum to provide knowledge and enable students to address the issues pertaining to gender equality and women empowerment.
2. Provide in-depth academic, vocational, and self-defence training to students for implementation of the targets of gender issues.
3. Enhance opportunities for capacity building of students, faculty, and staff to address challenges relating to gender issues.
4. Structure courses around real-world collaborative projects related to gender problems to make students understand and develop adaptive capacity while learning.

2.3 Organizational Governance, Operations, and Culture of the University

1. Focus on gender equity strategies by including women in leadership positions and promoting them to decision-making roles both in administration and academics.
2. Focus on the importance of gender balance in decision-making leadership.
3. Focus on reducing the gender pay gap.
4. Providing Flexi-timings, mandatory childcare centres at workplaces, and gender-enabling systems.
5. Participation in national campaigns for the prevention of violence against women and committing to report the sexual assault cases that take place at the institution.
6. Conducting workshops and awareness campaigns on gender issues.
7. For gender awareness, action research requires policy centres and gender labs at all levels in all colleges and institutions.

2.4 Cross-Sectoral Collaborations

1. Strengthen public engagement and participation in addressing gender issues by hosting lectures and workshops by renowned thinkers, forums to raise awareness regarding gender issues with relevance for the masses, and community events.
2. Initiate and facilitate collaboration, partnerships, and action partnerships on solutions to addressing the challenges of gender equality and women empowerment.
3. Play a lead role in policy formulation and promotion of gender equality and women empowerment by collaborating with policymakers to identify the problems and provide solutions.
4. Demonstrate the importance and commitment of HEIs in the implementation of gender-related policies through teaching, research, and innovations.
5. Need for the generation of part-time appointments for women.



2.5 Research on Gender Issues

1. Encourage women students and faculty to patent filing to reduce the gender gap.
2. Promote balance and gender inclusion in Research, Innovation, and Training.
3. Enhance gender perspectives in research processes.
4. Consider re-visioning and implementing research programs involving gender dimensions and integrating gender issues.
5. Organise campaigns within and outside the institution to promote gender diversity and the contribution of women in research.
6. Research on gender transformation conditions for women's empowerment to focus on the development of their skills, competencies, and expertise.
7. Adopting and implementing policies towards gender equality by universities and HEIs can have far-reaching effects on society in general as well as can contribute to shaping public policies accordingly.

3 Proposed Research Agenda for HEIs and Governmental Bodies

As per Global Gender Gap Report, 2021 issued by World Economic Forum (WEF), India ranked 140th globally by closing its gender gap by 62.5% to date. A noteworthy decline in women's number count as ministers was witnessed in the year 2021. The gender gap in India on the dimension of economic participation and opportunity broadened by 3% this year, leading to a 32.6% gap closed to date. The share of women in senior and managerial positions also remains low. The gender pay gap is yet another concern in India. Against this backdrop following recommendations will be pertinent for the HEIs to implement in their research agenda:

1. Integration of the gender dimensions into research and innovation
2. Promoting gender equality in research and innovation
3. Financial support to encourage women students and faculty to research
4. Encourage women students and faculty for patent filing to reduce the gender gap
5. Promoting Gender Balance and Inclusion in Research, Innovation and Training
6. To enhance gender perspectives in research processes
7. Gender dimensions should be taken into consideration in the area of research, re-visioning research programs and integrating the gender dimension into the design, assessment, and execution of research
8. To highlight gender diversity and women's contribution to the research area, campaigns should be organised within and outside the research institution.
9. Workshops for the integration of the gender dimension in research
10. Gender gaps in Educational Attainment and Health
11. The gender gap in Economic Participation and Opportunity
12. Policymakers should be provided with technical and financial data in order to find out the issues regarding gender equality and plan suitable policy action.
13. Identification of gender gaps in human capital and addressing the gaps in the policy framework.
14. Due to lower access to production inputs, women's access to economic opportunities is reduced.
15. Women's need and access to financial and credit facilities to be addressed
16. Agricultural extension networks are mainly led by men due to which female farmers suffer a lack of information in this field.
17. Women need access to productive assets so as to enhance their economic opportunities in the agriculture field, research area, or as micro-entrepreneur.
18. Promoting women empowerment as a research agenda for economic development and growth of the organization as well
19. Identifying the gender gap in political participation.



4 Recommendations for Government and Regulatory Bodies for the Achievement of SDG-5

4.1 Recommendations for Government or Regulatory Agencies

According to an elaborative detail on past activities, here are a few recommendations possibly from the sectors like Education, Security & surveillance, Job creation, Entrepreneurship, Health & Family Welfare, Skill development, Environment, Transport, Taskforce for reviewing implementation, Agriculture sector for socio-economic development and livelihood are proposed in Table-4.

Table 4: Minimal Recommended Actions for the Government Agencies for Implementation of SDG-5

SDG-5 Target	Minimal Recommended Actions for Government Agencies/ Policymakers
5.1 End all forms of discrimination against girls and women everywhere around the world	<ul style="list-style-type: none"> Formulate strategies for the advancement of understanding, acceptability, trust, and equality, among genders. Inclusion of interdisciplinary or social projects building cohesiveness among the genders to end discrimination against women; responsibility, and teambuilding, is also required. Formulate and strictly implement policies to address violence against girls and women in the family or public environment; molestation, trafficking, sexual exploitation, etc. National Education Mission and <i>Mukhyamantri Balika Cycle Yojana</i> are some government initiatives focussed on providing access to education to girls and bridging the gender gap.
5.2 Eliminate all forms of violence against girls and women in public and private places; violence includes trafficking and sexual exploitation.	<ul style="list-style-type: none"> A law enforcement policy against any violence against girls and women in the family or public environment on molestation, trafficking, sexual exploitation, etc. must be framed, and people from both sexes must be educated under mandatory awareness programs in cities and rural areas. Services for Women security, help-line, surveillance and transport facility for the evening and shift workers must be enhanced. Recruitment of Female security staff and service providers must be upgraded. Few of the initiatives which Government should take are: One stop crisis centre which includes medical assistance, counselling, legal help, shelter, a women's helpline initiative in the line of <i>Bharosa</i> (trust), an Initiative of the Hyderabad City Police & Telangana Government; <i>Himmat</i> (courage) Safety Solutions for Women: Delhi Police Emergency Services for Citizens.
5.3 Eliminate harmful practices including child marriage, forced and early marriages, as well as female genital mutilation.	<ul style="list-style-type: none"> Government regulatory agencies from Education; Health & Family Welfare; Media & Communication; and Law enforcement must come forward to organize education and awareness programmes and more importantly their implementation plan in rural and urban areas using online and offline media for early removal of the gender-related ill effects from the society. Some attraction/ support for the financial, scholarship based and future employment & investment benefits to individuals/families may be introduced. A centralized reporting or helpline system and judiciary framework for such cases should also be established.



<p>5.4 Recognize and value domestic work and unpaid care through the provision of public services, and social protection policies, as well as through the promotion of shared responsibility within the household and the family.</p>	<ul style="list-style-type: none"> • Essential services like medical; creche and caretaker for kids or family dependents (elderly or parents) must be enhanced by creating such centres in society or in respective organizations. • A culture of flexibility in job function, time, and location (work from home) to family-responsible staff male or female meeting the outcome of the position may also be introduced. • A recognition or appreciation for potential female contributors in a job role along with maintaining equilibration of family responsibility must be introduced by each organization under the regulation from the Government of the agency. • Flagship sanitation programme of the government for sanitation and menstrual hygiene, <i>Pradhan Mantri Ujjwala Yojana</i> are some programs of the government which need to be promoted robustly.
<p>5.5 Ensure effective and complete participation, and equal opportunities in leadership at all levels of decision-making in public, economic and political life.</p>	<ul style="list-style-type: none"> • Creation of more female job opportunities in each sector, sports, production, sales, education, transport, agriculture, health, etc. by MoE is to be done. • A mandatory incorporation of equal female member/s in the quorum of each expert or selection committee/ meeting must be implemented by the Central-/ State Govt. or public or private sector agencies.
<p>5.6 Ensure universal access to reproductive and sexual health, and reproductive rights as laid down in the “Program of Action of the International Conference on Population and Development,” the “Beijing Platform for Action” and the outcome documents of their review conferences.</p>	<ul style="list-style-type: none"> • A learning and education plan about body composition, requirements, abnormalities, reproductive growth, and behavioural, emotional & social changes across both genders using print and online media must be enhanced. • Identification or creation of family or public counsellor to hear and resolve such body issues among both sexes may be established by Government regulatory agencies. • The Integrated Child Development Services (ICDS) ensures maternal and child malnutrition, <i>Janani Suraksha Yojana (JSY)</i> provides conditional cash transfers to promote institutional deliveries among women from remote areas, and the National Health Policy was implemented. The Government of India has implemented several legislations and welfare schemes to curb the practice of female feticide and sex-selective abortion. The <i>Pradhan Mantri Ujjwala Yojana</i> was launched in 2016 to meet the need for clean fuel to protect the health of women and children.
<p>5.a Undertake reforms to provide women with equal rights to economic resources, access to ownership and control over land and other forms of property (inheritance, financial services, and natural resources), as per the national laws.</p>	<ul style="list-style-type: none"> • A plan to advance the role of a female member in the family or in society not in comparison to males but equality to the male must be framed out and hence be implemented. • Equal rights of decision-making about partner selection, marriage, parenting, family maintenance, job, travel, expansion of social circle etc. to a female under each govt. or public sector schemes must be incorporated. • Maternity Benefit Programme protects women from wage loss during the first six months after childbirth, several programmes are being implemented for enabling greater participation of women in the workforce and these include Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), Pradhan Mantri Jan-Dhan Yojana (PMJDY), the <i>Deendayal Antyodaya Yojana</i>. Initiatives for Improving Female Labour Force Participation: <i>Mahila E-HAAT</i>, Stand Up India, <i>Mahila Shakti Kendra</i>, Women Transforming India were also introduced.

<p>5.b Enhance use of enabling technology, particularly information technology and communications technology, to promote women empowerment.</p>	<ul style="list-style-type: none"> • Use of modern technology tools like IT, AI, computer science, Cloud management, software programming, hardware, online media etc. in each of the developing sectors must be incorporated by a respective regulatory agency and thereby successive utilization of trained and knowledgeable female candidates be empowered.
<p>5.c Strengthen and adopt policies and enforceable legislation to promote gender equality, and women and girl empowerment at all levels.</p>	<ul style="list-style-type: none"> • An outlined framework of each process, planning, management, maintenance, conduct etc. meeting the outcome of the operation must be designed by each of Govt. or public regulatory agencies in every sector and progressively implemented across Govt. public regulatory agencies. • However, the Prime minister's <i>Beti Bachao Beti Padhao</i> initiative aims at equal opportunity and education for girls in India, and the <i>Sukanya Samridhi Yojana</i> focuses on girl child prosperity

4.2 Recommendations for Regulatory Agencies

- 1) Regulatory bodies should incorporate SDG-5 related courses at the graduate and postgraduate levels.
- 2) Design/approve all India-level specialized tests for entry into the HEI'S offering the sustainability-oriented curriculums.
- 3) Conduct audits to monitor the quality and thoroughness of education and research in HEI'S offering specialized courses and degrees related to SDG-5 and other SDGs.
- 4) Create new committees/bodies for effective and focused regulation of SDGs-related education.

5 Conclusion Along With Prioritization of the Initiatives Recommended

SDG-5 focuses on social, economic, and ecological aspects of society. UNESCO has laid importance on HEIs and education regarding SDG-5 which includes access to information and women's education, increase participation of women, and ensuring gender equality and women empowerment through transformative social change. Institutions are responsible for training future world leaders, reducing the gender gap, fostering women's inclusion in institutional programs, designing gender-inclusive leadership models, and providing equal career opportunities. HEIs have a direct role in ensuring gender equality through education and research by implementing policies like scholarships, outreach activities for the representation of women in under-represented subjects, incubation centres for ensuring self-employability, teach gender issues in the curriculum. AIU's North Zone Vice Chancellors Meet 2021 was organized in collaboration with Shoolini University in November 2021. Various recommendations were provided at the meeting regarding the implementation of SDG-5. These included focused discussions on system-wide transformation in education and opportunities for women in decision-making as the prime focus since there is a need for gender balance in decision-making leadership. Specific research should be undertaken on gender transformation conditions for women's empowerment in order to enhance their skills, competencies, and expertise. Another important recommendation is the involvement of state and central governments in passing resolutions allowing women to be nominated as Vice Chancellors and engage them equally in ideal republic development. Efforts need to be made towards a positive discrimination viewpoint as well as for the generation of part-time appointments for women. As part of the country's National Population Policy, women are prioritized through various schemes initiated by the government of India including the National Rural Health Mission, *Janani Suraksha Yojana*, and *Beti Bachao Beti Padhao* among others. There is a need to develop a sensitized, gender-literate policy to investigate intersectionality and its influence; a gender audit should, therefore, be conducted by the AIU to assess the performance of universities and institutions. Flexi timing,



mandatory childcare centres at workplaces, gender enabling systems, and programs like ‘Skill India’ for skill development. The government, through its educational regulatory authorities, has taken numerous initiatives to achieve these goals.

AICTE has laid down the following regulations for the institutions approved by it and they include awards for girl students (*Medhavi Chhatra* award, *Udaymita* award, *Kala Shresthi* award, *Mira Bai* award, *Ojaswi* award, *Nivida* award, *Navonmesha* award), *Maa Saraswati* award for women faculty and staff members, and AICTE *Lilavati* award-2020.

The emerging recommendations for HEIs as well as government and regulatory bodies in order to achieve SDG-5 at a national level uniformly are concluded here.

The HEIs must ensure access to higher education through scholarship schemes, focussing on gender equity strategies to include women in administrative and academic decision-making roles, creating gender-enabling centres in institutions to address issues relating to harassment at the workplace, and generating part-time appointments for women. The government regulatory bodies can implement education policies such that there is a focus on educating both genders regarding team building, social responsibility, trust, and acceptability; enforcement of mandatory awareness programs in cities and rural areas to educate people about violence and exploitation of women and girls; enabling services for women safety including surveillance, transportation, and helpline numbers; flexibility in job timings and work from home options in order to enhance engagement of women in employment, designing schemes under government and public sectors to provide equal rights to women for decision making about marriage, parenting, work, travel, etc.; a detailed framework should also be designed for proper implementation of these recommendations by the government bodies.

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6 CLEAN WATER AND SANITATION



SDG-6: Ensuring Availability and Sustainable Management of Water and Sanitation for All

Summary

The present chapter focuses on Sustainable Development Goal (SDG) 6 which is defined as “ensure availability and sustainable management of water and sanitation for all” and has 8 defined targets to be achieved by 2030. It presents a brief overview of the current global and national status, recommendations given by United Nations, their execution by global and national agencies, achievements made relative to the target indicators, and initiatives taken by Indian Higher Educational Institutions (HEIs) so far. In this chapter, 9 broad areas for research and 20 implementation strategies for the HEIs, and 19 policy recommendations for government and regulatory bodies to achieve the SDG-6 targets are presented. Apart from a literature review of publications on sustainable water management and sanitation, expert opinions were taken, and a detailed case study of SDG-6 implementation in HEIs is provided. Key recommendations involve promoting circular water economy in HEIs and increasing provision of fundings by government agencies and scientific bodies on research in exploring water-food-energy nexus, increasing water use efficiency, developing low-cost sanitation and wastewater treatment systems, etc. The policy role of government is highlighted in areas ranging from water use governance, wastewater utilization and public awareness.

Key Recommendations to Achieve SDG-6

- Each HEI should aim to meet 100 percent of its water needs through initiatives such as water recycling, rainwater harvesting and optimal consumption of these resources.
- HEIs must conduct focused research on increasing water use efficiency, developing low-cost sanitation and wastewater treatment systems, low-cost desalination techniques, exploring water-food-energy nexus, management of solid waste and managing wetland ecosystems
- Government agencies should strictly monitor water use by implementing regulatory instruments and promote the utilization of treated wastewater among the general public. Incentivised programmes can also be launched.
- Improve farming systems to reduce water demand and alleviate the pressure on ecosystems. Healthy ecosystems are in turn essential to stabilize the water cycle, allowing more recharge for aquifers and a steadier run-off in surface streams.
- Facilitate the design of specific projects and interventions for making the campus clean and green by following national, and international standards and accepted parameters.
- About 18% of the world’s population is having a facility of 4% of available water HEIs should undertake research studies to find sustainable sweet water resources, sustainable storage mechanisms, creating interlinking rivers, etc.
- HEIs should support the GoI initiatives of ‘Swachh Bharat Mission’, ‘Jal Jeevan Mission’ ‘Har Ghar Jal’ and also the initiatives of management of solid and liquid wastes in their local area especially villages and, towns nearby.



- HEIs must take up the challenge of third-party evaluation of Government Policy initiatives and programmes and also create standard data resource centres in each university or a cluster of universities as the statistics available at different levels (state, national and international) do not coincide.
- Each HEI must monitor its water and sanitation facilities as per regulatory bodies requirements and provide support to Government and other concerned agencies like Public Health departments, Pollution Control Boards and Medical Institutions in the region and further focus its research on prevention of water borne diseases also

1. Context and Current Status of SDG-6

1.1 The Context and Current Status

The United Nations (UN) has determined that access to clean water and sanitation facilities is a basic human right. Safe drinking water and hygienic toilets protect people from disease and enable societies to be more productive economically. Over 2.2 billion people lacked safely managed drinking water and 4.2 billion people lacked safely managed sanitation, mostly in the developing world including India (UN, 2018). SDG-6 was introduced to address and ensure the availability and sustainable management of water and sanitation for all. By 2017, eighty countries were provided access to clean water for more than 99% of their population (WHO, 2019). Ending open defecation will require the provision of toilets and sanitation for 2.6 billion people as well as behaviour changes in the population (WHO, 2019). SDG-6 is closely linked with other Sustainable Development Goals (SDGs). Today, Sustainable Development Goal 6 is badly off track and it “is hindering the progress of the 2030 Agenda, the realization of human rights and the achievement of peace and security around the world,” (UNSD, 2020).

1.2 United Nations Sustainable Development Goal 6 Targets

SDG-6 has eight targets and eleven indicators that need to be achieved by at least 2030. Table 1 provides a list of SDG-6 targets, indicators, custodian agencies and their current status in global and Indian scenarios.

Table 1: SDG-6 Targets, Indicators, Custodian Agencies and Status

Targets	Indicator	Custodian agencies		Status*(2021)	
		Global	Indian	Global	Indian
By 2030, achieve universal and equitable access to safe and affordable drinking water for all.	6.1.1 Proportion of the population using safely managed to drink water services	W H O , UNICEF	MoJS	74%	--
By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.	6.2.1.a Proportion of population using safely managed sanitation services	W H O , UNICEF	M o J S , MoHUA, M o R D , MoWCD	54%	46%
	6.2.1.b Proportion of the population using a handwashing facility with soap and water available			71%	68%

By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.	6.3.1 Proportion of wastewater safely treated	W H O , UNICEF	MoEFCC, M o J S , MoHUA	56%	27%
	6.3.2 Proportion of bodies of water with good ambient water quality	UNEP		72%	--
By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.	6.4.1 Change in water-use efficiency over time	FAO	M o J S , MoAFW, MoRD	\$ 1 9 / m ³	\$3/m ³
	6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources			17%	66%
By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.	6.5.1 Degree of integrated water resources management implementation (0–100)	UNEP	M o J S , MoAFW, MoRD	54%	45%
	6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation	UNECE, UNESCO		58%	--
By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.	6.6.1 Change in the extent of water-related ecosystems over time	UNEP	MoEFCC, MoJS	21%	22%
By 2030, expand international co-operation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies.	6.a.1 Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan	W H O , O E C D , UNEP	M o J S , MoHUA, M o P R , MoEA	\$9.3b	\$380m
Support and strengthen the participation of local communities in improving water and sanitation management	6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management	W H O , O E C D , UNEP	M o J S , MoHUA, MoPR	-	-

*Source: Ortygia et al. (2018). Roy & Pramanick (2019). <https://www.SDG-6data.org/>



1.3 Summary of Progress on SDG-6 Implementation Globally

To meet SDG-6 targets for sanitation by 2030, nearly one-third of countries will need to accelerate progress to end open defecation, including Brazil, China, Ethiopia, India, Indonesia, Nigeria, and Pakistan. This will require cooperation between governments, civil society and the private sector. The current global status of achievement of SDG-6 targets is indicated in Table 1. Various global agencies have been actively working towards achieving the targets of SDG-6. UN Women acts to provide water and sanitation to all by helping governments craft policies and programmes that respond to women's needs and underpin sustainable services. These include measures that facilitate easy access to safe drinking water and safe sanitation practices so that women have more time to earn an income, girls are more likely to attend school, and family health and hygiene improve. In 2014, UN Report on the human right to safe drinking water and sanitation observed the realization of human rights in access to water and sanitation. It particularly stressed universal access to affordable, adequate water and sanitation services, including managing, recycling and treating wastewater, especially faecal sludge management, and controlling pollution (Carey 2020). UN Human Settlements Programme (UN-HABITAT), Centre on Housing Rights and Evictions (COHRE), the American Association for the Advancement of Science (AAAS), Swiss Agency for Development and Cooperation (SDC) prepared a manual that is designed to assist policymakers and practitioners in implementing the right to water and sanitation. The Global Programme of Action for the Protection of the Marine Environment from Land-based activity by the United Nations Environment Programme (UNEP) concentrates on the regulation and reduction of wastewater, marine litter, and nutrient loading.

1.4 Initiatives and Achievements of the Indian Government in SDG-6

India committed to SDGs right at the time when these were adopted by the United Nations (UN) General Assembly in September 2015. The Government of India (GoI) works in close coordination with state governments to realize SDGs by the target date of 2030. According to a report by the UN and Research and Information System for Developing Countries (RIS), Indian governments both at central and state levels are actively pursuing the achievement of SDGs, including SDG-6. The government of India has adopted a six-step strategy to achieve SDGs in India. These are – (1) mapping of ministries and programmes, (2) identification of indicators, (3) consultations with stakeholders, (4) dovetailing the national development agenda with SDGs, (5) meticulous implementation of schemes aligned with SDG targets and (6) rigorous outcome-based monitoring (NITI Aayog, 2022).

The progress of SDG-6 and its targets are being monitored through the SDG-India Index, version 3.0, which encompasses a globally accepted methodology and uses 115 indicators to analyse and measure the progress based on the data collected from various sources. SDG-6 is being assessed by qualitative methods. The indicators for SDG-India Index are chosen based on global SDG targets, alignment with the National Indication Framework, statistical data availability, permissions or approval of ministries or departments, and data coverage for at least 50% of states or union territories. The progress of SDG-6 in India is based on eight indicators listed below.

- Percentage of individual household toilets constructed against the target.
- Percentage of districts verified to be Open Defecation Free.
- Percentage of the rural population having improved sources of drinking water.
- Percentage of the rural population getting safe and adequate drinking water within premises through Pipe Water Supply.
- Percentage of groundwater withdrawal against availability.
- Percentage of blocks/manuals/taluka over-exploited.
- Percentage of industries complying with wastewater treatment as per Central Pollution Control Board norms.
- Percentage of schools with separate toilet facilities for girls.



Figure 1 shows the status of Indian states in their progress towards SDG-6. India has achieved an 83% index score which shows good overall progress. Goa and Lakshadweep have attained a 100% index score, which is commendable. Assam, Delhi and Rajasthan are the poorest performers in this category with 64%, 61% and 54% index scores, respectively. The majority of other states and union territories are above the national average mark of 83%.

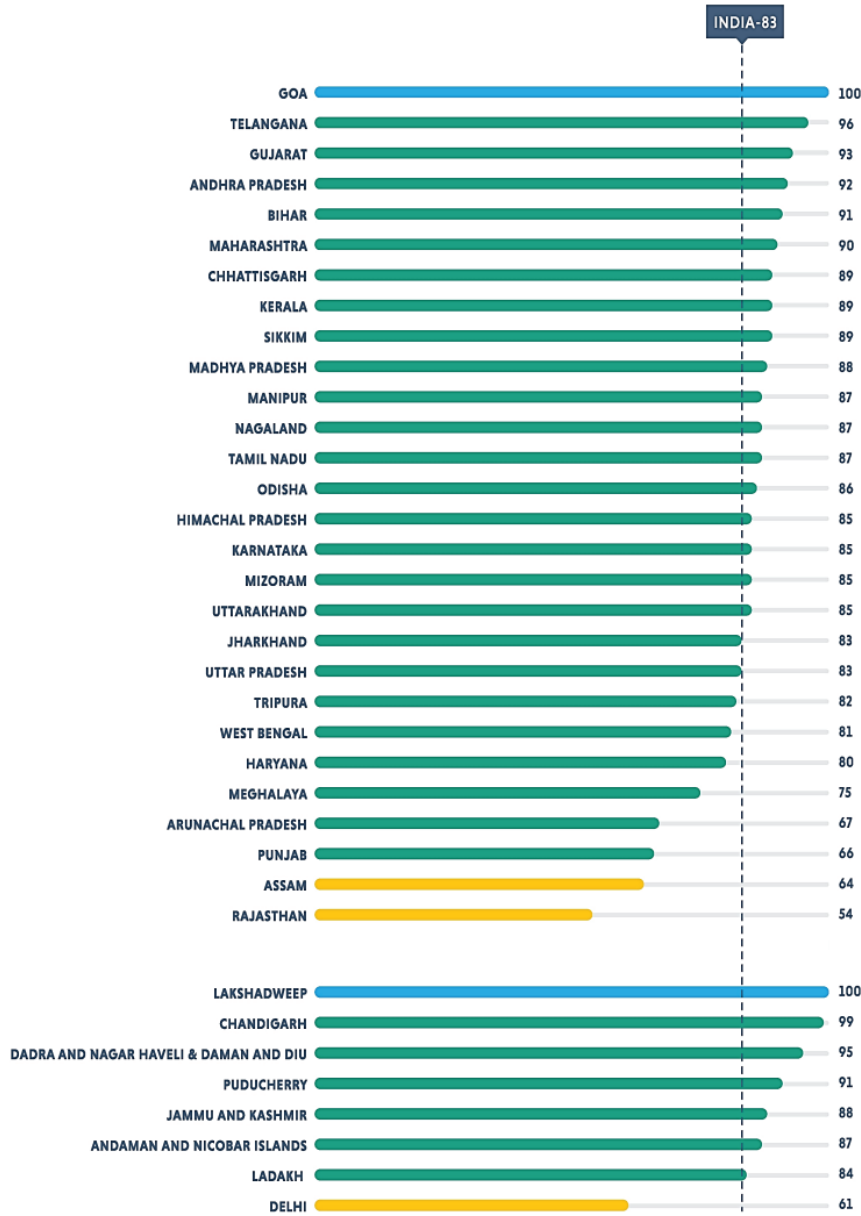


Figure 1: SDG 6 Progress in India (Data Source: NITI Aayog, 2021)

The main schemes or missions along with their concerned Ministries/Departments of the Government of India, related to the targets of SDG-6 are given in Table 2.

Table 2: Schemes under Various Missions of the Government of India

Programme Name	Description
National Rural Drinking Water Programme	The National Rural Drinking Water Programme (NRDWP, 2009) aimed to provide clean and adequate water for drinking, cooking and other domestic needs to every rural person on a sustainable basis. But this plan failed to achieve its targets due to insufficient implementation like incomplete, abandoned and non-operational works, unproductive expenditure on equipment, non-functional sustainability structures and gaps in contractual management.
Nirmal Bharat Abhiyan	<i>Nirmal Bharat Abhiyan</i> (NMA, 1999) aimed to create awareness among the people about the importance of sanitation, particularly among the people in rural areas. The idea was mainly to give more energy and motivate rural households to construct better latrine provisions, show them the hazardous effects of open defecation, and support them in using closed washrooms for defecation. But in 2014, this scheme has been discontinued as it failed to achieve its intended targets.
Swachh Bharat Abhiyan	<i>Swachh Bharat Abhiyan</i> (SBA, 2014), a restructured version of NMA, is the country-wide campaign initiated by the India Government in 2014 to eliminate open defecation and improve solid waste management. Phase 1 of the SBA lasted till October 2019. Phase 2 is being implemented between 2020–21 and 2024–25 to help cement the work of Phase 1. It also aims to clean up the streets, roads, and infrastructure of India's cities, towns, and urban and rural areas. <i>Swachhta</i> Action Plan guides institutions on various aspects of <i>Swachhta</i> for a clean and green campus using the Standard Operating Manual (SOP) and aims to build <i>swachhta</i> skills in students and ensure they take ownership of maintaining Swachh campuses. <i>Swachh Survekshan</i> aimed to instruct competition among urban areas to improve cities' performance on cleanliness and sanitation.
National Urban Sanitation Policy	National Urban Sanitation Policy (NUSP, 2008) was aimed to alter all urban areas into community-driven, healthy, sanitized, liveable towns and cities, confirming and sustaining good health and environmental consequences for all citizens. <i>Nirmal Shahar Puraskar</i> aims to encourage cities to strive for 100 percent access to sanitation facilities and 100 percent safe disposal of all city-generated waste. The rating and award are based on the premise that improved public health and environmental standards are two outcomes that cities must ensure for urban citizens. In doing so, state governments and urban areas must adopt a holistic, city-wide approach while incorporating processes that help reach outputs pertaining to the goals of the NUSP.
Integrated Low-Cost Sanitation	Integrated Low-Cost Sanitation (ILCS) Scheme started with the objective of eradicating all dry latrines and thereby liberating manual scavengers from the inhuman practice of carrying night soil. The scheme also has provision for the construction of new latrines for the Economically Weaker Section (EWS) households that have no latrine facility. The Employment of Manual Scavengers and Construction of Dry Latrines (Prohibition) Act of 1993 prohibited dry latrine construction and manual scavengers' employment.
Rashtriya Madhyamik Shiksha Abhiyan	<i>Rashtriya Madhyamik Shiksha Abhiyan</i> (RMSA, 2009), aims to ensure universal access to secondary education. It strongly emphasises providing school infrastructure, including toilets and drinking water facilities and disabled-friendly school buildings.
National River Conservation Plan	National River Conservation Plan (NRCP) aims to decrease the pollution load in rivers by implementing various pollution abatement works to improve their water quality. The plan involved interception and diversion works, laying of sewerage systems to capture raw sewage flowing into the rivers through open drains and diverting them for treatment, setting up sewage treatment plants for treating the diverted sewage, constructing low-cost sanitation toilets to prevent open defecation on river banks, riverfront development works, such as improvement of bathing ghats, public participation & awareness and capacity building, etc.

<p>Atal Mission for Rejuvenation and Urban Transformation</p>	<p>Atal Mission for Rejuvenation and Urban Transformation (AMRUT, 2015) aims to provide basic services (e.g., sewerage, water supply and urban transport) to households and build amenities in cities which will advance the quality of life for all, especially the poor and the disadvantaged. The major project components are the Water Supply System, Sewerage, Septage, Storm Water Drainage, Urban Transport, Green Space and Parks, Reforms management and support, Capacity building, etc. in that order of priority.</p>
<p>Namami Gange Programme</p>	<p><i>Namami Gange Programme</i> (2014) is an Integrated Conservation Mission to accomplish the twin objectives of effective abatement of pollution, conservation and rejuvenation of the National River Ganga. 70 sewage management projects are under implementation and 73 sewage projects have been completed in the states of Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, West Bengal, Delhi, Himachal Pradesh, Haryana, and Rajasthan. 63 Ghats/Crematoria projects for construction, modernization, and renovation of 262 Ghats/Crematoria and Kunds/Ponds have been initiated. High biodiversity areas have been identified in river Ganga for focused conservation action, rescue & rehabilitation centres have been established for the rescued aquatic biodiversity, a cadre of volunteers have been developed and trained to support conservation actions in the field, floating interpretation centre “<i>Ganga Tarini</i>” and interpretation centre “<i>Ganga Darpan</i>” have been established for developing awareness on biodiversity conservation and Ganga rejuvenation, key ecosystem services of Ganga river have been identified and an assessment framework developed to strengthen the environmental services in the river basin.</p>
<p>Pradhan Mantri Krishi Sinchayi Yojana</p>	<p><i>Pradhan Mantri Krishi Sinchayi Yojana</i> (PMKSY) aims to achieve convergence of investments in irrigation at the field level, expand cultivable areas under assured irrigation, improve on-farm water use efficiency to reduce wastage of water, enhance the adoption of precision-irrigation and other water saving technologies (More crop per drop), enhance recharge of aquifers and introduce sustainable water conservation practices by exploring the feasibility of reusing treated municipal wastewater for peri-urban agriculture and attract greater private investment in the precision irrigation system.</p>
<p>National Mission for Sustainable Agriculture</p>	<p>National Mission for Sustainable Agriculture (NMSA) caters to key dimensions of ‘Water use efficiency’, ‘Nutrient Management’ and ‘Livelihood diversification’ through the adoption of sustainable development pathways by progressively shifting to environmentally friendly technologies, adoption of energy-efficient equipment, conservation of natural resources, integrated farming, etc. Besides, NMSA aims at promoting location-specific improved agronomic practices through soil health management, enhanced water use efficiency, judicious use of chemicals, crop diversification, progressive adoption of crop-livestock farming systems and integrated approaches like crop-sericulture, agro-forestry, fish farming, etc.</p>
<p>River Basin Management Scheme</p>	<p>River Basin Management Scheme comprises 2 main components namely Brahmaputra Board and the Investigation of Water Resources Development Scheme (IWRDS). The Brahmaputra board covers the states of Arunachal Pradesh, Assam, and Meghalaya, parts of the states of Manipur, Mizoram, Nagaland, Tripura Sikkim and a part of West Bengal falling within the Brahmaputra Basin. Activities of the board include survey, investigation & preparation of Master Plan, preparation of DPR of Multipurpose Projects, Drainage Development Schemes, Anti-erosion works including protection of Majuli Island, Balat Village in Meghalaya, Mankachar and Masalabari area in Assam, etc from flood and erosion and construction of raised platforms. Investigation of the Water Resources Development Scheme (IWRDS) aims to establish techno-economic viability, after preparing DPR, performing detailed surveys and investigations and studies on hydrological, irrigation planning, environmental aspects, cropping pattern, crop water requirement, etc. The river basins will provide hydroelectric, and irrigation benefits in North-eastern Region including Sikkim and Jammu & Kashmir.</p>

Interlinking of Rivers	The interlinking of Rivers project has been split into three parts: a northern Himalayan rivers inter-link component, a southern Peninsular component and starting in 2005, intrastate rivers linking component. The overall implementation of the Interlinking of Rivers programme under the National Perspective Plan would give benefits of 35 million hectares of irrigation, raising the ultimate irrigation potential from 140 million hectares to 175 million hectares and generation of 34000 megawatts of hydropower, apart from the incidental benefits of flood control, navigation, water supply, fisheries, salinity and pollution control, etc. The project has faced severe criticism on different fronts such as costs, Ecological and environmental issues, Displacement of people and fisheries profession, Poverty and population issues, international issues, Technological developments, and political issues. The current progress of the project is 70% in FR and PFR stages, and 30% in the DPR stage.
Flood Management & Border Areas Programme	Flood Management & Border Areas Programme (FMBAP) is being implemented throughout the country for effective flood management, erosion control and anti-sea erosion and to help in maintaining peace along the border. The scheme benefits towns, villages, industrial establishments, communication links, agricultural fields, infrastructure, etc. from floods and erosion in the country. The catchment area treatment works will help in the reduction of sediment load into rivers. The Scheme aims at the completion of the ongoing projects already approved under the Flood Management Programme.
National Hydrology Project	National Hydrology Project aims to improve the extent, quality, and accessibility of water resources information, decision support system for floods and basin-level resource assessment/planning and to strengthen the capacity of targeted water resources professionals and management institutions in India. Some of the initiatives are the development of a Water Resources Information System, Water Resources Monitoring Systems, Water Resources Operations and Planning Systems, and Institutional Capacity Enhancement.
National Wetland Conservation Programme	National Wetland Conservation Programme (NWCP) aims to conserve and make acute use of wetlands in the country, therefore, preventing their further degradation. The scheme was introduced with the objective of undertaking extensive conservation measures in the wetlands that need immediate help.
Ground Water Management and Regulation	Ground Water Management and Regulation aims to develop and disseminate technologies and monitor and implement national policies for the Scientific and Sustainable development and management of India's Ground Water Resources, including their exploration, assessment, conservation, augmentation, protection from pollution and distribution, based on principles of economic and ecological efficiency and equity.
Green Skill Development Programme	Green Skill Development Programme is an initiative for skill development in the environment and forest sector to enable India's youth to get gainful employment and/or self-employment, utilizing the vast network and expertise of ENVIS Hubs/RPs. The programme endeavours to develop green skilled workers having technical knowledge and commitment to sustainable development, which will help in the attainment of the Nationally Determined Contributions (NDCs), Sustainable Development Goals (SDGs), National Biodiversity Targets (NBTs), as well as Waste Management Rules (2016).
National Water Mission	National Water Mission is "conservation of water, minimizing wastage and ensuring its more equitable distribution both across and within States through integrated water resources development and management". The five identified objectives of the Mission are: (a) a Comprehensive water database in the public domain and assessment of the impact of climate change on water resources; (b) Promotion of citizen and state action for water conservation, augmentation and preservation; (c) Focused attention to vulnerable areas including over-exploited areas; (d) Increasing water use efficiency by 20%; (e) Promotion of basin level integrated water resources management.

1.5 HEIs Status: Role of Higher Educational Institutions and Status of Adoption of SDG-6

HEIs/Universities are the hub of knowledge creation and dissemination. Their role in the development of sustainable economies and societies cannot be neglected. For example, researchers at University College London (UCL) are working with the Calthorpe Community Garden in Kings Cross, London, to create a vertical garden using microbial fuel cells, to generate electricity and decontaminate wastewater. A cross-disciplinary team at UCL has linked the need for safe sanitation to all 17 SDGs, demonstrating the far-reaching benefits of investing in sanitation infrastructure that goes beyond better health. Another team of UCL researchers is working with universities, water companies, and government ministries in Africa to improve and sustain access to safe drinking water. UCL is reducing the amount of water consumed during the construction and operation of its buildings. Multidisciplinary research is driving new nature-inspired engineering solutions to purify and desalinate water. A transdisciplinary network of researchers at UCL is challenging gender inequalities in sanitation across urban Africa.

Times Higher Education (THE) Impact Rankings [capture universities/HEI's impact on society](#) based on institutions' success in delivering the SDGs. Although many universities have programmes and activities in compliance with the SDGs, only three Indian universities have made it to the top 200 of the THE impact ranking in 2022. These are Amrita Vishwa Vidyapeetham (ranked 41), Lovely Professional University (ranked 74), and Shoolini University of Biotechnology and Management Sciences (ranked 101-200). These universities have further gained global recognition in excelling in specific SDGs. For example, Shoolini University is ranked 2nd in SDG-7 and 6th in SDG-6; Amrita Vishwa Vidyapeetham is ranked 5th in SDG-4 and 8th in SDG-5; Lovely Professional University is ranked 6th in SDG-7. Therefore, all Indian HEIs/universities must make SDGs an integral part of the organizational policy and culture, to improve their ranking and enhance their contribution to sustainable development. There is considerable scope in Indian HEIs for specific policy and objective alignment towards the same. Many universities have initiated specific projects and activities to expedite their work related to SDGs. All other HEIs must also conduct a thorough self-assessment regarding their current sustainable practices and follow the SDG path through the formal policy and set targets.

International Centre for Clean Water (ICCW), an initiative of the Indian Institute of Technology Madras (IITM), performs research and nurtures technologies through collaborations with industry and academia, and incubates start-ups to tackle socio-economic issues related to water at the grassroots level. Their expertise in all areas related to clean water is focused on the most challenging problems faced by every section of our society. To achieve the goal of delivering clean water through sustainable means, this Centre partners with various governments, co-operatives, NGOs, and industries.

Global Sanitation Graduate School (GSGS) at Birla Institute of Technology & Science (BITS) Pilani is a platform to facilitate the development and empower the dissemination of knowledge on sanitation through postgraduate (MSc/ME) programmes, online (self-study and instructor-led) courses, face-to-face (on-campus) courses and tailor-made training so that the sanitation challenges can be embraced with deeper insight, advanced knowledge, and greater confidence. BITS Pilani has launched this new ME Programme in Sanitation Science, Technology and Management in collaboration with IHE Delft at its Hyderabad campus, in the academic year 2020-21. A similar programme is also being undertaken by GSGS, Bandung Institute of Technology, Indonesia.

Various School Sanitation and Hygiene Education programme increased policy emphasis on school sanitation were manifested in the Indian government's campaign slogan of 'toilets before temples' and the subsequent launch of the *Swachh Bharat: Swachh Vidyalaya* (SBSV) initiative in 2015 that aimed to provide universal access to sex-segregated toilets.



The government of India through its ministries has established various research institutes to cater to the research and development needs of water, land, and agricultural water management and development at the national level e.g. ICAR-Indian Institute of Water Management, Water and Land Management Institute, Water and Land Management Training and Research Institute, Irrigation Management and Training Institute, North Eastern Institute for Water and Land Management, Centre for Water Resources Development and Management, etc.

One of the fastest methods for HEIs to start their journey towards SDG implementation is by creating Massive Open Online Courses (MOOCs). There are several HEIs, universities and UN-sponsored platforms that have already initiated MOOCs that focus on SDG-6. Some of these are listed in Table 3.

Table 3: Some of the MOOCs Related to SDG-6 Offered by Various HEIs

SDG Target	Course	Platform	Sponsor
6.1	Introduction to household water treatment safe storage	Coursera	Swiss Federal Institute of Technology Lausanne
	Water management	Class central EDX (X-series)	Delft University of Technology
6.2	Water supply and sanitation policy in developing countries	Coursera	University of Manchester
	Public health engineering in humanitarian context		Swiss Federal Institute of Technology Lausanne
	Hygiene and handwashing		Imperial College London
6.3	Wastewater treatment and recycling	NPTTEL	Indian Institute of Technology Kharagpur
	Drinking water Treatment	EDX	Delft University of Technology
6.4	Water Quality and Regulations	Coursera	University of Florida
	Water Security, Water Scarcity and the Adaptation Deficit	Coursera	University of Cape Town
6.5	Integrated Water Resources Management	United Nations University	United Nations University
	Introduction to Transboundary Water Cooperation and Water Security	EDX	SDG Academy / Multiple universities
6.6	Progress on Water-related Ecosystems	UNEP	
	Environmental science and sustainability	Coursera	Multiple universities
6.a	Planning and Designing of Sanitation Systems and Technology	Coursera	Swiss Federal Institute of Technology Lausanne
	Irrigation Efficiency :More Food with Less Water	EDX	KU Leuven
6.b	Introduction to Sanitation Safety Planning	Coursera	Swiss Federal Institute of Technology Lausanne

2. Recommended Actions for HEIs for Achievement of SDG-6

Based on the international and national status of SDG-6, the key action points for HEIs for effective implementation of SDG-6 are as follows:

Table 4: Minimal Recommended Actions for The HEIs For Implementation of SDG-6

SDG 6 Target	Minimal Recommended Actions for HEIs
6.1	<ul style="list-style-type: none"> • Provide drinking water facilities conforming to standards recommended by health professionals and government departments. • Encourage student projects on "Clean Water and Sanitation". When young students interact with the general public and develop a thought process on similar issues in surrounding areas, they will have a better understanding of things. • Introduce "Environmental Science" as a compulsory subject in the first year of the Bachelor's degree programme. SDGs and specifically "Access to clean water and sanitation for all" should be a part of the syllabus of the subject.
6.2	<ul style="list-style-type: none"> • Ensure a minimum number of fully equipped sanitation facilities (washrooms/toilets) within the campus. • Create a garbage collection and segregation unit within the campus of HEIs. • Develop a structured curriculum on Environmental Hygiene, Sanitation and Waste Management that is to be offered as an elective paper for UG Courses to widen the scope of job opportunities for degree students. • Develop a structured PG Diploma Course for universities/colleges on Waste Management and Environmental Hygiene that will lead to a skilled workforce being available to organizations involved in <i>Swachhta</i>. • Develop a structured MBA Programme on Environmental Hygiene and Social entrepreneurship for PG students that provides a managerial workforce to the organizations involved in <i>Swachhta</i>.
6.3	<ul style="list-style-type: none"> • Promote principles of circular water economy to recognize and capture the full value of water. • Develop independent water treatment facilities. The treated wastewater should be reused for non-potable applications within the premises and supplied to nearby agricultural farms rather than releasing it to freshwater bodies. • Increase the percentage of waste reduced, reused, recycled, and composted annually. • Expand the scope of waste reduction programmes to include the following: glass, steel/aluminium cans, plastic, food waste, cardboard, bond and computer paper, mixed paper, magazines, newspapers, construction, oil, leaves, tyres, scrap metal, hazardous chemicals, telephone books, contaminated soil, and mattresses at all areas and facilities of the campus.
6.4	<ul style="list-style-type: none"> • Develop a rainwater harvesting network to meet water requirements during high demand. Identify locations within and in the vicinity of the institutional area to maximize the collection and storage of rainwater. • Supply the harvested and stored rainwater to nearby localities to fulfil their water requirements and address the water scarcity issue.
6.5	<ul style="list-style-type: none"> • Develop a network of university departments, research and training institutes specializing in water, to build regional institutional and human capacity in Integrated Water Resources Management (IWRM) through training, education, research and outreach.
6.6	<ul style="list-style-type: none"> • Ensure the sustainability of the natural environment by protecting water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers, and lakes. HEIs focus on the ecosystem they are built in.



6. A & 6. B	<ul style="list-style-type: none"> Coordinate guest lectures and interactive group discussions by experts, and non-government organizations. Contribute to the <i>Swachh Bharat Abhiyan</i> by building awareness in universities/colleges through the celebration of various days throughout the year. Organize awareness programmes for the general public regarding "Access to clean water and sanitation". Organize short-term training programmes for the officials of Irrigation, Public Health and Water supply Departments on "Water Supply and Sanitation".
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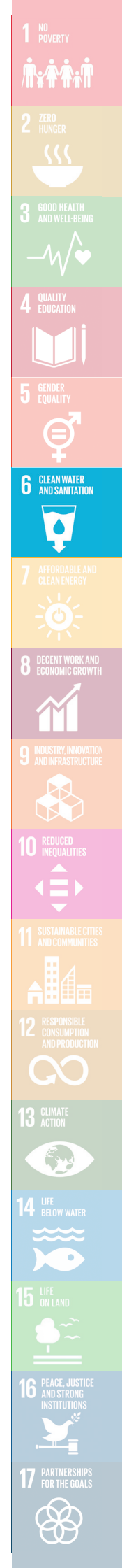
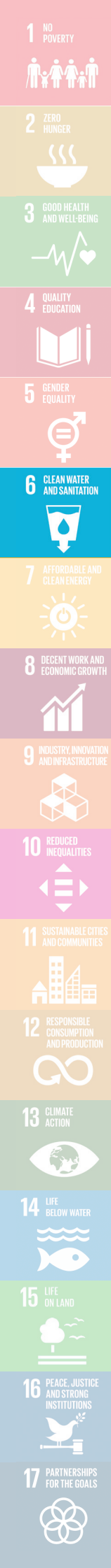
3. Proposed Research Agenda for HEIs and Governmental Bodies

The review of past studies and respective linkages with the SDG-6 targets has led to several key research areas that must be undertaken by HEIs. Proposed areas of research are highlighted in Table 5.

Table 5: Main Research Areas and Actions that can be Followed for SDG-6 Implementation

Research Area	SDG-6 Target	Need of Research	Key Activities / Actions
Data availability	All	Data is essential for monitoring the progress towards the defined indicators of SDG-6 and for accurate projection of future trends. In the present scenario, neither state-level comprehensive data for most of the indicators are available, nor is the district or any other lower unit level. Poor availability of data would simply create a homogeneous outline of resource consumption and access at the national level.	<ul style="list-style-type: none"> Prepare and maintain data concerning biophysical consumption at the state and district level, both for general awareness and scientific research purposes. Collate enough data to redesign policy frameworks or restructure governance in accordance with scientific findings. This would also enable the experts to perform statistical analysis. The bottom-up analysis would be more appropriate for implementation and policymaking i.e., from village to national scale.
A limited number of indicators	-	The set of global indicators for monitoring the goal progress does not yield a very complete and comprehensive picture of SDG-6 in India.	<ul style="list-style-type: none"> Develop additional indicators to better suit India's specific needs in terms of reflecting both regional and national scenarios.
Water-Food-Energy Nexus	6.4, 6.5, 6. A	The water-food-energy nexus is central to sustainable development. There is an increasing demand for all three, driven by a rising global population, rapid urbanization, changing diets and economic growth. The complex linkages between these critical domains require a suitably integrated approach for ensuring water and food security, sustainable agriculture and energy production worldwide	<ul style="list-style-type: none"> Prioritize research focus on water-food-energy systems by encouraging PhDs and postgraduate students.

Agricultural Water Use Efficiency	6.4, 6. B	Agricultural water withdrawal is highest in India among all other sectors. Utilizing water efficiently in irrigation will result in more sustainable food and industrial production systems.	<ul style="list-style-type: none"> • Increase water use efficiency in agriculture through drip irrigation, hydroponics, urban terrace and rooftop agriculture, utilization of treated household wastewater in agriculture, etc. • Regular inspection of water distribution systems to monitor water theft and undertake maintenance of leaking systems to avoid water loss during conveyance. • Using less thirsty crops, investing in new technology (soft sensors), and adopting modern irrigation methods and soil conservation techniques. Farmers and practitioners should be made aware of these advancements and provided with subsidies and incentives for adopting such measures. • Improve farming systems to reduce water demand and alleviate the pressure on ecosystems. Healthy ecosystems are in turn essential to stabilize the water cycle, allowing more recharge for aquifers and a steadier run-off in surface streams.
Correlated environmental concerns	6.4,	Environmental concerns arising from implementing water and soil conservation measures must be addressed.	<ul style="list-style-type: none"> • Ensuring that a lower amount of water usage in agriculture should not cause any physiological stress in staple crops. • Monitor probable adverse effects of using genetically or biotechnologically modified crops (e.g., more water-efficient crops) and take suitable precautions.
Desalination	6.1, 6.a	Desalination is currently expensive compared to most alternative sources of water, and only a very small fraction of total human use is satisfied by desalination.	<ul style="list-style-type: none"> • Develop low-cost seawater desalination techniques. Some progress has been reported in recent years, but there is a need to intensify research focus on desalination.
Water-related ecosystems	6.5, 6.6	Protecting and restoring water-related ecosystems will mitigate and strengthen resilience to climate change. For instance, wetlands trap carbon from the atmosphere and protect coastal areas from storm surges and inland areas from both floods and droughts by retaining water.	<ul style="list-style-type: none"> • Research activities must focus on monitoring and investigating the following factors: • spatial extent of water-related ecosystems (from satellite data) • water quality of lakes and artificial water bodies (from satellite data) • quantity of water (discharge) in rivers and estuaries (in situ data) • water quality imported from SDG Indicator 6.3.2 (in situ data) • quantity of groundwater within aquifers (in situ data)



Wastewater Treatment	6.2, 6.3	A large proportion of wastewater in developing countries is discharged partially treated or untreated directly into rivers, lakes or the ocean. Wastewater is increasingly seen as a resource providing reliable water and nutrients for food production to feed growing urban populations	<ul style="list-style-type: none"> Intensify research in advances in wastewater treatment including electrocatalysis, engineered composite materials, catalytic ozonation, and membrane technologies.
Solid waste management	6.2, 6.b	Improper handling and management of solid waste create unhygienic conditions which might lead to certain disease spread.	<ul style="list-style-type: none"> Create garbage collection, segregation and disposal units within the campus of HEIs. Promote research in the adoption of modern methods of solid waste management. Identify locations for waste disposal in their vicinity

4. Recommendations for Government and Regulatory Bodies for Achievement of SDG-6

Key action points for policymakers for effective implementation of SDG-6 are given as follows:

4.1 Recommendations for Government Agencies

Table 6: Minimal Recommended Actions for the Government Agencies for Implementation of SDG-6

SDG-6 Target	Minimal Recommended actions for Government agencies/ Policymakers
All	The government, non-government organizations (NGOs), higher educational institutions (HEIs) and the public, together should take more proactive steps towards the promotion and utilization of water resources as well as promoting safe sanitation practices to achieve SDG-6 in India.
6.4, 6.5	Strong implementation of regulatory instruments, such as - water utilization taxes, water recycling taxes, taxes for utilization of potable water for irrigation, etc. must remain a vital component of policies. Direct intervention and investment of the government agencies for encouraging consumers to purchase commercially available devices having improved water use efficiency and environmental characteristics (e.g., agricultural transport and household appliances etc.).
6.2, 6.3, 6.A & 6.B	Upgradation of existing wastewater treatment facilities to treat water at the tertiary level and commissioning of new facilities equipped with state-of-the-art instruments. Promote reuse of wastewater for non-potable purposes (e.g., gardening, car washing in garages and flushing) and agricultural purposes. A similar step has been taken by Brihanmumbai Municipal Corporation (BMC). The existing wastewater treatment facilities will be upgraded by 2025 and will treat 2,484 million litres of wastewater per day. BMC will use 20% of the treated wastewater. On-site solid waste management through waste segregation, waste sorting and treatment of bio-degradable and non-biodegradables separately. Public education campaigns to inform people about wastewater use.

4.2 Recommendations for Regulatory Bodies

The regulatory bodies like UGC, AICTE, NAAC, etc., and research funding agencies like the Department of Science & Technology, Council of Scientific and Industrial Research (CSIR), Ministry of Environment, Forest and Climate Change, Ministry of Earth Sciences, and State funding agencies shall facilitate in fostering and developing quality research, the educational curriculum in the training of future professionals in the field of sustainable development including SDG-6. Specific immediate action points for key regulatory bodies are identified as follows:

1. Issue guidelines regarding mandatory rainwater harvesting systems in all buildings and then ensure compulsory enforcement.
2. Build consensus on the need for maintaining a Clean and Green Campus among campus leaders at the student level, faculty level and campus level.
3. Present a step-by-step guide for making the campus clean and green through various management practices.
4. Facilitate the design of specific projects and interventions for making the campus clean and green by following national, and international standards and accepted parameters.
5. Monitor the existing environmental performance of the campus in a participatory and transparent way.
6. Generate case studies on best *Swachh* practices adopted on the campus which can serve as models for other institutions to adopt and apply.
7. Scrutinize and approve graduate and postgraduate degrees and courses related to the SDGs offered by HEIs with a focus on application-based projects.
8. Conduct audits to monitor the quality and diligence of education and research in the HEIs offering specialized courses and degrees related to SDGs and sustainability.
9. Prioritize the research thrust around SDGs for the award of research project funding.
10. Projects related to the water-food-energy nexus involving international collaborations must be taken up with high priority.
11. Disburse special funds to the HEIs offering quality education in sustainability and SDGs for further research and growth in the area.
12. Create a reward system for institutions that comply with SDGs and a national ranking system similar to the SDG-based impact ranking.

5. Conclusion Along With Prioritization of the Initiatives Recommended

SDG-6 aims to ensure the availability and sustainable management of water and sanitation for all through measurement and identification of changes in biophysical aspects of water and sanitation \influence human socioeconomic conditions which can be used to monitor, update, and refine the national SDG-6 framework. The summary of the conclusions and main recommendations are as follows:

1. Funding agencies must provide research grants to all public and private universities imparting quality education regarding sustainability and SDG-6 goal achievement
2. HEIs must conduct focused research on increasing water use efficiency, developing low-cost sanitation and wastewater treatment systems, low-cost desalination techniques, exploring the water-food-energy nexus, management of solid waste and managing wetland ecosystems. Projects involving international collaborations must be taken up with high priority. Research in science, technology, engineering, and management at the postgraduate and doctorate levels should focus on SDGs wherever possible.
3. HEIs should develop their rainwater harvesting network and water treatment facilities to promote a circular water economy. Regulatory bodies should issue guidelines regarding mandatory rainwater harvesting systems in all buildings of HEIs and ensure compulsory enforcement.
4. HEIs should create a solid waste management cell within the campus to facilitate the collection, segregation, treatment, recycling and disposal of waste generated by different units and laboratories and identify locations for waste disposal in a decentralised manner.
5. Government agencies should strictly monitor water use by implementing regulatory instruments and promoting the utilization of treated wastewater among the general public. Incentivised programmes can also be launched.



6. HEIs should organize short-term training programmes for government officials and awareness programmes for the general public.
7. Regulatory bodies like UGC, AICTE, and NAAC must promote the design and approval of new HEIs, degrees and course curriculums related to SDG-6 focused water and sanitation issues.
8. Regulatory bodies must devise a reward system for institutions that comply with SDGs and a national ranking system similar to THE SDG-based impact ranking.

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Annexure-1: Case Study

Vellore Institute of Technology, Tamil Nadu (India)

Times Higher Education’s Impact Rankings [capture universities’ impact on society](#) based on institutions’ success in delivering the SDGs. In their latest rankings, Vellore Institute of Technology (VIT) has been ranked 28 globally and 1 in India under SDG-6 “Clean Water and Sanitation” category. Therefore, a case study of VIT is presented to identify best practices on action on SDG in Universities/HEIs.

The institute has adopted “*Water Conservation and Waste Recycling Programme*” into its normal functioning. In 2015, VIT observed an entire week as “*Water Conservation Week*” (conducted from 31st of August to 4th September). General awareness for conserving every drop of water was demonstrated to the students through seminars, posters and competitive events. Mr. Ayyappa Masagi (founder of *Water Literacy Foundation*) was the chief guest for the programme.



7 AFFORDABLE AND CLEAN ENERGY



SDG-7: Ensuring Access to Affordable, Reliable, Sustainable, and Modern Energy for All

Summary

The present chapter focuses on SDG-7 which is defined as “Ensure access to affordable, reliable, sustainable and modern energy for all” and has five targets to be achieved by 2030. A brief overview of the international and national status and initiatives taken by Indian HEIs on SDG-7 is described followed by the recommendations to improve the outcomes. In this chapter, 6 broad areas for research and 12 implementation strategies for the HEIs, and 22 policy recommendations for government and regulatory bodies to achieve the SDG-7 targets are presented for follow-up. Apart from a literature review of publications on renewable energy and technologies, expert interviews were conducted and some examples, and a detailed case study of SDG-7 implementation in action are provided. The key recommendations involve development of courses and participation in projects related to SDG-7 and increasing provision of grants by regulatory and scientific bodies on research in renewable energy, energy efficient technologies, clean energy and safe cooking systems and fuels. The policy initiatives to be taken by the government, are highlighted in areas ranging from facilitation mechanisms for joint projects with HEIs, national and international agencies, promotion of renewable energy, development of new technologies, measures for replacement of less efficient systems.

Key Recommendations to Achieve SDG-7

- The government must involve HEIs in joint projects related to renewable energy and SDG-7 through MoUs or existing policy amendments.
- The government must formulate specific policies for every state for the promotion of renewable energy and create new schemes and benefits targeting commercial and industrial sectors for higher renewable energy penetration and reduction of pollution.
- HEIs must conduct focused research and projects concerning SDG-7, especially in areas of renewable energy, hybrid energy systems, green buildings, renewable energy storage, integration of renewable energy systems with the grid, and clean and efficient cooking technologies and fuels.
- Suggest new improved cooking systems for use in areas still dependent on the use of fossil fuels within the households (promote the use of biogas, solar cooking systems, and hybrid systems).
- HEIs to ensure to achieve net-zero energy consumption by increasing the share of renewable electricity within the campus or purchase renewable electricity from nearby plants.
- HEIs must utilize free and clean renewable energy sources and hybrid renewable energy-based systems to meet the energy requirements.
- Each HEI must establish a multidisciplinary Centre of Energy Science & Technology to coordinate SDG-7 related activities and for imparting higher education in sustainable energy technologies and to provide inputs to the government’s energy programmes in the region.



- There are no effective mechanism at present for monitoring of large number of solar energy projects in India as this task is entrusted to state /central energy agencies at present. The state governments must align with the central government for the effective implementation of SDG-7 and monitor the status of Solar projects through Energy Research Centres established in HEIs. This will also provide reliable data for further research and region-specific technology innovations and planning.
- HEIs must carry SDG-7 focused innovative energy technology research by creating an effective technology support system.
- Government should focus on the interface of Science, Finance, Policy, and Business for creating an efficient energy sector.
- HEIs should set up dedicated departments on interdisciplinary aspects of energy studies and make it essential for all students to undertake courses on energy conservation.

Context and Current Status of SDG-7

1.1 The Context and Current Status

Energy is a critical component in the economic development of a country. The absence of sustainable energy isolates people from being part of societal progress. It is discomfoting to know that in 2019, more than 759 million people around the world live without access to electricity, and 2.6 billion people used inefficient cooking systems that are injurious to health over prolonged usage. At the current pace, by 2030, about one-third of the global population will be deprived of clean cooking technologies leading to adverse health and climatic degradation impacts.

The purpose of Sustainable Development Goal 7 is to eliminate this disparity by ensuring the provision of affordable, reliable, and modern energy services to all by the year 2030. Hence, effective interventions for the introduction of renewable energy as well as for the improvement of the efficiency of conventional energy technologies are required. The significance of clean energy is apparent from the fact that the share of renewable energy has been steadily increasing in the last decade reaching around 29% of global electricity production (IEA 2021). However, the progress needs to be accelerated further and a new level of endeavors and partnerships needs to be developed amongst countries, governments, industrial organizations, and higher education institutions (HEIs) for the provision of clean, affordable, and reliable energy services.

SDG-7 is one of the most important goals that is a key enabler and catalyst for achievement of many other SDGs because energy is the key enabler for socio-economic growth and sustainable life of human society.

SDG-7 is also strongly linked with SDG-13 which aims at taking actions against climate change. Under the Paris Agreement of the UNFCCC 2015, stringent actions on a global level are required to reduce carbon emissions or new environmental crisis, is certain to happen. Henceforth, the importance of tackling energy issues will be significant and remain relevant for decades to come and the same is resonated by various organizations like the UN, IEA, IRENA, World Bank, etc. About 175 countries, have signed the Paris Agreement in 2018 and at least 168 countries have communicated their first national adaptive contributions which focus on carbon emission reduction. Hence, policy creation and national adaptation plans by various countries are crucial for the overall success of the SDGs at a global level.

1.2 United Nations Sustainable Development Goal-7: Targets

To achieve SDG-7, five targets have been defined along with indicators to measure the achievement of the targets. These are listed as follows:



Target	Indicator(s)
7.1 : By 2030, ensure universal access to affordable, reliable and modern energy services	7.1.1: Proportion of population with access to electricity 7.1.2: Proportion of population with primary reliance on clean fuels and technology
7.2 : By 2030, increase substantially the share of renewable energy in the global energy mix	7.2.1: Renewable energy share in the total final energy consumption
7.3: By 2030, double the global rate of improvement in energy efficiency	7.3.1: Energy intensity measured in terms of primary energy and GDP
7.A: By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology	7.a.1: International financial flows to developing countries in support of clean energy research and development and renewable energy production, including in hybrid systems
7.B: By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support.	7.b.1: Installed renewable energy-generating capacity in developing countries (in watts per capita)

1.3 Summary of Progress on SDG-7 Implementation Globally

In spite of a steady increase in renewable energy system installations, improved efficiency, increased access to electricity across the globe, the world is still falling short of providing affordable, reliable, sustainable and modern energy for majority of the population (UN Report E/2021/58). Global access to electricity increased from 83 per cent in 2010 to 90 per cent in 2019 and electricity deficit reduced from 1.22 billion in 2010 to 759 million in 2019 which shows good progress. But still, it is projected that around 660 million people will still have no access to electricity by 2030 and future progress is likely to be hampered by the COVID-19 pandemic. Moreover, as high as 34% of the global population was still using fossil fuel-based cooking systems in 2019 which increases the amount of polluted air in households and the chances of residents to develop respiratory and cardiovascular diseases including further vulnerability to COVID-19 virus. The share of renewable energy in total final energy consumption increased from 16.4% in 2010 to 17.1% in 2018. However, modern renewable share in final energy consumption was only 11% by 2018 which is required to be increased further to achieve targets 7.1 and 7.2 of the SDG. Global primary energy intensity improved by 2% from 5.6 MJ per dollar of GDP to 4.8 MJ in 2018. However, the improvement slowed down to 0.8% in 2020 due to the pandemic. It is required to achieve an average improvement rate of 3% for energy efficiency by 2030 to meet target 7.3. Funding to support renewable energy projects in developing countries reached USD 14 billion by 2018, an increase of 32% from 2010. In developing countries, the renewable energy capacity per capita was 219W by end of 2019 which showed an increase of 7%. Solar and wind energy showed the most growth with 22.2 and 11.3% per capita increase in capacity.

1.4 Initiatives and Achievements of Indian Government on SDG-7

India's electricity requirements are estimated to reach 2976-3517 Billion Units (BU) in 2036-37 from 1152-1188 BU in 2016-17 at a GDP growth rate of 7.3% (Central Electricity Authority, 2019).

This would require a total peak installed capacity of 398-483 GW of power plants. To meet this enormous demand in a sustainable way, the use of renewable energy is of utmost importance. The total installed renewable energy capacity in India, excluding large hydro, is 100 GW (MNRE Press Release Aug. 12, 2021). India achieved 4th position in the world in terms of installed renewable energy capacity, 4th in wind energy capacity, and 5th in solar energy installed capacity hence contributing to the target 7.2 of SDG-7. Currently, renewable energy (excluding large hydro) represents 27% of the total installed power (Figure 1), and the majority of energy still comes from fossil fuels. Realizing the importance of sustainable development, India has already set herself a target of 450 GW of renewable energy by 2030.

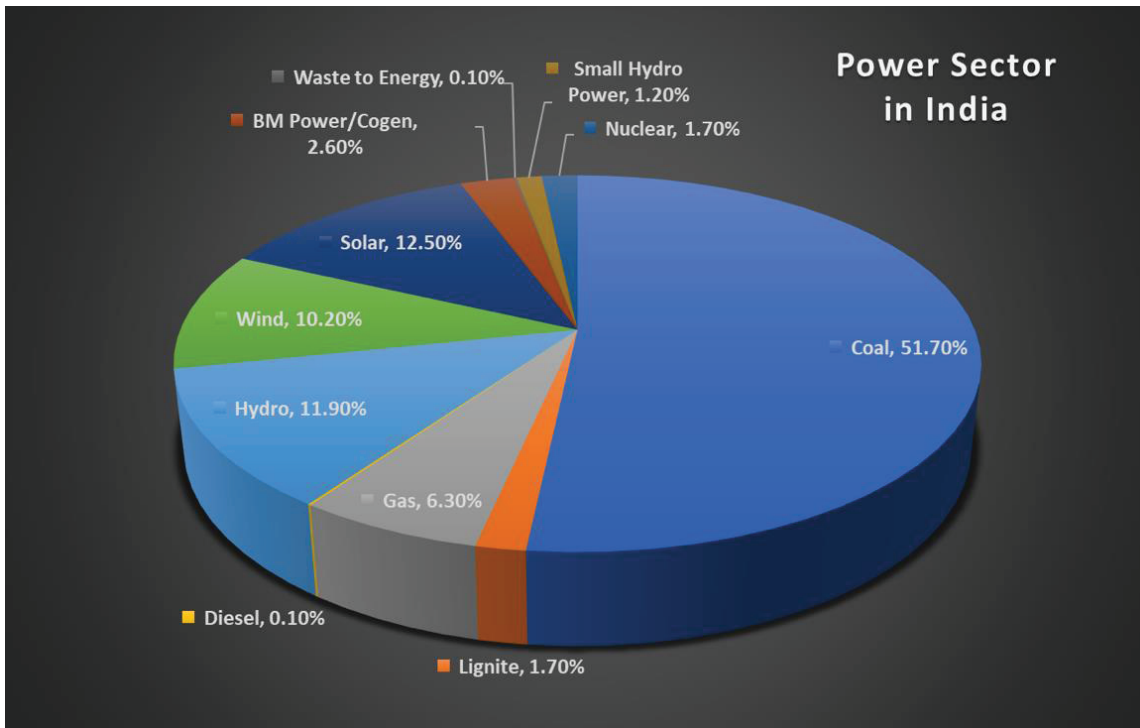


Figure 1: India's Power Sector at a Glance (Data Source: Ministry of Power as on 12-01-2022)

The budget of 2022-23 has focused on the facilitation of the transition into renewable energy by enabling domestic manufacturing of solar equipment and batteries. There would be an allocation of additional Rs. 19,500 crores for production-linked incentives for the manufacture of high-efficiency modules, with priority given to fully integrated manufacturing units.

At its core, the management and monitoring of all SDG implementation in India are being undertaken by NITI Ayog along with the partnership with other ministries and governments of states or union territories. The progress of 16 SDGs including SDG-7 and their targets are being monitored through the SDG-India Index, version 3.0, which encompasses a globally accepted methodology and uses 115 indicators to analyze and measure the progress based on the data collected from various sources. SDG-17 is being assessed by qualitative methods. The indicators for SDG-India Index are chosen based on global SDG targets, alignment with the National Indication Framework, statistical data availability, permissions or approval of ministries or departments, and data coverage for at least 50% of states or union territories. SDG Index Score for Goal-7 ranges between 50 and 100 for States and between 71 and 100 for UTs. The progress of SDG-7 in India is based on two indicators and one target 7.1 only (figure-2, table-1) with India achieving a 92% index score. There is a need to obtain more data so that all targets could be included in the evaluation. Fifteen states and five union territories showed a 100% index score which indicates that in the achievement of target 7.1, India has shown good progress.

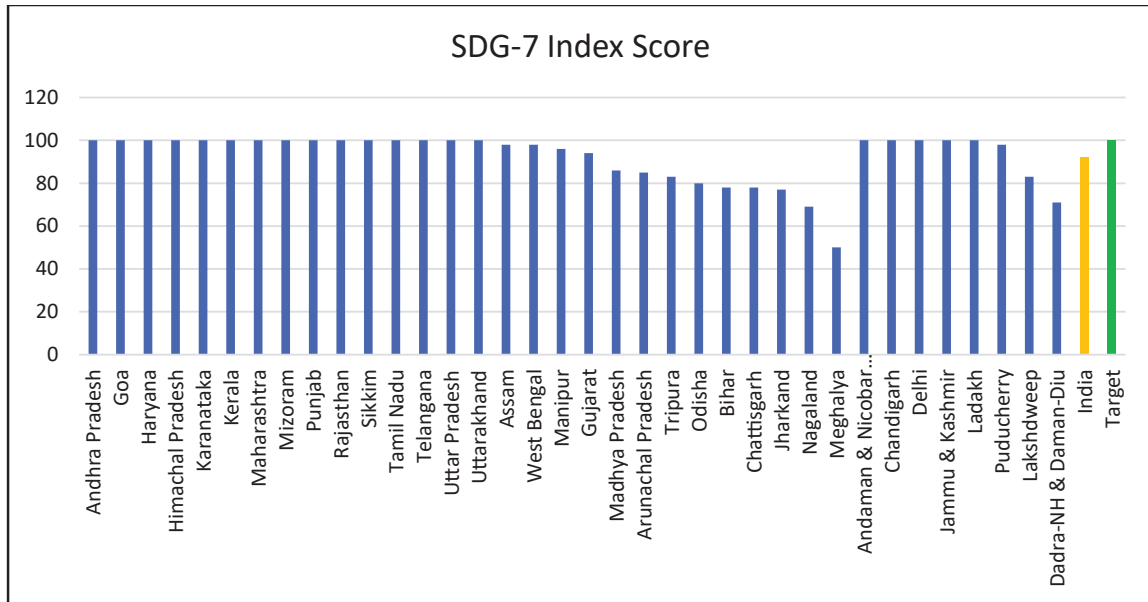


Figure 2: SDG-7 Progress in India (Data Source: NITI Ayog 2021)

Table 1: Progress of SDG-7 in India in Terms of Targets and Achievements by Various States and Union Territories (Data Source: NITI Aayog 2021)

7.1	7.1
Percentage of households electrified	Percentage of LPG-PNG connections against number of households
Total: 99.9% Target: 100%	Total: 92.02% Target: 100%
Highest: 100% State: Andhra Pradesh, Goa, Haryana, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Mizoram, Punjab, Rajasthan, Sikkim, Tamil Nadu, Telangana, Uttar Pradesh, Uttarakhand UT: Delhi, Jammu & Kashmir, Ladakh, Puducherry	Highest State: Goa: 147% UT: Ladakh: 170%
Lowest: State: Chhattisgarh: 99.67%	Lowest: State: Meghalaya: 47.5% UT: Daman & Diu: 78%

1.4.1 Jawaharlal Nehru National Solar Mission

India has a vast solar potential of about 748 GW assuming 3% of the wasteland area to be covered by Solar PV modules. Jawaharlal Nehru National Solar Mission (JNNSM) was launched in 2010 as one of the biggest government initiatives to promote solar power in India and increase the capacity of solar energy power plants in the country's energy mix. The mission has been successful in meeting its original capacity installation target of 20 GW by 2022 four years ahead of time and the same was revised to an ambitious target of 100 GW of solar power by 2022. The envisaged target is also to reach 280 GW by 2030. The promotion of solar power is conducted through schemes like Solar Park Schemes, VGF Schemes, CPSU Schemes, Defence Schemes, Canal bank & Canal top Schemes, Bundling Schemes, Grid Connected Solar Rooftop Schemes, etc. However, the impact of

the COVID-19 pandemic has hampered the project installation pace. The target still stands with 60 GW of ground-mounted photovoltaic (PV) and 40 GW of rooftop PV power plants to be installed by end of 2022. The installed solar capacity stood at 49.347 GW as of 12th, January 2022 (MNRE, 2022). JNNSM and other renewable energy development policies contribute to target 7.2 of SDG-7.

1.4.2 National Wind-Solar Hybrid Policy

National Wind-Solar Hybrid Policy was introduced in June 2016. Out of the total 175 GW of renewable energy by 2022, 60 GW is to be fulfilled by wind energy power plants. The complementary nature of solar and wind is recognized and hybridization would lead to more stable operation. The policy provides guidelines for both new hybrid plants as well as encourages hybridization of existing solar or wind power plants. The policy outlines mechanisms for Solar-Wind hybridization on AC and DC sides with the provision of integration of batteries. The policy also highlights the provision of funding for the development of standards and further research for solar-wind hybrid technology.

1.4.3 Policy for Repowering of the Wind Power Projects

Wind power represents a significant share of renewable energy capacity in India. Most wind turbines installed up to 2000 were less than 500kW installed at high wind resource sites and representing 27 GW in 2016. Hence, in order to optimize the utilization of wind energy resource, a repowering policy was introduced in 2016 for which wind turbines of 1 MW or lower capacity would be eligible for upgradation with all fiscal and financial benefits as applicable to new wind projects also being applicable to repowered projects.

1.4.4 National Offshore Wind Energy Policy – 2015

A preliminary survey indicated about 1 GW of wind energy potential along the coastlines of Rameswaram and Kanyakumari. The government of India formulated a policy in order to utilize the off-shore wind potential up to 200 nautical miles from baseline in the Exclusive Economic Zones (EEZ) of the country with additional objectives contributing to energy security, reduction of carbon emissions, promotion of investment in renewable energy infrastructure, etc. Projects under the policy would be eligible for financial incentives and provision of foreign direct investment (FDI) Public Private Partnership (PPP), and international collaborations.

1.4.5 National Electricity Policy

As per Census 2001, about 44% of the households did not have access to electricity. The National Electricity Policy aims to achieve 100% electrification of all households in the India by expansion of transmission and distribution infrastructure. As of now, about 99.9% of households have been electrified as per the government data. This initiative is contributing to the fulfillment of target 7.1 of SDG-7.

1.4.6 Welfare Schemes for Clean Cooking Fuel for Poor Households

The Government of India (GoI) introduced the ‘Pradhan Mantri Ujjwala Yojna’ with the allocation of Rs. 8000 crores in May 2016, for providing LPG connections to Below Poverty Line (BPL)

households and women. As per the progress made, about 37% of the SC/ST households have obtained LPG connections of the total LPG coverage in the country. For other minorities, the same has risen to 13%. Priority is given to the states of Uttar Pradesh and Bihar where the LPG penetration is below the national average. The National Biogas and Manure Management Programme has been formulated to set up household biogas plants in rural areas for the production of biogas, a clean cooking fuel that also serves as a source for lighting. These initiatives are contributing to the fulfillment of target 7.1 of SDG-7.

