India's Progress On Environmental Sustainable Development Goals: A Review

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	Abstract
	Environmental sustainability: ensures that the environment is preserved and used wisely, preventing it from being overused as a resource. Water conservation, the use of renewable energy, encouragement of ecologically friendly transportation, and improvements in green building and architecture are just a few of the variables that impact environmental sustainability.
	India has repeatedly demonstrated its dedication to environmental protection, climate change mitigation, and a concentration on renewable energy to decarbonize its economy. Different organs of the Indian government like the Ministry of New and Renewable Energy (MNRE), MoEFCC (the Ministry of Environment, Forest and Climate Change), and MoHI (the Ministry of Heavy Industries scheme to promote electric vehicles) along with others, have been the main driving forces behind India's effort in this direction because no single ministry is responsible for moving India towards net zero.
	Policymakers and business executives can invest in least-cost energy solutions, secure and resilient energy systems, efficiency and competitiveness, and social and environmental equity to drive short-term recovery and long-term resilience for India's better, greener future. This review article gives an insightful analysis of environmental SDGs in India. As a result, the report will offer basic information about India's Progress on Environmental Sustainable Development Goals. Furthermore, this review paper emphasizes the significance of sustainability in terms of waste management, green cover, technology adoption, financial requirements, etc. The current study also focuses on successfully applying technologies in the Indian subcontinent. Furthermore, education is essential for long-term sustainability in various social, economic, and cultural settings throughout the globe. The broader public's access to the environment is also crucial.
	Keywords: India, Environment, SDGs, waste management, green cover, technology adoption, financial

Introduction

The achievement of the "Sustainable Development Goals" as well as the Paris Accord on Climate Change necessitates the implementation of profound changes inside each nation. This undertaking calls for the

collaborative endeavours of governments, civil society, commercial entities, and research institutions. The establishment of a framework for national action and international collaboration on sustainable development has been undertaken by the member states of the United Nations through the adoption of the 2030 Agenda, which encompasses 17 Sustainable Development Goals (SDGs), as well as the Paris Agreement (The World in 2050, 2018; UN, 2015). The primary time-bound objectives of the Sustainable Development Goals (SDGs) are encapsulated by the five Ps, namely Prosperity, People, Planet, Peace, and Partnership. According to the Paris Agreement (IPCC, 2018), it is imperative for nations to achieve a state of net-zero greenhouse gas emissions by the mid-century.

The United Nations (UN) has formulated specific goals and metrics for each of the 17 Sustainable Development Goals (SDGs) outlined in the agenda. This has led to the establishment of a comprehensive global action plan consisting of 169 targets and 213 indicators (United Nations, 2017). The agenda also formulated a framework known as the five pillars (5Ps): individuals, environment, economic well-being, harmony, and collaboration (Tremblay et al., 2020).

India, similar to numerous other nations, has been actively engaged in the pursuit of attaining the Green Sustainable Development Goals (SDGs) are demarcated in the United Nations' 2030 Plan for Sustainable Development. The progression towards achieving environmental sustainability in India can be attributed to a range of policy efforts, governmental programmes, and international commitments. This paper provides a comprehensive summary of India's initiatives towards addressing the Environmental Sustainable Development Goals (SDGs).

India has made commitments at the international level by signing many accords and conventions that pertain to the promotion of environmental sustainability. Notable examples are the "Convention on Biological Diversity" (CBD) and "United Nations Framework Convention on Climate Change" (UNFCCC). These commitments establish the foundation for India's involvement in sustainable development.

India has developed multiple national action plans in order to effectively tackle environmental concerns. The National Action Plan on Climate Change (NAPCC) was officially initiated in the year 2008, serving as a comprehensive framework that delineates India's strategic approach towards both mitigating and adapting to climate change. The framework encompasses a total of eight national missions that are specifically targeted towards various facets of sustainable development.

The adoption of the 2030 Plan for Sustainable Development in 2015, encompassing 17 Sustainable Development Goals (SDGs), has furnished India with a comprehensive framework to pursue environmental sustainability. A number of the Sustainable Development Goals (SDGs) exhibit a clear correlation with the safeguarding and preservation of the environment.

The Swachh Bharat Abhiyan, (also known as the Clean India Mission,) was initiated in 2014 as a prominent endeavour aimed at attaining nationwide sanitation and cleanliness. This initiative makes a significant contribution towards achieving Sustainable Development Goal 6, which specifically targets the provision of clean water and sanitation.

Renewable Energy Initiatives: India has significantly expanded its renewable energy capacity over the years, focusing on solar and wind power. Advantages like the Jawaharlal Nehru National Solar Mission (JNNSM) have promoted clean energy sources, contributing to SDG 7 (Affordable and Clean Energy).

Afforestation and Biodiversity Conservation: Various programs and initiatives have been launched to increase afforestation and protect biodiversity. Projects like the Green India and National Mission for Sustainable Agriculture promote sustainable land use and conservation, contributing to SDG 15 (Life on Land).

Waste Management and Pollution Control: India has been working on waste management and pollution control through policies and regulations, including the National Clean Air Program (NCAP) and efforts to reduce single-use plastics. These initiatives align with SDG 11 (namely Sustainable Cities and Communities) and SDG 12 (namely Responsible Consumption and Production).

International Cooperation: India collaborates with international organizations and partners to access technology, finance, and expertise to support its sustainable development efforts. Bilateral and multilateral agreements have facilitated knowledge sharing and capacity building.

Research and Innovation: India invests in research and innovation to develop sustainable technologies and solutions. It includes initiatives to improve agricultural practices, promote eco-friendly transportation, and enhance water resource management.

Public Awareness and Education: Public awareness campaigns and educational programs are vital in promoting environmental sustainability. These efforts help raise awareness about environmental issues and encourage responsible behaviour among citizens.

India's ongoing journey towards achieving Environmental SDGs involves multiple stakeholders, with civil society organizations, government agencies, , and the private sector. It requires continued commitment and collaborative efforts to address the country's complex environmental challenges.

Policymakers and corporate executives in India can invest in energy solutions at the lowest possible cost. These energy systems are secure and resilient, efficient and competitive, and social and environmental equality to create short-term recovery and long-term resilience for India's better and greener future. An informative study of India's progress towards environmental SDGs can be found in this review article. Consequently, the report will include fundamental details regarding India's progress towards sustainable environmental development goals. In addition, this review article highlights the significance of sustainability in terms of waste management, green cover, technology adoption, financial demand, and so on. The successful implementation of technologies on the Indian subcontinent is another primary subject of this study. In addition, education is necessary for long-term sustainability in various social, economic, and cultural contexts worldwide. Access to the natural world for the general populace is another critically important factor.

Environmental Sustainable development goals

The United Nations Sustainable Development Goals (SDGs) allied to the environment are a subset of 17 SDGs. These goals specifically focus on environmental sustainability and address critical global ecological challenges. The environmental SDGs are as follows:

One of the Sustainable Development Goals (SDG) that is 6 is to provide safe drinking water and sanitation facilities for all people. This objective seeks to solve the problems of inadequate sanitary facilities, subpar water quality, and water scarcity.

SDG 7's "Affordable and Clean Energy" target is to provide reliable, low-cost electricity to all people around the world. The aim of this project is to increase access to renewable energy, improve energy efficiency, and reduce energy waste.

The purpose of Sustainable Development Goal 11 "Sustainable Cities and Communities" is to ensure that all people can live in and benefit from human settlements. This objective aims to green cities by improving urban planning, decreasing pollution, boosting public transit, and more.

SDG 12's "Responsible Consumption and Production" target is to promote environmentally friendly lifestyle habits. This objective places an emphasis on recycling more, conserving natural resources, and encouraging environmentally responsible corporate methods.

The "Climate Action" target of SDG 13 urges us to "take immediate action to combat climate change and its impacts." This objective seeks to reduce greenhouse gas emissions, increase climate resilience, and lessen the negative effects of climate change.

Goal No. 14 of "Life Below Water" is to preserve and wisely put to use the world's oceans, seas, and marine resources. The protection of marine life, the end of overfishing, and the reduction of ocean pollution are all central to this objective.

The seventh Sustainable Development Goal is to restore, protect, and encourage the sustainable use of terrestrial ecosystems (SDG 15, "Life on Land"). Desertification and biodiversity loss must also be halted, and forests must be managed properly. The challenges of deforestation, land degradation, and biodiversity preservation are all addressed in this objective.

These environmental SDGs are interconnected with other SDGs, and achieving environmental sustainability is crucial for sustainable development. Progress on these goals is tracked through various indicators and targets, and nations worldwide, including India, have committed to working toward their achievement.

Environmental SDG Status in India

Commitments made by India for 2030 reflect India's dedication to addressing climate change and transitioning to a more sustainable and low-carbon economy. Here's a breakdown of the commitments:

First, India plans to dramatically increase its non-fossil energy capacity by 2030, when it aims to have reached 500 GIGAWATTS. Solar, wind, hydro, and nuclear power are all examples of renewable energy. In order to

lessen the country's reliance on fossil fuels and greenhouse gas emissions, increasing the capacity of renewable energy sources is essential.

In order to meet its energy needs, India has set a goal of obtaining 50% from renewable sources by the year 2030. This target indicates a serious intent to make the change to renewable energy sources. If this goal is met, it will help reduce India's energy sector's carbon footprint.

