

CLIMATE ACTION FOR A SUSTAINABLE FUTURE

People, Policy, and SDG 13

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MS. AKANKSHA JAISWAL**



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We hope that readers will be able to understand and raise awareness of climate action through reading this book. The emphasis in this section on the achievements of Sustainable Development Goal 13 is a reaffirmation of the authors' thinking that only by reaching such a target can we secure anything resembling lasting peace and tranquility for future generations.

Thanking You

Dr. Sonia Bhatt & Ms. Akanksha Jaiswal

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Preface

In the 21st century, climate change has grown into one of the most debilitating problems the globe faces. It affects ecosystems, the economy, and people's health and happiness in all countries. Immediate and coordinated effort is required on a global, national, and local scale in response to the intensifying nature of extreme weather events, the acceleration of global warming, and the widening gap between the most vulnerable areas of the environment. Here, the UN Sustainable Development Goals (SDGs) framework and SDG 13 in particular offer a thorough road map for combating climate change via concerted, communal effort. The goal of writing *Climate Action for a Sustainable Future: People, Policy, and SDG 13* was to provide a thorough and organized analysis of climate action within the larger context of sustainable development. I have worked hard to ensure that this volume is accessible to students, researchers, academics, and policymakers by combining conceptual clarity with policy viewpoints in my roles as an editor and an author. This book aims to increase understanding of climate change and environmentally friendly procedures, with a specific focus on India. This book keeps its eyes firmly set on the challenges of climate action and sustainable development faced by everyone involved in education, research, or academic connections. The eight chapters of this book make it possible to see how climate change has come to be a public issue and provide some coping methods.

From Chapter One, "Sustainable Development Goals: Overview and SDG 17," we gain an understanding of sustainable development and quickly review the content of the SDGs. This chapter is devoted to Sustainable Development Goal 17—Partners for the Goals. It stresses the need for international cooperation to achieve long-term sustainability.

"SDG 13: Climate Action—Concept and Introduction" in Chapter 2 explains the theoretical understanding of climate action as well as goals, targets, and indicators associated with that area of SDGs. This chapter summarizes both the scientific and policy understanding of climate change while making clear how important action is to avoid future disaster, predicts all key factors on which mitigation depends, and balances new requirements for transparency with existing efforts that lead the way.

Chapter 3, Global Climate Governance and Action, focuses on international organizations and treaties. It illustrates how negotiation and action on a global scale are essential for resolving environmental problems that exceed national boundaries.

Taking on a national viewpoint, Chapter 4 of this book, Climate Change in India: New Features, Main Impact, and Policy Suggestions, presents the social, economic, and ecological impacts of global warming on Indians and their homeland. The discussion also covers the Indian government's response to climate change, with a focus on its new policies. The country has seen unique national goals and a series of major legislative initiatives going before its parliament in the pursuit of this matter.

I hope that this volume will serve as an asset for scholars, teachers, and politicians who are intrigued by the various aspects of climate action; it is my sincere desire as the book's editor and author. I think that educated comprehension and united effort are vital for achieving sustainable development and building climate resilience.

This work proved to be an academic, personal, and business boon to me. This book aspires to contribute to the growing body of knowledge on climate action by motivating individuals to take steps in building a sustainable and environmentally friendly world for future generations.

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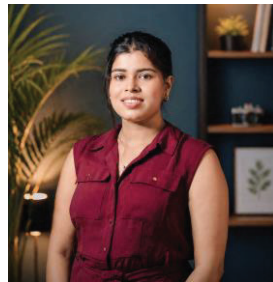
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Chapter 1

Sustainable Development Goals: Overview and SDG 17

1.1 Concept of Sustainable Development

Sustainable development is a way to approach towards holistic development. The word Sustainable development gained momentum from the Brundtland Report, “Our Common Future (1987). This report defined sustainable development as *“development that meets the needs of the present without compromising the ability of future generations to meet their own needs”* (World Commission on Environment and Development, 1987). Any development cannot be possible in isolation. For holistic development, growth should be come from all corners such as economic, social, financial, environment. The main components of sustainable development are economic, social and Environment. Efficient utilisation of the resources for the purpose of long-term growth is economic aspects of the sustainability. Equality in society and equal access of resources to all social class is social aspect of sustainability. Concern for nature, plants and weathers is environmental aspect of sustainability. The main purpose of sustainability is “Inclusiveness”. Upliftment in all parts of the society and benefits of these developments should reach to all social class. Sustainable development is vital for helping society go forward in the right direction by combining development in the economy, environmental conservation,

and communal happiness. It promotes the proper use of land and water to guarantee that economic growth doesn't hurt their surroundings. It helps safeguard ecosystems and keep the environment stable for the next generation by encouraging sustainable activities, including using clean energy, using resources wisely, and cutting down on waste. Sustainable development helps society go forward by raising the quality of life. It also promotes equitable growth, which means giving women and rural communities, as well as other groups who are often left out, chances to take part in social and economic activities. Sustainable development helps generate strong communities and supports long-term growth and stability across societies by encouraging responsible governance.

Addressing the growing obstacles of ecological destruction, diminishing supplies, and social inequality requires a concentrated effort on sustainable development. The consumption of natural resources is occurring at an unsustainable rate due to the accelerating factors of development, urbanization, and population growth. Sustainable development promotes accountable and productive utilization of materials, ensuring their availability for generations to come while maintaining environmental equilibrium. A fundamental objective of sustainable development is to enhance the quality of life for all individuals by reducing poverty levels. Sustainable development plays a crucial role in job creation and long-term economic stability by promoting clean energy initiatives, responsible consumption practices, and sustainable agricultural methods. Addressing global environmental challenges such as climate change, pollution, and biodiversity loss necessitates a concentrated

effort on sustainable development. It encourages governments, companies, and people to engage in practices that benefit the environment. Careful consideration of economic, social, and environmental factors ensures that sustainable development is balanced and equitable. This contributes to the development of a healthier, stronger, and more equitable society.

The increasing environmental, economic, and social challenges encountered by nations globally have led to a heightened focus on sustainable development. The processes of rapid industrialization, urbanization, and excessive use of natural resources have led to significant environmental issues, including climate change, destruction of forests, and a decline in ecosystems. Sustainable development provides a framework for addressing these issues by promoting the wise use of resources and encouraging practices that benefit the environment. A significant factor to consider is the increasing concern among individuals regarding poverty and inequality on a global scale. Numerous regions across the globe continue to face challenges in accessing fundamental necessities such as clean water, healthcare, education, and employment opportunities.

1.2 Emergence of the Sustainable Development Goals in Global Development Agenda

The Sustainable Development Goals (SDGs) are a set of universal targets that everyone can work toward to make the world a more equitable and sustainable place. All UN member states agreed to the 2030 Agenda for Sustainable Development in 2015. This is a global plan to solve the world's most significant social, economic, and

environmental problems. The SDGs are 17 goals that are all linked together. Their target is to end poverty, conserve the planet, and make sure that all people have happiness and security by 2030. These goals were created as an extension of the Millennium Development Goals, also known as the MDGs, because they recognized that a sustainable future needs an integrated approach. These differ from other global initiatives because they apply to all nations, no matter how advanced. They stress collaboration, accountability, and effort. There are 17 SDGs that deal with a lot of significant global problems. Some of these are No Poverty, Zero Hunger; Good Health and Well-being, Quality Education, Gender Equality; Clean Water and Sanitation, Affordable and Clean Energy; Decent Work and Economic Growth; Industry, Innovation and Infrastructure; Reduced Inequalities; Sustainable Cities and Communities; Responsible Consumption and Production; Climate Action; Life Below Water; Life on Land; Peace, Justice and Strong Institutions; and Partnerships for the Goals. Every objective is particular goals as well as tangible metrics to assist both governments and entities in seeing how far they've come over the years. "Leave No One Behind" is one of the most important ideas within the SDGs. This implies that development work should focus on the most at-risk groups, such as women and girls, children, people with disabilities, and those who are poor. The objectives stress equality, human rights, and access to basic services. The objectives motivate nations to fight global warming, protect ecosystems, effectively utilize natural assets, and switch to renewable energy sources. The SDGs encourage strategies that benefit both individuals and the natural world by tying conservation efforts to worldwide economic growth. Governments, corporations, institutions of higher learning,