15 HEIs Status: Role of Higher Educational Institutions and Status of Adoption of SDG-7

Energy plays a significant role in socio-economic development of people and hence energy consumption per capita is an indicator of the economic development of a country (Esen and Bayrak 2017). In all modern economies, large-scale production of goods requires energy and in absence of the same, economic growth is not possible. Moreover, energy consumption increases in a developing economy and a failure to keep up with demand leads to what is known as ‘energy deficit’. Similarly, an important factor in climate change, economic models of energy and environment policy is technological change (Loeschel 2002). It is apparent that technical change and innovations are deeply rooted in the Higher Education Institutes (HEIs) which are hubs of research and development as well as training centers for future professionals. Today’s world faces several key challenges that need to be addressed like climate change, lack of energy access, high consumption, lower efficiency, energy security, and long-term focus on energy roadmap (Vuuren et al 2012). The demand of primary energy is changing and shifting towards modern renewable technologies (International Energy Agency 2021, Hendersen and Sen 2021). With renewable energy penetration directly related to climate change and socio-economic development, it is clear that SDG-7 is one of the most crucial goals that need to be achieved for the sustainable growth of nations. The HEIs have been contributing towards sustainable development primarily in form of academic research as evident from various studies in the past (Salvia and Brandli 2020). However, the HEIs have a crucial role to play in the effective implementation of SDG-7 and there is a need to go beyond the latter. HEIs need to partner with the government and industry to research specific problems and issues related directly to the goal. There is a need to introduce reforms within the HEI to make SDG-7 an integral part of the curriculum and institutional policy.

There are several notable examples that demonstrate HEIs extending their reach and expertise to contribute directly to SDG-7. The University of Toronto completed a project under the World Bank’s ‘Renewable Energy for Rural Access Programme’ in 2017-18 that provided reliable, sustainable electricity using solar modules to Mongolia’s 140,000 nomadic households. The university is also actively working on UNDP’s ‘Solar for Health’ project which aims to provide reliable off-grid solar power to medical and health centres in Africa by starting a pilot project in Zimbabwe. In Japan, the Renewable Energy University League of Japan has been formulated in June, 2021 that aims to create a group of universities that will implement 100% renewable energy usage by 2030. The members of the league as of September, 2021 are the Chiba University of Commerce, International Christian University, Wayo Women’s University, University of the Sacred Heart, Tokyo University of Foreign Studies, The University of Nagano, Sophia University, Hiroshima University, Tokyo Medical, and Dental University, Tokyo Metropolitan University, Ashikaga University, Tokyo City University and Ritsumeikan University. The league aims to contribute directly to SDG-7 by switching to 100% renewable energy in terms of electricity, by producing or procuring renewable electricity, framing a plan of action, sharing the experience gained within and outside the league, and expanding the league to include more members over time. University of North Hampton, UK, has already framed a policy for reducing its carbon emissions and to become net zero carbon university by 2030 and is one of the leading universities in UK to reduce its carbon emissions and

energy usage. The university monitors its energy consumption through online energy management system. The use of energy efficient LEDs and sustainable construction policy are several other steps taken by the university for achievement of SDGs. University of Manchester, UK ranks first in the Times Higher Education rankings based on achievements of universities in view of compliance with the SDGs. The university offers several courses for each of the SDGs.

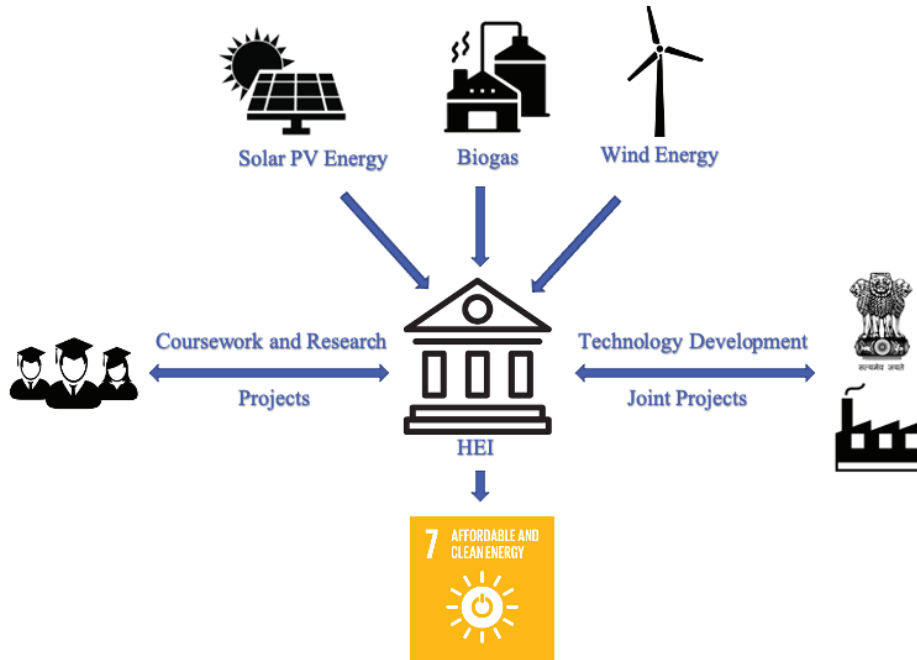


Figure 3: Strategy for the Achievement of SDG-7 by HEIs through Renewable Energy Adoption, Focused Coursework, Research, and Joint Projects With Industry and Government

Since universities and educational institutions are the hubs of knowledge creation and dissemination, their role in the development of sustainable economies and societies cannot be neglected. Being part of the Helix model, universities themselves have additional benefits to gain in addition to their standard importance and role by aligning themselves with the government’s goals or global SDGs.

Times Higher Education (THE) a UK-based company that ranks and reports various universities on the basis of the quality of education has also released rankings based on SDG compliance of various universities. Although many universities have activities in line with various SDGs, only one of the Indian universities has made it to the top 100 of THE SDG-based ranking in 2021. It is therefore apparent that in order to further improve their ranking, as well as doing their part in combating environmental change for a better quality of life, all universities must make SDGs an integral part of the organizational policy and culture.

Shoolini University was ranked 2nd globally in THE Global Ranking 2022 in SDG-7 compliance and demonstrated the high level of contribution and commitment of an Indian University in moving forward on the sustainable path and inspiring others to follow the same.

One of the fastest methods for HEIs to start their journey towards SDG implementation is by creating Massive Open Online Courses (MOOCs). There are several universities and UN-sponsored platforms that have already initiated MOOCs that focus on various SDGs and SDG-7. Some of these are listed in Table-2.

Table 2: Some of the MOOCs Related to SDG-7 Offered by Various HEI

Course Title	SDG Focus	Platform	Sponsor
Driving business towards the Sustainable Development Goals	Generic	Coursera	Erasmus University Rotterdam
Sustainable Development in the 21st Century with Ban Ki-moon	Generic	Coursera	Yonsei University
Inclusive Energy Systems - Exploring Sustainable Energy for All	SDG-7	edX	Delft University of Technology
United Nations SDG 7 – Affordable and Clean Energy	SDG-7	Online	Ubiquity University
System of Environmental-Economic Accounting (SEEA): In-depth Training on Energy Accounting	SDG-7,17	Online	United Nations Statistics Division
Regulation of Sustainable Development Goal-7	SDG-7	Online	Florence School of Regulation

Indian universities need to focus on SDG specific courses and introduce the same into their curriculum. All HEIs must conduct a thorough self-assessment regarding the current sustainable practices and follow the SDG path through a formal policy and set targets.

2 Recommended Actions for HEIs for Achievement of SDG-7

The initiation for SDG-7 implementation must start from within the institution itself. A flowchart for the facilitation of the same is shown in figure 4. The process begins with the creation of a **Dedicated Department (DD)** to create the Energy, Environment and Sustainability (EES) Policy which defines the rules and procedures to be followed in compliance with UN-SDGs within the campus. This department is also responsible for periodically reviewing and updating the policy as and whenever required. The next step is to ensure that SDG targets are defined, and key activities and projects are undertaken by the HEI and overall coordinated by the DD for efficient monitoring and management. The objectives can be set as targets specific to SDG-7 like the use of renewable energy by power plant installation or purchase of renewable electricity, the use of biogas and solar cooking systems for cooking, and participating in projects related to SDG with government or organizations like UNDP. The HEIs can also create their own projects for implementation and seek funding through UN programmes, the department of science and technology, the Government of India, etc. The recommendations for the HEIs are given in table-3.

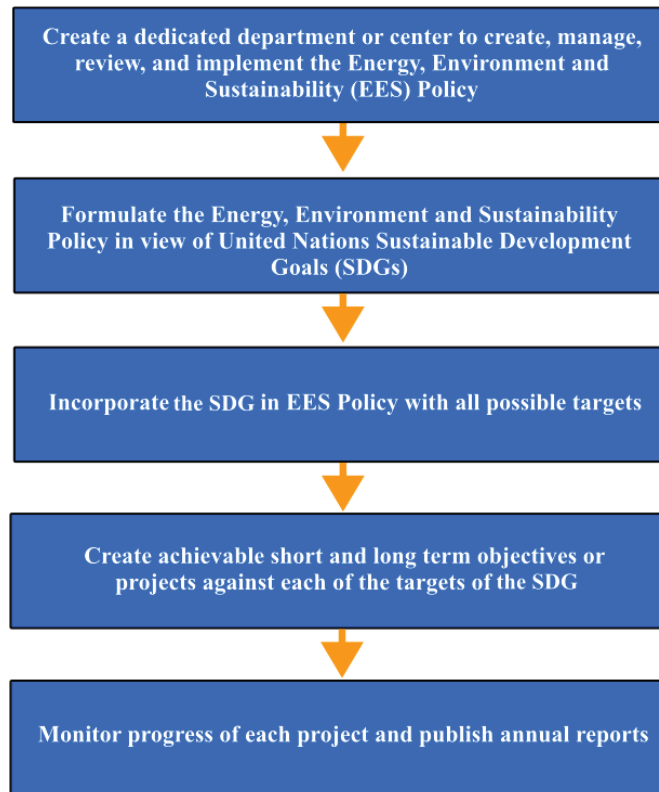


Figure 4: Flowchart for Getting Started with SDG-7 Implementation Within an HEI

Table 3: Minimal Recommended Actions for the HEIs for Implementation of SDG-7

SDG 7 Target	Minimal Recommended Actions for HEIs
7.1	1) Participate in joint projects with government to bring modern energy systems for electrification of rural and remote areas (suggest latest technologies, recommendations, provide consulting services) 2) Suggest new improved cooking systems for use in areas still dependent on the use of fossil fuels within the households (promote use of biogas, solar cooking systems, hybrid systems).
7.2	1) Increase the share of renewable electricity by installing solar photovoltaic or wind energy power plants within the campus or purchase renewable electricity from nearby plants. 2) Participate in projects for the installation of renewable energy power plants outside the campuses. 3) Create courses and seminars to promote use of renewable energy.
7.3	1) Conduct research to develop new improved renewable energy devices and systems. 2) Conduct research to improve the efficiency of existing renewable energy device or systems. 3) Participate in joint technology development projects with the government and industry.
7A	1) HEIs to design specialized courses or seminars to explain the technologies and benefits of using renewable energy systems to various stakeholders. 2) HEI's can start pilot projects for demonstration of new technologies that attracts attention of investors.
7B	1) HEI's can submit project proposals to the govt. funding agencies like DST for providing sustainable technology solutions to rural areas of India. 2) HEI's can participate in joint projects with govts. of other countries or international organizations like UNDP, World Bank, USAID, AUSAID etc. or receive funding from such organizations for their own projects in rural areas of India or the world.

3 Proposed Research Agenda for HEIs and Governmental Bodies

The review of past studies and respective linkages with the SDG-7 targets have led to several key research areas that must be undertaken by HEIs. It is recommended that the HEIs introduce SDG-focused courses into their curriculum to foster awareness as well as to train future professionals in the areas which require immediate attention. Proposed areas of research are highlighted in table-4.

Table 4: Main Research Areas and Models that can be Followed for SDG-7 Implementation

Field	Key Research Areas or Models	Key Activities
Renewable Energy	Solar Energy, Wind Energy, Biomass, Geothermal Energy, Hydro Energy Systems etc. Materials research, design and engineering, geospatial analysis and modelling, renewable energy resource assessment, predictive models for energy production forecasting, use of IoT, use of artificial intelligence in system modelling and forecasting etc.	Design, engineering, construction, optimization, and deployment of renewable energy systems. Methods of improvement or creation of new renewable energy technologies. Developing models for the simulation of renewable energy systems and energy forecasting.
Hybrid Energy Systems	PV-Wind, PV-Wind-Biomass hybrid systems or other combinations of renewable energy systems.	Research for hybrid renewable systems for better utilization of natural resources and overall enhanced efficiency.
Green Buildings	Zero Energy and nearly Zero Energy Building models, passive solar architectures, efficient water management, air quality, thermal comfort, waste reduction, toxics reduction, combating urban heat islands.	Mandatory construction of energy-efficient, low-carbon buildings and minimization of dependence on conventional electricity by use of renewable energy, sustainable building materials, passive solar architecture and other design methods. The better sustainable building design for resource efficiency, waste and toxics management, thermal comfort etc.
Renewable Energy Storage	Technologies for renewable energy storage.	Research and development into existing renewable energy storage methods. Development of new battery storage technologies.
Integration of Renewable Energy with the Grid	Smart grids, power factor management, load shifting, load shedding, etc. Use of AI models and techniques in grid management.	Research into key technical problems in the integration of renewable energy into existing grid infrastructure.
Clean and Efficient Cooking Technologies and Fuels	Design of efficient cookstoves, non-polluting fuels, bio-fuels, geospatial analysis and modelling of systems. Solar cooking systems, biogas systems.	Research for improved design of cooking systems and fuels for high efficiency, elimination or reduction in pollution and better health.

4 Recommendations for Government and Regulatory Bodies for Achievement of SDG-7

Key action points for policymakers for effective implementation SDG-7 are given as follows:

4.1 Recommendations for Government

SDG 7 Target	Minimal Recommended Actions for Government/policymakers
7.1	<ol style="list-style-type: none"> 1) Ensure that a policy is in place for the promotion of renewable energy systems in all the states. 2) Conduct state-level, and district-level, surveys to identify the potential for the installation of renewable energy systems in various areas of administration especially rural areas. 3) Plan off-grid solar and wind energy projects for remote areas where the conventional grid cannot be extended due to technical or financial reasons. 4) Distribute energy-efficient cookstoves and solar cookers to the rural population that still uses inefficient cookstoves. Promote the use of solar cooking systems, and biogas systems to eliminate or reduce the use of fossil fuels for cooking. 5) Involve HEIs in consulting, research, and technological guidance for the aforementioned projects. 6) Create a reward and recognition system for institutions, companies, organizations that demonstrate a high level of achievement in the implementation of renewable energy projects, or design of energy efficient cookstoves or assist in projects related to SDG-7.
7.2	<ol style="list-style-type: none"> 1) Install more solar, wind or other renewable energy technology power plants to reduce dependence on conventional electricity. 2) Create new schemes and benefits targeting the commercial and industrial sectors for higher renewable energy penetration and reduction of pollution. 3) Create a reward and recognition system for institutions, companies, organizations that demonstrate a high level of achievement in installing renewable energy systems or funding such projects or develop breakthrough technologies through research.
7.3	<ol style="list-style-type: none"> 1) Create funding for the development of energy-efficient technologies and invite proposals from HEI and industries. 2) Identify inefficient energy systems (e.g. lighting systems using old technologies, old machinery, devices etc.) in use in the various govt. offices and industries and replace them with energy-efficient devices and systems. 3) Create mandatory policies and standards for industries to manufacture only energy-efficient products and provide financial support or incentives to phase out old manufacturing platforms and products that have lower energy efficiency.
7A	<ol style="list-style-type: none"> 1) Create partnerships with international organizations, governments of other countries and HEIs for sustainable technology development and dissemination. 2) Participate in collaborative SDG-7 related projects with UNDP, World Bank, USAID, AUSAID etc. 3) Provide fiscal and other benefits to companies and organizations that install renewable energy projects so that more follow.
7B	<ol style="list-style-type: none"> 1) Participate in joint projects with foreign governments and external agencies like UNDP, World Bank etc. for introducing modern renewable energy technology projects in developing nations.

4.2 Recommendations for Regulatory Bodies

The regulatory bodies like UGC, AICTE, ICAR, NAAC etc., and research funding agencies like the Department of Science & Technology, Council of Scientific Research (CSIR), Ministry of New



and Renewable Energy (MNRE), Ministry of Environment, Forest and Climate Change and State Science, Energy & Environment agencies shall facilitate in fostering and developing educational curriculum, quality research, and training modules for training of future professionals in the field of sustainable development including SDG-7.

Specific immediate action points for key regulatory bodies are identified as follows:

- 1) Scrutinize and approve new graduate and postgraduate degrees and courses related to the SDGs offered by HEIs.
- 2) Make standards and guidelines for approval of new universities specialized in Energy, Environment and Sustainable Research, specifically including the UN SDGs.
- 3) Disburse special funds to the HEIs offering quality education in sustainability and SDGs for further research and growth in the area.
- 4) Design/approve all India-level specialized tests for entry into the HEIs offering the developed sustainability curriculums. Also include sustainability and SDG-related questions in existing tests like UGC-NET, CSIR-NET, ICAR-NET etc.
- 5) Conduct audits to monitor the quality and thoroughness of education and research in the HEIs offering specialized courses and degrees related to SDGs and sustainability.
- 6) Make recommendations to the central and state governments to bring about positive changes in higher education with reference to sustainability and SDGs for better awareness and for the generation of adequate number of future professionals who are specialized in the field.

5 Conclusion Along With Prioritization of the Initiatives Recommended

Energy is a key parameter for economic growth. Research shows that there is a global transition in the power industry towards renewables and this trend is likely to continue in the future. The SDG-7 aims to provide clean and safe energy access to all people and maximize renewable energy penetration throughout the globe. But it is critical for the governments as well as HEIs to jointly work towards the achievement of the SDG-7. The HEIs have a crucial role to play to assist the government in identifying, recommending and developing new renewable and sustainable technologies and researching into areas that directly contribute towards the achievement of SDG-7. The HEIs must also move up from their regular research and curriculum and participate in projects focusing on SDG-7 with the government and other national and international organizations. HEIs should also seek funding from various agencies for their own sustainability projects and take initiative. Government should ensure the participation and involvement of various HEIs in projects through MoUs or policy changes so that their expert recommendations and research could be included. Government should also create special funds for projects related to SDG-7 and invite proposals from HEIs and industries. Additionally, a reward system should be formulated for HEIs and other organizations that show a high level of achievement in the adoption of renewable energy technologies and SDG-7 to encourage them and motivate other HEIs to adopt it.

Overall, summary and conclusions based on the main recommendations are as follows:

- 1) The government must involve HEIs in formulating and implementing joint projects related to renewable energy and SDG-7 through MoUs or existing policy amendments.
- 2) Research grants must be provided by the UGC, DST, CSIR, ICAR, and other funding agencies to all public and private universities imparting quality education regarding sustainability and SDG-7.
- 3) Each HEI must establish a multidisciplinary Centre of Energy Science & Technology to coordinate SDG-7 related activities for imparting higher education in sustainable energy technologies and to provide inputs to the government's energy programmes in the region.
- 4) There are no effective mechanism at present for monitoring of large number of solar energy projects in India as this task is entrusted to state /central energy agencies at present. The



state governments must align with the central government for the effective implementation of SDG-7 and monitor the status of Solar projects through Energy Research Centres established in HEIs. This will also provide reliable data for further research and region-specific technology innovations and planning

- 5) The government must formulate specific policies for every state for the promotion of renewable energy and create new schemes and benefits targeting the commercial and industrial sectors for higher renewable energy penetration and reduction of pollution.
- 6) Government must plan off-grid solar and wind energy projects for remote areas where the conventional grid cannot be extended due to technical or financial reasons.
- 7) Each HEI must develop its campus as a sustainable energy township to promote and support the region through its Centre of Energy by providing technical inputs. This Centre will monitor and help in policy formulation, and effective implementation of government programmes in Energy in respective states.
- 8) The HEIs that demonstrate a high level of excellence in imparting education related to sustainability and research and deliver exceptional national/international projects related to SDG-7 must be rewarded by the government so that others also follow.
- 9) HEIs must start working for the achievement of SDG-7 by offering undergraduate and graduate level courses and MOOCs related to the same. HEIs must also review their own campuses for compliance with SDG-7 and create a policy for energy, environment, and sustainability.
- 10) HEIs must conduct focused research and projects concerning SDG-7, especially in areas of renewable energy, hybrid energy systems, green buildings, renewable energy storage, integration of renewable energy systems with the grid and clean and efficient cooking technologies and fuels. The research in science, engineering, technology and social sciences at the Master's and PhD levels should focus on SDGs wherever possible.
- 11) Government must implement joint projects involving experts and Centres of Excellence in Energy and provide consultancy projects to the HEIs for guidance and research.
- 12) Government must ensure that old inefficient systems that are in use should get replaced by government offices and industries. Government should provide incentives and support to industries to phase out old, less efficient manufacturing systems and products. New standards and energy policies can be made for enforcing the same.
- 13) Regulatory bodies like UGC, AICTE, and NAAC must foster the design and approval of new HEIs, degrees and course curriculums related to sustainability and SDGs and keep the quality in check.
- 14) The flexibility in imparting postgraduate energy research education for the vast pool of experienced energy industry professionals to be ensured by UGC in universities as is being offered by IITs for India to become a world sustainable energy leader with its vast solar, wind and another renewable energy potential.
- 15) State and Central Regulatory bodies including NAAC, NIRF must devise a reward system for institutions that comply with SDGs and a national ranking system similar to Times Higher Education (THE) SDG-based impact ranking.

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Annexure -1: Case Study of Higher Education Institution in Implementation of SDG-7: Shoolini University, Himachal Pradesh

Shoolini University, Solan, Himachal Pradesh India has been ranked as No. 2 in Global Ranking in the implementation of SDG-7 in its campus as sustainable Township by Times Higher Education Ranking on April 22nd, 2022. The implementation effort on SDG-7 has been catalyzed by the Centre of Excellence in Energy Science & Technology led by Prof. S.S. Chandel, Director, his team and actively supported by top University Management of the University Prof P.K. Khosla, Chancellor, Prof. Atul Khosla, Vice Chancellor.

Energy Policy of Shoolini University

Shoolini University is committed to United Nations Sustainable Development Goals (SDG) through its innovative energy policy to make Shoolini University a sustainable, energy efficient green campus. This energy policy applies to all operations and activities of the University including building construction, renovation, transportation, and any other operations for improving energy



efficiency through the installation of energy efficient systems and use of renewable energy sources. The environment protection, efficient water management and fossil fuel use reduction in various activities undertaken by the University are the linked aspects of this policy. The various measures are to be undertaken for the divestment of energy consuming, and fossil fuel based existing equipment/ vehicles etc., with innovative energy efficient systems and to invest in Climate Change solutions for a Carbon Neutral University Campus by 2025.

Energy Policy Goals of Shoolini University

- To protect environment in and around Shoolini University
- To develop a systematic waste management mechanism
- To develop rainwater harvesting system for water conservation and recharging
- To provide training and information on energy & environment protection measures
- To create awareness among student's faculty, employees and public to engage in initiatives those contribute for environment protection
- To reduce, reuse and plastic in any manner inside the University campus
- To create awareness on single use plastics impact on environment and encourage use of natural alternatives
- To explore production of energy from waste
- To take measures for the effective utilization of wastewater recycling
- To take measures to protect the forest and environment from forest fires

Environment Policy for Shoolini University

Shoolini University is committed to United Nations SDGs through its innovative Environment Policy which makes Shoolini University a sustainable, energy efficient and environment friendly green campus. This Environment Policy applies to all the operation and activities of the University including building construction and renovation, transportation, water, waste management and all its operations and activities undertaken by the university.

Environment Policy Goals

- To protect environment in and around Shoolini University
- To develop a systematic waste management mechanism
- To develop rainwater harvesting system for water conservation and recharging
- To provide training and information on energy & environment protection measures
- To create awareness among student's faculty, employees and public to engage in initiatives those contribute for environment protection
- To reduce, reuse and plastic in any manner inside the University campus
- To create awareness on single use plastics impact on environment and encourage use of natural alternatives
- To explore production of energy from waste
- To take measures for the effective utilization of wastewater recycling
- To take measures to protect the forest and environment from forest fires

Major Initiatives Undertaken by the University

Creation of Shoolini University as Sustainable Energy Township at Bahjol, Solan, Himachal Pradesh, India. Development of Shoolini University as Green Campus, Implementation of Policies on Energy, Environment, Waste utilization Wastewater Recycling, mandatory implementation of solar passive building technology in the University Campus vide which all the new buildings constructed have energy efficient passive solar features to enhance thermal comfort. Establishment of Centre of Excellence in Energy Science and Technology for imparting Undergraduate, M. Tech in Energy Technology and Climate Science and sustainable development besides providing inputs on Solar passive technology and Solar power generation to the Government of Himachal Pradesh.

8 DECENT WORK AND ECONOMIC GROWTH



SDG-8: Promote Sustained, Inclusive, and Sustainable Economic Growth, Full and Productive Employment and Decent Work for All

Summary

“Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all,” is SDG-8. It is also referred to as “Decent Work and Economic Growth.” It comprises of 12 sub-goals to be achieved by 2030. This chapter presents recommendations to achieve SDG-8 goals in 18 broad areas for research along with 36 implementation strategies for HEIs, and 45 policy recommendations for government and regulatory bodies. Key recommendations include development of vocational courses and short training programmes by HEIs. Emphasis is laid on sustainable industries like eco-tourism, rural tourism, handicrafts, local small-scale manufacturing, etc. to achieve this goal. A single independent monitoring authority should be established to audit the contribution of participating HEIs. The Government and regulatory bodies must issue directives to the HEIs to adopt at least 10 panchayats/ villages in a phased manner and conduct awareness/ trainings for youth for generating innovative employment opportunities in their area of influence with the assistance of govt/ industry/NGOs. Moreover, HEIs need to collaborate with National and International Institutions, Industry, science, technology and research funding agencies to establish innovative technology hubs at local level for students, artisans and semi-skilled manpower and rural youth for creating employment opportunities by upgrading their skills..

Key Recommendations to Achieve SDG-8

- Institution Innovation Council (IICs) under the Ministry of Education’s (MoE’s) along with Business Incubators (BI) by Ministry of Micro, Small & Medium Enterprises (MSME) and Atal Incubation centres need to be established and strengthened in HEIs to achieve the SDG8 targets effectively.
- HEIs must adopt at least 10 Panchayats/ villages. Semi urban areas in a phased manner and identify artisans, skilled, semiskilled manpower, including women and train them in sustainable earning opportunities in agriculture, horticulture, eco-tourism, rural tourism, Home stays, progressive organic farming, in collaboration with govt. industry and NGOs.
- Financial and logistic support to students unemployed youth, technical manpower for start-up businesses innovations, and handholding by closely monitoring and reviewing their progress.
- Explore and develop new rural and remote tourist destinations and improve cost effective quality home stay facilities. connecting tourist destinations with all modes of transportation.
- Financial inclusion through the ‘each one reach one’ model to create an understanding of the financial products and their benefits.
- HEIs should focus more on creating inclusive solutions to promote full and productive employment opportunities to all by adopting industry-linked academics and aligning employment, training, and regulation policies to be consistent with commitments to equity and access strategies and targets.



- Integration of Corporate Social Responsibility (CSR), adaptability, and capability of sustenance in any employment must be essential elements in the curriculum as well as creation of employment generation activities.
- Knowledge creation is critical, and a cluster approach of innovation should be implemented by HEIs to foster entrepreneurship through the strengths of creative thinkers.
- HEIs must foster entrepreneurship through the entrepreneurial-academic model with focus on capitalisation, interdependence, independence, hybridization, and reflexivity.

1 Context and Current Status of SDG-8

1.1 The Context and Current Status

Because of its numerous elements, sustainable development is a well-defined concept. The Brundtland report from the World Commission on Environment and Development in 1987 described it as “filling current demands without jeopardizing future generations’ ability to satisfy their own needs.” The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by the United Nations in 2015 as a universal call to action to eradicate poverty, protect the environment, and ensure that everyone lives in peace and prosperity by 2030.

The goal of “Promote Sustained, Inclusive, and Sustainable Economic Growth, Full and Productive Employment, and Decent Work for All,” also known as “Decent Work and Economic Growth,” is to ensure that every country’s economic sector meets the basic needs of its citizens, regardless of their background, colour, or culture. SDG 8 aims to foster sustainable and equitable economic growth for all employees, regardless of their background, race, or gender. This entails “raising economic productivity through diversification, technological upgrading, and innovation, with a focus on high-value-added and labour-intensive industries,” according to the report.

1.2 United Nations Sustainable Development Goal-8 Targets: Decent Work and Economic Growth

The idea behind Goal 8, aims to sustain an economic growth rate of 7% for the least developed countries by 2030, and achieve full and productive employment for all men and women everywhere in the next 15 years. Various nations around the globe are implementing different programmes for the achievement of this goal. To achieve SDG-8, United Nations Academic Impact (UNAI) has presented SDG Academia Series which includes vital targets to be achieved by 2030. These targets are listed below:

- 8.1 *Sustain per capita economic growth* by national circumstances and, in particular, at least 7% gross domestic product growth per annum in the least developed countries.
- 8.2 *Achieve higher levels of economic productivity* through diversification, technological upgrading, and innovation, including through a focus on high-value and labor-intensive sectors.
- 8.3 *Promote development-oriented policies* that support productive activities, decent job creation, entrepreneurship, creativity, and innovation, and encourage the formalization and growth of micro, small, and medium-sized enterprises, including through access to financial services.
- 8.4 *Improve progressively*, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead.
- 8.5 *By 2030, achieve full and productive employment and decent work for all* women and men, including for young people and persons with disabilities, and equal pay for work of equal value.



- 8.6 By 2030, *substantially reduce the proportion of youth not in employment, education, or training.*
- 8.7 *Immediate actions for child labour and human trafficking-* take immediate and effective measures to eradicate forced labor, end modern slavery and human trafficking, and secure the prohibition and elimination of the worst forms of child labor, including recruitment and use of child soldiers, and by 2025 end child labor in all its forms.
- 8.8 *Protect labour rights and promote safe and secure working environments* for all workers, including migrant workers, in particular, women migrants, and those in precarious employment.
- 8.9 By 2030, *devise and implement policies to promote sustainable tourism* that creates jobs and promotes local culture and products.
- 8.10 *Strengthen the capacity of domestic financial institutions* to encourage and expand access to banking, insurance, and financial services for all.
- 8. A *Increase Aid for Trade support for developing countries*, in particular, least developed countries, including through the Enhanced Integrated Framework for Trade-Related Technical Assistance to Least Developed Countries.
- 8. B *Develop and operationalize a global strategy for youth employment* and implement the Global Jobs Pact of the International Labour Organization.”

1.3 Summary of Progress on SDG-8 Globally

According to the UN report, E/2021/58, 2021, global economic growth was very slow before COVID-19. But the COVID-19 pandemic has made the situation even worse. In 2020, the gross domestic product (GDP) per capita has decreased by 4.6%, the Unemployment rate increased by 1.1% from the previous year (2019) and reached 6.5%. As compared to the year 2019, the number of unemployed people has increased by 33 million and reached 220 million. The tourism industry has faced a huge loss during the pandemic as the number of tourists has decreased by 74% in 2020 compared to 2019 with a loss of \$1.3 trillion).

There is a huge loss of 255 million full-time jobs, approximately 4 times the loss during the global financial crisis (2007-2009). There are 1.6 billion informal economy workers who are lacking social safety needs, and who were very hardly affected by the pandemic. Moreover, there are approximately 31.1% and 14.0% of young women and men respectively, who are not involved in education or training or are not even employed. Meanwhile, the global economy is recovering from the pandemic crisis. Global real GDP per capita is recovered from -4.5 (in 2020) to approximately 3.1 (in 2022) while some countries yet are in progress.

During the last decade, the installation of ATMs has increased globally but there was a decrease in the number of commercial bank branches. During 2019, aid for trade commitments also decreased by 6%. Other sectors were energy, transport, storage, and agriculture at 27.9% of total aid for trade, 22.6%, and 17.8% respectively (UN report, 2021).

UN Report, 2021 also concluded that “approximately 35 countries and territories among 107 had formulated and operationalized a youth employment strategy, while 41.1% had such strategies but did not provide conclusive evidence of their implementation, and 24.3% were in the process of developing a strategy”.

1.4 Initiatives and Achievements of the Indian Government on SDG-8

To lift huge numbers of underprivileged people out of poverty, India stressed the significance of rapid and inclusive economic growth. While eradicating poverty and promoting inclusive economic growth remain priority priorities, these massive challenges will necessitate increased resources and capacity-building activities. In view of the same, India has prioritized international partnership

to boost development, as well as proper implementation strategies such as increased Official Development Assistance (ODA) and favourable technology transfer to poor countries.

Given the global economic uncertainties, particularly in the aftermath of the COVID-19 epidemic, maintaining a high growth trajectory will be difficult for India, as it will be for all nations. However, the success of India's economic growth strategy over the last five years, as well as the lessons learned from it, will inform India's growth plans for the next ten years, in line with SDG-8 aspirations.

1.4.1 Initiatives of the Indian Government to Realise SDGs

The Government of India has launched several programmes to ensure that people, particularly the youth, have access to long-term employment prospects. These programmes are also fulfilling the targets of SDG-8 i.e. decent work for all. Some of these projects with the objectives are presented in Table 1.

Table 1: Initiatives Taken by the Indian Government

Programme name	SDG Target	Objectives	Sources
Make in India	8.1, 8.2	“to increase the manufacturing sector’s growth rate to 12-14% per annum; to create 100 million additional manufacturing jobs in the economy; to ensure that the manufacturing sector’s contribution to GDP is increased to 25% by 2022 (later revised to 2025)”	https://www.makeinindia.com/
Start-Up India	8.3, 8.5, 8.6	“to catalyse start-up culture and build a strong and inclusive ecosystem for innovation and entrepreneurship in India”	https://www.startupindia.gov.in/
Skilled India	8.3, 8.6	“to provide adequate training in market-relevant skills to over 40 crore youth”	https://www.skilledindia.org/
Pradhan Mantri Jan Dhan Yojna (PMJDY)	8.10	“Access to various financial services like availability of basic savings bank account, access to need-based credit, remittances facility, insurance and pension to the excluded sections i.e. weaker sections & low-income groups”	https://pmjdy.gov.in/
National Skill Development Mission	8.3, 8.6	“To create convergence across sectors and states in terms of skill training activities.” Sub-objectives are Institutional Training, Infrastructure, Convergence, Trainers, Overseas Employment, Sustainable Livelihoods, and Leveraging Public Infrastructure.	https://msde.gov.in/en/reports-documents/policies/NSDM#:~:text=The%20National%20Skill%20Development%20Mission,terms%20of%20skill%20training%20activities.
Deen Dayal Upadhyaya Antodaya Yojana (DAY)	8.1, 8.3, 8.5, 8.6	“To uplift the urban poor folks by enhancing sustainable livelihood opportunities through skill development”.	https://www.india.gov.in/spotlight/deen-dayal-antodaya-yojana

Atal Innovation Mission	8.2, 8.3, 8.6	“To promote a culture of innovation and entrepreneurship in the country and to ensure the creation of a problem-solving innovative mindset in schools and creating an ecosystem of entrepreneurship in universities, research institutions, private and MSME sectors.”	https://aim.gov.in/
Mahatma Gandhi National Rural Employment Guarantee Scheme	8.2, 8.3	Also called MGNREGA. “To enhance livelihood security in rural areas by providing at least 100 days of guaranteed wage employment in a financial year to every household whose adult members volunteer to do unskilled manual work.”	https://www.nrega.nic.in/Nregahome/MGNREGA_new/Nrega_home.aspx

The Indian National Development Goals i.e. “*Sab ka Saath, Sab ka Vikas*” or “*Development with all, and for all*” (Transformation of India, Leave no one behind) inclusively cover the SDGs. The task of coordination with the SDGs, has been entrusted to the NITI Aayog (the Government of India’s premier think tank). The NITI Aayog is in charge of overseeing the implementation of SDGs at the national level. The NITI Aayog has completed the mapping of all SDGs, Central Ministries, and centrally-sponsored projects as part of the implementation phase; in addition, the NITI Aayog has consulted with other national and regional partners, including states and union territories. The SDG India Index, a report on India’s progress toward the United Nations’ sustainable development objectives, is produced by the NITI Aayog.

Nine national-level indicators (as shown in table-3) have been established to monitor India’s progress toward Decent Work and Economic Growth. The SDG Index Score for Goal 8 for India is 61 (2020), based on four recognized national indicators, with scores ranging from 33 to 90 for States and 60 to 91 for UTs. Himachal Pradesh is the best-performing state with a score of 78, while Chandigarh is the best-performing UT. By the year 2030, India hopes that every citizen, male or female, including people with disabilities, would have a respectable job that contributes to the country’s GDP.

Entrepreneurship has been a major component of the economic prosperity agenda. India boasts the world’s third-largest entrepreneurial ecosystem. In recent years, there has been a notable increase in entrepreneurial activity. From 503 in 2015-16 to 32,577 in 2020, the number of start-ups recognized by Start-up India has risen. *The Micro Units Development and Refinance Agency (MUDRA)* scheme offers up to INR 1 million in financial assistance to small and micro-enterprises (USD 13.3 thousand).

The government of India is already supporting the SDGs and taking the appropriate actions from time to time. A Government-wide approach has been adopted for sustainable development. Action plans that have already been adopted by the central and state governments have been advised to follow the similar mapping of their scheme.

1.4.2 Achievements of the Government of India on SDG-8

In 2020, only 7 states and 8 UTs of India are positive performers as compared to 2019. These are Himachal Pradesh, Goa, Sikkim, Kerala, Mizoram, Nagaland, Manipur and Chandigarh, Puducherry, Delhi, Lakshadweep, Andaman and Nicobar Islands, Ladakh, Daman and Diu, and Jammu & Kashmir respectively while the performance of other states and UTs have been decreased from the year 2019 (NITI Aayog, 2020 <https://sdgindiaindex.niti.gov.in/#/ranking>).

Table 2: State-wise Performance of the Indian States and UTs

Band	States	UTs
• Front Runner (65-99)	Himachal Pradesh (78), Goa (76), Telangana (73), Sikkim (71), Tamil Nadu (71), Andhra Pradesh (67), Karnataka (66)	Chandigarh (70), Puducherry (68), Delhi (65)
• Performer 50-64	Karnataka (66), Chhattisgarh (64), Gujarat (64), Meghalaya (63), Uttarakhand (63), Kerala (62), Maharashtra (62), Madhya Pradesh (60), Harayana(59), Punjab (57), Rajasthan (57), Tripura (57), West Bengal (57), Jharkhand (54), Uttar Pradesh (53), Mizoram (51), Arunachal Pradesh (50), Assam (50), Bihar (50)	Lakshadweep (62), Andaman and Nicobar Islands (59), Ladakh (59), Dadra and Nagar Haveli (57), Daman and Diu (47)
• Aspirant 0-49	Nagaland (48), Odisha (48), Manipur (27)	Jammu and Kashmir (47)

SDG-8 Positive Performance of Indian States

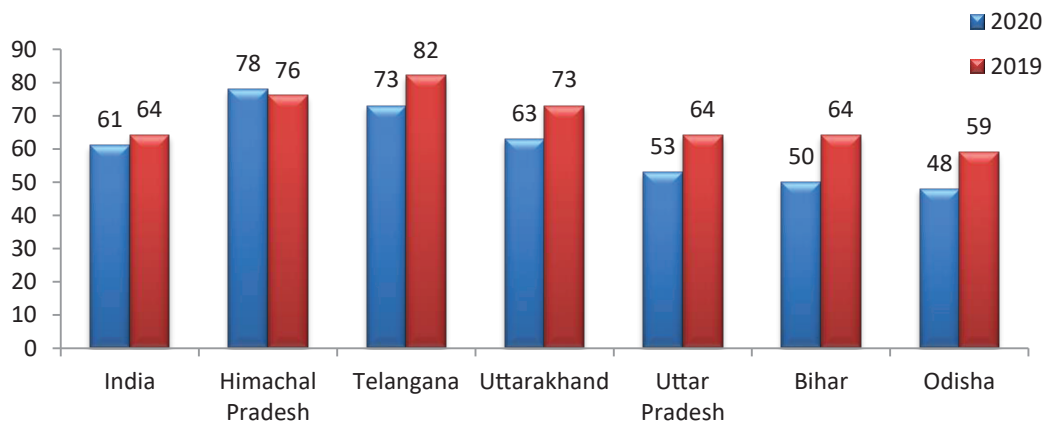


Figure 1: Indian States with Improved Performance as per NITI Aayog Annual Report, 2020

Source- <https://sdgindiaindex.niti.gov.in/#/ranking>

SDG-8 Negative Performance of India States

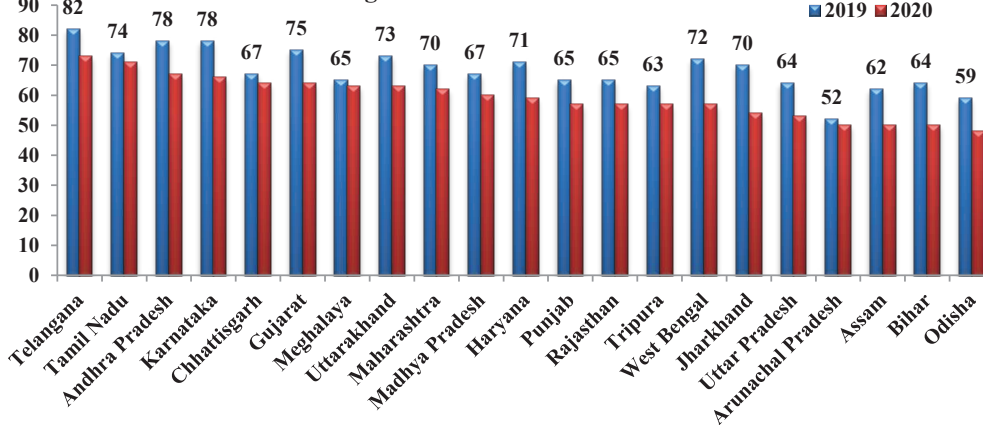


Figure 2: Indian States with Decreased Performance as per NITI Aayog Annual Report, 2020

Source- <https://sdgindiaindex.niti.gov.in/#/ranking>

NITI Aayog also has given a score of 65 in 2018, 64 in 2019, and 61 in 2020. A decrease in the SDG-8 index score has been noticed from the year 2018 to 2020. This score is based on nine parameters set by NITI Aayog. Figure 3 shows a decrease in index scores for SDG-8. Meanwhile, Table-3 shows the achievements against the targets set by the Government of India.

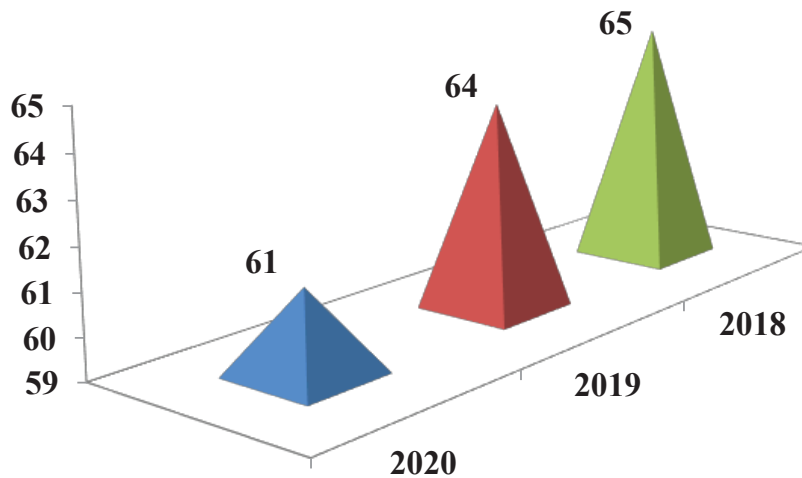


Figure 3: SDG-8 Index Score

Source: <https://sdgindiaindex.niti.gov.in/#/ranking>

Table 3: SDG-8 Progress (in Terms of Targets and Achievements) of India

Targets		A / T
8.1	The Annual Growth Rate of GDP (constant prices) per Capita	5.1 / 7
8.3	Ease of Doing Business (EODB) Score (feedback score)	71 / 50
8.6	Unemployment rate (15-59 years)	6.2 / 3
8.8	Labour Force Participation Rate (LFPR) (15-59 years)	53.6 / 68.3
8.8	Percentage of regular wage/ salaried employees in the non-agriculture sector without any social security benefit	51.9 / 0
8.10	Percentage of households covered with a bank account under PMJDY	99.9 / 100
8.10	Percentage of women account holders in PMJDY	55.34 / 50
8.10	Number of functioning branches of commercial banks	11.69 / 31.26
8.10	Automated Teller Machines (ATMs)	17.31 / 42

Source- NITI Aayog, 2020 (<https://sdgindiaindex.niti.gov.in/#/ranking>)

According to the UN report (2020), India's ranking in 2021 has dropped to 120 out of 165 countries. India had similarly fallen from 115th rank in 2019 to 117th place in 2020. The ranking has dropped within the last three years. This is a big concern. The main reason for this is the COVID-19 pandemic. But there are other reasons too. To overcome this issue, the Government of India has already taken some initiatives, but these figures show that India is lacking somewhere to achieve Goal 8.

1.4.3 Where India is Lacking to Achieve SDG-8

In India, unemployment has become a major issue. With an unemployment rate of 8% in December 2021, India lags behind most emerging nations such as Bangladesh (5.3%), Mexico (4.7%), and

Vietnam (4.7%). In 2020-2021, the unemployment rate was over 7%, according to the Centre for Monitoring Indian Economy (CMIE) (Biswas, 2022).

“The unemployment rate is considerably greater than anything witnessed in India for at least the last three decades, including the big crisis of 1991” (World Bank). Approximately 14 Crores (140 million) individuals lost their employment during the pandemic. In addition, the Indian economy has suffered significant losses as a result of the global financial crisis. Some economists also suggest that the epidemic is only partially to blame for the job losses.

Table 3, shows that the Indian Government is already covering some of the UN’s targets. As a result, the need for new policies to cover further targets has been identified. The Indian Government has already taken a step forward but this is not sufficient to achieve SDGs. For better achievements of the SDGs, India needs the participation of Higher Education Institutions (HEIs). Žalėnienė & Pereira (2021) also suggested in their study that higher education institutions (HEIs) have a crucial role in sustainability and can contribute indubitably to the SDGs implementation. It is a basis for the achievement of all SDGs goals. Some of the HEIs have already taken initiatives to realise the SDGs. But to achieve Goal 8, every single higher education institution needs to participate actively. Only then India will be able to achieve the ultimate goal.

1.5 Roles and Responsibilities of Higher Education Institutions for Implementing SDG-8

Higher education is critical for accomplishing long-term development goals. As epicentres of innovation and critical thinking, it is a primary driver of the SDGs on a worldwide scale. Select colleges in India must be identified and promoted as SDG Hubs to illustrate how higher education may help achieve universal goals.

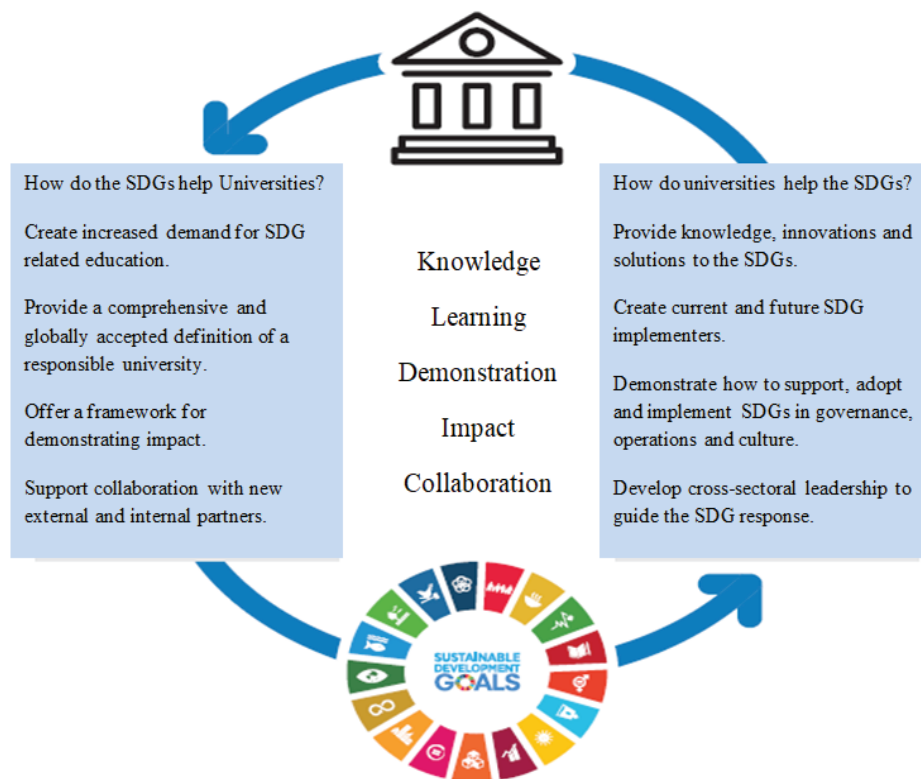


Figure 4: The Case for University Engagement in the SDGs

Source: Australia, New Zealand & Pacific Edition

Higher education institutions prepare the next generation of leaders and professionals to find practical solutions to the SDGs through discussions, debates, and research. HEIs can also influence this community to develop the skills and attitudes that are required to attain the Sustainable Development Goals of sustainable campuses and communities.

Australia, New Zealand & Pacific Edition have exemplified how HEIs can help as shown in figure 4. They concluded that the four factors that can assist universities to accomplish the SDGs are research, education, operations and governance, and external leadership. Cases of some of the Universities are presented here:

1. The Universidad Catolica Andres Bello (Venezuela) presented the “Centre of Innovation & Entrepreneurship” for the development of an integral entrepreneurship model and its implementation.
2. The Universidad Nacional Del Rosari (Argentina) initiated a very effective strategy i.e. “Circular Emplco Programme”. This is the programme that provides a platform for the students & graduates to create connections with organizations in the Private sector that might provide opportunities.
3. After analyzing the need for industrial training, Southern University (Bangladesh) showed different activities of business plans, production plans, production processes, and effective management of operations of large manufacturing plants to their students. This is a very effective activity as students will be aware of the actual work of the manufacturing industry. Every semester, this university also runs an entrepreneurship fair on its campus to promote self-employment.
4. In India, Assam Don Bosco University, India focused on the employability and entrepreneurial skills of the youth to promote self-employment among the students.
5. Right from its inception in 2009, Shoolini University has championed the cause of entrepreneurship, innovation, skill enhancement, and regional development amongst the students as well as other stakeholders. There are many programmes, regular and intermittent, which along with the state-of-the-art supportive infrastructure establish Shoolini University as one of the most entrepreneurial and innovation-friendly universities in the region. A top-rated Institutional Innovation Council (IIC), the introduction of the National Institutional Start-up Policy (NISP), the adoption of a couple of neighbouring villages, funding around half-a-dozen student start-ups, introducing first of its kind programmes like Post Graduate Diploma in Direct Selling (PGDDS) supporting the cause of inclusive entrepreneurship, having a preference policy towards employment of residents from neighbouring rural areas specifically for operations, low skill demanding jobs, are few of the initiatives taken by Shoolini towards the fulfilment of our objective of sustainable economic growth and decent work for all.

There is no doubt that Indian HEIs can take an idea from these activities and make their strategies to achieve the goal, but there are some issues with the implementation of these strategies. These activities are at a broad level. Moreover, the attitude of Indian youth is very different from western youth. So, HEIs need to set small targets first and should achieve them. Smaller changes in the education system are also very easy to adopt.

The All India Council for Technical Education (AICTE), Council of Engineers, Indian Medical Council, Bar Council, etc., need to proactively design new frameworks for professional education that integrate both the contents and the intents underlying the SDGs. There are 15 professional councils in India, each setting its professional standards. These councils and their elite leadership need to seriously study and incorporate the SDGs in the teaching of professionals.

UN already sponsored some online platforms for Massive Open Online Courses (MOOCs) to achieve SDGs. Several universities also have taken the initiative to provide online education to every individual from different countries with the help of MOOCs to achieve SDGs. Coursera, an online education platform is providing 2057 free courses with other paid courses, certificates, and degrees. Meanwhile, edX is providing 3600+ courses with free 36 SDG courses under the umbrella named SDG Academy.

Table 4: Some of the MOOCs Related to SDG-8 Offered by Various HEIs and the UN

To support Target	Online Platform	Course Title	Sponsors
8.2, 8.3	Coursera	Upgrading and Monitoring the Apigee Hybrid API Platform. Innovation from Creativity to Entrepreneur	Google Cloud University of Illinois at Urbana-Champaign
8.4	Coursera	Dairy Production and Management Sustainable Food Production Through Livestock Health Management Asian Environmental Humanities: Landscapes in Transition.	The Pennsylvania State University University of Illinois at Urbana-Champaign University of Zurich
8.7, 8.8	Coursera	ART of MOOC: Activism and Social Movements Confronting Gender-Based Violence: Global Lessons for Healthcare Workers Human Resources Analytics	Duke University Johns Hopkins University University of California, Irvine
8.9	Coursera	Sustainable Tourism- promoting environmental public health. Greeting the Economy: Sustainable Cities	University of Copenhagen Lund University
8.2, 8.3	edX	Cyber Security for Managers Design Thinking and Creativity for Innovation Becoming an Entrepreneur	IMD UQx MITx
8.4	edX	AP Microeconomics Plastics in Infrastructure and the Environment	MITx PurdueX
8.7, 8.8	edX	Child Protection: Children’s Rights in Theory and Practice	HarvardX
8.9	edX	Sustainable Tourism: Social and Environmental, aspects.	WageningenX
Generic	SDG Academy	Work and Employment for a Sustainable Tourism Macroeconomics for a Sustainable Planet	SDG Academy

Source: <https://www.coursera.org/in>, https://www.edx.org/school/sdgacademyx?utm_medium=partner-marketing&utm_source=webpage&utm_campaign=sdgacademyx&utm_content=continue_with_edx

2. Recommended Actions for HEIs for the Achievement of SDG-8

2.1 Recommendations for HEIs for Implementation of SDG-8

Table 5: Minimal Recommended Actions for the HEIs for Implementation of SDG-8

SDG-8 Targets	Minimal Recommendation Actions for HEIs
8.3	1 IICs set up under MoE’s Innovation Cell need to be strengthened more through effective control measures. Atal Incubation centers to be allocated to HEIs performing significantly well in the IIC framework.



8.4	2 Less dependency on naturally depleting resources causing environmental degradation and more focus on renewable sustainable resources. HEIs can play a significant role in this through the introduction of more programmes, courses, and dedicated centers of excellence to the cause, as also by organizing awareness programmes in a radial area of 50 km around them, the area that they can adopt towards economic sustainability.
8.1, 8.2, 8.5, 8.6	<p>3 60-40 practical and theoretical works respectively to be added to course curriculum to show how they are going to use the available theories to solve their and industrial real-time problems. Must add field study instead of classroom study</p> <p>4 Revise the fee structure to make it cost-effective as well as improve the quality</p> <p>5 Increase employability and entrepreneurship skills with the help of development programmes, competitions, and other activities (collaborate with other universities running the same programmes).</p> <p>6 Interdisciplinary approach (immediate adoption of New Education Policy NEP 2020).</p> <p>7 Time-to-time revision of curriculum (must be as per the need of the respective industry)</p> <p>8 Research Project as a mandatory aspect of curriculum (must start from 1st semester and continue till last semester)</p> <p>9 Collaborate with other HEIs for technology exchange (the latest technology must be taught to the students)</p> <p>10 Paid Internship on campus and industries (must collaborate with industries)</p> <p>11 Equal opportunities for all the students (no student should be left behind)</p> <p>12 Must run Training programmes and collaborate with other large and small education Institutions and industry experts.</p> <p>13 Extra-Curricular activities must be an integral part of the curriculum: to motivate the youth to become active, build self-confidence, strengthen them emotionally, physically, and mentally, etc.</p> <p>14 Financial and academic support</p> <p>15 Sponsor students for a start-up business, and innovation and handhold them.</p> <p>16 Training and development programme (with collaboration)</p> <p>17 Build Sustainable Infrastructure</p> <p>18 Free counselling activities in schools</p> <p>19 Real-time Social Projects should be undertaken.</p>
8.7	<p>20 Organise Awareness programmes</p> <p>21 Build young volunteers' army</p> <p>22 Volunteer activities</p> <p>23 Focus on NCC- National Cadet Corps</p>
8.8	<p>24 Build human values and professional ethics in students with the help of activities</p> <p>25 Awareness programmes in villages through Panchayats</p> <p>26 Training to workers involved in precarious jobs regarding safety measures</p>
8.9	<p>27 HEIs should adopt at least 10 large Panchayats in the near vicinity and get the prospective volunteers from these Panchayats trained on sustainable earning opportunities like eco-tourism, rural tourism, progressive farming, etc.</p> <p>28 Even the students can be utilized for these purposes, which would give us two-fold results- economic and human resource development of the area as well as practical exposure to the students</p>
8.10	<p>29 Financial inclusion through the "each one reach one" model to create an understanding of the financial products and their benefits.</p> <p>30 Encouraging and facilitating digital transactions for all HEI/ Panchayats related work toward a cashless economy.</p>





- 8. A**
 - 31 The solution to this lies in three words optimization, channelization, and disintermediation
 - 32 HEIs can play a role in all three. Providing know-how towards optimum utilization of resources, effective channelization of the yield, and elimination or reduction in the number of middlemen
 - 33 Again, the implementation has to be through effective outreach programmes, just like each HEI does for admissions
- 8. B**
 - 34 Vocational skills to be added in elementary education, and at least one skill to be mandated. HEIs can further build upon the same.
 - 35 More awareness centres to be created and opportunities like *Deen Dayal Upadhyay Grameen Kaushal Yojana (DDU-GKY)*.
 - 36 Youth Empowerment Programmes to be conducted at inter-university/ interstate/ intercity/inter-village levels covering important life skills like time management, financial management, goal setting, delayed gratification, etc.

3. Proposed Research Agenda for HEIs and Governmental Bodies

Table 6: Main Research Areas and Models that can be Followed for SDG-8 Implementation

Target	Key Research Areas of Models
8.1, 8.2	<ul style="list-style-type: none"> • Strategies to improve labour productivity • Strategies for Per Capita Economic Growth • Higher level of economic productivity • How to achieve better employment opportunities and greater economic security for all • Key challenges limiting the economic growth
8.5	<ul style="list-style-type: none"> • Measures to improve productive employment and decent work for all • Report on the current status
8.6	<ul style="list-style-type: none"> • Entrepreneurship Studies for creating pathways for youth to join the field • Changes needed in the curriculum • Generation of new ideas for business • Opportunities for business in a particular area
8.7, 8.8	<ul style="list-style-type: none"> • Simplifying Laws related to child labour, human trafficking, labour rights, etc., so that the common man can understand them.
8.9	<ul style="list-style-type: none"> • Tourism opportunities and Eco-tourism
8.10	<ul style="list-style-type: none"> • Financial Institutions related survey • Challenges faced by small entrepreneurs to get loans/credits from financial institutions
Common	<ul style="list-style-type: none"> • Track the progress of SDGs • Generation of new ideas for policy updating

4. Recommendations for Government and Regulatory Bodies for the Achievement of SDG-8

Regulatory bodies like i.e., UGC, AICTE, ICAR, CSIR, and NAAC have their specific and important roles in regulating and guiding the HEIs of India. Except for NAAC, other regulatory bodies also help in research work by granting funding to students.

4.1 Recommendations for Government/Policy-makers

Table 7: Minimal Recommended Actions for the Government/Policy-makers for Implementation of SDG-8

SDG 8 Targets	Minimal Recommended Actions for Government/Policy-makers
8.1	<ol style="list-style-type: none"> 1. Campaign for awareness among villagers to promote domestic production with the help of HEIs 2. Involvement of private HEIs and grading them according to their performance. 3. Mandate activities related to SDGs and ensure their participation.
8.2	<ol style="list-style-type: none"> 4. Provide technology upgrading-related permission within no time. 5. More scholarships for innovations.
8.3	<ol style="list-style-type: none"> 6. Increase in the number of government jobs (Employment creation). 7. Support new entrepreneurs by providing permission and funding easily. 8. Closely monitoring and reviewing the progress of the start-up movement. 9. Ensuring further improvements in the ease of doing business at the national and state level.
8.4	<ol style="list-style-type: none"> 10. Awareness of the programme i.e. “Sustainable Consumption and Production” among the HEIs.
8.5	<ol style="list-style-type: none"> 11. State-wise independent monitoring authority to keep track of the state-wise performance of HEIs. 12. Employ students to track the activities and performance and make a report of HEIs related to SDGs.
8.6	<ol style="list-style-type: none"> 13. HEIs to be given credits in NAAC/NIRF score to educate on government projects. 14. Keep track of the progress of the project/s with the help of interns. 15. Bridging the digital divide by making technology and the internet affordable and accessible in every part of the country
8.7	<ol style="list-style-type: none"> 16. Support NCC activities. 17. Every youth must be provided with a minimum of 6 months of rigorous training in the line of Army Training to make them physically and mentally fit and alert.
8.8	<ol style="list-style-type: none"> 18. Education is the only key to having a secure working environment. Basic education with human values must be given to every individual. 19. Every labour needs to know their rights. An awareness programme must be conducted by the Government with the help of HEIs. 20. Impose Immediate action on the violation of labour rights. 21. Implementing a mechanism to ensure labour rights protection. 22. Rewarding those organizations which provide a safe working environment to their employees. 23. Putting a mechanism in place that ensures minimum fatal injuries in working place.
8.9	<ol style="list-style-type: none"> 24. HEI needs to adopt the villages within a radius of 50 km and must educate and support them to promote local culture and products. The government needs to fund these kinds of projects. 25. Keep track of the performance with the help of a centralized force. 26. Performance must be analyzed based on real-time results and strict action must be taken on those who don't utilize the fund on projects. 27. Explore and develop new tourist destinations 28. Improve facilities at existing tourist places. 29. Connecting all tourist places with all modes of transportation.
8.10	<ol style="list-style-type: none"> 30. Promoting financial inclusion, especially at the rural level. 31. Spreading awareness about various government schemes. 32. Promoting the participation of private banks in covering rural areas.
8. A	<ol style="list-style-type: none"> 33. Promoting FDI and encouraging FII.

4.2 Recommendations for Regulatory Bodies

Table 8: Minimal Recommended Actions for Regulatory Bodies for Realisation of SDG-8

Regulatory Bodies	Recommendations
UGC (University Grant Commission) & AICTE (All Indian Council for Technical Education, and CSIR (Council of Scientific & Industrial Research)	<ul style="list-style-type: none"> • SDG-related activities • Funding for SDG research activities • Job Opportunities in these departments • Collaboration with universities • Research related to SDG-8 • Action-based strict rules and regulations related to placements, skill activities, collaboration, technology up-gradation, availability of resources related to research, and the infrastructure needed • Add Research work for all Universities
NAAC (National Assessment and Accreditation, CGPA (Council-Cumulative Grade Point Average) & NIRF (National Institute Ranking Framework)	<ul style="list-style-type: none"> • Must add SDG related Parameters for HEIs • Sponsor Seminars dedicated to SDGs • Job Opportunities in these departments • Must include a parameter for Best Teacher based on SDG-related activities and research • Include employed and entrepreneurs' outcome

5. Conclusion Along With the Prioritization of the Initiatives Recommended

The direction in which the economy of a country is headed defines its future, and is holistically captured in SDG-8, which focuses on the promotion of sustained, inclusive, and sustainable economic growth, and full and productive employment with the decency of work for all. To achieve such an audacious goal, each one of us has to contribute, whether it is the State Government, Central Government, regulator bodies, HEIs, faculty members, students, or even every citizen of the country. Only when we can create an aligned ecosystem, we shall be able to bring about a paradigm shift. To achieve SDGs, the active participation of HEIs and youth is needed. To conclude the discussion, here are the key recommendations:

1. *To Set-up a Single Independent Monitoring Authority* to audit the contribution of participating HEIs and carry out a detailed analysis of the impact being created. The more the impact, the more resources to be allocated.
2. *State-wise Regulatory Body:* to keep track of activities and achievements related to SDGs at the state level and report it to the monitoring authority. Instead of an experienced person from another government department, students from HEIs are to be involved as interns. Efficient interns must be employed by these regulatory bodies.
3. *Full Support in Terms of Resources, Intellectual, Financial, and Otherwise:* need to be provided to the HEIs to manage innovation and entrepreneurship activities efficiently Institution Innovation Council (IICs) under the Ministry of Education's (MoE's) along with Business Incubators (BI) by Ministry of Micro, Small & Medium Enterprises (MSME), Atal Incubation centres and other related programmes need to be established and strengthened to achieve the SDG-8 targets effectively in all govt supported and private HEIs
4. There is a clear cut divide between public and private HEIs when it comes to allocation of resources, be it projects, research grants, incubation centres, or MOOC development projects which should be purely on a merit/ capability/ result oriented basis immaterial of being private or public HEI, so that the deserved ones get a chance to deliver as per the expectations.



5. *Provide state-of-art, global standard exposure* to the outstanding performers from IICs/ NISP and other initiatives and use them as case studies for further implementation in other HEIs.
6. *Introduction of more and more skill-based, vocational courses* and also involving local youth in boot camps and short training programmes. The Government should mandate the inclusion of at least one vocational skill-based course in elementary education. This can be further taken up and developed into income-generating scales at the HEI level.
7. *Introduction of Inclusive Entrepreneurship Programmes* in which the residents can operate from the convenience of their homes without much investment or a predictable return on investment. Disintermediation-based business models like e-commerce, direct selling, insurance agencies, and franchising are some of the options which can be scaled up to a much bigger scale.
8. *Much emphasis be laid on sustainable industries* like eco-tourism, rural tourism, handicrafts, local small-scale manufacturing, etc. Practising professionals should be invited as guest lecturers to train the students and local youth.
9. *The Government and the Regulatory Bodies must Issue Directives to the HEIs* to adopt at least 10 large Panchayats/villages and conduct awareness/training sessions for the youth on contemporary sustainable income-generating opportunities available. The training should be followed up with controlled result measurement and analysis. Like corporates, HEIs can also have a CSR budget which can be utilized towards the overall sustainable development of the defined area.
10. *Being aware and creating an aware ecosystem* is the only way to counter and address issues of child labour, and labour rights and create a secure working environment, specifically for women's labour. It has to be taken up collectively by Government, regulatory bodies as well as HEIs.
11. Multiple people in a family have the capacity and capability to earn and contribute to the family income as well as GDP, but most families are restricted to a single earning member due to cultural or similar mental blocks. Ensuring education to all family members, to remove such mental blocks; assessing the interest and talent of the members and providing them with a sustainable, productive progression path can help.
12. *Strengthen the Culture of Innovation and Entrepreneurship* with the help of HEIs. Vocational skills need to be added as an inseparable part of the curriculum right from elementary school. HEIs must adopt the nearest schools and provide relevant vocational education to students so that they can utilise their skills for the betterment of local areas
13. *The curriculum must be updated at frequent intervals in every educational institution.* The ratio of theory and practice should be 60:40 i.e. 40% theory and 60% practical or the real-time application of theories/fieldwork. Fees must be reasonable and affordable to provide equal opportunity to have qualifications with the motto of "No One Left Behind".
14. *Sponsor more students for start-ups and innovations*, handhold and support them by providing financial as well as other required support till they establish themselves. Sponsorship must be from the government, regulatory bodies, and HEIs.
15. *NCC and NSS must be mandatory for everyone* to build young volunteers to fight against child labour and human trafficking.
16. Regulatory Bodies to ensure:
 - funding for SDG-related research activities.
 - job opportunities for youth
 - strict implementation of rules and regulations related to placements, skill activities, collaboration, technology upgradation, availability of resources related to research, and the infrastructure.
 - grading and ranking based on performance and achievements related to SDGs.

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SDG-9: Infrastructure, Industrialization, and Innovation: A Key to Our Sustainable Future

Summary

This chapter focus on “Industry, Innovation, and Infrastructure” that enfold SDG-9 with eight expound targets to be achieved by 2030. The main aim is to provide promote innovation, sustainable industrialization, and strong infrastructure. It not only accomplishes their own targets and indicators but also maximize the efficiency and effectiveness of other SDGs as well, by unleashing the economic forces for the creating employment and better economy. Along with a brief overview of national and international status on SDG-9 followed by the recommendations and actions by United Nations for Higher Educational Institutions (HEIs), government and regulatory bodies are discussed in this chapter. The three pillars of SDG-9 are related to other SDGs related to employment, health, technology, gender equality, and environment. The critical recommendations with respect to SDG-9 are to promote sustainable industrialization by ceasing discharge of untreated industrial waste, raise the budget for research and development, more productive innovation, and release of funds for infrastructure development in rural and underdeveloped areas.

Key Recommendations to Achieve SDG-9

- HEIs to allow and encourage the local community to use their campus infrastructures such as the library, Wi-Fi and other learning and innovation resources.
- All buildings in the HEIs are to be designed and built using energy-efficient and passive solar technologies for thermal comfort and reducing energy consumption so as to move towards Net Zero Energy and. Carbon free emissions.
- HEIs to identify, document, and undertake research related to traditional sustainable techniques and technologies of local and nearby communities.
- Funding related to the creation of SDGs infrastructure development in HEIs should come under priority sector lending by banks.
- Government to mandate a minimum of 10% from existing CSR allocation of corporates to HEIs for SDG-related infrastructure development and initiatives.
- HEIs must have supportive infrastructure as well as satisfactory industry backup leading to a stronger supply chain.
- HEIs must practice industry and academia collaboration, and cluster approach extensively to optimize infrastructure for fetching the utmost benefit.
- HEIs should ensure retrofits of existing buildings that increase resource efficiency and adopt clean and environmentally sound technologies.
- HEIs should commit to sustainable and reliable Information and communications technology processes and services.



1. Context and Current Status of the SDG-9

1.1 The Context and Current Status

The manufacturing industries play an essential role in any nation’s projectile towards growth. It is to be noted that the worldwide manufacturing increase in GDP was up to 16.3% during 2017, as compared to 15.2% in 2005 and most of it hailed from the manufacturing capacities in Asia. The under-developed nations have a huge potential for industrialization in several fields including agro-based industries, textiles, and garments industries. These domains have tremendous scope for sustained employment generation and higher productivity. As far as sustainable aims are concerned, the investment in solar energy dropped 3% and was valued at 131 billion in 2019, while wind generation showcase an evident climb of 6%, about 138 billion dollars. For the first time investments were done in wind and solar energy. Developing nations are spending more on the renewable energy sector compared to developed economies. In 2019, these developing nations committed \$152.2 billion.

Due to the COVID-19 pandemic times, some industries have faced grave consequences and required a lot of ideation and management to get uplifted. One such domain is the air travel industry. The year 2020 was a depression for air transportation, as the demand for passengers fell to 1.8 billion in 2020, approximately seeing a 60% decline than 2019. It resulted in financial losses to airlines, and air navigation services providers and may take many years to get back to pre-pandemic levels. This requires intervention by governments to bolster the air transport industry and help in restoring jobs to get the global economy back on track. During the COVID-19 pandemic, the movement of people and goods was disrupted badly and small-scale industries were also severely affected. For the global network to gain Goal-9, industrialization, infrastructure, research and technological innovation are the keys.

1.2 United Nations Sustainable Development Goal-9 Targets: Planning Sustainable Cities

To achieve SDG-9, eight targets have been defined along with twelve indicators to measure the achievement by 2030. Table 1 lists the global and national status of SDG-9 under particular targets and indicators in the respective year.

Table 1: SDG-9 Targets, Indicators, Years, and Status.

Target	Area	Indicator	Years	Status*	
				Global	National
9.1	Including local and trans-border infrastructure, to guide monetary development and human well-being, with a focal point on low-cost and equitable access for all	9.1.1 Proportion of the rural population who live within 2 km of an all-season road	-	-	-
		9.1.2 Passenger and freight volumes, by mode of transport	2019	-	6.75 million

9.2	Aiming that by 2030 we substantially improve the industry's share of employment and gross home products, consistent with countrywide occasions, and double its %age among the least evolved nations.	9.2.1 Manufacturing value-added as a proportion of GDP and per capita	2020	14.42%	12.96% GDP
		9.2.2 Manufacturing employment as a proportion of total employment	2017	32%	24.48%
9.3	Significant growth in access to information and communications technology and attempt to provide universal and cost-effective Internet in the least developed countries by 2020, but requires more efforts post the COVID-19 pandemic.	9.3.1 Proportion of small-scale industries in total industry value-added	2017	20%	2.24%
		9.3.2 Proportion of small-scale industries with a loan or line of credit	2022	45%	--
9.4	Aims to improve infrastructure and retrofit industries to lead them to a sustainable future by 2030, with multiplied resourced-use efficiency and greater adoption of easy and environmentally sound technologies and business approaches. Herein, all nations can contribute by using their respective capabilities.	9.4.1 CO ₂ emissions per unit of value-added	2018	0.33 Kg/\$	0.31 Kg/\$
9.5	Aims at enhancing scientific studies to improve the technological abilities of the commercial quarter in all international locations, in particular the developing countries, by 2030, encouraging innovation and considerably growing the variety of research and improvement within employees.	9.5.1 Research and development expenditure as a proportion of GDP	2014	2.73%	0.82% GDP
		9.5.2 Number of researchers (in full-time equivalent) per million inhabitants	2015	-	156.64 per million people
9.A	Facilitate sustainable and resilient infrastructure development in growing nations through greater economic, technological, and technical assistance to African nations, least evolved countries, landlocked developing international locations, and small island developing States.	9.A.1 Total official international support (official development assistance plus other official flows) to infrastructure	2019	4 2 5 million \$	7.3 billion \$

9. B	Support home technology development, research, and innovation in developing international locations, such as via making sure conducive policy surroundings for, inter alia, industrial diversification and fee addition to commodities.	9.B.1 proportion of medium and high-tech industry value added in total value-added	2019	-	41.33%
9. C	Significantly increasing access to information and communications technology and striving to provide universal and affordable access to the Internet in the least developed countries.	9.C.1 Proportion of the population covered by a mobile network, by technology	2019	106.40 per 100 people	84.29 per 100 people
			2019	80%	32%
		Mobile phone subscriptions per 100 people, 2019			
		Share of the population using the internet			

*Source: <https://www.SDG-9data.org/>

1.3 Summary of Progress on SDG-9 Implementation Globally

Sustainable and resilient service delivery infrastructures are the first requirement for effective exchange and financial integration, attracting support, growing organizations, and building effective capacity. However, as transport is an urgent need that responds to the development of the global financial system, pressure is placed on global service delivery and transport systems. In addition to transportation costs, addressing ongoing infrastructure problems namely: scarcity, inadequacy, overcrowding, and poor protection is important to ensure the sustainability and durability of delivery structures that support trade and commerce. Transport infrastructure spaces are cost-effective, minimizing access, and undermining effectual participation in international shipping.

The need for infrastructure development, as well as the associated financial gaps, have been detailed. Different levels of aspirations for future funding in the transportation sector have been prioritized. This includes 1.1 trillion dollars per annum globally during the 2013–2030 period; approximately USD 1.1 trillion respectively worldwide year from 2014 to 2025; 2.5 trillion dollars at 2008 prices in 30 Asian countries for the 2010–2020 period; USD 1.4 trillion per annum and 9 trillion dollars worldwide at 2013-2030 and 2009-2030 periods, respectively.

To end the major infrastructure shortages gap in developing countries, including transportation, current spending estimates suggest that it should have reached USD 1.8 - 2.3 trillion by 2020, compared to the current levels of USD 0.8 - 0.9 trillion. Currently, 60% of the expected investment in annual shipping infrastructure is distributed to countries for the Organization of Economic Co-operation and Development (OECD).