India's goal for the year 2030 is a 45 percent reduction in the carbon intensity of its economy. Sustainable development and climate change adaptation necessitate decoupling economic growth from carbon emissions, and our pledge entails doing just that. It means that resources are being used in a more sustainable manner.

The government of India has pledged to cut its anticipated carbon emissions by one billion tonnes by the year 2030. This lofty aim is a big move towards sinking greenhouse gas emissions and meeting international climate targets like those in the Paris Agreement. Funding Priorities for Clean Energy, Alternative Power, and Electric Transportation.

These commitments indicate India's recognition of the urgent need to address climate change as well as promote sustainable development. Achieving these targets will require policy measures, investments in renewable energy infrastructure, technology innovation, and international cooperation. Monitoring and reporting on progress will also be crucial to track India's efforts towards meeting these commitments.

The concept of a one-word movement like 'LIFE' (Lifestyle For Environment) is a compelling and straightforward way to convey the message of mindful and sustainable living. It emphasizes the importance of shifting from a mindless and destructive consumption culture to one where individuals and societies are more conscious of their environmental impact.

Incorporating such a movement into public consciousness can be a powerful way to promote sustainable lifestyles, reduce waste, and minimize the carbon footprint. It encourages people to make environmentally friendly choices and prioritise the planet's well-being.

India's pledge to achieving net-zero carbon emissions by 2070 reflects the country's recognition of the urgency of addressing climate change. Achieving net-zero emissions involves assessment of the amount of greenhouse gases released into the atmosphere with the captured, effectively reducing the overall impact of human activities on the climate.

It's worth noting that the specific provisions related to climate in the Union Budget 2022-23 would play a critical role in translating this commitment into action. These provisions may include funding for renewable energy projects, climate resilience initiatives, and measures to reduce carbon emissions across various sectors of the economy.

i.India's progress in achieving the SDG 6: "Clean Water and Sanitation"

India was making efforts to achieve SDG 6, which focuses on clean water and sanitation (Table 1). The objective of SDG 6 is to ensure access to sanitation and clean water for all. Here is a summary of India's progress towards this objective:

1. Access to Clean Water:
• India has made noteworthy progress in improving access to clean water sources, particularly in rural areas. Initiatives such as the Swachh Bharat Abhiyan (Clean India Mission) included the construction of millions of toilets and the promotion of safe sanitation practices.
• The government has been working on the provision of piped water supply to rural households through schemes like the Jal Jeevan Mission. The goal is to provide tap water to every rural household by 2024.
• Despite progress, there were still areas in India facing challenges related to access to clean drinking water, especially in remote and underserved regions.

2. Sanitation:
• The Swachh Bharat Abhiyan was a significant national campaign aimed at improving sanitation and ending open defecation. It led to the construction of millions of toilets across the country.
• The campaign also aimed to promote safe sanitation practices, hygiene education, and the proper disposal of human waste.
• The progress made under the Swachh Bharat Abhiyan contributed to improvements in sanitation and reduced the practice of open defecation.

3. Challenges:
• Despite progress, challenges remained, including the sustainability of sanitation facilities, ensuring the quality of drinking water, and addressing disparities in access between rural and urban areas.

- Water pollution in rivers and groundwater contamination remained significant concerns, affecting water quality and posing health risks.
- In some rural and tribal areas, access to clean water and sanitation remained limited due to geographical and infrastructural constraints.
- Climate change impacts, such as fluctuating rainfall patterns and droughts, posed challenges to water availability and quality.

India was actively working on achieving SDG 6, with various government initiatives, raising awareness about hygiene practices, and addressing water quality issues. The government's commitment to the Jal Jeevan Mission and continued efforts to improve sanitation and water supply infrastructure were positive steps toward achieving SDG 6.

2. India's progress achieving the SDG 7: "Affordable and Clean Energy"

India was making significant strides in working towards SDG 7 seeks to guarantee that everyone has access to modern, dependable, affordable energy, while also promoting clean energy sources (Table 1). Here is a summary of India's progress towards this objective:

i. **Expansion of Renewable Energy:**
   - • India has actively pushed for the use of renewable energy, especially wind and solar energy. The nation has established challenging goals to boost the capacity of renewable energy.
   - •The National Solar Mission, also known as the Jawaharlal Nehru National Solar Mission, sought to increase solar power production and lower the price of solar energy.
   - Wind power projects were also being developed in various regions, including coastal areas and wind-rich states.

ii. **Rural Electrification:**
   - India has made significant progress in electrifying rural areas. "The Pradhan Mantri Sahaj Bijli Har Ghar Yojana" (Saubhagya) aimed to connect electricity to rural households.
   - Efforts were being made to ensure reliable and uninterrupted power supply in rural areas, improving the quality of life and promoting economic development.

iii. **. Energy Efficiency:**
   - Initiatives to improve energy efficiency, such as the Perform, Achieve, and Trade (PAT) scheme, were in place, which aimed to encourage energy-efficient practices in industries.
   - Programs like the Standards & Labeling program focused on promoting energy-efficient appliances.

iv. **Carbon Emissions Reduction:**
   - India was working to reduce its carbon emissions and combat climate change. It included measures to reduce emissions in sectors like industry, transportation, and agriculture.
   - The government has also pledged to increase the share of non-fossil fuel energy capacity in its energy mix.

v. **Access to Energy for All:**
   - India recognized the importance of ensuring energy access for all its citizens, including those in remote and underserved areas.
   - Efforts were made to provide clean cooking solutions to reduce indoor air pollution besides improve health outcomes, particularly in rural households.

vi. **Challenges:**
   - Despite progress, challenges remained, including the need for continued investment in renewable energy infrastructure, grid reliability, and energy storage solutions.
   - Balancing energy security with environmental sustainability was an ongoing challenge, particularly given India's significant reliance on coal for power generation.
   - Access to clean cooking solutions remained challenging for a large segment of the population, exclusively in rural areas.

India's commitment to expanding renewable energy and improving energy access while addressing environmental concerns was a positive step toward achieving SDG 7.

3. India's progress in achieving the SDG 11: "Sustainable Cities and Communities"

India has made progress towards Sustainable Development Goal (SDG) 11, which focuses on creating sustainable cities and communities (Table 1). SDG 11 aims to make cities more safe, inclusive, resilient, and sustainable by 2030.

i. **Smart Cities Mission**: India launched the Smart Cities Mission in 2015, aiming to develop 100 smart cities nationwide. The mission focuses on improving urban infrastructure, providing essential services, and promoting sustainable urban development.

ii. **Affordable Housing**: The "Pradhan Mantri Awas Yojana" (PMAY) is a substantial initiative to provide affordable housing for all by 2022. The program aimed to build houses for the urban poor and promote the concept of 'Housing for All.'

iii. **Urban Transport**: Several Indian cities have been working on improving their public transportation systems. For example, cities like Delhi and Bengaluru have expanded their metro networks, while others have invested in bus rapid transit (BRT) systems.

iv. **Waste Management**: Several cities have improved waste management and promoted recycling. The Swachh Bharat Abhiyan (Clean India Mission) is one such initiative aimed at improving sanitation and cleanliness in urban areas.

v. **Air Quality**: India has faced challenges related to air quality in many urban areas. Various measures have been taken to reduce pollution, such as implementing stricter emission standards for vehicles, promoting cleaner fuels, and introducing schemes to control dust pollution.

vi. **Resilience**: Building resilience to natural disasters is an essential aspect of SDG 11. Indian cities prone to disasters have been working on disaster preparedness, early warning systems, and infrastructure that can withstand natural calamities.

vii. **Inclusivity and Slum Rehabilitation**: Many Indian cities have initiatives to improve the living conditions of slum dwellers, aiming to provide them with better housing, access to essential services, and prospects for economic improvement.

viii. **Digitalization**: Digitalization and the use of technology have been integrated into city planning and governance. It includes the development of smart city solutions for better management of resources and services.

It's important to note that challenges remain. Rapid urbanization, infrastructure deficits, and environmental issues remain significant concerns. Moreover, progress may vary significantly from one city to another. Some cities are making substantial strides, while others face more significant challenges in achieving the targets set by SDG 11.
Solar and wind energy currently contribute more than 50% of the total renewable capacity of the country. India had a fully renewable energy capacity of 168.9 gigawatts, including 67.82 gigawatts of solar power and 43.20 of wind power (as of May 30, 2023).