organizations representing civil society, and everyone must work together to achieve the SDGs. Organizations help by way of creativity and ethical behavior, whereas governments develop regulations and supply assets. By embracing environmentally friendly lifestyles and promoting equitable growth, both groups and individuals also have a crucial role. Many obstacles still exist, yet there has been growth in fields like reducing inequality, the embrace of green power, and having access to education. Worldwide issues like emergencies in public health, inequalities, disagreements, and global warming have impeded progress in several areas. Thus, to achieve the 2030 targets, sustained dedication, funding, and international interaction are required. In the end, SDGs offer a thorough road map for creating a safer and ecologically sustainable globe. By tackling interrelated global problems through cooperative action, the SDGs improved life, guaranteeing that growth advantages every person while protecting the natural assets of the world. The SDGs translate the broad idea of sustainability into specific goals and targets, enabling countries to design policies and measure progress toward sustainable outcomes (United Nations, 2015). Thus, sustainable development serves not only as a guiding philosophy but also as a practical framework for both international and domestic development planning.

The seventeen interconnected SDGs, which were unanimously adopted by every nation in the United Nations in 2015, aim to promote the welfare of humans and the preservation of the environment, along with equitable revenue generation (UN, 2015). They initially emerged as a progression of the Millennium Development Goals

(MDGs), but with an objective that remained more large-scale, worldwide, and broad. The SDGs emphasize the significance of a holistic approach, acknowledging that improvements for a single area—such as cutting down on poverty, addressing climate change, or providing excellent schooling and achievement opportunities—are dependent on improvements in other areas. Because of this interconnected link, nations, organizations, and private companies must match environmentally friendly development agendas with governance, innovation, and regulatory frameworks. This new agenda will guide peace and prosperity both for the present generation and for all generations to come on earth. At their core, the 17 SDGs are present. These call not only for development in all countries but also demand a partnership of all to ensure a better world.

- In last June, at Rio's Earth Summit, over 178 countries signed Agenda 21 to obtain international consensus for a global partnership arrangement intended for the sake of growth that is good for people and the planet in the long run.
- At the September 2000 meeting at UN Headquarters in New York, Heads of State and Government unanimously adopted the Millennium Declaration. On this basis left eight Millennium Development Goals (MDGs) were left with a 2015 deadline to end extreme poverty.
- Since doctors are not experts on financial matters, they may have no time to think about their future. Therefore, an international organization specializing in financial analysis and comprehensive investment

management online first researched the area before proceeding with this book.

- Sustainable Development: A Declaration and Action Plan from Johannesburg, a blueprint for the future, was adopted at a summit in South Africa in 2002. A reaffirmation of the global community's commitments to poverty eradication, environment, and further focus on multilateral partnerships than before, it built upon Agenda 21 (a blueprint for environment-friendly sustainable development) and other agreements by including such commitments as well.
- "The Future We Want" was the outcome document that the member states adopted. They agreed to develop a set of Sustainable Development Goals (SDGs) through a specific process, aiming to improve upon the Millennium Development Goals (MDGs) and to establish the UN High-level Political Forum on Sustainable Development in the future. Also cited in the Rio+20 outcomes were other provisions for implementation of sustainable development.
- In the first month of January in 2015, the General Assembly embarked on a negotiation process for post-2015 development goals. One outcome of this process later led directly (September 2015) to adoption by world leaders at the UN Sustainable Development Summit of 2030 Agenda for Sustainable Development, which had 17 Sustainable Development Goals (SDGs) at its core.

Figure 1.1: United Nations Sustainable Development Goals



Today, the United Nations Department of Economic and Social Affairs' Division for Sustainable Development Goals provides support and skill development through in-depth substantive research. Some first-rate university graduates were born and educated in their home countries, not migrating to large cities. DSDG helps to promote international cooperation linked with water and drainage on wetlands; affordable clean energy; safeguarding the climate; sustainable use of oceans; cities as a concentration of population; transport systems; the application of science and technology; the Global Sustainable Development Report's main research share; partnerships; and small island developing states.

DSDG also has an important role in carrying out evaluations of the comprehensive implementation progress achieved to date by the UN system to realize the 2030 Agenda. DSDG also participates in publicity and advocacy efforts for the SDGs. The SDGs are known to be owned by a wide number of people because all stakeholders should implement this global agenda in a rectangular plan. DSDG

aims to help promote this participation. At the same time, the SDGs have contributed to the global shift in direction of responsible conduct by pushing companies to adopt environmentally friendly company structures and readily available accountability mechanisms that strike a healthy equilibrium that exists between earnings creation and ecologically and socially responsible behavior. Even while progress towards the 2030 Agenda is showing an increasing pace, there are still a number of serious issues that are brought on by geopolitical instability, economic inequality, climate change, and uneven implementation capability across areas. With the objective of quickly accomplishing SDGs, academics emphasize the importance of diverse stakeholders' engagement, information-based accountability, and creative establishments. The SDGs continue to direct government officials, academics, and those involved in creating civilizations that are adaptive, egalitarian, and ecologically stable as a globally acknowledged framework for development that is sustainable.

They point the way for communities, governments, and organizations toward sustainable solutions that balance economic development, social inclusion, and environmental preservation. The SDGs' emphasis on inclusion, as embodied by the "Leave No One Behind" concept, is another crucial aspect. By directing development initiatives toward the most disadvantaged groups, this idea promotes social justice and helps lessen economic disparities. Hunger, environmental degradation, and educational inadequacies are all interrelated problems that need comprehensive approaches that work for everyone, not just a few isolated solutions. As an all-

encompassing global development agenda, the SDGs are helpful. The SDGs are crucial because they bring governments and stakeholders together and strengthen international cooperation. In light of the growing importance of climate change and limited availability of resources, the SDGs promote eco-friendly practices that save biodiversity and ensure the prosperity of future generations. Their impact goes beyond only shaping policies; they also influence educational institutions, business objectives, and community efforts all across the world.

1.3 Overview of the 17 Sustainable Development Goals

Sustainable Development Goal 1:

No Poverty

The longest-running and complicated issue facing the world today is poverty, which impacts social justice, liquidity in the economy, and sustainable development. Nearly seven hundred million individuals globally still live in severe hunger, which has been described as earning a minimum of USD 2.15 per day, irrespective of significant advancements in the past few decades (World Bank, 2022). “In its efforts to end poverty in all of its manifestations by 2030, the General Assembly of the United Nations recognised the varied manifestations of poverty and included Sustainable Development Goal 1 (SDG 1): No Poverty as a foundational goal (United Nations, 2015)”. SDG 1 focuses on resilience to social, economic, and environmental shocks as well as having entry monetary capital, social safety mechanisms, and fundamental amenities, transcending socioeconomic disadvantage.