Resilience, affordability, sustainability and equitable approach desire that expenditure in shipping infrastructure is increased and an additional portion of the funding should be directed to assist the shipping infrastructure. In addition, novel funding and resource mechanisms or additional partnerships between public-private finance partners are needed.



1.4 Initiatives and Achievements of the Indian Government on SDG-9

NITI Aayog's extensive countrywide *Strategy for New India* is a defined exposition of 41 vital regions that recognize the development already made, identify binding constraints, and suggest the manner ahead for accomplishing the stated goals. The NITI Aayog plan is a mutual approach for getting ready the strategy. Each division in NITI Aayog had major consultations with all three stakeholders: government officers, teachers, and businesspersons. This also included conferences at the extent of the Vice-Chairman with numerous associations and distinguished persons from seven units of contributors involving farmers, scientists and innovators, think tanks, civil society organizations, enterprise representatives, labour representatives and exchange unions.

1.4.1 Initiatives Taken by the Indian Government

Make in India

Prime Minister launched the Make in India initiative in 2014, with the purpose of converting India into an international production hub, with the aid of multinationals to promote home businesses to fabricate their merchandise in the country. Make in India is a major national programme of the Government of India designed to facilitate investment, foster innovation, enhance skill development, protect intellectual property and build best-in-class manufacturing infrastructure in the country. The primary objective of this initiative is to attract investments from across the globe and strengthen India's manufacturing sector. It is being led by the Department for Promotion of Industry and Internal Trade (DPIIT), Ministry of Commerce and Industry, Government of India. The Make in India program is very important for the economic growth of India as it aims at utilising the existing Indian talent base, creating additional employment opportunities, and empowering the secondary and tertiary sectors. The programme also aims at improving India's rank on the Ease of Doing Business index by eliminating unnecessary laws and regulations, making bureaucratic processes easier, and making the government more transparent, responsive, and accountable.

Public Private Partnership (PPP)

In 2020, GDP per capita based on PPP for India was 6,461 international dollars. GDP per capita based on PPP of India increased from 2,022 international dollars in 2001 to 6,461 international dollars in 2020 growing at an average annual rate of 6.39%. The total number of PPP Projects is 1,139 with a \$286,103 investment.

Start-Up India

Start-up India is meant to construct a robust eco-machine for innovation and to generate large-scale employment. The campaign was first announced by India's Prime Minister in 2015. It was inaugurated on 16 January 2016 by the then Finance Minister of India. The government of India via this enterprise empowers start-ups to develop through design and innovation.

Border Area Development Pogramme (BADP)

The most important aim of the BADP is to join the distinct developmental desires and well-being of the citizens living in far-off and isolated regions placed near the international border and to saturate border areas with the complete required infrastructure via the combination of Central/ State/ BADP/ Local schemes and aid schemes. The BADP policy encompasses the manufacturing of number one fitness centres, faculties, drinkable water supply, connectivity, drainage and network centres to enable the sustainable development of people residing in border areas. The BADP was begun in 1980 across the western border with Pakistan. In June 2020, the policy covered around 400 blocks in 111 border districts in 18 states and union territories. This BADP plan expands to



evolution projects within 10 km of the border. These projects can include health facilities, roads, bridges, irrigation, sports facilities and primary schools. In 2019–20, the strategy was planted ₹ 825 crore (US\$110 million) while in 2020–21 it was allotted ₹ 784 crore (US\$100 million). BADP plan was started in 1997 in Arunachal Pradesh. It was firstly applied in Indo-Myanmar Border and was extended to Indo-China and Indo-Bhutan borders in 1998. After ten years, the scheme was not able to produce development over Arunachal Pradesh's 1500 village borders. Of 21 GPs surveyed, electricity was obtained in seven, six were linked by all-weather roads, water taps were accessible in five; none of the telephone lines was fixed. Narrowly, two of the 21 GPs had PDS shops; a few villages were almost 25 km far from these shops. Various villages did not even have *anganwadi* centres and primary schools.

Digital India

Digital India is a campaign released with the aid of the Government of India to make sure that government services are made electronically available to its citizens via advanced infrastructure and increasing internet connectivity and making the country digitally empowered. The scheme of digital India includes 3 core components: developing comfortable and stable virtual infrastructure, delivering authorities offerings digitally, and ordinary digital literacy. It is also beneficial for other key schemes of the Government of India, such as Make in India, Start-up India, Bharat Net, industrial corridors, Bharatmala, Sagarmala, etc. On 31 December 2018, India had a 130-crore population (1.3 billion), 121 crores (1.21 billion) mobile phones, 44.6 crores (446 million) smartphones, 123 crores (1.23 billion) Aadhaar digital biometric identity cards, 56 crores (560 million) internet users up from 481 million people in December 2017, and 51 percent growth in e-commerce. This initiative contains plans to connect rural areas with high-velocity networks.

Bharat Net

Bharat Net is a project of national importance established in 2017. It aims at establishing large accessible network infrastructure on a non-discriminatory basis, to supply affordable broadband connectivity for all households and capacity to all institutions. This shall be accomplished by the partnership of the private sector and states. The aim is to facilitate the delivery of e-health, e-banking, e-governance, e-education, internet, and other services for rural India. Bharat Net Phase-I, connected 100,000 villages in December 2017, whereas Phase-II is targeted to complete on 31 March 2023 in 16 states (July 2021 update). The last mile connectivity, with 700,000 Wi-Fi hotspots to envelop all 625,000 villages of India by adding 2-5 Wi-Fi hotspots or a minimum of one hotspot per gram panchayat has been created using high-speed 4G connecting tower stations for commercial telecom operators to Bharat Net. Bharat Net will provide more employment opportunities, improved service delivery, and the impulse to Digital India, Make in India, and Start-up India initiatives. According to the survey of Morgan Stanley, of the 33% internet perforation in November 2017, only 15% of users use online shopping and 2% retail shopping and it is estimated to grow up to 62% online shoppers, 78% penetration and 15% online retail shopper by 2027.

Women Entrepreneurship Platform (WEP)

The WEP is a Government of India project undertaken by the NITI Aayog to boost and support women entrepreneurs in India. The aim is to handhold and assists them in their journey from starting to scaling up and enlarging their ventures. WEP recognizes partners who are the essential agents that alter WEP's vision into reality through incisive interventions. This is one of its kind initiative by the government that also reinforces the objective of 'Beti Bachao, Beti Padhao' and motivates young girls to get into the business world and make a mark.

Atal Innovation Mission (AIM)

Atal Innovation Mission (AIM) is the Government of India's flagship initiative to promote a culture of innovation and entrepreneurship in the country and was set up in 2016. Towards this end, AIM



has taken a holistic approach to ensure the creation of a problem-solving innovative mindset in schools and creating an ecosystem of entrepreneurship in universities, research institutions, private and MSME sectors. The Atal Incubation Centres (AICs) strategy helps put in greenfield incubation centres that nurture modern begin-up agencies in their pursuit to turn into sustainable and scalable companies. AIM envisages invigorating these Established Incubation Centres (EICs) in the country through the provision of financial scale-up support. The Established Incubation Centres (EICs) project strengthens the current incubation centres, while AIM proposes to support their overall achievement by presenting them with scale-up aid. In both of the schemes, AIM is imparting grants of up to ₹10 Crores over three to five years.

Start-Up India

Start-up India is an initiative of the Government of India to build a strong eco-system for nurturing Start-ups and innovation in the country with an aim to drive large-scale employment opportunities and sustainable economic growth. This scheme was first announced by India's Prime Minister Shri Narendra Modi during his speech in 2015 and later it was inaugurated by the then Finance Minister of India, Shri Arun Jaitley on 16 January 2016. The Government of India through this initiative empowers start-ups to grow through design and innovation.

NIDHI Programme

Department of Science and Technology has launched a National Initiative for Developing and Harnessing Innovations (NIDHI) software under which programme for seed finances, accelerators, setting up incubators, and 'Proof of Concept' grants for entrepreneurs. Under NIDHI, Promoting and Accelerating Young and Aspiring Innovators and Start-ups (PRAYAS) programme has been originated wherein already set up Technology Business Incubators (TBI) are carried with PRAYAS supply to aid marketers and innovators which allows for 'Proof of Concept' and growing prototypes. A maximum grant of ₹220 lakh is given to a TBI for programming a PRAYAS Centre which includes ₹20 lakhs for the operational cost of the PRAYAS Centre, ₹100 lakhs for PRAYAS SHALA, and a maximum of Rs. 10 lakhs to one innovator for originating a prototype. Support for ten innovators is given to the TBI in a year. NIDHI-Technology Business Incubator (TBI)-Converts Innovations to start-ups. To offer a platform for quick commercialization of technology evolved using the host group or via any academic/technical/R and D group or with the aid of a man or woman. To build a colourful start-up surrounding, using establishing a network among academia, monetary establishments, industries, and other establishments.

Delhi Mumbai Industrial Corridor (DMIC)

This is a construction project for the development of industries between the Indian capital Delhi and the financial hub and the major port city of Mumbai. The project was launched in December 2006 in the emulation of a memorandum of understanding (MOU) signed between the Government of Japan and the Government of India. It is a megaproject, with an estimated investment of \$90 billion, and designed high-tech industrial zone across six Indian states. It involves eight smart cities, 24 industrial regions, five power projects, two international airports, two logistical hubs, and two mass rapid transit systems. The eight financing regions originate to be developed in Phase I of the project are Manesar-Bawel in Haryana, Pithampur-Dhar,-Ambedkar Nagar in Madhya Pradesh, Dadri-Noida- Ghaziabad in Uttar Pradesh, Khushkhetra-Bhiwadi-Neemrana and Jodhpur-Pali-Marwar in Rajasthan, Aurangabad Industrial City (AURIC) and Digital Port Industrial Area in Maharashtra and Ahmedabad- Dholera Special Investment Region (SIR) in Gujarat. The scheme has received a major promotion from India and Japan, due to an agreement for a development fund of ₹1,000 crore (US \$131.2 million). Governments of both countries contribute equally and progress at a rapid pace, with the dedicated freight corridor expect to complete by December 2022.

Pradhan Mantri Gram Sadak Yojana (PMGSY)

The PMGSY is authorized by the Ministry of Rural Development started in 2000 and financed by the central (60%) and state governments (40%). The goal is to provide roads to all villages, tribal and desert areas, and hill states. However, there are some areas that still need improvement. The average construction speed of PMGSY was 130 km per day. The approval for the continuation of PMGSY 2022 has been given by Cabinet Committee on Economic Affairs. The road connectivity project has also been extended up to 2023.

National Highway Development Project (NHDP)

The NHAI is an independent company of the GOI installed in 1995 and control over 50,000 km. It is implemented in seven phases in the year 2000, 2003, 2005, 2006 (thrice), and 2007. NHAI enables the imposition of the Special Accelerated Road Development Programme for the North-eastern Region (SARDP-NE); a mission to improve National Highways connecting kingdom capitals to two lanes or four lanes within the north-jap region.

1.4.2 Achievements of the Government of India on SDG-9

India's achievement in SDG-9 was assessed in 2020 where seven Indian states are the front runners as compared to the annual report given by NITI Aayog in 2019. Table 2, classify the different states and UTs in accordance with their performance in SDG-9. Also, India has brought business refinement to enhance its rank in World Bank's Ease and secured 63rd rank in 2019 for improvement in industries. Also, the total manufacturing of national highways and roads doubled in 2019 which builds strong connectivity among the states and UTs. Port capacity for holding cargo's was improved by 84% in 2019. While in terms of innovation India's top three universities secured 44th rank which is close to the final rank of 50 in the World University Rankings.

Table 2: Performance of the Indian States and UTs

Achievers	States and UTs
Front Runner	Haryana, Goa, Delhi, Maharashtra, Gujarat, Tamil Nadu, Punjab
Performer	Kerala, Andhra Pradesh, Puducherry, West Bengal Himachal Pradesh, Uttarakhand, Karnataka, Telangana, Sikkim, Telangana
Aspirant	Uttar Pradesh, Jammu and Kashmir, Andaman and Nicobar Islands Manipur, Daman and Diu, Nagaland, Arunachal Pradesh, Tripura, Assam, Rajasthan, Bihar, Chandigarh, Odisha, Chhattisgarh, Jharkhand, Dadra and Nagar Haveli, Mizoram, Meghalaya, Lakshadweep, Madhya Pradesh, Ladakh,

Source- <https://sdgindiaindex.niti.gov.in/#/ranking>

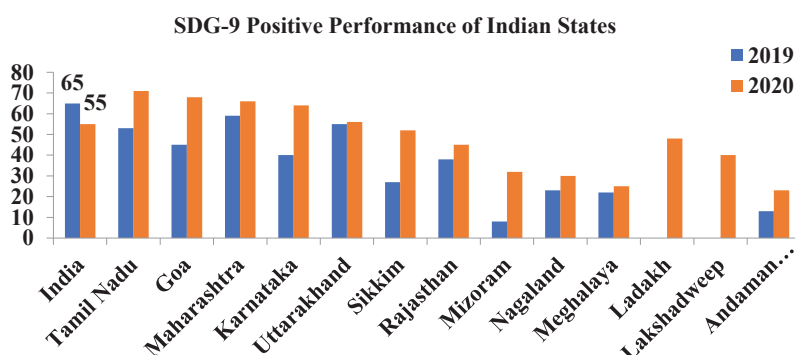


Figure 1: Positive Performance of Indian States (NITI Aayog, 2020)

Source: <https://sdgindiaindex.niti.gov.in/#/ranking>

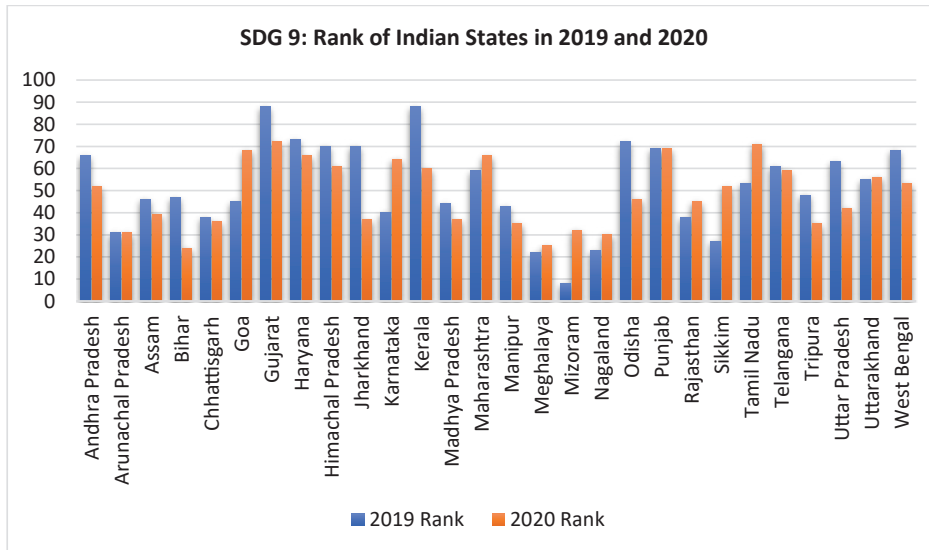


Figure 2: Performance of Indian States (NITI Aayog, 2020)

Source: <https://sdgindiaindex.niti.gov.in/#/ranking>

1.5 HEIs Status: Role of Higher Educational Institutions and Status of Adoption of SDG-9

Invest in new, resilient infrastructure in growing international locations or retrofit present infrastructure to make it more sustainable. Expand the geographic reach of research and improvement facilities, bringing R & D talents to developing nations. Promote innovation by allowing all stakeholders to offer innovative solutions to sustainability-demanding situations. Further, scope out the best ideas and offer awards to the best. Consult and engage an extensive range of stakeholders, including minority businesses, to make certain that infrastructure improvement benefits and creates opportunities for all.

Plantation and upgradation of laws that confirm agency ingenuity should be managed sustainably. The collaboration of public zone with NGOs improves sustainability boom in developing areas. China pursuing solar and hydropower opportunities has not yet delivered overarching tips for the requirement of sustainable Belt and Roads initiatives. Additionally, the authentic record drafting the BRI's actions and vision for a safe environment is essential in passing, with no point out of strategic environmental assessments (SEAs) or EIAs. This is mainly because the 21st century Maritime Silk Road passes through many Southeast and South Asian nations maintaining a woodland-structured community and a greater concentration of world biodiversity hotspots.

Similarly, diverse proposed routes of BRI's cross-included zones could 'open for exploitation of unique old-growth forests. India's patent filings are much fewer compared to different developed and developing nations in particular for domestic innovators. Further, there are delays in granting patents – presently, it takes 4 to 6 years from the filing of an application to the supply of a patent. The government needs to reinforce the ecosystem to harness the skills in schools and universities to document more patents. Industries can also be recommended to invest in innovations, open accelerators, and incubators.

Some of the universities with the UN have already taken the initiative to achieve SDG-9. One of the initiatives is Massive Open Online Courses (MOOCs) in which any student from any country can increase his/her knowledge with the help of online courses. Some of the courses are free while some are paid courses. Online platforms like Coursera, edX, SDG Academy, etc. are parts of MOOCs. Table 3 below shows some MOOCs along with the sponsors of these courses.

Table 3: Some of the MOOCs Related to SDG-9 Offered by Various HEIs and the UN

SDG Target	Course	Platform	Offered by
9.1	Global Management Programme for Infrastructure	Coursera	Indian School of Business
	Innovation and Design for Global Grand Challenges	Coursera	Duke University
	Plastics in Infrastructure and the Environment	edX	PurdueX
9.2	Construction Engineering and Management Master Track Certificate	Coursera	University of Michigan
	Becoming a changemaker: Introduction to Social Innovation	Coursera	University of Cape Town
9.3	Greening the Economy: Lessons from Scandinavia	Coursera	Lund University
	Financial Market Analysis	edX	IMFx
	Economics and Finance Courses	edX	World bank group
	Social Impact Strategy: Tools for Entrepreneurs and Innovators	Coursera	University of Pennsylvania
	Global Financial Markets and Instruments	Coursera	Rice University
	Financial Markets and Investment Strategy	Coursera	Indian School of Business
9.4	How Green is that Product? An Introduction to Life Cycle Environmental Assessment	Coursera	North western University
	Management of Urban Infrastructure	Coursera	Ecole Polytechnique Federal de Lausanne
9.5	Solar Energy Technology	Nptel HRD via YouTube	Indian Institute of Technology, Kharagpur
	Strategy and Sustainability	Coursera	IESE Business School
	Six Sigma Black Belt	Coursera	University System of Georgia
	Creativity, Innovation, and Change	Coursera	Pennsylvania State University
9.A	Entrepreneurship and Innovation	HBS online	Harvard Business School
	Country Level Economics: Policies, Institutions, and Macroeconomic Performance	Coursera	University of Illinois at Urbana-Champaign
	The Industry and Profession in Construction Management	edX	UMD, USMX
9.B	Autodesk Certified Professional: Civil 3D for Infrastructure Design Exam	Coursera	Auto Desk
	Social Entrepreneurship	Coursera	Copenhagen Business School
	Social Business Model and Planning for Social Innovation	Coursera	Copenhagen Business School
	Creating a Social Business	Coursera	Yunus Social Business

9.C	Principles of Modern CDMA/ MIMO/ OFDM Wireless Communications	Nptel HRD via YouTube	Indian Institute of Technology, Kanpur
	Responsible Innovation: Ethics, Safety and Technology	edX	Delft University of Technology
	Wireless Communication	Nptel HRD via YouTube	Indian Institute of Technology, Delhi
	Digital Circuits and Systems	Nptel HRD via YouTube	Indian Institute of Technology, Madras

2. Recommended Actions for HEIs for Achievement of SDG-9

Across SDG-9, the development in industries is governed by encouraging small enterprises, cooperating across border and investment in more resilient infrastructure will be highly important. Therefore, we need to modify our present technologies and commercial infrastructures. Both businesses and Governments have to collaborate to produce hospitable policies to enhance scientific research, innovation and infrastructure for upcoming future. Based on the international and national status on SDG-9, the key action points for HEIs for effective implementation of SDG-9 is given in table 4.

Table 4. Minimal Recommended Actions for the HEIs for Implementation of SDG-9

SDG-9 Targets	Minimal Recommendation Actions for HEIs
9.1	<ul style="list-style-type: none"> Research with AI and latest technologies should be conducted for infrastructural planning that contributes to SDG-9. SDG based research should be implemented in the curriculum by the HEIs. Introduction of sustainable architecture in academic institutions to foster development along with environmental protection.
9.2	<ul style="list-style-type: none"> Universities should promote product manufacturing at student level by providing them proper infrastructure and funds. Promotion of small enterprises will highly be crucial to assure sustainable industrial improvement and every HEI incubator should reserve some space for the same.
9.3	<ul style="list-style-type: none"> Small scale industries should be promoted and HEIs must promote ideation not only topical concepts but also upgradation of small scale industries that already exist and can be improved by innovation. Universities should promote local small scale industries like handlooms, textiles etc. by accepting proposals related to the same through their technology incubators. Adding sustainability and its practical applications as a part of the primary curriculum irrespective of the field invites ideation from each perspective.
9.4	<ul style="list-style-type: none"> Making surroundings that works on net-zero carbon emission. It can be achieved by revamping the current energy systems or installing new technologies. Making a mandatory task to have some specific energy usage of the institution as 'green consumption' aiming at our sustainable goals.
9.5	<ul style="list-style-type: none"> Research and development (R&D) are an important motive of economic growth because it spurs innovation, invention, and progress. HEIs should ensure more students enroll for research degrees at Masters and PhD level by spreading awareness.
9.A	<ul style="list-style-type: none"> R&D spending can be capital-extensive, but also can lead to breakthroughs that could power both earnings and health for customers. Conduct awareness programme on industry, innovation and infrastructure. Strive to conduct international collaborations and projects.

9. B	<ul style="list-style-type: none"> • HEI should focus on creating intellectual properties • Student involvement should be there in filing patents • Sustainable and environment friendly research on industry, innovation, and infrastructure must be promoted.
9. C	<ul style="list-style-type: none"> • Every university should have their independent IPR cell to enhance the intellectual properties and target growth of new communication technologies.

3. Proposed Research Agenda for HEIs and Governmental Bodies

The review of past studies and respective linkages with the SDG-9 targets have led to several key research areas that must be undertaken by HEIs. Proposed areas of research are highlighted in Table 5.

Table 5. Main Research Areas and Actions that can be Followed for SDG-9 Implementation

Research Area	SDG-9 Target	Need of Research
Research on Industry	9.1, 9.2, 9.3, 9.B	<ul style="list-style-type: none"> • The research agenda could be Entrepreneurship and looking for students with start-ups. • Get knowledge with industry research database advantaged by lots of businesses. • Impact of initiatives started by the government of India on SDG-09. • Start-up India is an initiative started by PM Modi in 2016 what are the implications of how many start-ups have grown and how much they contributed to the country's GDP. • More case studies can be taken up by the HEIs.
Research on Infrastructure	9.5, 9.A, 9.C	<ul style="list-style-type: none"> • All the infrastructure-related projects usually fail to meet the deadline, hence HEI's can research the possible reasons for this delay and come out with solutions, how to avoid such delays. It will help in saving labour, cost, and time. • HEI's should aim at translational research to help the country to achieve its goals. • Research on Development of Technologies (Innovation): The R&D Cells shall promote the innovation at a small level from their campus, with which the start-ups can take place and the other two main agendas can be fulfilled by default. • The income from research and start-ups will be useful for the institute's growth with which they can work for other goals as well. • Expose student to practical resources used across the world.
Research on Innovation	9.5	<ul style="list-style-type: none"> • SDG-9 based specific research project must be developed by HEIs • The idea of sustainability was not maintained by development of industries due to the discharge of untreated chemical effluents into the water bodies and generation of secondary hazardous pollutants.

4. Recommendations for Government and Regulatory Bodies for Achievement of SDG-9

Key action points for policy makers for effective implementation of SDG-9 are as follows.

4.1 Recommendations for Government Agencies

Table 6. Minimal Recommended Actions for the Government Agencies for Implementation of SDG-9

SDG Target	Minimal Recommended Actions for Government Agencies/ Policymakers
9.1	<ul style="list-style-type: none"> Infrastructure planning can be improved by usage of technology such as AI, digital transformation, and machine learning in fields such as manufacturing, health care, and banking can be supported by promoting multidisciplinary research that includes subjects such as economics, engineering, social sciences, and medicine. To support such programmes, the government and the private sector may sponsor research institutes that work closely with policymakers, businesses, academics, international organizations, and foreign governments. Funding can also be provided through international research collaborations.
9.2	<ul style="list-style-type: none"> To increase manufacturing output and employment in manufacturing industry, the govt. must support new innovative startups and give support to indigenous industries. Collaborative projects between govt., academia and industry is likely the way to increase growth.
9.3	<ul style="list-style-type: none"> To increase the role of small scale industries in the economy the govt. must increase the financial incentives like credit and loans given to such industries and actively also ease the terms and conditions for the same.
9.4	<ul style="list-style-type: none"> To ensure sustainable growth of industries the govt. must develop norms and incentives for industries to use more energy from renewable energy power plants like solar and wind.
9.5	<ul style="list-style-type: none"> Innovation and R&D in the Private Sector: Past two decades, India's investment on R&D has been sedentary at 0.63 % of its GDP. For India to turn out to be an Innovation Economy, not only the financial part for R&D must be accelerated, but also the way that R&D is completed desires to be modified. Developed and innovative economies like Germany and United States are evidence that R&D in and through the personal sector can catalyse innovation performance. The government ought to offer a platform to every HEI to increase innovative techniques to realise the SDG 09 goals. Focus and investment must also be on translational studies and developing international collaboration for student and college exchange packages. Fund must be released to develop the infrastructure in rural and underdeveloped areas.
9.A	<ul style="list-style-type: none"> This problem reflects the interdependence between the various stages - from welfare, health, economic and social prosperity to climate and environment. The governments determine weaknesses through the pandemic, it must develop similar solutions and structural changes guided by the SDGs. It refers to effective strength in community safety programmes and social services (education, water, health, sanitation, and other basic aids); growing investment in innovation, science, and technology; building a financial base in developing countries (green economy, investing in clean industry, and balanced diet transition).
9.B	<ul style="list-style-type: none"> Increase Patent filing and IPR Awareness: India's patent filings are less as compared to different developed and developing nations, specifically for domestic innovators. Further, there are delays in granting of patents, and presently takes 4 to 6 years from the submitting of an application to providing a patent. The authorities need to strengthen the patent filing system and encourage schools and universities to file patents. Industries also can be encouraged to put money into innovations, open accelerators, and incubators. Government should offer seed funds (via DBT and DST) to install IPR cells among HEIs and provide a platform to connect academia and Industry for business development and to promote Make in India policy.



9.C	<ul style="list-style-type: none"> • Alternates are required to make technology more efficient and affordable, and SDGs provide a road map. India’s government has introduced diverse strategies such as Start-up India, Make in India, and Digital India, which are associated to the IPR Policy Vision. Make in India aim to modify India into a global hub for production and design - a goal for strong IPR regime is paramount. Similarly, Digital India and Start-up India designed to empower India globally by enhancing India's business model and developing digital and business infrastructure and pan-India innovation capabilities.
	<p>Promotion of Interdisciplinary Research:</p> <ul style="list-style-type: none"> • Connecting with the locals: Organizing awareness and discussion sessions with the local people to gather ideas and resources, and motivate them to create indigenous things that can be beneficial to them. • Advertising cum Awareness sessions regarding various policies, projects, and schemes: To create awareness in people in rural and remote areas regarding various policies, projects, and schemes of the government which are useful for them. • Organising interactive sessions with experts to create awareness and sensitivity in the students of HEIs regarding SDGs • Inter-departmental Interaction Sessions be organised in Higher Educational Institutions for students from different departments to extract interdisciplinary innovative ideas from different fields and promote collaboration and teamwork. • Building Conducive Environment for Start-ups: Upgrade scientific research, and technological potential of industrial sectors, and encourage innovation in HEIs. The state-level centralized research labs could be promoted to meet the need of talent nurturing among HEIs.

4.2 Recommendations for Regulatory Bodies

The recommendations for regulatory bodies are as follows:

- Raise the research and development budget for more productive scientific innovation.
- Research areas like nanotechnology, nuclear technology and technology-driven Green Revolution should be given priority in HEIs.
- The quality of industry and infrastructure needs to be improved in terms of a good economy.
- Conduct audits to monitor the quality and impact of existing policies and schemes.
- Recognize and reward the HEIs for achieving the SDGs
- Prioritize the research funding based on SDGs

5. Conclusion Along With Prioritization of the Initiatives Recommended

Industrial innovation and startups are a necessity for the growth of economy. To meet the targets of SDG-9 successfully and on time, HEIs, govt. and the industry have to work together. We conclude the key recommendations as follows:

- 1) HEIs must bring SDG-9 into their curriculum and increase the allocation of funding for students by collaborating with the govt. funding agencies or through private funding.
- 2) HEI’s must increase the awareness around SDG-9 through online courses, webinars, conferences.
- 3) Every HEI must have a technology incubation centre and should promote start-ups for not only topical ideas but also for supporting or improving local and small scale industries.
- 4) HEIs and governments should strive for executing international projects by collaborating with foreign governments and institutes.
- 5) Govt. should ensure adequate funding support to all HEIs and not focus primarily on IITs/ NITs for incubation of ideas and start-up support.



- 6) Govt. should increase funding to small scale industries as they form important part in SDG-9.
- 7) Govt. should ensure adequate development of infrastructure like roads and telecommunication networks to create ideal environment for growth of industries throughout the country.

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Annexure-1: Case Studies

Nagaoka University of Technology (NUT) of Japan: Ambitions to supply innovative capabilities depended upon academic philosophy of the “Science of Technology (GIGAKU)”, The NUT has sent more than 10,000 engineers out into the field to provide improvement of infrastructure and enterprise. NUT has installed the SDG-focused engineer schooling scheme GIGAKU SDG institute via inter-college co-operation. To expand the scheme, NUT collaborated with UNESCO Chair on Engineering Education for Sustainable Development as part of the UNITWIN/UNESCO Chairs Programme. The primary target is to expand pupil talents to modify their expertise to resolve actual-international issues. The college collaborates with more than hundred other institutes and universities of Japan and other countries in global has installed distant places workplaces in seven countries. NUT also holds a worldwide convention on Science of Technology Innovation (STI-GIGAKU) to %age investigation development and acquirements in progress of 2030 Agenda for Sustainable Development, inspection issues consisting of strength, climate exchange, poverty, and starvation and looking for answers to those global troubles.

Universidad Pedagógica y Tecnológica de Colombia (Colombia) finished second in the latest problem of choosing Materials scheme done in Spain. The aim of event was promoting education of building materials engineering and continuous improvement using software devoted to that motive. Of the more than 300 stakeholder categories, one at the center received distinct identification for project, which concentrated on securing the lives of cyclists on highways, by the use of precision mechanical, visible, and environmentally friendly materials.

Universidad Técnica Federico Santa María (Chile) passively promotes the usage of electrical automobile at home level by research conducted through Valparaiso Scientific, Technologic centre, advanced Centre for Electrical and Electronics Engineering in association with non-public field. The main accent is on chargers and converters should be more efficient and faster. A special attempt was constructed to assemble locally generated technologies that could be transported to Latin America.

The African University of Science and Technology (Nigeria) under a 10-year framework was established and line up to build meaningful relationships with the surrounding society, provide the first phase of a series of planned technology and science quiz competitions in selected high school in the Federal Capital Territory, Abuja. The President Professor Kingston Nymphan of the Institute, encourage the participating students to concentrate on studies, a better science context background so that they can become world-class engineers and scientists.

The University of Pretoria (South Africa) is produced “Hillcrest Campus” for the upcoming future Africa Institute, addresses the vital needs of responsible and disciplinary research, to develop a new generation of the internationally acclaimed scientific community with a reading perspective and a voice focused on Africa. The Hillcrest campus enter for scientific innovation and discovery is considered a leading place where all over world African scientists and scholars can come together.

University of Geneva (Switzerland) hosted SDG Summer School between July and August, for great collaboration with UN agencies, coming together to think a good way to use crowdsourcing technology, affordable open-source and open data solutions to tackle them. Sustainable development and development of a ready-to-deploy prototype. Current year’s publication goals on solving team-based problem and developing of a practical model in the health sector run in partnership with Be Mobile, Be Healthy, a joint pogramme between WHO and ITU.

Chemnitz University of Technology (Germany) has been a successive research project called Merge Technologies for Multifunctional Lightweight Structures (MERGE) in the German Excellence Initiative. The Chemnitz University of Technology have 7 out of 8 faculties, two local Fraunhofer-Institutes as external research partners and some industrial partners work together to develop new lightweight materials e.g., weight loss vehicles that utilize low fuels and save natural resources.

Vimal Jyothi Engineering College (India) is regulating an in-depth, outsourced research project, entitled SCADA-based cloud-based Water Resources Management and Development Pogrammes in District Kannur, Kerala, to address concerns about service delivery and management through modernization, control computer systems, network data communications, and human-to-human process (HMI) process. This project aims to address drought, floods, and salt infiltration.

The Harbin Institute of Technology (China) recently organized the 10th Annual Longjing Cup, an innovative competition for graduate students of advanced modelling of product information and mapping technology. This competition aims to use the spirit of the Undergraduates Entrepreneurship and Innovation Promotional Proposition promoted by the Heilongjiang Province government. It also aims to develop new student skills through the participation of 20 teams comprising 150 graduate students from 16 universities, including HIT.

Pohang University of Science and Technology (Republic of Korea) researchers team led by Professor Wonbin Hong (Department of Electrical Engineering) collaborated with the Pohang Nambu Fire Station, formulate a self-propelled fire extinguisher helmet. In addition, the lightweight speaker and antenna, both modular and waterproof which easily closed and sprayed with water for a variety of purposes. Worldwide, some universities are already embarking on the SDGs, sponsored by the United Nations such as the Principles of Responsible Management Education initiative, Sustainable Development Solutions Network and Higher Education Sustainability Initiative. However, the remaining universities, especially those in low and middle-income nations, have significant role in achieving the SDGs. United Nations report shows that the progress pace in many SDGs areas is slower than what is needed to meet targets by 2030. To accelerate universities action on the SDGs, Sustainable Development Solutions Network Australia / Pacific has reported a practical expert that provides a survey, how universities can cause implementation of the SDGs. These comments are also drawn highlight and discussion for the importance of university collaboration with communities and govt. It first illustrates governments and community's relations with university then go on to discuss the benefits of such relationships for the benefit of the SDGs.



SDG-10: Reduce Inequality Within and Among Countries

Summary

The current chapter focuses on SDG-10, which is referred to as “reducing inequality” and has ten specific 2030 goals. The mission of the United Nations is to eliminate inequity and ensure that no one is left behind. The world’s resources must be wisely mobilized and evenly distributed. This chapter covers the context and UN mandate in relation to inequality, as well as global efforts to remove the scourge, as well as India’s multiple initiatives, their success thus far, and what needs to be done. Finally, it recommends strategies for higher education institutions to contribute positively to society by focusing on reducing inequality. Universities have the advantage of being populated with young people who are eager to make a difference in the world. Their zeal can be utilized to help bridge the social divide between rich and poor individuals.

Key Recommendations to Achieve SDG-10

- Required Interventions and initiatives should be undertaken by HEIs in a mission mode to transform the communal fabric that creates or encourages inequality.
- Programmes that strengthen people’s legal, economic, and technical empowerment should be prioritised.
- Voting registration campaigns should be organised for minorities and underprivileged groups to raise their engagement and representation in the institutions of power.
- Regulatory authorities should use tools and voluntary standards to build the regulatory frameworks that are needed to operationalize SDG 10.
- HEIs must institute an equity agenda and plan that commits to equal opportunity and reduced inequalities in all processes and activities and provides a supportive, inclusive and safe working and learning environment for people from financially and socially disadvantaged backgrounds, rural and regional areas, people with disabilities, women and diverse genders and sexualities, and people from diverse cultural and faith communities.
- HEIs can have a real impact on countries’ development only when three key things are ensured viz., first, universities have to function together as part of a coherent system in the public interest; second, access to higher education must be equitable and allow admission for talented students from disadvantaged backgrounds; third, teaching, research and community engagement must address key local and national development needs.
- HEIs should ensure that the diversity of the population gets the opportunity to be represented and have a voice in the decision-making process.
- Regulatory bodies must formulate a new flexible admission policy for students with lower percentages of marks, who are denied admission to HEIs due to current admission criteria with higher cut-off requirements which are against the principle of equality and are of serious concern. Many successful entrepreneurs, innovators creative artists, etc., rise from this section of society therefore introspection and urgent attention are required. This can be achieved by providing education to facilities through flexible online and conventional offline modes.



Context and Current Status of SDG-10

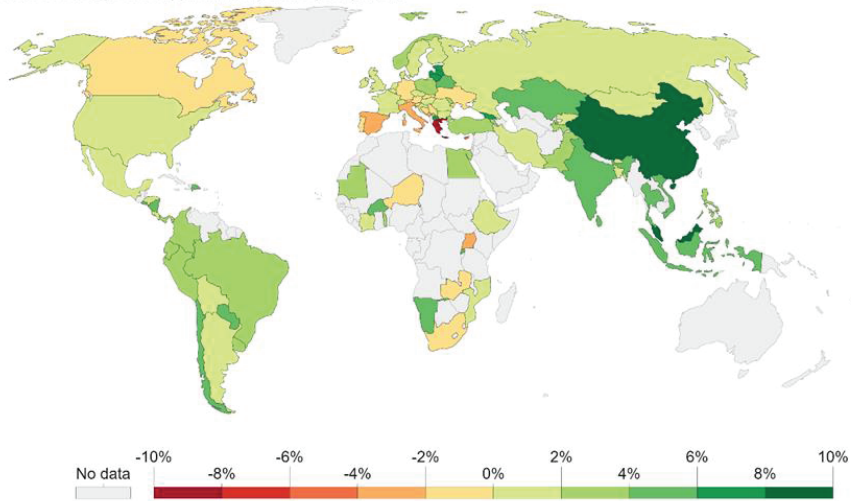
The Context and Current Status

Goal 10 (also known as SDG 10) is one of the United Nations' 17 Sustainable Development Goals, which were established in 2015. "Reduce inequality inside and across countries," the full title reads. The Goal has ten objectives that must be accomplished by 2030. Indicators will be used to track progress toward goals. The first seven "outcome objectives" are as follows: Reduce income inequality; promote universal social, economic, and political inclusion; ensure equal opportunity and eliminate discrimination; implement fiscal and social policies that promote equality; improve the regulation of global financial markets and institutions; increase the representation of developing countries in financial institutions, and implement responsible and well-managed migration policies. The final three goals are "means of achievement", targets: preferential and differentiated treatment for developing nations, increased development aid and investment in LDCs, and lower migrant remittance transaction costs.

Annualized average growth rate in per capita real survey mean consumption or income, bottom 40% of population, 2017

The growth rate in the welfare aggregate of the bottom 40 percent is computed as the annualised average growth rate in per capita real consumption or income of the bottom 40 percent of the population in the income distribution in a country from household surveys over approximately a five year period.

Our World in Data



Source: World Bank

CC BY

Figure 1: The Annualized Average Growth Rate in Per Capita Real Survey Mean Consumption or Income, Bottom 40% of the Population, 2014 to 2015

Income, gender, age, disability, sexual orientation, ethnicity, class, ethnic origin, religion, and opportunity continue to be disparities all over the world. Inequality, which impedes poverty reduction and decreases people's feelings of fulfilment and self-worth, jeopardizes long-term social and economic prosperity. As a result, violence, disease, and environmental damage could all rise. We will not be able to accomplish sustainable growth and make the world a better place for everyone if people are denied the opportunity for a better life. Despite some encouraging signs, inequality is rising far more than 70% of the world's population, heightening division risks and impeding economic and social growth. Furthermore, COVID-19 has a disproportionately negative impact on the most vulnerable individuals, who are frequently discriminated for one reason or the other. Inequalities must be reduced, and no one left behind if the Sustainable Development Goals are to be achieved. Inequality continues to be a source of concern both inside and across countries. Despite some encouraging indicators in some areas, such as reduced relative wealth gaps in some nations and preferred trading status for lower-income countries, inequality continues.

COVID-19 has exacerbated disparities by harming the poorest and most vulnerable people disproportionately. It made the focus on economic inequalities and weak social safety nets more intense, which have disproportionately hurt vulnerable populations. Simultaneously, social, political, and economic inequality has exacerbated the pandemic's effects. The COVID-19 epidemic has resulted in a major surge in worldwide unemployment and a significant decline in worker earnings in terms of the economy. COVID-19 also jeopardised the scant progress made in recent decades toward gender equality and women's rights. COVID-19's effects on women and girls are increased in every field, from health to the economy, security to social protection, just because of their gender. Inequalities are also widening among the most vulnerable populations in developing countries with underdeveloped health systems and those affected by humanitarian crises. Refugees and migrants, as well as indigenous peoples, the elderly, the disabled, and children, are among those who have been left behind. Hate speech directed against marginalised communities is also on the rise.

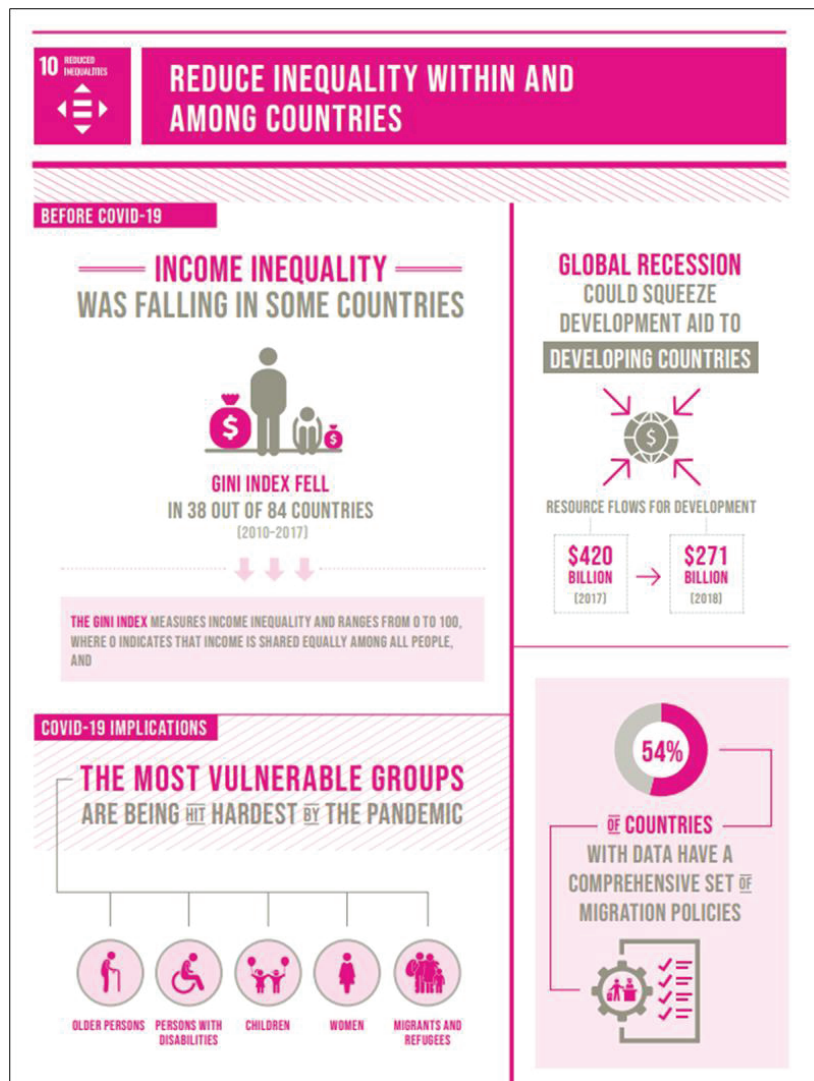


Figure 2: SDG 10- Current Status

Source: https://www.un.org/sustainabledevelopment/wp-content/uploads/2019/07/E_Infographic_10.pdf

1.2 United Nations Sustainable Development Goal-10 Targets

Five targets have been established to help accomplish SDG-10, as well as indicators to track progress. The following is a list of these objectives:

- **Target 10.1:** By 2030, progressively achieve and sustain income growth of the bottom 40 percent of the population at a rate higher than the national average.
- **Target 10.2:** 2030, empower and promote the social, economic, and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion, or economic or another status
- **Target 10.3:** Ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies, and practices and promoting appropriate legislation, policies, and action in this regard.
- **Target 10.4:** Adopt policies, especially fiscal, wage, and social protection policies, and progressively achieve greater equality.
- **Target 10.5:** Improve the regulation and monitoring of global financial markets and institutions and strengthen the implementation of such regulations.
- **Target 10.6:** Ensure enhanced representation and voice for developing countries in decision-making in global international economic and financial institutions in order to deliver more effective, credible, accountable, and legitimate institutions.
- **Target 10.7:** Facilitate orderly, safe, regular, and responsible migration and mobility of people, including through the implementation of planned and well-managed migration policies.
- **Target 10.7 A** Implement the principle of special and differential treatment for developing countries, in particular, least developed countries, in accordance with World Trade Organization agreements.
- **Target 10.7 B** Encourage official development assistance and financial flows, including foreign direct investment, to States where the need is greatest, in particular, least developed countries, African countries, small island developing States, and landlocked developing countries, in accordance with their national plans and programmes.
- **Target 10.7 C** By 2030, reduce to less than 3 percent the transaction costs of migrant remittances and eliminate remittance corridors with costs higher than 5 percent.

1.3 Summary of Progress on SDG-10 Implementation Globally

Despite some positive signs, such as lower economic inequality in some countries and special trade treatment for low-income countries, inequality persists in a variety of ways. The COVID-19 scenario has exacerbated this inequality. It affected the most vulnerable people disproportionately. The pandemic's worldwide consequences were most severe for the world's poorest countries. In this scenario, if a global recession causes a drop in development resource flows, the consequences will be far more severe, increasing the likelihood of division and suffocating economic and social growth.

By leaving no one behind, those with lower salaries can benefit from and share in a country's overall economic prosperity. The increase in household income of a country's poorest 40% can be used to measure progress toward shared prosperity (or consumption). Between 2012 and 2017, real income increased in 73 of the 90 nations for which data was available. Furthermore, the lowest 40% of the income distribution rose faster than the national average in more than half of those countries (49), indicating reduced levels of inequality. Despite this, in every country with statistics, the poorest 40% of the population received less than 25% of total income.

Eastern and Southeast Asia have made the most progress toward shared prosperity, with the poorest 40% of the population expanding at an average annual pace of 4.9 percent. Growth in Sub-Saharan African countries has been slower, but comparisons are difficult due to a lack of data (available for 15 countries only). Improved data collection is critical now so that the governments may identify

and address situations where COVID-19's economic ramifications disproportionately affected the poorest people.

Between 2010 and 2017, the Gini Index for Disposable Income (or consumer spending) in 38 of the 84 countries having data declined by at least one point, showing that inequality decreased in those countries. In 25 of the countries for which data is available, income inequality grew over the same time period. Despite declining inequality in the vast majority of nations with a Gini Index greater than 40 in 2010, many countries continue to have significant levels of income inequality. Out of 166 countries with data, 65 maintained a Gini index value of more than 40 in their most recent readings, with 17 over 50. Slovenia and the Czech Republic had the lowest levels of income inequality, with Gini index values below 25.

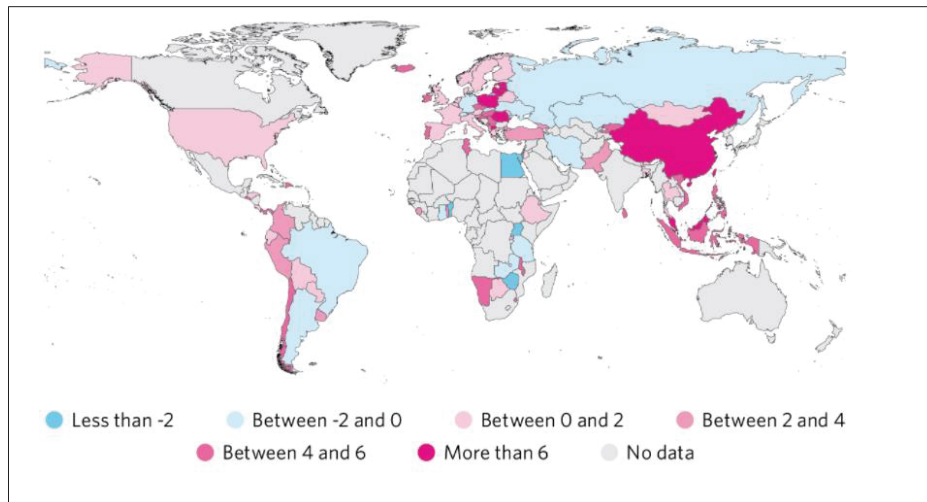


Figure 3: Annualized per Capita Growth Rate of Income of the Poorest 40 Percent of the Population, 2012–2017 (Percentage)

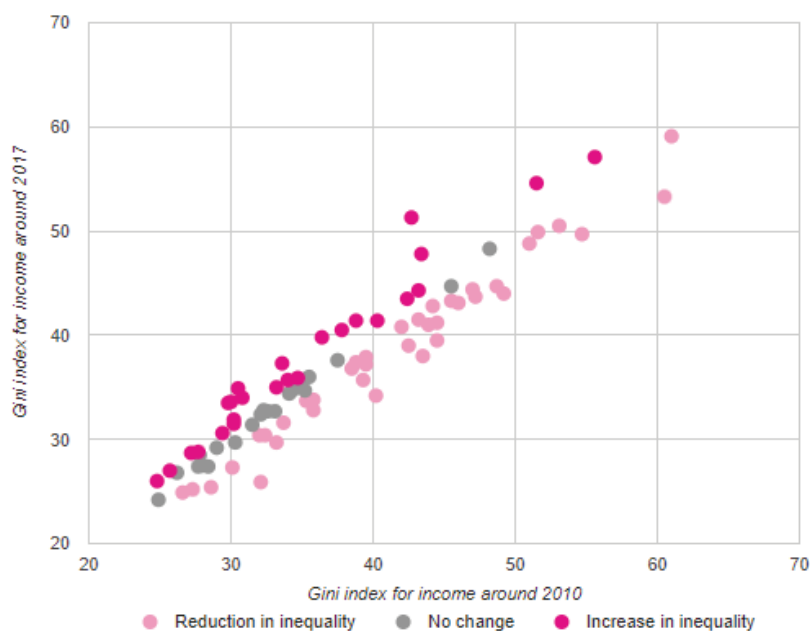


Figure 4: Gini Index for Disposable Income (or consumption expenditure) by Country, Around 2010 and 2017

1.4 Initiatives and Achievements of the Indian Government on SDG-10

Sashakt Bharat - Sabal Bharat (Sustainable and Empowered India): Through economic growth and empowerment, India has successfully lifted over 271 million people out of multidimensional poverty. Improved access to nutrition, child health, education, sanitation, drinking water, power, and housing has reduced inequalities, particularly among disadvantaged groups.

Swachh Bharat - Swasth Bharat (Clean and Healthy India): Through a state-wide campaign led by the Clean India Campaign and the National Nutrition Mission, India achieved 100 percent rural sanitation and major reductions in stunting, child, and maternal mortality rates. The world's largest health-care programme, Ayushman Bharat, has established universal health coverage by delivering an annual benefit of USD 7,000 to 100 million households and over 500 million people. India is spearheading the charge for a worldwide coordinated response to the COVID-19 pandemic. With a USD 10 million first commitment, the country has offered medical aid to a number of countries and established the SAARC COVID-19 Emergency Fund. A USD 22.5 billion economic stimulus programme, comprehensive health coverage for frontline workers, and direct cash transfers to the most disadvantaged are among India's internal responses to the COVID-19 pandemic.

pandemic.

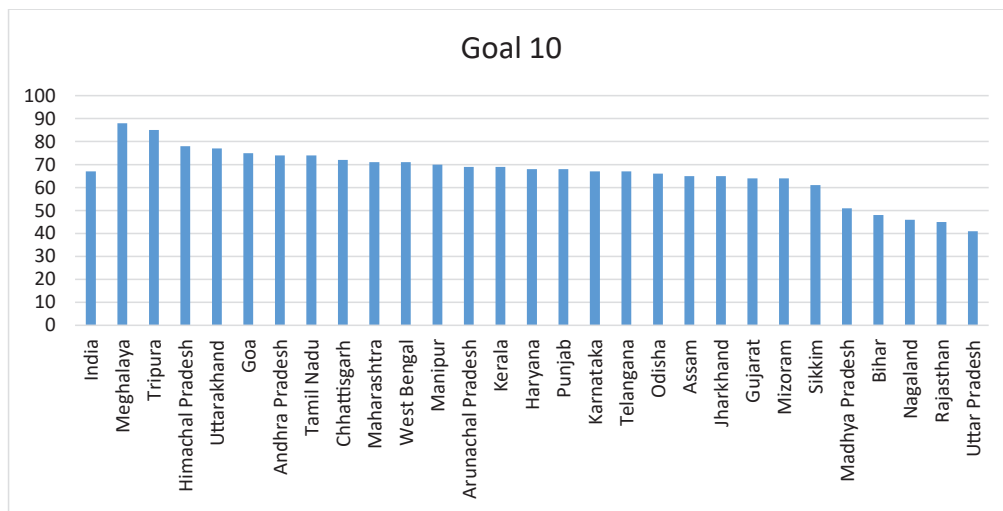


Figure 5: SDG-10 Progress Index

Samagra Bharat - Saksham Bharat (Inclusive and Entrepreneurial India): Ensure universal access to nutrition, health, education, and social security, as well as enhance entrepreneurial and job capabilities, to achieve social inclusion. The Jan Dhan-Aadhaar-Mobile (JAM) trinity – near-universal access to bank accounts facilitated by the Jan Dhan Yojana (National Financial Inclusion Scheme); Aadhaar cards (National unique identity number) for over 90% of the population; and widespread access to mobile phones – has accelerated the poor's economic empowerment, including the empowerment of over 200 million women.

Satat Bharat – Sanatan Bharat (Sustainable India): The necessity of clean and efficient energy systems, disaster-resistant infrastructure, and planned eco-restoration is emphasised in India's climate change plans. In accordance with its nationally determined contributions, India has electrified 100 percent of its villages, reduced 38 million tonnes of CO2 emissions annually through energy-efficient appliances, provided clean cooking fuel to 80 million poor households, and set a target to install 450 GW of renewable energy and restore 26 million hectares of degraded land by 2030. India is ranked third in the world for renewable energy, fourth for wind energy, and fifth for solar energy. In order to enhance global collaboration on climate change and catastrophe resilience, India founded the Coalition for Disaster-Resilient Infrastructure and the International Solar Alliance.

With a young population and a dynamic innovation and business ecosystem, India is one of the fastest-growing developing market economies. With a GDP of USD 2.72 trillion in 2018-19, India intends to grow its economy to USD 5 trillion by 2025, with expanded manufacturing, infrastructure development, investment stimulation, technological innovation, and entrepreneurship as key components.

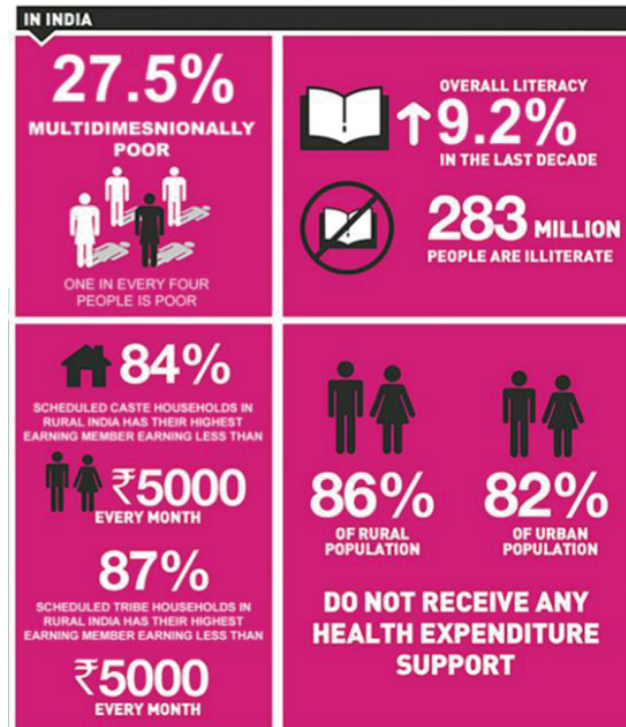


Figure 6: Current Status- SDG 10 (India)

1.5 HEI Status: Role of Higher Educational Institutions and Status of Adoption of SDG-10

Higher education institutions have been incorporating sustainability, community, and engagement studies into their systems or operating procedures for quite some time now. However, it was not until the 1990s that the term “sustainability” came to be used to describe and quantify the impact of higher education institutions on the communities and jurisdictions in which they serve and operate. Furthermore, higher education institutions regularly demonstrate how they communicate with their stakeholders, contribute to urban or regional economic growth, and achieve the goals of their strategic plan in statutory or ad hoc reports. The Sustainable Development Goals (SDGs) are meant to energise efforts to abolish all forms of poverty, combat inequalities, and battle climate change while ensuring that no one is left behind.

The SDGs are universally relevant; however, they are not legally binding. This necessitates collaboration and coordination of actions among higher education institutions (regardless of area, institutional typology, affiliation, or status), as well as any other partner or stakeholder, to ensure that the SDGs are met. Higher education leaders are asked to review their suggested approaches to addressing the SDGs and map out a path forward while noting the existence of several limits and roadblocks (whether these are political, economic, or geographical).

Institutional barriers may also exist, which must be overcome in order to develop an institution-wide strategy. They are also expected to modify existing performance assessment systems and third-mission objectives in order to track institutional progress toward the SDGs. Higher education

institutions are about to embark on a journey unlike any other in history toward sustainable development in the coming years. Because of globalisation, spatial borders have dissolved, allowing for borderless participation and the connectivity of local and global contexts.

Between the SDGs to which Indian universities have contributed and those to which they have not, there is a huge policy and objective disparity. However, with one of India's private universities, OP Jindal Global University, issuing its 'Sustainable Development Report 2021,' which shows the university's commitment to completely implementing major SDGs on campus, awareness looks to be increasing. Similarly, a number of other colleges have started projects focusing on work related to the SDGs, but this is insufficient. Such work necessitates more effort. All higher education institutions must conduct an in-depth self-evaluation of their current sustainable practises and commit to implementing the SDGs through a defined policy and set of targets.

The University Grants Commission (UGC) has set a goal of increasing the Gross Enrolment Ratio (GER) in higher education to 30% by 2020; ensuring the availability of motivated teachers, updating the curriculum on a regular basis with clearly defined learning outcomes and soft skills, assisting youth in securing employment/self-employment, developing social-industry connections, and establishing accreditation to ensure qualitative self-improvement in HEI." The National Education Policy (NEP) 2020 focuses on an education system rooted in Indian culture that directly contributes to India's long-term transformation into an equitable and vibrant knowledge society by providing universal access to high-quality education and thus transforming India into a global knowledge superpower by providing universal access to high-quality education.

Education is often referred to as the great equaliser because it may connect a family to the employment, resources, and skills they need to not only survive, but prosper. Children's access to high-quality elementary education and other services is widely acknowledged as a strategy to break the poverty cycle. This is owing to the fact that it takes into account a variety of different factors that influence a community's vulnerability.

Table 1: Some of the MOOCs Related to SDG-10 Offered by Various HEI and the UN

SDG Target	Course	Platform	Sponsor
10	Education for All: Disability, Diversity and Inclusion	FutureLearn	University of Cape Town
10	The Age of Sustainable Development	Coursera	Columbia University
10	The Changing Global Order	Coursera	Leiden University
10	The Challenge of World Poverty	Open Course Ware	MIT
10	Poverty & Population: How Demographics Shape Policy	Coursera	Columbia University

2. Recommendations for HEIs for Achievement of SDG-10

In the last few years, many Governments have enhanced their involvement in sustainable development by employing new policies that would promote the accomplishment of the 17 Sustainable Development Goals (SDGs) defined by the United Nations in Agenda 2030. Within society, universities are placed in a very exceptional position with the comprehensive mandate of generation and dissemination of knowledge. Universities are the powerful force behind global and national innovations and the drivers for economic and social development. Universities have a key role in the accomplishment of SDGs, and they will also benefit by engaging themselves with

the broader vision of SDGs. The HEIs are diverse in their composition and destined to become a benchmark. They acknowledge diversity and provide equal opportunities to people from different castes, creeds, religions, ethnicity, religion, gender, sexual orientation, nationalities, specially-abled monetary capabilities. Although there are immense instances where higher education institutions have proven their footprints towards reducing inequalities, it can still be witnessed across the globe that focus on SDGs and, in particular, attention to SDG-10 is still a dream yet to be realized.

At the national level, higher education institutions can contribute in the following way to achieve SDGs:

1. HEIs need to more actively focus on the attainment of SDGs in general and SDG-10 in particular.
2. Gender equality is the state of equal ease of access to resources and opportunities regardless of gender, including economic participation and decision-making; and the state of valuing different behaviors, aspirations and needs equally, regardless of gender.
3. One of the prime responsibilities of HEIs is to remove societal ills and make a positive impact. Working to reduce and eliminate inequalities has to be the core of institutions and should be included in the mission and vision statement of the institutions. This should further infiltrate into the academic programmes offered.
4. For national and international rankings, efforts and achievements of the HEIs in the reduction of inequalities should be an essential criterion.
5. Contribution towards SDGs has to be given weightage in Ranking frameworks for HEIs.
6. HEIs have to adopt the strategy of being globally competent and locally relevant. They have to ensure that community-relevant education in consonance with SDG-10 is communicated and research studies and projects are picked from domains that address inequality in the context of geographical areas where the institutions exist. There is a need to examine local issues using the SDG lens.
7. Achievement of SDG-10 needs immense support and funding, but distrust towards private institutions is a big challenge in the present scenario therefore, discrimination between public and private HEIs by policymakers and administrators should be removed. Policymakers and administrators must alter their perspectives and work to abolish discrimination among HEIs.
8. Academic sovereignty and institutional autonomy to highlight gaps and challenge the status quo are strongly needed. It will, of course, also need persistence on the part of institutions. There is an immense need to identify the gaps and fill them to bring positive change in the education and social systems.
9. Inequality, discrimination, and biases are psychological in nature, these appear from social learnings, and therefore HEIs must develop effective programmes to sensitize all the stakeholders. On one side, there is a need to provide mentoring, counselling, or peer support to those who experience discrimination; on the other side, there is a requirement to implement robust mechanisms that abstain people from anything that fuels inequality.
10. Catering to the specially-abled involves a specific set of knowledge, skills, and approaches from higher education faculty. It is therefore essential that training programmes are organized to arm the stakeholders to better understand the perception of the specially-abled and to provide training in sign-languages, etc. Creating an environment where all can flourish regardless of disability, will require a cultural shift. To provide them with equal opportunities, institutions have to establish special offices.
11. Required Interventions and initiatives should be undertaken by HEIs in a mission mode to transform the communal fabric that creates or encourages inequality.



3. Proposed Research Agenda for HEIs and Governmental Bodies

Table 2: Main Research Areas and Actions that can be Followed for SDG-10 Implementation

Research Area	SDG-10 Target	Need of Research
The Impact of Public Investment in Social Care Services on Employment, Gender Equality, and Poverty	10.1	The social care service sector (i.e., care services for children, the elderly, the disabled, and the sick) remains an underdeveloped sector
Why and how a country lens matters for the SDGs	10.2	Under the rallying cry of ‘leave no one behind’, the Sustainable Development Goals (SDGs) have placed substantial emphasis on inequalities within countries.
Equality and empowerment for decent work	10.3	The subject of equality is topical across the globe. The ILO’s Discrimination (Employment and Occupation) Convention, 1958
Managing gender equality using the dimensions of Hofstede’s national culture and organisation culture	10.4	It reveals the significant difference in inequality between them, which requires a better framework of governance and management in public universities.
Financial Regulation in Developing Countries	10.5	Examine the progress made in implementing the reforms, analyse the weaknesses, and suggest policy options for further reforms.
The Challenge of Good Governance for the IMF and the World Bank	10.6	The International Monetary Fund (IMF) and the World Bank enjoy a special place in the politics of world economic relations
Migration and Urban Transition in India: Implications for Development	10.7	Migration has been a historical process shaping human history, economy, and culture. It re-emerged as a strong force shaping cities and urbanization since the time of the industrial revolution

4. Recommendations for Government for Achievement of SDG-10

4.1 Recommendations for Government Agencies

Table 3: Minimal Recommended Actions for the Government Agencies for Implementation of SDG-10

SDG 10 Target	Minimal Recommended actions for Government agencies/Policy makers
10.1	To successfully use the human rights foundation, develop a rights-based National Legal Roadmap (NLR).
10.2	Equality promotion and protection should be mainstreamed
10.3	Programmes and methods that increase people's legal, economic, and technical empowerment should be prioritised.
10.4	For the extension of social security, implement social protection floors.
10.5	As a strategy for alleviating inequality, promote business rights (i.e., the rights of businesses).
10.6	Prepare Voluntary National Reviews (VNRs) and other reports on SDG implementation in close collaboration with current national human rights reporting systems

4.2 Recommendations for Regulatory Bodies

The Recommendations for Regulatory Bodies for realising SDG-10 are:

- Find a Goal-10 charity that can be supported. Donations, be they big or small can come a long in making a huge difference.
- It must be ensured in all their policies and initiatives that everyone is equal regardless of their gender, race, social and economic background, and physical abilities.
- Visits to local shelters, orphanages or minority community centres must be done to make them aware about the importance of these rights.
- Lack of representation of minorities and underprivileged groups in the government is also one of the main causes of inequalities. Voting registration campaigns creating sensitivity towards inequalities can be done by HEIs for underprivileged groups to raise their engagement and representation in the institutions of power.
- Migrants and refugees should be supported in each community. There can be volunteers in a local refugee camp who gather and then donate essentials such as appliances, food, and clothes to the needy.
- Regulatory authorities should use tools and voluntary standards to build the regulatory frameworks that are needed to operationalize SDG 10.

5. Conclusion Along With Prioritization of the Initiatives Recommended

Equality is essential for a society to be stable, just, prosperous, and peaceful. The benefits of economic progress have disproportionately benefited the world's wealthiest in recent years. Income inequality in OECD countries has reached new heights in the last half-century. It climbed by 11% in underdeveloped nations between 1990 and 2010. Furthermore, while the gap between developed and developing countries has narrowed, other emerging countries' average incomes have fallen further behind developed countries. Many groups, including women, racial minorities, and indigenous people continue to be denied equitable access to opportunities, including exclusion from business ownership and corporate decision-making, as well as pay, employment, and financial services discrimination. The concluding points are as follows:

- 1) HEIs must include SDG-10 in the curriculum and strive to achieve it by reducing inequalities like age, gender, ethnicity, etc. in terms of employment and opportunities and set an example for others to follow.
- 2) HEIs must research areas relevant to SDG-10.
- 3) HEIs must conduct campaigns to reduce inequalities in their local regions and spread awareness.
- 4) To successfully use the human rights foundation, govt. should develop a rights-based National Legal Roadmap (NLR).
- 5) Equality promotion and protection should be mainstreamed.
- 6) Programmes and methods that increase people's legal, economic, and technical empowerment should be prioritized.
- 7) Social protection floors to be implemented.
- 8) As a strategy for alleviating inequality, promote business rights.
- 9) Prepare Voluntary National Reviews (VNRs) and other reports on SDG implementation in close collaboration with current national human rights reporting systems.

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SDG-11: Make Cities and Human Settlements Inclusive, Safe, Resilient, and Sustainable

Summary

The present chapter focuses on SDG-11 which is defined as “make cities and human settlements inclusive, safe, resilient and sustainable” and has ten clear targets to be achieved by 2030. After providing a brief overview of the international and national status and initiatives taken by Indian HEIs so far, the focus is on recommendations to improve outcomes of the same. In this chapter, 10 broad areas for research and 21 implementation strategies for the HEIs, and 40 policy recommendations for government and regulatory bodies to achieve the SDG-11 targets are presented. Key recommendations involve development of courses and green campus planning by HEIs and increasing provision of grants by regulatory and scientific bodies on research in urban planning, green buildings, and waste management. The policy role of government is highlighted in areas ranging from smart city planning, sustainable energy provision and efficient use of public resources.

Key Recommendations to Achieve SDG-11

- The government must formulate specific policies for the construction of sustainable green buildings or zero energy buildings in their respective states as is being done by the Government of Himachal Pradesh under the Solar House Action Plan.
- The government must promote renewable energy, sustainable technologies, and electric vehicles by making specific policies for the same and providing suitable incentives for their adoption by people and organizations.
- HEIs must conduct focused research and projects concerning SDG-11, especially in areas of smart cities, urban planning, green infrastructure, green buildings, the resilience of urban systems and engineering, disaster management, waste management, urban transportation, life expectancy, and death rates, and heritage research.
- Government must introduce the latest sustainable technologies in urban development projects and provide consultancy projects to the HEIs for guidance and research.
- The HEIs which demonstrate high level of excellence in imparting education related to sustainability and research must be rewarded by the government so that others also follow.
- HEIs must convert their campuses into Sustainable Energy and Carbon Neutral Green townships, with affordable housing, including hostels, transport systems, etc. with mandatory use of natural passive solar heating, cooling and energy-efficient technology for all buildings that need to be ensured on the institution’s campus. This can be achieved through the formulation of sustainable energy, environment, clean water, and rainwater harvesting policies for the campus and adjoining villages and towns.
- HEIs should observe the best practices and learn from examples of successful sustainable urban development occurring worldwide and implement them in Indian cities through joint collaboration and research involving academia, industry, government, and other

stakeholders to increase the contribution to their existing projects and programmes as well as through new models or MoUs.

- Capacity building is an important aspect of sustainable urban development and there is a need to create more specialized HEIs along with focused courses throughout the country.
- Use of digital technology for monitoring, safety, and efficiency; better medical facilities along with Ayurvedic and Yoga facilities for natural health care should be created within the HEIs.
- HEIs should allow fluid campus boundaries to encourage the use of green space by local community members as a public amenity.

1. Context and Current Status of SDG-11

1.1 The Context and Current Status

As a famous person once said, “the best way to predict the future is to create it.” Cities are the icons representing the advancement of civilization and mirrors of cultural, technological, and economical excellence. How we design our cities today will in turn shape our future, which must rest on the foundation of sustainability. Cities occupy about 2% of the earth’s surface but consume 60–80% of global energy. The global urban population has reached 2.8 billion in the 20th century, increasing 13 times and is projected to reach 6.9 billion by 2050, representing 70% of the world population (Sodiq et al 2019). The 20th century has witnessed various other social, economic and environmental issues on a global scale (Yigitcanlar and Lee 2014). To counter such challenges, various efforts have been made leading to the materialization of the concept of intelligent cities (Komninos 2002).

The rapid growth in the urban population and expansion of cities and successive environmental impact has highlighted the importance of formulation of goals and the need to take necessary action for sustainability and improvement of quality of life of citizens in all countries.

1.2 United Nations Sustainable Development Goal 11 Targets: Planning Sustainable Cities

To achieve SDG-11, ten targets have been defined along with indicators to measure the achievement of the targets. These targets are listed as follows:

- **Target 11.1:** By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums
- **Target 11.2:** By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons.
- **Target 11.3:** By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries.
- **Target 11.4:** Strengthen efforts to protect and safeguard the world’s cultural and natural heritage.
- **Target 11.5:** By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations.
- **Target 11.6:** By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.



- **Target 11.7:** By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities.
- **Target 11.a:** Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning.
- **Target 11.b:** By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels.
- **Target 11.c:** Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials.

1.3 Summary of Progress on SDG-11 Implementation Globally

According to the UN's report E/2021/58, the number of slum dwellers has been increasing rapidly reaching over 1 billion by 2018. Region-wise, population living in slums is mostly concentrated in three regions of the world, Eastern and South-Eastern Asia (370 million), sub-Saharan Africa (238 million), and Central and Southern Asia (226 million). Data collected in 2019, from 610 cities and 95 countries indicates that about 50% of the population has access to public transport like trams, buses, ferries, railways, etc. However, due to the impact of COVID-19 pandemic and consequent lockdowns, access to transport became limited or completely cut-off. Data collected in 2020 from 911 cities in 114 countries indicates a trend of rapid urbanization from 1990 to 2019, especially in smaller cities. Additionally, the spatial urbanization rate was high as compared to population growth, highlighting the fact that rural areas are fast disappearing or getting merged in cities at a high rate. The rate of increase in built-up area per capita has been rising steadily across the globe with the exception of sub-Saharan Africa and Eastern and South-Eastern Asia. The UN-recommended goal of 30% area reservation for streets and open spaces has not been achieved as is evident from the data collected from 911 cities and 114 countries which shows only 16% area reservation in 2020. By March 2021, 156 countries have formulated policies related to urban development, with 38% in their starting phases of implementation and 13% at the stage of evaluation of the implemented policies.

1.4 Initiatives and Achievements of the Indian Government on SDG-11

India is projected to add 416 million urban dwellers between 2018 and 2050. Statistically, 68% comprises of the rural population and 17% of the urban population are slum dwellers. Various government schemes have worked towards the achievement of the SDG-11 targets in the past and the present, like the Smart Cities Mission, the Jawaharlal Nehru National Urban Renewal Mission, and the Atal Mission for Rejuvenation and Urban Transformation (AMRUT), to address the challenge of improving towns and cities. The prime minister's Pradhan Mantri Awas Yojana aims to achieve housing for all by 2022 (Ministry of Housing and Urban Development, 2005-2021). Swachh Bharat Mission aims to construct sanitation facilities in urban areas and 100% door-to-door collection of waste. At its core, the management and monitoring of all SDG implementation in India is being undertaken by NITI Ayog along with partnerships with other ministries and governments of states or union territories. The progress of 16 SDGs including SDG-11 and their targets are being monitored through the SDG-India Index, version 3.0, which encompasses a globally accepted methodology and uses 115 indicators to analyze and measure the progress based on the data collected from various sources. SDG-17 is being assessed by qualitative methods. The indicators for SDG-India Index are chosen based on global SDG targets, alignment with the National Indication Framework, statistical data availability, permissions or approval of ministries or departments, and data coverage

for at least 50% of states or union territories. The progress of SDG-11 in India is based on eight indicators and three targets 11.1,11.2 and 11.6 (figure-1) with India achieving a 79% index score which shows good overall progress. Punjab and Chandigarh achieved the highest score amongst all the states and union territories respectively whereas the north-eastern Indian states still require improvement based on the national average.