4. India's progress in achieving the SDG 12: "Responsible Consumption and Production"

India has been taking various measures to progress toward Sustainable Development Goal (SDG) 12, which focuses on responsible consumption and production by 2030 (Table 1). Here are some of the key initiatives and progress made by India up to that point:

i. **Resource Efficiency**: India has been improving resource efficiency in various industries. It includes efforts to reduce the consumption of energy and raw materials, increase recycling and reuse, and minimize waste generation. Several sectors, including textiles and manufacturing, have been encouraged to adopt cleaner and more efficient production processes.

ii. **Waste Management**: The Swachh Bharat Abhiyan (Clean India Mission) focuses on responsible waste management. The mission promotes waste segregation at source, recycling, and proper waste disposal. Many cities have implemented waste-to-energy projects and composting facilities to manage organic waste.

iii. **Renewable Energy**: India has significantly promoted renewable energy sources such as solar and wind power. This shift towards cleaner energy production contributes to responsible consumption and production by reducing the reliance on fossil fuels.

iv. **E-waste Management**: India has recognized the importance of responsibly managing electronic waste (e-waste). Regulations have been implemented to ensure the proper recycling and disposal of electronic products.

v. **Green Packaging**: Some Indian companies have started to adopt eco-friendly wrapping materials and practices to reduce the environmental impact of their products.

vi. **Sustainable Agriculture**: Initiatives have been launched to promote sustainable agricultural practices. It includes adopting organic farming, efficient water use, and reduced use of chemical inputs.

vii. **Consumer Awareness**: Efforts have been made to raise awareness among consumers about responsible consumption and sustainable products. Initiatives like labelling products with environmental information and promoting eco-friendly choices have been introduced.

viii. **Circular Economy**: India has been exploring the concept of a circular economy, which focuses on reducing waste and extending the lifespan of products and materials.

ix. **Legislation and Policies**: The government has enacted policies and regulations to encourage responsible consumption and production. It includes policies related to environmental clearances, product standards, and waste management.

It's important to note that while progress has been made, challenges remain. India's large and diverse population and rapid economic growth pose significant sustainability challenges. Striking a balance between economic development and sustainable consumption and production is ongoing.

5. India's progress in achieving the SDG 13: "Climate Action"
India has been actively addressing the goals set out in Sustainable Development Goal (SDG) 13, which focuses on climate action. As one of the world's largest and most rapidly developing nations, India has taken various steps to mitigate climate change and enhance its resilience (Table 1). Here are some of the key initiatives and progress made by India about SDG 13 up to that point:

i. **Renewable Energy Expansion**: India has made significant strides in expanding its renewable energy capacity, particularly solar and wind power. The country has set aspiring targets for renewable energy deployment and invests in grid-connected and off-grid renewable energy solutions.

ii. **National Solar Mission**: This is one of India's flagship programs to promote solar energy generation and reduce greenhouse gas emissions. It includes incentives and subsidies to encourage the adoption of solar power.

iii. **Afforestation and Reforestation**: India has been involved in afforestation and reforestation efforts to increase carbon sequestration and improve the resilience of ecosystems. The Green India Mission is one such initiative.

iv. **Energy Efficiency**: The Perform, Achieve, and Trade (PAT) scheme and the Standards & Labeling program are initiatives focused on improving energy efficiency in industries and appliances, respectively.

v. **Climate Adaptation**: India has been working on climate adaptation strategies, especially in sectors vulnerable to climate change impacts, such as agriculture and water resources. Initiatives like the National Mission for Sustainable Agriculture aim to enhance adaptive capacity.

vi. **International Commitments**: India has ratified the Paris Agreement and is committed to achieving its climate goals under this agreement. The country has pledged to decrease its carbon intensity, increase the share of non-fossil fuel energy capacity, and create carbon sinks.

vii. **Electric Mobility**: Promoting electric vehicles (EVs) and investing in EV infrastructure is a part of India's climate action plan. "The Faster Adoption and Manufacturing of Hybrid and Electric Vehicles" (FAME) scheme is one such initiative.

viii. **Green Finance**: India has been exploring avenues for green finance, including issuing green bonds and incentivizing financial institutions to invest in sustainable and climate-resilient projects.

ix. **Climate Awareness and Education**: Efforts have been made to raise public awareness about climate change and the importance of climate action. Educational programs and campaigns have been launched to inform and engage citizens.

x. **Disaster Preparedness**: India has been working on disaster risk reduction and preparedness to mitigate natural disasters and the impacts of extreme weather events, often exacerbated by climate change.

It's important to note that India faces unique challenges in pursuing climate action. Balancing economic growth and development with carbon reduction targets is a complex task. Additionally, addressing the impacts of climate change, such as water scarcity and increased vulnerability to extreme weather events, is critical.

6. India's progress in achieving the SDG 14: "Life Below Water"
As a coastal nation with a vast coastline and a significant marine ecosystem, India has been trying to address Sustainable Development Goal (SDG) 14, which focuses on "Life Below Water." This goal aims to use and conserve marine resources for sustainable development (Table 1). Here are some of the key initiatives and progress made by India with SDG 14:

i. **Marine Conservation Areas**: India has established several protected areas, including national parks and sanctuaries, to conserve its rich marine biodiversity. The Gulf of Mannar, Marine National Park and Kutch Marine National Park are notable examples.

ii. **Marine Biodiversity Conservation**: Efforts have been made to protect and conserve marine biodiversity, including endangered species like sea turtles, dugongs, and dolphins. Conservation projects have been implemented along the coasts to protect nesting sites and migratory routes.

iii. **Sustainable Fisheries Management**: India has been working on sustainable fisheries management practices, including implementing guidelines to prevent overfishing and promoting responsible fishing practices.

iv. **Mangrove Conservation**: Mangroves play a crucial role in coastal ecosystems. India has been involved in mangrove conservation efforts, recognizing their significance in providing habitat for marine life and protecting coastal areas from erosion and storm surges.

v. **Plastic Waste Management**: India has taken steps to reduce plastic use and improve waste management practices to address plastic pollution in the oceans. Initiatives like the Swachh Bharat Abhiyan include components to reduce plastic waste in coastal areas.

vi. **Marine Research and Monitoring**: India invests in marine research and monitoring programs to understand and mitigate the impacts of climate change, and pollution on marine ecosystems.

vii. **International Agreements**: India is a party to international agreements related to marine conservation, such as the "Convention on Biological Diversity" (CBD) and the "Convention on International Trade in Endangered Species of Wild Fauna and Flora" (CITES), which contribute to protecting marine life.

viii. **Blue Economy**: India has been exploring opportunities in the blue economy, which involves sustainable economic activities related to oceans and coasts, including fisheries, aquaculture, and marine tourism.

ix. **Clean Ganga Mission**: The Namami Gange (Clean Ganga) Mission aims to rejuvenate the Ganges River and its tributaries. This mission includes efforts to improve the health of the river's ecosystems, which are connected to marine life in the Bay of Bengal.

x. **Capacity Building**: India has been building the capacity of coastal communities and relevant authorities to engage in sustainable coastal and marine management.

It's important to note that challenges related to marine conservation persist, including illegal fishing, habitat degradation, pollution, and climate change impacts. India continues to work on addressing these challenges to achieve the targets set out in SDG 14.

7. India's progress in achieving the SDG 15: "Life on Land"

India has actively worked to address Sustainable Development Goal (SDG) 15, which focuses on "Life on Land." It aims to protect, restore, and promote the ecological use of terrestrial ecosystems, sustainably manage forests, mitigate land degradation, combat desertification, and reduce biodiversity loss (Table 1). Here are some of the key initiatives and progress made by India about SDG 15:

i. **Forest Conservation and Management**: India has implemented various programs and policies for forest conservation and sustainable management. Initiatives like the Joint Forest Management (JFM) program, in which local communities are involved in maintaining and preserving forests through a programme, are considered.

ii. **Afforestation and Reforestation**: India has launched afforestation and reforestation programs to increase forest cover and combat deforestation. The Green India Mission, as part of the National Action Plan on Climate Change, aims to increase forest and tree cover.

iii. **Wildlife Conservation**: The country has established a network of wildlife sanctuaries and national parks to protect biodiversity and provide habitats for various wildlife species. Initiatives like Project Tiger and Project Elephant focus on conserving specific species.

iv. **Biodiversity Conservation**: India is home to many plant and animal species. The National Biodiversity Authority (NBA) works to conserve and sustainably use biodiversity by implementing the Biological Diversity Act.

v. **Land Degradation and Desertification**: India has been addressing land degradation and desertification through initiatives such as the "National Mission for Sustainable Agriculture" (NMSA) and the Soil Health Card program, which promote sustainable land use practices.

vi. **Community Participation**: Many conservation efforts involve local communities to ensure the sustainable consumption of natural resources and land. Community-based conservation models have been established, like community reserves and village forest committees.

vii. **Protected Areas**: India has designated various protected areas, including biosphere reserves, to conserve biodiversity, maintain ecological balance, and provide opportunities for scientific research and environmental education.

viii. **Rural Development**: Programmes for integrated rural development seek to raise living standards while easing the strain on the environment and promoting the sustainable use of land.

ix. **Environmental Laws and Policies**: India has enacted laws and policies to address land-related issues, such as the Forest (Conservation) Act and the Wildlife Protection Act, to regulate activities affecting forests and wildlife.

x. **Agroforestry**: Promoting agroforestry practices that combine agriculture and tree planting helps improve land productivity, enhance biodiversity, and mitigate climate change.

Challenges remain, including deforestation, habitat loss, invasive species, and conflicts between conservation efforts and development needs. Balancing the interests of biodiversity conservation and economic development continues to be complex.

Budget Allocations and Initiatives Driving Environmental Sustainability and Electric Mobility in India

Figure 1 shows the budgetary resources allotted to the "Ministry of Environment, Forest, and Climate Change" (MOEFCC) in 2013–14, 2021–22, and 2022–23. The budget for the National Mission for Green India has increased this fiscal year, up 24.72 percent over the previous fiscal year. The increase from Rs 290 crore to Rs 361.69 crore is shown in Figure 2.