Figure 1.2: No Poverty



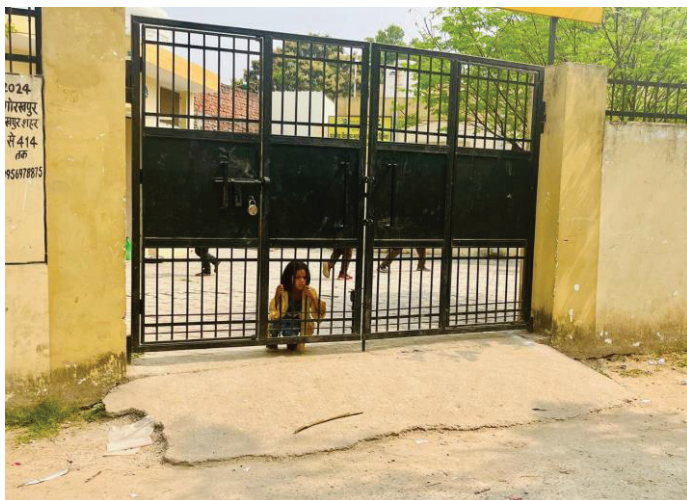
Table 1: Sustainable Development Goal 1: No Poverty

Aspect	Description
Goal Title	SDG 1 - No Poverty
Primary Objective	Cure utter poverty to earn every single individual worldwide by 2030.
Multidimensional Focus	The problem of poverty includes deficiencies in housing, healthcare, education, hygienic conditions, and living standards.
Key Targets	End severe poverty; eradicate all forms of hunger; build strengthening social structures; ensure equitable possession of goods and services; and foster resilience against financial

Aspect	Description
	and environmental disruptions.
Global Challenges	Growing climate-related disasters, economic disparities, and interruptions like COVID-19 are slowing down efforts to reduce extreme poverty.
Policy Priorities	strengthening adaptive capacity by way of strategies, creating employment, safeguards for society, and fair expansion of the economy.
Relevance to Other SDGs	The appropriateness of Additional SDGs, particularly related to SDGs 2 (Zero Hunger), 3 (Good Health), 4 (Quality Education), 8 (Decent Work), and 10 (Reduced Inequalities).

Competent administration, accessible economic development, and institutionalized efficacy are all strongly related to poverty reduction from a management and policy standpoint. By means of the creation of jobs, diversified approaches to business, and focused philanthropic companies, governments, and non-state actors all contribute significantly to the advancement of SDG 1. Global catastrophes, including outbreaks of illness, climate change, and economic upheavals, have caused major delays and unequal progress toward SDG 1 throughout regions, negatively affecting the most vulnerable individuals (UNDP, 2023).

Figure 1.3: Sustainable Development Goal 1: No Poverty



These difficulties emphasize the necessity of policy development based on evidence, cross-sectoral cooperation, and integrated management techniques for long-term poverty reduction. To comprehend how the structures of institutions, business procedures, and strategic actions may successfully bring about prolonged poverty reduction, it is imperative that SDG 1 is examined from the point of view of management. The crucial role of SDG1 is to minimize poverty. It works for all segments. Social protection systems and government policies work for framing developed societies. Efficient policies can improve people's living standards. Sustainable Development Goal 1 is crucial since it stresses getting rid of poverty and raising the standard of living for people all over the world. Poverty finds it challenging for people to obtain basic requirements like food, healthcare, education, and housing, which slows down human development and economic growth. Achieving this goal promotes social equity, economic

stability, and long-term growth by making sure that disadvantaged and marginalized groups have the help and chances they need. It also improves social protection systems and supports inclusive policies that help people and communities become economically independent and better able to handle economic and environmental challenges.

Sustainable Development Goal 2:

Zero Hunger

Deteriorating health outcomes, economic productivity, social stability, food insecurity, and scarcity remain fundamental obstacles to universal sustainable development. The world's produce from agriculture made strides in the past, but in 2022, a staggering 735 million people still suffered from severe food insecurity. This setback was caused by a confluence of factors, including changing climates, economic recessions, and geopolitical conflicts (FAO, IFAD, UNICEF, WFP, & WHO, 2023). As a result, the UN set Sustainable Development Goal 2 (SDG 2): Zero Hunger as a target for 2030. This goal seeks to eradicate and alleviate hunger, enhance nutrition, secure food supplies, and encourage sustainable agriculture (United Nations, 2015). SDG 2 emphasizes the necessity of adaptive and inclusive agri-food systems, emphasizing food supply, access, use, and predictability. To achieve Zero Hunger, organizations that promote development, agronomic enterprises, supply chain players, and administrations must work together to improve effectiveness while also guaranteeing social integration and environmental sustainability.

Optimizing food system stability and lowering susceptibility to disruptions requires significant investments in technological advancement in agriculture, small-scale farmer participation, and sustainable supply chain management. Proper food development is required to eradicate hunger. Hunger is the biggest problem that needs to solve it. If we fail to solve this problem, it could lead to other serious issues for society. Self-help centers and training methods are required to provide training to the farmers. We will discuss various tactics with the farmers to enhance agricultural productivity.

Sustainable Development Goal 2: Zero Hunger

Aspect	Description	Key Sources
Goal Title	SDG 2 – Zero Hunger	(United Nations 2023)
Primary Objective	By 2030, eliminate hunger, improve food security, better nutrition, and improve sustainable agriculture.	(United Nations 2023)
Key Issues Addressed	Insufficient nutrition, food insecurity, malnutrition (stunting, wasting, micronutrient deficiencies), and increasing levels of obesity.	(FAO 2023); Development Initiatives 2023)
Key Targets	2.1 End hunger; 2.2 end malnutrition; 2.3 double agriculture productivity; 2.4 Guarantee sustainable food production; 2.5 maintain diversity in	(United Nations, 2023)

	genetics; 2.a–2.c increase expenditures and correct distortions in trade.	
Global Challenges	consequences such as climate change, fluctuations in prices, supply chain failures, food interruptions caused by conflict, and economic instability.	(Laborde et al., 2021)
Role of Sustainable Agriculture	Improves productivity, strengthens adaptability, reduces the harm to the environment, and supports balanced agricultural systems.	(Rockström et al., 2017)
Vulnerable Groups	the populations in climate-sensitive regions, such as women, children, small-scale farmers, and countryside communities.	(Béné et al., 2021)
Policy Priorities	Climate-resilient crop cultivation, strengthened social protection, sustainable food systems, innovation in agricultural equipment, and nutritionally orientated approaches.	(Development Initiatives 2023); Rockström et al.,2017)

Figure 1.4: Zero Hunger



An increase in the occurrence of climate-related upheavals is making food poverty worse; thus, there has to be empirically supported policy changes and resilient management measures (IPCC, 2022). For this reason, it is essential to examine SDG 2 from a managerial perspective in order to comprehend the ways in which administrative capacities, structures of government, and collaborations across sectors may aid in achieving equitable food availability and reducing poverty in the long run.

Sustainable Development Goal 3 ***Good Health and Well-Being***

Human productivity, economic growth, and social stability are all directly affected by the well-being and wellness of individuals, making these factors crucial to targeting sustainable development. Inadequate access to excellent healthcare services, especially in low- and middle-income countries, as well as preventable illnesses and health inequities, remain major obstacles despite substantial improvements in global health performance in recent centuries (WHO, 2023). The United Nations (UN) established Goal 3 of the Global Sustainable Development Agenda: Optimal Health and Happiness to address these concerns. The plan's deadline is 2030, and its objective is to guarantee that all people, regardless of age, enjoy excellent health (United Nations, 2015). The scope of SDG 3 extends beyond the mere prevention of sickness. This includes preparedness for health emergencies, mental health services, universal health care, and the health of mothers and children. Effective medical systems, competent leadership, competent resources, and dependable organizations are necessary for management to accomplish SDG 3. Improving services, expanding access to public health, and fostering innovative approaches to managing medical conditions are all critical responsibilities of governments, healthcare organizations, private sector players, and independent entities. Worldwide health emergencies, such as the COVID-19 pandemic, have exacerbated the situation by revealing the inadequacy of healthcare infrastructure and widening existing imbalances; consequently, progress with regard to SDG 3 cannot be regarded as steady (OECD, 2021), particularly in

areas such as access to essential health services and equitable distribution of vaccines.