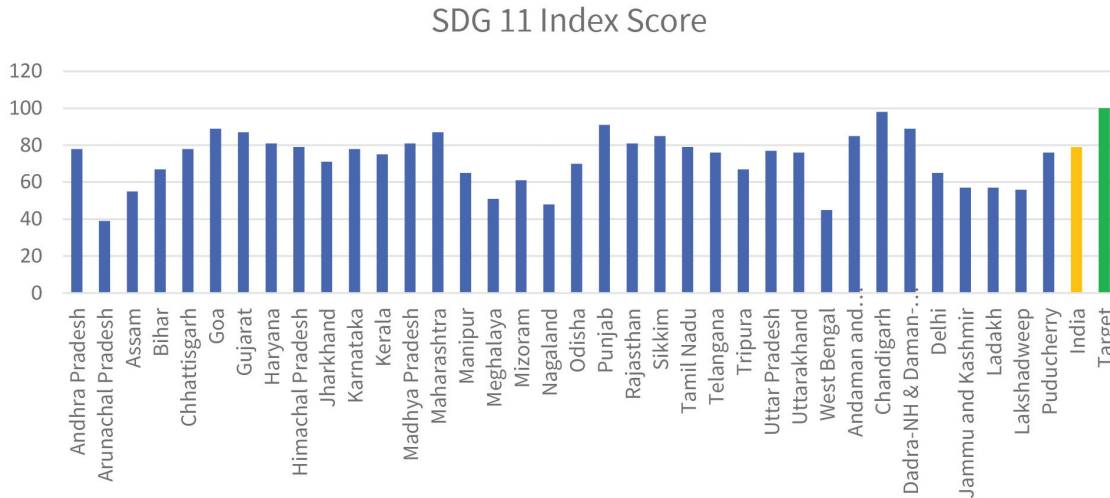


Figure 1: SDG-11 Progress in India

Table 1: Progress of SDG-11 in India in Terms of Targets and Achievements by Various States and Union Territories

11.1	11.1	11.1	11.2	11.6	11.6	11.6	11.6
Percentage of urban households living in katcha houses	Percentage of urban households with drainage facility	Percentage of individual household toilets constructed against target	Deaths due to road accidents in urban areas (per 1,00,000 population)	Percentage of wards with 100% door to door waste collection	Percentage of MSW processed to the total MSW generated	Percentage of wards with 100% source segregation	Installed sewage treatment capacity as a percentage of sewage generated in urban areas
Total: 0.80% Target: 0%	Total: 87.6% Target: 100%	Total: 105.1% Target: 100%	Total: 12.2% Target: 7.05%	Total: 97% Target: 100%	Total: 68.1% Target: 100%	Total: 78.03% Target: 100%	Total: 38.86% Target: 100%
Highest	Highest	Highest	Highest	Highest	Highest	Highest	Highest
State: Arunachal Pradesh: 8.9% UT: Delhi: 0.89%	State: Haryana, Uttarakhand: 97.4% UT: Chandigarh: 98.9%	State: Gujarat: 138% UT: Daman & Diu: 178%	State: Himachal Pradesh: 43.05% UT: Chandigarh: 8.32%	State: Andhra Pradesh, Chattisgarh, Goa, Gujarat, Himachal Pradesh, Madhya Pradesh, Karnataka, Manipur, Mizoram, Odisha, Rajasthan, Sikkim, Telangana, Uttarakhand, UT: Dadra & Nagar Haveli, Daman & Diu, Delhi, Chandigarh, Andaman & Nicobar Islands, Puducherry	State: Himachal Pradesh: 98.1% UT: Dadra & Nagar Haveli: 100%, Andaman & Nicobar Islands: 95.6%	State: Himachal Pradesh, Chhattisgarh, Karnataka: 100% UT: Dadra & Nagar Haveli, Daman & Diu, Andaman & Nicobar Islands, Puducherry: 100%	State: Haryana: 115.76% UT: Chandigarh: 123.57%

Lowest	Lowest	Lowest	Lowest	Lowest	Lowest	Lowest	Lowest
State: Goa, Meghalaya (0%) UT: Dadra & Nagar Haveli, Daman & Diu, Chandigarh, Andaman & Nicobar Islands, Lakshadweep (0%).	Lowest State: Manipur (33.3%) UT: Lakshadweep (48.1%)	Lowest State: Mizoram (18%) UT: Delhi (15%)	Lowest State: Nagaland (1.14%) UT: Lakshadweep (0%)	Lowest State: Meghalaya (61.4%) UT: Jammu and Kashmir, Ladakh (85.09%)	Lowest State: West Bengal (9.1%) UT: Puducherry (12.4%)	Lowest State: West Bengal (18.99%) UT: Jammu and Kashmir, Ladakh (12.45%), Delhi (20.07%)	Lowest State: Arunachal Pradesh, Meghalaya, Nagaland (0%) UT: Andaman & Nicobar Islands, Lakshadweep (0%)

1.4.1 Smart Cities Mission

Smart City is a city that aims at connecting the physical, IT, social, and business infrastructures to improve the overall efficiency and growth (Hollands, 2008). India launched its smart cities mission in 2015 with a goal to provide high quality infrastructure and facilities for its citizens by a combination of renewable energy and smart energy efficient technologies. A total of 100 cities have been identified to be developed into smart cities which will act as models for other cities to follow gradually. This was planned to be achieved through central government financing with INR 2,05,018 crores to be invested in 5,151 for 5 years with an average of INR 100 crore per city. By 9th November, 2021, 3129 projects worth INR 53,174 crores have been completed under the programme. The projects encompassed in the mission include the creation of walkable public spaces and bicycle pathways, use of bicycles and eco-friendly transportation, creation of health and social welfare centers, efficient water supply, better sanitation and waste management with the help of improved technology, use of digital technology like cameras, sensors, early warning systems, weather forecasting systems, GPS and CCTV tracking of buses, distance learning classrooms, and campuses for the government. schools and colleges, etc.

1.4.2 Jawaharlal Nehru National Urban Renewal Mission

The Jawaharlal Nehru National Urban Renewal Mission (JNNURM) was launched by the Ministry of Housing and Urban Affairs (MoHUA) in 2005 as a plan to modernize 65 cities. The programme involved central government investment of Rs. 50,000 crores from 2005 to 2012. The programme's strategy involved the improvement of the socio-economic fabric of the cities, through sub-projects of "Basic Services to Urban Poor (BSUP)" that focused on the development of slum areas and "Urban Infrastructure and Governance" with a focus on solid waste management, water supply and sanitation, road network, urban transport, and redevelopment of old city areas. Although a good initiative, the JNNURM could not perform as envisaged with only 8.9% of 2815 projects accomplished by 31st March 2011 (Audit Report No.15, GoI). Major reasons for the latter were the lack of creation of dedicated staff in the JNNURM directorate, diversion of funds by state governments for other purposes, poor project monitoring and management at central and state level, absence of penalties for non-implementation of projects. This scheme was concluded and succeeded by Atal Mission for Rejuvenation and Urban Transformation (AMRUT) in 2014.

1.4.3 Atal Mission for Rejuvenation and Urban Transformation

The mission of providing basic civic amenities to improve the quality of life for all irrespective of their economical background, was further restructured in the form of the AMRUT programme. The main objectives of the programme are (i) provision of water supply and sewerage connection to all households, (ii) construction of green spaces and parks, (iii) pollution control by promotion

of public transport usage and cycling. AMRUT covers about 500 cities and towns that have a population of 1 lakh and involves an investment of INR 50,000 crores from financial year 2015-16 to 2019-20. The scheme is now extended in form of AMRUT 2.0 as announced by MoHUA on 1st Oct 2021 incorporating an investment of INR 4.4 lakh crores. The AMRUT scheme improved upon the lessons learnt from JNNRUM implementation and as such has been better performer than its predecessor. As on 11th Feb. 2021, a total of Rs. 78,910 have been invested in projects. Work worth Rs. 47,703 crores are under progress with projects amounting to Rs. 16,449 crores completed. 97 lakh waters tap connection and 62 lakh sewer household connections have been provided. Sewer Treatment Plants (STPs) of capacity 1,090 million litre per day (MLD) have been developed against the target of 6,000 MLD. 80 lakh streetlights have been replaced with energy efficient LED lights. Online Building Permission System (OBPS) have been adopted in 2,205 towns.

1.5 Role of Higher Educational Institutions and Status of Adoption of SDG-11

It has been analyzed in the past, with examples of Montreal, London, and Stockholm, that the planning and implementation of smart cities is a complex process and depends on the economic needs, cultural and social factors (Letaifa, 2015). Moreover, its successful implementation requires the cohesive efforts of governments, businesses, institutions, and people in general. However, research in the last decade has spun new models like ‘Triple Helix’ that highlight the importance of universities as key facilitators for the implementation of smart city eco-systems (Etzkowitz and Leydesdorff, 2000). This model has been further researched (Carayannis & Campbell, 2010) and analyzed as Quadruple Helix (consideration of effects of media-based and culture-based public) and Quintuple Helix (consideration of sustainable development and social ecology). These studies clearly highlight that it is unlikely for a society or a country to progress without leveraging and enhancing knowledge. In fact, economic growth is very well tied to the creation of knowledge-based societies.

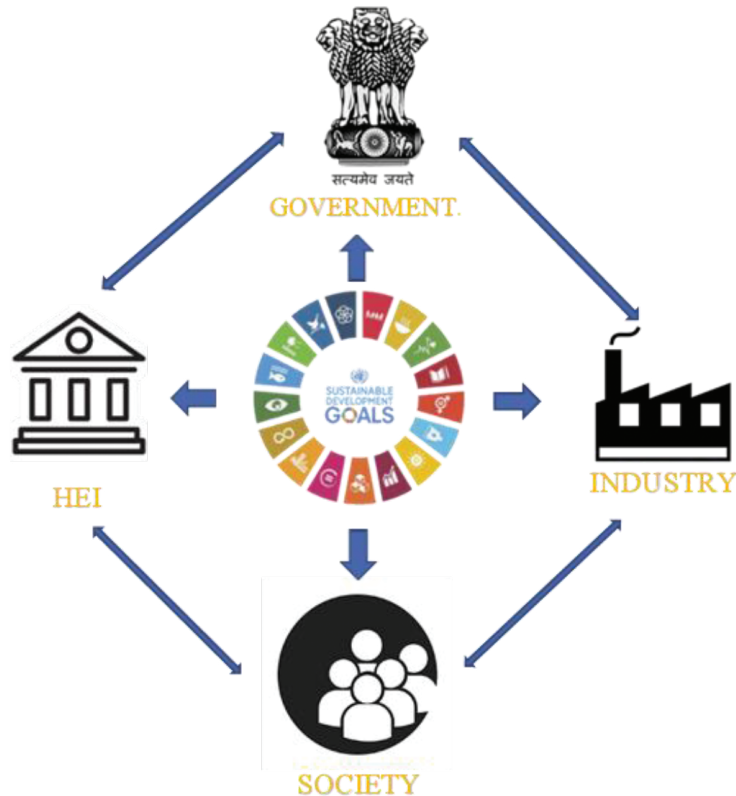


Figure 2: Linkages between Government., HEI, Industry and Society for SDG Implementation and Sustainable Economic Growth

Since universities and educational institutions are the hub of knowledge creation and dissemination, their role in the development of sustainable economies and societies cannot be neglected. Being part of the Helix model, universities themselves have additional benefits to gain in addition to their standard importance and role by aligning themselves with the government's goals or global SDGs.

Times Higher Education (THE) a UK-based company that ranks and reports various universities on the basis of quality of education has also released rankings based on SDG compliance of various universities. Although many universities have activities in line with various SDGs, only one of the Indian universities have made it to the top 100 of the THE SDG-based ranking in 2021. It is therefore apparent that in order to further improve their ranking, as well as do their part in combating environmental change for a better quality of life, all universities must make SDGs an integral part of the organizational policy and culture.

SDG-11 is expected to set a benchmark for future urban planning techniques and policy. Several universities have already recognized its importance and have taken measures towards alignment. As a good example, UNICINOS, one of the top three private universities in Brazil is the first university in Latin America to receive ISO14001 certification for its environmental management on campus. The university also supports environmental projects for communities residing in the region. In addition to the graduate and undergraduate programs on Architecture and Urbanism, the university offers nine undergraduate programs that are linked to research towards sustainable development. In direct connection to SDG-11 the Architecture and Urbanism School conducts research in two areas, namely, 'Cities' (concerned with planning, management and technologies towards sustainable cities) and 'Buildings' research (that deals with energy efficient sustainable architectural design, technologies and construction methods). UNICINOS also hosts an extension program known as Architecture and Urbanism Model Office where students create urban, architectural and consultancy projects for the benefit of the rural and vulnerable population. The university has also promoted the São Leopoldo Science Park – Tecnosinos, which hosts various renewable energy and environmental science companies and conducts awareness programs regarding sustainable development.

The case study of UNICINOS highlights several key actions and approaches that can be undertaken by any HEI. First, the creation of a policy or management system within the campus to demonstrate a high-quality sustainable model township for others to follow. Second, to teach students courses that directly deal with sustainable research and SDG-11. Third, the creation of facilities and support for students to generate and conduct actual environmental and sustainability projects for the rural community. Lastly, the support for and creation of technological hubs to promote entrepreneurship in environmental and sustainable development areas as well as the popularization of the same amongst general public.

One of the fastest methods for HEIs to start their journey towards SDG implementation is by creating Massive Open Online Courses (MOOCs). There are several universities and UN sponsored platforms that have already initiated MOOCs that focus on various SDGs. Some of these are listed in Table-2.

Table 2: Some of the MOOC Related to SDGs Offered by Various HEI and the UN

Course Title	SDG Focus	Platform	Sponsor
Driving business towards the Sustainable Development Goals	Generic	Coursera	Erasmus University Rotterdam
Sustainable Development in the 21st Century with Ban Ki-moon	Generic	Coursera	Yonsei University
Understanding Poverty and Inequality	SDG-1,10	SDG Academy	United Nations Sustainable Development Solutions Network
Sustainable Food Security: Food Access	SDG-2	edX	Wageningen University & Research
Sustainable Tourism – promoting environmental public health	SDG-3,6,14,17	Coursera	University of Copenhagen
Global Public Health	SDG-3	SDG Academy	United Nations Sustainable Development Solutions Network
The Best Start in Life: Early Childhood Development for Sustainable Development	SDG-4	SDG Academy	United Nations Sustainable Development Solutions Network
Human Rights, Human Wrongs	SDG-5, 16	SDG Academy	United Nations Sustainable Development Solutions Network
Water: Addressing the Global Crisis	SDG-6	SDG Academy	United Nations Sustainable Development Solutions Network
Inclusive Energy Systems - Exploring Sustainable Energy for All	SDG-7	edX	Delft University of Technology
Macroeconomics for a Sustainable Planet	SDG-8	SDG Academy	United Nations Sustainable Development Solutions Network
Natural Resources for Sustainable Development	SDG-9, 12	SDG Academy	United Nations Sustainable Development Solutions Network
Cities and the Challenge of Sustainable Development	SDG-11	SDG Academy	United Nations Sustainable Development Solutions Network
The Sustainable Development Goals – A global, transdisciplinary vision for the future	SDG-13	Coursera	University of Copenhagen
Planetary Boundaries and Human Opportunities	SDG-13,14,15	SDG Academy	United Nations Sustainable Development Solutions Network
Ethics in Action	SDG-16, 17	SDG Academy	United Nations Sustainable Development Solutions Network

In India, although the universities have been directly or indirectly contributing towards the achievement of the various SDGs, there is still a significant lacuna for specific policy and objective alignment towards the same. But now, the awareness seems to be spreading with Shoolini University achieving 2nd and 6th rank in Times Higher Education Global Rankings 2022 for contribution towards SDG-7 and SDG-6 respectively. Another private Indian university, OP Jindal Global University having released its ‘Sustainable Development Report 2021’ which highlights the HEI’s accomplishments and commitment to fully implement various SDGs within its campus. Similarly, many other universities have initiated some projects that highlight work related to SDGs but more needs to be done. All HEIs must conduct a thorough self-assessment regarding the current sustainable practices and follow the SDG path through a formal policy and set targets.

A demonstration of SDG compliance at the institutional level will further inspire the promotion of nation-wide developmental programmes like Smart Cities Mission and AMRUT. It is also a good idea for the Indian government. to create a reward system for institutions that comply with SDGs and also a national ranking system similar to the THE SDG-based ranking. SDG compliance demonstration at institutional level is important and would have a very strong impact as they involve the young generation of the country who would made aware of the importance of future sustainability, energy conservation and efficiency, recycling, safety and other indicators defined in the SDGs that aim to make the world a better place.

2. Recommended Actions for HEIs for Achievement of SDG-11

HEIs are model townships and hence the initiation for SDG-11 implementation must start from within the institution itself. A flowchart for facilitation of the same is shown in figure 3. The process begins with the creation of a dedicated department (DD) to create the Energy, Environment and Sustainability (EES) Policy which defines the rules and procedures to be followed in compliance of UN-SDGs within the campus. This department is also responsible for periodically reviewing and updating the policy as and whenever required. The next step is to ensure that SDG targets are defined, and key activities and projects are undertaken by the HEI and overall coordinated by the DD for efficient monitoring and management. The objectives can be set as targets specific to SDG-11 like following energy efficient architecture, use of sustainable building materials, use of renewable energy, use of electric vehicles, improved security measures, waste segregation and recycling, better medical facilities etc. The HEIs can further participate in joint projects focusing on urban development or create their own projects for implementation.



Figure 3: Flowchart for Getting Started with SDG-11 Implementation Within an HEI

Based on the international and national status of SDG-11, the key action points for HEIs for effective implementation of actions for realizing SDG-11 are as follows:

Table 3: Minimal Recommended Actions for the HEIs for Implementation of SDG-11

SDG-11 Target	Minimal Recommended Actions for HEIs
11.1	<ol style="list-style-type: none"> 1) Develop each HEIs as sustainable energy township by following solar passive, energy efficient, climate responsive technologies and use of sustainable building materials. 2) Provide hostels and scholarships to aid students from weaker sections of society. 3) Take up projects with the government agencies to upgrade slums (suggest better house designs, facilities, sanitation etc., as per the latest technologies). 4) Provide business opportunities to people living in slums through new business models, education and training.
11.2	<ol style="list-style-type: none"> 1) Provide university buses for safe and convenient transportation for occupants especially women and elderly staff. 2) Provide dedicated medical transportation facility for the sick and for emergencies.
11.3	<ol style="list-style-type: none"> 1) Promotion of sustainable solutions like photovoltaic power plants, solar steam cooking systems, biogas and low-carbon building construction with energy-efficient solar passive housing. 2) Use of solar /electric carts for internal transportation within the university or institution. 3) Creation of sustainable policies for implementation, monitoring and management of sustainable development within the HEI and implementation of the same in the region outside the HEI through joint projects with the government/industry.
11.4	<ol style="list-style-type: none"> 1) HEIs can have special galleries to promote cultural heritage within their township. 2) The same can also be promoted at a higher level through collaborative projects with UNESCO outside their campuses.
11.5	<ol style="list-style-type: none"> 1) HEIs must construct and maintain dedicated health centers and ambulance service for emergencies. 2) Vaccination drives for COVID-19 and infectious diseases should be frequently undertaken for reducing the risk of infections and death. 3) External programmes in nearby rural areas can also be undertaken by HEIs in collaboration with the government. medical agencies. 4) Also, seminars regarding better hygiene and nutrition can be frequently imparted.
11.6	HEIs must construct and maintain waste recycling plants and additional measures for proper segregation of biodegradable and non-biodegradable wastes and promote a similar strategy for planning of towns and cities through joint projects with the government.
11.7	<ol style="list-style-type: none"> 1) HEIs must construct adequate green spaces and public spaces sufficient for their occupants. 2) Adequate facilities for persons with disabilities should be constructed.
11.a	HEIs must do projects sponsored by government agencies to uplift rural populations in nearby regions through education, training and providing new business models to people with weak economic background.
11.b	HEIs must expand campuses in other states in order to spread awareness and sustainable development model. The new campuses shall be governed by existing energy and environment policies and shall pave the path for future sustainability. Hence HEI can become ideal models to be followed by larger towns and cities.
11.c	HEIs can achieve this goal only through joint projects with government or foreign agencies to disseminate energy efficient construction practices and business models for rural areas.

3. Proposed Research Agenda for HEIs and Governmental Bodies

The review of past studies and respective linkages with the SDG-11 targets have led to several key research areas that must be undertaken by HEIs. It is recommended that undergraduate and postgraduate level courses are redesigned in keeping with the SDG. Proposed areas of research are highlighted in Table 4.

Table 4: Main Research Areas and Models that can be Followed for SDG-11 Implementation

Field	Key Research Areas or Models	Key Activities
Urban Planning	Smart City model	Resource optimization, water management, energy efficiency, use of sensors and automation, information systems, IoT, electric vehicles, etc.
Project Implementation	Triple, Quadruple and Quintuple Helix models	Participation of Government., HEIs, Industry, and media in city/ urban and rural development projects for sustainable development. Each HEI to establish Sustainable Energy Research and Educational Centre to support and monitor all activities in the sustainable HEI township. These systems will be practical laboratories for science, technology and engineering students for the promotion of innovation besides enhancing skills & job potential.
Green Buildings	Zero Energy and nearly Zero Energy Building models, passive solar architecture, efficient water management, air quality, thermal comfort, waste reduction, toxics reduction, combating urban heat islands.	Mandatory construction of energy efficient, low carbon buildings and minimization of dependence on conventional electricity by use of renewable energy, sustainable building materials, passive solar architecture and other design methods. Better sustainable building design for resource efficiency, waste and toxics management, thermal comfort etc.
Green Infrastructure	Methods and techniques for integration of green infrastructure in towns and cities.	Planning urban areas in natural and sustainable way by planting trees, restoring wetlands and by other methods to manage stormwater treatment and floods.
Disaster Management	Predictive models for disaster forecasting, integrated disaster management models, artificial intelligence models for disaster management	Predictive modelling involves forecasting of disasters with probability using algorithms and techniques with historical or live data or combination of both. Integrated models use AI, satellites, information systems for quick response and management of disasters.
Resilience of Urban Systems and Engineering	Resilience quantification frameworks (4R resilience model, resilience index etc), resilience quantification of electricity, communication, and transportation systems, earthquake engineering.	Resilience quantification studies and engineering of buildings, urban systems against natural threats like fire, floods, earthquakes, cyclones etc.
Waste Management	Models based on life cycle analysis (LCA models), models based on multicriteria decision analysis (MCDA models)	Source reduction and reuse, recycling and composting, energy recovery, treatment and disposal.
Urban Transportation	Sustainable transportation, public transport systems, travel demand models, travel behavior, climate change and tourism, use of AI, metaheuristic techniques for scheduling, routing, loading problems, traffic management and reduction of accidents	Measurement of environmental, economic and social impact of sustainable transport, level of carbon emissions, economic, social, practical and technical considerations. Modeling and solving traffic management problems.

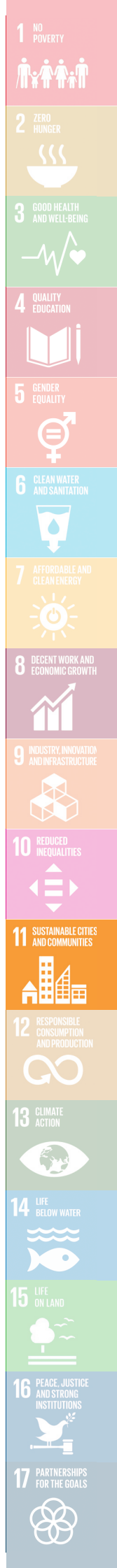
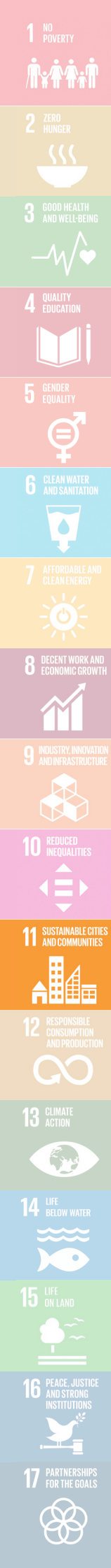
Life Expectancy, Death Rates and Health	Forecasting, improvement of life expectancy, trends and differences in various regions, research on deaths due to calamities and disasters and methods for reduction in the same	Analyze trends, life expectancy measures, death rates in various regions and research methods, processes, systems to reduce loss of life due to accidents, disasters and calamities that result in loss of GDP. Build special mechanisms, projects, technologies, facilities to aid the poor and vulnerable population.
Heritage Research	Cultural heritage, sustainable management of heritage, global heritages, international development and global challenges, tribal arts/heritage, conservation materials and technologies. health monitoring of ancient artifacts, textile heritage etc.	Human resources capacity building and encourage new researchers to work in these areas, scientific R&D activities for conservation of heritage objects, explore new approaches, materials, technologies to preserve the heritage and ancient artworks. Explore local and global issues related to heritage research.

4. Recommendations for Government and Regulatory Bodies for Achievement of SDG-11

Key action points for policymakers for the successful realization of SDG-11 are given as follows:

4.1 Recommendations for Government

SDG-11 Target	Minimal Recommended actions for Government/policymakers
11.1	<ol style="list-style-type: none"> 1) Conduct surveys to identify slum areas in the respective administrative zone 2) Make a policy for people coming in BPL and housing schemes for upgradation of slums 3) Ensure participation from HEIs for design of economical and energy efficient buildings, facilities, sanitation etc. as per latest technologies. 4) Draft new entrepreneurial schemes to train and employ people living in slums and provide low interest loans in collaboration with HEIs which will facilitate training and incubation of startup businesses.
11.2	<ol style="list-style-type: none"> 1) Provide buses for safe and convenient transportation for occupants especially women and elderly staff. 2) Ensure public transport is affordable to all people of the society. 3) Ensure dedicated medical transportation facility for the sick and for emergencies.
11.3	<ol style="list-style-type: none"> 1) Make policy for widespread implementation of renewable energy projects like photovoltaic power plants, wind energy farms, biogas plants and low carbon building construction 2) Make policy for all buildings to implement energy efficient solar passive housing features. 3) Implement policy for use of electric cars and bicycles for environment protection. 4) Creation of sustainable policy monitoring framework and budget for implementation, monitoring and management of sustainable development 5) Provide framework for participation of HEIs in design of water, sanitation, civil, designs of towns and cities through consulting projects.
11.4	<ol style="list-style-type: none"> 1) Ensure identification, publicity and proper maintenance of cultural and heritage sites in the respective administrative region 2) Participate in collaborative projects with UNESCO for external funding and support.



11.5	<ol style="list-style-type: none"> 1) Ensure adequate number of hospitals are constructed in population centers, towns, cities and rural areas. 2) Ensure hospitals are equipped with up-to-date medical facilities through audits and surveys 3) Ensure free vaccination drives for COVID-19 and infectious diseases is frequently undertaken for reducing the risk of infections and death. 4) Conduct special programmes for health awareness and vaccinations in rural areas. 5) Conduct surveys to identify any undernourished children in the concerned administrative region. 6) Participate in joint projects with external agencies like UNICEF, WHO etc.
11.6	<ol style="list-style-type: none"> 1) Construct and maintain waste recycling plants 2) Take measures for proper segregation of biodegradable and non-biodegradable wastes 3) Consult HEIs for new, improved methods and technologies that could be implemented in town and city planning.
11.7	<ol style="list-style-type: none"> 1) Adequate green spaces and public spaces to be constructed in towns and cities. 2) Adequate facilities for persons with disabilities should be constructed in towns and cities. 3) Law and enforcement agency personnel should be deputed to ensure safety of people especially women and elderly in towns and cities. 4) Special services like emergency call, SMS service to call police or ambulance etc. should be enabled for emergency situations especially for women and the elderly.
11.a	<ol style="list-style-type: none"> 1) Create projects and policy framework to uplift rural population in nearby region by education, and training, and providing new business models to people with weak economic background. 2) Include HEIs for consultation and joint implementation.
11.b	<ol style="list-style-type: none"> 1) Create integrated policy framework and plan for inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters. 2) Create specific disaster management policy as per Sendai Framework for Disaster Risk Reduction 2015-2030.
11.c	<ol style="list-style-type: none"> 1) Participate in joint projects with foreign agencies to implement energy efficient construction, use of local construction materials and business models for facilitating the same in foreign or local rural areas. 2) Promote and facilitate passive solar housing technology in rural areas. 3) Ensure participation of HEIs in projects for research, development and technological support.

4.2 Recommendations for Regulatory Bodies

The regulatory bodies like UGC, AICTE, ICAR, NAAC, etc., and research funding agencies like the Department of Science & Technology, Council of Scientific Research (CSIR), Ministry of New and Renewable Energy (MNRE), Ministry of Environment, Forest and Climate Change and State Science, Energy & Environment agencies shall facilitate in fostering and developing quality research, the educational curriculum in the training of future professionals in the field of sustainable development including SDG-11.

Specific immediate actions points for key regulatory bodies are identified as follows:

1. Scrutinize and approve graduate and post-graduate degrees and courses related to the SDGs offered by HEIs.
2. Make standards and guidelines for approval of new universities specialized in Energy, Environment, and Sustainable Research specifically including the UN SDGs.



3. Disburse special funds to the HEIs offering quality education in sustainability and SDGs for further research and growth in the area.
4. Design/approve all India-level specialized tests for entry into the HEIs offering the developed sustainability curriculums. Also include sustainability and SDG-related questions in existing tests like UGC-NET, CSIR-NET, ICAR-NET, etc.
5. Conduct audits to monitor the quality and thoroughness of education and research in the HEIs offering specialized courses and degrees related to SDGs and sustainability.
6. Make recommendations to the central and state governments to bring about positive changes in higher education with reference to sustainability and SDGs for better awareness and for the generation of an adequate number of future professionals who are specialized in the field.

5. Conclusion Along With Prioritization of the Initiatives Recommended

The immediate focus of attention on the sustainable development of humanity is of the utmost importance not only at the government level but at every level of the social hierarchy. Research shows that HEIs are among the key facilitators in the effective design and implementation of sustainable development goals formulated by the United Nations at a global level and for the benefit of all nations. Since HEIs are repositories of knowledge and train young minds, the idea of sustainable development must be sown herein, so that the responsibility of achieving the SDGs is felt at the individual level. The participation of science, policy, industry and society as suggested by the Quadruple and Quintuple Helix Model is one of the most effective ways to achieve innovation, growth, societal development, and the achievement of sustainability goals. SDG-11 directly aims at the creation of sustainable cities and settlements and hence plays a very important role in the future of mankind in a world already facing health disasters, and environmental and climate change-related challenges. Overall, we conclude with a summary of the main recommendations as follows:

- 1) The government must involve HEIs in joint projects related to urban planning, development, and SDG-11 through MoUs or existing policy amendments.
- 2) Research grants must be provided by the UGC, DST, CSIR, ICAR, and other funding agencies to all public and private universities imparting quality education regarding sustainability and SDG-11.
- 3) The state governments must align with the central government for the effective implementation of SDG-11 and monitor the status of related projects through online systems.
- 4) The government must formulate specific policies for the construction of sustainable green buildings or zero energy buildings in their respective states as is being done by the Government of Himachal Pradesh under the Solar House Action Plan.
- 5) The government must promote renewable energy, sustainable technologies, and electric vehicles by making specific policies for the same and providing suitable incentives for their adoption by people and organizations.
- 6) The HEIs that demonstrate a high level of excellence in imparting education related to sustainability and research must be rewarded by the government so that others also follow.



- 7) HEIs must start working for the achievement of SDG-11 by offering undergraduate and graduate level courses and MOOCs related to the same. HEIs must also review their own campuses for compliance with SDG-11 and create a policy for energy, environment, and sustainability.
- 8) HEIs must conduct focused research and projects concerning SDG-11, especially in areas of smart cities, urban planning, green infrastructure, green buildings, the resilience of urban systems and engineering, disaster management, waste management, urban transportation, life expectancy, and death rates, and heritage research. The research in science, engineering, technology, and social sciences at the Master's and Ph.D. levels should focus on SDGs wherever possible.
- 9) Government must introduce the latest sustainable technologies in urban development projects and provide consultancy projects to the HEIs for guidance and research.
- 10) Regulatory bodies like UGC, AICTE, and NAAC must foster the design and approval of new HEIs, degrees, and course curriculums related to sustainability and SDGs, and keep the quality in check.

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12 RESPONSIBLE CONSUMPTION AND PRODUCTION



SDG-12: To Ensure Sustainable Consumption and Production Patterns

Summary

This chapter focuses on SDG-12 which is described as “sustainable consumption and production patterns” and has 11 clear targets to be achieved by 2030. After providing a brief overview of the international and national status and initiatives taken by various HEIs so far, the focus is on recommendations to improve the outcomes. In the present chapter, the implementation strategies and policy recommendations to achieve efficient management of natural resources, disposal of toxic waste and pollutants are presented. In addition, key recommendations involve development of courses and awareness campaigns planning by HEIs and encouraging scientific bodies and increasing provision of grants by regulatory. SDG-12 is related to the idea where, materials designing can be reused, remanufactured, recycled or recovered along with low dissipation of the natural resources. The role of government to construct different related policies and their implementation is highlighted in areas ranging from efficient use of natural resources, reducing chemical waste and food losses, encouraging companies to adopt sustainable practices, and monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products.

Key Recommendations to Achieve SDG-12

- A comprehensive National Chemical Profile assessing the existing institutional, administrative, technical, and legal infrastructure vis-a-vis the requirements of safe handling of chemicals should be prepared.
- Segregation of biodegradable and non-biodegradable wastes and rigorous monitoring of recycling rate and percentage of the city’s solid waste disposal.
- Implementing National Programme for Light Emitting Diode (LED) based Home and Street Lighting in India (LED) bulbs, since they are 10 times more energy efficient compared to ordinary incandescent light bulbs and consume about half the energy compared to compact fluorescents lamps (CFLs) per unit of light generated.
- Research into resistant crop varieties, pest control, better packing and transport, low-cost storage technologies, and post-harvesting solutions by modern technology for example nano-polymer coating for vegetables to increase the shelf life and nano powder as pest control and further record types and quantities of food waste discharges in the faculty and hostel mess.
- Installation of sustainable solutions like PV power plants, solar steam cooking, biogas, and use of low-carbon building construction.
- HEIs should implement best practices in pollution control (including air) and waste management processes and policies for minimization of waste and recycling of wastewater and converting waste to energy.



- Government should address the problems of rapid population growth and migration of rural people to cities for improved sustainable urban planning.
- HEIs should commit to the development of, and investment in the university and the local community to ensure that the campus always remains safe, and green, and provides accessibility for all levels of mobility by working with local and state governments for greater access to and provision of sustainable transport systems including public transport and bike paths.

1 Context and Current Status of SDG-12

1.1 The Context and Current Status

At the 2002 World Summit on Sustainable Development, governments set the goal of minimizing significant adverse impacts on the environment and human health related to the production and use of chemicals by the year 2020. This goal was accompanied by a call for the implementation of the strategic approach to international chemicals management (SAICM), which aims to promote the sound management of chemicals throughout their life cycle. To achieve resource decoupling and impact decoupling, products and materials should be designed to be reused, remanufactured, recycled, or recovered, thereby maintaining them in the economy for as long as possible. The generation of waste, especially hazardous waste, should be avoided or minimized, and greenhouse gas emissions should be prevented or reduced. One way to achieve this is through the implementation of circular economy principles, which focus on reducing waste and maximizing resource efficiency through the reuse, repair, refurbishment, and recycling of products and materials. This can help to decouple economic growth from resource use and environmental degradation. In addition, there is a need for more sustainable consumption patterns, which can be achieved through education and awareness-raising campaigns, as well as through the development of sustainable products and services that meet consumers' needs while minimizing environmental impact. Overall, achieving environmental sustainability while promoting economic growth and welfare requires a holistic approach that takes into account the entire life cycle of products and materials, as well as the broader social and economic context in which they are produced and used.

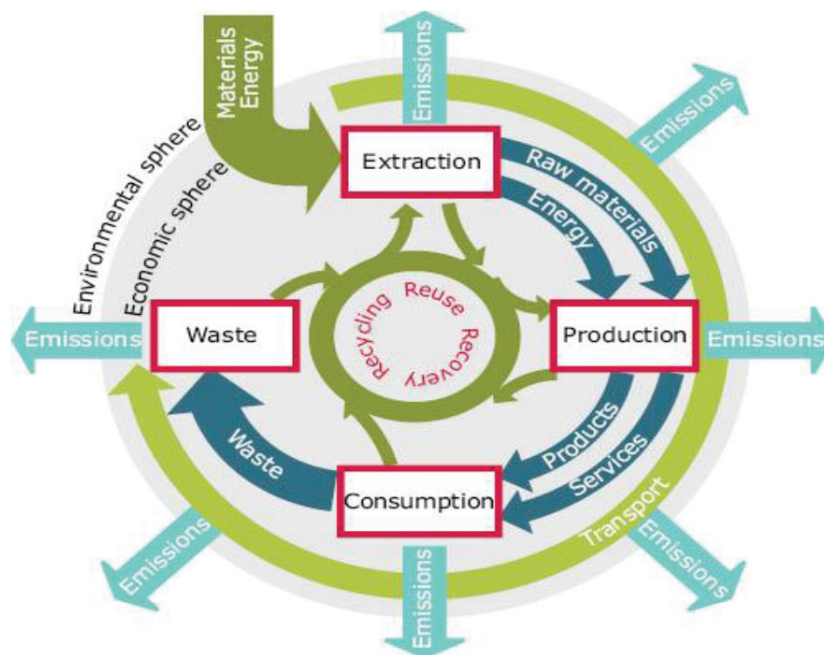


Figure 1: Schematic Representation of the Context and Crux of SDG-12

1.2 United Nations Sustainable Development Goal-12 Targets

To achieve SDG-12, eleven targets have been defined along with indicators to measure the achievement of the targets. These targets are listed as follows:

- ❖ **Target 12.1:** Implement the 10-year Framework of Programmes on Sustainable consumption and production patterns, all countries taking action with developed countries taking the lead, taking into account the development and capabilities of developing countries.
- ❖ **Target 12.2:** By 2030, achieve sustainable management and use of natural resources.
- ❖ **Target 12.3:** By 2030, half of global per capita food waste.
- ❖ **Target 12.4:** By 2030, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.
- ❖ **Target 12.5:** Waste generation should be reduced through prevention, reduction, recycling, and reuse.
- ❖ **Target 12.6:** Encourage companies, especially large and translational companies to adopt sustainable practices and to integrate sustainability information into their reporting cycle.
- ❖ **Target 12.7:** Promote public procurement practices that are sustainable in accordance with national policies and priorities.
- ❖ **Target 12.8:** By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature.
 - ❖ **Target 12.8.a:** Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production.
 - ❖ **Target 12.8.b:** Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products.
 - ❖ **Target 12.8.c:** Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities.

SDG-12 Indicators and Targets in India

Table 1: Justification of Target Indicator List (Data Source: Niti Ayog SDG Index Report 2021)

Indicator	Target (India)	Justification of the Target
12.2 Per capita fossil fuel consumption (in kg.)	64.1	The per capita fossil fuel consumption target of 64.1 kg corresponds to the sustainable development goal (SDG) target 12.2, which aims to achieve sustainable management and efficient use of natural resources by 2030. This target also aligns with SDG target 8.4, which aims to improve global resource efficiency in consumption and production and to decouple economic growth from environmental degradation.
12.4 Percentage use of nitrogenous fertilizer out of total N,P,K, (Nitrogen, Phosphorous, Potassium)	57	The ideal ratio for NPK fertilizer is considered to be 4:2:1, which means that nitrogen (N) should make up 4 parts of the mix, phosphorus (P) should make up 2 parts, and potassium (K) should make up 1 part. This ratio is considered to be balanced and sustainable for plant growth. It also implies that the use of nitrogenous fertilizers (which provide nitrogen) should not exceed 57% of the total mix, since nitrogen is the primary macronutrient provided by NPK fertilizer.

12.5 Hazardous waste generated per 1,000 population (Metric tonnes/Annum)	4.04	The correct target corresponding to SDG 12.5 is to substantially reduce waste generation through prevention, reduction, recycling and reuse. The target is to reduce the per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses, by 2030.
12.5 Quantity of hazardous waste recycled/utilized to total hazardous waste generated (%)	100	SDG target 12.5 aims to "substantially reduce waste generation through prevention, reduction, recycling and reuse" by 2030. This target is part of the broader Sustainable Development Goal 12, which focuses on "ensuring sustainable consumption and production patterns." The goal aims to promote more sustainable patterns of consumption and production, including reducing waste and increasing the efficient use of resources.
12.5 Plastic waste generated per 1,000 population (Tonnes/Annum)	1.27	While SDG target 12.5 aims to substantially reduce waste generation through prevention, reduction, recycling, and reuse, it does not specifically target plastic waste or set a goal of halving the current generation of plastic waste. However, there are other SDG targets that do specifically address plastic waste, such as SDG target 14.1 which calls for preventing. Significantly reducing marine pollution of all kinds, including from land-based activities, and SDG target 14.6 which calls for effectively regulating and managing the harvesting and ending overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implementing science-based management plans.
12.5 Percentage of BMW treated to total quantity of BMW generated	100	This target corresponds to the global SDG target 12.5 that aims to substantially reduce waste generation through prevention, reduction, recycling and reuse
12.a Installed capacity of grid interactive bio power per 10 lakh population (MW)	21.81	The installed capacity of grid interactive bio power per 10 lakh population in India is 21.81 MW, which corresponds to the global SDG target 12.a that aims at sustainable patterns of consumption and production. The target is to achieve the average of the three best performing states in terms of installed capacity of grid interactive bio power per 10 lakh population.

Fossil fuel consumption: On an average, 157.3 kg of fossil fuel was consumed per capita in India in 2020. Goa has the highest fossil fuel consumption of 547 kg per capita. Bihar has the lowest fossil fuel consumption of 51 kg per capita.

Use of nitrogenous fertilizer out of NPK: The excessive use of nitrogenous fertilizer can lead to soil degradation, water pollution, and decreased soil fertility, which can ultimately harm crop productivity and the environment. Therefore, it is important to follow balanced and sustainable fertilizer consumption practices to ensure optimal plant growth and protect the environment. The government of India has implemented several initiatives and programs to promote the balanced use of fertilizers, including the Soil Health Card Scheme, which provides soil nutrient status to farmers and recommends balanced fertilization. Additionally, the government has launched the Fertilizer Subsidy Policy, which promotes the use of fortified fertilizers to ensure balanced and sustainable consumption. As of 2020, the use of nitrogenous fertilizer in the country out of total N, P, K is 64.39 percent, 7.39 percentage points higher than the ideal standards. The percentage use of nitrogenous fertilizer out of total NPK is higher than the target in eleven States and two UTs.

Hazardous waste generation: The hazardous waste generated in the country per 1,000 population is 8.09 metric tonnes per annum (mta) in 2020. Among the States and UTs, Mizoram generates zero tons of hazardous waste per 1,000 population. Gujarat has the highest amount of hazardous waste generation per 1,000 population (50.12 metric tonne per annum).

Hazardous waste recycled/utilized: In 2020, 4.8 million metric tonnes of hazardous waste was recycled/utilised out of 10.7 million metric tonnes of hazardous waste generated. Recycling/ utilising of hazardous waste is the lowest in Sikkim, Delhi, Andaman and Nicobar Islands and Lakshadweep. Jammu and Kashmir and Ladakh, Haryana, Rajasthan and Uttarakhand recycle/ utilise more than 95 percent of the hazardous waste generated

Plastic waste generation: An average of 2.5 tonne of plastic per annum was generated per 1,000 population in India in 2020. Goa generated 21 tonne of plastic per annum per 1,000 population, the highest in the country while Sikkim, Mizoram and Tripura generated the least. Among the UTs, Delhi generated the highest amount of 11.49 tonne of plastic per annum per 1,000 population.

Grid interactive bio-power: As of November 2020, the installed capacity of grid interactive bio-power per 10 lakh population in India is 7.62 MW. Karnataka has the highest at 28.4 MW while Arunachal Pradesh has the lowest. In terms of the installed capacity of grid interactive bio-power, Maharashtra leads the country with a total capacity of 2.6 GW, with ‘nil’ capacity in Arunachal Pradesh.

1.3 Summary of Progress on SDG-12 Implementation Globally

According to the UN Report, each year, an estimated one-third of all food produced- equivalent to 1.3 billion tons worth around USD 1 trillion-ends up rotting in the bins of consumers and retailers or spoiling due to poor transportation and harvesting practices. More than one billion people still do not have access to fresh water. Less than 3% of the world’s water is fresh (drinkable), of which 2.5% is frozen in Antarctica, the Arctic, and glaciers. Humanity must therefore rely on 0.5% for all man’s ecosystems and freshwater needs.

Effective implementation of SDG-12 requires a systemic approach and cooperation among actors operating in the supply chain, from producer to final consumer. It involves engaging consumers through awareness-raising and education on sustainable consumption and lifestyles, providing consumers with adequate information through standards and labelling, and engagement in sustainable public procurement. This will involve a new global partnership between businesses, consumers, policymakers, researchers, scientists, retailers, the media, and development cooperation agencies.

1.4 Initiatives and Achievements of the Indian Government on SDG-12

India is home to 18% world’s population, it has only 4% of global water resources. The generation of waste and pollutants also poses a huge threat and challenge. Only 19.9% of India’s urban waste is processed. India is the third highest emitter of carbon dioxide and is responsible for 6.9 % of global emissions. However, in Oct 2015, India made a commitment to reduce the emissions intensity of its GDP by 20-25% from its 2005 levels by 2020 and by 33-35% by 2030. On 2nd, October 2016, India formally ratified the historic Paris Agreement. The National Policy on Biofuels and the National Clean Energy Fund are some of the government’s flagship schemes aimed at achieving sustainable consumption and production and managing the efficient use of natural resources. Various government schemes have worked towards the achievement of the SDG-12 targets in the past and present like the Jal Shakti Abhiyan Soil health card scheme, *Pradhan Mantri Kisan SAMPDA Yojana*, The Mega Food Park project, and also some other schemes like Skill India, Start-up India, Make in India.

1.4.1 Jal Shakti Abhiyan -I (JSA-I)

This scheme was launched in 2019 in 1592 blocks out of 2836 blocks in 256 water-stressed districts. The interventions under the scheme, such as water conservation and rainwater harvesting, can go a long way in promoting sustainable water use and reducing water scarcity. It’s also encouraging



to see that multiple stakeholders are taking steps towards water conservation. I hope this scheme continues to make a positive impact on the water situation in India.

1.4.2 Soil Health Card Scheme

It is one of the flagship programmes of the Government of India that was launched in February 2015. The Soil Health Card Scheme is a scheme managed by the Integrated Nutrient Management (INM) Division in the Ministry of Agriculture Cooperation and Farmers' Welfare (AC&FW), Government of India (GoI). The scheme was launched in 2015 and aims to help farmers in India know the health condition of their soil based on 12 important soil parameters, such as nitrogen, phosphorus, potassium, pH, EC, organic carbon, sulphur, zinc, boron, iron, manganese, and copper.

1.4.3.1 PM Kisan SAMPADA Yojana

The Pradhan Mantri Kisan Sampada Yojana (PMKSY) is a central sector scheme launched by the Ministry of Food Processing Industries (MoFPI) in 2017. The scheme aims to create modern infrastructure facilities for food processing along the value chain from farm to market with a focus on reducing wastage, increasing efficiency, and enhancing value addition. The scheme has various components, including the creation of food processing infrastructure, expansion of existing food processing units, setting up of cold chains, and support for backward and forward linkages. The PMKSY has been extended till 2025 with an allocation of Rs. 10,000 crores.

1.4.3.2 The Mega Food Park Project

Corporate registered under the Companies Act. State Government, State Government entities and Cooperatives are not required to form a separate SPV for the implementation of Mega Food Park project. Subjectfulfilment of the conditions of the Scheme Guidelines, the funds are released to the SPVs. To view the status of 41 Mega Food Parks funded under the scheme.

1.4.4 Skill India

1.4.4.1 School Initiatives and Higher Education

NSDC (National Skill Development Corporation) is expanding its footprint in the school education space by engaging with more states and UTs and increasing the number of schools it works with. The restructuring of the implementation model for skill development training in schools from a 4-year to a 2-year model is also a positive step, as it allows students to acquire skills at an earlier stage and potentially enter the workforce earlier. The identification of 73 job roles across 21 sectors is commendable and will help students to gain a better understanding of the career opportunities available to them. It's also good to see NSDC partnering with organizations such as Delhi Public School, Kunskapsskolan, and Manav Rachna International University, as this will help to bring in new ideas and approaches to skill development in schools. The pilot project in 100 schools in Haryana focusing on beauty and wellness, IT-ITeS, and retail is a step in the right direction, and it's great to see model IT labs being developed in five schools across five districts in Haryana. These labs will provide students with hands-on experience and exposure to the latest technology, which is essential for success in the digital age. The successful completion of training and facilitation of placements for students through job melas organized in collaboration with education departments across five states is a significant achievement. This will help to bridge the gap between education and employment and provide students with opportunities to gain meaningful employment after completing their education.



1.4.4.2 Setting up of Indian Institutes of Skills

IISs are being established in the country to enhance training standards beyond the current programmes available in the skill eco-system and to provide ‘hands-on skills training to trainees in specialized areas in collaboration with industry, catering to local/ regional industry requirements. The IISs will conduct NSQF-compliant 2-year diploma courses in identified sectors/domains. Providing specialized training to trainees in collaboration with the industry is an effective way to bridge the gap between skills and industry requirements. The focus on vertical mobility through NSQF-compliant 2-year diploma courses is also a positive step towards enabling trainees to aspire for higher positions in their respective fields. Furthermore, the provision of career pathways and academic equivalence will encourage the creation of sectoral experts, which will ultimately benefit the industry and the economy as a whole.

1.4.5 Start-up India

1.4.5.1 The Venture Capital Assistance Scheme

IISs are being established in the country to enhance training standards beyond the current programmes available in the skill eco-system and to provide ‘hands-on skills’ training to trainees in specialised areas in collaboration with industry, catering to local/ regional industry requirements. The IISs will conduct NSQF-compliant 2-year diploma courses in identified sectors/domains. Providing specialized training to trainees in collaboration with the industry is an effective way to bridge the gap between skills and industry requirements. The focus on vertical mobility through NSQF-compliant 2-year diploma courses is also a positive step towards enabling trainees to aspire for higher positions in their respective fields. Furthermore, the provision of career pathways and academic equivalence will encourage the creation of sectoral experts, which will ultimately benefit the industry and the economy as a whole.

1.4.5.2 Support for International Patent Protection in Electronics & Information Technology (SIP-EIT)

1.4.5.2.1 Ministry of Electronics & Information Technology

SIP-EIT stands for the Scheme for Intellectual Property and Entrepreneurship Awareness amongst MSMEs and Technology Startups. It is a scheme launched by the Ministry of Micro, Small and Medium Enterprises (MSMEs) to provide financial support to MSMEs and technology startups for international patent filing. The scheme aims to encourage innovation, recognize the value of the intellectual property (IP), and capture growth opportunities in the Information and Communication Technology Electronics and IT (ICTE) sector

1.4.5.3 Single Point Registration Scheme

1.4.5.3.1 Ministry of Micro Small & Medium Enterprises

The Government is the single largest buyer of a variety of goods. With a view to increasing the share of purchases from the small-scale sector, the Government Stores Purchase Programme was launched in 1955-56. NSIC registers Micro & small Enterprises (MSEs) under the Single Point Registration scheme (SPRS) for participation in Government Purchases.



1.4.5.4 Extra Mural Research or Core Research Grant

1.4.5.4.1 Science and Engineering Research Board (SERB) under the Ministry of Science & Technology

As per the latest information available on the SERB website, the Extramural Research (EMR) funding scheme has been renamed as the Core Research Grant (CRG) scheme. The CRG scheme aims to support individual researchers or a group of researchers working in areas of science and engineering that have the potential to lead to new discoveries and innovations. The scheme provides funding for equipment, manpower, consumables, and other research-related expenses. The objective of the scheme is to encourage and support researchers to pursue independent research.

1.4.5.5 High Risk -High Reward Research

High Risk and High Reward Research is a scheme supporting and inviting new proposals and ideas expected to have a paradigm shifting influence on the Science and Technology

1.4.6 Make in India

It is a major national programme of the Government of India designed to facilitate investment, foster innovation, enhance skill development, protect intellectual property and build best in class manufacturing infrastructure in the country. The primary objective of this initiative is to attract investments from across the globe and strengthen India's manufacturing sector. It is being led by the Department for Promotion of Industry and Internal Trade (DPIIT), Ministry of Commerce and Industry, Government of India. The Make in India programme is an important initiative for the economic growth of India. By attracting investments and strengthening the manufacturing sector, it can create more job opportunities and contribute to the overall development of the country. Additionally, by improving the ease of doing business, eliminating unnecessary regulations, and promoting transparency, it can make India a more attractive destination for foreign investment and promote entrepreneurship and innovation. The programme also focuses on skill development, which can help to enhance the talent pool and increase competitiveness in the global market.



Figure 2: Various Schemes Related to SDG-12 by Government of India

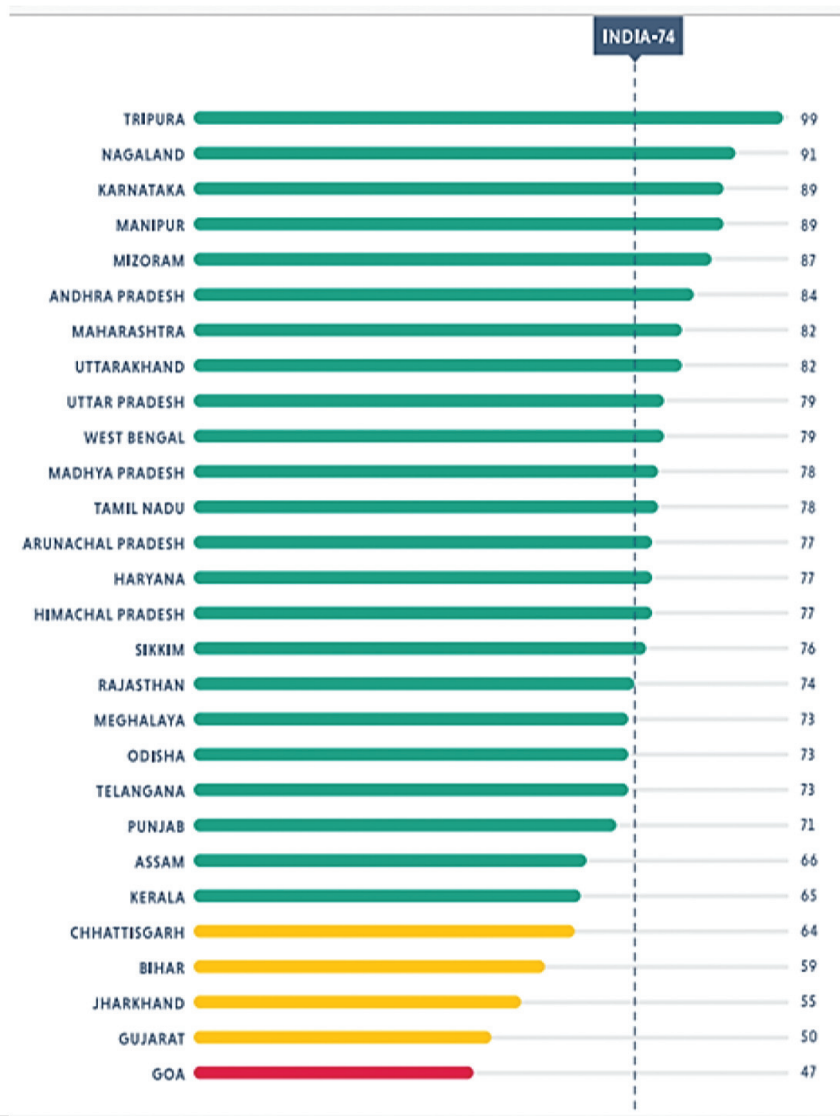


Figure3: SDG 12 Index Score of different States in India

Table 3: Progress of SDG-12 in India in Terms of Targets and Achievements by Various States and Union Territories

Percentage of BMW treated to total quantity of BMW generated	Percentage use of nitrogenous fertilizer out of total N,P,K, (Nitrogen, Phosphorous, Potassium)	Quantity of Hazardous waste recycled/ utilized to total hazardous waste generated	Hazardous waste generated	Plastic waste generated	Per capita fossil fuel consumption	Installed Capacity of grid interactive bio-power
Total: 100	Total: 57	Total: 100	Total: 4.04	Total: 1.27	Total: 64.1	Total: 21.81
Target: 86.91	Target: 64.39	Target: 44.89	Target: 8.09	Target: 2.54	Target: 157.3	Target: 7.62

Highest: States Tamil Nadu, Telangana, Tripura, Uttarakhand, Uttarakhand, West Bengal, Meghalaya, Mizoram, Nagaland, Odisha, Punjab, Uttarakhand, Uttarakhand, Uttarakhand,	Highest States Assam, Bihar, Gujarat, Haryana, Jharkhand, Punjab, Rajasthan, Telangana, Uttar Pradesh, Uttarakhand,	Highest: States: Haryana, Rajasthan, Uttarakhand, Tripura, Andhra Pradesh, Madhya Pradesh, Himachal Pradesh, Odisha, Uttar Pradesh, Karnataka, Telangana, Nagaland, Mizoram, West Bengal, Tamil Nadu,	Highest: States: Gujarat, Odisha, Goa, Tamil Nadu, Tamil Nadu, Jharkhand, Andhra Pradesh, Telangana, Maharashtra, Chhattisgarh,	Highest: States: Goa, Tamil Nadu, Gujarat, Karnataka, Manipur, Punjab, Kerala, Maharashtra, West Bengal, Uttarakhand, Arunachal Pradesh,	Highest: States: Goa, Haryana, Chandigarh, Gujarat, Punjab, Himachal Pradesh, Karnataka, Sikkim, Tamil Nadu, Telangana, Kerala, Maharashtra, Arunachal Pradesh, Uttarakhand, Rajasthan, Meghalaya, Chhattisgarh, Andhra Pradesh,	Highest: States: Karnataka, Maharashtra, Punjab, Tamil Nadu, Uttarakhand, Andhra Pradesh, Uttarakhand, Chhattisgarh,
Highest: UT: Andaman and Nicobar Islands, Chandigarh Dadra and Nagar Haveli Daman and Diu, Delhi, Jammu and Kashmir, Ladakh,	Highest: UT: Puducherry, Dadra and Nagar Haveli, Daman and Diu, Delhi	Highest: UT: Jammu and Kashmir, Ladakh,	Highest: UT: Puducherry,	Highest: UT: Puducherry, Ladakh, Jammu and Kashmir, Andaman and Nicobar Islands, Delhi, Chandigarh,	Highest: UT: Dadra and Nagar Haveli, Daman and Diu, Andaman and Nicobar Islands, Lakshadweep, Puducherry Delhi,	Highest: UT:
Lowest: States: Rajasthan, Sikkim, Manipur, Kerala, Jharkhand, Assam, Bihar, Chhattisgarh,	Lowest: States: Andhra Pradesh, Arunachal Pradesh, Chhattisgarh, Goa, Himachal Pradesh, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Sikkim, Tamil Nadu, Tripura, West Bengal,	Lowest: States: Sikkim, Manipur, Arunachal Pradesh, Meghalaya, Jharkhand, Goa, Maharashtra, Punjab, Chhattisgarh, Assam, Bihar, Kerala, Gujarat, Tamil Nadu,	Lowest: States: Manipur Mizoram, Arunachal Pradesh, Nagaland, Tripura, Bihar, Meghalaya, Uttar Pradesh, Assam, Chandigarh, West Bengal, Uttarakhand, Sikkim, Madhya Pradesh, Punjab, Haryana, Karnataka, Rajasthan, Chhattisgarh,	Lowest: States: Jharkhand, Odisha, Haryana,	Lowest: States: Tripura, Nagaland, Assam, Manipur, Uttar Pradesh, West Bengal, Jharkhand, Madhya Pradesh, Mizoram, Odisha,	Lowest: States: Sikkim, Arunachal Pradesh, Mizoram, Manipur, Nagaland, Tripura, Kerala, Assam, Jharkhand, Goa, Bihar, Gujarat, Himachal Pradesh, Odisha, Madhya Pradesh, West Bengal, Meghalaya, Telangana, Haryana,

Lowest: UT: Lakshadweep,	Lowest: UT: Chandigarh, Andaman and Nicobar Islands, Jammu and Kashmir, Laksh adweep,	Lowest: UT: Lakshadweep, Daman and Diu, Dadra and Nagar Haveli, Andaman and Nicobar Islands, Puducherry, Chandigarh, Delhi,	Lowest: UT: Delhi, Lakshadweep, Andaman and Nicobar Islands, Dadra and Nagar Haveli, Daman and Diu, Jammu and Kashmir, Ladakh	Lowest: UT: Daman and Diu, Dadra and Nagar Haveli, Lakshadweep,	Lowest: UT: Ladakh, Jammu and Kashmir,	Lowest: UT: Dadra and Nagar Haveli, Daman and Diu, Andaman and Nicobar Islands, Puducherry Chandigarh Lakshadweep, Delhi, Jammu and Kashmir, Ladakh
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1.5 HEIs Status: Role of Higher Educational Institutions and Status of Adoption of SDG-12

Times Higher Education (THE) a UK-based company that ranks and reports various universities on the basis of the quality of education has also released rankings based on SDG compliance of various universities. Many universities have activities in line with various SDGs, but only one of the Indian universities have made it to the top 100 of the THE SDG-based ranking in 2021. It is therefore apparent that in order to further improve their ranking as well as do their part in combating environmental change for a better quality of life, all universities must make SDGs an integral part of the organizational policy and culture. HEIs have taken several steps to implement SDG within the curriculum by creating Massive Open Online Courses (MOOCs). In addition, there are several universities and UN-sponsored platforms that have already initiated MOOCs that focus on various SDGs. Some of these courses are listed in Table 4.

Table 4: Some of the MOOC, Coursera, edX, and Swayam Related to SDG-12 Offered by Various HEI and the UN

Sr. No.	Coursera		edX		Swayam	
	Name of courses	Name of University	Name of courses	Name of University	Name of courses	Name of University
1.	Transformation of the Global Food System	Copenhagen University	Water Management	Delft University of Technology	Renewable Energy Engineering: Solar, Wind and Biomass Energy Systems	IIT Guwahati And NPTEL
2.	Sustainable Agricultural Land Management	University of Florida	Solar Energy	Delft University of Technology	Waste to Energy Conversion	IIT Roorkee And NPTEL
3.	Ecosystem Services: A Method for Sustainable Development	University of Geneva	Waste Management and Critical Raw Materials	Delft University of Technology	Environmental Quality Monitoring & Analysis	IIT Madras And NPTEL
4.	Municipal Solid Waste Management in Developing Countries	École Polytechnique Fédérale de Lausanne	Drinking Water Treatment	Delft University of Technology	Soil And Water Conservation Engineering	IIT Kharagpur And NPTEL

5.	Global Environmental Management	Technical University of Denmark	Sustainable Urban Development	Delft University of Technology and Wageningen University & Research	Awareness Programme on Solar Water Pumping System	Indira Gandhi National Open University
6.	Natural Attenuation of Groundwater Contaminants: New Paradigms, Technologies, and Applications	Rice University	Sustainable Energy: Design a Renewable Future	Delft University of Technology	Water and waste water treatment	IIT Roorkee And NPTEL
7.	Introduction to Environmental Law and Policy	University of North Carolina at Chapel Hill			Groundwater hydrology and management	IIT Bombay And NPTEL
8.	Introduction to solar cells	Technical University of Denmark			Electronic Waste Management - Issues and Challenges	IIT Kharagpur And NPTEL
9.	Exploring Renewable Energy Schemes	University of Pennsylvania				
10.	Wind resources for renewable energies	Institute Polytechnique de Paris				
11.	Fundamentals of Global Energy Business	University of Colorado Boulder				

SDG Index Score for Goal 12 ranges between 47 and 99 for States and between 50 and 95 for UTs. Tripura and Ladakh and Jammu and Kashmir are the top performers among the States and the UTs, respectively. Twenty-three States and five UTs bagged a position in the category of Front Runners (score range between 65 and 99, including both). However, Goa fell behind in the Aspirants category (with Index scores less than 50).

2 Recommended Actions for HEIs for the Achievement of SDG-12

Indian HEIs are far from fully incorporating sustainability into their operational systems, with only 50% of the parameters in assessment frameworks found to be currently implemented at nine campuses. This framework emphasizes the need for HEIs to engage with local communities and contribute to sustainable development in the country. The UGC has also issued guidelines for the establishment of Internal Quality Assurance Cells (IQACs) in universities and colleges, which are tasked with developing and implementing quality assurance policies and promoting sustainable practices on campus. Additionally, the government of India has launched initiatives to encourage sustainability in HEIs, such as the Green Campus Initiative (GCI), which provides funding and support for universities and colleges to implement eco-friendly practices on campus. The GCI aims to create a network of green campuses across the country and promote sustainable development in higher education. Overall, there is a growing recognition of the importance of incorporating sustainability and the SDGs in the operations of HEIs in India. Policy initiatives and frameworks are being developed to encourage and support sustainable practices on campus, and there is a need for further collaboration and engagement between universities, policymakers, and local communities to achieve the SDGs.





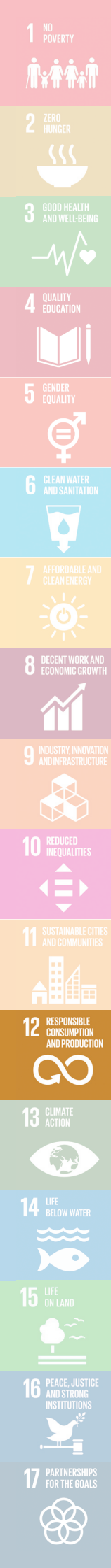
Actions Recommended for HEIs

- **There is a need to strengthen the national and international collaborative trans disciplinary research traditions in universities and colleges**
- **Higher Rank Institutes should run various programs to encourage significant reasoning, opinion, objectives, hypothesis and methodology**
- **HEI can promote entrepreneurship among young faculty, scholars and students through systematic talent hunt, mentorship programs, ideas, innovation, research presentation competitions, annual research seminars and start-up guidance.**
- **Research University/Institute should strengthen faculty development and postdoctoral research fellowship programs in all disciplines and also promote academic and research ethics and integrity**

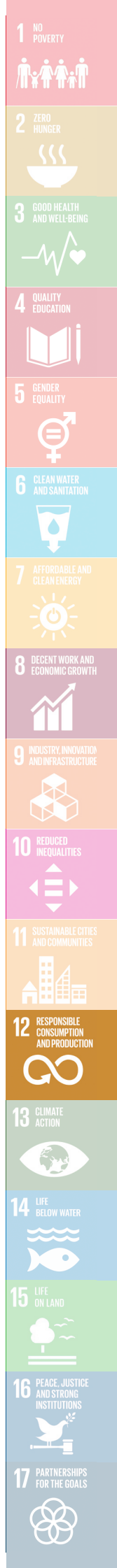
Figure 4: Actions Recommended for HEIs for Implementation of SDG-12

Table 5: Recommended Actions for HEIs for Implementation of SDG-12

SDG-12 Targets	Recommended Actions for HEIs
12.1	<ol style="list-style-type: none"> 1. Promoting interdisciplinary research and collaboration among different faculties and departments within universities to address sustainability challenges from different perspectives. 2. Encouraging universities to adopt sustainable procurement policies that prioritize environmentally and socially responsible products and services. 3. Developing partnerships between universities and local communities to address sustainability challenges, such as waste management, energy efficiency, and biodiversity conservation. 4. Investing in green infrastructure on university campuses, such as renewable energy systems, green buildings, and sustainable transportation options, to demonstrate sustainable practices and serve as living laboratories for sustainability education. 5. Promoting student-led sustainability initiatives and projects, such as community gardens, recycling programs, and alternative transportation options, to foster a culture of sustainability on campus and in the wider community. 6. Offering sustainability-focused degree programs and courses to equip students with the knowledge and skills necessary to address global sustainability challenges in their careers. 7. HEI's can design and ensure the sustainability of waste management infrastructure, and responsible consumption and production culture. For Example technology used by Taiwan in the plastic <i>waste</i> sector is supporting a circular economy: lessons for developing countries.
12.2	<ol style="list-style-type: none"> 1. Implementing water conservation practices in HEIs such as low-flow showerheads, water-efficient toilets, and fixing leaks can significantly reduce water consumption. 2. Utilizing renewable energy sources such as solar panels and wind turbines can help reduce energy consumption and greenhouse gas emissions. 3. Encouraging sustainable transportation options such as cycling, walking, and public transportation can reduce carbon emissions from transportation and promote a healthier lifestyle. 4. Implementing waste reduction and recycling programs in HEIs can significantly reduce the amount of waste sent to landfills.



	<ol style="list-style-type: none"> Engaging the campus community in sustainability initiatives through awareness campaigns, events, and educational programs can help create a culture of sustainability in HEIs. Organize workshops and conferences on sustainable management and use of natural resources Provide the educational opportunity for our students to acquire the knowledge and skills needed to promote sustainable development Reducing all waste (including hazardous waste) and increasing recycling
12.3	<ol style="list-style-type: none"> Implementing food waste reduction campaigns and awareness-raising programs for students, faculty and staff. These campaigns can educate people about the environmental impact of food waste, the benefits of reducing food waste, and practical strategies for reducing waste. Collaboration with local food banks and charities to donate excess food from campus dining facilities to those in need. This can help reduce food waste while also providing valuable resources to people in the community who may be food insecure. Conducting regular audits of food waste in campus dining facilities to identify areas for improvement and track progress over time. This can help inform future waste reduction strategies and demonstrate the effectiveness of current efforts. Investing in composting infrastructure and encouraging the composting of food waste generated on campus. Composting can help reduce the amount of food waste that ends up in landfills, while also creating nutrient-rich soil that can be used in campus gardens or donated to community gardens.
12.4	<ol style="list-style-type: none"> Establishment and improvement of Recycling centres for the segregation of wastes (glass bottles aluminum cans, and plastics) into biodegradable and non-biodegradable waste to ease the process of recycling and minimize land pollution Awareness camps in communities teaching them methods of sustainable consumption and disposal of waste. Introducing them to different bins for different types of wastes Establishment of special deposition Centres for disposal of domestic hazardous waste Improving recycling of textiles based on lessons from policies for other recyclable materials. Organic waste from tree trimmings can be stockpiled for future reuse. Hazardous medical waste produced should be disposed of on campus by professional specialist contractors
12.5	<ol style="list-style-type: none"> HEIs can also promote the use of circular economy principles, which focus on minimizing waste and keeping resources in use for as long as possible. This can be achieved through the adoption of sustainable practices such as recycling, upcycling, and waste reduction strategies. HEIs can also work with local businesses and communities to establish circular economy networks. Another important initiative that HEIs can undertake is the development and promotion of sustainable food systems. This includes sourcing local and organic produce, reducing food waste, promoting plant-based diets, and supporting sustainable farming practices. HEIs can also establish campus gardens or partner with local farmers to provide fresh, healthy, and sustainable food options for their students and staff. HEIs can also promote sustainable transportation by encouraging the use of public transportation, carpooling, biking, or walking. They can provide facilities such as bike racks, showers, and changing rooms to support these options. HEIs can also adopt green transportation policies and incentivize sustainable commuting behaviors among their students and staff.
12.6	<ol style="list-style-type: none"> Investigate the role of artificial intelligence, machine learning and soft computing inappropriate waste management. Organize workshops for waste management and educate people to prevent, reduce, recycle and reuse waste the at micro-level. Appropriate research is required in reusing waste in the construction industry. Develop alternative technologies to reduce impacts of waste on the environment.



12.7	<ol style="list-style-type: none"> Appropriate awareness of Green Public Procurement (GPP), and Sustainable Public Procurement (SPP) throughout the country is required through education and various training programs for the common people. Courses on quantitative analysis of SPP and GPP is required. Provide an educational opportunity for our students to acquire the knowledge and skills needed for start-ups to promote local culture and products.
12.8	<ol style="list-style-type: none"> Organize workshops for waste management and educate people to prevent, reduce, recycle and reuse the waste Installation of sustainable solutions like PV power plants, solar steam cooking, biogas flow-carbon-carbon building construction Take up projects with govt. agencies to promote research and development interlinked with SDGs Use of solar/ electric carts for internal transportation within the university or institution Construction of waste recycling plants and proper segregation of biodegradable and non-biodegradable wastes
12.a	<ol style="list-style-type: none"> National and international collaborative transdisciplinary research traditions in universities and colleges could be strengthened by motivating young faculty to take on projects based on national problems pertaining to social, educational and economic aspects of development. Higher Rank Institutes should run various programs to encourage significant reasoning, opinion, objectives, hypothesis and methodology. Research Universities/Institutes should strengthen faculty development and postdoctoral research fellowship programs in all disciplines and also promote academic and research ethics and integrity
12.b	<ol style="list-style-type: none"> Engaging staff and students in all sustainable campus activities Provide the educational opportunity for our students to acquire the knowledge and skills needed for start-ups to promote local culture and products To encourage faculty, research scholars and students to undertake basic /applied/ action research projects with the engagement of the people in the larger framework of national priorities, policies and public good
12.c	<ol style="list-style-type: none"> Organize workshops for waste management and educate people to prevent, reduce, recycle and reuse the waste Appropriate research is required in reusing wastes in construction industry

3 Proposed Research Agenda for HEIs and Governmental Bodies

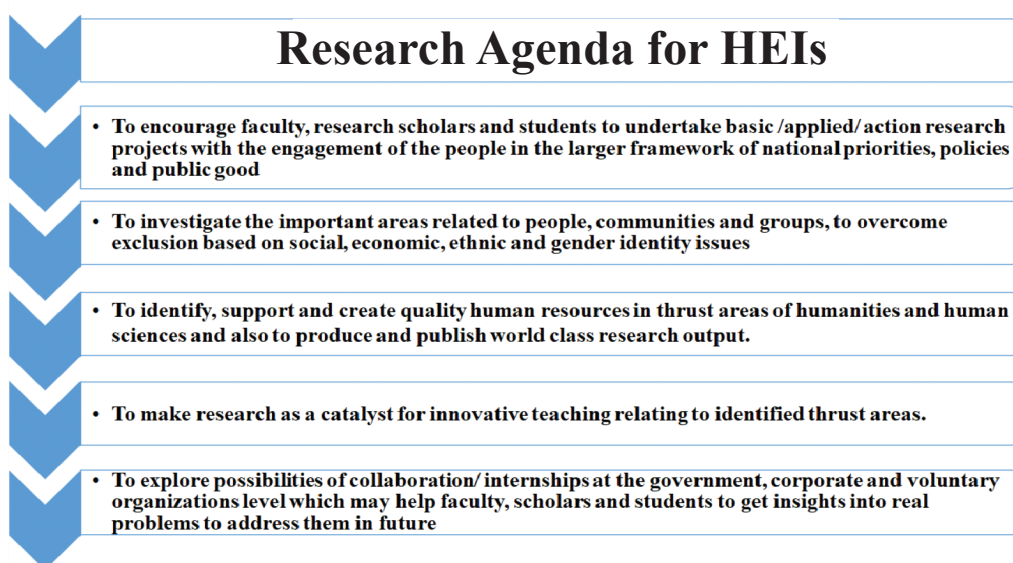


Figure5: Research Agenda for HEIs for Implementation of SDG-12

Academic disciplines can indeed pose a challenge to the institutional integration of the SDGs (Sustainable Development Goals) in teaching and research activities at Higher Education Institutions (HEIs). One of the main reasons for this challenge is that academic disciplines are often siloed, with their own specific frameworks, methodologies, and theories. This can make it difficult to integrate the SDGs across different disciplines, as each discipline may have its own way of understanding and approaching sustainable development. Another challenge is that some disciplines may not see the relevance of the SDGs to their field or may view them as outside of their purview. For example, a discipline like mathematics may not immediately see how it can contribute to sustainable development, which can create barriers to incorporating the SDGs into its teaching and research. Furthermore, the SDGs require an interdisciplinary approach, which can be challenging to achieve within traditional disciplinary structures. This requires HEIs to develop new interdisciplinary programs and collaborations that bridge disciplinary boundaries and integrate the SDGs. To overcome these challenges, HEIs need to create a culture of sustainability that emphasizes the importance of the SDGs and their relevance to different disciplines. This can be achieved through faculty development programs that promote interdisciplinary approaches, cross-disciplinary research projects, and the incorporation of the SDGs into the curriculum across different disciplines. HEIs can also create new interdisciplinary departments or programs that focus specifically on sustainable development, bringing together experts from different disciplines to collaborate on research and teaching initiatives. Finally, HEIs can work to create partnerships with other institutions and stakeholders outside of academia to help bridge disciplinary boundaries and address sustainability challenges in a holistic way.

Table 6: Key Activities and Key Research Areas or Models for Different Fields of SDG-12

Research Agenda	Key Research Areas or Models	Key Activities
Energy	Renewable Energy Engineering: Solar, Wind, and Biomass Energy Systems	First and foremost, the leadership of HEIs and universities must encourage institution-wide appreciation of and learning about SDGs. Platforms of Vice-Chancellors and university presidents must put this urgently on their agenda. National and provincial ministries responsible for higher education policy and Higher Education Councils in all countries must encourage, mandate and resource such shifts towards linking the core functions of HEIs and universities to SDGs. Renewable Energy Engineering: Solar, Wind and Biomass Energy Systems
Ecosystem Services	Sustainable Agricultural Land Management, Method for Sustainable Development	Associations of teachers, researchers and universities can play a mobilising role to generate demand for such an engagement with SDGs. Such networks and associations can place SDG on the agenda of their forthcoming meetings.
Environmental Quality Monitoring & Analysis	Waste to Energy Conversion, Environmental Quality Monitoring & Analysis, Municipal Solid Waste Management in Developing Countries	Students can become key champions of higher education engagement with SDGs. Local, national and international student associations can focus on SDGs in their forthcoming meetings, thereby generating demand for university authorities to act.