There was an increase from the previous year's allocation of Rs 2869.93 crores to this year's allocation of Rs 3030 crore for the Ministry of Environment, Forests, and Climate Change. The current fiscal year's allocation of Rs 361.69 crores to the National Mission for Green India is an increase of 24.72 percent from the previous fiscal year's allocation of Rs 290 crores.

The Electric Vehicle programme at the Ministry of Heavy Industries has been greatly improved (Figure 3). Money allocated to the programme, also known as FAME-India (Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicle in India), increased dramatically from INR 800 crores in 2016–17 to INR 2,908 crores in 2017–18. Phase II of the" Faster Adoption and Manufacturing of Electric Vehicles" (FAME) Scheme has been approved by the government, and it will begin on April 1, 2019, with a budget of INR 10,000 Crore over five years. Through supporting the rollout of 1,040,000 electric two-wheelers, 500,000 electric three-wheelers, almost 55,000 electric four-wheeler passenger cars (including hybrid solid vehicles), and 7090 electric buses, this project hopes to stimulate market demand. Permits are no longer needed to operate an electric vehicle. The current nationwide total of electric vehicles is 966,363 as of 11 February 2022. To inspire the widespread adoption of electric vehicles, the GST on such vehicles has been reduced from 12% to 5%. Additionally, the GST on EV chargers and EV charging stations has been condensed from 18% to 5%. Before April 2015, there was neither a project nor an effort that was created with EVs in mind.

An additional Rs 75 crores, or 27.65%, has been added to the National Afforestation Programme's budget from the previous year's Rs 235 crores. Consistent with the resources provided in the previous fiscal year, Rs 30 crores have been allocated to the Climate Change Action Plan.

The "Ministry of Environment, Forest, and Climate Change" (MoEFCC) has a total permitted budget of Rs 3030 crores, of which Rs 460 crores has been allocated specifically for pollution control. The Indian forest cover between 2011 and 2021 is graphically represented in Figure 4.

India has lofty goals for the future of renewable energy, and they've given that responsibility to the "Ministry of New and Renewable Energy" (MNRE). A total of Rs 6,900.68 crores have been set aside in the budget to help get these goals accomplished.

Mission of water conservation in the Namami Gange region

The NainamiGang Mission aims to protect, preserve, and restore the Ganga River Basin. The Cabinet approved the mission in 2015 for a five-year duration (2015-2020) with a budget of 20,000 crores of rupees. Therefore, the Environment (Protection) Act 1986 formally recognised the "National Mission for Clean Ganga" (NMCG) on October 7, 2016. The NMCG is the central organisation charged with overseeing and carrying out the NamamiGange Mission. It was done in accordance with the 1986 Environmental Protection Act. Jan Ganga (People-River Connect), Nirmal Ganga (Unpolluted Flow), Aviral Ganga (Continuous Flow), and Gyan Ganga (Research and Knowledge Management) are the four pillars upon which the mission's efforts rest. There would have been 363 projects with a total value of Rs.30,841.53 crores approved by the mission by the end of 2021. The Ganges River is the focus of the Namami Gange Mission, which attempts to clean and restore it. Figure 5 depicts the distribution of sewage infrastructure projects created across the states as part of the Namami Gange Mission since its inception. Uttar Pradesh has the most completed projects, with 43, followed by Bihar with 29 and Uttarakhand with 26.

PARIVESH Portal

To help get environmental permits for India's many construction projects, there's a handy internet hub called the PARIVESH Portal.

This abbreviation stands for Pro-Active and Responsive facilitation by means of an Interactive, Virtuous, and Environmental Single-window Hub, and it's often used to describe such a system. Prime Minister Narendra

Modi launched the "green clearance portal" in 2018. This online resource is used to apply for and track down necessary permits related to protecting the environment. In question is a web-based workflow system for the submission and tracking of proposals made by proponents seeking permissions from Central, State, and district authorities in regards to Environment, Forest, Wildlife, and Coastal Regulation Zone (CRZ). New proposals can be submitted online, existing proposals can be edited and updated, and proposal statuses can be displayed at any point in the proposal's lifecycle. The potential for this online platform to expand and flourish via a Centralised Processing Centre-Green (CPC-Green) was also highlighted in the Union Budget for 2022.

Improvement in forest cover in India

In terms of total forest area, India is the tenth largest country in the world. This entity ranked third globally between 2010 and 2020 in terms of the average net gain in forest area each year. As reported in the "India State of Forest Report 2020-21," the country's total forest cover in 2021 was 7,13,789 square kilometres, an increase of 3.14 percent from 2011. forest expansion or improvement Changes in conservation practises, protection initiatives, afforestation activity promotion, tree planting campaigns, and agroforestry methods may all contribute to the predicted increase in canopy density. From 2010 to 2020, India was among the top ten countries in terms of annual net gain in forest area (Figure 4), as reported by the India State of Forest Report 2021.

India Railways Goes Green

Three-phase regenerative braking, "head on generation" technology to do away with diesel-powered power cars, and renewable energy sources (133.26 MW solar and 103 MW wind installed capacity) are among the major carbon emission reduction efforts that will be implemented by December 2023. Every train stop should have LED lighting, and trees should be planted to act as a carbon sink. Figure 6 displays the expected decrease in CO2 emissions by renewable energy for the Indian Railways.

Indian Railways (IR) has set a goal of being the "net zero carbon emitter" and the world's largest green railway by the year 2030. Mission GOAL: Using only renewable energy, Indian Railways hopes to be carbon neutral by 2030*. Electrifying railways, making locomotives, trains, and fixed installations more energy efficient, certifying installations and stations as environmentally friendly, installing biotoilets in coaches, and using renewable energy sources are all part of the plan to reduce carbon emissions to zero.

Rooftop solar panels (Developer type) are used in Mission Mode on Indian Railways to produce 500 MW of energy. One hundred megawatts (MW) of solar plants, with nine hundred stations, will have been placed on rooftops by July 2020. Construction of solar farms with a combined capacity of 400 MW has begun. A total of 245 MW have been allocated, with completion expected on December 1st, 2022.

Focus on renewable energy.

In January of 2022, the government of India funded Rs 1,500 crores in the Indian Renewable Energy Development Agency (IREDA), which provides funding for RE projects. As a result of this equity investment, 10,200 new employment will be made, and 7,49,000,000 tonnes of carbon dioxide equivalent will be saved.

Green Energy Corridor Phase-II, which will link renewable energy sources like solar and wind farms to the grid in seven different states, was also given the green light by the federal government. National financing of Rs 3,970 crores would be allocated towards the corridor programme, which is expected to cost Rs 12,031 crores. By 2030, the initiative will have helped increase renewable energy capacity by 450 GW. According to the Economic Survey 2021," 'through the measures below, 49.35 GW of solar power capacity will have been installed by December 31, 2021; 36 GW will be under construction; and 19 GW will have been tendered.

Initiated in 2019, the PM-KUSUM Scheme seeks to de-dieselize farms, increase energy and water security, and generate income for farmers using solar power. With an estimated Rs. 34,000 Crores in federal investment, the initiative aims to add 30.8 GW of solar power. There are three sections to it:

• Built 10,000 MW of solar power plants with capacities of up to 2 MW each and connected them to the grid.
• Set up 20 million individual solar-powered irrigation pumps.

The solarization of 15 million agricultural pumps connected to the grid.

To expand access to credit, the Reserve Bank of India established the Priority Sector Lending Guidelines. Approximately 77,000 individual solar pumps, 25.25 MW solar power plants, and 1026 pumps were solarized as of December 31, 2021.

Large-scale, grid-connected solar power projects with a target capacity of 40 gigawatts by March 2024 are the focus of the "Development of Solar Parks and Ultra Mega Solar Power Projects" initiative. Approval has been given to 50 solar parks totaling 33.82 GIGAWATTS in capacity across 14 different states. Solar energy systems producing 9.2 GW have been installed at these parks.

By the end of the year 2022, Roof Top Solar Plan Phase-II wants to have installed 40 gigawatts of solar rooftop systems. The total amount of solar rooftop installations in the country is 5.87 gigawatts.

There is currently an initiative underway to build 12 GIGAWATTS of grid-connected solar PV power projects, with CPSUs included. The financial shortfall is supported by this scheme. Under this programme, the government has greenlighted 8.2 gigawatts in construction.

Solar powered street lights, desk lamps, and portable power packs could be obtained through the Off-Grid Solar PV Applications Programme's Phase-Ill through March 31, 2021. The State Nodal Agency reports that by the end of 2021, 1.45 million solar-powered street lights, 9.14 million solar-powered study lamps, and 2.5 MW of solar-powered power packs would have been installed.

In October 2015, the Indian government unveiled the Offshore Wind Energy Policy to promote the use of offshore wind energy off its coast. Off the coasts of Gujarat and Tamil Nadu, the government of India aims to construct wind farms. Optimal transmission infrastructure and land use, reduced fluctuation in renewable power generation, and improved grid stability are all goals of the wind-solar hybrid programme, which has been formally announced by the Ministry.

India has made great strides in the installation of renewable energy capacity, particularly in the areas of solar and wind power. Figures 7 and 8 display the most recent cumulative achievements in installed capacity for various RES (April 2023) and renewable energy capacity (Wind, Solar, Biopower, and Small Hydro). Generation of Electricity from RES is depicted graphically in Figure 9.