Figure 1.5: Good Health and Well-Being



Adaptable and resilient health management solutions are also required in light of emerging issues such as the increasing prevalence of non-contagious diseases and the medical dangers posed by changing temperatures. Examining SDG 3 from a managerial viewpoint may provide light on how medical organizations can be strengthened via standardized processes, improved governance, and cross-industry cooperation, all of which contribute to long-term improvements in health.

Sustainable Development Goal 3: *Good Health and Well-Being*

Aspect	Description	Key Sources
Goal Title	SDG 3 – Good Health and Well-Being	(United Nations, 2023)
Primary Objective	guarantees healthy lives and encourages overall wellness for all at all stages of development by 2030.	(United Nations, 2023)
Key Issues Addressed	Infectious conditions, non-communicable diseases (NCDs), psychological well-being, the availability of pharmaceuticals, mortality among women and children, and universal health coverage (UHC).	(World Health Organisation, 2022)
Key Targets	3.1 Reduce the mortality of mothers; 3.2 end unnecessary deaths of children and newborns; 3.3 prevent diseases that are communicable; 3.4 reduce NCD mortality; 3.5 strengthen mental well-being and substance abuse therapies; 3.6 decrease road accident rates; 3.7 access to sexual and reproductive health; 3.8 obtain UHC; 3.9 mitigate air pollution-associated deaths.	(United Nations, 2023)
Global Challenges	Antimicrobial resistance (AMR), worldwide epidemics, health disparities, inadequate systems for health care, along health risks brought about by climate change.	(Karamagi et al., 2021)
Significance of UHC	Make sure financial protection, the availability of necessary amenities, and the diminution of catastrophic health care expenses.	(Hogan et al., 2018)

Aspect	Description	Key Sources
Policy Priorities	developing stronger primary medical care, extending UHC, improving health care worker capacity, and investing in electronic health advancements.	(Kruk et al., 2018)

Sustainable Development Goal 4

Quality Education

By 2030, all people should have permission to excellent instruction that is both affordable and accessible. This is Sustainable Development Goal 4 (SDG 4). Many people believe that higher education is essential to sustainable development because it helps individuals become more employable, reduces disparities in wealth and opportunity, and strengthens social bonds. “Goal 4 of the Sustainable Development Agenda emphasizes the significance of equitable, high-quality, and contextualized educational environments at all levels by concentrating on academic achievement in addition to accessibility to educational opportunities (United Nations, 2015)”. Education (both elementary and secondary), infant and toddler growth, and equitable opportunities for quality, cost-effective technological, vocational, and college-level education are key to Sustainable Development Goal 4. For marginalized communities, including young people, kids with medical conditions, and those living in areas ravaged by violence, it highlights the critical need to end gender, social, and financial disparities in educational opportunities. Empowering people to take an active part in contemporary financial markets and society requires an improvement in reading, mathematical understanding, and computational skills (UNESCO, 2022). Proper administration, sufficient

funding, qualified educators, and strong educational structures are necessary for the achievement of SDG 4 from a systems and management viewpoint. Adapting teacher preparation, course content, and assessment strategies to meet the needs of a changing market for employment is essential for providing students with excellent instruction. Strategic oversight of educational enterprises and collaborations with commercial and non-governmental entities may enhance creative thinking, productivity, and inclusivity in providing education. Globally, educational achievements continue to be a big problem, even while pupil enrolment has been on the rise.

Figure 1.6: Quality Education



A huge number of students from all over the world are struggling to meet basic literacy and mathematical competency requirements; this issue has become known as an international educational crisis. The worldwide dissemination of the COVID-19 epidemic and other recent

calamities revealed systemic flaws in our educational institutions and exacerbated existing achievement disparities, particularly around marginalized communities (World Bank, 2018).

SDG 4 urges a paradigm shift with regard to education toward more fairness, effectiveness, and continuous growth. It may require concerted action from governing bodies, schools, nonprofits, and businesses to reduce chronic inequality and boost student achievement. In order to achieve SDG 4, it is crucial that we reinforce the educational system via strategies that are founded on knowledge and good procedures for management.

Sustainable Development Goal 4: *Quality Education*

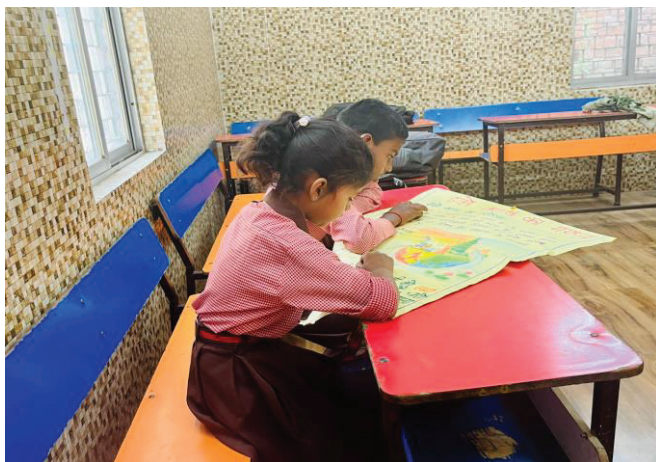
Aspect	Description	Key Sources
Goal Title	SDG 4 – Quality Education	(United Nations, 2023)
Primary Objective	Promote high-quality education is accessible to all and facilitate continuous educational possibilities to all by 2030.	(United Nations, 2023)
Key Issues Addressed	The knowledge gap, inequalities between men and women, substandard level of literacy, poor possibilities for education, unequal treatment in Educational possibilities, and inadequate instruction for educators	(World Bank, 2022)
Key Targets	Full schooling in primary and secondary school at no cost; Access to early childhood development; Equal access to technical, vocational	(United Nations, 2023)

Aspect	Description	Key Sources
	and tertiary education; Skills for employment; Eliminate gender disparities; Promote literacy and numeracy; Education for sustainable development; a improve educational facilities; b scholarships; c teacher training.	
Global Challenges	COVID-19 learning losses, inadequate funding, teacher shortages, fragile education systems, and technological inequalities.	(Azevedo et al., 2021)
Importance of Quality Education	Enhances human capital, promotes economic growth, supports gender equality, and drives social development.	(Psacharopoulos & Patrinos, 2018)
Vulnerable Groups	Girls, rural populations, children with disabilities, conflict-affected learners, and low-income households.	(UNESCO, 2021)
Policy Priorities	Digital learning access, inclusive schooling, teacher capacity development, early childhood education, and equitable financing mechanisms.	(Schleicher, 2018)

Sustainable Development Goal 5: *Gender Equality*

Gender equality wants to make sure that all women and girls have the same opportunities by 2030. Equal treatment for women and men is an inherent right of humanity, but it additionally constitutes an important factor in the long-term development of the economy, the advancement of society, and the efficient operation of institutions. Persistence of differences between sexes in schooling, job prospects, medical care, and civic engagement remains an obstacle to the future possibilities of women and girls around the globe, especially throughout countries that are developing and emerging (United Nations, 2015)". SDG 5 tackles many aspects concerning gender unequal treatment, such as ending harassing behavior and prejudice against women, recognizing unpaid assistance and household duties, giving women a comparable right to economic goods and services, and attempting to ensure that women can fully participate in management and decision-making. These goals show how structural and cultural barriers limit the possibilities for women and keep unequal outcomes going from a single generation to the next (UN Women, 2023). To reach such objectives, we need to change not simply the law but also society and organizations. From a management and governance perspective, equal treatment of men and women is crucial for how well a corporation does, how innovative it is, and how democratic its administrators are. Studies show that organizations with a mix of men and women make better decisions and have better commercial and community results (World Economic Forum, 2023).