Soil And Water Conservation	Soil And Water Conservation Engineering, Awareness Programme on Solar Water Pumping System	International networks and associations of universities and their leaders can do likewise to promote engagement with SDGs. The International Association of Universities (IAU) is one such example. The Association of Commonwealth Universities (ACU) had taken a lead in the run-up to SDGs and made great contributions. Other regional and sectoral associations can also be so mobilised. GUNI has created a panel of experts which continue to promote integration of SDGs in HEIs.
Technologies and Applications	Water and waste water treatment, Groundwater hydrology and management, Natural Attenuation of Groundwater Contaminants: New Paradigms, Technologies, and Applications	UNESCO has a special role to play in this regard. Its regional and national associations and offices should be proactively convening dialogues with universities to promote such engagement with SDGs.
Electronic Waste Management	Electronic Waste Management - Issues and Challenges, Fundamentals of Global Energy Business	India's large and rapidly growing higher education sector needs to urgently focus its core functions of teaching and research on the SDGs. Not only will their enormous educational and intellectual resources be valuable for finding local solutions to the SDGs, but they will also be able to mobilise future generations to pay attention to sustainability challenges in the decade ahead.

4 Recommendations for Government and Regulatory Bodies for Achievement of SDG-12

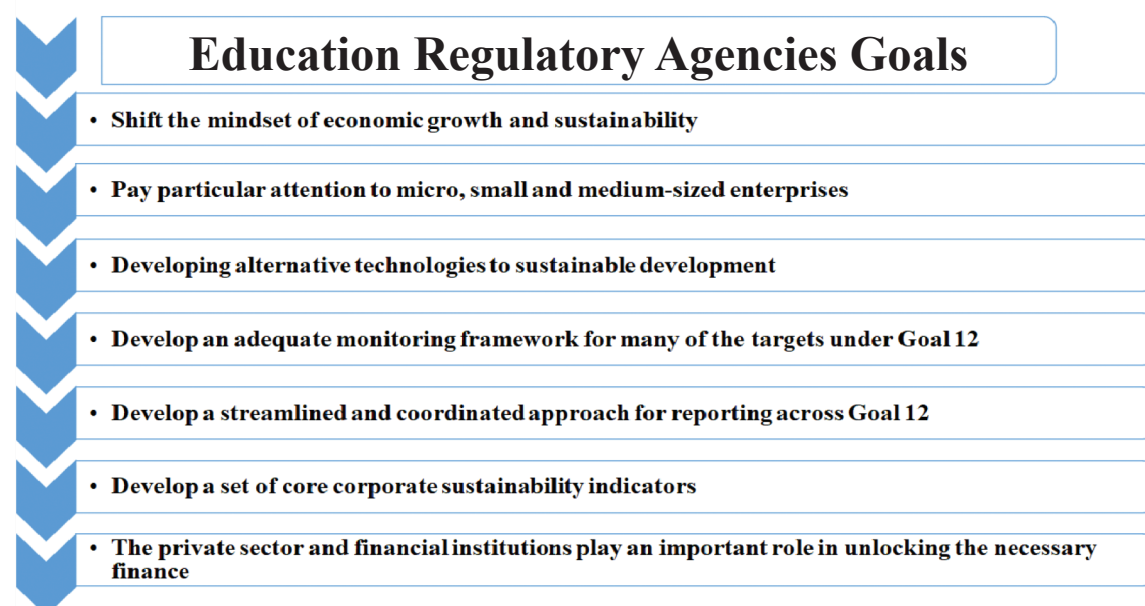


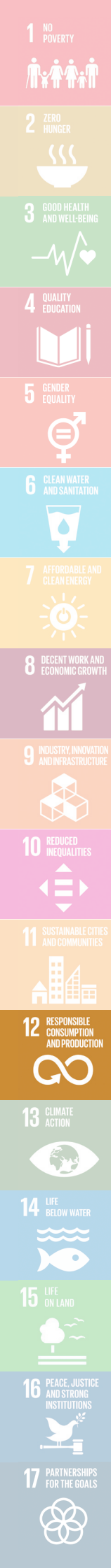
Figure6: Education Regulatory Agencies' Goals for Implementation of SDG-12

4.1 Recommendations for Government

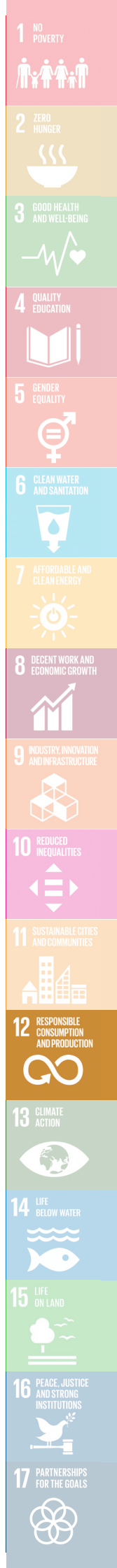
The recommended actions for the Government/policymakers for effective implementation of SDG-12 are given in Table 7.

Table 7: Recommendations for Government for the Achievement of SDG-12

SDG-12 Targets	Recommended Actions for Government/ Policy Makers
12.1	<ol style="list-style-type: none"> 1. The government and regulatory bodies should create policies and regulations that incentivize sustainable consumption and production practices. This could include tax credits for companies that adopt sustainable practices, subsidies for sustainable products, and penalties for companies that do not adhere to sustainability standards. 2. The government should work with businesses to promote sustainable supply chain practices. This could include partnering with businesses to reduce waste, promote sustainable transportation methods, and create sustainable packaging solutions. 3. The government and regulatory bodies should work together to educate the public about sustainable consumption and production patterns. This could include public awareness campaigns, education programs in schools and universities, and community engagement programs. 4. The government should promote international collaboration to address global sustainability challenges. This could include partnerships with other countries to share best practices, promote sustainable trade, and collaborate on sustainable development goals. 5. The regulatory bodies should monitor and evaluate the implementation of sustainable consumption and production patterns. This could include measuring the impact of policies and regulations on sustainability, and regularly reporting progress to the public.
12.2	<ol style="list-style-type: none"> 1. To encourage the use of new equipment for fuel resource exploitation, policymakers could consider: 2. Providing incentives such as tax credits or subsidies for companies that invest in more sustainable and efficient technology. 3. Implementing regulations that require companies to use newer and cleaner equipment in order to obtain permits for resource extraction or transportation. 4. Collaborating with international organizations to develop and promote best practices for sustainable resource exploitation across all countries and industries. 5. To encourage foreign investment in clean energy development, policymakers could consider: 6. Providing financial incentives or tax breaks for foreign companies that invest in renewable energy projects in the country. 7. Establishing partnerships with international organizations or other countries to share knowledge and resources for sustainable energy development. 8. Developing and enforcing environmental standards and regulations that make it more attractive for foreign companies to invest in clean energy rather than traditional fossil fuels. 9. To better link political, social, and economic targets with renewable energy development, policymakers could consider: 10. Conducting comprehensive assessments of the environmental and social impacts of different energy policies and projects. 11. Creating cross-sectoral collaborations between government agencies, businesses, and civil society organizations to promote sustainable energy development. 12. Developing education and awareness campaigns to increase public understanding and support for renewable energy and its benefits for the economy, environment, and society.



12.3	<ol style="list-style-type: none"> 1. Providing proper storage and transportation facilities for agricultural produce to prevent food wastage. 2. Urban organic agriculture can contribute to food security, counter trends to processed foods and reduce transportation of food by emphasizing localization, health, soil conservation, biodiversity, recreation, local identification, and social cohesion. 3. Cutting food waste can significantly reduce a city’s consumption-based carbon footprint. For example, in the case of Bristol, the city’s consumption-based emissions are three times the production-based emissions, largely due to the impacts of imported food and drink. 4. It is recommended to develop a food loss and waste measurement protocol, which should be globally applicable to enable consistency, comparability, and transparency across users. Promoting sustainable diets and healthy eating habits, such as reducing meat 5. Promoting sustainable diets and healthy eating habits, such as reducing meat consumption and increasing consumption of plant-based foods.
12.4	<ol style="list-style-type: none"> 1. Developing partnerships between; manufacturers of consumed products, governments (administrative and education departments and ministries) and businesses which play a role in making “green” decisions and developing policy frameworks for waste prevention, and the consumers who are the active participants in the waste management system, must all be considered in the analysis. 2. The global uptake of this standard as well as accompanying analyses should be encouraged to improve the consistency of data 3. Encouraging the adoption of circular economy principles, which prioritize waste reduction and resource efficiency, can also play a significant role in reducing waste generation and promoting sustainable consumption and production. This can include practices such as designing products for longevity and recyclability, implementing closed-loop systems for materials and waste, and developing business models that prioritize product-service systems over ownership-based consumption. 4. There is a need for more systematic data and impact assessment of chemicals production and consumption, in order to ensure that new technologies (e.g. nanotechnology, detergent enzymes, biocatalysts) reduce energy use and pollution without harming health and environment.
12.5	<ol style="list-style-type: none"> 1. Identification Criteria for Hazardous Industrial Wastes 2. Measurement for the collection, clearance and treatment of waste articles and containers 3. Industrial waste storage, collection and processing methods and implementation standards 4. Implementation of extended producer responsibility (EPR) programs that hold producers responsible for the disposal of their products, including e-waste. 5. Setting up collection centers for e-waste to facilitate its proper disposal and recycling, including public awareness campaigns to encourage individuals to bring their e-waste to these centers. 6. Implementation of regulations to prevent the export of e-waste to developing countries, where it is often disposed of unsafely. 7. Collaboration between governments and the private sector to develop innovative solutions for e-waste management, including the use of advanced technologies for recycling and disposal. 8. Encouraging research and development of new materials and technologies that are more sustainable and environmentally friendly. 9. Education and training programs for workers in the e-waste management industry, to ensure safe handling and disposal practices.



12.6	<ol style="list-style-type: none"> Facilitate a rational, equitable and integrated approach to addressing the life-cycle impacts of products in relevant international agreements. Survey companies about their motivations for life cycle assessment adoption and understand the impact of initiatives promoting its use in industry reporting practices. Focus on sustainable innovation practices by considering sustainability orientation, design of innovation process, and cooperation with stakeholders. Ensure training of distributors to enhance the service quality of brand products. Encourage energy-efficient resources for energy-intensive production processes.
12.7	<ol style="list-style-type: none"> Development of a comprehensive monitoring system to track the implementation and impact of SPP and GPP policies across various sectors and levels of government. Encouraging the participation of private sector firms in SPP and GPP through incentives and support programs. Promotion of green public procurement in international trade agreements to encourage global adoption of sustainable procurement practices. Collaboration between government, civil society organizations, and private sector stakeholders to develop and implement sustainable procurement policies and practices. Integration of life cycle assessment and other sustainability assessment tools into procurement decision-making processes to ensure the long-term environmental and social sustainability of purchased goods and services.
12.8	<ol style="list-style-type: none"> Installation of sustainable solutions like PV power plants, solar steam cooking, biogas and low carbon building construction Environmental pollution increases due to trade openness, because most developed countries transfer their outdated, often polluting equipment to developing countries. This decreases environmental pollutants in developed countries due to utilisation of advanced technology and renewable energy

4.2 Recommendations for Regulatory Bodies

Shift the mindset of economic growth and sustainability: The shift in mindset from economic growth to sustainability requires a fundamental change in the way we view the world and our place in it. Instead of seeing the economy as separate from nature, we need to recognize that it is a subset of nature and that our well-being depends on the health of the natural systems that sustain us. One way to shift the mindset is to adopt a “circular economy” approach, which prioritizes resource efficiency, waste reduction, and renewable energy. This means designing products and systems to minimize waste and pollution, using renewable resources wherever possible, and creating closed-loop systems where waste is transformed into new resources. Another way to shift the mindset is to adopt a more holistic approach to measuring progress and well-being. Instead of relying solely on GDP (Gross Domestic Product) as a measure of economic success, we need to consider a broader range of indicators that reflect social, environmental, and economic well-being. This could include metrics such as access to clean air and water, social equity, and biodiversity.

Pay particular attention to micro, small and medium-sized enterprises: Micro, small, and medium-sized enterprises (MSMEs) are critical to economic development and job creation, particularly in developing countries. However, these enterprises often face significant challenges in enhancing resource and energy efficiency, due to limited resources, lack of access to financing, and limited technical capacity. To address these challenges, it is essential to develop tailored policies and programs that support MSMEs in adopting sustainable practices. This could include providing technical assistance and training, access to financing, and incentives to encourage sustainable practices. One example of such a program is the Green Industry Platform, which provides support to MSMEs in developing countries to adopt resource-efficient and low-carbon practices. The program

offers technical assistance, training, and access to financing and markets to help MSMEs transition to sustainable practices. Another example is the Eco-Innovation Observatory, which provides information and support to MSMEs in Europe to develop eco-innovative products and services. The program offers access to technical expertise, funding, and networking opportunities to help MSMEs improve their resource and energy efficiency and reduce their environmental impact.

Develop an adequate monitoring framework for many of the targets under Goal 12: Goal 12 of the United Nations Sustainable Development Goals (SDGs) focuses on ensuring sustainable consumption and production patterns. The targets under this goal cover a wide range of issues, including resource efficiency, waste reduction, sustainable procurement, and environmentally sound management of chemicals and waste. To monitor progress towards these targets, an adequate monitoring framework is essential. However, many of the indicators under Goal 12 remain at Tier III, meaning that no internationally established methodology or standards are yet available for the indicator. This presents a significant challenge to monitoring progress towards Goal 12 and identifying areas that require further attention. To address this challenge, it is necessary to develop and implement robust monitoring frameworks for the indicators under Goal 12. This could involve the development of standardized methodologies, data collection tools, and reporting mechanisms that allow for consistent and comparable data across countries and regions.

Develop a set of core corporate sustainability indicators. Corporate sustainability indicators are essential tools for tracking and reporting on the environmental, social, and governance (ESG) performance of companies. They provide stakeholders with information on how companies are managing their impacts on the environment and society and help to hold them accountable for their sustainability commitments. To develop a set of core corporate sustainability indicators, it is necessary to undertake methodological work that aligns with overall SDG monitoring. This involves developing standardized methodologies, data collection tools, and reporting mechanisms that allow for consistent and comparable data across companies and sectors. One approach to developing such indicators is to engage in multi-stakeholder partnerships that involve companies, investors, civil society organizations, and standard-setting bodies. These partnerships can help to build consensus on the indicators, methodologies, and reporting mechanisms, and ensure that they are relevant and responsive to the needs of different stakeholders. Finally, it is essential to ensure that the indicators are relevant and responsive to the needs of different stakeholders, including investors, consumers, and civil society organizations. This means engaging in regular dialogue and consultation with these stakeholders to ensure that the indicators reflect their priorities and concerns.

The private sector and financial institutions play an important role in unlocking the necessary finance: Achieving the targets of SDG 12 on sustainable consumption and production will require significant investment in sustainable infrastructure, innovation, and business models. However, SDG 12 is currently the least well-resourced of all SDGs, and there is a significant financing gap that needs to be bridged to support actions that are transformational and at scale. In this context, the private sector and financial institutions have an essential role to play in unlocking the necessary finance for SDG 12. To mobilize private investment, it is necessary to create an enabling environment that incentivizes and rewards sustainable business practices. This could involve the introduction of fiscal policies, such as tax incentives and green bonds, that encourage private sector investment in sustainable infrastructure and technologies. Promoting sustainable finance involves encouraging financial institutions to incorporate ESG factors into their investment decisions and risk management processes. This could involve developing ESG disclosure standards, promoting the use of ESG ratings and indices, and providing training and capacity-building support to financial institutions to integrate ESG factors into their investment decision-making. Innovative financial instruments, such as green bonds, green loans, and impact investing, can also play a critical role in supporting sustainable consumption and production. These instruments allow investors to finance specific sustainable projects and businesses, providing a clear link between investment and sustainability outcomes.

5 Conclusion Along With Prioritization of the Initiatives Recommended

Developed countries have a responsibility to decouple economic growth from increased consumption of resources and to transform their own economies to a more sustainable pattern. They can also make an important contribution to developing countries by reducing the overall burden they place upon the planet and its resources. Businesses have a role to play in finding new solutions that enable sustainable consumption and production patterns, and individuals can also make a difference by reducing their waste and being thoughtful about what they buy. In addition, there is a need for more systematic data and impact assessment of chemicals production and consumption, and for policies that can help delink private vehicle ownership from rising incomes. Urbanization and economic growth are also drivers of increasing waste generation in Africa and Asia, and solutions are needed to address this challenge. Currently, we lose 13.8 per cent after harvesting and during transport, storage and processing alone, amounting to a cost of over \$400 billion a year. The information provided highlights the need for businesses and individuals to adopt more sustainable consumption and production patterns in order to reduce waste and pollution, and improve the overall environmental and social impact of products and services. It is important for businesses to have a better understanding of the environmental and social impacts of their products and services, and to identify areas where interventions can have the greatest potential to improve the overall sustainability of the system. Individuals can also contribute to sustainable consumption and production by reducing waste and being thoughtful about their purchasing choices. This can include carrying reusable bags, refusing to use single-use plastics like straws, and recycling plastic bottles. Additionally, providing deposition centres for the disposal of hazardous waste can help to reduce pollution and protect the environment. Innovation and design solutions can also play a role in enabling and inspiring individuals to lead more sustainable lifestyles, while reducing environmental impacts and improving overall well-being. Ultimately, a collective effort from both businesses and individuals is necessary to achieve sustainable consumption and production patterns and address the environmental and social challenges we face today

HEI has wider role in attaining SDG-12 by sensitizing the students and faculty and even the non-teaching staff due to the fact India's higher education sector is the third largest in the world. There are 1019 universities, more than 10,000 professional technical institutes and 42,000 colleges, in both the public and private sectors.

- Framing of policies and provision of incentives: Governments and institutional leaders can play a key role in formalizing sustainable development policies on campuses. Policies can help to guide sustainable practices and provide a framework for implementing and tracking progress towards sustainable development goals. Incentives, such as grants or awards, can also motivate institutions to prioritize sustainability in their operations and practices.
- Monitoring, verification, and reporting mechanism: It is important to develop a mechanism to monitor and verify sustainability performance on campuses. This can help institutions to identify areas where they need to improve and track progress towards sustainability goals. Reporting mechanisms can also help to increase transparency and accountability, and enable benchmarking and sharing of best practices.
- Adequate credits for SDGs courses: Allocating adequate credits for SDGs-focused courses can help to ensure that students develop a comprehensive understanding of sustainable development issues. This can also incentivize institutions to offer more courses on sustainable development topics.
- Translation of knowledge to planning and executing agencies: HEIs can play a crucial role in translating knowledge and research findings to planning and executing agencies to inform policy-making and decision-making processes. Developing effective communication channels and partnerships between HEIs and agencies can facilitate this process.



- Emphasis on SDGs-based projects: Encouraging HEIs to prioritize SDGs-based projects can help to accelerate progress towards sustainable development goals. Governments can provide support for such projects by offering funding and making them a priority in funding decisions.
- Focus on research and innovation for SDGs: HEIs can also contribute to sustainable development through research and innovation. Encouraging research on SDGs can help to identify new solutions and technologies that can accelerate progress towards sustainable development goals.

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Annexure -1: Case Studies

It is important to note that while HEIs in developed countries are already implementing policies and measures to support sustainable development, developing countries such as India require greater resources and incentives to do the same. In India, the focus is on reducing energy consumption and increasing the generation of renewable energy on campuses. Despite the mandate for environmental education at all levels of formal education in India, formal policy initiatives have not fully reflected this. Therefore, government support, continuous monitoring mechanisms, and policy framing are crucial to achieving sustainable development goals in Indian HEIs. The study examined nine Indian HEIs that deliver technical education on residential campuses, funded by the central government, and located in composite climates as defined by the Energy Conservation Building Code of 2007. These institutions are encouraged to work towards sustainable development as per the directive of the Ministry of Human Resource and Development. The selected HEIs, being the premier institutions for technical education in India, were more likely to act as good examples of sustainable campuses for other HEIs. These institutes are:



1. The Indian Institute of Technology, Roorkee (IITR)
2. The Indian Institute of Technology, Delhi (IITD)
3. The Delhi Technological University (DTU)
4. Giani Zail Singh College of Engineering and Technology (GZSCET), Bhatinda, Punjab
5. The National Institute of Technology, Jalandhar (NITJ), Punjab
6. The National Institute of Technology, Kurukshetra (NITK), Haryana
7. Deenbandhu Chotu Ram University of Science and Technology (DCRUST), Murthal, Haryana
8. Punjab Engineering College (PEC), Chandigarh
9. Netaji Subhas Institute of Technology (NSIT), Delhi

The following parameters were taken into account for SDG-12

Academics: This parameter focusses on formal education programmes, courses and research that deals with SD. In addition to formal education programmes and research, it is important for universities to integrate sustainability principles into all aspects of campus life. This includes campus operations such as waste management, energy use, and transportation. The study found that all nine campuses have taken steps to improve campus sustainability, including the implementation of energy efficiency measures, waste reduction and recycling programs, and the promotion of sustainable transportation options. However, there is room for improvement, particularly in the area of sustainable food systems. Overall, the study suggests that while Indian HEIs have made progress in integrating sustainability into their operations and curriculum, there is a need for greater policy support, monitoring mechanisms, and incentives to promote holistic SD across campuses. The study recommends that all HEIs in India should be encouraged to adopt a sustainability strategy that includes formal education, research, and campus operations, and that these efforts should be supported by government policies and funding mechanisms.

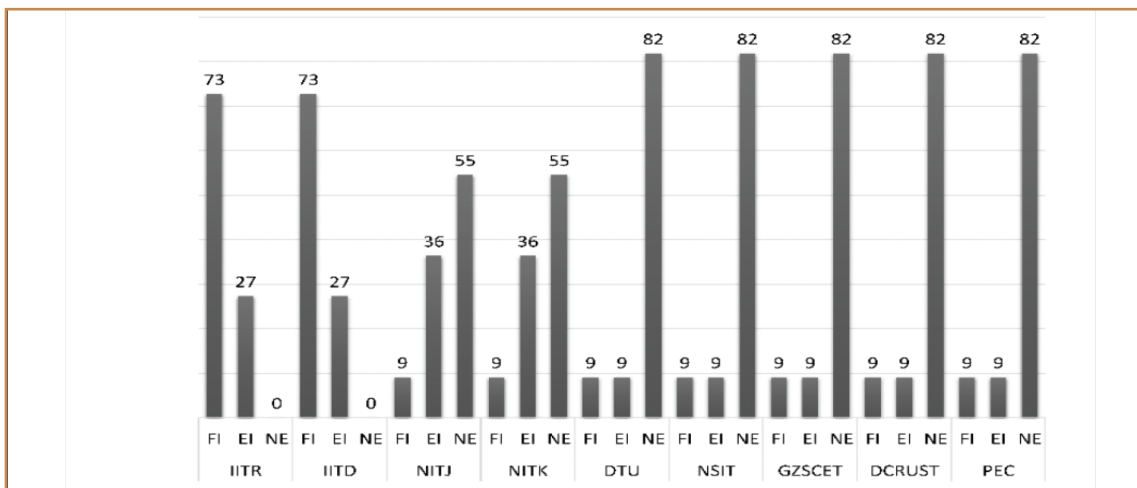


Figure A.1: Percentage Adherence (%) of Individual Campuses to Academic's Parameter

Waste: Figure 2 shows that with the exception of the IITD and NSIT, no efforts are being taken towards promoting sustainable solid waste management programmes; for all other campuses the “no evidence” (NE) category rating was 100%. It is important to note that waste management is a crucial component of sustainable development, and HEIs should prioritize implementing sustainable waste management programs. The results show that only IITD and NSIT have taken steps towards promoting sustainable solid waste management programs. It is recommended that other campuses take immediate action to implement solid waste management programs and appropriate sewerage disposal.

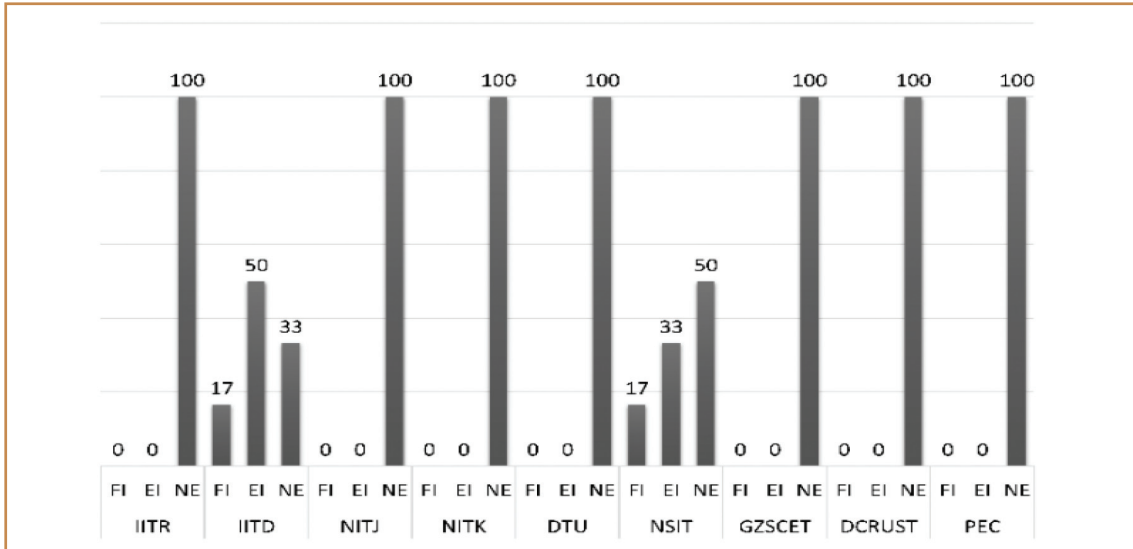


Figure A.2: Percentage Adherence of Individual Campuses to Waste Parameter

Water: This parameter focusses on reducing water usage increasing water conservation and ensuring good quality water. Due to the absence of water use monitoring and conservation policies, compliance with this parameter was zero at the IITR and the DTU (100% NE rating). Additionally, it is important to note that there is a need to address water quality issues, such as ensuring access to safe drinking water and proper treatment of wastewater before disposal. This can be achieved through the implementation of appropriate water treatment technologies and the development of policies and regulations to ensure compliance. Overall, there is a need for Indian HEIs to take a more comprehensive approach to water management, addressing both usage and quality issues.

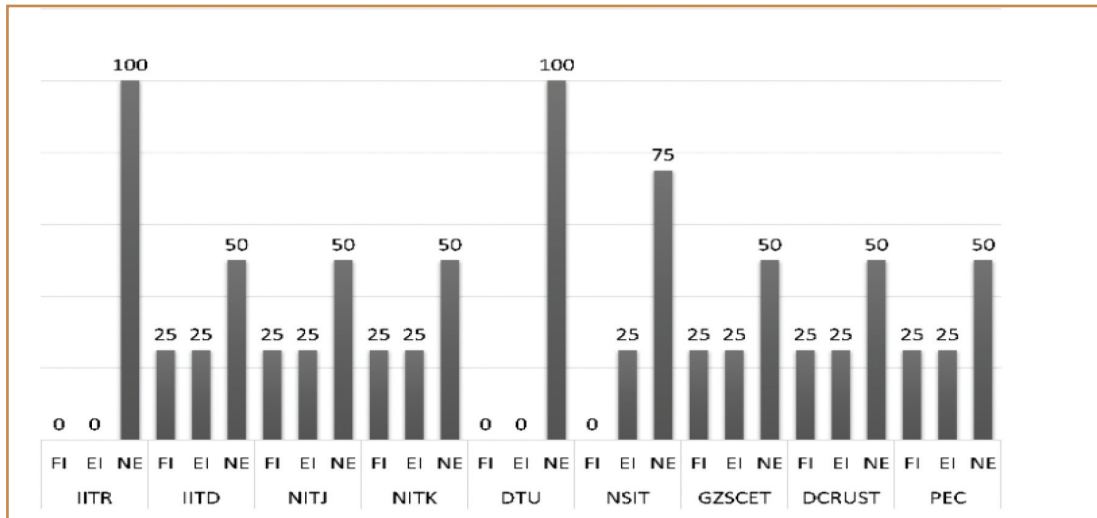


Figure A.3: Percentage Adherence of Individual Campuses to Water Parameter

- FI: Inclusion of courses completely focussed on sustainability in the curriculum (IITR and IITD had courses focussed on sustainability, including those on the sustainable built environment, ecology and sustainable development, etc.).
- EI: Inclusion of courses that have sustainability as a part of the curriculum (all institutes except the IITs had courses where sustainability was partially included, including those on building materials and construction).
- NE: No courses that focus on sustainability.



SDG 13: Take Urgent Action to Combat Climate Change and its Impacts

Summary

The present chapter focuses on SDG-13 which is defined as “Take urgent action to combat climate change and its impacts” and has five targets to be achieved by 2030. After providing a brief overview of the international and national status and initiatives taken by Indian HEIs so far, the focus is on recommendations to improve outcomes of the same. In this chapter, 6 broad areas for research and 8 implementation strategies for the HEIs, and 18 policy recommendations for government and regulatory bodies to achieve the SDG-13 targets are presented. Apart from a literature review of publications on climate action, some examples of SDG-13 implementation in action are provided. Key recommendations involve development of courses and implementation of climate mitigation measures within the campuses like shift to renewable energy by HEIs and increasing provision of grants by regulatory and scientific bodies on research in renewable energy, climate change, energy policy, energy systems, alternative fuels, carbon markets etc. The policy role of government is highlighted in areas ranging from tuning the climate change policy to UN’s framework, promotional activities, funding of research projects for climate action and related technologies, monitoring and rewarding initiatives by organizations for fulfillment of SDG-13 targets.

Key Recommendations to Achieve SDG-13

- HEIs to start measuring their carbon footprint to become carbon-neutral campuses by 2030 through adopting sustainable policies and clean technologies. HEIs to transfer these learnings to 8-10 nearby towns and villages to help them become carbon neutral.
- HEIs must conduct focused research and projects concerning SDG-13, especially in areas of climate change, renewable energy, energy policy, energy systems, alternative fuels and carbon markets.
- HEIs must start working for the achievement of SDG-13 by offering undergraduate and postgraduate level courses and MOOCs related to the same. HEIs must also review their own campuses for compliance with SDG-13 and create a policy for energy, environment, and sustainability.
- Research grants must be provided by the UGC, DST, CSIR, ICAR, and other funding agencies to all public and private universities imparting quality education regarding sustainability and SDG-13.
- Governments must research and analyze statistical data, in collaboration with HEIs, related to deaths attributed to natural disasters and related research for better decision-making or policy formulation.
- Climate action innovation hubs need to be set up in all HEIs for undertaking research through multidisciplinary and interdisciplinary approaches as this involves not only scientific but also social, human and economic aspects. Emphasis should be on finding



nature-based solutions to reduce climate change impact in urban areas and also undertake innovation, exploration, and research on molten salt, hydrogen energy, solar energy, mobility, etc.

- HEIs should include climate finance and audits into research and higher learning.
- HEIs should convert into net-zero energy, waste free and clean water institutions.
- HEIs should work towards the Mantra of Panchamrit solutions for sustainable development so that India will bring its carbon intensity down 45% by 2030 and can fulfil 50% of its energy requirement to renewable energy by 2030.
- HEIs should be actively engaged in solving real-world problems and imparting better education and research needed to create and maintain a sustainable society.
- Higher education institutions need to play a pivotal role in creating awareness of climate change and its impact and acting as role models for the rest of society for ensuring low carbon reduction and addressing climate adaptation and mitigation.
- HEIs should work for the green hydrogen mission and its challenges to achieve zero-carbon emissions.

1 Context and Current Status of SDG-13

1.1 The Context and Current Status

SDG-13 focuses on initiating global action on the climate change problems and preventing significant environmental and health problems arising from the same.

The year 2019 was the second warmest year ever. In spite of the global efforts to take action on climate change through the initiatives like the Paris Agreement, the objectives of restraining global warming to 1.5 or 2°C are far from being met. Due to the COVID-19 pandemic, GHG emissions are projected to decrease by 6% in 2020, but this slowdown is temporary as the world recovers and economic activities resume. If the current global warming trend continues, there would be serious consequences for the environment and natural habitat of the planet. Hence, there is a need to take urgent action for governments and businesses worldwide to control and find alternate sustainable solutions to meet the challenge of climate change. The future sustainability of the human race depends critically on developing climate-resilient economies and societies.

1.2 United Nations Sustainable Development Goal-13 Targets

To achieve SDG-13, five targets have been defined along with indicators to measure the achievement of the targets. These targets are listed as follows:

- **Target 13.1:** Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.
- **Target 13.2:** Integrate climate change measures into national policies, strategies and planning.
- **Target 13.3:** Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.
- **Target 13.a:** Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly \$100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible.
- **Target 13.b:** Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing



States, including focusing on women, youth and local and marginalized communities acknowledging that the United Nations Framework Convention on Climate Change is the primary international, intergovernmental forum for negotiating the global response to climate change.

1.3 Summary of Progress on SDG-13 Implementation Globally

In spite of a slowdown in 2020 due to the COVID-19 pandemic, the levels of greenhouse gas emissions continue to rise. The world witnessed record-high warmest years from 2015 to 2020. In order to restrict global warming to 1.5°C above pre-industrial levels as per the Paris Agreement, the world needs to achieve net zero CO₂ by 2050. As of April 2020, 118 countries and territories had reported the development and adoption of national or local disaster risk reduction strategies in alignment with Sendai Framework for Disaster Risk Reduction 2015 –2030, with 48 more countries joining since the first-year adoption of the latter on March 18, 2015. As of December 31, 2020, 190 parties (countries, territories, and European Union) conveyed their national contribution to the United Nations Framework Convention on Climate Change. As on March 31, 2021, 125 of 154 developing countries had communicated their national plans and policies for the implementation of SDG-13. Additionally, six least-developed nations and four small island nations had completed their national climate change action policy. In order to meet the 1.5°C targets, the global GHG and carbon emissions should be restrained to 45% below 2010 levels by 2030. In 2014, emissions from 70 developing nations increased by 14.4%. Emissions from developed nations in 2019 were 6.2% lower than 2010 levels. Funding to the United Nations Framework Convention on Climate Change reached an average of \$48.7 billion in the period 2017–2018, showing a 10% increase from 2015-16.

1.4 Initiatives and Achievements of the Indian Government on SDG-13

In view of the UN’s call on global climate action as well as the imminent need for sustainable development, India launched its National Action Plan on Climate Change in 2008 which encompasses eight sub missions. The plan focuses on meeting the demands of the growing economy whilst minimizing emissions and climate impact consequent to the same. At its core, the management and monitoring of all SDG implementation in India are being undertaken by NITI Ayog along with a partnership with other ministries and governments of states or union territories. The progress of 16 SDGs including SDG-13 and their targets are being monitored through the SDG-India Index, version 3.0, which encompasses a globally accepted methodology and uses 115 indicators to analyze and measure the progress based on the data collected from various sources. SDG-17 is being assessed by qualitative methods. The indicators for SDG-India Index are chosen based on global SDG targets, alignment with the National Indication Framework, statistical data availability, permissions or approval of ministries or departments, and data coverage for at least 50% states or union territories. SDG Index Score for Goal 13 ranges between 16 and 70 for States and between 18 and 77 for UTs. The progress of SDG-13 in India is based on five indicators and two targets 13.1 and 13.2 (figure-1) with India achieving an index score of 54. Odisha and Andaman and Nicobar Islands have received the highest score amongst the states and union territories respectively. Ten states and two union territories had scored less than 50.

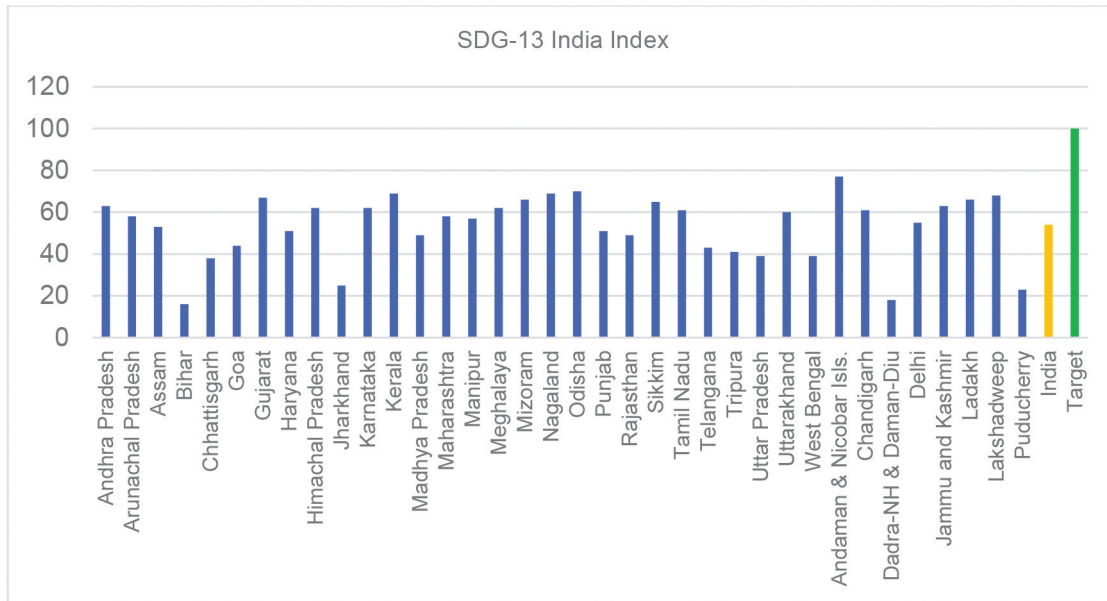


Figure 1: SDG-13 Progress in India (Data Source: Niti Ayog 2021)

Table 1: Progress of SDG-13 in India in Terms of Targets and Achievements by Various States and Union Territories (Data Source: NITI Aayog 2021)

13.1	13.1	13.2	13.2	13.2
Number of human lives lost per 1 crore population due to extreme weather events	Disaster preparedness score as per Disaster Resilience Index	Percentage of renewable energy out of total installed generating capacity (including allocated shares)	CO₂ saved from LED bulbs per 1,000 population (Tonnes)	Disability Adjusted Life Years (DALY) rate attributable to air pollution (per 1,00,000 population)
Total: 15.44 Target: 0	Total: 19.20 Target: 50	Total: 36.37% Target: 40%	Total: 28.24 Target: 103.22	Total: 3469 Target: 1442
Lowest State: Haryana: 1.06	Highest State: Maharashtra: 27.5 UT: Delhi: 25	Highest State: Himachal Pradesh: 93.96% UT: Lakshadweep: 100%	Highest State: Himachal Pradesh: 121.79 UT: Lakshadweep: 309.38	Lowest State: Nagaland: 1408 UT: Delhi: 1890
Highest State: Himachal Pradesh: 472 UT: Jammu and Kashmir, Ladakh: 23.6	Lowest State: Jharkhand: 7.5 UT: Lakshadweep: 9.5	Lowest State: Goa: 1.06% UT: Dadra and Nagar Haveli: 1.1%	Lowest State: Tamil Nadu: 5.97 UT: Dadra and Nagar Haveli: 27.66	Highest State: Rajasthan: 4528 UT: Jammu and Kashmir, Ladakh: 3029

The eight sub missions of the government of India under the NAPCC are discussed in the following sections.

1.4.1 Jawaharlal Nehru National Solar Mission

India's solar potential is estimated at 748 GW by the National Institute of Solar Energy. Jawaharlal Nehru National Solar Mission (JNNSM) was launched in 2010 as one of the biggest government initiatives to promote solar power in India and increase the capacity of solar energy power plants in the country's energy mix. The mission has been successful in meeting its original capacity installation target of 20 GW by 2020 and the same was revised to an ambitious target of 100 GW of solar power by 2022. The envisaged target is also to reach 280 GW by 2030. The promotion of solar power is conducted through schemes like Solar Park Scheme, VGF Schemes, CPSU Scheme, Defense Scheme, Canal bank & Canal top Scheme, Bundling Scheme, Grid Connected Solar Rooftop Scheme etc. However, the impact of the COVID-19 pandemic has hampered the project installation pace. The target still stands with 60GW ground-mounted photovoltaic (PV) and 40GW of rooftop PV power plants to be installed by end of 2022. The installed solar capacity stood at 49.347 GW as on 12th, January 2022.

1.4.2 National Mission to Enhance Energy Efficiency (NMEEE)

NMEEE consist of four initiatives to enhance energy efficiency in energy-intensive industries which are as follows:

- 1) Perform Achieve and Trade (PAT): Improving energy efficiency in energy-intensive sectors
- 2) Energy Efficiency Financing Platform (EEFP): Providing a platform for capacity enhancement of stakeholders related to energy efficiency financing
- 3) Market Transformation for Energy Efficiency (MTEE): Shift towards energy-efficient appliances
- 4) Framework for Energy Efficient Economic Development (FEEED): Development of fiscal instruments for promotion of energy efficiency

NMEEE is implemented by the Bureau of Energy Efficiency (BEE) and Energy Efficiency Services Ltd. (EESL).

In the first phase of PAT(2012-13 to 2014-15), the actual savings were reported as 8.67 million tons of oil equivalent (Mtoe) against a set target of 6.68 Mtoe, yielding savings of INR 9,500 crores for selected energy-intensive industries. PAT Cycle-I resulted in 31 million tonnes of CO₂ emission reductions and yielded investments of INR 24,500 crores in energy efficiency. The second phase of PAT (2016-17 to 2018-19) included railways, refineries and DISCOMS with a total industry count of 621 with an estimated target savings of 8.87 Mtoe. The estimated savings for the third phase is approximately 1.06 Mtoe by 2019–20.

Under EEFP, BEE signed MoUs with M/s. PTC India Ltd, M/s. SIDBI, HSBC Bank, Tata Capital and IFCI Ltd to promote financing for energy efficiency projects and with Indian Banks Association for conducting training programs for scheduled commercial banks.

Under the MTEE, *Bachat Lamp Yojna* (BLY) was introduced in 2009 to replace all incandescent lamps with CFL. The BLY was succeeded in 2015 by the *Unnat Jeevan* by Affordable LEDs for All (*UJALA*) that aims to replace all incandescent or CFL lights with LED lights. Street Lighting National Programme (SLNP) was also launched in 2015. About 36.78 crore LEDs have been distributed across the country under *UJALA* in seven years leading to 47,778 million kWh energy per annum, 3,86 crore tonnes of reduction in CO₂ emissions (Ministry of Power, 2022). Under SLNP, EESL has installed about 1.14 crore LED streetlights across India. This has resulted in an estimated energy savings of 7.67 billion kWh per year with an avoided peak demand of 1,280 MW and an estimated GHG emission reduction of 5.29 million tonnes CO₂ per year with estimated annual monetary savings of INR 5,210 crore in electricity bills of municipalities. The Super Efficient Equipment

Program (SEEP) has also been launched by BEE to replace conventional appliances with energy-efficient ones by incentivising manufacturers to produce energy efficient products.

FEEED enabled the creation of funds like the Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE) which is aimed to provide partial risk coverage to commercial banks to protect against defaulters in long-term energy efficiency projects.

The Venture Capital Fund for Energy Efficiency (VCFEE) is a fund for energy efficiency projects for providing venture capital.

1.4.3 National Mission on Sustainable Habitat (NMSH)

NMSH aims to create standards for formation of sustainable habitats, development plans for cities, energy efficient transportation plans and capacity building to conduct various activities relevant to the mission. NMSH is implemented under the four major programmes of the Ministry of Urban Development namely Atal Mission on Rejuvenation and Urban Transformation (AMRUT), Smart Cities Mission, Swachh Bharat Mission and Urban Transport Programme.

1.4.4 National Water Mission (NWM)

The overall objective of National Water Mission is equitable distribution of water sources throughout the country for tackling the issues attributed to climate change which are primarily water availability and pollution. The mission also aims to achieve 20% water use efficiency and focusing on vulnerable and overexploited areas. The govt. recognizes various organizations for their outstanding achievement in line of the fulfillment of NWM objectives through the National Water Mission Awards.

1.4.5 National Mission for Sustainable Himalayan Ecosystem (NMSHE)

NMSHE is a government programme focused specifically on understanding the impact of climate change in Himalayas which is a region of significant importance for maintaining the ecological balance and sustenance of many parts of the country. The programme is also aimed to take adaptive actions for the protection of the natural ecosystem of the Himalayas. NMSHE is coordinated by the Ministry of Science and Technology.

1.4.6 Green India Mission

Green India Mission was launched in February 2014 to protect, restore and enhance India's biological resources from the harmful effects of climate change. The mission also aims for developing forests and their fringe areas in a holistic and sustainable way. The mission activities have fallen short by 30% of its target 2015-16 to 2020-21. Five states that have reached their five-year target are - Mizoram, Odisha, Punjab, Karnataka and Sikkim. A change in forest cover over an area of 1,17,507 hectares has been achieved against their total target of 1,67,151 hectares.

1.4.7 National Mission for Sustainable Agriculture (NMSA)

NMSA was launched in 2014-15 which aims in increasing agricultural productivity, making agriculture sustainable, remunerative and resistant to climate change. It aims to achieve the set goals by focusing on measures such as the promotion of location-specific farming practices, soil and water conservation methods, soil health management, rainwater utilization and harvesting technologies. Under rainfed area development, 12,41,689.62 Ha area has been developed against a target of 43,31,992.54 Ha for FY2020-21.



1.4.8 National Mission on Strategic Knowledge for Climate Change (NMSKCC)

NMSKCC was released in 2010 with the broad objective of creating knowledge systems in response to climate change. Various goals of NMSKCC are: the formation of well-designed knowledge networks and frameworks, building and upgrading research capability in climate science, building a monitoring system for keeping a watch over economic sectors likely to be affected by climate change, technologies development for climate change adaptation and counter measures supporting organizations in the implementation of the National Action Plan for Climate Change. Key achievements under the programme are: the formation of the Science and Engineering Research Board; the launch of Innovation in Science Pursuit for Inspired Research (INSPIRE); promotion of University Research and Scientific Excellence (PURSE); Cognition Science Initiative and Innovation Clusters; Security Technology Initiative; Water Technology Initiative; establishment of Indian Beamline in the Synchrotron in KEK, Japan; Joining International Consortia on Facility for Anti Proton and Ion Research (FAIR); Establishment of New Institutes and Centers under Nano mission; Establishment of Science Bridges and Support of Next Generation Telecom Network; Research Project support under strategic partnerships under EU-India, Indo-UK, Indo-Australia, Indo-Israel, Indo-Canada programmes, etc.

1.5 HEIs Status: Role of Higher Education Institutions and Status of Adoption of SDG-13

Although SDGs are a global agenda, it is critical to assess and link local issues and awareness into the implementation. The role of HEIs is crucial for successful implementation of the same as HEIs are educational hubs in a region and train young minds. The responsibility of implementation of the SDGs should be felt at individual level, and hence HEI's must embed the idea amongst students as well as communities through educational programmes as well as awareness programmes. The activities should further go beyond just spreading awareness (Filho 2017) and knowledge transfer must be tailored to specific roles or functions of the people, communities, and other organizations. This can be effectively achieved when the HEIs join hands with govt. and industries for knowledge sharing and work on projects for SDG implementation (figure 2). Climate change is a very relevant issue today and requires to be addressed at a fast pace to accomplish SDG-13 by 2030 and HEIs are a key facilitator for the same.

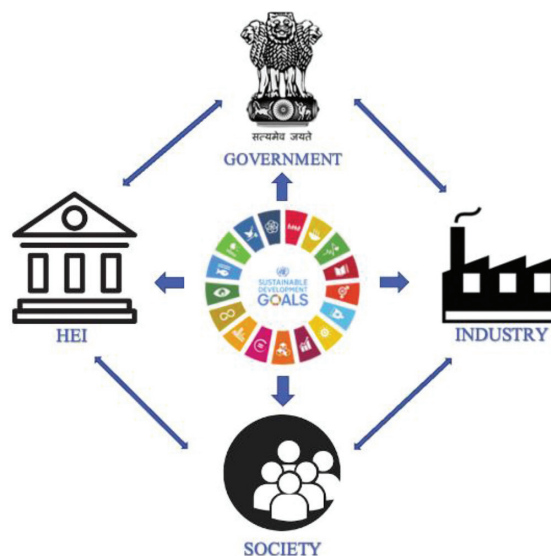


Figure 2: Linkages between Government., HEI, Industry and Society for SDG Implementation and Sustainable Economic Growth

Since universities and educational institutions are the hub of knowledge creation and dissemination, their role in the development of sustainable economies and societies cannot be neglected. Being part of the Helix model, universities themselves have additional benefits to gain in addition to their standard importance and role by aligning themselves with the government’s goals or global SDGs.

Recognizing the crucial role of HEIs in implementing global sustainability practices, the period from 2005-2014 was declared as the UN’s Decade of Education for Sustainable Development (UN DESD). The key findings during the UNDESD were that many HEIs had already begun to make significant changes in their education curriculum, research, operations and community activities (Wals 2014). Subsequent to UNDESD, the 17 SDGs were defined with an overall objective “to secure a sustainable, peaceful, prosperous and equitable life on earth for everyone now and in the future” and targeted to be achieved by 2030. UNESCO has also conveyed the importance of HEI participation in the achievement of sustainable development goals through the concept of Education for Sustainable Development (ESD) which calls for the integration of SDGs into education systems globally (UNESCO 2014). ESD is also mentioned in one of the targets of SDG-4 (4.7) which aims to ensure that people acquire the requisite skills and knowledge for the promotion of sustainable development and achievement of all other SDGs (UNESCO, 2017). UNESCO also has prioritized the need of adding more countries through its Global Action Programme on ESD (GAP) to the pool of all those which have integrated ESD into their education system, policies and strategies. For the promotion of ESD, it is important to review education system and follow what is known as the ‘whole-school’ approach (UNESCO 2018) which encompasses facets of institutional governance, methods of teaching, educational content, campus management, and cooperation with communities and external agencies.

Times Higher Education (THE) a UK-based company that ranks and reports various universities on the basis of the quality of education has also released rankings based on SDG compliance of various universities. Although many universities have activities in line with various SDGs, only one of the Indian universities have made it to the top 100 of THE SDG-based ranking in 2021. It is therefore apparent that in order to further improve their ranking, as well as do their part in combating environmental change for a better quality of life, all universities must make SDGs an integral part of the organizational policy and culture.

One of the fastest methods for HEIs to start their journey towards achieving the SDG is by creating Massive Open Online Courses (MOOCs). There are several universities and UN-sponsored platforms that have already initiated MOOCs that focus on various SDGs. Some of these are listed in Table-2.

Table 2: Some of the MOOC Related to SDGs Offered by Various HEIs and the UN

Course title	SDG Focus	Platform	Sponsor
Climate Change: The Science and Global Impact	SDG-13	SDG Academy	United Nations Sustainable Development Solutions Network
ClimateAction: Solutions for a Changing Planet	SDG-13	SDG Academy	United Nations Sustainable Development Solutions Network
Sustainable Development Goal 13: Climate Action	SDG-13	Canopy LAB	Canopy Lab A/S
Nature-based Solutions for Disaster and Climate Resilience	SDG-13,14,15	SDG Academy	United Nations Sustainable Development Solutions Network

Driving business towards the Sustainable Development Goals	Generic	Coursera	Erasmus University Rotterdam
Sustainable Development in the 21st Century with Ban Ki-moon	Generic	Coursera	Yonsei University
Beyond the Sustainable Development Goals (SDGs): Addressing Sustainability and Development	Generic	Coursera	University of Michigan
The Sustainable Development Goals – A global, transdisciplinary vision for the future	Generic	Coursera	University of Copenhagen

2 Recommended Actions for HEIs for Achievement of SDG-13

HEIs are model townships and hence the initiation for SDG-13 implementation must start from within the institution itself. A flowchart for facilitation of the same is shown in figure-3. The process begins with the creation of a dedicated department (DD) to create the Energy, Environment and Sustainability (EES) Policy which defines the rules and procedures to be followed in compliance of UN-SDGs within the campus. This department is also responsible for periodically reviewing and updating the policy as and whenever required. The next step is to ensure that SDG targets are defined and key activities and projects are undertaken by the HEI and overall coordinated by the DD for efficient monitoring and management. The objectives can be set as targets specific to SDG-13 like use of renewable energy, use of electric vehicles, integration of SDG 13 into education and policy and so on. The HEIs can further participate in joint projects focusing on action against climate change or create their own projects for implementation.

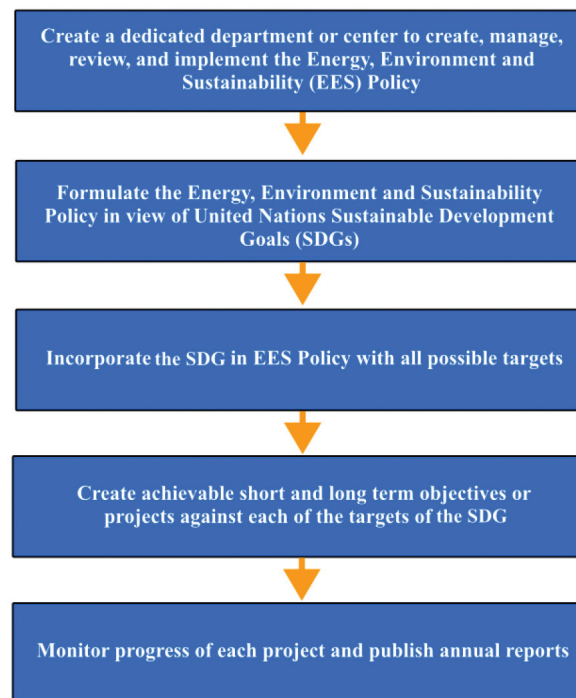


Figure 3: Flowchart for Getting Started with the Process of Accomplishing SDG Within an HEI

Based on the international and national status on SDG-13, the key action points for HEIs for effective implementation of the same are as follows:

Table 3: Minimal Recommended Actions for the HEIs for Realizing SDG-13

SDG 13 Target	Minimal Recommended Actions for HEIs
13.1	<ol style="list-style-type: none"> 1) Give research inputs to government for framing Disaster Management Policy of the country 2) Participate in joint projects with the govt. to analyze statistical data related to deaths attributed to natural disasters and related research for better decision-making or policy formulation.
13.2	<ol style="list-style-type: none"> 1) Suggest the technologies and research perspective that must be included in the climate change policy of the country 2) Take joint research projects with the govt. to create new technologies to counter climate change and integrate the same into the country's policy.
13.3	<ol style="list-style-type: none"> 1) Drive the educational awareness through special programs on climate change mitigation, adaptation, impact reduction and early warning 2) Become key partner with the govt. for technology incubation and transfer to combat climate change as well as for respective capacity building
13.a	1) Take projects and funding related to UNFCCC or help, through joint projects, for mobilization of funds towards climatic change mitigation measures.
13.b	1) Build mechanisms and plans through projects with various international organizations like UNDP for raising funds and dissemination of funds in the least developed nations for instigating action against climate change.

3 Proposed Research Agenda for HEIs and Governmental Bodies

The review of past studies and respective linkages with the SDG-13 targets have led to several key research areas that must be undertaken by HEIs. It is recommended that undergraduate and postgraduate level courses are redesigned in keeping with the SDG or that new courses are created. Proposed areas of research are highlighted in table 4.

Table 4: Main Research Areas and Models that can be Followed for Realizing SDG-13

Field	Key Research Areas or Models	Key Activities
Climate Change	Climate Change Adaptation, Green House Gas emissions and mitigation, Carbon Sequestration, Climate Models, Global Warming, Life Cycle Assessment, Carbon Emissions, Hydrogenation etc.	Carry out focused research on Climate Change and mitigation strategies. Ensure research starts from the Masters level to Post -Doctoral level for adequate knowledge and solutions to build up that can be then transferred to the policymakers.
Renewable Energy	Technologies of renewable energy systems and components, issues on integration to grid, smart grids, micro-grids, energy storage for renewable systems, hybrid renewable systems etc.	Promote research and studies on Renewable Energy Systems through courses and research at the graduate and postgraduate levels.
Energy Policy	Energy Production and Consumption, Sustainable Technologies, Sustainable Buildings, Waste Recycling, Environment Protection etc.	Ensure the creation of a sustainable Energy Policy for the institution and enforce the same. Motivate scholars to study the Energy Policies of various countries and improve the policies India from time to time.

Energy Systems

Optimization of power systems, power generation, power trading, competition in electricity markets, bidding strategies, electricity risk management, market power issues. Modeling problems such as optimization of processes, design and operation of energy systems etc.

Promote research and studies on Energy Systems through courses and research at the graduate and post-graduate level.

Alternative Fuels

Hydrogen, Fuel Cells, Biofuels, Nuclear Fuels etc.

Promote research and studies on Alternative Fuels and develop new technologies.

Carbon Markets

Carbon credit system, carbon trading, certifications, business models, regulatory framework etc.

Promote research and studies on Carbon Markets for the promotion of renewable energy and usage of alternate technologies to control GHG emissions worldwide.

4 Recommendations for Government and Regulatory Bodies for Achievement of SDG-13

Key action points for policy makers for realization of SDG-13 are given as follows:

4.1 Recommendations for Government

SDG 13 Target	Minimal Recommended Actions for Government/Policy Makers
13.1	<ol style="list-style-type: none"> 1) Central govt. must frame Disaster Management Policy in line with Sendai Framework for Disaster Risk Reduction 2015–2030. 2) Central govt. must encourage state govts. to formulate their own disaster management policies as per the local conditions and geographic profiles. 3) Govts. must analyze statistical data related to deaths attributed to natural disasters and related research for better decision-making or policy formulation. The assistance of HEIs can be taken to accomplish this task, especially for analysis and research aspects.
13.2	<ol style="list-style-type: none"> 1) Integrate suitable incentives for use of low-carbon energy in the electricity sector (Rs/kWh or Rs/ton of CO₂ avoided). 2) Carbon credit mechanism or carbon trading should be encouraged 3) Include GHG emission targets for 2020, and 2030 in view of achieving <2°C global warming goal and the strategy to achieve the same. 4) Make provisions to measure and limit GHG emissions in industries, agriculture, forests and other land use in tons of CO₂ emitted (tCO₂e). 5) Include rate of primary energy intensity improvement measures in the policy.
13.3	<ol style="list-style-type: none"> 1) Drive educational awareness through special programs on climate change mitigation, adaptation, impact reduction and early warning. 2) Provide funding for research and technology development to combat climate change as well as for respective capacity building in institutions.
13.a	<ol style="list-style-type: none"> 1) Take projects and funding related to UNFCCC or participate in joint projects, for mobilization of funds towards climatic change mitigation measures.
13.b	<ol style="list-style-type: none"> 1) Build mechanisms and plans through projects with various international organizations like UNDP for raising funds and dissemination of funds in the least developed regions for instigating action against climate change.

4.2 Recommendations for Regulatory Bodies

The regulatory bodies like UGC, AICTE, ICAR, NAAC etc., and research funding agencies like Department of Science & Technology, Council of Scientific Research (CSIR), Ministry of New



and Renewable Energy (MNRE), Ministry of Environment, Forest and Climate Change and State Science, Energy & Environment agencies shall facilitate in fostering and developing quality research, the educational curriculum in the training of future professionals in the field of sustainable development including SDG-13.

Specific immediate actions points for key regulatory bodies as follows:

- 1) Scrutinize and approve graduate and postgraduate degrees and courses related to the SDGs offered by HEIs.
- 2) Make standards and guidelines for approval of new universities specialized in Energy, Environment and Sustainable Research specifically including the UN SDGs.
- 3) Disburse special funds to the HEIs offering quality education in sustainability and SDGs for further research and growth in the area.
- 4) Design/approve all India level specialized tests for entry into the HEIs offering the developed sustainability curriculums. Also include sustainability and SDG related questions in existing tests like UGC-NET, CSIR-NET, ICAR-NET etc.
- 5) Conduct audits to monitor the quality and thoroughness of education and research in the HEIs offering specialized courses and degrees related to SDGs and sustainability.
- 6) Make recommendations to the central and state governments to bring about positive changes in higher education with reference to sustainability and SDGs for better awareness and for the generation of adequate number of future professionals who are specialized in the field.

5 Conclusion Along With Prioritization of the Initiatives Recommended

Global warming is a very formidable threat faced by humanity today and need to be controlled immediately. SDG-13 directly aims to combat climate change which is crucial for future survival of all biological life as well as for preservation of the natural habitat of the planet. Since HEIs are repositories of knowledge and train young minds, the idea of sustainable development must be sown herein, so that the responsibility of achieving the SDGs is felt at the individual level. Hence, the effective achievement of SDG-13 requires combined and coordinated actions of HEIs, govt., industry and society as well. In this chapter we have analyzed and reviewed certain crucial aspects that can be addressed for the achievement of SDG-13. Overall, the summary of main recommendations is as follows:

- 1) The central government must formulate specific policy for action against climate change and SDG-13 and also tune it to Sendai Framework for Disaster Risk Reduction 2015–2030 and also promote state govts. to formulate their own policies as per the local conditions and geographic profiles.
- 2) A focus-oriented National Policy on saving of Indian Himalayas need to be formulated to protect Himalayan Glaciers, Forests, Mountains, protection of Eco-systems. There needs to be a check on the construction of multilane roads and the establishment of Cement plants which are destroying Himalayan Mountains Forests and Water resources.
- 3) The government must involve HEIs in joint projects related to actions against climate change and SDG-13 through MoUs or existing policy amendments.



- 4) Government. must research and analyze statistical data, in collaboration with HEIs, related to deaths attributed to natural disasters and related research for better decision-making or policy formulation.
- 5) Governments must integrate suitable incentives for use of low carbon energy in the electricity sector (Rs/kWh or Rs/ton of CO₂ avoided), encourage carbon trading, GHG emission reduction targets and strategies in view of achieving <2°C global warming goal, include rate of primary energy intensity improvement measures in climate change mitigation policy.
- 6) Research grants must be provided by the UGC, DST, CSIR, ICAR, and other funding agencies to all public and private universities imparting quality education regarding sustainability and SDG-13.
- 7) The state governments must align with the central government for the effective implementation of SDG-13 and monitor the status of related projects through online systems.
- 8) The government must promote awareness and action against climate change, renewable energy, sustainable technologies and electric vehicles by making specific policies for the same and providing suitable incentives for their adoption by people and organizations.
- 9) The HEIs that demonstrate a high level of excellence in education related to sustainability and research must be rewarded by the government so that others also follow.
- 10) HEIs must start working for the achievement of SDG-13 by offering undergraduate and graduate level courses and MOOCs related to the same. HEIs must also review their own campuses for compliance with SDG-13 and create a policy for energy, environment, and sustainability.
- 11) HEIs must conduct focused research and projects concerning SDG-13, especially in areas of climate change, renewable energy, energy policy, energy systems, alternative fuels and carbon markets. The research in science, engineering, technology and social sciences at the Master's and PhD levels should focus on SDGs wherever possible.
- 12) Government must develop new climate mitigation technologies through projects given to the region-specific HEIs for guidance and research.
- 13) Regulatory bodies like UGC, AICTE, and NAAC must foster the design and approval of new HEIs, degrees and course curriculums related to sustainability and SDGs, and keep the quality in check.

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SDG-14: Life Below Water: Conserve and Sustainably Use the Oceans, Seas and Marine Resources for Sustainable Development

Summary

“Life below water”, the Sustainable Development Goal 14 (SDG-14) under Agenda 2030 is to, “Conserve and sustainably use the oceans, seas, and marine resources for sustainable development”. SDG-14 relates to the aquatic biome of the Earth, which covers the three-fourth of the planet, thus making its management and conservation a major challenge to be achieved. This chapter reviews the progress made by HEIs and Government bodies for SDG-14 implementation, at national and global level. This Report highlights the UN recommendations on SDG-14 and the performance of some HEIs from the top ranked countries in SDG Report 2021. Based on the current status on SDG-14, key recommendations are proposed. The recommendations have been framed with the vision of achieving SDG-14 goal targets by as per the UN Agenda 2030.

Key Recommendations to Achieve SDG-14

- Implementation of measures to control land, air, and water-based pollution for aquatic ecosystem conservation and building of a smart model for water resource management at the national level.
- Funds should be provided for research, innovation, and the creation of new technological advancements toward achieving the SDG-14 goal.
- The dependency on the aquatic sector needs to be facilitated by providing new opportunities to the people employed in the aquaculture sector and giving them practical knowledge.
- HEIs should adopt and form groups for carrying out different activities concerning cleaning plastic debris from local water bodies, such as students’ involvement in ‘Swachh Sagar Abhiyan’.
- Assessment of employment and income dependency on fishing and aquaculture at the local level has to be done and recommendations should be provided for an alternative income source, in case of overfishing and loss incurred in the trading market.
- HEIs should undertake research on oceans, the development of cleaner technologies, and the relationship of economics, Blue Economy international relations, and political science with sustainability as the key areas.
- Students of HEIs should undertake the responsibility of creating awareness among local population regarding the effects of ‘mistreating’ the oceans and ways to harness the oceans for economic sustainability by creating business model development.
- Government should find ways to combat the issue of plastic and other marine litter through the implementation of national and regional action plans, facilitation of technical and policy support, science-based solutions, and general platforms for discussion.
- HEIs should explore the concept of ocean biological pump which is a highly efficient, and sensitive system to control atmospheric carbon dioxide by depositing a portion of the unused carbon dioxide on the sea floor as sediment.



- HEIs should undertake research on Trace Elements that serve as micronutrients, and regulate the dynamics of the marine ecosystem, and carbon cycle; and the availability of unutilized High Nutrient Low Chlorophyll (HNLC) in the world oceans which impacts productivity and eventually hampers marine life near the coastal regions.

Context and Current Status of SDG-14

1.1 The Context and Current Status

The United Nations has estimated the rise in the world’s population from 1950-2022 (i.e., from 2.6 billion to 7.9 billion) to be around 1.05% [1]. The 2018 data from the Food and Agricultural Organization of the United Nations (UNFAO) reports the direct employment dependency of 59.5 million people on fisheries and aquaculture, with the remaining being indirect, thus resulting in 3/4th of the total world’s feeding and employment percentage dependency on aquatic ecosystem [2]. The Natural Resources Defence Council (NRDC) has reported climatic change, land-based pollution, and overfishing as the three reasons for the marine diversity decline [3]. The human dependency on the aquatic ecosystem coerces a set up for environmental sustainability norms for its protection, restoration, and stabilization.

1.2 United Nations Sustainable Development Goal-14 Targets

The surface of planet Earth is surrounded by about 71% water in the form of oceans and water bodies, which play a vital role in the biological, ecological, and environmental balance of life on Earth. Accordingly, the objective of SDG-14 focuses on the conservation and sustainable use of the resources from oceans, seas, and marine sources for sustainable development. The SDG-14, “Life Below Water”, comprises of ten targets and indicators, with the single focal point of aquatic conservation of marine and freshwater ecosystems [4]. These targets are as follows:

Table 1: SDG-14 “Life Below Water” Targets and Indicators

Goals and targets	Indicators
14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution	14.1.1 Index of coastal eutrophication and floating plastic debris density
14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans	14.2.1 Proportion of national exclusive economic zones managed using ecosystem-based approaches
14.3 Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels	14.3.1 Average marine acidity (pH) measured at agreed suite of representative sampling stations
14.4 By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics	14.4.1 Proportion of fish stocks within biologically sustainable levels
14.5 By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information	14.5.1 Coverage of protected areas in relation to marine areas



<p>14.6 By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation⁵</p>	<p>14.6.1 Progress by countries in the degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing</p>
<p>14.7 By 2030, increase the economic benefits to small island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism</p>	<p>14.7.1 Sustainable fisheries as a proportion of GDP in small island developing States, least developed countries and all countries</p>
<p>14.a Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries</p>	<p>14.a.1 Proportion of total research budget allocated to research in the field of marine technology</p>
<p>14.b Provide access for small-scale artisanal fishers to marine resources and markets</p>	<p>14.b.1 Progress by countries in the degree of application of a legal/regulatory/policy/institutional framework which recognizes and protects access rights for small-scale fisheries</p>
<p>14.c Enhance the conservation and sustainable use of oceans and their resources by implementing international law as reflected in the United Nations Convention on the Law of the Sea, which provides the legal framework for the conservation and sustainable use of oceans and their resources, as recalled in paragraph 158 of “The future we want”</p>	<p>14.c.1 Number of countries making progress in ratifying, accepting and implementing through legal, policy and institutional frameworks, ocean-related instruments that implement international law, as reflected in the United Nations Convention on the Law of the Sea, for the conservation and sustainable use of the oceans and their resources</p>

Source: <https://unstats.un.org/sdgs/indicators/indicators-list/>

1.3 Progress on SDG-14 Implementation Globally

The SDG report 2021 depicts the progress of SDG-14 to be stagnant with a 0.1 percent score, and no country is classified under the ‘SDG Achievement Zone’ [5]. The SDG-14 status of different groups of countries which is done by classifying them through geographical regions and overall income status marks all of them under the red zone of ‘Major Challenges Remain’. These findings indicate an alarming concern for massive efforts to be undertaken towards SDGs 13-15, all of which are associated with biodiversity and climate. India stands at 120th position in SDG 2021 Report, occupying 32nd position according to the spill-over score, and has made a lot of progress in SDG-14 targets of fish stocks sustainability and imports. A major initiative of the UN towards SDG-14 attainment concerns the launch of the “Ocean Stewardship 2030 Roadmap” which will assist in the sustainable use of ocean resources towards making healthy and productive oceans by 2030. The five key goals of this roadmap are ‘sustainable seafood, decarbonized shipping, ocean energy, ocean mapping and data, and waste management [6]. The UN-GA recommends technological advancements towards SDG-14. The introduction of the Global Pilot Programme on Science, Technology, and Innovation for the Sustainable Development Goals Road Maps (STI for SDGs Road maps) along with internet availability recommendations for the deprived areas is a major step towards achieving SDG-14 goals [7].



1.4 Initiatives and Achievements of the Indian Government for Achieving SDG-14

To monitor the achievement of SDG targets, NITI Aayog, GOI has established an SDG India Index, which shows the state-wise progress of each SDG (figure-1). The SDG Index Report 2021 indicates that India's total score improved by 6 points due to efforts made across the country in 'clean water and sanitation and 'cheap and clean energy, but the progress made within SDG-14 is slow but is going at a steady pace, with Odisha and Andhra Pradesh having the top SDG-14 score [8].

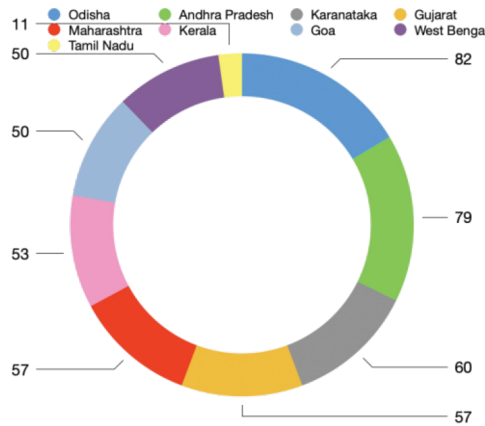


Figure 1: SDG-14 Index Score for Various Coastal Indian States (Data Source: NITI Aayog).

The Ministry of Environment, Forest and Climate Change, Ministry of Animal Husbandry, and Ministry of Earth Sciences of the Indian Government have contributed towards SDG-14 by launching different advisory and initiatory programmes for monitoring water quality, regulation of fisheries and equalizing aquaculture-dependent employment. The key programmes include Environment Protection, Management and Sustainable Development, National Coastal Management Programme, Potential Fishing Zone Advisory Programme, Sagarmala Programme, *Neel Kranti Mission* (Blue Revolution), O-STORMS (Ocean Services, Technology, Observations, Resources Modelling and Science), and ESSO-Indian National Centre for Ocean Information Services.

Mangrove Forest restoration under the Integrated Coastal Zone Management Project (ICZMP), the first scientific management reported globally, has led to an increase in mangrove forests in different Indian states over a span of two years (2015-2017) as follows: 181 sq. km area in Sundarbans (Bay of Bengal), 82 sq. km in Maharashtra, 37 sq. km in Andhra Pradesh and 33 sq. km in Gujarat. The marine protected areas in India include 25 in the Indian peninsular region and 106 in marine islands (Andaman and Nicobar Islands and Lakshadweep Islands). Towards SDG-14 goals, the Indian Government has launched *Namami Gange* (2014) and Ganges Action Plan (2015) with the funding of ₹ 20000 crores and \$3 billion for river rejuvenation [9]. The Indian Government in collaboration with UNEP and SACEP have also organised *Swachh Sagar Abhiyan*, conducted every September since 2017, which has resulted in marine litter removal of about 81335 kg in 2017, 71220 kg in 2018, 75224 kg in 2019, and 38008 kg in 2021 from 14 Indian coastal areas [10].

1.5 HEIs Status: Role of Higher Educational Institutions and Status of Adoption of SDG-14

The HEIs have played a significant role towards SDG-14. In the recent Times Higher Education Ranking (*THE*, 2021) of universities/HEIs role in achieving SDG-14, the University of Plymouth, University of Manchester and Queen's University Belfast, United Kingdom (UK), ranked among the top 5 universities, while JSS Academy of Higher Education and Research, India and Pondicherry University (India) ranked within the top 200 universities [11]. The key achievements of the UK universities towards SDG-14 include programmes associated with combating threats against the

ocean (UKRI GCRF One Ocean Hub, Diver Sea Food Project), building technology for wastewater treatment plans, creating green labs and water management systems, and organizing awareness programmes and study programmes [12, 13]. Both the top-ranking Indian universities have also indulged in research studies, organizing courses and awareness programmes by implementing SDG-14 in their academic mandates [14, 15].

Research carried out by the scientists of the University of Manchester revealed high levels of pollution by microplastics in River Tame (Denton), and the existence of a dead zone for fisheries in the ocean and seas [16, 17]. These studies indicate the presence of plastic pollution not only in river Tame, but also point towards the global problems due to marine litter. The land-based pollutants, tourism and mismanagement are the key factors contributing to debris formation in coastal areas. The Faculty of Science and Engineering at the University of Plymouth (United Kingdom) is an active participant in SDG-14 related projects such as One Ocean Hub, a £ 20 million funded project, and Low Carbon Devon project, a £ 2.6 million funded project, which focus on identifying and overcoming the threats responsible for ocean deterioration [18].

The University of Sydney (Australia) manages One Tree Island under the Great Barrier Reef and conducts research for the removal of polyfluoroalkyl substances from contaminated water and geologic glue for protection against ocean acidification [19]. The Coastal Engineering lab of Queen's University (Canada), the largest hydraulics lab carries out experiments related to the oil spill, aquatic ecosystem monitoring and biodiversity observation on the Great Lakes ecosystem [20].

According to SDG Index Report 2021, Norway ranks 7th, with an 81.98 score out of 100, among all 193 countries under a voluntary agreement. Accordingly, the University of Bergen, Norway has been designated as the UN SDG hub for SDG-14, owing to its excellent contribution towards achieving SDG-14 (Annexure 1).

The Department of Science and Education, South Africa introduced 'SEAmester'-South African Floating University (2016), a course available as On-Ship Programme, as an inter-institutional activity, providing knowledge on ship and ocean dynamics [21, 22].

The University of Australia has also introduced a Master of Ocean Leadership Programme, a multi-disciplinary programme involving different marine applied sciences education in collaboration with the University's Oceans Graduate School and Ocean Institute dynamics [23]. Australia ranks 35th in SDG 2021 Report with a 75.58 score, owing to the efforts of HEIs, and governmental and non-governmental organizations towards SDG-14 target achievement.

The Ocean Frontier Institute in collaboration with Dalhousie University, Memorial University of Newfoundland, and University of Prince Edward Island, is involved in research on the North Atlantic and Canadian Arctic Gateway, so as to build inter-relation commitment with UN Decade of Ocean Science to achieve SDG-14 goals [24, 25].

JSS Academy of Higher Education and Research, Mysuru, India in collaboration with the National Institute of Ocean Technology organized study programmes on Environmental Conservation, and water resource management (Marine Natural Product Chemistry) and awareness programmes like the "Save Kaveri" programme. Indian Institute of Technology, Guwahati has also introduced a course on UN SDG exclusively in Bachelor's programme [26].