Discussion

India, akin to numerous nations globally, has been actively engaged in endeavours to attain the Sustainable Development Goals (SDGs) established by the United Nations, encompassing objectives pertaining to environmental sustainability. The aforementioned objectives seek to tackle urgent worldwide issues, such as the phenomenon of climate change, the decline in biodiversity, and the deterioration of the environment. This document is a comprehensive analysis of India's advancements towards achieving the Sustainable Development Goals (SDGs) in the realm of environmental sustainability.

India has made notable progress in augmenting its renewable energy capacity, thereby contributing to the achievement of Sustainable Development Goal 7, which focuses on ensuring access to affordable and clean energy. The nation has established lofty objectives for augmenting the proportion of renewable energy within its energy composition. The National Solar Mission, along with several state-level initiatives, has played a crucial role in facilitating the advancement of solar and wind energy. India has made significant strides in augmenting its renewable energy generation, hence diminishing its dependence on fossil fuels.

The provision of clean water and sanitation, as outlined in Sustainable Development Goal 6, has emerged as a significant area of emphasis within India's developmental endeavours. The Swachh Bharat Abhiyan, also known as the Clean India Mission, has achieved significant advancements in enhancing sanitation and hygiene nationwide, leading to heightened availability of clean water and sanitation amenities.

India has undertaken several conservation programmes and initiatives to safeguard its marine and terrestrial ecosystems, in alignment with Sustainable Development Goal 14 (Life Below Water) and Sustainable Development Goal 15 (Life on Land). The Blue Economy Initiative and Project Tiger exemplify endeavours aimed at preserving marine biodiversity and imperilled species. Furthermore, several initiatives have been implemented to mitigate deforestation, enhance afforestation efforts, and foster the adoption of sustainable land use strategies.

India has demonstrated proactive engagement in combatting climate change through the establishment of ambitious objectives aimed at mitigating greenhouse gas emissions. The National Action Plan on Climate Change delineates a range of policies aimed at mitigating the impacts of climate change and fostering sustainable development. India has also demonstrated advancements in augmenting its forest and tree coverage, thereby making a significant contribution to the process of carbon sequestration.

India has actively participated in international partnerships and collaborations in order to tackle global environmental concerns, as outlined in Sustainable Development Goal 17: Partnerships for the Goals. The country in question has formally approved international agreements such as the Paris Agreement and is actively engaged in global dialogues pertaining to climate change and the preservation of biodiversity.

The process of rapid urbanisation in India has given rise to several difficulties pertaining to pollution, congestion, and waste management, hence impacting the goal of achieving sustainable cities and communities as outlined in SDG 11. Nevertheless, the government has implemented efforts such as the Smart Cities Mission in order to foster sustainable urban development, boost transit infrastructure, and augment the general standard of living in urban areas.

India has achieved notable advancements in tackling environmental Sustainable Development Goals (SDGs); yet, there are still persistent difficulties that need to be addressed. The country's environmental sustainability is persistently jeopardised by air pollution, water scarcity, and deforestation. Furthermore, the COVID-19 pandemic has underscored the imperative of ensuring that development is characterised by both sustainability and resilience in the face of unforeseen disruptions.

It is imperative for India to persist in its endeavours to attain environmental sustainability through the implementation of policies and practises that prioritise the preservation of natural resources, the use of clean energy sources, and the management of resources in a sustainable manner. The attainment of these significant objectives will heavily rely on the collaboration among governmental entities, corporations, civil society organisations, and the international community.

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Table 1: Environmental SDGs in India: A Mapping of the Goals concerning the Nodal Ministry, Centrally Sponsored Schemes, Related Interventions, and Concerned Ministries/Departments

S. No.	Goal (Environmental SDGS)	Name of the goal	Nodal Ministry	Centrally Sponsored Schemes (CSS)	Related Interventions	Other concerned Ministries/Departments
1	GOAL 6:	Clean Water and Sanitation	Ministry of Water Resources, River Development & Ganga Rejuvenation (MoWR,RD&GR)	National Rural Drinking water Programme (Core) Nirmal Bharat Abhiyan (Core) Pradhan Mantri Krishi Sinchayee Yojana National River Conservation Programme (NRCP)	Namami Gange - Integrated Ganga Conservation Mission Inter-linking of rivers	Drinking Water & Sanitation
2	GOAL 7:	Affordable and Clean Energy	Power	-------------	Deen Dayal Upadhyaya Gram Jyoti Yojana National Solar Mission –India Energy Policy Power (2015) – Electrificiation of the remaining 20,000 villages including offgrid Solar Power by 2020 Five new Ultra Mega Power Projects,	Power, New & Renewable Energy Coal, Tribal Affairs Petroleum & Natural Gas,New & Renewable Energy
3	GOAL 11:	Sustainable Cities and Communities	Urban Development	Rajiv Awas Yojana Indira Awas Yojana (IAY) Pradhan Mantri Adarsh Gram Yojana (PMAGY) National Programme for Persons with Disabilities Jawaharlal Nehru National Urban Renewal Mission (JNNURM) (ACA)	Smart Cities Mission (Core) Pradhan Mantri Awas Yojana (Housing for All-2022) (Core) Atal Mission for Rejuvenation and Urban Transformatio n (AMRUT) (Core) Heritage City Development and Augmentation Yojana (HRIDAY)	HUPA, RD, Urban Development
4	GOAL 12:	Responsible Consumption and Production	MoEF&CC	---------	National Policy on biofuels National Clean India Fund (NCEF) National Clean Energy Fund Renewable Energy: Renewable Energy Global Investment Promotion Meet and Expo (REINVEST), Feb-2015 Soil Health Card Scheme	MoEF&CC
5	GOAL 13:	Climate Action	MoEF&CC	------	National Action Plan on Climate Change National Mission for a Green India National Solar Mission National Mission for Enhanced Energy Efficiency, National Mission for Sustainable Agriculture National Mission for Sustainable Habitat, National Water Mission, National Mission for Sustaining the Himalayan Ecosystem, National Mission on Strategic Knowledge for Climate Change.	Home Affairs MoEF&CC
6	GOAL 14:	Life Below Water	Earth Sciences	Conservation of Natural Resources and EcoSystems	National Plan for Conservation of Aquatic Ecosystem Sagarmala Project (Blue Revolution)	Earth Sciences, MoEF&CCEarth Sciences, Dept. of Animal Husbandry, Dairying & Fisheries (DADF), Tourism
7	GOAL 15:	Life on Land	MoEF&CC	National Mission for a Green India (Core) Integrated Development of Wild Life Habitats (Core) Project Tiger (Core) National Afforestation Programme	Project Elephant National Environmental Policy 2006 National Agroforestry Policy (2014) National Action Programme to Combat Desertification (2001)	MoEF&CC Tribal Affairs Agriculture & cooperation, Land Resources

Figures

Figure 1 shows an increase in the budget allocation for the Ministry of Environment Forest and Climate Change (MoEF&CC) for three financial years: 2013-14, 2021-22 and 2022-23.

Increase in Allocation of Budget for Ministry of Environment Forest and Climate Change (MoEF&CC)

	FY 2013-14	FY 2021-22	FY 2022-23
Budget(Rs. in Crore)	2630.2	2869.9	3030

Budget (Rs. in Crore)

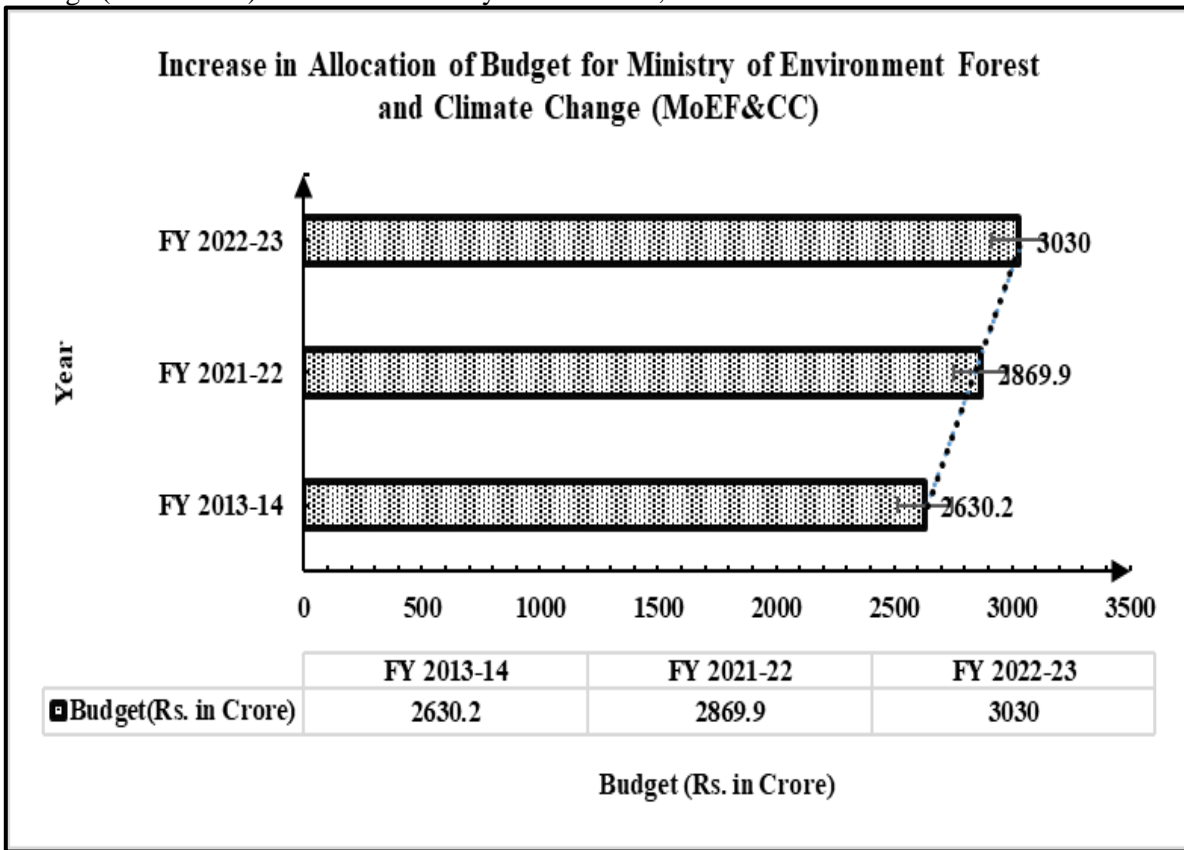**Figure 2** shows the Budget allocation for the National Mission for Green India for three financial years that are 2020-21, 2021-22, and 2022-23.