Figure 1.7: Gender Equality



Equal opportunity legislation, tolerant behaviors at work and fair systems for managing human resources are all important ways that public and private sector organizations can help achieve SDG 5. Even though countries around the world have promised to work toward SDG 5, achievements is still uneven and slowly occurring. Women still face pay gaps, a lack of involvement in management positions, and an unfair amount of unpaid care work. External influences like financial downturns, infectious diseases, and environmental degradation have made the current disparities even worse. This shows how important it is to have gender-inclusive approaches that can modify and be strong (UNDP, 2023). SDG 5 calls for long-term and coordinated work at legislative, professional, and communal levels. To make progress toward achieving gender parity, governments, corporations, and civil society must work together to break down institutional obstacles, change cultural expectations, and strengthen women. To make sure that advancement with regard to equality

between men and women and the more general sustainable development initiative lasts, it is important to improve the capabilities of institutions as well as reporting systems.

Sustainable Development Goal 5: Gender Equality

Aspect	Description	Key Sources
Goal Title	SDG 5 – Gender Equality	(United Nations, 2023)
Primary Objective	By 2030, strengthen all women and girls and accomplish equal status between men and women.	(United Nations, 2023)
Key Issues Addressed	Sexual orientation prejudice, violence against women, detrimental behaviours, incomplete labour participation, unequal access to financial assets, and administration gaps.	(UN Women, 2022)
Key Targets	5.1 end unfair treatment; 5.2 minimise violence; 5.3 end harmful behaviours (child marriage, FGM); 5.4 acknowledge free childcare work; 5.5 ensure engagement with leadership; 5.6 ensure sexual and reproductive rights; 5.a equal the availability of resources; 5.b enhance information and communications technology utilisation; 5.c consolidate gender equality regulations.	(United Nations, 2023)
Global Challenges	insufficient protections from the law, standards of femininity becoming increasingly prohibitive, assaults committed against women, a persistent disparity in pay gap, and constrained access to the world of internet.	(Demirgüç-Kunt et al., 2022)
Importance	promotes human growth and	(Duflo,

Aspect	Description	Key Sources
of Gender Equality	development, accelerates growth in the economy, consolidates democratic processes, and alleviates the effects of poverty and inequality.	(2012)
Vulnerable Groups	Women in remote regions, women with impairments, migrant women, indigenous women, and girls encounter detrimental cultural behaviours.	(UNICEF, 2021)
Policy Priorities	legislative improvements, gender-appropriate fiscal management, digital inclusion, strengthened sexual and reproductive healthcare services, and empowering the role of women in government.	(Heise et al., 2019)

Sustainable Development Goal 6: *Clean Water and Sanitation*

“Goal 6 of the Sustainable Development Goals (SDG 6) is to make sure that everyone has access to safe drinking water and sanitation and they are managed in a way that lasts.” For the well-being of humanity, dignity for humans, and prosperity in the economy, it is very important to have access to clean water for consumption and good sanitary conditions. Even though things are getting better around the world, billions of citizens continue to lack adequate sanitation and safe drinking water facilities, especially in countries with low to middle incomes. This shows that there are still big gaps in the availability of clean water and sanitation facilities.

Figure 1.8: Clean Water and Sanitation



SDG 6 has a lot of goals, such as making sure everyone has a reliable supply of nutritious and cheap water for consumption, good cleanliness and hygiene, improvements in water purity, cleaning up sewage, and efficient use of water. It also stresses the need for the governance of supplies of water and for the safeguarding of biological communities that are connected with the availability of water. These goals acknowledge that issues related to water are related to warming temperatures, growing urban populations, agriculture, and economic development. To reach SDG 6, government entities, private utilities, and community organizations need to work together and have strong institutional capacity, effective policy implementation, and coordinated action.

To improve providing services and ensure that it lasts for many years, it is important to have effective water management, devote resources to infrastructure improvements, and use advanced technologies.

Autonomous administration techniques and collaboration between the public and private sectors can make systems for drinking and sanitation even more accountable and efficient. But advances regarding SDG 6 are still not the same in all areas and for all groups of people. Accelerated urban growth, polluted water, climate change that makes water scarce, and insufficient funding continue to hinder universal access. Insufficient water supplies and inadequate hygiene have a bigger impact on those who are disadvantaged, such as rural communities and informal urban settlements, which make healthcare and economic inequalities worse. SDG 6 calls for a unified and open technique for managing sanitation and water resources, which strikes equilibrium between social fairness, environmental sustainability, and economic efficiency. To reach SDG 6 and help with other environmentally friendly development goals, it is important to enhance legislative institutions, encourage partnership among stakeholders, and put money into water-related facilities that can withstand change.

Sustainable Development Goal 6: *Clean Water and Sanitation*

Component	Description	Sources
Goal Definition	Always make sure accessibility and environmentally friendly handling of water and sanitation for all.	(UN-WWDR, 2023).
Key Targets	• Achieve equal and comprehensive access to adequate drinking water • Achieve appropriate personal hygiene and sanitation for all • Improve water quality through decreasing pollution • Boost your effectiveness of water use in all sectors • Put comprehensive water resources management into practice • safeguarding and re-establishing water-related ecosystems	(United Nations, 2022).
Major Challenges	• Water scarceness exacerbated by climate change • Poor infrastructure for sanitation • Groundwater overexploitation • Manufacturing-related	(Boretti & Rosa, 2019). (Kaza et al., 2018).

Component	Description	Sources
	pollution of the water • Insufficient financing for drinking water infrastructure	
Global Progress	• 2.2 billion individuals worldwide continue to absence appropriately maintained drinking water • 3.5 billion lack properly administered sanitation	(WHO & UNICEF, 2021).
Policy Recommendations	• Improve integrated water resources management (IWRM) • Invest more funds into drinking water infrastructure • Make water distribution networks that are capable of accommodating climate change • Treat greater quantities of wastewater • Get residents to participate and make improvements to how communities manage their water	(Daher et al., 2021).

Sustainable Development Goal 7 *Affordable and Clean Energy*

The United Nations General Assembly set up 17 Sustainable Development Goals in 2015. Its goal is to "make sure that everyone has the availability of reliable, economical, environmentally friendly, and current energy." Accessing energy is a key part of people's health, economic growth, and reducing poverty. By 2030, the goal includes five specific actions that need to be completed. Six indicators demonstrate the extent to which the goals are being met. Three of the five goals are the result goals: people can have liberty to utilize current energy, renewable energy used should be double, and the amount of energy saved should be double. These goals include making sure everyone has access to cheap as well as trustworthy energy and expanding the amount of renewable energy in the energy mix around the globe. They also want to make energy use more efficient, work together with other countries, put money into clean energy infrastructure, and make sure everyone has equitable access to energy.

The main goals of SDG 7 are to make contemporary electrical services available to everyone, to substantially raise the amount of energy from renewable sources in the overall mix of energy sources, and to make energy use more efficient. These goals recognize that we need to find a balance between making energy more accessible and lowering the emissions of greenhouse gases and damage to our surroundings. Switching to clean renewable energy sources is also very important for climate action, keeping businesses competitive, and making the economy strong for a long time. To reach SDG 7, energy administration, strategic expenditure, and innovation across energy value

chains must all work together. Governments, energy providers, and banks are crucial for making environmentally friendly energy processes more widely used, improving the infrastructure for energy production, and getting private money to work. Two instances that illustrate commercial frameworks that have worked in places where there aren't many chances to use alternative sources of energy include distributed energy generation systems, such as solar panels installed on residential buildings, and partnerships between both the public and private industries, like government incentives for renewable energy projects. A lot of progress has been made in using electrical power from sources that are environmentally friendly, although there continue to be difficulties with expenses, grid utilization, and unequal access, particularly throughout low-income neighborhoods and rural regions.

Figure 1.9: Affordable and Clean Energy



Worldwide disruptions to energy and increasing petroleum prices are leaving our electricity systems even more fragile. This shows that we need to make our systems more resilient and use a wider range of energy sources. To fill those gaps, all businesses need to work collectively and plan ahead. SDG 7 basically says that we need to move towards renewable energy sources that don't add to the impact of climate change and are available to every individual. To meet SDG 7 and promote growth over the long run in communities and economic development, it is necessary that government systems work better, support new technologies, and guarantee that every person has access to green energy.