SAMUDRAYAAN project undertaken by the Ministry of Earth Sciences, GOI and the National Institute of Ocean Technology are one of the major initiatives towards 'Deep Ocean Exploration and SDG-14 goals' (Figure 4) [27]. TraceBioMe Project (2021) launched by the Council of Scientific and Industrial Research-National Institute of Oceanography (CSIR-NIO), Goa, aims to the exploration of the genetic diversity of the Indian Ocean to achieve SDG-14 targets [28]. The exploration spans the coastal city Vishakhapatnam ending with Goa towards the observation of marine habitat and



biodiversity. The SRM Institute of Technology has taken initiatives towards SDG-14 through its Carbon Neutrality Pledge, renewable energy, waste treatment and management, and SMART city development projects [29].

School of Sustainability from Xavier Institute of Management, Bhubaneswar had organized an Immersion Course for creating awareness among students on SDG-14 [30].

HEIs can also start various MOOCs related to SDG-14. Some examples are listed in Table 2.

Table 2: Some of the Massive Open Online Courses (MOOCs) Offered by Various HEIs and Companies

S. No.	Course	SDG Focus	Platform	Sponsor
1	One Planet, One Ocean	SDG 14	SDG Academy	United Nations Sustainable Development Solutions Network
2	Nature-based Solutions for Disaster and Climate Resilience	SDG 13,14,15	SDG Academy	United Nations Sustainable Development Solutions Network
3	Planetary Boundaries and Human Opportunities	SDG 13,14	SDG Academy	United Nations Sustainable Development Solutions Network
4	Driving business towards the Sustainable Development Goals	Generic	Coursera	Erasmus University Rotterdam
5	Sustainable Development in the 21st Century with Ban Ki-moon	Generic	Coursera	Yonsei University

2. Recommended Actions for HEIs for Achievement of SDG-14

The adoption of SDG-14 in HEIs can be initiated with an interlinked organizational plan as shown in Figure 2. The recommended actions for HEIs against each target of SDG-14 are listed in Table 3.



Figure 2: Schematic Action Plan for HEIs towards SDG-14 Attainment

A centre for SDG-14 management will act as a central hub and work in a concerted manner with feedback from various committees formed within the HEI.

Table 3: Minimal Recommended Actions for the HEIs for Achievement of SDG-14

SDG-14 Targets	Minimal Recommended Actions for HEIs
14.1	<ol style="list-style-type: none"> 1. Assessment of the causes of the extent and causes of aquatic pollution in local water bodies and their cause including debris from leftover waste treatment and land activities 2. Recommending new water treatment strategies for water entering the local water bodies
14.2	<ol style="list-style-type: none"> 1. Assessment of local aquatic ecosystem biodiversity and their population effect by alteration in aquatic conditions 2. Recommendation of different management and regulatory strategies, through control of land-based pollution and habitat build-up. 3. Demarcation of aquatic conservation zone in respective adjoining areas.
14.3	<ol style="list-style-type: none"> 1. A guideline of pH regulatory mandates for local water bodies. 2. Assessment of the cause and recommendation of combating strategies.
14.4	<ol style="list-style-type: none"> 1. Assessment of employment and income dependency on fishing and aquaculture at the local level. 2. Recommendations for an alternative income source, in case of overfishing and loss incurred in the trading market 3. Training programmes for fish farmers: providing them with knowledge on sustainable fishing through aquatic biodiversity assessment.
14.5	<ol style="list-style-type: none"> 1. Organizing debates and discussions for evolving consensus for giving input for the formulation of policies and laws regarding the conservation of coastal and marine ecosystems.
14.6	<ol style="list-style-type: none"> 1. Creating awareness among the local population to restrain from illegal fishing in conservation zones and promote sustainable fishing.
14.7	<ol style="list-style-type: none"> 1. Organizing awareness programmes and discussions for small and developing island states on sustainable fishing, marine resource conservation, natural hazards and disaster management. 2. Forming teams of likeminded and sensitive people and adopting local water bodies for carrying out cleansing activities in the line of 'Swachh Sagar Abhiyan'
14.a	<ol style="list-style-type: none"> 1. Planning and undertaking research activities on the marine ecosystem, blue economy and sustainable development 2. Development of new innovative technologies and strategies for waste treatment 3. Encouragement of competition for better creation of research strategies
14.b	<ol style="list-style-type: none"> 1. Transportation of local fisheries from rural to urban areas
14.c	<ol style="list-style-type: none"> 1. The proper management of the demarcated conservation zone with SDG-14 2. Organizing Awareness programmes for the local people on SDG-14 through discussions on the 'Law of Sea 'and aquatic management, conservation and restoration

3. Proposed Research Agenda for HEIs and Governmental Bodies

SDG-14 is a difficult goal to achieve but is important since the aquatic resources form an important and major component of our earth's biome. The research should comprise new innovative ideas towards building technologies and overcoming the shortcomings of the ocean restoration plan. Bioprospecting of marine biodiversity might prepare a base for ocean sustainability and overcome risks upon new technology implementation. Indian universities have been involved in research for ocean sustainability but their direct link with SDG-14 targets is still an untouched task. The various areas of research agenda for HEIs towards achieving the targets of SDG-14 are summarized in Table 4.

Table 4: Recommended Research Areas for SDG-14 Implementation by HEIs

Fields	Research areas
Cartography	Modelling water pointing map, demarcating all local water bodies, streams, and rivers in the nearby surroundings.
Aquatic Biodiversity	Aquatic population assessment for all local water bodies, streams, rivers or oceans, in the nearby surrounding and dependency of terrestrial population on the aquatic ecosystem. Bioprospecting and sustainable use of marine resources.
Environment Protection and Conservation	Assessment of aquatic pollution and causal factors, including land-based activities, water traffic, oil spill and airborne pollutants
Waste Management	Assessment of treatment process of industrial and local sewage waste entering the streams, and combating solutions and upgradation of the treatment process.
Disaster Management	Combating any harm caused due to water-borne diseases and disasters and reducing effects on local population, aquatic and terrestrial biodiversity
Ecology	Total Population Research, Aspect Ratio on Natality and Mortality Rate
Archaeological	Research on old discoveries from water bodies
Tourism	Maintaining the beauty of water bodies for encouraging the cleanliness, protection and restoration of water resources
Smart Research	Creating a new technological framework for smart management of water resources in local areas

4. Recommendations for Government and Regulatory Bodies for Achievement of SDG-14

4.1 Recommendations for Government

The concerted action of HEIs and the Government can be an exemplary approach to SDG-14 achievement. The introduction of Educational Programmes on SDG-14 in academia is an important step that must be undertaken by Indian Educational Agencies for the dissemination of knowledge on sustainable development goals, which seems to be insufficient currently. The promotion of research on marine resources and aquatic ecosystems needs to be promoted by Government agencies. Organization of Awareness Programmes, International Conferences, involving Indian HEIs, Competitions, Workshops, and Seminars for SDG-14 awareness and implementation by GOI is imminent (Table 5).

Table 5: Minimal Recommended Actions for the Government

Strategies for SDG-14 Implementation by Government Agencies	
Smart Model	Development of SDG-14 SMART plan for the nation based on the introduction of technological advancement and its promotion for usage among the population
Awareness Programme	Awareness Campaigns, Seminar, and Workshops related to SDG14 goals need to be carried out starting from local to higher levels of society for aquatic protection, preservation, and restoration
Funded Projects	Funds should be provided for research for innovation and the creation of new technological advancements towards SDG14 goals
Competitions/ workshops	Competition amongst members of academia can stimulate research and creative ideas for solving SDG14 targets



Water Resource Development	The land resources are on the verge of getting exhausted and its time new research ideas need to be encouraged for providing alternative resource dependency on aquatic ecosystems
Conservation of marine biodiversity	The dependency on the aquatic sector needs to be shifted by providing new opportunities to the people employed in the aquaculture sector and giving them practical knowledge. This shift might lift the burden on biodiversity, and assist in aquatic sustenance and conservation of marine life
Ocean policies	Strict laws and policies against threats towards the ocean from land base activities and pollution, exploitation of fishing areas by subsidiaries, and heavy shipping trafficking in oceans

4.2 Recommendations for Regulatory Bodies

Table 6: Minimal Recommended Actions for Regulatory Bodies for Achievement of SDG-14

Regulatory Bodies	Recommendations
UGC (University Grant Commission) & AICTE (All Indian Council for Technical Education, and CSIR (Council of Scientific & Industrial Research)	Funding HEIs and other research institutions for SDG-14-related research activities. Collaboration with universities for defining courses and curriculum related to SDG-14 Promote and regulate research related to SDG-14 Formulate rules and regulations related to placements, skill activities, collaboration, technology up-gradation, availability of resources related to research, and the infrastructure.
NAAC (National Assessment and Accreditation, CGPA (Council-Cumulative Grade Point Average) & NIRF (National Institute Ranking Framework)	Must add SDG-related parameters and criteria for ranking and grading of HEIs Sponsor Seminars dedicated to SDGs Must initiate awards and incentives for Teachers for their accomplishments in SDG-related activities and research Ranking system for SDG-based education

5. Conclusion Along With Prioritization of the Initiatives Recommended

As per the UN SDG report 2021, the global progress towards achieving SDG-14 targets falls in the red zone, with very few countries in the zone of 'Challenges Remain' Yellow Zone, and 'Significant Challenges Remain' Orange Zone, while most of them being in the Major Challenges Remain ie. Red Zone. Thus, it's an urgent need for HEIs to prepare an action plan for SDG-14 achievement by 2030. The HEIs can play a crucial role in aquatic restoration by creating awareness at academic, local, societal and economic levels. The governmental organisations and regulatory bodies should assist the HEIs in achieving SDG-14, as any influential idea, work, creation or innovation which can bring even a minute change can be a stepping stone for attaining the SDG-14 targets. The overall strategic plan for SDG-14 achievement by HEIs includes the following key recommendations:

1. Involvement and collaborative action of HEIs with the government bodies towards realisation of SDG-14 goals.
2. Introduction of Special Course on SDG-14 at all academic levels--graduate, postgraduate and Ph.D.
3. Emphasis on conservation of Aquatic Biodiversity among academia and societal level.
4. Organization of Awareness Campaigns, Seminars, Workshops, Discussions and Surveys on SDG-14.



5. Implementation of measures to control land, air and water-based pollution for conservation of aquatic ecosystem.
6. Building of smart models for Water Resource Management at the national level.
7. Sub-bodies are required for the management of SDG-14 at different levels as the population of the country is too vast to be regulated by a small number of managing bodies.
8. Policies and Laws are essential for controlling illegal fishing and trading, controlling water trafficking and demarcation of aquatic zones for conservation.
9. Promotion of research on marine biodiversity and ocean health and support through funds.
10. Recognition and acceptance of the problems, fallouts and criticism for better development and SDG-14 achievement.

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Annexure -1: Case Studies

University of Bergen (UiB) is in alliance with UNAI as a member institution for carrying out SDG 14 propaganda and has been declared as an SDG 14 HUB [1]. The SDG Bergen Task Force of University of Bergen has been in alliance with Ocean Sustainability Bergen (OSB) for continuous administration and encouraging partnership at a global level, creation and safeguarding international law for protecting aquatic ecosystem [2, 3]. The SDG Bergen initiative began with the very first SDG conference of University of Bergen which aimed at bringing together the national and international scholarly talents for generating a defined strategic plan for carrying out the SDG 14 target achievement process. SDG Bergen Science Advice (SDG BSA) have played an effective role in creating policies and strategies by merging the science diplomacy with the principles and objectives ought to set for following the path towards SDG 14 achievement [4]. The policies were formed and assessed for its application and setbacks. Several briefing series have been launched to create a joint wired network between the policy-makers, administrators and science diplomats for



enhancement of the impact of the initiatives taken through application of policies. The initiation of partnerships and alliance with different organizations, involved in Agenda 2030 attainment such as with United Nations Academic Impact (UNAI), Worldwide Universities Network (WUN), the International Association of Universities (IAU), the Southern African-Nordic Centre (SANORD), Norway's Ministry of Foreign Affairs (MFA), Biodiversity Beyond National Jurisdiction (BBNJ) University of Oslo (UiO), Norwegian University of Science and Technology (NTNU), The Arctic University of Norway (UiT), Norwegian University of Life Sciences (NMBU) was done to create a synergic impact of HEIs in assisting SDG 14 progress.

The University of South Florida (USF) in United States, ranked 10th in Times Higher Education SDG 14 Ranking (2021) has become one of the institutions among several HEIs, partaking in SDG 14 target goal achievement [8]. The USF has been focusing on sustainability by its implementation in its academia, infrastructure and career development. School of Global Sustainability (College of Behavioural and Community Sciences), College of Marine Science and USF's Patel College of Sustainability is in alliance for better incorporation, implementation and emergence of SDG 14 objectives in university governance and academia [9]. For initial application they have segregated and organized the factors supplementing the SDG 14 objective progress, such as funding, educational courses, awareness programmes, workshop, technical training and research. USF have been following the blueprint of formulation plans, strategic planning and management for SDG 14 targets. It has also recognized aquatic ecosystem quality decline as a result of climatic change, pollution, fisheries and tourism.

College of Marine Science has focused itself in dealing with marine threats [9,10]. Discharge from Industrial plants released in water bodies is a major threat to aquatic ecosystem. USF researchers in Research vessel deployed as of April 2021 have been studying impact of wastewater released in Tampa Bay, from breach in retired processing plant (Piney Point). Research Vessel (R/V) Weather bird II, primarily operated from Bayboro Harbor, has been collecting data on impacts of Deep-Water Horizon oil spill (2010) in Gulf of Mexico. For Food Sustainability and Security, the impact of different factors which have evolved due to uncontrolled anthropogenic activities, such as rise in algal blooms and effect on fish spawning, is being compiled in data so as to process the overall deteriorated condition of the state's aquatic bodies. Florida is 3/4th covered by Gulf of Mexico, Atlantic Ocean and Straits of Florida, the mapping of the state's coastal water, is being done in a slow steady process, but so far it has been effort made by different USF researchers.



SDG-15: Protect, Restore, and Promote Sustainable Use of Terrestrial Ecosystems, Sustainably Manage Forests, Combat Desertification, and Halt and Reverse Land Degradation and Halt Biodiversity Loss

Summary

The chapter focuses on the SDG-15 which deals with the protection, restoration and sustainable development of terrestrial ecosystems by managing deforestation, desertification, land degradation, and biodiversity loss. The United Nations has recommended 12 targets (15.1-15.9c) each with defined target. In order to protect natural resources and for long term sustainable land management, the initiatives taken by national and international bodies have been reviewed. A total of 11 broad research areas, 32 implementation strategies for HEIs, and 41 policy recommendations for Government and regulatory bodies are presented to achieve the SDG 15 targets. A detailed literature review of publications, Government initiatives including case studies on SDG 15 are also included. The key recommendations include improvement of Government policies, educating people through awareness camps, introducing MOOC courses for students, protecting traditional knowledge by documenting indigenous flora and fauna and promoting collaborations for SDG 15 goal specific research projects at national and international level.

Key Recommendations to Achieve SDG-15

- HEIs should involve in the bioprospection of the mountain and hilly areas, particularly the Himalayas, for identifying plants having medicinal, aromatic, edible, and other values to generate sustainable livelihood for the mountain communities.
- HEIs should promote more field studies in academics, the establishment of nature and biodiversity parks, the promotion of plantations, and work for the conservation of traditional germplasm focusing on high-altitude plants.
- HEIs can take the initiative to protect the traditional knowledge by documenting our ethnomedicinal plants and by identifying old traditions and beliefs (Sacred Grooves and Sacred Trees) through interaction with gram panchayat, local medicine men, old knowledgeable people, etc.
- Government agencies should equally promote funding for all, government and private universities that will be taking research initiatives for the fulfillment of the goals of SDG-15.
- Government should promote sustainable tourism by adopting eco-tourism models i.e., restricting the number of tourists visiting the area, imposing special fines on visitors for destroying the livelihood of the inhabitants, investing in natural infrastructure as a cost-competitive alternative to grey infrastructure, promoting local home stays instead of constructing resorts and hotels in sensitive regions.

- Base load stations of appropriate capacity must be commissioned in HEIs for optimal utilization of environmental flows.
- Department of Fisheries in the states and HEIs should work towards developing separate hatcheries for snow trout and mahseer.
- HEIs should play a key role in the ex-situ conservation of natural habitats through biological research and can support capacity building at the grassroots level for the sustainable use of natural resources.
- HEIs should contribute towards the development of the database and documentation of bio-resources and associated knowledge.
- HEIs should help in the generation of awareness and sensitivity among students and rural and urban stakeholders towards the use and conservation of rich biodiversity in India through targeted campaigns and should act as model centre of awareness and sustainability.
- HEIs should undertake focused research on applied aspects related to eco-restoration and conservation.
- HEIs should follow the One-Health approach to design focused awareness programs on the management of zoonotic diseases.

1. Context and Current Status of SDG-15

1.1. The Context and Current Status

The foundation of our life on the planet depends on thriving life on land. Deforestation, land degradation, and loss of natural habitats have caused severe damage to our ecosystem. Forests are home to more than 80 % of all terrestrial species of plants, animals, and insects. Approximately 1.6 billion people including some 70 million indigenous people depend on forests for their livelihood (IUCN, 2021). Currently, forest area continues to decline at an alarming rate throughout the world along with the extinction of different species. According to FAO, in the 1990s each year the net loss of forest was 7.3 million hectares which decreased to 4.7 million hectares during 2010-2020. However, increased greenhouse gas emissions, wildlife trafficking, and poaching are still a cause of concern. As a result, the global Red List Index of threatened species has fallen from 0.82 to 0.74 (Green governance initiative, 2022). Moreover, deforestation, habitat encroachment, and surging wildlife crime are the primary reasons for infectious disease transmission. We are witnessing the result of this in the present time as Covid-19 which is threatening the world economy and public health. Now, it is necessary for the present scenario to protect and preserve life on land by promoting sustainable use of the ecosystem.

1.2. United Nations Sustainable Development Goal 15 Targets

The United Nations recommended twelve targets to achieve this goal along with indicators to measure the achievement of the targets. These targets are listed as follows:

- **Target 15.1:** By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements.
- **Target 15.2:** By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally.
- **Target 15.3:** By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.



- **Target 15.4:** By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development.
- **Target 15.5:** Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species.
- **Target 15.6:** Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed.
- **Target 15.7:** Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products.
- **Target 15.8:** By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species.
- **Target 15.9:** By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts.
- **Target 15.a:** Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems.
- **Target 15.b:** Mobilize significant resources from all sources and at all levels to finance sustainable forest management and provide adequate incentives to developing countries to advance such management, including for conservation and reforestation.
- **Target 15.c:** Enhance global support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities.

1.3. Summary of Progress on SDG-15 Implementation Globally

According to the Global Forest Resources Assessment (2020) report around 31% of the World's land area is under forest cover. Among them, more than 54% of forests are found in a few countries like Brazil, Canada, China, the United States of America, and the Russian Federation. A sharp increase in the destruction of forests was observed in the recent past, with at least 42,000 sq km of tree cover lost in key tropical regions, and a 12% increase in rainforest destruction was observed in 2019 (Weisse and Goldman, 2021). The recent regional assessment reports issued by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) found that biodiversity is in decline in all regions of the world (IPBES, 2019). The conversion of forests to agricultural land continues to be the main driver of deforestation. In addition, due to unsustainable use, forest degradation is increasing globally, driven by poverty or poor land governance. Different countries have implemented multiple approaches to achieve the SDG-15 targets. From 2000 to 2017, the average worldwide coverage of mountain, freshwater, and terrestrial key biodiversity areas increased from 39% to 49%, from 32% to 43%, and from 35% to 47%, respectively (IUCN, 2017).

Internationally a number of UN conventions and fora provide direct support for the achievement of SDG-15, including the UN Forum on Forests (UNFF); the UN Convention on Biological Diversity (CBD); the UN Convention to Combat Desertification (UNCCD); United Nations Development Programme (UNDP); United Nations Environment Programme (UNEP); the Ramsar Convention on Wetlands (RAMSAR); the UN Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); the Convention on Migratory Species (CMS); International Union for Conservation of Nature (IUCN).

However, these conservation efforts are continuously disrupted by wildlife poaching and illicit trafficking. Several countries are implementing strict laws to stop this illegal action which will help to fulfill the targets of SDG-15. The International Consortium on Combating Wildlife Crime (ICWC), a partnership between CITES, INTERPOL, UNODC, the World Bank and the WCO, is

a promising development for the Coordination within and across regions and continents to ensure trade chains from source to consumer.

1.4. Initiatives and Achievements of the Indian Government on SDG-15

Sustainable development is crucial for India, and it can be achieved by the incorporation and implementation of SDGs in different government policies. Earlier, the developmental strategy of India was predominantly created by the Planning Commission of India which was a Quasi-Constitutional Body led by the Prime Minister of India and assisted by several experts in various fields. In 2014, the government of India established National Institution for Transforming India (NITI-Aayog) and scrapped the Planning Commission. The NITI-Aayog boosted cooperative federalism by supporting the bottom-down approach (Sharma and Chaturvedi, 2020). The Sustainable Development Goals by the UN was introduced in 2015 and since then the government of India in coordination with NITI-Aayog contributed significantly to the achievement of SDGs. With an objective to track the progress of SDGs of all states and union territories, NITI-Aayog started publishing the SDG index in 2018. The SDG India index reports of past years with respect to goal 15 are presented in the following Table-1.

Table 1: Year-wise Composite India Index of SDG-15

Year	2018 (Baseline report)	2019 – 2020 (V2.0 report)	2020 – 2021 (V3.0 report)
The composite index of SDG-15	Not calculated	66	66

(Source: NITI-Aayog)

According to the National Biodiversity Action Plan (NABP) Report (Implementations of India’s National Biodiversity Action Plan an Overview, 2019), a comprehensive web of policies and legislative framework has evolved for the proper implementation of NABP. In 10 biogeographic zones in the country over 1,00,690 species of fauna and 47,480 species of flora have been documented. The correlation between the degradation of forests and their regeneration should be maintained to ensure that the forest cover does not get depleted. According to a recent report India’s Biodiversity Vision 2050 has been aligned with SDG goals through the implementation of NABP (Implementations of India’s National Biodiversity Action Plan an Overview, 2019). In 2021, a 1,540 Km² increase in forest cover has been observed in India as compared to 2019. As per this latest report, the forest cover in India is presently 21.71% of the country’s geographical area (India State of Forest Report, 2021).

In India, various organizations like the Ministry of Environment and Forests (MoEF), and Defence Research and Development Organization (DRDO), work in a strategic way across key elements of policymaking and best practices to protect environmental resources. The Department of Science and Technology (DST) initiated the programmes on National Mission for sustaining the Himalayan Ecosystems (NMSHE). Under this 60 different research organizations and universities with about 100 research teams were involved to implement this mission.

To achieve these SDG-15 targets, initially, six national-level indicators have been identified based on the availability of data across states and UTs. These targets will help to measure India’s performance towards the goal of SDG-15. The targets and achievements under these indicator lists are presented in Table 2 and state wise progression of SDG-15 in India is represented in Figure 1. The performances of Indian states with respect to the initial six indicators are represented in Table 3.

Table 2: SDG-15: Life on Land - Indicator List (2020-2021)

Area	Target	India
Forest + Tree cover as a percentage of total geographical area	33	24.56
Percentage of area covered under afforestation schemes to the total geographical area	2.74	0.51
Forest cover as a percentage of total geographical area	-	21.67
Tree cover as a perc total geographical	-	2.89
Percentage of degraded land over total land area	5.46	27.77
Number of cases under Wildlife Protection Act [1972]	0	15
Percentage increase in area of desertification	0	1.98

(Source: NITI-Aayog SDG India Index 3.0, <https://sdgindiaindex.niti.gov.in/#/ranking>)

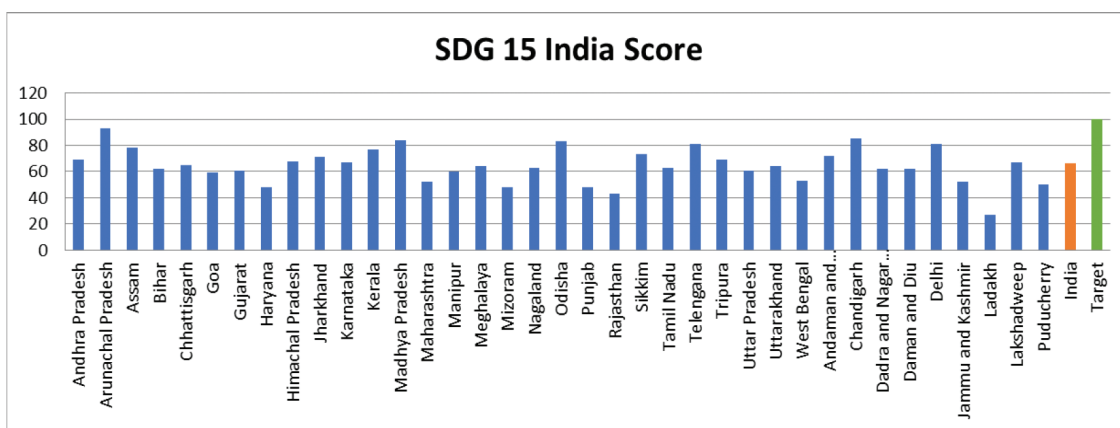


Figure 1: SDG-15 Progress in India (Data Source: NITI Aayog, 2021)

Table-3: Progress of SDG-15 in India in Terms of Targets and Achievements by Various States and Union Territories (Data Source: NITI Aayog, 2021)

Status	15.1	15.2	15.3	15.3	15.3	15.7	
	Forest cover as a % of total geographical area	Tree cover as a % of total geographical area	Combined 15.1+ 15.2	% of area covered under afforestation schemes to the total geographical area	% of degraded land over total land area	% increase in area of desertification	Number of cases under Wildlife Protection Act (1972) per million hectares of protected area
Achieved	21.67%	2.89%	24.56%	0.51%	27.77%	1.98%	15%
Target	-	-	33%	2.74%	5.46%	0%	0%
Highest	Lakshadweep (90.33%)	Chandigarh (22.34%)	Lakshadweep (91.3%)	Telangana (4.37%)	Rajasthan (52.69%)	Mizoram (95.52%)	West Bengal (115%)
Lowest	Ladakh (1.47%)	Andaman and Nicobar Island (0.50%)	Ladakh (1.47%)	Goa (0%), Lakshadweep (0%)	Chandigarh (0.50%)	Uttar Pradesh (-16.69%)	Karnataka (2%)

Recently to manage forests and combat desertification further, more indicators have been selected by the Government of India. To achieve the goals of SDG-15, the total National Indicators have been increased to fourteen (SDG India 2030 dashboard, 2022). These indicators (Table-4) represent the performance of India on different aspects of SDG-15 like the area of the Ramsar site, the percentage change in forest cover, tree cover, the percentage change in per capita income of the Himalayan States, progress towards national targets established in accordance with Aichi Biodiversity target, etc.

Table 4: Present National Indicators in India to Fulfill SDG-15 Targets (<http://www.sdgindia2030.mospi.gov.in/dashboard/india>).

Targets	Total National Indicators
15.1: By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements	15.1.1: Forest cover as a percentage of total geographical area
	15.1.2: Protected area as a percentage of total geographical area
	15.1.3: Area of Ramsar sites as a percentage of total wetland area
15.2: By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally	15.2.1: Percentage change in Forest Cover
	15.2.2: Total area covered under different afforestation schemes
	15.2.3: Tree cover as a percentage of total geographical area
15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world	15.3.1: Proportion of land that is degraded over a total land area
15.4: By 2030, ensure the conservation of mountain ecosystems including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development	15.4.1: Percentage change in forest cover in hill districts
	15.4.2: Percentage change in per capita income of Himalayan States over the previous year
15.5: Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species	-
15.6: Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed	15.6.1: Whether the country has adopted legislative, administrative and policy frameworks to ensure fair and equitable sharing of benefits
15.7: Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both the demand and supply of illegal wildlife products.	15.7.1: Number of cases registered under the Wildlife Protection Act 1972 (similar to 15.c.1)
15.8: By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species	-
15.9: By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts	15.9.1 (a) Progress towards national targets established in accordance with Aichi Biodiversity Target 2 of the Strategies Plan for Biodiversity, 2011-2020; (b) Integration of biodiversity into national accounting and reporting systems, defined as implementation of the System of Environmental-Economic Accounting

15.a: Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems	-
15.b: Mobilize significant resources from all sources and at all levels to finance sustainable forest management and provide adequate incentives to developing countries to advance such management, including for conservation and reforestation	15.b.1: Percentage of government spending on environmental protection to total government expenditure
15.c: Enhance global support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities	15.c.1: Number of cases registered under the Wildlife Protection Act 1972 (similar to 15.7.1)

In the case of SDG-15, stabilization and prevention of further decline of the index was achieved in 2020 – 2021 through several government policies. Some important initiatives taken by the Government of India related to SDG-15 are presented below:

1.4.1 National Environmental Policy

The National Environment Policy (NEP) by the Ministry of Environment and Forests (MoEF) launched in 2006, aims at mainstreaming environmental concerns into all developmental activities. It emphasizes the ways to conserve resources and shows that the best methods to aid conservation to ensure that people dependent on resources obtain better livelihoods from conservation than from degradation of the resources.

1.4.2 National Action Programme to Combat Desertification

It is the perspective plan of action building upon the existing national efforts and priorities. It was launched in 2001 and updated as per environmental challenges. The program recognizes the massive investment required to address the issues in a holistic manner on a long-term basis and the required financial and technical support and capacity building of the stakeholders for the implementation of various activities thereunder.

1.4.3 National Agroforestry Policy

India is the first nation in the world to adopt a comprehensive agroforestry policy when it launched the National Agroforestry Policy (NAP) at the World Agroforestry Congress held in Delhi in February 2014. The National Agroforestry Policy addresses the problems faced by the agroforestry sector including adverse policies, weak markets, and a dearth of institutional finance.

1.4.4 National River Conservation Programme

National River Conservation Plan (NRCP) is a centrally funded scheme launched in 1995, aimed at preventing the pollution of rivers. It provides information about each state on the amount sanctioned under NRCP to which city and for what purpose. Purposes included under the plan are the construction of STP, riverfront development, low-cost sanitation, afforestation, etc. The details of the number of schemes sanctioned and total expenditure for each state are provided. Some of the important projects sanctioned under this scheme are – 1. The Ganga Action Plan, 2. Nambal River Rejuvenation plan, 3. Tapi River Rejuvenation, etc. (National River Conservation Programme PIB press release, 2020)

1.4.5 Conservation of Natural Resources and Ecosystem

The umbrella Scheme on the Conservation of Natural Resources and Eco-systems through its different sub-schemes formulated for the protection of corals, mangroves, biosphere reserves, wetlands, and lakes conserve the natural resources and these eco-systems of the country.

1.4.6 Integrated Development for Wildlife Habitat

Integrated Development of Wildlife Habitats (IDWH) is a centrally sponsored scheme where the Centre provides financial and technical assistance to the State/UT Governments for activities aimed at wildlife conservation. It was launched by the Government of India in the year 1991-92 and currently completed the 12th plan period. The aim is to provide support to Protected Areas (National Parks, Wildlife Sanctuaries, Conservation Reserves, and Community Reserves), and help in the protection of wildlife outside Protected Areas. Along with other activities, it also helps in recovery programmes for saving critically endangered species and habitats. (Source: Ministry of Environment, Forest and Climate Change)

1.4.7 National Biodiversity Act

The Biological Diversity Act was enacted in 2002; it aims to conserve biological resources, management of its use in a sustainable way, and enable equitable and fair sharing of benefits gaining from the use and knowledge of biological resources with the local communities. The act was implemented through a three-tier structure namely - The Biodiversity Management Committees (BMCs), The State Biodiversity Boards (SBBs), and The National Biodiversity Authority (NBA) for regulation of the biological resource access from the local to national level. Recently, the Biological Diversity (Amendment) Bill, 2021 has been introduced to Lok Sabha by the government to improve biodiversity conservation initiatives.

1.5. HEIs Status: Role of Higher Educational Institutions and Status of Adoption of SDG-15

The United Nations Conference on Sustainable Development (Rio+20) was held in Rio de Janeiro, Brazil in July 2012. At this conference a number of higher education institutions (HEI) around the globe assembled on a single platform to collaboratively champion education, research, and actions of the Higher Education Sustainability Initiative (HESI) on sustainable development. This was an action-based conference to evaluate the role of higher education institutions toward a sustainable future. All stakeholders, including Major Groups, the UN System/IGOs, and Member States submitted commitments to focus on delivering concrete results to advance sustainable development. From all submitted commitments by higher institutes, only 73% were found to have made at least partial progress on their commitments either directly or indirectly. By the end of the Conference, over 700 voluntary commitments were announced, and an online registry was made that focused on the promotion of sustainable development. In addition to these, Rio+20 Higher Education Sustainability Initiative has also spurred the implementation of collective actions to promote sustainability across higher education institutions, such as the Platform for Sustainability Performance in Education.

The Higher Education Sustainability Initiative (HESI) for Rio+20 was also membered by UN partners, including the Executive Coordinator of Rio+20, UN DESA, UNEP, UNESCO, UN Global Compact, UNU, and UN Global Compacts Principles for Responsible Management Education to promote the initiative for higher education institutions. Thus, HESI initiated commitments on behalf of 272 organizations from 47 countries to take an active role in building a more sustainable society, representing 36% of all commitments (UN SDG event, 2021).



Around 85% of the commitments were made by countries in the North, and a range of countries in the South was represented by Nigeria, Colombia, India, Brazil, Ethiopia, Thailand, Bangladesh, South Africa, Guatemala, Ghana, Mexico and Kenya. The highest number of pledging HEIs by country has been given in Figure 2. The quantity and depth of sustainability initiatives varied significantly across institutions and sustainable development was taken up to be achieved by four outcomes--- education, research, operations, and outreach programmes.

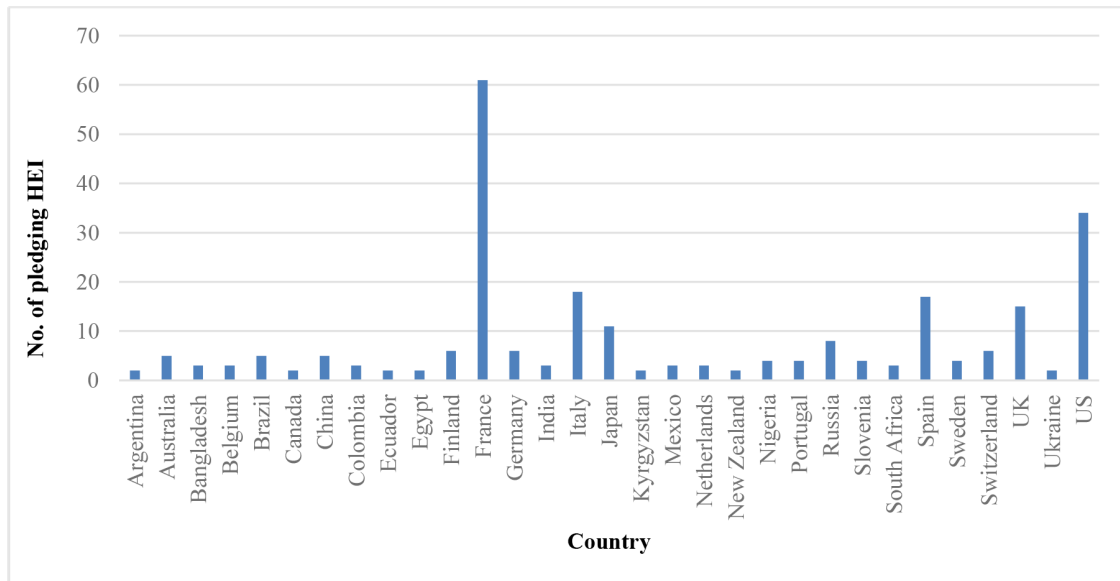


Figure 2: Number of Pledging HEIs per Country under HESI

1.5.1 National and International Status on the Role of HEIs

- The University Grants Commission (UGC), in the year 2019 proposed a sustainable campus framework to set out the principles for achieving a green and sustainable campus environment for Indian Higher Education Institutions (HEIs) (UGC SATAT, 2019). This framework is called SATAT and was developed with the initiative of environmental experts which intended to help Indian HEIs achieve campus sustainability ‘Sustainable Campus Policy’ by providing appropriate policies and practices towards achieving SDGs. This also involved the adoption of sustainability concepts in curricula and research activities of HEIs. The framework also includes generic guidelines to make campuses sustainable by campus planning, designing and development, resource optimization, landscapes and biodiversity, etc.
- Promotion of environmental education and research is key in the Indian HEIs as per the recommendations of the National Education Policy (NEP-2020). The policy focuses on environmental awareness including management of biological resources, climate change, resource and water conservation and sustainable development being an integral part of the curricula in the HEIs. This helps students to be able to make ethical decisions related to environmental consciousness. NEP-2020 also favours online education and access to downloadable versions of textbooks.
- The Sustainability Literacy Test, supported by PRME, UNESCO, UNDP, and UN DESCA and created in collaboration with other HESI endorsers, is a tool for higher education institutions across the globe to systematically assess the sustainability literacy of their students. In particular, the test assesses the level of knowledge in economic, social and environmental issues. To date, 255 universities from around the world use this test, and more than 24,000 students have taken it.

- The IEDC-Bled School of Management in Slovenia established the Coca-Cola Chair of Sustainable Development, dedicated to research, education and practice of sustainable value creation and has developed deeper relations with Coca-Cola University to promote CSR in corporate activities. However, most others had larger task forces typically consisting of a variety of stakeholders, including students, professors and faculty, and meeting on a consistent basis.
- Several universities like Arizona State University, Colorado State University, Florida Gulf Coast University, and Seattle University have implemented various initiatives to green their campus and the environment at large. Initiatives range from implementing recycling programs to offering bike-share services to planting 100 trees across campus. A regular report is developed and published regarding environmental management plans with monitoring reduction in carbon footprints. A few institutions have also engaged in independent environmental auditing schemes like LEED and ISO 14000 (U.S. Green Building Council, 2017).
- Conferences, forums and workshops are hosted focusing on sustainability organized by the Gordon Institute of Business Science in South Africa to Tongi University in China's International Forum on Innovation and Sustainable Development. Awareness creation on sustainability has been promoted by several universities like the Universidad del Pacific in Ecuador's annual Global Compact Support Week.

1.5.2 Best Practices and Case Studies on the Role Played by HEIs on SDG-15

1.5.2.1 National Level Initiatives

- T A Pai Management Institute in India conducted an inventory of species and habitats on the campus which was implemented under the guidance of the Manipal Bird Watcher's Club.
- Several HEIs in India including IITs, universities and other institutions have adopted a paperless examination model to reduce paper and plastic waste. Lately, institutions, particularly new ones, are focusing on building infrastructure that includes green building design. Among these is the Indian Institute of Management, Bengaluru, Universal Business School, Mumbai, IIT Roorkee, Jesus and Mary College, New Delhi, and Mangalore University (ranked 1st in the country as the most sustainable university).
- To mainstream environmental education and to build the skills and capacities of India's youth, UNEP with the support from TERI School of Advanced Studies (TERI SAS) proposes to develop India Green University Network (IGUN). This critically analyses the role of Universities/Higher Education Institutes to achieve SDGs in preparing future generations to achieve a sustainable and inclusive green economy with a healthy and productive ecosystem.
- All India Council for Technical Education (AICTE) has initiated the 'Clean and Smart Campus Award' and has launched various National Level Programmes like Faculty Development Schemes, Institutional Development Schemes, and Research & Innovation Development Schemes.
- The case study of UNICINOS highlights several key actions and approaches that can be undertaken by any HEI. First, the creation of a policy or management system within the campus to demonstrate a high-quality sustainable model township for others to follow. Second, to teach students courses that directly deal with sustainable research and SDG-15. Third, the creation of facilities and support for students to generate and conduct actual environmental and sustainability projects for the rural community. Lastly, the support for and creation of technological hubs to promote entrepreneurship in environmental and sustainable development areas as well as the popularization of the same amongst the general public.
- One of the most convenient methods for HEIs to start their journey towards SDG implementation is by creating Massive Open Online Courses (MOOCs). There are several universities and UN-



sponsored platforms that have already initiated MOOCs that focus on various SDGs. Some of these are listed in Table 5.

Table 5: MOOCs Related to SDGs Offered by Various HEI and the UN.

S.No.	Course Title	SDG Focus	Platform	Sponsor
1.	A business approach to sustainable landscape restoration.	SDG-15.3	Coursera	Erasmus University Rotterdam
2.	The Sustainable Development Goals- A global, transdisciplinary vision for the future	SDG-15.9	Coursera	University of Copenhagen
3.	Impact Measurement & Management for the SDGs	SDG-15.b	Coursera	Duke University
4.	Beyond the Sustainable Developmental Goal (SDGs): Addressing Sustainability and Development	SDG-15.b, 15.c	Coursera	University of Michigan
5.	Measuring Sustainable development	SDG-15.1	edX	SDG Academy X
6.	Sustainable & Inclusive Landscapes	SDG-15.3	edX	Wageningen University
7.	Energy within Environmental Constraints	SDG-15.1	edX	Harvard University
8.	Sustainable Management of Biodiversity	SDG-15.5	Swayam	Indira Gandhi National Open University
9.	Ecology and Environmental Ethics- Problems and Perspective	SDG-15.1	Swayam	Amrita Viswa Vidyapeetham
10.	Ecology Environment and Tourism	SDG-15.b	Swayam	Indira Gandhi National Open University

1.5.2.2. International Level Initiatives

- The University of Zanjan, Iran has been ranked as among the top 47 greenest university campuses of the world and is one of the steering committee members of the UI Green Metric World University Ranking Network. The university is located in a semiarid region and over the last 40 years the university has expanded its tree cultivation to over 72 hectares, and its total vegetation area now covers over 94% of the total campus area.
- A higher education institution in Brisbane, Australia, promotes community gardening in the context of integrating social responsibility, integrating diverse campus communities, and sustainability (Luetz and Beaumont 2019).
- In the USA, Higher Education Institutions (HEIs) like Gonzaga University, Adelphi University etc. have practiced campus sustainability to improve environmental management and foster social change on campuses.
- A study from Germany highlights how Ernst Moritz-Arndt-Universität Greifswald is on its way towards a “carbon-neutral university”. Besides this, it fosters a localized institutional framework on sustainability to bring out changes to daily operations, implement interdisciplinary research, and incorporate sustainability into teaching, and outreach programs.

- In Charles Sturt University, Australia 20,000 trees were planted in the different campuses. Bird surveys were also conducted in the university's biodiversity zone. Approximately 100 indigenous melaleuca and tea tree species were planted by school students. The promotion of the plantation of native species of plants was also emphasized.
- In the UK, Winchester Business School campuses features created a mosaic of different habitats, including grassland, hedgerows, ponds, and woodland. These can be considered hotspots for wildlife.
- Kristianstad University is located in one of the first UN Man and Biosphere (MAB) reserves in Sweden according to UNESCO. Large parts of the academic and research activities of the university benefit from being situated in a MAB reserve.
- Students at Nottingham Business School, UK worked in association with Sustainable Development Team for the greening the city project to design more pocket parks to increase green space on the campus and increase biodiversity.

1.5.3 The Commitment Signed by the Leaders of Higher Institutions during Rio+20 HESI as Action Forward by HESI

- **Teach Sustainable Development Concepts**, to ensure that they form a part of the core curriculum across all disciplines so that future higher education graduates develop the skills necessary to enter sustainable development workforces and have an explicit understanding of how to achieve a society that values people, the planet and profits in a manner that respects the finite resource boundaries of the earth. Schools are also encouraged to provide sustainability training to professionals and practitioners.
- **Encourage research on sustainable development issues**, to improve scientific understanding through exchanges of scientific and technological knowledge, enhancing the development, adaptation, diffusion and transfer of knowledge, including new and innovative technologies.
- **Green our campuses by:** i) reducing the environmental footprint through energy, water and material resource efficiencies in our buildings and facilities; ii) adopting sustainable procurement practices in our supply chains and catering services; iii) providing, sustainable mobility options for students and faculty; iv) adopting effective programmes for waste minimization, recycling and reuse, and v) encouraging more sustainable lifestyles.
- **Support sustainability efforts in the communities in which we reside**, working with local authorities and civil society to foster more livable, resource-efficient communities that are socially inclusive and have small environmental footprints.
- **Engage with and share results through international frameworks**, such as the UN Decade of Education for Sustainable Development, led by UNESCO, the UN University system, the UN Academic Impact, the Global Compact, the UN-supported Principles for Responsible Management Education initiative and the UN Environment Programme's Environmental Education and Training, in order to exchange knowledge and experiences and to report regularly on progress and challenges.

1.5.4 Limitations in Achieving SDG-15

Though several initiatives and schemes have been taken by the Government of India, several challenges regarding land degradation, deforestation and gradual loss of biodiversity still persists. These schemes and policies are fragmented and lack a clear road map. There is gap between the expenditure and the required funds to fulfill different targets. Proper allocation and management of funds under different schemes with respect to progress their progress are required. According to research, central government expenditure on 116 schemes for the period 2012-13 to 2016-17 was Rs.20,031.51 crore (USD 2.64 billion) however, the total funds required was estimated to be



around Rs. 91,437 crores (USD 12 billion) to fulfill 12 National Biodiversity Targets (Pandey et al., 2020; Ansari et al., 2018; Soundarapandi, 2017). Documentation and valuation of important species of protected lands and other forests are still not complete and available for further action. The conservation of terrestrial ecosystems is not progressing in a good direction. Forest areas are declining at an alarming rate, protected areas are not concentrated in biologically diverse locations, and species are still threatened with extinction. Furthermore, rising wildlife crime, land use changes such as deforestation, and habitat encroachment are main transmission channels for new infectious illnesses such as COVID-19, posing a threat to public health and the global economy. The tide is being turned with valiant efforts. These include improved protected area coverage for terrestrial, freshwater, and mountain ecosystems, as well as expanded sustainable forest management. Countries are progressing in their implementation of biodiversity and ecosystem protection programmatic, legislative, and accounting concepts. These advances must be strengthened and reinforced in order to recover more quickly following the global pandemic. To achieve a more balanced coexistence, it is necessary to promote understanding and raise awareness of the linkages between people and the natural environment.

Though HEIs and stakeholders have been working together for the greening of campuses and introduction of course curricula across India then also the efforts are lacking which require a ‘*Whole Institutional Approach*’ or ‘*System Redesign*’ to include environment and sustainability within HEIs. It is essentially required to focus on the practical implementation of various schemes and approaches. It is essentially required that assessment of the goals targeted, and progress made is monitored regularly to know what has been achieved, what the gaps are, and how future targets can be achieved. In order to achieve this, the stakeholders from regulatory bodies, implementing agencies, funding organizations, universities, and college campuses need to work in close association and have a continuous dialogue on the progress made. It is also required that HEIs in India develop environmentally safe practices and environmental consciousness to safeguard natural resources and also for building green-friendly campuses. The education sector can play a pivotal role in undertaking research and making concrete efforts to preserve and restore ecosystems. In 2015, India committed itself to the UN 2030 Agenda for Sustainable Development; therefore, it is the prime duty of Indian universities to align their operation and educational priorities around relevant Sustainable Development Goals (SDGs).

In the coming decade, higher education institutions will be required to vigorously adopt the attainment of sustainable goals in their Mission & Vision statement. It required that HEIs will have to transcend the boundaries of geography, institutional typology, affiliation, and status to work in collaboration with other institutes to ensure the achievement of the SDGs. India needs to identify selective universities that could be designated as SDG Hubs for educating future generations about the SDGs and global challenges. These SDG Hubs within the HEIs are an indication of how universal goals can be achieved through higher education.

2. Recommended Actions for HEIs for Achievement of SDG-15

HEIs can be considered as initiation hubs for SDG-15 implementation and therefore attention must be given to supporting and develop his research departments that work on lines in compliance with UN-SDGs within the campus. Students can be actively involved in ‘*green works*’ and other activities to achieve SDGs. ‘*Green work*’ is a job involved in the areas of the economy engaged in producing goods and services for environmental protection as well as those participating in conserving and maintaining natural resources (United Nations System of Environmental-Economic Accounting definition). Local people can be actively involved through awareness creation and participation in achieving the SDGs. The research department will be responsible for periodically reviewing and updating progress made. The next step is to ensure that SDG targets are defined, and key activities and projects are undertaken by HEI for efficient monitoring and management. A

flowchart for the facilitation of the same is shown in Figure 3. The objectives can be set as targets specific to SDG-15 like the promotion of plantations, afforestation programmes, conservation and restoration of ecosystems, and workshops on sustainable use of bioresources with the involvement of local people.

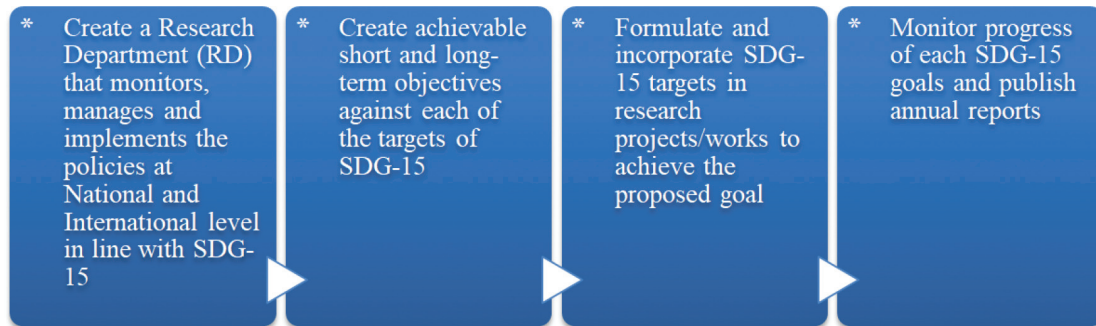


Figure 3: Flowchart for **Getting Started** with SDG-15 **Implementation Within** an HEI

Based on the international and national status of SDG-15, the key action points for HEIs for effective implementation of SDG-15 are presented in Table 6.

Table 6: Minimal Recommended Actions for HEIs for Implementation of SDG-15

Targets	Recommended Actions for HEIs
15.1	<ol style="list-style-type: none"> 1. Need for the implementation of an integrated approach to the conservation of freshwater ecosystems and their restoration 2. HEIs should work in conjugation with local communities through awareness creation for the conservation restoration and sustainable use of terrestrial and inland freshwater ecosystem services 3. Valuation of ecosystem services can act as a very important tool for the sustainability of such ecosystems using software like SolVES, InVEST, etc. 4. Restoration and rejuvenation of different ecosystems by Promotion of large-scale plantations by HEIs
15.2	<ol style="list-style-type: none"> 1. Management and restoration of degraded forests. HEIs can work in close association with the forest departments and line agencies for the implementation of different schemes. 2. Take up projects with government agencies to upgrade the degraded forests 3. Organizing awareness programs dealing with afforestation in which students can be involved largely. 4. HEIs can promote a Green Cover of their campuses to restore degraded ecosystems.
15.3	<ol style="list-style-type: none"> 1. Desertification can be addressed by HEIs through large-scale plantation drives in the nearby degraded lands involving students and local communities. 2. HEIs should work on awareness camps to inform and educate people regarding the adverse effects of desertification 3. Conduct workshops to train people to overcome droughts and floods by involving experts in these fields.
15.4	<ol style="list-style-type: none"> 1. HEIs should involve in organizing programmes related to sustainable mountain development and mountain ecosystem conservation. For example, imparting training to mountain communities regarding the sustainable harvest of plant resources. 2. Work on projects funded by government agencies to document the mountain biodiversity to conserve threatened species 3. HEIs can jointly work with the local administration to enable sustainable livelihood generation for the mountain communities by establishing non-farm industries like cottage industries.

15.5	<ol style="list-style-type: none"> 1. HEIs should take up projects that focus on surveys for documentation of flora and fauna, assess their status, and conserve the threatened species using various research tools 2. HEIs can initiate mass awareness by visual display of information regarding threatened species of that region and their conservation 3. Work in close association with international and national organizations like CITES, IUCN CBD, State biodiversity boards, and Forest departments through collaborative projects
15.6	<ol style="list-style-type: none"> 1. HEIs should sensitize the local people regarding intellectual property rights and the benefits arising from the access and utilization of these resources. 2. HEIs should strictly implement and monitor the policies of Nagoya protocol related to genetic resource utilization in a fair and equitable way with indigenous communities holding this knowledge
15.7	<ol style="list-style-type: none"> 1. HEIs should promote the use of enforcement tools and technologies like SMART to prevent wildlife trafficking 2. Organize outreach programs and run public awareness campaigns to inform the stakeholders within wildlife trade chains about the trafficking issues behind wildlife trade and the importance of sustainability
15.8	<ol style="list-style-type: none"> 1. HEIs should work on projects in association with Government agencies to identify the invasive alien species in different regions and ecosystems and assess their region-specific impact 2. Promote ecosystem services and devise spatial planning tools to evaluate the costs and benefits of species-specific intervention at a regional level that will help to manage the alien invasive species
15.9	<ol style="list-style-type: none"> 1. HEIs must include biodiversity values into different developmental plans of the campus as well as suggest the integration of the same to local development authorities 2. Implement different projects in collaboration with Government and private agencies (under CSR initiative) to elevate the economy of the rural population
15.a	<ol style="list-style-type: none"> 1. HEIs can involve business experts and business management students to provide business models to poor rural populations for sustainable use of bioresources 2. HEIs can initiate training programs with respect to the conservation and sustainable use of natural resources like timber, fibre, phytomedicine, and wild food products 3. Promote innovative educational and extension programs for the farmers to foster the sustainable use of natural resources in ways that can be economically viable to rural populations
15.b	<ol style="list-style-type: none"> 1. HEIs can help in the achievement of this goal through joint projects with foreign and government agencies to provide financial benefits to forest dwellers and financial assistance to stakeholders associated with forest management. 2. HEIs can help the communities to learn about the attractive incentives to encourage them to conserve and restore forests
15.c	<ol style="list-style-type: none"> 1. HEIs should actively involve collaborating with global agencies like International Anti-Poaching Foundation, World Wildlife Fund, Chengeta Wildlife, The WILD Foundation, etc. to get maximum support against illegal trafficking and poaching 2. HEIs must involve with forest departments, government authorities and NGOs to plan sustainable livelihood for the local population

3. Proposed Research Agenda for HEIs and Governmental Bodies

The reviews of past studies and respective linkages with the SDG-15 targets have led to several key research areas that must be undertaken by HEIs. It is recommended that undergraduate and postgraduate level courses are redesigned in keeping with the SDG. Proposed areas of research are highlighted in Table 7.

Table 7: Main Research Areas and Key Activities Followed for SDG-15 Implementation

Field	Research Areas	Key Activities
Biodiversity and Conservation	Biodiversity survey and management	<ul style="list-style-type: none"> Science and technology-based integrated approach should be developed to regenerate and manage micro-ecosystems and biodiversity for sustainable livelihood based on HEIs in association with government and private agencies involving local stakeholders. Utilization of unutilized, underutilized, and invasive biomass.
	Balancing forest use and conservation	<ul style="list-style-type: none"> Value addition to products including Non -Timber Forest Produce (NTFP) based on traditional skills through surveys and documentation by researchers and Scientists in association with villagers of the nearby areas and regulating bodies.
	Traditional knowledge biodiversity conservation	<ul style="list-style-type: none"> Minimizing pressure on forest resources and prevention of forest fires by educating and awakening local people through seminars, plays, and nukkad natak organized by higher educational institutes, respectively. Exploration, harvesting, spring recharge, and purification of water resources through tree plantations like Moringa, Oak, Populus, etc. Microorganisms like purifying bacteria, protozoa, and rotifers can be used to purify water. Traditional tribal traditions: Sacred Forest, Sacred Grooves, and Sacred Trees should be identified by the HEIs in collaboration with local authorities like gram panchayat, and Mahila Mandal and necessary actions should be taken to protect these tribal traditions. Herbal pharmacovigilance of herbal drugs, Phytochemistry and pharmacological screening of unexplored medicinal plants should be done by HEIs. Conservation strategies should be developed to protect traditional knowledge and over explored herbal plants after conducting a survey at the small and large levels through students.
Ecology	Forest and Wetland ecosystem	<ul style="list-style-type: none"> Wetland types and ecosystem service types should be added to the course curriculum by HEIs. Policy designing by the government in collaboration with environmentalists and local authorities to protect forest and wetland ecosystems. Replicate habitat types in multiple areas to spread risks associated with climate change. Design estuaries with dynamic boundaries and buffers.
	Ecosystem protection, toxicology	<ul style="list-style-type: none"> Prevent or limit groundwater extraction from shallow aquifers Interaction of anthropogenic and non-anthropogenic pollutants in the environment and their impact on the ecosystem should be studied by HEIs and environmentalists. Risk factor study associated with aerospace agrochemical pharma and nanotech sector should be introduced in the course curriculum for students.
	Environment impact assessment	<ul style="list-style-type: none"> Effect of pollutants from natural events like wildfires, volcanic eruption, floods, tsunamis or earthquakes should be studied and analysed by HEIs in association with environmentalist. To determine ecosystem services and benefits through quantitative methods such as questionnaires or collection diaries to obtain data Planning, designing and management by govt. in association with environmentalist.

	Coastal habitat and mangroves	<ul style="list-style-type: none"> Economic benefits and green economy: risk management, mitigating land and soil degradation, wood security, and food and nutrition security topics should be added to the course curriculum by HEIs.
	Climate change and adaptation	<ul style="list-style-type: none"> Sustainable development practices should be introduced at small and large levels by HEIs through the R3 approach, promoting environmental education and awareness, and by improving quality of life including social, economic, and cultural dimensions. The role of mangroves in coastal risk reduction and their multiple values should be identified by HEIs and environmentalists. Further policies should be designed to manage mangroves for the coastal defence by coastal defence strategies, managing coastal zones and bringing the mangroves back. The course on climate change and its impact on the environment should be introduced in the course curriculum for students by HEIs. Climate change should be reversed by implementing a weather warning system, planting trees in urban areas, implementing education campaigns, by creating a disaster preparedness programme by govt in association with environmentalists.
Land use	Disaster Management and Landslides Control	<ul style="list-style-type: none"> The main goal of disaster management is to minimize the event's impact, something that involves preparedness, response, recovery, and mitigation by coordinating the role and responsibilities of responders, private sector agencies, non-profit and faith-based organization, volunteers etc. The course should be introduced in the curriculum and students should be skilled in disaster management by HEIs.
	Cropping system and crop production	<ul style="list-style-type: none"> Integrated crop management and development of farming system model for different land holding. Ecology-oriented economy generation; land-based income-generating activities like off-season vegetable production, low-cost nursery techniques.
	Sustainable Agriculture & Bio-farming	<ul style="list-style-type: none"> Crop diversification, soil management, seed conservation and micro-irrigation techniques. Food, fuel and fodder management and preservation techniques. Plant based herbicide and pesticides formulation. Livestock development in mixed crop farming system.

India is a country with a large ethnic society and has immense wealth due to which it is rich in biodiversity. There are 45,000 species of wild plants out of which 9,500 species are ethnobotanically important species. Of these 7,500 species are in medicinal use for indigenous health practices (Arora, 1991). In addition to these, a number of plants are used as timber, building material and about 700 species are culturally important from a moral, cultural, religious, aesthetic, and social point of view of the Indian sub-continent are one of the twelve mega-centres of biodiversity representing two of the eighteen hotspots of biological diversity one occurring in Western Ghat and another in North-Eastern Himalaya (Zeven and Zhikovskiy, 1973). Floristically 141 endemic genera belonging to over 47 families of the higher plant occur in India. In India, 11.95% of the world's biodiversity has been conserved by ethnic people in many ways (Arora, 1997). The botanical survey of India has reported 46,214 plant species are found in India of global flora of these 17,500 represents flowering plants. Thirty-seven of these are endemic and found in North -East of India (Arora, 1997).

Many plants are conserved in their natural habitat by tribals due to their belief that they are the habitats of gods. The tribal culture prevalent in tribal pockets in Central India has been recorded



in the Dindori, Balaghat and Mandala districts of Madhya Pradesh and Kawardha and Bilaspur districts of Chhatisgarh states. Example *Mangifera indica* Linn. of Anacardiaceae is worshipped for Lord Vidhyadhara, *Terminalia arjuna* W&A of Combretaceae for Lord Brahma. Since knowledge of medicinal plants being used is confined mostly to local herbal healers, it is of utmost importance to document this knowledge for future generations because information on the use of plants for therapeutic purposes has been passed from one generation to the next through oral tradition. This knowledge of therapeutic plants has started to decline and become obsolete due to the lack of recognition by younger generations as a result of a shift in attitude and ongoing socio-economic changes. In this process, the knowledgebase that accumulated over generations has also been swept away. Both biological diversity and traditional knowledge are inextricably interlinked, and the loss of one leads to the erosion of the other. In spite of various policy measures, the excessive and illegal gathering of medicinal plants persists, with the collection of species considered endangered and which is prohibited by law, to obtain higher incomes in the short term with little concern for sustainability. As a result, there has been a negative impact on the biodiversity of medicinal plants and the traditional healthcare system of the region. Therefore, the cultivation of medicinal plants to sustain the traditional healthcare system throughout all the States is essential through strong policy implementation. If interested farmers are registered with HRDI or other government agencies and offered the benefits of loans, subsidies, better planting material, and better practices of cultivation and harvesting technology, medicinal plant cultivation and traditional healthcare system will become part of their livelihood. There is a need to organize extension activities for farmers through demonstrations and training programmes on cultivation practices and marketing knowledge of medicinal plants.

4. Recommendations for Government and Regulatory Bodies for Achievement of SDG-15

4.1. Recommendations for the Government

Management planning involves the interpretation and expression of broader policies at the local level: i.e., the local delivery of broader strategy. Effective implementation through excellent public governance is critical to the accomplishment of these aims. Government must invest in strategies that in every possible way promote sustainable development. But it cannot bear the sole responsibility of guiding us toward a more sustainable future. Society, culture, and humanity are equally responsible, as these are the realities on the ground of economic policies, and religious and other structured beliefs. Good governance can only create a vehicle for informed decision-making as well as invest in and preserve the democratic system's checks and balances. It can create and maintain plans, policies, and initiatives that will assist us all in achieving a successful future. Hence, the following (Table 8) are the key action points for the government and policymakers for the effective implementation of SDG-15.

Table-8: Recommendations for the Govt. for SDG-15 Implementation

Targets	Minimal Recommended Actions for Government/Policy Makers
15.1	<ul style="list-style-type: none"> Produce a map showing the priority areas and actions to focus on freshwater ecosystem conservation and planning Ensure the conservation, restoration, and sustainable use of terrestrial and inland freshwater ecosystems in line with obligations under international agreements. Integrate policies and measures to ensure longevity, maintain funding and, where appropriate, enhance and scale up interventions.





15.2	<ul style="list-style-type: none"> • Imposing severe fines for cutting of trees or causing any harm to the flora. • Support and apply landscape approaches, based on multi-stakeholder dialogue and collaborative action, to overcome social and environmental fracture lines in landscapes facing deforestation, land, and ecosystem degradation • Law enforcement, awareness raising, and capacity building. Ensuring People’s participation in forest management, and afforestation activities in degraded areas.
15.3	<ul style="list-style-type: none"> • Conducting tree plantation drive regularly in communities and fellow lands. • Finance the restoration of degraded land for production and/or conservation purposes. • Scale up best practices for land use planning and management. E.g., Construction of rainwater harvesting structures, countering erosion through soil conservation techniques i.e., Bench terracing, contour bunding, hedge row intercropping, etc.
15.4	<ul style="list-style-type: none"> • Ensure provision on sustainable tourism E.g., Adopting ecotourism models i.e., restricting the number of tourists visiting the area and awareness campaigns. • Imposing of special fines on visitors for destroying the livelihood of the inhabitant. • Invest in natural infrastructure as a cost-competitive alternative to grey infrastructure. E.g., through promoting local stays instead of constructing resorts and hotels in sensitive regions.
15.5	<ul style="list-style-type: none"> • Increase in the number of protected areas (National Parks, Wildlife Sanctuaries, conservation reserves, and community reserves. • Ensure the protection of wildlife outside protected areas. Initiate recovery programmes for critically endangered species and habitats. • Scale up industrial reuse of water and support watershed protection programs. • Ensure the implementation of national conservation and environmental directives/initiatives. E.g., National species plans in the UK are delivered through Management Plans for sites within the UK.
15.6	<ul style="list-style-type: none"> • Consider the importance of genetic resources for food and Agriculture and their special role in food security. • Promote and encourage scientific research that contributes to the conservation and sustainable use of biological diversity. • Pay due regard to cases of present or imminent emergencies that threaten human, animal, or plant health.
15.7	<ul style="list-style-type: none"> • Ensure the ban on illegal trading of wildlife and eliminate the consumption of wild animals to safeguard people's lives and health E.g., by raising public awareness and support for ending the wildlife trade. • Develop and promote wildlife trade policies in line with national and international legislation • Incentivizing sustainable use typically has more immediate positive effects on wildlife populations than direct trade bans.
15.8	<ul style="list-style-type: none"> • Strengthen the bio-security and legal framework measures to monitor and eradicate alien species. • Ensure the contribution of all stakeholders and groups of interest for early detection and rapid eradication of Invasive Alien Species (IAS) in the environment. E.g., developing a list of Invasive Alien Species at national, regional, and global levels and making it easily accessible to all interested parties. • Information on programmes to collections, development, and policies relating to the Invasion of Alien Species (Putting sufficient and adequate public information campaigns that describe the concern of IAS in direct and simple terms).
15.9	<ul style="list-style-type: none"> • Ensure the integration of agri-environmental schemes and other policy instruments towards desired biodiversity outcomes. • Conduct an assessment of existing and planned policies across the government affecting biodiversity and identify opportunities and options for addressing biodiversity concerns. • Establishment of awards or recognition programmes promoting behavior beneficial to biodiversity.





15.A	<ul style="list-style-type: none"> • Build awareness of the merits and potential of investment in nature for countries. • Ensure the use of Sustainable intensification approaches to reduce the impact on the environment. • Should focus on natural capital modeling. E.g., Economic valuation of the environment and applying natural capital at a local level.
15.B	<ul style="list-style-type: none"> • Direct financial support must be given to projects, organizations, and local people for the conservation, reforestation, and sustainable management of forests. • Expand markets for responsible forest products and thereby support sustainable forest management
15.C	<ul style="list-style-type: none"> • Total prohibition on illegal wildlife trade • Eliminate the consumption of wild animals

4.2. Recommendations for Regulatory Bodies

Education regulatory agencies are uniquely placed to lead the cross-sectoral implementation of the SDGs, providing an invaluable source of expertise in research and education on all sectors of the SDGs, in addition to being widely considered neutral and influential players. By 2030, the Sustainable Development Goals (SDGs) agenda intends to address the world’s most pressing issues. Higher education institutions’ knowledge and experience are critical resources for moving the agenda forward. Theoretical and practical knowledge, as well as critical thinking, are more vital than ever at this moment, when the globe is unified in the aim to create a sustainable future.

Specific immediate actions point for key regulatory bodies are identified as follows:

1. Scrutinize and approve graduate and postgraduate degrees and courses related to the SDGs offered by HEIs. Curricula for a new subject should be developed, amended, and implemented by universities.
2. Policies and strategic initiatives to address the SDGs should be adopted by university governing bodies. These policies should focus on gender equality, proper environmental management on campus, striving toward a carbon-neutral institution, and collaborating with local communities to achieve sustainable goals, in addition to quality education and research.
3. Universities may also contribute to the advancement of systems thinking and planetary health. (Eg. performing integrated, transdisciplinary, and context-specific research to improve understanding of environmental and human health connections).
4. Education regulatory bodies can also push innovative governance frameworks that encourage cross-sector collaboration and policy consistency.
5. Education institutions empower and mobilize young people; provide in depth academic and vocational training to implement SDG’s solutions (E.g. Seminars, workshops and awareness campaigns).
5. Encourage and promote the SDGs as a topic of research (for Postgraduate programmes) within the university; supporting the full spectrum of research approaches needed to address the SDGs.

5. Conclusion Along With Prioritization of the Initiatives Recommended

Various steps have been taken by the Government to achieve the SDG-15 goal and various policies have been developed. However, these all were not implemented successfully at the national or international level either due to the unawareness of the people or due to the limitation of these policies. There is still a noticeable gap between governments, academic institutions, and other major players. As the government is not the sole responsible governing body for the executions

of policies or plans, a positive attitude of people towards the protection of natural resources with society, culture, religion, and other structured beliefs is equally crucial. To achieve these goals, there are essential requirements to fill the gaps by eliminating policy limitations and warning people about the SDG's goals. Education regulatory bodies are equally well-positioned to lead the cross-sectoral implementation of the SDGs. It can provide an invaluable source of experience in research and education on SDG areas. Financing research, development, and innovation work are required because the initiatives to be conducted must be founded on and supported by scientific data that gives recommendations and considerations to be examined and implemented in decision-making. Overall, the main recommendations of the present chapter for HEIs and government bodies are as follows:

- HEIs should involve in the bioprospection of the mountain and hilly areas, particularly the Himalayas, for identifying plants having medicinal, aromatic, edible, and other values to generate sustainable livelihood for the mountain communities.
- HEIs should promote more field studies in academics, the establishment of nature parks, and biodiversity parks, the promotion of plantations, and work for the conservation of traditional germplasm focusing on high-altitude plants.
- Various awareness camps like seminars and *nukkad natak* should be organized by the HEIs in collaboration with NGOs and the government at a small and large levels to educate the people about the consequences of destroying nature. Mankind should be made conscious of the worth of flora and fauna, their interaction, and human dependence on them for the sustenance of life on the planet by readapting ancient practices and culture.
- HEIs can take the initiative to protect our traditional knowledge by documenting our ethnomedicinal plants and by identifying our old traditions (Sacred Grooves and Sacred Trees) and beliefs through interaction with gram panchayat, local medicine men, old knowledgeable people, etc. After documentation, further, necessary actions or conservation practices should be taken in association with the government to protect overexploited plants or resources. HEIs can conduct various small and large research projects to introduce these livelihood practices like farming, livestock rearing, etc. to students that educate them about the role of cultural and traditional values in strengthening livelihood resilience. HEIs can help in policy designing with the government in collaboration with environmentalists and local authorities to protect forest and wetland ecosystems.
- HEIs should design small projects where students participate in the plantation of trees like Moringa, Oak, Populus, etc. near water resources for water purification purposes. Some microorganisms like purifying bacteria, protozoa, and rotifers can be used to purify contaminated water after successful trials in the laboratory. HEIs should take part in reversing climate change in association with the government by implementing a weather warning system, planting trees in the urban area, implementing education campaigns, creating disaster preparedness programmes, employing land use planning to reduce flash floods, insulating buildings fortifying sanitation systems and by design climate services by government in association with environmentalist.
- The role of mangroves in coastal risk reduction and their multiple values should be identified by HEIs and environmentalists and further policies should be designed to manage mangroves for coastal defence through coastal defence strategies, by managing coastal zones, and by bringing the mangroves back.
- By developing sustainable practices at a small and large level through the R3 approach, HEIs can promote environmental education and awareness and therefore, can improve the quality of life including social, economic, and cultural dimensions.

- Government should take the initiative to rank and recognize the research institutes and universities in the country that are working to make SDGs an important component in their curriculum and research.
- Government agencies should equally promote funding for all government and private universities that are taking research initiatives for the fulfillment of the goals of SDG-15.
- HEIs must start working for the achievement of SDG-15 by offering undergraduate and graduate-level courses and MOOCs related to the same. HEIs must also review their campuses for compliance with the SDG-15 and create a policy for biodiversity, land use, environment, and sustainability.
- The State Governments must align with the Central Government for the effective implementation of SDG-15 and monitor the status of related projects through online systems.
- Regulatory bodies like UGC, AICTE, and NAAC must foster the design and approval of new HEIs, degrees, and course curriculums related to biodiversity, ecosystem, forest management, and SDGs, and make policies to keep the quality in check.

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16 PEACE, JUSTICE AND STRONG INSTITUTIONS



SDG-16: Promote Peaceful and Inclusive Societies for Sustainable Development, Provide Access to Justice for All and Build Effective, Accountable and Inclusive Institutions at All Levels

Summary

Sustainable Development Goal-16 states ‘Promote peaceful and inclusive societies for sustainable development, offer access to justice for all, and build effective, responsible, and inclusive institutions at all levels.’ Conflict, insecurity, poor institutions, and restricted access to justice continue to pose significant challenges to long-term development. According to the UNHCR, the number of people escaping war, persecution, and conflict surpassed 70 million in 2018, the greatest number in nearly 70 years. In 2019, the United Nations recorded 357 killings and 30 enforced disappearances of human rights defenders, journalists, and trade unionists in 47 countries, while the births of one in every four children under the age of five are never officially recorded, depriving them of a legal identity that is essential for the protection of their rights and access to justice and social services. This document examines how teaching, research, governance, and external leadership may all help higher education achieve SDG-16. It also focuses on the problems confronted by HEIs in meeting these goals. In this chapter, 10 broad areas for research and 37 policy recommendations for government and regulatory bodies to achieve the SDG-16 targets, are presented. The key recommendations are to involve the Higher Education Institutions (HEIs) in research and policy-making, recognition of efforts done by HEIs in promoting just, peaceful, and inclusive societies and vigilantly track the status of SDG projects.

Key Recommendations to Achieve SDG-16

- A sense of rule of law and natural justice should be strongly instilled in the students by HEIs so that the right kind of knowledge is inculcated in them which will further lead to the expansion of consciousness and eventually to “viveka”- the ability of discrimination and rationalization through which the idea of peace will be perpetuated.
- India, being the powerhouse of ancient and modern knowledge, has the potential to achieve the goals of this SDG; therefore, it should take a lead to show the sustainable pathway to the world by propagating its culture, traditions, and spirituality.
- A Global Education Managing Council should be established to work on the ‘welfare of mankind’
- HEIs should explore ways of finding constructive alternatives for well-being; reintegrating with nature, effective institutional reforms and community participation required to achieve the targets of SDG-16 for . Peace, Justice and Strong Institutions worldwide.
- Development-induced displacement, violence and insecurity, and growing inequities are creating restlessness in the country which requires urgent action to induce peace and justice in the society should help students and faculty achieve inner peace by developing the inner



strength, through yoga and meditation for a peaceful mind and composed personality which will be helpful in creating peace and justice in society.

- Strengthen international and national political commitment for access to justice.

1. Context and Current Status of the SDG-16

1.1 The Context and Current Status

The Sustainable Development Goals which were introduced in 2015, are remarkable for including subjects such as environmental education at all levels, i.e. primary, secondary, and tertiary education. This was a much-required move to make the development sustainable and the planet liveable for future generations. SDG 16 on peace, justice, and inclusion is a major step forward as these aspects were not given much significance in education in comparison to subjects like engineering and technology in the purview of development policy.

So far, there has been a mixed bag of results in the achievement of SDG-16 is concerned. ‘As of now, available data indicates that progress toward SDG16 has been ‘uneven’ at best’ throughout the first four years.’ One of the messages of SDG, ‘leave no one behind, is the central, transformative promise of the 2030 Agenda for Sustainable Development. It represents the unequivocal commitment of all UN Member States to eradicate poverty in all its forms, end discrimination, and exclusion, and reduce the inequalities and vulnerabilities that leave people behind and undermine the potential of individuals and of humanity as a whole. This commitment to ‘leave no one behind’ is at the heart of the SDGs, not only is it morally unacceptable to keep a vast number of people structurally locked out of progress but delivering on it is a prerequisite for achieving Agenda 2030. The fundamental failure of the state to perform functions necessary to meet citizens’ basic needs and expectations”—is especially vulnerable. Over the last five years, numerous types of research have been undertaken on our social systems, and some of their findings can be helpful in preparing strategies for achieving SDGs.