Budget Allocation for National Mission for Green India

	FY 2020-21	FY 2021-22	FY 2022-23
Budget(Rs. in Crore)	190.9	290	361.69

Budget(Rs. in Crore)
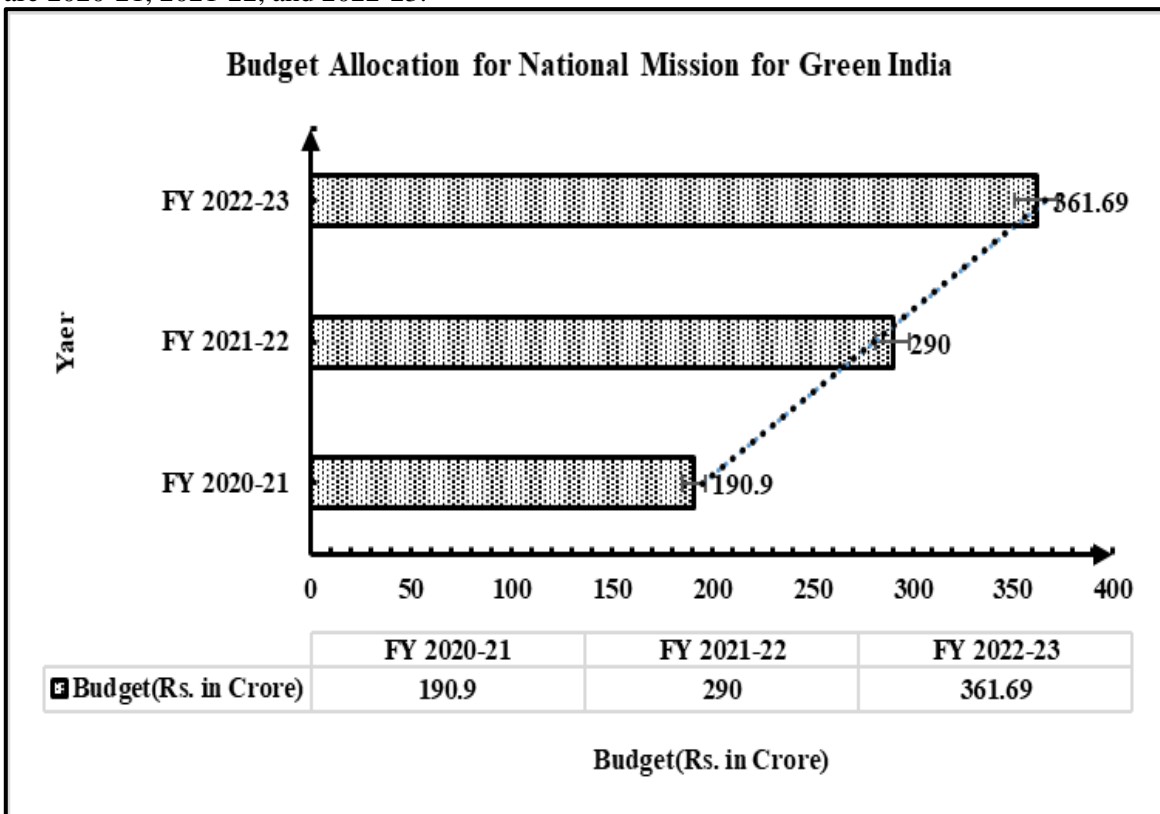
Figure 3: It shows funds allocation to FAME in Phases 1 and 2 since inception for seven financial years: 2016-17; 2017-18; 2018-19; 2019-20, 2020-21; 2021-22; and 2022-23.

Funds Allocated to FAME India in Phase 1 & 2 since inception

	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Budget(Rs. in Crore)	144	165	145	500	318.35	756.66	2908.28

Budget(Rs. in Crore)
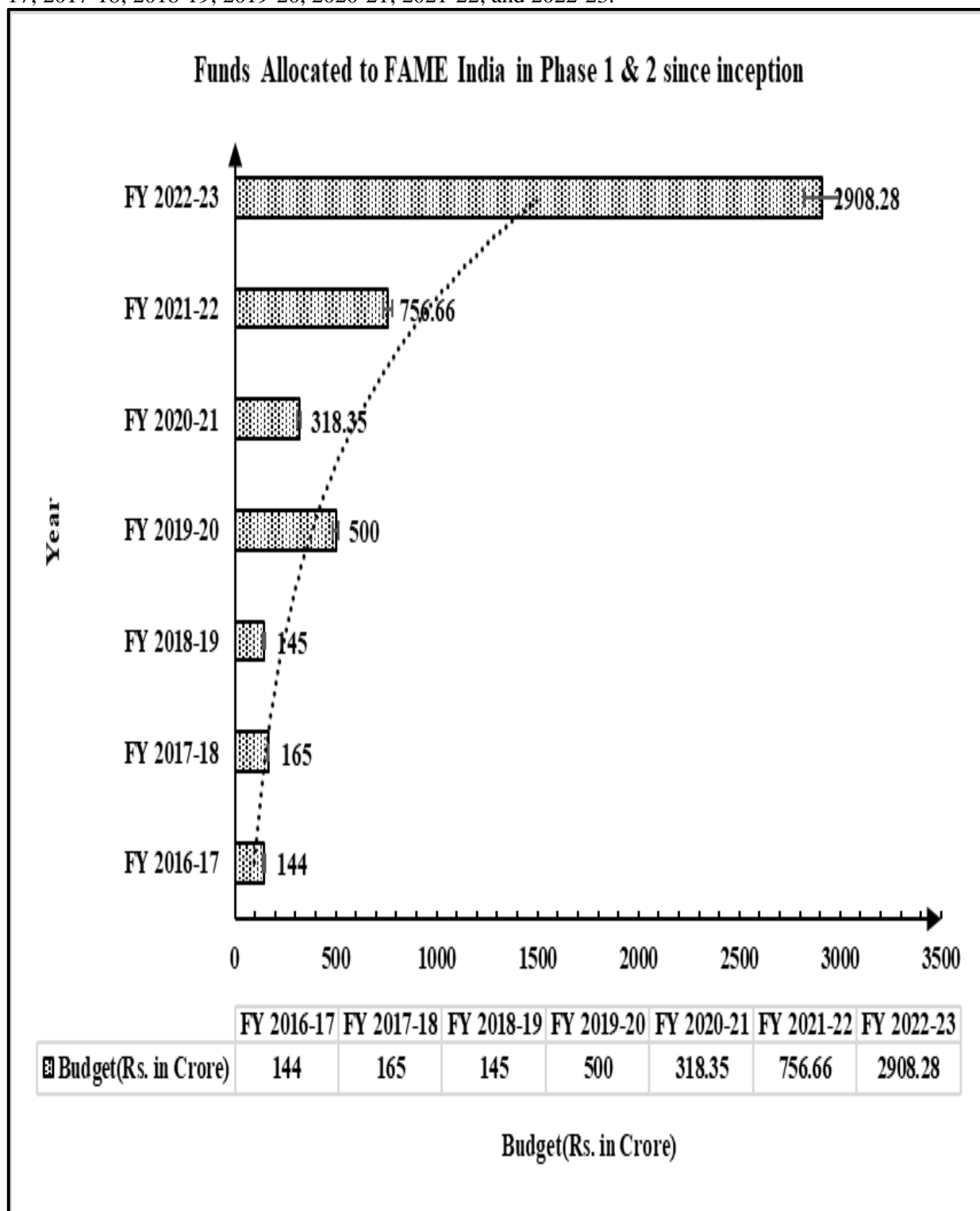
Figure 4: Graphical Representation of Forest Cover in India in 2011 and 2021.