Sustainable Development Goal 7: *Affordable and Clean Energy*

Component	Description	Sources
Goal Definition	To make sure that everyone has a way of getting energy that's affordable, trustworthy, and sustainable as well.	(Sovacool et al., 2020).
Key Targets	boosting the breakdown of renewable energy in the worldwide mix of energy sources • Improving the efficiency of energy usage throughout the globe • Strengthening international partnerships and making investments in environmentally friendly methodologies • Expanding possibilities for	(IEA, 2022).

Component	Description	Sources
	clean sources of energy in countries that are developing	
Major Challenges	• A significant reliance on petroleum and natural gas • Rising worldwide appetite for energy • inadequate possession of electricity in Africa north of the Sahara and certain regions of South Asia • Investment difficulties for clean energy projects • Innovation & gaping infrastructure deficiencies	(Newell & Simms, 2020).
Global Progress	• Huge developments in solar and wind energy • The decreasing cost of alternative energy sources • Certain geographic areas show considerable power generation developments • However, 675 million people continue to have no access to electric power	(Jäger-Waldau, 2020).
Policy Recommendations	Encourage greater advancements in renewable and unconventional energy systems • Strengthen the laws and regulations for clean energy by encouraging incentives for investment (subsidies, green bonds, carbon pricing) • Widen the adoption of rural electricity solutions	(Kuzemko et al., 2020).

Component	Description	Sources
	• Advocate for the development of energy technology and related research initiatives.	

Sustainable Development Goal 8: *Decent Work and Economic Growth*

“The 2030 Agenda for Sustainable Development of the UN has an aim named Goal 8 of Sustainable Development Goals (SDG 8), or “Decent Work and Economic Growth.” This goal is one of the most important parts of the globe's development scheme”. This goal stresses the need for long-term, inclusive, and sustainable economic growth, as well as uninterrupted and decent wages for everyone. It demonstrates that individuals comprehend the necessity of aligning economic growth with societal participation, equitable employment conditions, and opportunities to enhance people's self-worth and happiness. SDG 8 basically says that economic expansion isn't enough if it doesn't lead to bettering their standard of living, fair income distribution, and safe workplaces. Numerous economies grow while not creating enough jobs, which leads to unemployment, underemployment, and the development of unofficial labor markets. These kinds of deficiencies cause structural disparities, decrease output, and make long-term sustainable development harder. SDG 8 calls for a model of growth that is strong, open to everyone, beneficial for the surroundings, and creates many jobs. The idea of "acceptable employment" is an important part of SDG 8. It includes fair pay, job security, safe workplaces, social protection, and the end of exploitative labor practices like forced labor, child labor, and human trafficking.

Ensure that quality work is especially important in developing economies where most people continue to work informally and rights related to labor are not always implemented. SDG 8 aims to create lucrative careers that empower people and encourage prosperity through inventiveness by encouraging labor-intensive industries, entrepreneurship, and small and medium-sized businesses (SMEs). Employment for young people is another big part of SDG 8. Children and adolescents all over the world are having trouble finding good jobs because their skills are inadequate for the available positions, technology is changing too quickly, and they don't get enough vocational education and training. This goal advocates people investing in their education, skill development, and digital skills so that the population at large is ready for changes in job opportunities brought on by automation, artificial intelligence, and globalization. To ensure that economic growth leads to real possibilities for employment for young people, it is important to connect educational institutions with the needs of businesses.

Figure 1.10: Decent Work and Economic Growth



Under SDG 8, sustainable revenue growth also means using resources more efficiently and separating economic development from damage to the environment. Traditional growth models have often depended on taking too many resources and using carbon-heavy methods of manufacturing, which put the balance of the ecosystem and long-term sustainability at risk. SDG 8 promotes environmentally friendly ways of making things, a business model that is circular, as well as accountable ways of using goods that let economies grow while protecting the planet's resources. In this situation, it is important to promote eco-innovation, green jobs, and sustainable tourism to build a strong economy while maintaining a balanced one. The purpose also makes it clear how important it is to include everyone in the economy, make it easier for people to obtain credit, and make policies that support innovation and entrepreneurship feasible. Countries can help women and people living in remote regions, who are often left out

from commercial activities, by making their own insurance firms, banking institutions, and digital financial services stronger and making them more accessible. These kinds of open banking structures not only help businesses grow, but they also lower inequality and impoverishment, which supports the bigger goals of sustainable development. Also, SDG 8 acknowledges that globalization and international trade can change the way people work and live. To make sure that economic integration helps individuals as well as communities instead of continuing to abuse them or pay them less than they deserve, fair trade practices, ethical supply chains, and responsible business conduct are all necessary. Making sure that labor requirements are followed and improving international collaboration can make economies around the world more stable and fairer.

Decent Work and Economic Growth

Component	Description	Sources
Goal Definition	Promotion of full and efficient employment, decent employment for all, and ongoing, inclusive, and sustainable expansion of the economy.	(ILO, 2020).
Key Targets	• Maintain economic development per capita • Encourage labor-intensive and highly lucrative sectors • Encourage independent entrepreneurs and small businesses • Promote efficient deployment of available assets • Ensure that everyone has	(Blanchard & Rodrik, 2021).

Component	Description	Sources
	adequate, productive jobs and decent-paying employment • Lower the rate of unemployment among young people • Put an end to exploitation of kids and labor by force • Preserve safe conditions for employees and rights in the workplace	
Major Challenges	• Growing rates of unemployed people in economies that are developing. The predominance of the illicit business sector; the gender imbalance in employment; the persistence of exploitation of children and compulsion to labour; the growing automation imminent threat to less skilled jobs; and small and medium-sized enterprises' restricted opportunities for financing.	(Chen, 2016).
Global Progress	• Traditional employment has grown moderately; in certain areas, female labour force participation has gone up. • The aftermath of the pandemic financial turnaround is uneven; the internet-based economy produces new opportunities for employment.	(ILO, 2021).
Policy Recommendations	Make investments in knowledge of technology and vocational education; bolster security	(Razzak, 2021).

Component	Description	Sources
	measures and labour guidelines; provide financial assistance to micro enterprises; advance gender-responsive labour laws; and encourage industries with innovative and long-term development.	

Sustainable Development Goal 9:

Industry, Innovation, and Infrastructure

Also, SDG 8 acknowledges that globalization and international trade can change the working pattern and the economy. Financial integration helps individuals as well as communities instead of continuing to abuse them or pay them less than they deserve, fair trade practices, ethical supply chains, and responsible business conduct are all necessary. Making sure that labor requirements are followed and improving international collaboration can make economies around the world more stable and fairer. The construction of infrastructure is a key part of making economic growth, social connections, and cooperation between regions possible. Systems of transportation that work well, power sources that are trustworthy, electronic communication, and municipal infrastructure that lasts all help trade, reduce fees for transactions, and make it easier to get to markets and schools as well as medical care. But in many developing economies, gaps in infrastructure are still provided, making it harder for businesses to grow, limiting worker efficiency, and making geographical disparities worse. Inclusive and sustainable industrialization is a different important part of SDG 9. Previously, growth in the industry has led to more jobs, better technology, and

changes in the way financial systems are structured. But traditional industrial models often used processes that used a lot of resources, which hurt the environment as well as made cultural disparities worse.

SDG 9 calls for a move toward cleaner production technologies, energy-efficient manufacturing, and manufacturing procedures that are good for the natural world and the economy. Encouraging small businesses, local manufacturing, and value-added production also helps developing countries fit better into the worldwide value chains while also creating jobs and encouraging new ideas. Creative thinking is what connects infrastructure and industry and helps communities evolve to new technologies and changes in the world's economic landscape.