- Corruption, theft, bribery, and tax evasion cost developing nations some \$1.26 trillion each year.
- Only 73 % of children under the age of five have their births registered across the world.
- In Sub-Saharan Africa births of only about 46% of children are registered.
- Of the 28.5 million primary school-age children out of school in conflict-affected countries, 12.6 million live in sub-Saharan Africa, 5.3 million live in South and West Asia, and 4 million live in the Arab States. The vast majority, 95%, live in low and lower-middle-income countries.
- The development and rule of law are inextricably linked and mutually reinforcing, making them indispensable for long-term development at both the national and international levels.
- In the recent decade, the percentage of convicts held in solitary confinement without being sentenced has stayed nearly steady, at 31% of all prisoners.
- Violence against children impacts almost one billion children worldwide, costing countries up to \$7 trillion every year.
- Every year, 50% of the world’s youngsters are exposed to violence.
- Every 7 minutes, a child is killed by violence somewhere on the planet.
- Before the age of 18, one out of every ten youngsters is sexually molested.
- 9 out of 10 children live in nations where corporal punishment is not completely illegal, leaving 732 million youngsters unprotected by the law.
- The National Centre for Missing and Exploited Children have reported child online sexual abuse increased from 1 million in 2014 to 45 million in 2018.
- School-related violence around the world is reported at 246 million per year.



1.2 United Nations Sustainable Development Goal 16 Targets

Table 1. SDG-16 Targets and Indicators

SDG 16 TARGETS	INDICATORS
Target 16.1. Significantly reduce all forms of violence and related death rates everywhere	16.1.1 Number of victims of intentional homicide per 100,000 population, by sex and age 16.1.2 Conflict-related deaths per 100,000 population, by sex, age and cause 16.1.3 Proportion of the population subjected to (a) physical violence, (b) psychological violence and (c) sexual violence in the previous 12 months 16.1.4 Proportion of the population that feel safe walking alone around the area they live
Target 16.2. End abuse, exploitation, trafficking and all forms of violence against and torture of children	16.2.1 Proportion of children aged 1–17 years who experienced any physical punishment and/or psychological aggression by caregivers in the past month 16.2.2 Number of victims of human trafficking per 100,000 population, by sex, age, and form of exploitation 16.2.3 Proportion of young women and men aged 18–29 years who experienced sexual violence by age 18
Target 16.3. Promote the rule of law at the national and international levels and ensure equal access to justice for all	16.3.1 Proportion of victims of violence in the previous 12 months who reported their victimization to competent authorities or other officially recognized conflict resolution mechanisms 16.3.2 Unsensitized detainees as a proportion of the overall prison population 16.3.3 Proportion of the population who have experienced a dispute in the past two years and who accessed a formal or informal dispute resolution mechanism, by type of mechanism
Target 16.4. By 2030, significantly reduce illicit financial and arms flows, strengthen the recovery and return of stolen assets and combat all forms of organized crime	16.4.1 Total value of inward and outward illicit financial flows (in current United States dollars) 16.4.2 Proportion of seized, found, or surrendered arms whose illicit origin or context has been traced or established by a competent authority in line with international instruments
Target 16.5. Substantially reduce corruption and bribery in all their forms	16.5.1 Proportion of persons who had at least one contact with a public official and who paid a bribe to a public official, or were asked for a bribe by those public officials, during the previous 12 months 16.5.2 Proportion of businesses that had at least one contact with a public official and that paid a bribe to a public official or were asked for a bribe by those public officials during the previous 12 months
Target 16.6. Develop effective, accountable and transparent institutions at all levels	16.6.1 Primary government expenditures as a proportion of the original approved budget, by sector (or by budget codes or similar) 16.6.2 Proportion of the population satisfied with their last experience of public services
Target 16.7. Ensure responsive, inclusive, participatory and representative decision-making at all levels	16.7.1 Proportions of positions in national and local institutions, including (a) the legislatures; (b) the public service; and (c) the judiciary, compared to national distributions, by sex, age, persons with disabilities and population groups 16.7.2 Proportion of the population who believe decision-making is inclusive and responsive, by sex, age, disability and population group

Target 16.8. Broaden and strengthen the participation of developing countries in the institutions of global governance	16.8.1 Proportion of members and voting rights of developing countries in international organizations
Target 16.9. By 2030, provide legal identity for all, including birth registration	16.9.1 Proportion of children under 5 years of age whose births have been registered with a civil authority, by age
Target 16.10 Ensure public access to information and protect fundamental freedoms, in accordance with national legislation and international agreements	16.10.1 Number of verified cases of killing, kidnapping, enforced disappearance, arbitrary detention and torture of journalists, associated media personnel, trade unionists and human rights advocates in the previous 12 months 16.10.2 Number of countries that adopt and implement constitutional, statutory and/or policy guarantees for public access to information
Target 16.a Strengthen relevant national institutions, including through international cooperation, for building capacity at all levels, in particular in developing countries, to prevent violence and combat terrorism and crime	16.a.1 Existence of independent national human rights institutions in compliance with the Paris Principles
Target 16.b Promote and enforce non-discriminatory laws and policies for sustainable development	16.b.1 Proportion of the population reporting having personally felt discriminated against or harassed in the previous 12 months on the basis of a ground of discrimination prohibited under international human rights law

1.3 Summary of Progress on SDG-16 Implementation Globally

The Sustainable Development Goals succeed the Millennium Development Goals, which served as the first global development framework from 2000 to 2015. SDGs are aspirational global norms that are globally applicable but not legally binding. Governments and stakeholders have more flexibility in focusing on key SDGs and tailoring implementation methods to specific settings. The Sustainable Development Goals (SDGs) are a bold, all-encompassing agenda that incorporates environmental concerns, inequities, and peace into global development norms. More than 30 linked organisations, programmes, funds, and specialised agencies make up the UN system, each having its own membership, leadership, and budgeting processes. To promote peace and prosperity, these organisations collaborate with and via the UN Secretariat. UN funds and programs are financed through voluntary rather than assessed contributions, some of them being:

1.3.1 United Nations International Children’s Emergency Fund (UNICEF)

United Nations International Children’s Emergency Fund provides long-term humanitarian and development assistance to children and mothers around the world. UNICEF is also in charge of obtaining immunizations for 45 percent of the world’s children, saving 2.5 million children’s lives each year.¹

1.3.2 United Nations High Commissioner for Refugees (UNHCR)

United Nations High Commissioner for Refugees protect refugees and helps them relocate. Millions of people have been displaced due to various reasons and UNHCR is working to aid them in more than 120 countries.

¹ Official website of UNICEF, available at <https://www.unicef.org/research-and-reports>, last visited on 19/05/2022

1.3.3 UN Office On Drugs and Crime (UNODC)

The United Nations Office on Narcotics and Crime (UNODC) provides assistance to member States to improve criminal justice system capacity and is a world leader in the battle against illicit drugs and related crimes. It is also a good source of research and information on drugs and crime control for the effective implementation of relevant international treaties.

1.3.4 United Nations Development Programme (UNDP)

The United Nations Development Programme (UNDP) is the UN's worldwide development network. UNDP assists in the facilitation of elections in roughly 60 countries each year, especially those facing difficult post-conflict political transitions.

1.4 Initiatives and Achievements of the Indian Government on SDG-16

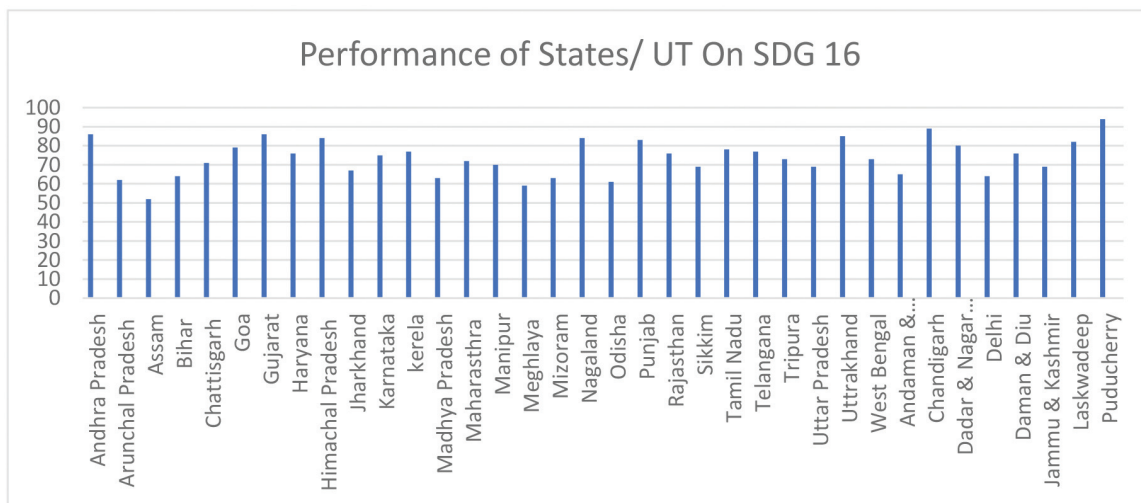


Figure 1: SDG-16 Scores: States & UTs (Data source: Niti Aayog)

Graph representing the SDG Index Score of 36 States/ UT, as per the NITI Aayog SDG Report 2019². The Performer States are Arunachal Pradesh, Assam, Bihar, Madhya Pradesh, Meghalaya, Mizoram, Orissa, and Delhi and the rest of the States in the graph are the front runners.

The Indian judiciary is overworked due to a significant number of pending cases, with a backlog of 35 million cases as of June 2019 - 31 million in lower courts, 4.35 million in higher courts, and 58, 669 in the Supreme Court.³ India has made enhancing justice a priority through government efforts such as the PRAGATI Platform, a public grievance redressal mechanism, and the creation of judiciary infrastructure, including *Gram Nyayalays* for villages.

India has developed a solid legal framework for dealing with violence against all sectors of society over time. Although the total crime rate per lakh people has decreased from 388.6 in 2017 to 383.5 in 2018, there has been an increase in the rate of crime under certain categories.⁴

² NITI Aayog, SDG 2019- 2020, available at https://www.niti.gov.in/sites/default/files/SDG-India-Index-2_0_27-Dec.pdf, last visited on 19/05/2022

³ PSR Legislative Research, official website, available at <https://prsindia.org/policy/vital-stats/pendency-and-vacancies-in-the-judiciary>, last visited on 19/05/2022

⁴ National Crime Record Bureau (NCRB) Official website, available at <https://ncrb.gov.in/en>, last visited on 19/05/2022

The Comptroller and Auditor General (CAG) of India, the quasi-judicial authorities of the *Lokpals* (at the central level) and *Lokayuktas* (at the subnational level), and the independent judiciary extending from the district to the national level are all critical parts of the country's institutional bulwark of accountability. The Right to Information Act of 2005 has improved public institutions' accountability and transparency. The PRAGATI Platform (an IT-based grievance redressal and monitoring system extending to the district/sub-district level) and the Digital India campaign (focused on delivering e-governance solutions for citizen-centric projects) have proven beneficial in strengthening participatory governance.

The unique identity system *Aadhaar* when combined with access to bank accounts and mobile phones, has enabled 380 million people to benefit from various government schemes and programmes.

1.4.1 *Rashtriya Gram Swaraj Abhiyan (RGSA)*

The RGSA is one of a kind plan that aims to build and enhance the Panchayati Raj system across India, mostly in rural regions. Its major goal is to develop rural India, which will ultimately lead to the development of the entire country. Train and help newly elected Gram Panchayats around the country so that they can do their jobs effectively at the grassroots level. The plan is designed to assist Panchayati Raj Institutions in achieving more long-term goals and accelerating general development in rural areas.

1.4.2 *Panchayat Yuva Krida aur Khel Abhiyan (PYKKA)*

The goal is to provide infrastructure for basic sports so that rural youth is encouraged, and to give them the opportunity to compete in sports competitions at the block and district levels, leading to additional opportunities for talented athletes to receive advanced training and exposure, as well as to compete and excel in the state, national, and international tournaments.

1.4.3 *Digital India*

Digital India is a government programme aimed at ensuring that government services are made available to citizens electronically.

1.4.4 *Digital India Land Record Modernization Programme*

The Government of India began the Digital India Land Record Modernization Programme (DILRMP) in 2008 with the goal of digitising and modernising land records and developing a centralised land record management system.

1.4.5 *PRAGATI Platform (Public Grievance Redressal System)*

PRAGATI is one of a kind interactive and integrative platform. The platform aims to address ordinary man's problems while also monitoring and assessing significant Government of India initiatives and projects

1.4.6 *RTI (Right to Information Act)*

The RTI Act was enacted with the primary purpose of empowering citizens and increasing transparency and accountability in government operations. The Right to Information Act mandates that any citizen who requests information receives a prompt response..



Table 1: Various Centrally Sponsored and Central Sector Schemes laid by Indian Government with respect to SDG-16

SDG Description	Linkage with other SDGs	SDG Targets	Centrally Sponsored / Central Sector Schemes (CSS)	Concerned Ministries/ Departments
Promote peaceful and inclusive societies for sustainable development, provide access to justice for all	SDGs 1, 4, 5, 8, 10, 11 and 17	16.1		Ministry of Home Affairs
		16.2	Umbrella ICDS National Labour Project	Home Affairs, Labour & Employment
		16.3	1. Nyaya Bandhu (Pro Bono Legal Services) 2. Nyaya Mitra 3. Legal Literacy and Legal Awareness 4. National Legal Services Authority (NLSA) 5. Designing innovate solutions for holistic excess to justice (DISHA)	Home Affairs, Law & Justice
		16.4		Home Affairs
Build effective, accountable and inclusive institutions at all levels		16.5		Ministry of Home Affairs
		16.6	Digital India Digital India Land Record Modernization Programme	Science & Technology
			3.Rashtriya Gram Swaraj Abhiyan (RGSA)	Panchayati Raj
			4.Modernisation of Police Forces (including Security Related Expenditure)	Ministry of Home Affairs
			Development of Infrastructure Facilities for Judiciary including Gram Nyayalayas and e-courts	Ministry of Law & Justice
			Scheme for action research and studies on judicial reforms	
		16.7		Personnel, Public Grievances and Pensions, HUA, RD, Panchayati Raj
		16.8		External Affairs
		16.9	Aadhaar Card	UIDAI, Home Affairs, Panchayati Raj
		16.10		Ministry of Home Affairs, MEA
		16.a		Ministry of Home Affairs, MEA
		16.b		Ministry of Home Affairs

1.4.7 Contribution of University Grant Commission

Scheme for Trans-disciplinary Research for India's Developing Economy (STRIDE)

UGC is proposing STRIDE, a system to promote excellent research by academics and students, as part of its quality mandate. It will encourage creative and critical thinking and increase the quality of doctorate research. The MoE has already announced the following schemes:

- Impacting Research Innovation and Technology (IMPRINT)
- Impactful Policy Research in Social Science (IMPRESS)
- Scheme for Promotion of Academic and Research Collaboration (SPARC)
- Scheme for Transformational and Advanced Research in Fundamental Sciences (STARS)

Over 310,000 technological ideas, innovations, and traditional knowledge practices are stored in the National Innovation Foundation's database, which spans 608 districts across the country. The MoE has recognised over 1000 Institutional Innovation Councils. This potential expertise and resources can make a big difference in India's economy. Objectives of the Scheme are:

1. Identifying young talent, strengthening research culture, building capacity, promoting innovation, and supporting cross-disciplinary research that is relevant to national development and society's general well-being.
2. To support high-impact national network projects in the humanities and human sciences, as well as Indian knowledge systems.

Unnat Bharat Ahiyaan 2.0

The UBA was launched in February 2018 by the Ministry of Education (MoE) erstwhile Ministry of Human Resource Development (MHRD). It aspires to bring about a revolutionary change in rural development by the active engagement of higher education institutions with rural communities, as well as community reorientation through research and development. In June 2018, the University Grants Commission (UGC) established a Subject Expert Group (SEG) on Curricular Reforms and Educational Institutions Social Responsibility to help UBA 2.0 achieve its goals.

Rajiv Gandhi National Fellowship (RGNF) For Scheduled Caste/Scheduled Tribe Candidates

The Ministry of Social Justice & Empowerment and the Ministry of Tribal Affairs together create and fund the Rajiv Gandhi National Fellowship (RGNF) Scheme for Scheduled Castes and Scheduled Tribes. Candidates from Scheduled Castes and Tribes who aspire to pursue higher education, such as normal and full-time M.Phil. and PhD degrees in Sciences, Humanities, Social Sciences, and Engineering & Technology are eligible for the initiative. Every year, there are 1333 slots for Scheduled Caste applicants and 667 slots for Scheduled Tribe candidates for all subjects. According to the government of India's stipulation, 3% of fellowships are designated for physically handicapped SC/ST candidates.

The scheme was created with the social backgrounds of the candidates in mind, with the goal of providing them with the opportunity to pursue further studies and research.

Post-Doctoral Fellowship for Women Candidates

The Post-Doctoral Fellowship for Women Candidates is designed to help unemployed women candidates with a PhD to pursue advanced study and research in their chosen subject areas.



Scheme of Maulana Azad National Fellowship for Minority Students

The Ministry of Minority Affairs created the Maulana Azad National Fellowship for Minority Students and funds them. The scheme is offered to candidates who are members of a Minority Community, i.e. Muslim, Sikh, Parsi, Buddhist, and Christian students who want to pursue higher education in the form of a normal or full-time M.Phil/Ph.D. Science, Humanities, Social Sciences, and Engineering & Technology degrees are available. Every year, there are 756 places available for all topics. As per the Government of India's rule, 3% of fellowships are earmarked for Physically Handicapped candidates from Minority Communities.

1.5 Status of Adoption of SDG-16 by the Higher Educational Institutions

1.5.1 Higher Education and the SDGs

Despite the fact that higher education is not a primary SDG pillar, the SDGs lay a larger focus on it than the MDGs, which placed it on the periphery. Teaching and learning, research and development, operations and governance, and external leadership are the four key activities via which higher education may contribute to the SDGs, according to SDSN. The work adds to a growing body of research on university-based peace-building and resistance, as well as post-conflict rehabilitation and conflict transformation. The SDSN framework is used in the following part as a heuristic mechanism for classifying university agencies' engagement with SDG16. The document then goes on to discuss some cross-cutting difficulties that university agencies face when it comes to implementing SDG16.

1.5.2 Overview of University Contributions to the SDGs

1.5.2.1 Education

Universities' educational missions can contribute to the SDGs in a variety of ways, including courses, extracurricular activities, and youth mobilisation for sustainable development. During times of conflict, university education suffers a number of obstacles, including decreased access, quality, and equity, as well as disruptions to learning processes. The most direct approach to contribute to SDG-16 is to teach SDG-16 related issues.

1.5.2.2 External Leadership

Universities can help with SDG implementation, research, and policy participation on a global scale. Universities are a logical lead partner in the SDGs' cross-sectoral implementation, providing a vital source of expertise in research and education across all SDG sectors, as well as being largely seen as neutral and prominent stakeholders. SDG-16, in particular, provides a unique opportunity for universities at the heart of the global academic community to mobilise resources and demonstrate the external effect in addressing grand concerns such as peace, governance, and global injustice. Through external impact, public involvement, and lobbying, this section will examine whether universities can and should make SDG-16 a major element of their service mission.

1.5.2.3 Operations and Governance

Higher education can also help to achieve SDG-16 governance goals by demonstrating engagement and robust institutions. This can be accomplished by open and transparent university governance,



such as student or community representation on university governing boards, meritocratic appointments, or providing opportunities for students to engage in democratic organising.

MIT-WPU is one of India's few colleges that offer programmes based on the United Nations' Sustainable Development Goals. By incorporating sustainable development goals into all of its academic programmes, the MIT-WPU Faculty of Sustainability Studies fosters social innovation, partnerships, and co-creation.

To establish a sustainable future, the educational system must educate students with the necessary skills, attitudes, and values. Students are encouraged to develop critical and creative thinking abilities, participate in authentic interdisciplinary learning activities, and establish a value system that emphasises social justice and responsibility to oneself, others, and the environment.

All of MIT- WPU's programmes and campus projects are established with academic input from famous academicians, researchers, and industry experts, and it is a UNESCO Chair for human rights, peace, democracy, and tolerance. To build an effective learning framework known as WPU Methodology, the study programmes are driven by the 17 United Nations Sustainable Development Goals, value-based universal education, and peace studies. Reading the pulse of changing global dynamics across industry, environment economy, and society, MIT-WPU has introduced some futuristic study programs that retain the strengths of conventional programmes and focus on modern requirements. MIT-WPU is the only university in India offering these programmes guided by the 17 UN SDGs. Some of these programmes include: BA (Social Sciences), M.Sc (Sustainable and inclusive Development), M.Sc (Compassion, Peace, Humanitarian Action and Disaster Risk Management), M.Sc (Sustainable Rural Development, M.Sc (Agribusiness Entrepreneurship, MPH (Masters in Public Health).

The foregoing programmes at MIT-WPU also expose students to international forums, the United Nations Development Programme (UNDP), UNICEF, and the International Fund for Agricultural Development (IFAD). NITI Aayog, State Administrative Departments, Government District Agencies, Urban Livelihood Mission, the Ministry of Environment, Forests and Climate Change, State Forest Departments, the Department of Science and Technology, Council of Scientific and Industrial Research are among the national agencies and boards with which the university has developed strong ties.

The University of Toronto's Munk School of Global Affairs and the Department of Political Science collaborated on the study. A collaboration between the Munk School of Global Affairs and the Mastercard Centre for Inclusive Growth has made this research possible. The research was also supported by the Canada Research Chairs programme and the Ralph and Roz Halbert Professorship of Innovation at the Munk School of Global Affairs, in addition to these two organisations. From September 2016 to May 2017, research was undertaken, with primary fieldwork in India in April 2017. In one union territory and several states, interviews and site visits were undertaken. The University of Toronto's Ethics Review Board examined and approved this study endeavour, which included fieldwork. This report provides a case study on how to recognise the value of identification as a tool for inclusion, which is one of the SDG 16 aims to be met by 2030. (target 16.9 of SDG i.e. provide legal identity for all). This study is centred on the concept of development reach, and in particular, innovative programmes that are successfully addressing the most difficult-to-reach people.

As of February 2016, around 1.5 billion people in the developing world lacked legal evidence of identity, according to the World Bank. An individual may struggle to collect government cash transfers, enrol in school, find formal work, vote, or purchase a SIM card without identity. Even worse, when marginalised people lack confirmation of identity, they risk missing out on government benefits and protection programmes that are meant to help them. In India, proving one's identification helps with inclusion in a variety of ways. Individuals may be eligible to access

social welfare programmes with proof of identity. A lot of these programmes include financial transfers to beneficiaries to help them satisfy their basic needs. Individuals can also use proof of identity to gain access to banking services. Proof of identification, when taken as a whole, guarantees that an individual gets the most out of the programmes, services, and other opportunities available to them.

Table 2: Some of the Courses Related to SDG-16 Offered by Various HEIs and the United Nations

S.NO.	TITLE	PLATFORM	SPONSORS
1	Human Rights for Open Societies	Coursera	Utrecht University
2	Gender and Sexuality: Diversity and Inclusion in the Workplace	Coursera	University of Pittsburgh
3	Children's Human Rights - An Interdisciplinary Introduction	Coursera	University of Geneva
4	Human Rights, Human Wrongs	SDG Academy	United Nation Sustainable Development Solution Network
5	Refugees in the 21st Century	Coursera	University of London
6	Understanding Poverty and Inequality	SDG Academy	United Nation Sustainable Development Solution Network
7	Measuring Sustainable Development	SDG Academy	United Nation Sustainable Development Solution Network
8	Justice	EdX	Harvard University
9	Economic Growth and Distributive Justice Part II - Maximize Social Wellbeing	Coursera	Tel Aviv University
10	Law and Justice in a Globalizing World	Swayam	National Law University Odisha

2 Role of HEIs in the Achievement of SDG-16

A number of the SDGs expressly mention education and research, and universities play a key role in achieving them. Universities, on the other hand, may make a significant contribution to the SDGs by supporting the implementation of all of the SDGs as well as the SDG framework itself. Some of these main areas of contribution are presented here.

Teaching

While education is a sustainability objective in and of itself, it is intimately linked to SDG 16. For a sustainable future, inclusive education for sustainable development that mobilises youth for social action is critical. HEIs can help students learn more about legal rights and environmental law. Students' abilities to think through complexity can be developed, and their learning can be enhanced through dialogue and communication. They can motivate children to contemplate deeply, form a worldview, and value sensitivity. Higher education institutions are in a unique position to reinforce the most effective skills for promoting fairness and consensus, such as conflict resolution techniques. They can promote gender equality, non-discrimination, and participatory democracy by instilling these principles. There are two approaches to including these disciplines in the curriculum. Horizontal integration refers to the incorporation of sustainable development into many courses and topics. Vertical integration entails the creation of specific courses centred on the SDGs. The first alternative is thought to be more effective because it addresses the complexities of sustainability



issues. The significance of higher education institutions in education might extend beyond the students enrolled. Local stakeholders, such as NGOs, the commercial sector, and governmental institutions, can receive tailored training on the SDGs, and these institutions can become partners in transdisciplinary co-creation pathways.

Research

Providing the necessary knowledge, evidence-base, solutions, technologies, pathways, and innovations to underpin and support the global community’s implementation of the SDGs – using both traditional disciplinary approaches and newer interdisciplinary, transdisciplinary, and sustainability science approaches; building capacity in developing countries to conduct and use research; collaborating with and supporting innovative companies to implement SDGs. HEI can contribute to evidence-based policymaking through research, for example, by independently reviewing SDG indicators. This contribution ensures that official and governmental data on SDG implementation is evaluated, allowing HEIs and civil society actors to conduct transparent and objective evaluations of SDG implementation. It is critical to guarantee that research is open and accessible, according to the “Association for the Advancement of Sustainability in Higher Education’s 2019 Technical Manual.” Non-academics will be able to access quality peer-reviewed research as trusted sources, enhancing institutional transparency and accountability. Furthermore, through applied or problem-solving research, critical scholarship, and the research process itself, HEIs can contribute to the achievement of SDG 16.

Organisational Governance, Culture, and Operations of the University

Putting the SDGs’ ideals into practice through governance structures and operational policies and decisions in areas such as employment, finance, campus services, support services, buildings, procurement, human resources, and student administration. In terms of governance, HEIs can help achieve SDG 16 in conflict-affected areas, according to a report by Qatar’s Centre for Conflict and Humanitarian Studies. HEIs can play a role in resolving political conflicts by ensuring academic freedom in the face of conflict so that political activity can be evaluated. They can also act as a bridge between local demands and the global logic of the SDGs as a paradigm for peacebuilding. Makeni University in Sierra Leone is a great example of how to put it into effect. Its civic education programme strives to strengthen the democratic system by educating voters and monitoring elections, for example, and actively improving the transparency and dependability of institutions. In conflict-affected areas, HEIs can further assist Goal 16 by addressing social, political, and economic imbalances and engaging constructively in identity politics. They could also help by increasing educational possibilities and attainment levels, which would reduce the degree of violence. In another sense, HEIs may and should set an example in terms of sustainable forms of governance by implementing the spirit of SDG 16 into their rules in areas such as employment, finance, support services, and others. HEIs can pave the way by including staff, students, and important stakeholders in decision-making or guaranteeing intercultural acceptance on campus. According to The Commonwealth’s 2017 Curriculum Framework for the Sustainable Development Goals, education should aspire to be free of discrimination, violence, and harassment, while also building skills that will enable students to fight injustice in their communities. This strategy entails delivering a gender-sensitive, rights-based, community-oriented, and inclusive education directed primarily at vulnerable and marginalised groups, as well as a commitment to eliminate all forms of inequality.

External Leadership

Increasing public participation and engagement in SDG implementation; assisting in the development of SDG-based policies; and demonstrating sector commitment to the SDGs. Many have pointed out that HEIs educate future “sustainable development leaders” when it comes to external leadership.

Young leaders with a sustainable attitude are entering government institutions and the business sector, with the potential to strengthen the existing ties between local and global societies. With this in mind, it is critical that HEIs increase public participation and engagement while tackling the SDGs, as exposing these future leaders to the UN's Agenda 2030 will hopefully impact their future institutional behaviour. This can be accomplished by providing educational opportunities such as lectures and seminars in which renowned professionals discuss sustainability issues, as well as being loud about HEIs' policymaking interventions and advocacy for sustainable development. Given that most HEIs already have the research and teaching skills needed to create capacity and support policymakers, the SDGs provide a chance to strengthen this leadership position.

Higher Education Institutions, on the other hand, will not be able to accomplish and fulfill their role in the implementation of the SDGs unless they have the necessary capacities and information, and are viewed as one of the key stakeholders by governments. They should also believe that their duty is not restricted to the university campus but should extend their support to local communities in order to make a significant difference. Institutional barriers, according to research in this sector, are the most major difficulties that must be addressed and overcome in order for the SDGs to be implemented in higher education institutions.

3 Proposed Research Agenda for Higher Education Institutions and Governmental Bodies

Education is one of the few sectors capable of supporting, promoting, and contributing to the achievement of all of the Sustainable Development Goals by 2030. HEIs, on the other hand, can contribute to the SDGs in a much larger way, as they can help with the implementation of all of the SDGs as well as the SDG framework itself. HEIs hold a unique place in society and are critical to achieving the SDGs because they can provide the next generation with the skills, knowledge, and understanding needed to address sustainability challenges and opportunities, as well as conduct research that advances the sustainable development agenda. They can also use their experience, capabilities, and leadership to persuade stakeholders to embrace and model more sustainable practices by setting an example. HEIs play a vital role in supplying the essential knowledge, evidence base, solutions, and innovations to underpin and assist this endeavour, due to their substantial research capabilities and activities. Some of the areas where Research can contribute to realizing SDGs are:

Understanding the Challenges

Understanding the origins and dynamics of sustainable development difficulties in terms of Peace and Justice, as well as determining the appropriate policies and strategies to meet them. Research is a key tool for filling knowledge gaps that contribute to these difficulties.

Localising the SDG-16 Agenda

Research also plays an important role in translating the global SDG-16 agenda to national and local contexts, including assisting in the identification of relevant local concerns, action priorities, and appropriate indicators for tracking progress. This encompasses our country's various economic, social, and political aspects.

Developing Solutions

Across the SDG-16 problems, research is required to drive the development of social and technological ideas and solutions. This will include sites such as ESAMADHAN and PRAGATI, as well as the most recent constitutional and legislative reforms.

Supporting the Operationalisation of the SDG-16 Framework

The research community plays a crucial role in synthesising and assessing worldwide progress on the SDGs, as well as having extensive skills and facilities for data collection, management, and analysis, which could help with the massive burden of monitoring progress on the SDGs.

Research Agenda for Higher Education Institute to Achieve SDG-16

1. To investigate the impact of various government initiatives aimed at promoting justice, peace, and strong institutions, as well as their effectiveness and recommendations for improvement.
2. Examining existing strategies and plans and finding areas for improvement in relation to various targets SDG-16.
3. Making recommendations to resolve difficulties with current strategies and plans, as well as their execution and implementation.
4. Setting targets that Panchayats, Blocks, and other *samitis* can adopt to achieve SDG-16.
5. Developing effective strategies and plans that make the most use of available resources and capabilities.
6. Increasing public participation and engagement by supporting and facilitating research projects aimed at attaining multiple aims of SDG-16.
7. Initiate and facilitate cross-sectoral discourse and action on the implementation of SDG-16 for research that addresses sustainable development issues. Form collaborations and exchange programmes with institutions in other poor countries in areas relevant to SDG-16.
8. Facilitate knowledge exchange on how to address SDG-16 difficulties with and among communities or countries.
9. To assist the government in addressing the enormous obstacles of monitoring progress on SDG-16.
10. Initiate a Research Grant to encourage young scholars to conduct research related to SDG-16 through strong and innovative partnership between higher education and society in general.

4 Recommended Actions for HEIs, Government and Regulatory Bodies

4.1 Recommendations for the HEIs

- India, being the powerhouse of ancient and modern knowledge, has the potential to achieve the said SDGs therefore, it should take a lead to show the sustainable pathway to the world by propagating its culture, traditions and spirituality.
- A sense of rule of law and natural justice should be strongly instilled in the students by HEIs so that the right kind of knowledge will be inculcated in them which will further lead to the expansion of consciousness and eventually to “*viveka*” the ability of discrimination and rationalization through which the idea of peace will be perpetuated.
- Liberal Arts is an important subject that allows students to hone several skills along with value-based education and therefore, it must be a mandatory component across curricula.
- Global Education Managing Council should be established to work on the ‘welfare of mankind’.
- Development-induced displacement, violence and insecurity, and growing inequities are creating restlessness in the country which requires urgent action to induce peace and justice in the society. Peace can be propagated by the individual only when he/she has peace with oneself, HEIs should help students and faculty achieve inner peace by developing the habit of



spirituality and meditation for a peaceful mind and composed personality which will be helpful in creating peace and justice in society.

- HEIs should encourage collective actions among students towards realizing SDGs.
- HEIs to institute a zero-tolerance policy towards corrupt practices at all levels within the institution.
- HEIs should induce the students with morals, values and ethics, tolerance and abilities to follow the path of virtue, and also face and overcome difficult life situations.
- HEIs should help the students to imbibe the significance of relationships in comparison to materialism so that the value of humanitarian relations is restored in society which will help in fostering peace in society. This is how peace will lead to the expansion of consciousness and that would lead to justice. It's time that we make our GenZ learners think on their own
- HEIs should explore ways of finding constructive alternatives for well-being; reintegrating ourselves with our nature, effective institutional reforms and community participation required to achieve all the SDG of Peace, Justice and Strong Institutions.
- Self-realization is necessary but it cannot be taught but can be generated and students need to look within to find the answers - contemplation and meditation can help them achieve personal peace' and then gradually move towards 'World Peace'.

4.2 Recommendations for the Government

Table 4: Recommendations for the Government

SDG-16 TARGETS	INDICATORS	SUGGESTIONS
SDG 16.1 Significantly reduce all forms of violence and related death rates everywhere	<ul style="list-style-type: none"> • Freedom from forced labour, • Torture, political killings, Internal conflict 	<ul style="list-style-type: none"> • To open family centres for domestic violence for safety and security. • To open help line for the aggrieved parties to have free consultancy with advocates. • Free counselling for victims
SDG 16.2 End abuse, exploitation, trafficking and all forms of violence against and torture of children		<ul style="list-style-type: none"> • Sex Education courses in schools. • Counselling sessions for parents and school students • use of child-friendly and interactive teaching-learning methods. • To inculcate private defense/survival skills through different experts as well as courses.
SDG 16.3 Promote the rule of law	<ul style="list-style-type: none"> • Access to justice for all • Judicial corruption decision • Judicial accountability • Fair trial • Independence of Judiciary • Law and order • Transparent laws with predictable enforcement 	<ul style="list-style-type: none"> • Strengthen international and national political commitment to engage in access to justice. • Emphasis on research and framing of new policies and strategies • A sense of rule of law and natural justice should be strongly instilled in the students by HEIs so that the right kind of knowledge will be inculcated in them which will further lead to the expansion of consciousness and eventually to "viveka" the ability of discrimination and rationalization through which the idea of peace will be perpetuated.



<p>SDG 16.5 reduction of corruption and bribery</p>	<ul style="list-style-type: none"> Public sector theft Executive embezzlement and theft, bribery and corrupt exchanges 	<ul style="list-style-type: none"> To effectively execute the direct benefit transfer principle To imbibe the culture of zero tolerance towards corruption from the grassroots level through government agencies and HEI's To appreciate and reward honest employees.
<p>SDG 16.6 Develop effective, accountable, and transparent institutions at all levels</p>	<ul style="list-style-type: none"> Law and order Independence of Judiciary Legislature questions officials in practice Executive oversight Legislature investigates in practice Executive constraints Barriers to parties Opposition parties' autonomy Elections multiparty Competitiveness of participation Engaged society 	<ul style="list-style-type: none"> To execute E-Governance in all institutes across the country. To implement E-Tendering in all public offices. To Conduct awareness programs through educational institutions like HEIs, Government agencies.
<p>SDG 16.7 Ensure responsive, inclusive, participatory, and representative decision-making at all levels</p>	<ul style="list-style-type: none"> Elected official's index Competitiveness of executive recruitment Openness to executive recruitment Electoral management bodies' autonomy Election government intimidation Election free and fair Competition Election voting age population turnout Local government index Subnational elections free and fair Social class equality in respect of civil liberties Social group equality in respect of civil liberties Power distributed by socio-economic position Representation of disadvantaged social groups Religious tensions Ethnic tensions 	<ul style="list-style-type: none"> To ensure 50% representation of women / marginalized people in the parliament / state legislature. To conduct workshops and training programmes to develop skills and provide technical assistance to the under privileged. The government must include higher education institutions in research and policymaking on issues such as justice, peace, and inclusive societies. The government must ensure that women and marginalised persons are represented equally in parliament and state legislatures. Government should open a helpline for the aggrieved party to have a free consultancy with advocates. Strengthen international and national political commitment to engage in access to justice.

<p>SDG 16.10 Ensure public access to information and protect fundamental freedoms, in accordance with national legislation and international agreements</p>	<ul style="list-style-type: none"> • Print/broadcast censorship effort • Harassment of journalists • Media self-censorship • Freedom of discussion for women • Freedom of discussion for men • Freedom of academic and cultural expression • Freedom of opinion and expression • Print/broadcast media critical perspectives • Print/broadcast media • Media bias • Media corruption • Media freedom • Freedom of foreign movement • Freedom of movement and residence • Freedom of Domestic movement • Freedom of religion • Religious organization repression • Freedom of thought, conscience, and religion • Freedom of assembly and association 	<ul style="list-style-type: none"> • Formation of an independent institution which monitors media and ensures the safety and security of journalists and their rights. • To conduct training programmes and workshops to create awareness on media ethics. • To support national reforms and broadcasting. • Documenting the cases of media rights violation • Fostering transparency, credibility, and independence of media.
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4.3 Recommendations for the Regulatory Bodies

Table 5: Minimal Recommended Actions for Regulatory Bodies for Implementation of SDG-14

Regulatory Bodies	Recommendations
UGC (University Grant Commission) & AICTE (All Indian Council for Technical Education, and CSIR (Council of Scientific & Industrial Research)	<ul style="list-style-type: none"> • Provide ample funding for SDG-14 research activities in HEIs • Collaboration with universities for defining courses and curriculum related to SDG-16 • Promote and regulate research related to SDG-16 • Action-based stringent rules and regulations related to placements, skill activities, collaboration, technology up-gradation, availability of resources related to research, and the infrastructure needed • Add Research work for all Universities
NAAC (National Assessment and Accreditation, & NIRF (National Institute Ranking Framework)	<ul style="list-style-type: none"> • Must add SDG related Parameters for assessment of HEIs • Sponsor Seminars dedicated to quality in achieving SDGs • Must include parameter for Teachers based on SDG related activities and research • Include employment and entrepreneurship outcomes in • Ranking system for SDG based education

5 Conclusion Along With Prioritization of the Initiatives Recommended

Not just at the government level, but at every level of the social hierarchy, immediate attention to sustainable development is critical. According to research, HEIs are one of the most important



facilitators in the effective execution of Sustainable Development Goals for the benefit of all nations. Because HEIs are information storehouses and training grounds for young minds, the concept of sustainable development must be planted here, so that personal responsibility for achieving the SDGs is nurtured in students. The involvement of the government, higher education institutions, and regulatory authorities is critical for societal progress and the accomplishment of sustainability goals. Some of crucial recommendations are as follows:

- 1) The government must include higher education institutions in research and policymaking on issues such as justice, peace, and inclusive societies.
- 2) The UGC, DST, CSIR, ICAR, and other funding bodies must award research grants to all public and private universities that deliver quality instruction on sustainability and SDG-16.
- 3) For efficient implementation of SDG-16, state administrations must collaborate with the federal government and use online technologies to track the status of linked projects.
- 4) To instil a culture of zero tolerance for corruption at all levels of government and higher education institutions.
- 5) The government must ensure that women and marginalised persons are represented equally in parliament and state legislatures.
- 6) The government should recognise HEIs that demonstrate a high level of competence in providing education connected to sustainability and research so that others would follow.
- 7) HEIs must begin to contribute to the achievement of SDG-16 by providing undergraduate and graduate level courses, as well as MOOCs, on the topic. HEIs must also assess their own campuses for SDG-16 compliance.
- 8) Judiciary's role should be expanded and properly utilised. To establish a hotline/help line for aggrieved parties to receive free legal advice from advocates.

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17 PARTNERSHIPS FOR THE GOALS



SDG-17: Strengthen the Means of Implementation and Revitalise the Global Partnership for Sustainable Development

Summary

SDG 17 aims to strengthen the means of implementation and revitalise the global partnership for sustainable development. Successful achievement of SDG-17 is very important for attaining other SDGs and creating a long-term partnership for sustainable development. It is one of the most comprehensive goals because the means of implementation encompasses sharing of Knowledge, Financial Resources, Information and Communication Technology (ICT), Capacity-Building, International Trade, Data Monitoring and Global Partnerships. SDG-17 contains a wide range of targets and indicators, which are analyzed in this Chapter. An extensive literature review has been done to identify policy papers and to examine the complex relationships between SDG-17 and forest-related means of implementation and global partnerships for sustainable development. This chapter explores the ways to strengthen the means of implementation and provides tangible recommendations for achieving SDG 17 targets.

Key Recommendations to Achieve SDG-17

- Implementation and monitoring of SDGs must become a key mission for the HEIs and Government bodies to leverage the expertise of HEIs for significant SDG-related projects through structured consulting and research projects.
- HEIs should use Smart Campus Cloud Network (SCCN) to reduce the time and cost of making global partnerships; foster positive competition among universities and convert university campuses into laboratories to address the issue of climate change and strengthen the overall achievement of SDGs.
- Government to mandate a minimum of 10% from existing CSR allocation of corporates to HEIs for SDG-related infrastructure development and initiatives.
- Social Impact Bonds should be created and issued as investments by the Government as well as HEIs.
- Internationally appealing and attractive fellowships and scholarships be initiated by HEIs to strengthen collaborations and partnerships.
- Each HEI to promote, fund, seed and incubate at least five entrepreneurial ventures related to SDGs among students, faculty and local communities.
- HEIs should design a proposal to optimise the benefit of Official Development Assistance (ODA) by making it a 'rebalancing agenda', not a proposal where developed countries only shoulder the commitment. Poorer countries should agree to some kind of universal commitment to reflect contemporary geopolitical power and influence.
- Government to create an SDG related ranking framework for HEIs of India in line with THE Impact Rankings. In addition, SDG-related efforts should also be given weightage in other ranking and accreditation frameworks such as NIRF & NAAC.



1. Context and Current Status of SDG-17

1.1 The Context and Current Status

The COVID-19 pandemic has had significant impacts on international and global partnerships, and the challenges it poses are testing the stability of these partnerships. The pandemic has created debt distress in many countries, constraining their budgetary and policy flexibility to invest in recovery efforts, including vaccine access, climate action, and achieving the Sustainable Development Goals (SDGs). As a result, the recovery process could be prolonged. While official development assistance (ODA) has increased, and remittance flows have declined less than expected, foreign direct investment (FDI) has dropped by 40 per cent. This underscores the need for a coordinated global response that can support all countries, particularly the poorest ones, to confront and recover from the parallel health, economic, and environmental crises caused by the pandemic. Strengthening multilateralism and global partnerships is critical in addressing these challenges. The interconnectedness of the global economy requires a collaborative approach to ensure that no country is left behind. By working together, we can leverage our collective resources, expertise, and knowledge to find solutions that benefit everyone.

1.1.1 Foreign Aid Reached an All-time High During the Crisis, but Contributors Are Yet to Meet their Obligations

According to the Organization for Economic Cooperation and Development (OECD), net Official Development Assistance (ODA) flows by member countries reached \$161 billion in 2020, representing a 7 percent increase in real terms from 2019. This increase was driven by members' support for an inclusive global recovery in light of the pandemic, as well as an increase in bilateral sovereign lending by some loan-giving members. However, the net ODA flows in 2020 only represented 0.32 percent of donors' total gross national income (GNI), falling short of the goal of 0.7 percent. While most members were able to maintain their planned ODA commitments, more needs to be done to respond to the COVID-19 crisis. In terms of net bilateral flows to low-income countries, there was a decrease of 3.5 percent in real terms from 2019, reaching \$25 billion. Meanwhile, net bilateral ODA increased by 6.9 percent to lower-middle-income countries, and by 36.1 percent to upper-middle-income countries, reaching \$33 billion and \$18 billion, respectively. These figures suggest that while some progress has been made in increasing ODA flows, there is still a need for more concerted efforts to meet the development needs of low-income countries, particularly in the face of the COVID-19 pandemic.

1.1.2 Foreign Direct Investment Flows Fell sharply in 2020, Especially in poorer Regions

The year 2020 saw a significant decline in Foreign Direct Investment (FDI), with FDI flows dropping by 40 percent to \$1 trillion, the first time this has happened since 2005. This decline was due to existing investment projects being hampered by lockdown measures, as well as the fear of a deep recession, which prompted global corporations to reconsider future ventures. Furthermore, governments implemented new investment restrictions that also contributed to the decline. International private sector investment flows to developing and transition economies in industries related to the Sustainable Development Goals (SDGs) decreased by almost one-third in 2020. Investment activity declined significantly across all SDG sectors, with the decline being more evident in poorer regions, except for renewable energy, where growth in new projects

persisted but was cut to one-third of pre-COVID levels. The outlook for FDI in 2021 is also gloomy, with the latest wave of the pandemic, the delayed pace of vaccination roll-out, and uncertainty about the global investment policy environment all contributing to the projection of a continued decline in FDI. These developments pose significant challenges to achieving the SDGs and economic development in low-income countries, as FDI plays a crucial role in providing capital, technology, and expertise needed for sustainable development. To address this challenge, it is critical to implement policies that promote investment in SDG-related sectors, particularly in poorer regions, and provide support for the recovery of existing investments that have been negatively impacted by the pandemic.

1.1.3 Remittance Flows Remained Strong in 2020, Despite the Pandemic

The year 2020 saw a significant decline in Foreign Direct Investment (FDI), with FDI flows dropping by 40 percent to \$1 trillion, the first time this has happened since 2005. This decline was due to existing investment projects being hampered by lockdown measures, as well as the fear of a deep recession, which prompted global corporations to reconsider future ventures. Furthermore, governments implemented new investment restrictions that also contributed to the decline. International private sector investment flows to developing and transition economies in industries related to the Sustainable Development Goals (SDGs) decreased by almost one-third in 2020. Investment activity declined significantly across all SDG sectors, with the decline being more evident in poorer regions, except for renewable energy, where growth in new projects persisted but was cut to one-third of pre-COVID levels. The outlook for FDI in 2021 is also gloomy, with the latest wave of the pandemic, the delayed pace of vaccinations roll-out, and uncertainty about the global investment policy environment all contributing to the projection of continued decline in FDI. These developments pose significant challenges to achieving the SDGs and economic development in low-income countries, as FDI plays a crucial role in providing capital, technology, and expertise needed for sustainable development. To address this challenge, it is critical to implement policies that promote investment in SDG-related sectors, particularly in poorer regions, and provide support for the recovery of existing investments that have been negatively impacted by the pandemic.

1.1.4 Despite the Immense Need for Connectivity During the Pandemic, nearly half of the Global Population is Still Not Online

The digital divide is a significant challenge that requires continued collective efforts to address. Bridging the gap in Internet access and digital skills can have a profound impact on the lives of millions of people, especially in low-income countries and rural areas. It is crucial to ensure that no one is left behind in the digital age. The digital divide between regions with high Internet connectivity and those with low connectivity is a significant challenge that needs to be addressed to ensure equal access to information, opportunities, and resources. The data highlights the need for concerted efforts to bridge the gap in Internet access, especially in low-income countries and rural areas. Governments, policymakers, and network operators can play a significant role in expanding Internet access. They can promote policies that reduce the cost of Internet access and increase investments in infrastructure development, including the deployment of broadband networks in rural areas. Such measures can help to create an enabling environment for digital inclusion and foster socio-economic development. Efforts to connect the unconnected must also take into account the need to develop digital skills among the population. Digital literacy programs can help to equip people with the skills they need to take advantage of the opportunities presented by the Internet. These skills are essential for accessing educational resources, remote work opportunities, and e-commerce platforms, among other things.

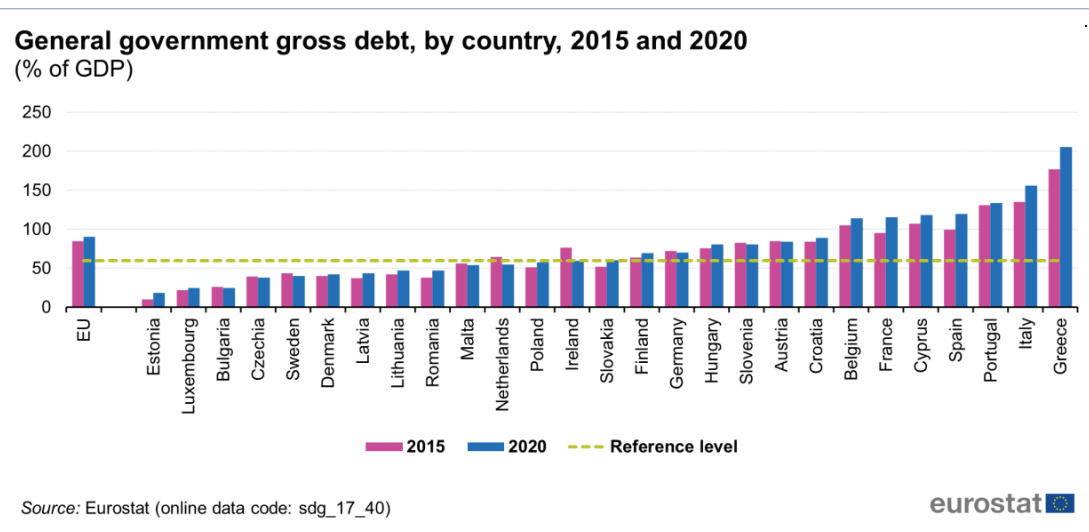
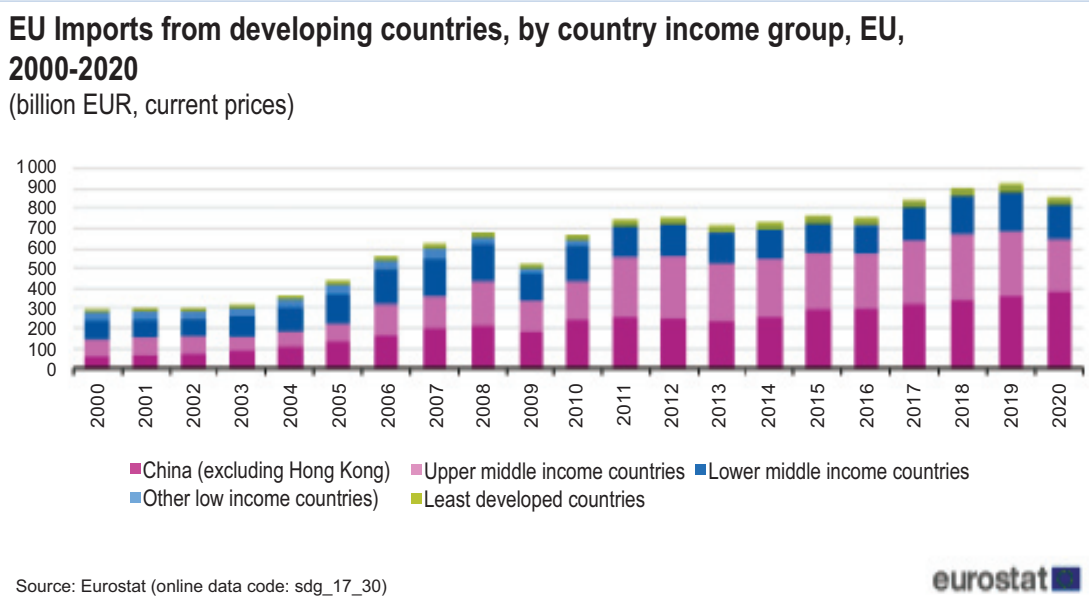


1.1.5 International Support for Data and Statistics Remains Inadequate

It is found that since adoption of the SDGs, funding for data and statistics has increased as it grew from \$591 million in 2015 to \$693 million in 2018. However, support was levelling off in 2019. Despite an increase in need for data to assist pandemic-related decisions, development support for data and statistics has not increased in lockstep. According to the recent survey 63 percent of low-middle-income countries are in need of additional financing for data and statistics to meet the challenges posed by COVID-19.

In the year 2020, 132 countries and territories reported that they were implementing a national statistical plan, with 84 plans that were fully funded. Only 4 out of the 46 Landlocked Developing Countries reported that they have fully funded national statistical plans. Countries could face more difficulties in implementing and funding such plans due to costly and labour-intensive activities (such as censuses and household surveys) that were moved to 2021 due to the pandemic.

Total official development assistance dedicated to statistical capacity-building activities, 2015–2016 and 2017–2018 (millions of current US dollars)



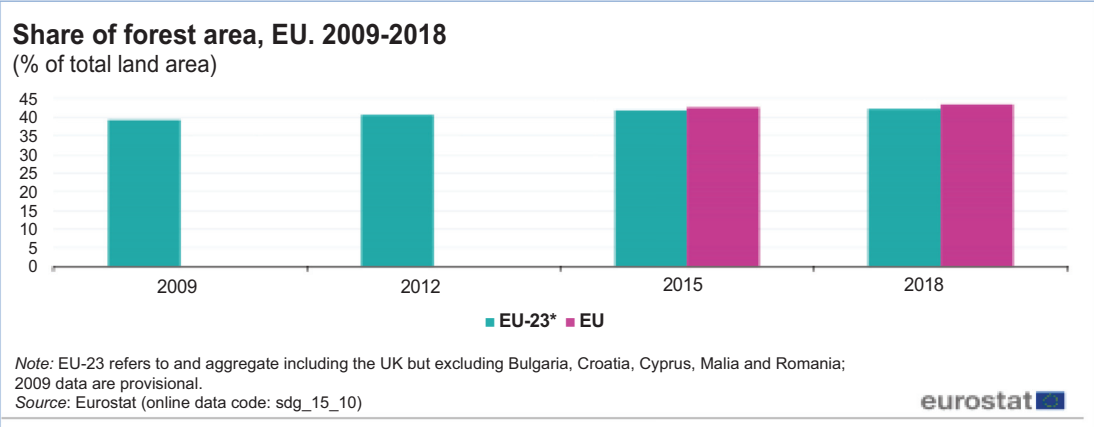
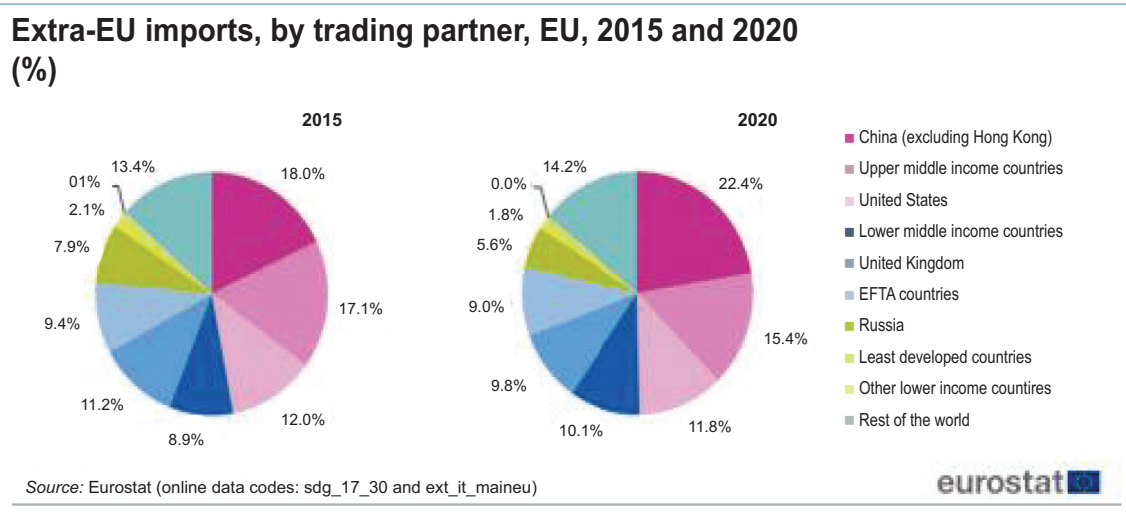


Figure:1 Statistics related to SDG-17

Source: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=SDG_17_-_Partnerships_for_the_goals

1.2 United Nations Sustainable Development Goal 17 Targets

Table 1: SDG-17 Targets

Targets	Objectives
17.1	To strengthen domestic resource mobilization, including through international support to developing countries, to improve domestic capacity for tax and other revenue collection.
17.2	To Develop countries by the implementation of official development assistance commitments, including the commitment by many developed countries to achieve the target of 0.7 per cent of gross national income for official development assistance (ODA/GNI) for developing countries and 0.15 to 0.20 per cent of ODA/GNI to least-developed countries.
17.3	To mobilise additional financial resources for developing countries from multiple sources.
17.4	To assist developing countries in attaining long-term debt sustainability through coordinated policies aimed at fostering debt financing, debt relief and debt restructuring, as appropriate, and address the external debt of highly indebted poor countries to reduce debt distress.
17.5	To adopt and implement investment promotion regimes for least developed countries.
17.6	To enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation, and enhance knowledge-sharing on mutually agreed terms

India's advocacy for greater international cooperation in this area is a step in the right direction. As the global financial system becomes increasingly interconnected, addressing tax evasion and avoidance requires a collaborative effort from both developed and developing countries. Initiatives like the Multilateral Convention on Mutual Administrative Assistance in Tax Matters can play a crucial role in facilitating information sharing and other forms of cooperation among countries. Overall, India's tax reforms and compliance efforts are a positive development, and continued efforts to tackle illicit financial flows through international cooperation will be critical in building a fairer and more transparent global financial system.

1.3.2 Improving Public Expenditure Efficiency

Over the past few years major expenditure reforms introduced, which have simplified appraisal and approval processes, eliminated the plan or non-plan difference in the budget-making process, and managed cost centers as a single entity within the statutory revenue capital framework. These reforms have enabled the implementation of a trackable Output-Outcome Monitoring Framework (OOMF) that compiles all schemes/programs outputs and outcomes, along with their financial outlays. This framework ensures greater accountability of the agencies involved in executing government schemes/projects and presents measurable terms to Parliament. The use of technology-driven systems such as the Public Finance Management System (PFMS) and Government Integrated Financial Management System (GIFMIS) has further improved accountability, responsiveness, and transparency in payments, receipts, accounting, internal audit, and fiscal reporting. The efficiency of these systems has enabled a significant number of beneficiaries to receive Direct Benefit Transfers (DBT) while also preventing leakages of INR 1.7 trillion (USD 22 billion). The spending efficiency achieved through these reforms can contribute to mobilizing funds for achieving the Sustainable Development Goals (SDGs).

1.3.3 Promoting Entrepreneurship and the Private Sector

Due to the COVID-19 pandemic India's recent economic growth and the challenges it has faced. The government's persistent focus and thoughtful planning on business reforms have led to improvements across various parameters in the Ease of doing Business Index, aimed at strengthening the country's business environment. Initiatives to increase cross-border trade have also been implemented by reducing border and documentary compliance time for both exports and imports. The start-up ecosystem in India has emerged as one of the world's largest, with roughly 26 new start-ups being recognized every day. The government has made significant investments in start-ups, and the legal environment has been streamlined to make it more user-friendly, with a rebate for patent and trademark filing fees provided to start-ups under the SIPP scheme. In addition, foreign direct investment (FDI) is a major source of non-debt financial economic growth for the private sector and driving economic growth in the country.

The Indian government's efforts to attract FDI by opening up several key sectors to such investment, including defence, railways, coal mining, digital sectors, and insurance intermediaries. The investment in the private sector is seen as a key driver of high growth, employment, and improved productive efficiency. India has been successful in attracting FDI, with FDI equity inflows standing at USD 456.79 billion during the period from April 2000 to December 2019. In 2019, India was among the top 10 recipients of FDI, attracting USD 49 billion in inflows, and annual FDI inflows are expected to rise to USD 75 billion over the next five years. However, subjective assessments of the Indian policy and regulatory environment by global financial institutions and rating agencies have raised the costs of private financial flows to India, which affects long-term finance for infrastructure and other investments crucial for achieving the SDGs. India has a young working-age population and a "demographic dividend" that can power growth, and the government is investing in crucial areas such as education, health, skilling, and decent jobs, especially for the youth. The government

is also taking measures to boost rural incomes, including cash transfers to farmers and working towards doubling farmers' incomes by 2022 and overall revival of the rural economy.

1.3.4 Strengthening South-South Cooperation

India has also played an active role in various multilateral forums, such as the United Nations, G20, BRICS, and the International Solar Alliance, to promote cooperation on issues of global importance such as climate change, sustainable development, and counterterrorism. India's leadership in the International Solar Alliance, which was launched in partnership with France in 2015, has been crucial in promoting the use of solar energy for sustainable development in the developing world. The initiative aims to mobilize more than USD 1 trillion in investments by 2030 to promote solar energy, reduce dependence on fossil fuels, and combat climate change.

In addition to its global engagement, India has also implemented several domestic initiatives to promote sustainable development. The Swachh Bharat Abhiyan (Clean India Mission) launched in 2014, aims to ensure cleanliness, sanitation and elimination of open defecation across the country. The National Rural Livelihoods Mission (NRLM) launched in 2011, aims to reduce poverty by promoting self-employment and entrepreneurship among rural poor. The Pradhan Mantri Jan Dhan Yojana launched in 2014, aims to provide access to financial services to the unbanked population in the country. India's commitment to South-South Cooperation is reflected in its various initiatives and partnerships aimed at promoting mutual learning, capacity building, and progress among developing countries. Through its Indian Technical & Economic Cooperation (ITEC) initiative, India provides fully-sponsored training programs to professionals from developing countries, with a focus on participants from small island developing countries (SIDS) and least developed countries (LDCs). India has also extended concessional financing, grant assistance, and scholarships to African countries, including the e-Vidhya Bharati Aarogya Bharati Network Project aimed at providing tele-education and tele-medicine services to African students and healthcare professionals.

India's South-South Cooperation also extends to its partnership with the United Nations, through the India-UN Development Partnership Fund which supports projects aimed at realizing the SDGs in small island developing states (SIDS), least developed countries (LDCs), and landlocked developing countries (LLDCs). India has also established the India Brazil and South Africa (IBSA) Fund for the Alleviation of Poverty and Hunger which supports poverty and hunger alleviation projects in partner countries from the Global South, with a focus on least developed countries. Overall, India's South-South Cooperation initiatives demonstrate its commitment to global development partnerships and its role as a responsible global citizen.

1.3.5 Coalition-Based Approach

India's initiatives in the field of disaster resilience and solar energy are commendable. The Coalition for Disaster Resilient Infrastructure (CDRI) and the International Solar Alliance (ISA) are critical steps towards ensuring a sustainable and resilient future for the world. CDRI is a much-needed platform that brings together stakeholders from various fields to share knowledge and best practices on disaster and climate resilience of infrastructure. By providing technical expertise, CDRI will help developing countries upgrade their infrastructure capacities in accordance with their risk context and economic needs. The Indian government's support of USD 70 million for CDRI's Secretariat office and recurring expenses is a welcome move that will enable CDRI to fulfill its mandate effectively. The International Solar Alliance (ISA) is another crucial initiative that aims to help nations address key common challenges in the scaling up of solar energy. The fact that 86 countries have already joined the alliance is a testament to its importance. The Indian government's allocation of 5 acres of land to ISA at the National Institute of Solar Energy (NISE) campus and the creation of a USD 26 million corpus fund will go a long way in promoting solar energy globally.



1.3.6 COVID-19 and India's Global Response

India has also participated in several global initiatives such as the COVAX initiative which aims to provide equitable access to COVID-19 vaccines for all countries. India has also supplied vaccines to several countries under its Vaccine Maitri (Vaccine Friendship) initiative, which is aimed at providing COVID-19 vaccines to partner countries as a humanitarian gesture. India has supplied vaccines to over 80 countries as of February 2021, including low and middle-income countries in Africa, Asia, and Latin America. India has also participated in the G20's Debt Service Suspension Initiative (DSSI), which aims to provide debt relief to low-income countries affected by the pandemic. India has provided debt relief to several partner countries as part of this initiative. Furthermore, India has worked closely with other countries and international organizations to develop effective strategies to combat the pandemic. India has participated in several virtual summits and meetings, including the G20 summit, the BRICS summit, and the SAARC summit, to discuss and coordinate global responses to the pandemic. Overall, India has demonstrated its commitment to global collaboration and cooperation in the fight against COVID-19, while also taking steps to ensure the health and well-being of its own citizens.

1.3.7 Revisiting Official Development Assistance (ODA) Commitments and Performance

While domestic resource mobilization is becoming more significant, high-income countries that are members of the Development Assistance Committee (DAC) fulfil their commitments of provide 0.7percent of their GNI as ODA. Despite the emergence of new donors the members of the DAC, who remain the primary contributors of aid are expected to deliver. India recognizes the importance of ODA in achieving the SDGs and calls for a change of course to meet the commitments made by donor countries. India also emphasizes the need for eligibility standards and transparency in accounting for aid, as well as robust monitoring systems to follow up on aid commitments. The current levels of ODA do not match the collective ambition of the 2030 Agenda for Sustainable Development, or the international commitments set out in the Addis Ababa Action Agenda. India supports the global call for reforms in the ODA architecture to strengthen development cooperation. The lack of progress in meeting the commitment to raise USD 100 billion annually through the Green Climate Fund is a cause for concern. Climate change is a global problem that requires a collective response, and developing countries that are disproportionately affected by its impact need financial and technological support to mitigate and adapt to its effects. The failure to meet the funding commitments undermines the trust between developed and developing countries and could weaken global cooperation on climate change.

The low levels of ODA and the failure of most DAC members to meet the ODA/GNI target of 0.7 percent also pose challenges to achieving sustainable development goals. Development cooperation is essential for addressing poverty, inequality, and other development challenges in developing countries. Donor countries need to live up to their commitments and provide adequate financial and technical support to developing countries. The lack of progress in meeting the ODA commitments could impede progress towards the SDGs and undermine global efforts to reduce poverty and promote sustainable development.

India recognizes that development cooperation plays a critical role in achieving the SDGs and believes that stronger cooperation is needed to address the gaps and challenges in the current ODA architecture. India supports the global call for reforms in ODA architecture to ensure that aid is disbursed in an effective, efficient, and transparent manner. This includes the need for unambiguous eligibility standards and greater transparency in accounting for aid. India also emphasizes the importance of putting in place robust monitoring systems to ensure that donor countries fulfill their aid commitments. Only through strong and effective cooperation can we achieve our shared goals of sustainable development and poverty eradication.

1.3.8 Improving Data, Monitoring and Accountability

Customizing indicators at the sub-national level is crucial for effectively monitoring and measuring progress towards the SDGs in India. The country has made efforts to do so through the development of state-level SDG plans and localized monitoring mechanisms. For example, several states in India have developed their own SDG-specific dashboards, which track progress on state-specific indicators related to the SDGs. Additionally, civil society organizations, academia, and the private sector have also played a role in monitoring progress at the sub-national level. While India has made progress in monitoring and measuring progress towards the SDGs, there are still challenges that need to be addressed. One challenge is the need for improved data collection and reporting mechanisms, especially at the sub-national level. There is also a need for greater integration and coordination between different levels of government and stakeholders, as well as increased awareness and participation among marginalized communities. By addressing these challenges, India can better ensure that progress towards the SDGs is tracked and achieved at all levels of society.

Therefore, NITI Aayog and MoSPI are working directly with the States/UTs for mounting specific State and District Indicator Frameworks (S/DIF). The development of State and District Indicator Frameworks (S/DIF) and the SDG India Index & Dashboard are important tools for measuring and ranking the performance of States and UTs on each of the SDGs. The use of these tools can create healthy competition among the States and UTs, which can lead to better performance and implementation of the SDGs.

In addition to these tools, it's also encouraging to see that the government is engaging with civil society to explore the possibilities of using citizen-generated data in monitoring the progress towards SDGs. This approach can help to ensure that data collection is inclusive and transparent, and that progress is monitored from the perspective of the people who are most impacted by the SDGs. Overall, these efforts demonstrate India's commitment to achieving the SDGs and ensuring that progress towards them is effectively monitored and measured.

1.3.9 Challenges and Way Forward

To achieve all SDGs the role of SDG 17 and its associated targets play a crucial role. This is based on the principle that partnerships among the government, civil society, and the private sector sit at the core of the success of the sustainable development agenda. Governments and civil society must work in tandem to effectively address the new challenges posed by changing times. Both should work hand in hand with the private sector to derive innovative and cost-effective solutions to the challenges faced by the planet and its life forms. Inclusive partnerships need to be built at various levels - global, national, sub-national, and local, based on shared vision and values to drive the sustainable development agenda forward. NITI Aayog strives to realize such partnerships. Through its close collaboration with the State/ UT governments and creating platforms where the States/ UTs come together to discuss SDGs, NITI Aayog develops strong inter-government partnerships. These promote knowledge exchange and facilitate the sharing of good practices. The consultations with the civil society organized by NITI Aayog are avenues where the voices of the vulnerable are echoed, and plans are drafted to address them. NITI Aayog's engagements with the private sector and industry bodies help propagate the messages of sustainable and responsible business practices. The United Nation system in India has been a close partner of the governments and civil society since the inception of SDG adoption, implementation, and monitoring in the country. The idea behind these efforts is to cultivate and disseminate the principles of leaving no one behind and sharing responsibilities to ensure a sustainable future. While much progress has been achieved, challenges remain. In a global economic climate challenged severely by the pandemic, the rate of economic growth must be accelerated to carry forward the country's ambitious sustainable

development agenda. Technology should ensure that no one is left behind in claiming the fruits of development. The frequency of data collection must improve; at the same time collecting data in a broader set of indicators, is absolutely essential for more comprehensive SDG monitoring. Innovative tools to assess the gaps in financial resources required to meet the targets on time, and instruments to fill the gaps, must be derived. The power of the private sector and Science, Technology and Innovation (STI) should be leveraged to a more significant extent to ensure faster and more inclusive journey towards achieving the 2030 Agenda. Inclusive partnerships need to be built at various levels - global, national, sub-national, and local, based on shared vision and values to drive the sustainable development agenda forward.

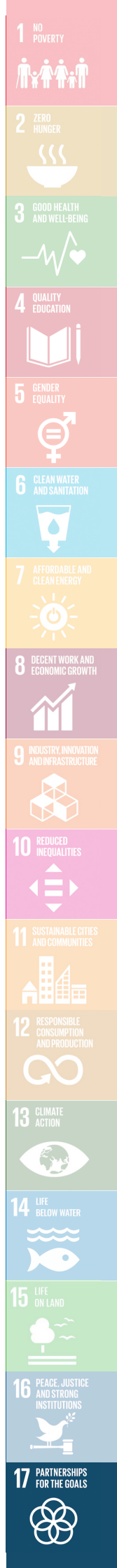
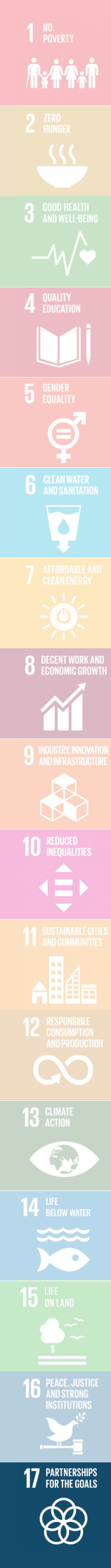
2 Recommended Actions for HEIs for Achievement of SDG-17

Table 2: Recommended Actions for HEIs for Implementation of SDG-17

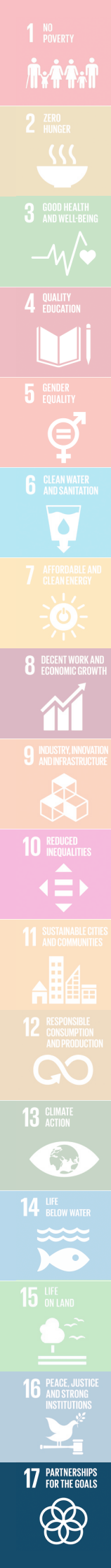
Targets	Recommended Actions for HEIs
Target 17.1	<ol style="list-style-type: none"> 1. HEI can design the procedures for regional agreement to subject all contracts with foreign investors, especially in the extractive sector, to standard national tax regimes. 2. A regional agreement to move towards the levying of minimum withholding taxes on all arrangements types of investment. Dividend payments made by locally incorporated subsidiaries of transnational groups. 3. A regional agreement to adopt Brazilian-style presumptive minimum or normal profit may require the modification of double-taxation treaties. margins or markups when assessing subsidiaries of transnationals for corporate income tax.
Target 17.2	<ol style="list-style-type: none"> 1. The poorer countries should have a say in the decision-making processes of international organizations and initiatives that impact global development. This could be achieved by allowing poorer countries to have a symbolic or metaphorical seat at the table, as well as physical representation on boards that make decisions about priorities and policies. By giving poorer countries a voice in these processes, their perspectives and needs would be better represented and taken into account, which could lead to more effective and equitable outcomes. 2. Poorer countries to become contributors to international public finance is not only about sharing the financial burden but also about rebalancing the power dynamics in multilateral organizations to reflect contemporary geopolitical power and influence. 3. Poorer countries may agree to make universal commitments, but only if they have a more significant say in decision-making processes, which currently favour richer countries. This would require reforming existing institutions, such as the World Bank and the International Monetary Fund, to give a greater voice to poorer countries. The goal is not just to redistribute wealth but also to redistribute power so that all countries have a fair and equitable say in shaping the future of our global community.
Target 17.3	<ol style="list-style-type: none"> 1. External resource mobilisation strategies could include seeking partnerships with industries, non-profits, and other organisations to establish research and development projects that could lead to the generation of revenue for the institution. 2. Institutions could seek to establish partnerships with international development agencies and donor organisations that support education and research initiatives. 3. Institutions can also explore the potential of fundraising campaigns targeted towards alumni and philanthropic individuals who may be willing to contribute towards the institution's development. Crowd funding campaigns could also be established to fund specific projects or initiatives. 4. Institutions can also explore the potential of engaging in public-private partnerships (PPPs) with private entities to support the institution's financial sustainability. Through PPPs, institutions can leverage private sector expertise and resources to support the development of infrastructure, research facilities, and academic programmes.

Target 17.4	<ol style="list-style-type: none"> 1. The goal of assisting developing countries in attaining long-term debt sustainability is important to promote economic growth and stability. Coordinated policies aimed at fostering debt financing, debt relief, and debt restructuring are necessary to ensure that countries do not become overburdened with debt. 2. One approach to promoting debt sustainability is to encourage responsible borrowing and lending practices. This can be achieved through the development of transparent and accountable debt management systems, which can help countries to better assess their borrowing needs and to negotiate favorable terms with lenders. 3. Debt relief programs can be established to help countries manage their debt burdens. These programs can take many forms, including debt cancellation, debt rescheduling, or debt reduction. The goal of debt relief programs is to reduce debt distress and promote economic growth and stability.
Target 17.5	<ol style="list-style-type: none"> 1. Strong institutions, including civil society organizations, require autonomy in order to work effectively towards their goals. 2. This includes self-regulation and the ability to set guidelines for their sector. 3. Equal global partnerships are crucial, and universities have a great capacity to build people-to-people communities to achieve this. However, addressing global imbalances in research and education is necessary to achieve this fully.
Target 17.6	<ol style="list-style-type: none"> 1. Universal and collective: This means that the principles should apply to everyone, regardless of their geographic location or socioeconomic status. The focus is on common challenges that affect all people and require a collective effort to address. 2. Shared responsibilities and common challenges between North and South: This refers to the idea that the developed (or "North") and developing (or "South") countries have a shared responsibility to address global challenges such as poverty, climate change, and inequality. The focus is on working together to find solutions that benefit everyone. 3. Strengthen mutual capacities: This means building the skills and capabilities of individuals, organizations, and communities in partner countries. The goal is to create sustainable and effective solutions that can be managed locally. 4. Triangular and N-S exchanges: This refers to the idea of promoting partnerships and collaborations between countries in the global South, as well as between the South and the North. The goal is to facilitate knowledge-sharing and capacity-building across different regions and contexts.
Target 17.7	<ol style="list-style-type: none"> 1. HEIs act as enablers by promoting research, education, and innovation in the field of sustainable energy, or as barriers by perpetuating outdated energy paradigms and promoting fossil fuel technologies. 2. Enabling criteria to analyze the national level of the energy transition. 3. Criteria that are important for the decarbonization of entire systems and sector coupling. This suggests that HEIs can play a key role in promoting sector coupling, which refers to the integration of different energy systems (such as electricity, heating, and transportation) to achieve greater efficiency and reduce carbon emissions. 4. Decisive factors may need to be treated differently from country to country. This suggests that HEIs need to be aware of the specific context and conditions of different countries and regions, and tailor their approaches accordingly. For example, some countries may have more abundant renewable energy resources than others or may face different political and regulatory challenges. HEIs can help to identify the most effective strategies for each context and support the development of tailored solutions that are aligned with local needs and priorities.
Target 17.8	<ol style="list-style-type: none"> 1. The target set a deadline of 2017 for fully operationalizing these mechanisms. It is important to note that this target has already passed, and it is unclear to what extent the mechanisms have been fully operationalized. However, ongoing efforts are being made to support the development of these mechanisms and increase their effectiveness in supporting LDCs.