Forest Cover of India (2011 and 2021)

	Very Dense Forest	Moderately Dense Forest	Open Forest	Total Forest Cover
Forest Cover 2021 (sq.km)	99,779	3,06,890	3,07,120	7,13,789
Forest Cover 2011 (sq.km)	83,471	3,20,736	2,87,820	6,92,027

Total Forest Cover

Forest Cover 2021 (sq.km)   Forest Cover 2011 (sq.km)
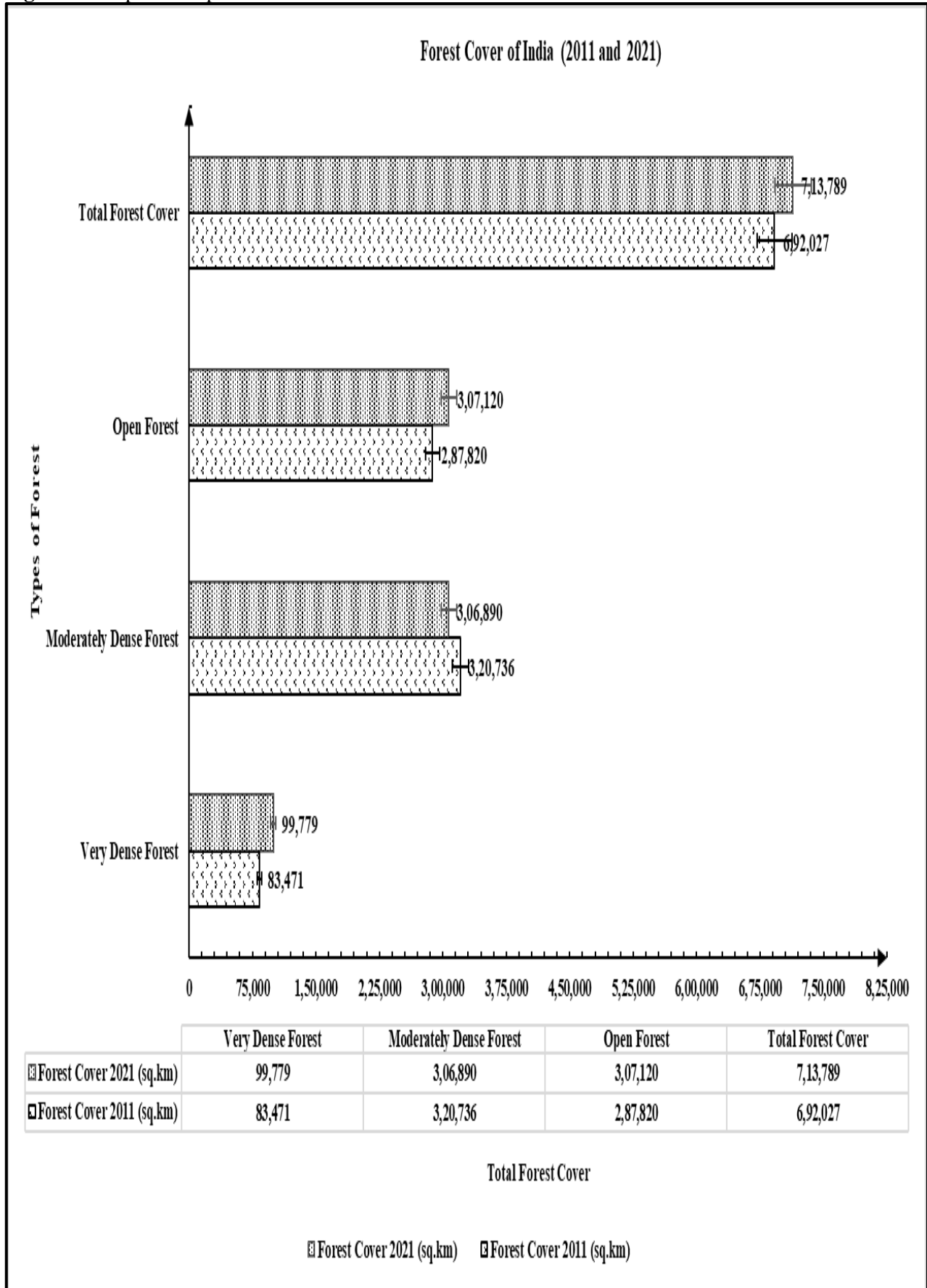
Figure 5: It shows Sewerage Infrastructure Projects Under the Namami Gange Mission as of December 31,2021

Sewerage Infrastructure Projects Under the Namami Gange Mission as of December 31,2021

	Uttar Pradesh	Bihar	Uttarakhand	West Bengal	Delhi	Jharkhand	Himachal Pradesh	Rajasthan	Haryana
▣ Total No.of Sewerage Projects Created	53	30	36	24	10	3	1	1	2
■ No.of Sewerage Projects Created Under Namami Gange Mission	43	29	26	20	10	2	1	1	0
▣ No.of Sewerage Projects Created Before 2014	10	1	10	4	0	1	0	0	2

No.of Sewerage Projects Created

▣ Total No.of Sewerage Projects Created   ■ No.of Sewerage Projects Created Under Namami Gange Mission
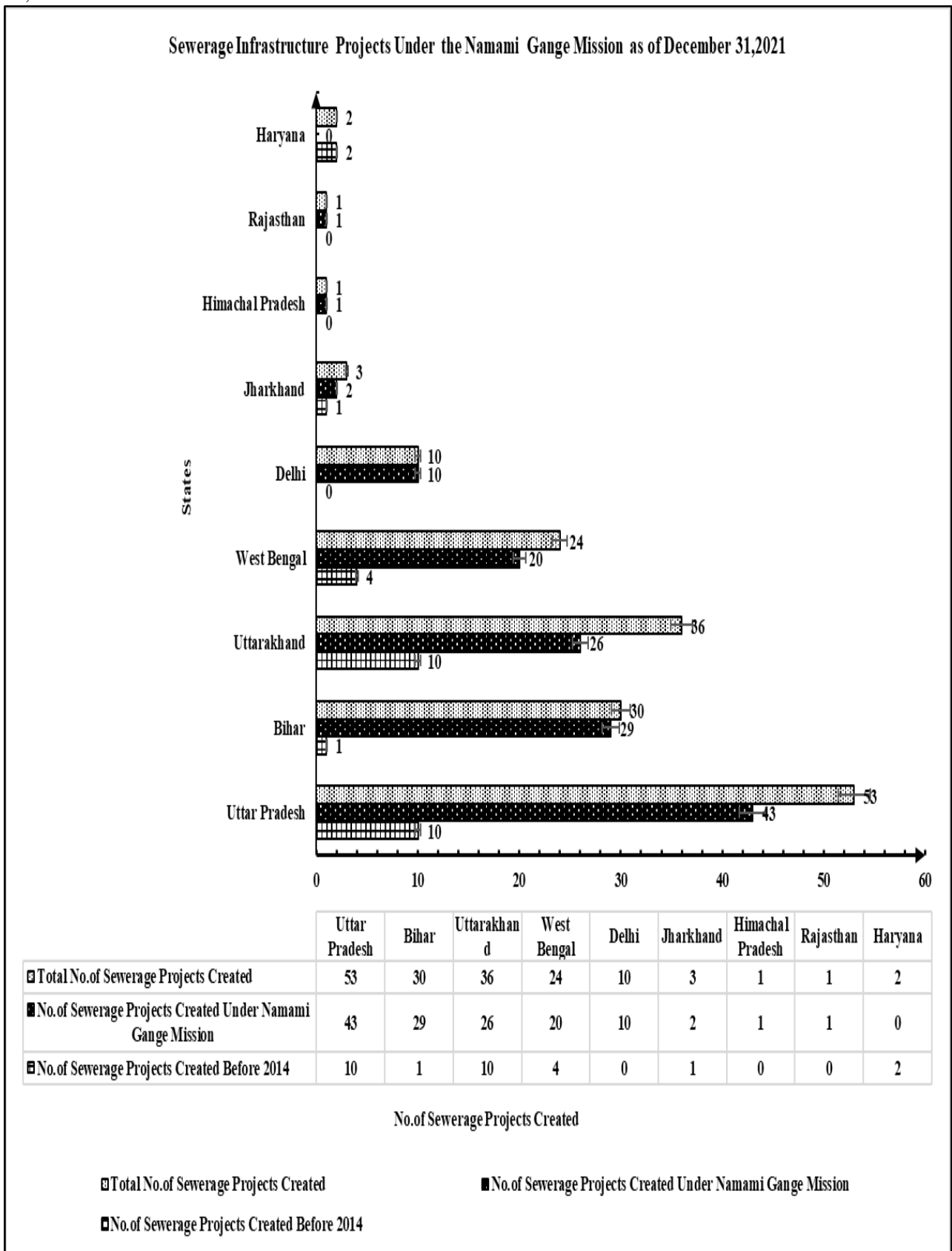
▣ No.of Sewerage Projects Created Before 2014

Figure 6: Graphical representation of the expected CO2 emission reduction by Indian Railways through the use of renewable energy