Figure1.11: Industry, Innovation and Infrastructure



Making an investment in research and development (R&D), technological advancement that includes machine learning (ML) and knowledge-based sectors are crucial for

improving business productivity and competitive edge. Goal 9 is about improving technology, upgrading research and encouraging collaboration among educational institutions, businesses and government departments. These kinds of creative-thinking ecological systems not only speed up the technological advancement of industry, but they also help find approaches to important world issues like climate change, energy transitions, and sustainable urbanization. The purpose also points out how important it is for everyone to have equal access to information and communication technologies (ICTs). The infrastructure of digital technology has become a key part of modern economies, affecting areas like finance, education, health care, and government. SDG 9 includes things like making the internet cheaper, teaching more people how to use technology, and putting money into smart infrastructure. By closing the gap between economies, technology levels, and countries, they can create new opportunities for entrepreneurship, e-commerce, and the spread of knowledge, all of which will lead to advancement driven by technological advancement.

Industry, Innovation, and Infrastructure

Component	Description	Sources
Goal Definition	Let fresh ideas flourish as you build sturdy facilities and promote long-term, inclusive industrial development.	(UNIDO, 2020).
Key Targets	Foster industrialization that involves all people and endures • Construct infrastructure that is reliable, lasting and of excellent quality	(Dosi et al., 2021).

Component	Description	Sources
	• Encouraging more accessible banking and technological services for entrepreneurs of small sizes • Enhancing resource efficiency and the use of environmentally friendly technology across sectors Assist poor countries in constructing durable and long-lasting infrastructure • Enhance research capabilities and creativity	
Major Challenges	Emerging nations' inadequate transportation networks, low-income nations' lack of investment in R&D, digital inequality, traditional industries' disproportionate contribution to global warming, and small and medium-sized firms' lack of advantage in competitiveness are all factors to consider.	(Calderón & Servén, 2014).
Global Progress	• Rapid expansion of technological capabilities (5G, internet) • Increased worldwide investment in research and development and innovation • Decreased economic growth in nations with the lowest levels of development • Greater industry-related income in emerging nations	(Rotolo et al., 2017).
Policy Recommendations	• Build infrastructure that is climate-resilient and lasts a long time	(Aghion et al., 2021).

Component	Description	Sources
	• Help ecological systems for entrepreneurial activity and research and development (R&D) • Make it easier for small and medium-sized businesses (SMEs) to get loans and technological advances • Encourage clean and energy-efficient goods manufacturing • Improve access to information and communications technologies and online accessibility	

Sustainable Development Goal 10:
Reduced Inequalities

“Goal 10 of the United Nations 2030 Agenda for Sustainable Development, Reduced Inequalities,” is a pillar within this global project aiming to promote a fairer world”. SDG 10 demands decisive measures for reducing inequality of income, wealth, and opportunity. It acknowledges that poverty, discrimination, and the uneven distribution of resources restrict development and prevent people from living in peace. SDG 10 is about achieving income equality by promoting policies that empower the disadvantaged in addition to income earnings; it is also about raising opportunities and reducing gaps of all sorts.

Figure 1.12: Reduced Inequalities

The gender pay gap gives rise to inequalities that in turn lead directly to poor health outcomes: girls suffer more from malnutrition than boys since they are less able from an early age to work in their parents' fields or to pay for food themselves. Now this latest proviso reads, at least in part, that those countries following alongside will have neither a place at the international table nor anywhere within world system structures they could call home.

Sustainable Development Goal 10: *Reduced Inequalities*

Component	Description	Key Sources
Goal Definition	Lower the gap within as well as between nations by dealing with inequality in earnings and differences.	UN Department of Economic and Social Affairs. (SDGs)
Key Targets (Outcome / Substantive)	Slowly but surely, the bottom 40% of the adult population should see their incomes rise at a	Official target list from UN's SDG

Component	Description	Key Sources
	rate that is in excess of the national average. Encourage everyone, no matter their socioeconomic standing, to be included in the political, economic, and social world. Get rid of laws, policies, and practices that are unfair to everyone so that everyone has the same chance and the differences in outcomes are smaller. To gradually accomplish more equality, adopt procedures for wages, taxes, and safeguards for society. Make it easier to keep an eye on and regulate international financial markets and companies. Make sure that nations that are developing have greater authority and involvement in global economic and financial institutions. Ensure that things go smoothly, safely, regularly, and responsibly, with the migration and mobility of people.	framework. (SD Knowledge Platform)
Key Targets (Means of Implementation / International Cooperation)	10.a – Follow the World Trade Organization's rules and give countries that are developing, especially the least developed countries (LDCs), unique and differentiated treatment. 10.b – Encourage official development assistance (ODA) and money flows, such as foreign direct investment (FDI), to go to the countries where they are most needed. 10.c – Lower the	As defined in the official SDG 10 targets. (SD Knowledge Platform)

Component	Description	Key Sources
	financial transaction expenses associated with migrant cash transfer transportation to less compared with 3% (for corridors with costs higher than 5%).	
Key Issues / Dimensions Addressed	Discrimination based on physical or mental impairment, race, ethnicity, origin, belief system, sexual orientation, and other factors; economic, social, and ideological marginalization and inequality in earnings; unequal chances; unequal representation at global organizations; unfairness in movement of people, money transfers, and sending money back.	UN description of SDG 10's scope. (SDGs)
Importance for Sustainable Development	The concept of inequality makes it harder to reduce poverty, bring people together, get better access to assistance and chances for employment and contribute to overall progress. Addressing inequality helps make sure that growth is open to all and "leaves no one left behind".	Analytical discussion in international law and development literature. (Cambridge University Press & Assessment)
Challenges / Barriers	Persistence of inequality in all its forms (income, social, institutional), failing social assistance structures, prejudice-based laws and regulations, inadequate representation and participation for those with limited resources in emerging nations; disparities in global	Recognized worldwide; SDG documents highlight these as impediments, (United Nations)

Component	Description	Key Sources
	monetary and commercial systems, immigration legislation barriers, high return costs for migrants.	

Presumably not all such countries have the capability to do functionality research; in other words, there would be no sources to copy editing work from. SDG 10 is not just about reducing disparities—it is about creating a world in which equality becomes a dynamic for peace, justice, and sustainable development.

Sustainable Development Goal 11:
Sustainable Cities and Communities

"Creating urban places which are inclusive, safe, resilient and sustainable" is the goal of Sustainable Development Goal 11--Sustainable Cities and Communities. Nowadays, for the first time over half of the world's people are urban dwellers. During its rapid growth, these cities face an ever-extending range of problems--from explosive increases in populations and getting people out slums to air that is too polluted and infrastructure left hopelessly inadequate. It is not enough just to build new cities or to turn every piece of land into a shanty town, Sustainable Development Goal 11 declares. Well-planned urbanization that includes safeguards against unnecessary degradation and overconsumption of resources must be pursued in order that increasing returns at lower costs can be achieved for the common good. SDG 11 will try to address this problem by promoting well-planned urbanization. The aim is to help all people gain access to secure and affordable housing, reliable transport, green public spaces, and disaster resistance. This involves promoting community involvement, narrowing inequalities within cities and prioritizing sustainable infrastructure development. Hence the idea that SDG 11 is about transforming cities into engines of opportunity, innovation and environmental stewardship. In the final analysis, the objective is for urban areas to become more congenial places to live - more just and more resilient in the face of future challenges. Just as peace emanates from the heart, it grows outwards to engulf the whole nation.