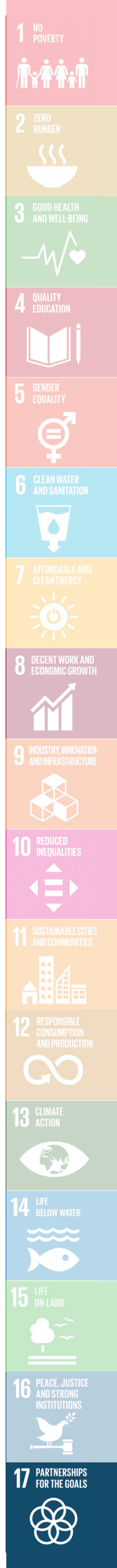




	<ol style="list-style-type: none"> Enabling technology, particularly information and communications technology (ICT), is a critical tool for supporting sustainable development. ICT can help to improve access to information, education, and health care, as well as promote innovation and entrepreneurship. Achieving this target requires a coordinated effort by a range of stakeholders, including governments, international organizations, private sector actors, and civil society. Collaboration and partnership are key to supporting the development of effective technology and innovation mechanisms that can meet the diverse needs of LDCs.
Target 17.9	<ol style="list-style-type: none"> Funding is crucial to implement capacity-building programs in developing countries. Donor countries, international organizations, and private foundations can increase their financial support for these programs to enable the implementation of the SDGs. Capacity-building programs should be designed to meet the specific needs of developing countries. International organizations, governments, and private organizations should collaborate to implement capacity-building programs. International organizations can play a critical role in facilitating the transfer of technology and knowledge to developing countries through capacity-building programs. Women and marginalized groups often have limited access to capacity-building programs. Efforts should be made to ensure their participation in these programs, as they can bring unique perspectives and expertise to address development challenges.
Target 17.10	<ol style="list-style-type: none"> Research and Analysis: HEIs can conduct research and analysis on the functioning of the multilateral trading system, including the WTO, to provide evidence-based information on its benefits and challenges. This can help in identifying areas that need improvement and suggest policy recommendations for policymakers. Education and Training: HEIs can offer courses and training programs that educate students and professionals on the principles and rules of the multilateral trading system, including the WTO. This can help build the capacity of future policymakers, diplomats, and negotiators to promote a fair and equitable trading system. Advocacy and Outreach: HEIs can engage in advocacy and outreach activities to promote the benefits of a multilateral trading system and the importance of the WTO in achieving it. This can include organizing seminars, workshops, and conferences to bring together experts, policymakers, and stakeholders to discuss trade-related issues. Collaboration and Partnerships: HEIs can collaborate with other universities, research institutions, and organizations to share knowledge and expertise on the multilateral trading system. They can also partner with international organizations, such as the WTO, to promote research, training, and outreach activities on trade-related issues. Policy Analysis and Advice: HEIs can provide policy analysis and advice to governments, policymakers, and international organizations on issues related to the multilateral trading system. This can include analyzing trade policies, negotiating trade agreements, and implementing trade-related reforms.
Target 17.11	<ol style="list-style-type: none"> Research and Analysis: HEIs can conduct research and analysis on the trade potential and competitiveness of developing countries, particularly the least-developed countries, in various sectors, and identify areas where they can increase their exports. This can help identify policies and strategies that can promote export growth and competitiveness. Education and Training: HEIs can offer courses and training programs that provide the necessary skills and knowledge to exporters, policymakers, and entrepreneurs to develop and implement export strategies. This can include training in export marketing, export finance, trade regulations, and export promotion. Partnership and Networking: HEIs can partner with export promotion agencies, trade associations, chambers of commerce, and international organizations to develop export promotion programs, provide market intelligence, and facilitate networking and business matchmaking services for exporters. Policy Analysis and Advocacy: HEIs can provide policy analysis and advocacy on issues related to export promotion, including trade policy, market access, and export financing. They can also engage in dialogue with policymakers and stakeholders to promote policies and reforms that support export growth and competitiveness.



	<ol style="list-style-type: none"> 5. Entrepreneurship and Innovation: HEIs can promote entrepreneurship and innovation through incubation centers, start-up competitions, and innovation hubs, which can help develop new export-oriented businesses and products.
Target 17.12	<ol style="list-style-type: none"> 1. Developed countries need to fulfil their commitments made under the World Trade Organization's decisions to provide duty-free and quota-free market access for least-developed countries. 2. Raising awareness and understanding of the benefits of duty-free and quota-free market access can help encourage more countries to implement these policies. Education and outreach programs targeting policymakers, traders, and other stakeholders could be developed and implemented. 3. Promoting greater access to finance, including through initiatives such as trade finance and export credit guarantee schemes, can help level the playing field for least-developed countries. 4. Efforts to reduce or eliminate non-tariff barriers should be prioritized, and technical assistance and capacity building provided to least-developed countries to help them comply with international standards and regulations. 5. Support for regional integration initiatives that prioritize least-developed countries can help create larger, more integrated markets, which can in turn lead to increased investment and job creation.
Target 17.13	<ol style="list-style-type: none"> 1. Strengthen Partnerships: HEIs can collaborate with other universities, research institutions, and organizations to share knowledge, expertise, and best practices on sustainability. By partnering with other organizations, HEIs can increase their reach and impact in promoting sustainability. 2. Expand Engagement and Outreach: HEIs can expand their engagement and outreach efforts to raise awareness and build support for sustainability. This can include organizing sustainability-themed events, campaigns, and social media campaigns to engage with students, staff, and the broader community. 3. Advocate for Policies: HEIs can advocate for policies that advance sustainability in higher education. This can include lobbying governments and policymakers to support sustainability initiatives and advocating for policies that promote sustainable practices in higher education. 4. Integrate Sustainability into Curricula: HEIs can integrate sustainability into curricula across disciplines to prepare students to be leaders and change agents in advancing sustainability in their future careers. 5. Embrace Sustainable Operations: HEIs can implement sustainable practices in their own operations and administration, such as reducing energy use, water consumption, and waste generation. This can serve as a model for other institutions and demonstrate the practical benefits of sustainability.
Target 17.14	<ol style="list-style-type: none"> 1. Higher education institutions should promote the global partnership to articulate efforts of national governments, other interested institutions and the people of all regions of the world to achieve compliance with the Sustainable Development Goals agreed upon in the 2030 Agenda. 2. HEIs can incorporate sustainable development into their curricula and training programs to prepare future policymakers and leaders to think and act coherently. This can include interdisciplinary courses that examine the interconnections between economic, social, and environmental issues and emphasize the importance of coherence. 3. Collaboration and Partnership: HEIs can collaborate with government agencies, civil society, and other stakeholders to identify opportunities for policy coherence and work together to promote coherent policies. This can include forming partnerships with government agencies to provide technical assistance and advice on sustainability policies.





<p>Target 17.15</p>	<ol style="list-style-type: none"> 1. Provide Professional Development: HEIs can offer high-value professional development programs to help members build their capacity as sustainability leaders. These programs can include workshops, webinars, and other training opportunities focused on topics such as sustainability leadership, strategic planning, and stakeholder engagement. 2. Develop and Improve Resources: HEIs can develop new and improve existing resources, tools, and publications to support sustainability leadership. These resources can include best practice guides, case studies, and toolkits that provide practical guidance on sustainability leadership and implementation. 3. Strengthen Annual Conference and Expo: HEIs can strengthen their annual conference and expo to be the marquee forum for all stakeholders in the higher education sustainability community. This can include expanding the program to include more sessions focused on sustainability leadership and providing opportunities for members to connect with and learn from other sustainability leaders. 4. Expand Networking and Community Building: HEIs can expand opportunities for networking and community building among sustainability leaders. This can include creating online communities, hosting regional events, and facilitating peer-to-peer learning and collaboration among members. 5. Promote Thought Leadership: HEIs can promote thought leadership in sustainability by showcasing the work of their members and creating opportunities for members to share their expertise and insights. This can include hosting webinars, publishing thought leadership pieces and providing speaking opportunities at conferences and events.
<p>Target 17.16</p>	<ol style="list-style-type: none"> 1. Mobilize and share knowledge, expertise, technology, and financial resources: HEIs can participate in multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology, and financial resources to support the achievement of the SDGs. This can include partnerships with governments, international organizations, NGOs, and other stakeholders. 2. Support national development efforts: HEIs can support national development efforts by providing technical assistance, capacity building, and knowledge transfer to developing countries. This can include supporting the development of sustainable agriculture, renewable energy, and other key sectors. 3. Support an enabling international economic environment: HEIs can advocate for policies that support an enabling international economic environment, including coherent and mutually supporting world trade, monetary and financial systems, and strengthened and enhanced global economic governance. This can include promoting fair trade practices, advocating for debt relief for developing countries, and supporting international tax reform. 4. Develop and facilitate the availability of appropriate knowledge and technologies: HEIs can develop and facilitate the availability of appropriate knowledge and technologies globally to support the achievement of the SDGs. This can include conducting research, developing new technologies, and sharing best practices with stakeholders around the world.
<p>Target 17.17</p>	<ol style="list-style-type: none"> 1. Indeed, self-regulation can be a highly effective way to ensure quality and standards within particular sectors. In the case of higher education, self-regulation can also promote collaboration and cooperation between universities across different countries, even during difficult times. The European Standards and Guidelines for Quality Assurance is an excellent example of how universities can work together to ensure quality education for all. 2. Furthermore, self-regulation can be a more flexible and adaptable approach compared to government regulation, allowing universities to respond more quickly to changes and developments within their fields. This can be especially important in rapidly evolving fields such as technology and innovation. 3. However, it is important to note that self-regulation should not be seen as a replacement for government regulation, but rather as a complement to it. Government regulation is still necessary to ensure that minimum standards are met, and to provide oversight and accountability. Self-regulation can be a valuable tool to supplement and enhance government regulation, but it should not be the sole approach to ensure quality and standards.



Target 17.18	<ol style="list-style-type: none"> 1. Establishing regional centres as Sustainable Environment Institutes can be an effective way to promote collaboration and partnership between institutions of higher education in advancing sustainability initiatives. These institutes can serve as a hub where students, faculties, and staff can work together towards common goals of advancing sustainability, and improving social well-being, health, and prosperity. 2. By housing these institutes within institutions of higher education, there is an opportunity to leverage the expertise and resources of these institutions to promote sustainability initiatives. These institutes can serve as a clearing house for programs and projects, faculty expertise, and student involvement to articulate how these goals are supported through sustainability initiatives at the home institution. 3. Moreover, the institutes can serve as boundary-spanning entities that reach across schools, departments, programs, communities, government agencies, industries, and other institutions. By serving as a catalyst for economic growth, collaboration, and partnership, these institutes can position each host institution as a leader in sustainability beyond the 21st century. This can also help foster a culture of sustainability within higher education institutions and the wider community.
Target 17.19	<ol style="list-style-type: none"> 1. Identify and engage potential partners from different regions to explore opportunities for synchronized food production seasonality and joint export and marketing facilities. 2. Develop and share best practices and technologies for sustainable food production, including techniques for climate-smart agriculture, soil health, water management, and pest control. 3. Support capacity building and training programs to strengthen the skills and knowledge of farmers, extension workers, and other stakeholders in sustainable agriculture practices. 4. Advocate for policies and programs that promote sustainable food systems, including investments in research and development, infrastructure, and market access for smallholder farmers. 5. Monitor and evaluate the impact of these initiatives on food security, economic development, and environmental sustainability, and use the results to inform future actions and investments.

3 Proposed Research Agenda for HEIs and Governmental Bodies

Table 3: Key Activities and Key Research Areas or Models for Different Fields of SDG-17

Field	Key Research Areas or Models	Key Activities
Domestic resource	<p>Natural Resources: Coal, petroleum, natural gas, water, spectrum, etc.</p> <p>Human Resources: A nation's labour force and intellectual power.</p>	<p>Indeed, mobilizing domestic resources is crucial for sustainable economic growth and poverty reduction in low-income countries. Domestic resource mobilization refers to the process of increasing the amount of financial resources that a country generates from its own economy, such as taxes, natural resource revenues, and domestic borrowing. There are several reasons why DRM is important. First, it enables countries to have greater control over their development agenda by reducing their dependence on external sources of financing. This can help to ensure that resources are used in a way that is aligned with national development priorities, and that investments are made in sectors that are important for long-term economic growth.</p> <p>Second, DRM is more stable and predictable than external sources of financing such as aid or FDI. This is because domestic resources are generated within the country and are therefore less subject to external shocks such as changes in donor priorities or fluctuations in commodity prices.</p>

		<p>Third, DRM can help to build a stronger social contract between citizens and the state. When citizens contribute to the financing of public services through taxes, they are more likely to hold the government accountable for the provision of these services. This can help to strengthen governance and promote more effective and efficient public service delivery.</p>
Financial resources	Bank, Tax	<p>The financing required to achieve the Sustainable Development Goals is indeed substantial, and it is important to tap into various sources of funding to bridge the gap. Multilateral development banks and other international financial institutions can play a crucial role in this by providing long-term financing from their own resources and leveraging additional capital, including private investment, through co-financing projects with other partners. It is also important to tackle illegal financial transactions, which has been a significant driver of international tax cooperation in recent years. International tax cooperation is critical in the current era of hyperglobalization as tax systems in one country can have a significant impact on public revenue collection in other countries.</p>
Long-term debt	Liquidity risk, start-up, immediate capital	<p>Established companies may also use long-term debt to finance growth and expansion projects. These projects may include acquisitions, new product development, or expansion into new markets. Long-term debt allows companies to spread out the cost of these projects over time, making them more manageable and lessening the impact on current cash flows.</p> <p>However, it is important for companies to carefully consider their ability to repay the debt before taking on such obligations. Failure to meet the repayment schedule can lead to default, which can have serious consequences for the company, including damage to its credit rating, loss of investor confidence, and even bankruptcy. Overall, while long-term debt can provide important financial benefits, companies should approach it with caution and carefully consider their ability to manage the associated risks.</p>
Investment promotion		<p>In developed economies, capital flight and other forms of illicit financial flows can lead to a loss of critical development resources, as funds are siphoned off to offshore tax havens or other opaque financial systems. This can lead to a lack of investment in key areas such as infrastructure, education, and healthcare, ultimately hampering long-term economic growth. In developing economies, illicit financial flows can have an even more damaging impact. These economies often rely on foreign aid, foreign investment, and other external resources to fund their development initiatives. When resources are illegally obtained, transferred, or used, it can undermine these efforts, leading to a lack of investment in key areas and hindering economic growth. Problems about illegal financial flows represent a variety of policy concerns, but the underlying analytical frameworks and empirical approaches are still being debated. Illicit financial flows do not have to be criminal if appropriate legal frameworks do not effectively reflect or cover broader public social and economic interests.</p>



Technology and Innovation	Funder of new markets, a vehicle for innovation, enhancer of human capabilities	Markets and market dynamics are greatly influenced by new technology. This has always been the case, but it is happening quicker than ever before in the digital age. We've seen how digital technology has impacted a variety of markets over the previous few decades. Streaming has wreaked havoc on the music industry, as well as television and movies, and social media has completely transformed the media landscape.
Multilateral trading		<p>For purchasing and selling securities and other assets, multilateral trading facilities provide numerous benefits. One significant advantage is that the operators cannot pick and choose which trades to execute: they must establish and adhere to explicit regulations, ensuring that trades and prices are transparent. MTFs employ computer algorithms to link buyers and sellers in high-speed trading. Higher liquidity than over-the-counter trading allows for reduced bid-ask spreads and more efficient price discovery. Furthermore, because MTFs are often run on a commission basis, there are no conflicts of interest with individual traders.</p> <p>HEIs should undertake Research studies on the Pros and Cons of Multilateral Trading and provide the findings.</p>
Market access	<ul style="list-style-type: none"> Marketing Projects Abroad Capacity Building Support for Statutory Compliances Studies Project Development Developing Foreign Trade Facilitation web Portal To support Cottage and handicrafts units 	<p>The Market Access Initiative (MAI) Scheme is an Export Promotion Scheme designed to act as a catalyst for the long-term promotion of India's exports. The scheme is based on a focus product-focus country method to develop a specific market and product through market research and survey. Assistance would be provided to Export Promotion Organizations/Trade Promotion Organizations/National Level Institutions/ Research Institutions/Universities/Laboratories, Exporters etc., for enhancement of exports through accessing new markets or increasing market share in the existing markets. The level of assistance for each eligible activity has been fixed.</p>
International support	International Student Support	<p>Official developmental assistance (ODA) is the most prevalent type of aid and it focuses on poverty reduction, public welfare, and economic development. International organizations such as the World food programme and United Nations contribute considerable sums of aid to underdeveloped countries.</p> <p>Investing in international help is a noble cause. Every year, the major US Government agency, USAID, alone saves more than 3 million lives through immunization programs. Annually USAID educates about 850,000 people on HIV prevention with 40,000 trained to safeguard their countries in the long run. USAID's population program, which serves more than 50 million couples globally,, and USAID land cultivation training in Honduras which helps 21,000 families to practice sustainable agriculture, are two examples of long-term education programmes.</p>



Economic stability	Combining the development variables viz. property, labour, capital, and organization. Increasing acquisition of funds and broadening the tax base.	It is true that a country's economic growth depends on its ability to produce more goods and services. Mobilizing economic capital is crucial for this, and India's lower domestic investment despite its higher savings rate is a challenge. Investing in agriculture, industry, and services can help India prosper, but broadening the tax base is also important. Development variables like property, labor, capital, and organization must be combined to create a favorable environment for development and investment. Organizations do not grow organically, but through the acquisition of funds, and technologies are more easily accessible in today's capital culture. The right balance of resources is not always available, and the most valuable resource in any organization is its members for their efficiency and savings.
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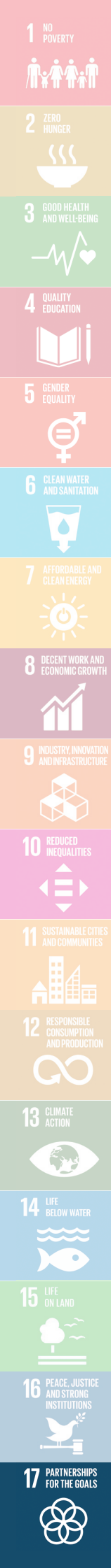
4 Recommendations for Government and Regulatory Bodies for Achievement of SDG-17

4.1 Recommendations for Government

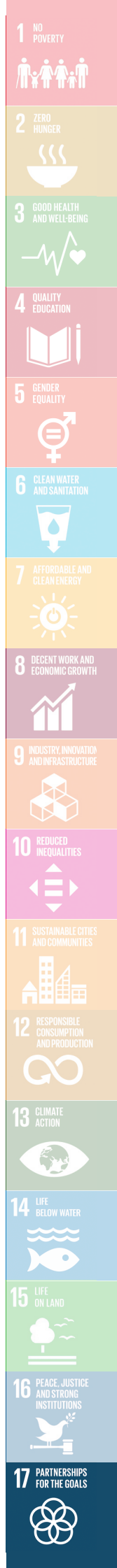
The recommended actions for the Government/policymakers for effective implementation of SDG-17 are given in Table 4.

Table 4: Recommendations for the Government for the Achievement of SDG-17

Targets	Recommended Actions for Government/ Policymakers
Target 17.1	<ol style="list-style-type: none"> Governments should make all efforts to strengthen domestic resource mobilization to make the country self-sustaining without depending on international support. The regional international agreement should be made towards the levying of minimum, withholding taxes on all types of investment. A set of principles covering the criteria for the granting of tax exemptions for investors. Dividend payments made by locally incorporated subsidiaries of transnational groups. Margins or markups when assessing subsidiaries of transnationals for corporate income tax.
Target 17.2	<ol style="list-style-type: none"> Poorer countries' engagement as contributors of international public finance, rather than just as recipients, would fundamentally rewrite the rules of engagement in line with the universal vision of the SDGs. Indian Government may convince the governments of poor countries towards this. Poorer countries should agree to some kind of universal commitment in exchange for the rebalancing of multilateral organizations to reflect contemporary geopolitical power and influence. In short, this should be a 'rebalancing' agenda, not a proposal for all to shoulder the commitment without sharing power (particularly through global institutions).



Target 17.3	<ol style="list-style-type: none"> 1. The focus of the government should be on the Circular Economy. 2. Government should adopt, customise and evolve our economic models. 3. Government out the national and regional needs first and then aim at the world-class model. 4. Countries can mitigate financial distress by adopting internal and external resource mobilisation strategies investing in treasury bills and bonds, and facilitating the easy availability of short-term loans through banks and other financial institutions, among others. 5. Government should find innovative ways of financial resource mobilization.
Target 17.4	<ol style="list-style-type: none"> 1. Government should frame conducive policies for fostering debt financing, debt relief and debt restructuring, as appropriate, and address the external debt of highly indebted poor countries to reduce debt distress.
Target 17.5	<ol style="list-style-type: none"> 1. Equal global partnerships are important for sustainable harmonious development so Governments should work towards this through collaborations and building people-to-people communities.
Target 17.6	<ol style="list-style-type: none"> 1. Government should work out the shared responsibilities and common challenges between North and South and strengthen mutual capacities that help in the improvement of public policies in partner countries. 2. 3. Participatory and multi-level collaborations should be there with emphasis on the addition and articulation of actors of diverse nature and the promotion of triangular and N-S exchanges as well as the promotion of participation, presence and personal discourse in spaces of global incidence. 4. 5. Innovation helps to achieve sustainable, social, economic and ecologic growth and the requirement is to work on the 3 key players in innovation- industries, research centers and government
Target 17.7	<ol style="list-style-type: none"> 1. Government should make criteria should be made at the regional, business, or project level to strive for the decarbonisation of the entire system and push sector coupling. 2. 3. Government should make Regulations which can act as barriers or enablers as required for the transfer or dissemination of sustainable and carbon-neutral technologies to support the reduction of fossil fuel technologies.
Target 17.8	<ol style="list-style-type: none"> 1. Government should make a priority of improving our alliances with major countries for multilateral development – mostly from the UN members – to develop global initiatives through localized pilot projects, where India can add expert value or contribute to multi-donor funds. 2. 3. Promoting the inclusion of new technologies in development; Promotion of interaction between the migrant/refugee population and the holders of the responsibilities, obligations and rights in their countries of origin; Increasing the importance of sensitizing the citizens through multiple and varied formats to reach new audiences and all age groups. 4. 5. Strengthen the technology bank and science, technology and innovation capacity-building mechanism for and enhance the use of enabling technology, in particular information and communications technology, so that India becomes an expert and resource-rich country and supports the least developed countries.



Target 17.9	<ol style="list-style-type: none"> 1. Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans for effective implementation. Enhance organizational capacity and resilience. 2. Optimize internal efficiency and improve customer experience. 3. Strengthen leadership and governance. 4. Create a culture that supports employee well-being and motivation. 5. Providing a long-term vision, and rigorous and independent advice, to governments and parliaments of other countries. 6. Ensuring and promoting cooperation between scientists, policy-makers and citizens of collaborating countries. 7. Providing new methodologies for citizens to conduct research or contribute to scientific evidence.
Target 17.10	<ol style="list-style-type: none"> 1. Government should make policy documents under SDG 17 for the least developing countries to boost research and development
Target 17.11	<ol style="list-style-type: none"> 1. The government should access technologies and knowledge which can undeniably be a significant contribution to expanding the production capacity in the least developed countries and, thus, to producing exportable surpluses.
Target 17.12	<ol style="list-style-type: none"> 1. Scientific and technological development can be a bridge for trade so Government should open up opportunities for cooperation and commercial development in low per capita income countries. 2. Government should open up more international markets, link countries, and sign international agreements.
Target 17.13	<ol style="list-style-type: none"> 1. The government should formulate policies that advance sustainable development and promotion of Micro, Small and Medium-sized Enterprises. 2. International Green tribunals be set up and made effective and expeditious for disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal right relating to the environment and giving relief and compensation for damages to the countries, persons and property and for matters connected therewith or incidental thereto.
Target 17.14	<ol style="list-style-type: none"> 1. Government should organise international Roundtables of leaders of different countries from time to time to discuss the policies in place in various countries and ensure that the policies are coherent.
Target 17.15	<ol style="list-style-type: none"> 1. The policies of different countries need to be analysed thoroughly to ensure that they are supportive of India. On the basis of analysis, the government should strategize its position on the policies and deal with them. 2. Government should organise International Roundtables of leaders to discuss issues related to sustainability. 3. A mindset needs to be developed that Economic Growth should foster sustainable development, recognizes the economy as a subset of nature, respect planetary boundaries, and supports the concept of living in harmony with nature.
Target 17.16	<ol style="list-style-type: none"> 1. Government should engage in more international relations through collaborations and tie-ups to enhance the global partnership for sustainable development, complemented by a multi-stakeholder partnership that mobilises and shares knowledge, expertise, technology, and financial resources, to support the achievement of Sustainable Development Goals in all countries, in particular developing countries. 2. National development efforts need to be supported by an enabling international economic environment, including coherent and mutually supporting world trade, monetary and financial systems, and strengthened and enhanced global economic governance

Target 17.17	<ol style="list-style-type: none"> 1. Government should formulate conducive policies for public-private partnerships and civil society partnerships. 2. In-house Sustainable Development efforts need to be enhanced by creating an enabling international economic environment, including coherent and mutually supporting world trade, monetary and financial systems and strengthened and enhanced global economic governance in the country for sharing resources with other countries.
Target 17.18	<ol style="list-style-type: none"> 1. Government should establish nodal centres in each at the National, State and District level for collection, analysis and disaggregation of data. The national centre should be ready with reliable data at any given point in time. 2. Government should develop a streamlined and coordinated approach to clarify data flows and ensure a consistent understanding of methodologies and terminologies for comparable data collection. 3. Government should evolve a One Nation-One Data-One Agency policy to avoid resubmission of the same data in different formats through different agencies and uniformly collect data from all agencies across the nation.
Target 17.19	<ol style="list-style-type: none"> 1. Establish global partnerships, and many possibilities for growth open up such as exploring synchronized food production seasonality, so that, together, partners are able to supply consumer markets and even share export and marketing facilities in importing countries. 2. Minimize bottlenecks in funding, negotiation, logistics and storage processes. 3. Establishing bases for production, productivity gains and value-added products.

4.2 Recommendations for Regulatory Bodies

SDG-17 is focused on strengthening the means of implementation and revitalizing the global partnership for sustainable development. The government and Education Regulatory agencies (UGC, AICTE, NAAC) can take several steps to achieve the SDG-17 goals. Here are some suggestions:

- 1. Develop policies and regulations that support sustainable development:** The government and regulatory agencies should create policies and regulations that support sustainable development. This can include regulations that encourage the use of renewable energy, promote sustainable transportation, and support sustainable agriculture.
- 2. Increase investment in sustainable development:** The government should increase investment in sustainable development. This can include funding for research and development of sustainable technologies, as well as investment in infrastructure that supports sustainable development.
- 3. Promote public-private partnerships:** Public-private partnerships can be an effective way to achieve sustainable development goals. The government and regulatory agencies should work to promote these partnerships and create a supportive environment for them.
- 4. Foster international cooperation:** The SDGs are a global effort, and international cooperation is essential to achieving them. The government and regulatory agencies should work to foster international cooperation and collaboration on sustainable development issues.
- 5. Ensure accountability and transparency:** To achieve the SDG-17 goals, it is important to ensure accountability and transparency in the implementation of policies and regulations. The government and regulatory agencies should establish mechanisms to monitor and evaluate progress towards the SDGs and ensure that all stakeholders are held accountable.
- 6. Provide education and training:** Education and training can play a critical role in achieving the SDGs. The government and regulatory agencies should provide education and training on sustainable development issues to all stakeholders, including students, teachers, and policymakers.



Overall, achieving the SDG-17 goals will require a coordinated effort from all stakeholders, including the government and regulatory agencies. By developing policies and regulations that support sustainable development, increasing investment in sustainable development, fostering public-private partnerships, promoting international cooperation, ensuring accountability and transparency, and providing education and training, the government and regulatory agencies can make significant progress towards achieving the SDGs.

5 Conclusions Along with Prioritization of the Initiatives Recommended

For any country, the most essential factor affecting growth is a resource in the form of investment. As a result, mobilizing resources to enhance investment has always been a priority. The work of mobilizing resources involves an intentional decision on a large investment, spending control, performance monitoring and achieving the intended level of economic activity. It also encompasses the prevention and avoidance of tax avoidance.

HEIs and their university networks are in fine condition to provide the Global Partnership for Sustainable Development with critical scientific knowledge, technological innovations and proposals. Mobilizing resources, including investment, is essential for a country's growth. This involves making intentional decisions about investments, controlling spending, monitoring performance, and preventing tax avoidance. Higher Education Institutions (HEIs) and their university networks can play a critical role in providing thought, knowledge, innovations, and policy proposals to contribute to the achievement of Sustainable Development Goals (SDGs). However, it is important for HEIs to maintain a reflexive and critical attitude towards the economic and social systems that generate global problems, as they work towards achieving the SDGs.

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Detailed Implementation Plan

SDG	Recommendation	Implementing Agency	Completion Date	KPI
1 NO POVERTY	Develop and implement rapid and sustained economic growth policies and programs, in areas such as health, education, nutrition, and sanitation, allowing the poor to participate and contribute to the growth.	Government	2027	<p>Total number of tools and policies introduced and implemented.</p> <p>Outcome and impact of implemented policies and programs.</p> <p>Total number of people brought above the poverty line.</p>
	Provide policymakers with the knowledge and tools to enable them to evaluate the effects of policy decisions on people's livelihoods.	HEI	2027	<p>Number of tools provided, and research reports published through MoUs with government or concerned government bodies per year.</p> <p>Number of Research Studies conducted on the impact of Policies the on livelihood of people.</p> <p>Total number of people brought above the poverty line.</p>
	Involve a multidisciplinary and multinational team of policy analysts, social and natural scientists, and engineers.	Government	2027	<p>Number of profiles of national and international experts, social scientists, scientists, and engineers included in published policies and reports.</p> <p>To assess the robustness of the research conducted on the basis of which policy is made.</p>

	Participatory approach to create a holistic system to formally evaluate ecosystem services and poverty in the context of the wide range of changes that are occurring.	Government	2027	Number of evaluation indices developed to measure and monitor poverty in various regions. Number of success stories on the results of those indices presented in the annual reports.
	Preparing students to be socially responsible citizens committed to poverty alleviation.	HEI	2027	Total number of students enrolled in SDG-1-related courses and concerned social projects.
	Organize various community-based social outreach programmes and volunteer in various extension activities that help to explore social issues, promote equity and social justice, educate and work towards economic empowerment.	HEI	2027	Total number of programmes conducted each year.
	Support the local community by purchasing food at farmers' markets and making sustainable, nutritious food choices, and buying from sustainable businesses that support and work toward zero hunger.	HEI	2027	Total number or quantity of supplies purchased from local farmers/sustainable businesses targeting SDG-1 per year.
	Improve management of water and other natural resources and give access to the poor.	Government	2027	Total number of water supply connections, wells, handpumps, etc. created for the poor.
	Develop social protection systems to support those who cannot support themselves.	Government	2027	Total number of social protection laws or schemes introduced for the unprivileged.
	Empower people living in poverty by involving them in the development and implementation of plans	Government	2027	Total number of people enrolled/helped in govt. poverty alleviation plans.

SDG	Recommendation	Implementing Agency	Completion Date	KPI
	Promote student volunteering activities, university exchange programs related to food security issues, promotion of greenhouses for off-season crops, and measures to reduce food waste on the campus and at the community level e.g. 'save food' campaigns.	HEI	2027	Total number of students enrolled in volunteering activities and total number of university exchange programs created.
	Undertake Research and development for quality improvements in food crops, climate-smart farming technologies, promote the production and extension of the portfolio of biofortified food crops, improving farm productivity, and devising models for promoting Hi-tech and High-density farming for round-the-year cash flow.	HEI	2027	Total number of research papers published related to the concerned research.
	Find research-based solutions for reducing the post-harvest losses of agricultural produce, which at present are high in the range of 30-40% for different agri-produce.	HEI	2027	Total number of research papers published related to reduction in post harvest losses.
	Incorporate target-wise action plans for sustainable food systems in curricula for actions at local level to achieve the larger goal of zero hunger and malnutrition.	HEI	2027	Total number of projects done annually related to removal of hunger and malnutrition in affected areas.
	Formation of Regional Consortia of HEIs for specific regions for making concerted efforts through standardized policies and plan of action to realise in the their respective regions SDGs.	HEI	2027	Number of Consortia of HEIs formed across the country. Number of SDGs realized Region-wise. Number of Regions which have realized SDGs.

	Promote back-yard supplementary agri-enterprises like poultry farming, mushroom cultivation, etc. in rural areas to realise the twin purposes, one of employment to the unemployed rural youth and second of lessening the protein deficiency in the food of villagers.	Government and HEI	2027	Total number of unemployed youths trained in supplementary agri-enterprises. Number of persons with improved health due to protein fulfillment in their diet.
	Promote/strengthen the schemes like mid-day meals, creches, etc. on school campuses.	Government and HEI	2027	Total number of schools covered for mid-day meals including the creation of new indices to measure satisfaction level and health of children after introduction of such programmes.
	Develop ergonomically efficient farm machineries especially designed for small-scale and topographically distinctly located farmers.	Government and HEI	2027	Total number of developed prototypes under research projects sponsored by the government.
	Establish gene banks for important crops, including conservation of their wild relatives.	Government	2027	Total number of gene banks created.
	Train farmers for value addition and post-harvest management of agricultural produce particularly, perishable products.	Government and HEI	2027	Total number of people enrolled/helped under the training schemes and special projects.
	Expand and strengthen partnerships and collaborations with international agencies and HEIs to address the issue of sustainable food systems, agri trade, and climate change.	Government and HEI	2027	Total number of MoUs signed with various international agencies for implementation of SDG-2 related projects. Total number of projects completed under the latter.
	Introduce measures to reduce food waste.	Government and HEI	2027	Total quantity of food saved per year and increment of saving as compared to previous year. Total number of research publications as well as new technologies developed to increase the shelf life of vegetables and fruits.



	Incentivize flow of private sector investments in food processing and efficient supply chain management.	Government	2027	Total number of schemes and policies or policies to incentivize private sector work in the areas of food processing and supply chain management. Total number of private sectors which entered into the areas of food processing and supply chain management.
	Strengthen and enlarge the scope of schemes like POSHAN, Saksham Aanganwadi, Pradhan Mantri Kisan SAMPADA Yojana.	Government	2027	Total number of incentives, benefits, enhancements, and features added to the extent and scope of the said schemes.
	Encourage private parties (including religious/philanthropic bodies) to participate in feeding vulnerable sections of the society on a voluntary basis.	Government	2027	Total number of private and religious bodies activated for addressing SDG-2.
	Emphasize and incentivize production of biofortified crops.	Government	2027	Number of schemes introduced to promote biofortified crops.
	Increase government fund allocation towards fortified mid-day meal, take home ration, hot cooked food to children and mothers in creches and hospitals for prevention and control of micronutrient deficiencies. Develop indicators in collaboration with HEIs to monitor the impact of such schemes.	Government And HEIs	2027	Total fund allocation for the concerned schemes and activities. Monitoring the impact through effective indicators to measure the success of the schemes. Number of indicators developed by the Government in collaboration with HEIs for monitoring the impact of such schemes.
	Documentation of Indigenous Technical Knowledge (ITK) and Indigenous Agricultural Practices (IAPs) of the traditional sustainable farming for their patenting.	Government and HEI	2027	Total number of documents and research reports published in the concerned areas.

	Incentivize agricultural practices for soil organic carbon enhancement (through public or private efforts).	Government	2027	Total number of schemes and incentives for the concerned practices.
	Increase the area under high-yielding and short-duration varieties to increase the food grain production.	Government	2027	Total area allocated for short-duration food grain varieties.

SDG	Recommendation	Implementing Agency	Completion Date	KPI
	Involve medical HEI's to improve maternal health in urban and rural areas. Link the Aanganwadi nutrition distribution process with the biometric system of UIDAI (Aadhar no.) to ensure transparency. Medical HEI's should train Aanganwadi workers.	HEI	2027	Number of persons facilitated for maternal health by HEIs in urban and rural areas. Number of Aanganwadi workers trained by the HEI.
	Make Health Insurance mandatory for the citizens. The health insurance charges should be as per the annual income, with lower-income and BPL people getting free health coverage.	Government	2027	Number of persons provided with free health insurance or facilitated with subsidized health insurance.
	The scheme "Mission Vikas Pariwar" should target the entire country. HEIs should provide free services for female sexual and reproductive health.	Government and HEI	2027	Total number of persons provided with free health services. Total number of health camps organized per year by the HEIs for female sexual and reproductive health.
	HEIs should provide lab testing services, vaccinations, and awareness programs for communicable diseases and their treatments.	HEI	2027	Total number of services, vaccinations, awareness programmes organized per year by the HEIs.

	HEIs should implement "Swachh Bharat Mission" in each degree program as a part of social activity.	HEI	2027	Total number of "Swachh Bharat Mission" related projects or activities conducted along with the total area covered by the same.
	Government should mandate the availability of sufficient numbers of dustbins in cities and towns through their respective Municipal Corporation/ Nagar Nigam. Commercialized products packed in polythene bags/ containers should be replaced by biodegradable packaging material.	Government	2027	Total increase in number of garbage disposal containers placed and total number of states banning the use of polythene bags.
	Yoga should be a mandatory subject at Schools from class 1 to class 12th, and NEP Yoga/ Meditation should be part of foundation papers (Mandatory).	Government and HEI	2027	Number of schools/HEIs making Yoga mandatory.
	The Government must promote the establishment of Health and Wellness Centers in states across the country. Schools and HEIs should start Yoga, meditation, and counseling centers to boost the physical and mental health of the students.	Government and HEI	2027	Total number of health and wellness centers opened by the government in required areas. Total number of HEIs having Yoga training centers within their campuses.
	Government should initiate startup/open schemes for supporting individuals prone to mental disorders or suicidal tendencies due to financial reasons. Make bank loans easy for startups with subsidies and low-interest rates.	Government	2027	Number of startups supported by the government for entrepreneurs having weak financial background.
	Government should link all vaccination with Aadhar, as done in the case of COVID-19 vaccination so that the government can have a record of vaccination done in the country.	Government	2027	Total number of additional Aadhaar-linked vaccination drives across the country.

	HEIs should have an intervention method like counselling centres, and police patrolling at the campuses, to control drug addiction in youth.	HEI	2027	Number of HEIs have counselling centres and police patrol or dedicated private squads to prevent drug abuse and the sale of abusive drugs on the campuses.
	HEIs should promote health-related programs and offer fellowship to the scholars pursuing these programs.	HEI	2027	Number of fellowships offered for specific health improvement programmes focusing on SDG-3.

SDG	Recommendation	Implementing Agency	Completion Date	KPI
4 QUALITY EDUCATION	<p>Should involve in literacy activities under the extension services to ensure total literacy in the country by 2027.</p> <p>A new, broader definition of literacy that includes being socially, culturally and environmentally aware; being equipped with skills that guarantee employment and having the ability to operate basic technology to be initiated.</p> <p>Avenues be created for continuing and life-long education for neo-literates</p> <p>NSS students can take-up this responsibility to provide skills, continuing and lifelong education during literacy programmes.</p> <p>HEIs can allocate credits to these activities and make it mandatory to undertake these activities.</p>	HEI	2027	<p>Number of literacy and awareness programmes conducted by HEIs.</p> <p>Number of NSS Students involved in literacy activities.</p> <p>No of HEIs involved in creating credits for literacy and literacy-related activities.</p>
	Initiate Impact Ranking in India in line of THE SDG-based impact ranking to ensure alignment of HEIs with the SDG.	Government	2027	Total number of top-ranking universities.




	Create a consortium of universities to work collaboratively to realise SDG-4.	HEI	2027	Number of consortia formed to work towards realizing SDG-4. Accomplishments in realizing SDG-4 calculated through already available indices like ranking, employability, etc.
	Universities with required paraphernalia and strong dedication towards realizing SDGs can assume the flagship to handhold other universities and surrounding communities and act as the driver in realizing the SDGs.	HEI	2027	Total number of projects completed by the HEIs concerning SDGs in their region.
	Promoting the use of digital technology to increase reach and improve the quality of education.	HEI	2027	Total number of digital tools and techniques introduced by the HEIs on their campuses to facilitate teaching and learning.
	Best practices followed by the successful institutions of other countries to be made a part of the curriculum.	HEI	2027	Total number of SDG-related case studies introduced in the HEI's curriculum.
	Breaking down SDG goals into time-bound yearly, and 3-yearly goals and actively reviewing the achievements of these.	Government and HEI	2025	Total number of SDG-related activities completed per year (e.g. total number of courses introduced, total number of SDG projects completed, MoUs signed, etc.)

SDG	Recommendation	Implementing Agency	Completion Date	KPI
	Incorporation of social projects for boys and girls for the advancement of understanding, acceptability, responsibility, teambuilding, trust and equality amongst genders.	Government and HEI	2027	Total number of special gender equality projects, activities, and exercises conducted by the Government and HEIs per year.
	More gender equality policies to be framed by regulatory agencies such as Health & Family Welfare; Education; Human Resources, etc. in consultation with the experts.	Government	2027	Total number of policies in existence regarding gender equality.

	Services for women security, help-line, surveillance and transport facility for evening and shift workers must be enhanced. Recruitment of female security staff and service providers must be upgraded.	Government and HEI	2027	Total number of services in existence. Total number of upgradations done in the provided services.
	Gender Audits be made essential for the HEIs	Government		Number of universities conducting gender audits and preparing objective reports.
	A culture of flexibility in timings, working hours, and work from home be ensured for both male and female employees as per their requirements.	Government and HEI	2027	Number of HEIs which have revised their rules and brought flexibility as per the requirement of both male and female staff.
	Awareness programs be organized in surrounding areas of HEIs regarding the law enforcement policies against violence against girls and women in family or public, particularly against molestation, trafficking, sexual exploitation, etc.	Government	2027	Total number of policy reforms, amendments or introduction of new policies related to violence against women or harassment of women in the family and workplace or anywhere. Total number of awareness programmes conducted per year.
	Creation of job opportunities for females in each sector, sports, production, sales, education, transport, agriculture, health, engineering and technology, etc. by the Government.	Government	2027	Total number of jobs created or reserved for women in the respective sectors.
	Making it mandatory to have equal representation of female members in the quorum of each expert or selection committee by Central or State Government or public or private sector agencies.	Government	2027	Total number of new opportunities and reservations for female candidates in jobs and committees.

	Schemes like Beti Bachao Beti Padhao which aims at equal opportunity and education for girls in India; Sukanya Samridhi Yojana which focuses on financial empowerment of girl children along with National Rural Health Mission, Janani Suraksha Yojana, etc. should be continued, enhanced, monitored necessary improvements be made in the scope and facilities covered under the schemes	Government	2027	Progress of the schemes in various states through a central monitoring mechanism developed with the help of HEIs. Improvements made in the schemes and their implementation.
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SDG	Recommendation	Implementing Agency	Completion Date	KPI
	Funding agencies must provide research grants to all public and private universities imparting quality education regarding sustainability and SDG-6.	Government	2027	Total funds allocated as research grants for SDG-related research and projects for the HEIs.
	Conduct focused research on increasing water use efficiency, developing low-cost sanitation and wastewater treatment systems, low-cost desalination techniques, exploring the water-food-energy nexus, management of solid waste and managing wetland ecosystems. Projects involving international collaborations must be taken up with high priority. Research in science, technology, engineering, and management(STEM) at the postgraduate and doctorate levels should focus on SDGs wherever possible.	HEI	2027	Total number of research papers and collaborative projects completed by the HEIs, monitored on annual basis. Number of Collaborative Research Projects initiated. Number of SDG Focused Researches in SDGs

	Develop rainwater harvesting network and water treatment facilities to promote circular water economy. Should issue guidelines regarding mandatory rainwater harvesting systems in all buildings of HEIs and then ensure compulsory enforcement.	Government and HEI	2027	Number of policies or schemes launched for mandatory rainwater harvesting in all buildings. Number of buildings brought under the ambit of Rainwater Harvesting
	Should create a solid waste management unit within the campus to facilitate the collection, segregation, treatment, recycling and disposal of waste generated by different units and laboratories and identify locations for waste disposal in their vicinity.	HEI	2027	Presence of at least one waste management unit within the HEI campus.
	Strict monitoring of water usage by implementing regulatory instruments and promoting the utilization of treated wastewater among the general public. Incentivized programs can also be launched.	Government	2027	Number of monitoring systems and mechanisms in place to measure efficient use of water. Number of programmes launched to promote water recycling, rainwater harvesting and other methods to conserve water.
	Organize short-term training programs for government officials and awareness programs for the general public.	HEI	2027	Total number of training and awareness programmes introduced per year by the HEIs and the number of people trained in the same.
	Regulatory bodies like UGC, AICTE, etc., must promote the design and approval of new HEIs, degrees and course curriculums related to water and sanitation.	Government	2027	Total number of new HEIs, degrees and courses created to achieve SDG-6.

	Regulatory bodies must devise a reward system for institutions that comply with SDGs and a national ranking system similar to the THE SDG-based impact ranking.	Government	2027	Number of reward systems introduced for HEI ranking for contribution towards SDG targets.
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SDG	Recommendation	Implementing Agency	Completion Date	KPI
	The government must involve HEIs in joint projects related to renewable energy and SDG-7 through MoUs or existing policy amendments.	Government	2027	Total number of MoUs signed with the HEIs. Number of completed projects related to SDG-7.
	Research grants must be provided by the UGC, DST, CSIR, ICAR, and other funding agencies to all public and private universities imparting quality education regarding sustainability and SDG-7.	Government	2027	Total allocation of research grants for SDG-7-related research.
	The state governments must align with the central government for the effective implementation of SDG-7 and monitor the status of related projects through online systems.	Government	2027	Total number of online systems or mechanisms developed to monitor state government SDG-related projects and proper coordination between central and state governments.
	The government must formulate specific policies for every state for the promotion of renewable energy and create new schemes and benefits targeting the commercial and industrial sectors for higher renewable energy penetration and reduction of pollution.	Government	2027	Create a renewable energy penetration policy for all states/union territories and use scientific indices like SARAL to monitor the same and make amendments wherever necessary in the respective policies.
	Government must plan off-grid solar and wind energy projects for remote areas where the conventional grids cannot be extended due to technical or financial reasons.	Government	2027	Total number of off-grid solar and wind energy projects completed in remote and far-flung areas.

	The HEIs that demonstrate a high level of excellence in imparting education related to sustainability and research and deliver exceptional national/international projects related to SDG-7 must be rewarded by the government so that others also follow.	Government	2027	Reward system for the HEIs demonstrating exceptional achievement towards meeting SDG-7 targets.
	HEIs must start working for the achievement of SDG-7 by offering undergraduate and graduate level courses and MOOCs related to the same. HEIs must also review their own campuses for compliance with SDG-7 and create a policy for energy, environment, and sustainability.	HEI	2027	Total number of online and regular-mode courses offered by HEIs related to SDG-7. Creation of SDG compliance and management policy for the HEI.
	HEIs must conduct focused research and projects concerning SDG-7, especially in areas of renewable energy, hybrid energy systems, green buildings, renewable energy storage, integration of renewable energy systems with the grid and clean and efficient cooking technologies and fuels. The research in science, engineering, technology and social sciences at the Master's and PhD levels should focus on SDGs wherever possible.	HEI	2027	Total number of research publications related to renewable energy; Total number of research projects completed by the HEI related to SDG-7.
	Government must ensure old inefficient systems that are in use should get replaced from govt. offices and industries. Govt. should provide incentives and support to industries to phase out old, less efficient manufacturing systems and products. New standards and policies can be made for enforcing the same.	Government	2027	Total number of inefficient pieces of equipment replaced. Total number of policies or schemes introduced for supporting industries to phase out inefficient production platforms and switch to renewable energy and more efficient manufacturing systems.



	Regulatory bodies like UGC, AICTE, and NAAC must foster design and approval of new HEIs, degrees and course curriculums related to sustainability and SDGs and keep the quality in check.	Government	2027	Total number of new courses, and degrees, introduced. Total number of new HEIs of national importance opened by the government for focusing on SDGs.
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SDG	Recommendation	Implementing Agency	Completion Date	KPI
	<p>Institution's Innovation Councils (IICs) set-up under MoE's Innovation Cell which is fostering a culture of innovation and entrepreneurship in HEIs need to be strengthened more through effective control measures.</p> <p>Atal Incubation centers to be allocated to HEIs performing significantly well in the IIC framework.</p>	Government	2027	Increase in infrastructure and funding allocated to various innovation/incubation centers and schemes.
	<p>Less dependency on naturally depleting resources causing environmental degradation and more focus on renewable sustainable resources.</p> <p>Introduction of more programs, courses, and dedicated centers of excellence in HEIs to the cause.</p> <p>Adoption of 50km surrounding area by each HEI and organizing awareness and other programs leading towards economic sustainability.</p>	Government and HEIs	2027	<p>Total number of renewable energy projects completed.</p> <p>Number of dedicated centers of excellence opened within the HEI.</p> <p>Number of awareness programmes conducted around the HEI.</p>

	Increase employability and entrepreneurship skills with the help of development programs, competitions, and other activities (collaborate with other universities running the same programs).	HEI	2027	Total number of placement of students in industries. Total number of successful startups created. Total number of collaborative agreements done with other HEIs.
	Time to time revision of curriculum (must be as per the need of the respective industry)	HEI	2027	Total number of courses upgraded to include SDGs. Total number of new SDG-related courses introduced.
	Make Research Project as a mandatory aspect of curriculum (must start from 1st semester till last semester)	HEI	2027	Mandatory inclusion of research projects related to SDG-8 in degree programmes.
	Collaborate with other HEIs for technology exchange (the latest technology must be taught to the students)	HEI	2027	Total number of exchange programmes conducted related to SDG-8.
	Paid Internship on campus and industries (must collaborate with industries)	HEI	2027	Total number of internships offered or fostered with the industries.
	Equal opportunities for all the students (no student should be left behind). Financial and logistic support to students for start-up business innovations.	HEI	2027	Total number of students with weak economic backgrounds helped through flexible policies within the HEI.
	Creating more monitoring mechanisms and closely monitoring and reviewing the progress of the start-up movement.	Government and HEI	2027	Total number of monitoring mechanisms in place for reviewing the performance of startup schemes. Total number of Startups monitored.


	<p>HEIs should adopt at least 10 large Panchayats in the near vicinity and get the progressive volunteers from these Panchayats by training them on sustainable earning opportunities like eco-tourism, rural tourism, progressive farming, etc.</p> <p>Monitoring the progress of individuals after each training and updating records with percentage of successes or failures to improve the programmes in the future</p>	HEI	2027	<p>Total number of Panchayats catered</p> <p>Number of individuals trained.</p>
	<p>Every labour needs to know their rights. An awareness program monthly must be conducted by the Government with the help of HEIs. HEIs involvement should be a must.</p>	Government	2027	<p>Number of awareness programmes conducted in collaboration with HEIs.</p>
	<p>Immediate action on the exploitation of labour rights. Implementing a mechanism to ensure labour-rights protection.</p>	Government	2027	<p>Number of policies in place for labour rights protection.</p>
	<p>Rewarding those organizations which provide a safe working environment to their employees.</p>	Government	2027	<p>Reward system for the HEIs and other organizations.</p>
	<p>Explore and develop new tourist destinations and improve facilities at existing tourist places. Connecting all tourist places with all modes of transportation.</p>	Government	2027	<p>Total number of new tourist places developed.</p> <p>Total number of buses, trains, roads, and railway networks added to foster tourism growth in various regions.</p>
	<p>Financial inclusion through “each one reaches one” creates an understanding of financial products and their benefits. Generally, ignorance and insecurity are the biggest hindrances to mass financial inclusion.</p>	Government	2027	<p>Number of schemes for economically weak sections of the society to ensure financial inclusion.</p>

	Encouraging and facilitating digital transactions for all HEI/Panchayats-related work towards a cashless economy.	Government	2027	Number of platforms, apps and awareness programmes created to promote a shift towards the digital economy.
	Promoting FDI and encouraging FII.	Government	2027	Total FDI and FII achieved during each financial year contributing to SDG-8.

SDG	Recommendation	Implementing Agency	Completion Date	KPI
	Fund sufficiently for R&D infrastructure in emerging government and personal establishments/universities and colleges to harness the expertise for fostering innovation.	Government	2027	Total fund allocation towards innovation, startups, incubation centers, research grants to HEIs.
	Enhancing the conduciveness of the commercial enterprise environment, incentivizing, and inspiring India-made innovation to attract lucrative jobs.	Government	2027	Total number of schemes launched to promote startups and innovations. The extent of increase in funding for existing schemes.
	Simplification of the process for start-ups and making it free of charge for Women Entrepreneurs for start-ups, MSMEs, and so forth.	Government	2027	Simplifications done in the format and submission process of the startup from application to approval in comparison to earlier formats.
	Investing in ICT (Information and Communications Technology) connectivity and increasing broadband carriers to enable states to fully benefit from the digital revolution.	Government	2027	Total number of communication towers installed and internet services provided.
	Implementing measures, including discouraging heavy or special taxes on ICT gadgets and services, encouraging R&D, improving generation security and privacy, and enhancing e-literacy with a focal point among the rural populace.	Government	2027	Reduction in taxes on ICT products and services. R&D projects with HEIs.

	Strengthening the capability of national statistical structures to boom facts availability and satisfactory to plot, display and evaluate ICT for SDG regulations.	Government	2027	Central repository created for information collection, knowledge database and enablers for sharing data.
	Utilizing modern financing strategies that channel public resources into neighbourhood economies to finance SMEs and build resilient infrastructure.	Government	2027	Number of new innovative schemes for financing SMEs.
	Develop financial initiatives that empower women economically.	Government	2027	Number of incentives or schemes for women entrepreneurs. Number of jobs created for women.
	Promoting collaboration amongst stakeholders to lessen technology gaps.	Government	2027	Number of collaborations done for technology development and indigenization.
	Invest in new, resilient infrastructure in developing nations or retrofit current infrastructure to make it greater sustainable.	Government and HEI	2027	Total investment for procuring new or upgrading existing infrastructure.
	Expand the studies and improvement centres, connecting HEI with business platforms to enhance the scaleup and commercialization.	HEI	2027	Total number of courses introduced related SDG-9 and number of linkages created between HEI and business platforms.
	Investing in ICT connectivity and extending broadband service to allow farmers to enjoy the digital revolution.	Government	2027	Total number of ICT and internet services provided to farmers.
	Enabling the educational structure and framework to encompass sustainable goals, so that the motive reaches the grassroots.	HEI	2027	Number of courses introduced and projects undertaken concerning SDG-9.
	Encouraging start-up initiatives from students for a sustainable infrastructure & providing them with threshold funding.	HEI	2027	Number of startups funded and incubated.

	Formalizing a branch of government to fund infrastructure start-ups that can have sub-branches & is easier to approach for young entrepreneurs.	Government	2027	Number of startups funded and incubated.
	The emphasis should be given to infrastructure investment in priority sectors such as health, energy, water and sanitation, agriculture, transport, and ICTs; that can expand market activity, enable access to new markets, and create job opportunities for women and youth in the formal and informal sectors.	Government	2027	Total funding for infrastructure development in priority areas.

SDG	Recommendation	Implementing Agency	Completion Date	KPI
	Find a Goal 10 charity that can be supported. Donations, be they be big or small can come along in making a huge difference.	HEI	2027	Formation of Goal-10 Charity.
	Voices must be raised against any type of discrimination. It must be understood that everyone is equal regardless of their gender, race, sexual orientation, social background, and physical abilities.	Government	2027	Formation of new laws for prevention of discrimination and reduction of inequalities.
	Visits to local shelters, orphanages or minority community centres is a must, this must be done in order to ensure that there is a dedicated space for conversation and to discuss the importance of these rights for volunteers.	HEI	2027	Number of visits and support given to disadvantaged people in terms of monetary or other support like education, consulting, etc.
	It should be ensured that everyone at the specified workplace has access to healthcare. An individual should know about their rights to work. There should be revolt against inequality.	Government and HEI	2027	Number of healthcare centres and facilities available. Work ethics and equal opportunity policies in place.


	Voter registration campaigns are one of the issues contributing to rising inequalities. It is caused by the lack of representation of minorities and underprivileged groups in government. You can run a voting registration education in these groups to raise their engagement and representation in institutions of power.	Government and HEI	2027	Number of awareness and training programmes related to voting registration.
	Migrants and refugees should be supported in each community. There can be volunteers in local refugee camps who gather and then distribute essentials such as appliances, food, clothes, etc., needed.	Government and HEI	2027	Total number of refugees or homeless people helped.
	Regulatory authorities should use risk management tools – including voluntary standards to build the regulatory frameworks that are needed to operationalize SDG 10.	Government	2027	Number of risk management tools and standards developed to aid in SDG-10 achievement.

SDG	Recommendation	Implementing Agency	Completion Date	KPI
11 SUSTAINABLE CITIES AND COMMUNITIES	The government must involve HEIs in joint projects related to urban planning, development and SDG-11 through MoUs or existing policy amendments.	Government	2027	Total number of MoUs between government and HEIs related to SDG-11.
	Research grants must be provided by the UGC, DST, CSIR, ICAR, and other funding agencies to all public and private universities imparting quality education regarding sustainability and SDG-11.	Government	2027	Total funds provided by the government and/or funding agencies for supporting SDG related education in HEIs.
	The state governments must align with the central government for the effective implementation of SDG-11 and monitor the status of related projects through online systems.	Government	2027	Total number of online systems or mechanisms developed to monitor state government SDG-related projects and for proper coordination between central and state governments.

	The government must formulate specific policies for the construction of sustainable green buildings or zero energy buildings in their respective states as is being done by the Government of Himachal Pradesh under the Solar House Action Plan.	Government	2027	Formation of policy for Zero Energy buildings and Passive Solar buildings.
	Promote renewable energy, sustainable technologies and electric vehicles by making specific policies for the same and providing suitable incentives for their adoption by people and organizations.	Government	2027	Number of policies or schemes in place for the promotion of renewable energy. Incentives and subsidies are offered for the installation of renewable energy projects.
	The HEIs that demonstrate a high level of excellence in imparting education related to sustainability and research must be rewarded by the government so that others also follow.	Government	2027	Reward system for exceptional performance of HEIs for their contribution towards SDGs.
	HEIs must start working for the achievement of SDG-11 by offering undergraduate and graduate level courses and MOOCs related to the same. HEIs must also review their own campuses for compliance with SDG-11 and create a policy for energy, environment, and sustainability.	HEI	2027	Number of regular courses offered related to SDG-11. Number of online courses offered.
	HEIs must conduct focused research and projects concerning SDG-11, especially in areas of smart cities, urban planning, green infrastructure, green buildings, the resilience of urban systems and engineering, disaster management, waste management, urban transportation, life expectancy and death rates, and heritage research. The research in science, engineering, technology and social sciences at the Master's and PhD levels should focus on SDGs wherever possible.	HEI	2027	Total number of research papers published in the concerned fields related to SDG-11. Total number of research projects completed in collaboration with the government or through government funding or private funding.



	Government must introduce the latest sustainable technologies in urban development projects and provide consultancy projects to the HEIs for guidance and research.	Government and HEI	2027	Number of sustainable technology development projects undertaken by the government and supported by HEIs. Number of research projects related to sustainable technology development completed by the HEIs.
	Regulatory bodies like UGC, AICTE, and NAAC must foster the design and approval of new HEIs, degrees and course curriculums related to sustainability and SDGs, and keep the quality in check.	Government	2027	Total number of new courses, and degrees, introduced. Total number of new HEIs of national importance opened by the government for focusing on SDGs.

SDG	Recommendation	Implementing Agency	Completion Date	KPI
	Frame policies and create database for the food losses and the reasons for food losses with rigorous monitoring of the database.	Government	2027	Total number of policies or schemes in force. Creation of a database for keeping a record of food losses and an online tracking system to keep losses in check.
	A comprehensive National Chemical Profile assessing the existing institutional, administrative, technical, and legal infrastructure vis-a-vis the requirements of safe handling of chemicals should be prepared.	Government	2027	Creation of National Chemical Profile.
	Regular Monitoring and reporting mechanism of the National Implementation Plan (NIP) for Persistent Organic Pollutants (POPs) assigned to Industrial Toxicology Research Centre (ITRC), Lucknow in association with United Nations Industrial Development Organisation (UNIDO).	Government	2027	Creation of an online monitoring system for the concerned plans.

	Involve HEIs in joint projects related to efficient use of natural resources and implementing course curriculums related to SDG 12.	Government	2027	Total number of joint projects related to SDG-12 completed in collaboration with the HEIs.
	Segregation of biodegradable and non-biodegradable wastes and rigorous monitoring of recycling rate and percentage of the city's solid waste that is disposed of.	Government and HEI	2027	Total number of dustbins for segregation of waste installed. Monitoring of waste recycling through regular publishing and updation of data.
	The regulatory bodies must foster approval of new degrees, and course curriculums related to SDGs and monitor them on a regular basis.	Government	2027	New courses introduced concerning SDG-12.
	The state governments should align with the central government for the effective implementation of SDG-12 and monitor the status of ongoing projects to accelerate research and innovation.	Government	2027	Creation of a monitoring system involving central and state governments to monitor SDG-12-related projects.
	The government must promote renewable energy and alternative resources of energy for the efficient use of natural resources by making specific policies and providing suitable incentives for their adoption and implementation.	Government	2027	Total number of renewable energy projects completed and incentives provided.
	Make sure that the HEIs that demonstrate and work towards sustainable development goals must be rewarded.	Government and HEI	2027	Reward systems initiated for HEI showing exceptional performance in SDG-12 implementation.
	Proposals submitted by the HEIs aligned with SDG 12 to be given higher priority and preference. Research projects undertaken by HEIs by central and state governments should be monitored on a regular basis.	Government	2027	Policies and regulations related to prioritising selection and approval of SDG-12-related research projects. Online monitoring system for keeping track of project progress.


	The government in collaboration with HEIs should organize awareness camps in communities teaching them methods of sustainable consumption and disposal of wastes and introduce them to different bins for different types of waste.	Government and HEI	2027	Total number of awareness camps organized per year by the government and HEIs.
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SDG	Recommendation	Implementing Agency	Completion Date	KPI
 13 CLIMATE ACTION	The central government must formulate specific policy for action against climate change and SDG-13 and also tune it to Sendai Framework for Disaster Risk Reduction 2015–2030 and also promote state govts. to formulate their own policies as per the local conditions and geographic profiles.	Government	2027	Policies created by the central and state Government for climate action in line with Sendai Framework for Disaster Risk Reduction.
	Must involve HEIs in joint projects related to actions against climate change and SDG-13 through MoUs or existing policy amendments.	Government	2027	Total number of MoUs signed between government and HEIs. Total number of completed projects related to SDG-13.
	Governments in collaboration with HEIs, should research and analyze statistical data related to deaths attributed to natural disasters for better decision-making or policy formulation.	Government and HEI	2027	Number of completed joint research projects concerning the analysis of statistical data related to deaths due to natural disasters and causes of occurrence of the same.
	Accord suitable incentives for use of low carbon energy in the electricity sector (Rs/kWh or Rs/ton of CO2 avoided). Encourage carbon trading, GHG emission reduction targets and strategies in view of achieving <2oC global warming goal, including the rate of primary energy intensity improvement measures in climate change mitigation policy.	Government	2027	Incentives given for the abatement of CO2 and GHG emissions. Number of policy interventions to promote carbon trading and the possible creation of new methods to encourage organizations and industries to reduce carbon emissions.


	Research grants must be provided by the UGC, DST, CSIR, ICAR, and other funding agencies to all public and private universities imparting quality education regarding sustainability and SDG-13.	Government	2027	Total research grants allocated and disbursed to the HEIs for supporting SDG-13-related research projects.
	The state governments must align with the central government for the effective implementation of SDG-13 and monitor the status of related projects through online systems.	Government	2027	Total number of online systems or mechanisms developed to monitor state government SDG-related projects and for proper coordination between central and state governments.
	Promote awareness and action against climate change, renewable energy, sustainable technologies and electric vehicles by making specific policies for the same and providing suitable incentives for their adoption by people and organizations.	Government	2027	Number of policies and incentives for implementation of renewable and sustainable technologies by HEIs and other organizations.
	The HEIs that demonstrate a high level of excellence in imparting education related to sustainability and research must be rewarded by the government so that others also follow.	Government	2027	Reward system for outstanding HEIs for contribution towards SDG-13.
	Offer undergraduate and graduate level courses and MOOCs related to SDG=13. Review respective campuses for compliance with SDG-13 and create a policy for energy, environment, and sustainability.	HEI	2027	Number of regular courses offered related to SDG-13. Number of MOOCs and online courses offered. Creation of policy for environment protection and for the fulfillment of targets of SDG-13.
	Conduct focused research projects concerning SDG-13, especially in areas of climate change, renewable energy, energy policy, energy systems, alternative fuels and carbon markets. The research in science, engineering, technology and social sciences at the Master's and PhD levels should focus on SDGs wherever possible.	HEI	2027	Total number of projects completed related to SDG-13. Total number of PhD and Master level research focused around SDGs.



	Government must develop new climate mitigation technologies through projects given to the HEIs for guidance and research.	Government and HEI	2027	Number of Joint projects or consulting projects given to HEIs for development of technologies to counter climate change. Total research projects completed related to SDG-13.
	Regulatory bodies like UGC, AICTE, and NAAC to foster design and approval of new HEIs, degrees and course curriculums related to sustainability and SDGs, and keep the quality in check.	Government		Total number of new courses, and degrees, introduced. Total number of new HEIs of national importance opened by the government for focusing on SDGs.

SDG	Recommendation	Implementing Agency	Completion Date	KPI
 14 LIFE BELOW WATER	Involvement and collaborative action of HEIs and government bodies towards SDG-14 goals.	Government	2027	Number of SDG-14-related joint projects of Government and HEIs.
	Introduction of Special Course on SDG-14 at all academic levels.	HEI	2027	Number of SDG-14-related courses introduced into the curriculum.
	Emphasis on conservation of Aquatic Biodiversity among academia and societal level.	Government and HEI	2027	Total number of awareness programmes conducted per year to promote conservation of aquatic biodiversity.
	Organization of Awareness Campaigns, Seminars, Workshops, Discussions and Surveys on SDG-14.	Government and HEI	2027	Total number of awareness programmes, seminars, workshops, and surveys conducted per year related to SDG-14.
	Implementation of measures to control land, air and water-based pollution for aquatic ecosystem conservation.	Government	2027	Number of pollution monitoring and control systems deployed for aquatic ecosystem conservation.

	Building of Smart model for Water resource management at the national level.	Government	2027	Creation of Smart Water Resource Management Model at national level.
	Sub-bodies are required for the management of SDG-14 at different levels as the population of the country is too vast to be regulated by a small number of managing bodies.	Government	2027	Number of local bodies constituted for enforcing SDG-14-related targets in respective regions.
	Policies and Laws be created for controlling illegal fishing and trading, controlling water traffic and demarcation for conservation of aquatic zones.	Government	2027	Number of laws in force or new laws created to keep the concerned issues in check.
	Promotion of research on marine biodiversity and ocean health and support through funds.	Government and HEI	2027	Total research funding is given to HEIs by the government for SDG-14. Number of research projects completed by HEIs concerning the same.
	Recognition and acceptance of the problems, fallouts and criticism for better development and SDG-14 achievement	Government and HEI	2027	Monitoring of the projects and their outcomes and the number of improvements introduced in policy and future projects.

SDG	Recommendation	Implementing Agency	Completion Date	KPI
	Should involve in the bioprospection of the Himalayan resources like medicinal and aromatic plants, and wild edible fruits to generate sustainable livelihood for the mountain communities.	Government and HEI	2027	Number of joint research projects for the concerned area between government and HEIs.
	Should promote more field studies in the areas of establishment of nature parks, biodiversity parks, promotion of plantations, and work for the conservation of traditional germplasm focusing on high altitude plants.	HEI	2027	Number of field studies conducted and associated research publications.


<p>Various awareness camps like seminars and nukkad natak (street shows) should be organized in collaboration with NGOs and the government at a small and large level to educate the people about the consequences of destroying nature.</p> <p>Sensitization Programmes should be organised to make people conscious of the worth of flora and fauna, their interaction, and human dependence on them for the sustenance of life on the planet by readapting ancient practices and culture.</p>	<p>HEI</p>	<p>2027</p>	<p>Total number of awareness camps organized per year.</p>
<p>Should take the initiative to protect our traditional knowledge by documenting our ethnomedicinal plants and by identifying our old traditions (Sacred Grooves and Sacred Trees) and beliefs through interaction with gram panchayat, local medicine men, old knowledgeable people, etc.</p> <p>After documentation, further, necessary actions or conservation practices should be taken in association with the government to protect overexploited plants or resources. HEIs can conduct various small and large research projects to introduce these livelihood practices like farming, livestock rearing, etc. to students that educate them about the role of cultural and traditional values in strengthening livelihood resilience. HEIs can help in policy designing with govt. in collaboration with environmentalists and local authorities to protect forest and wetland ecosystems.</p>	<p>Government and HEI</p>	<p>2027</p>	<p>Number of publications to document traditional knowledge related to plants.</p> <p>Policies and interventions for protection of overexploited plants.</p> <p>Number of research projects completed concerning traditional livelihood practices and resilience.</p>




	Design small projects where students participate in the plantation of trees like Moringa, Oak, Populus, etc. near water resources for water purification purpose. Some microorganisms like purifying bacteria, protozoa, and rotifers can be used to purify contaminated water after successful trials in the laboratory. HEIs should take part in reversing climate change in association with the government by implementing a weather warning system, planting trees in the urban area, implementing education campaigns, creating disaster preparedness programs, employing land use planning to reduce flash floods, insulating buildings fortifying sanitation systems and design climate services by govt in association with environmentalist.	Government and HEI	2027	Total number of joint research projects completed related to water purification through tree plantation, and purifying microorganisms. Installation of weather warning systems, creation of disaster management policy.
	The role of mangroves in coastal risk reduction and their multiple values should be identified by HEIs and environmentalists and further policies should be designed to manage mangroves for coastal defence through coastal defence strategies, by managing coastal zones, and by bringing the mangroves back.	Government and HEI	2027	Policy for mangrove plantation for disaster risk reduction.
	By developing sustainable practices at a small and large level through the R3 approach, HEI can promote environmental education and awareness and therefore can improve the quality of life including social, economic, and cultural dimensions.	HEI	2027	Number of awareness programmes completed by HEIs per year.



	Take initiatives to rank and recognize the research institutes and universities in the country that are working to make SDGs an important component in their curriculum and research.	Government	2027	Ranking and reward system for the high-performing HEIs for SDG implementation.
	Promote funding for all government and private universities that are taking research initiatives for the fulfilment of the goals of SDG-15.	Government	2027	Total funds allocated for SDG-15-related research for the HEIs.

SDG	Recommendation	Implementing Agency	Completion Date	KPI
	Include higher education institutions in research and policymaking on issues such as justice, peace, and inclusive societies.	Government and HEI	2027	Number of joint projects for policy-making and implementation with respect to SDG-16.
	The UGC, DST, CSIR, ICAR, and other funding bodies should award research grants to all public and private universities that deliver quality instruction on sustainability and SDG-16.	Government	2027	Total research funding for SDG-16 is provided to HEIs.
	For efficient implementation of SDG-16, state administrations must collaborate with the central government and use online technologies to track the status of linked projects.	Government	2027	Number of online monitoring and coordination system for central and state governments for effective project implementation.
	To instill a culture of zero tolerance for bribery and corruption at all levels of government and higher education institutions.	Government and HEI	2027	Number of amendments strengthening existing policies and laws or creation of new policies and laws for action against bribery and corruption.
	Ensure that women and marginalized persons are represented equally in parliament and state legislatures.	Government	2027	Number of reservations for women and minorities in various governmental establishments.

	Recognize HEIs that demonstrate a high level of competence in providing education connected to sustainability and research so that others would follow.	Government	2027	Reward system for HEIs demonstrating exceptional performance for implementation of SDG-16.
	Contribute to the achievement of SDG-16 by providing undergraduate and graduate level courses, as well as MOOCs, on the topic. HEIs must also assess their own campuses for SDG-16 compliance.	HEI	2027	Number of online and regular courses related to SDG-16 started by the HEIs. Monitoring implementation and work culture related to SDG-16 in the campus through audits.
	The third pillar of the judiciary's role should be expanded and properly utilized. To establish a hotline/helpline for aggrieved parties to receive free legal advice from advocates.	Government	2027	Establishing helpline for free counselling and legal advice for special cases.

SDG	Recommendation	Implementing Agency	Completion Date	KPI
	Need to develop a new mindset that respects planetary boundaries, recognizes the economy as a subset of nature, and supports the concept of living in harmony with nature.	Government and HEI	2027	Total number of sensitisation and awareness programmes, seminars, and workshops for creating sensitivity towards sustainable development.
	Promotion of Micro, Small and Medium-sized Enterprises. Research and development for designing a mechanism to enhance resource and energy efficiency.	Government and HEI	2027	Total number of incentives given to micro, small and medium enterprises for switching towards sustainable practices. Total number of research projects completed with the help of HEIs to enhance resource and energy efficiency.

	Developing alternative policies, programmes and strategies, as appropriate, including poverty reduction strategies to reduce the impacts of waste on the environment.	Government and HEI	2027	Number of new policies and schemes introduced to promote alternate technologies, poverty reduction, technologies and practices to reduce waste production.
	Develop an Adequate Monitoring Framework for Goal 17 as there are no internationally established methodologies or standards available for the indicators of the goal.	Government and HEI	2027	Development of a monitoring system for indexing and measuring the progress of SDG-17. Creation of an international standard for the latter.
	Develop a streamlined and coordinated approach. It is necessary to clarify data flows and ensure a consistent understanding of methodologies and terminologies for comparable data collection.	Government and HEI	2027	Design modern data analysis techniques and artificial intelligence models to better monitor and analyze complex relationships between data and integrate the same for effective project and policy implementation.
	Develop a set of core Corporate Sustainability Indicators for more methodological work and align them with overall SDG monitoring.	Government	2027	New indicators for monitoring SDG project performance with respect to various metrics.
	To create a more coherent response at scale, it is important to pool expertise and assets across UN entities, to strengthen partnerships involving the private sector and multi-stakeholder actors.	Government and HEI	2027	Number of agreements made with HEIs, and other organizations for the fulfilment of SDGs.
	Providing access to financial resources from Private Sector and Financial Institutions for unlocking the necessary finance to support actions that are transformational and at scale for successful implementation.	Government, HEI and Industries	2027	Number of joint partnerships to fund SDG-related projects.

	Change consumer behaviour towards sustainable products as consumer behaviour has a significant impact on how resources are used and markets are shaped.	Government and HEI	2027	Number of promotional and awareness projects completed for making consumers aware of the benefits of sustainable products and technologies adoption.
	Ensure integrated policy-making and implementation at the national level through national coordination mechanisms with the mandate to coordinate policy-making and implementation across ministries mandated to design policies that influence consumption and production patterns.	Government	2027	Special policies launched for the integration of SDG-17-related efforts at the national level.



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