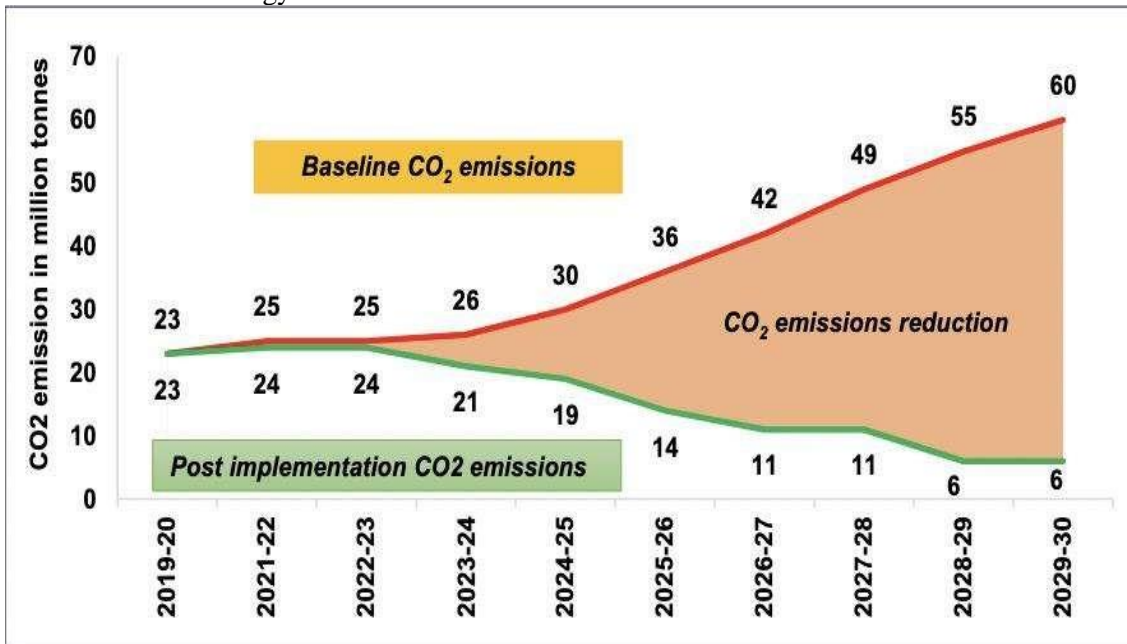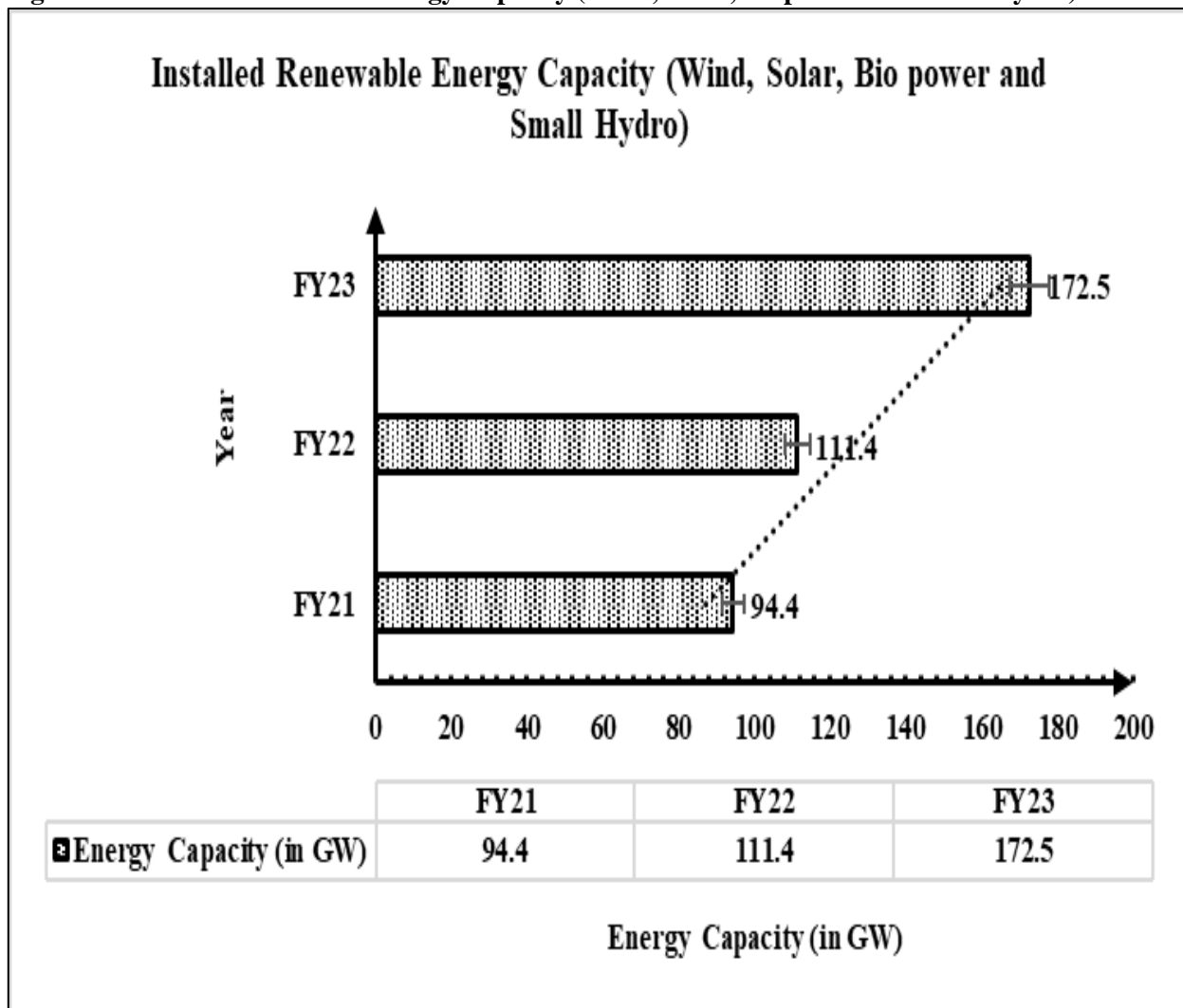**Figure 7: Installed Renewable Energy Capacity (Wind, Solar, Biopower and Small Hydro)**

Installed Renewable Energy Capacity (Wind, Solar, Bio power and Small Hydro)

	FY21	FY22	FY23
Energy Capacity (in GW)	94.4	111.4	172.5

Energy Capacity (in GW)

Figure 8: Installed Capacity for Different RES (April 2023 Cumulative Achievement)
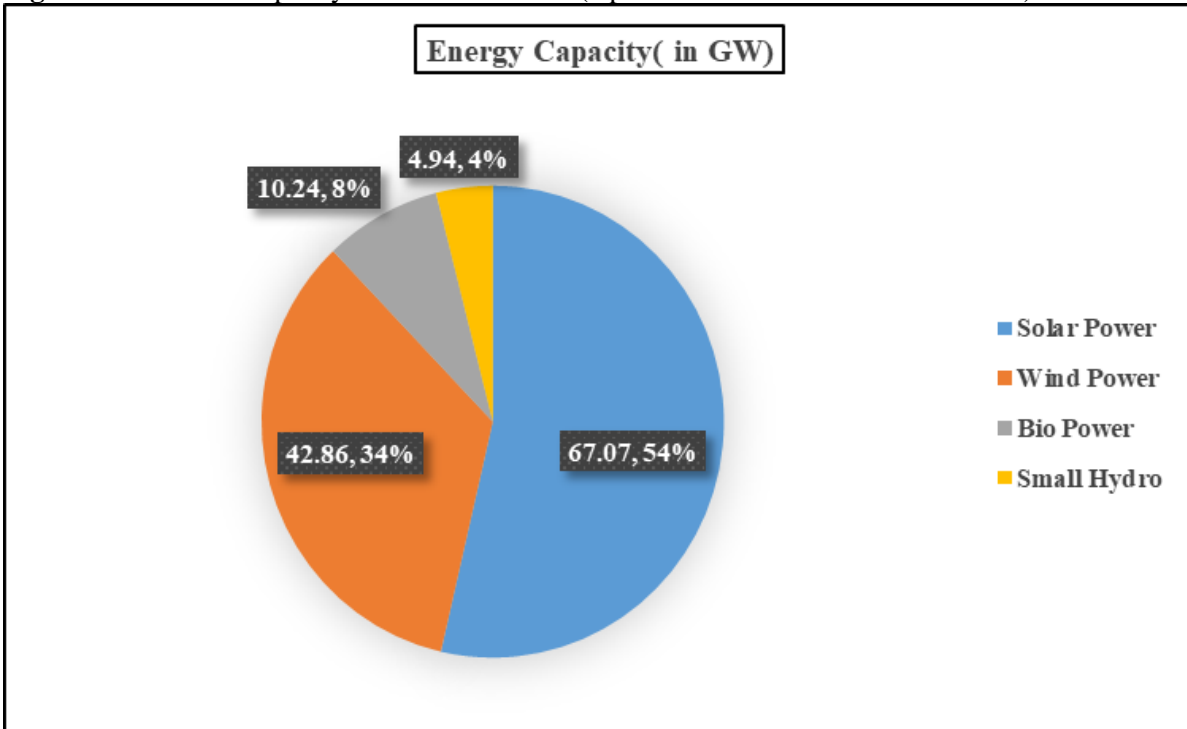

Figure 9: Graphical representation of Electricity Generation from RES

	FY16	FY17	FY18	FY19	FY20	FY21	FY22
Electricity Generation (in Billion Unit)	65.78	81.51	101.84	126.76	138.32	147.25	170.91

Electricity Generation (in Billion Unit)