Figure 1.13: Sustainable Cities and Communities



Sustainable Development Goal 11: *Sustainable Cities and Communities*

Component	Description	Key Sources
Goal Definition	Develop cities and other places where people live safe, welcoming, strong, and long-lasting.	United Nations (UN) SDG 11 official goal description. (SD Knowledge Platform)
Key Targets	• Make sure that everyone has the opportunity to enjoy secure, reasonably priced, and suitable accommodation and basic necessities; and improve slums. • Make sure that everyone has accessibility to convenient, affordable, readily available, and sustainable transportation.	Targets list per UN SDG 11 metadata. (UNSD)

Component	Description	Key Sources
	• Improve urbanization that is environmentally friendly and sustainable, as well as the ability to plan human settlements in a way that allows for participation and integration. • Protect and preserve the entire globe's heritage of culture and nature. • Lower the number of fatalities, homeless people disadvantaged, and economic damage caused by disasters • Lower the negative effects of cities on the environment (like garbage management and air quality) • Make sure that everyone has a connection to safe, inclusive, and accessible green and public spaces • Strengthen ties throughout arid regions and rural areas; provide assistance disaster preparedness mitigation or resilience; provide assistance environmentally friendly, able to cope building in the nations with the lowest development rates	
Challenges / Issues Addressed	Increased urbanization, impoverished communities/slums, impoverished housing and necessary amenities,	According to UN analyses of urbanization and SDG 11 progress. <u>(SD Knowledge</u>

Component	Description	Key Sources
	unsustainable infrastructure for transportation, contamination and environmental deterioration, sensitivity to disasters, loss of cultural/natural heritage, lackluster green and communal areas, improper disposal of waste, and inefficient policies.	<u>Platform)</u>
Global Progress & Trends	Historically (2000–2014), percentage of urban population living in slums declined globally (from ~39% to ~30% in developing countries), but absolute numbers of slum-dwellers continued to increase due to population growth and rapid urbanization. Waste collection services remain uneven globally; many cities struggle with municipal solid waste management. Air pollution remains a major challenge: a sizable fraction of urban populations worldwide live in areas not meeting air quality standards.	
Policy / Implementation Priorities	– Making the development of cities and leadership more inclusive, collaborative, and interconnected – Making it easier for people to find decent homes and fixing up slums – Making public transportation better and	Recommended in global reviews and SDG 11 synthesis, these priorities address the breadth of targets under SDG 11, (UN-

Component	Description	Key Sources
	more environmentally friendly – Making garbage management, drinking water, air quality, and ecological sustainability better – Encouraging cities to reduce risk from disasters, build resilient infrastructure, and prepare for warming temperatures – Protecting cultural and natural heritage during the planning process – Making sure that everyone has access to environmentally conscious environments, services, and safe, welcoming cities.	Habitat)

Sustainable Development Goal 12: Responsible Consumption and Production

The purpose of Sustainable Development Goal 12, named "Really A necessary Part of all the effort happens in Right Now Pediatrics: Treatment for Women and Children That Is Underdeveloped Under Global Opportunity for Child Survival Un Energy Affairs" is to save resources and energy, minimize wastage and pollution have made through sustainable production chain throughout every sector. As population growth increases and consumption patterns change globally, the strain on natural resources mounts. This leads to environmental worsening, pollution and climate anomalies.

Figure 1.14: Responsible Consumption and Production



SDG 12 addresses these challenges by advocating for responsible production practises - that is to say reducing emissions and using cleaner technologies on the one hand as well as continuing consumption aspects methodology conservation reducing waste from promoting sustainable lifestyles with a view towards reducing surplus foods or superfluous materials! By adopting a circular economy strategy-that is to say products can be re-used, repaired or recycled to produce another-and minimising waste at every stage of the process, the goal of 12 is closer to being implemented. By adjusting production and consumption in harmony with sustainable development, SDG 12 aims to harmonize economic growth with environmental protection; so that present and future generations of human beings can live within the earth's limits.

Responsible Consumption and Production

Component	Description	Key Sources / Notes
Goal Definition	Make sure that people around the world use and make things in a way that doesn't harm the environment.	United Nations (2023) official goal description.
Key Targets	Create a 10-year plan for programs on a sustainable way of life (SCP); By 2030, control and make use of earth's resources in a way that is good for the surroundings and efficient; By 2030, cut the disposal of food in half at the level of both consumers and retailers as well as across the manufacturing and distribution chains; By 2020, oversee chemical substances and all garbage in an environmentally conscious way regardless of the course of their existence; By 2030, cut down on generated waste by a lot through preventing, minimizing, reusing, recycling, advocate for business organizations (especially large and international ones) to adopt environmentally conscious procedures and include sustainability data in their reports.	Full list from SDG indicator metadata.

Component	Description	Key Sources / Notes
	Promote environmentally friendly government procurement techniques. Make sure that everyone has access to the understanding and expertise they need for environmentally friendly growth and ways of life that are in accordance with nature. Help nations with limited resources build up their scientific and technological capacity for sustainable consumption and production. Create and use tools to track the environmentally friendly effects of tourism. Make fossil fuel subsidies more efficient by taking into account the environmental effects they have and making sure that struggling and disadvantaged neighbourhoods are protected.	
Key Issues Addressed	Consumption overload, exhaustion of resources, generation of waste (solid waste, e-waste, food waste), unstable manufacturing chains, pollution, harm to the environment, and the necessity for environmentally friendly company operations and garbage and chemical handling.	Commentary by UN and environmental agencies on SCP importance.

Component	Description	Key Sources / Notes
Global Trends & Challenges	The amount of materials used around the world and especially in the US has grown a lot in the recent past. Waste disposal costs (especially hazardous waste, plastic, and e-waste), as well as losing food and recyclables, continue to be high. A number of nations still have trouble managing their waste efficiently and finding ways to make and use goods in a way that is good for the environment. There have been more institutional endeavors and reports on environmentally friendly development, but threats to the environment are still strong.	Data and analysis from UN SDG reports and global SCP assessments.
Importance for Sustainable Development	Responsible production and consumption are essential for conserving natural resources, minimizing garbage and pollutants, combating the effects of global warming, safeguarding biological systems, and promoting enduring human welfare and equitable treatment. SCP has an effect on a lot of other SDGs, like climate, health, governance of resources, and life on land and in water.	United Nations and environmental policy literature on sustainability interlinkages.

Component	Description	Key Sources / Notes
Implementation & Policy Priorities	Creating and enforcing national policies that focus on SCP; encouraging businesses to use renewable energy behaviors; supporting efficiency of resources, recycling, and waste reduction; raising public awareness and education; monitoring and reporting through responsible publications; decreasing out fossil-fuel subsidies; helping economically disadvantaged nations adopt renewable energy technologies; renewable energy audience acquisition; and fostering environmentally friendly tourism.	Institutional guidance and SDG 12 implementation frameworks.

Sustainable Development Goal 13: *Climate Action*

With the profound impact on the ecological system, financial markets, and the lives of people, “climate change is one of the 21st century’s major obstacles. Sustainable Development Goal 13: Climate Action, which encourages urgent action in the face of its consequences, was adopted in the 2030 Agenda for Sustainable Growth by the United Nations to acknowledge this worldwide urgency. (“European Floods Are Latest Sign of a Global Warming Crisis” 2021)”. SDG13 highlights a significant value in boosting the capacity of institutions, promoting awareness, and implementing climate measures into policies. Global

greenhouse gas (GHG) emissions remain on the increase, regardless of strengthening commitments; local as well as global action needs to be accelerated.

Figure 1.15: Climate Action



Climate change manifests in every action of nature. It's the midst of 2021, Germany experienced one of the deadliest and most destructive disasters from natural causes throughout its turbulent past, with history-breaking rainfall levels not seen in 500 to even 1000 years in some regions (The largest sign of a global crisis of 2021 is the European floods). On top of it, in 2021, wildfires grabbed attention worldwide, particularly in Siberia, Mediterranean countries and Canada.

Since 1888, the driest weather has been experienced by Yakutia, whose temperature reached at its peak point of 39 °C in spite of the cold climate of Russia in its northern

regions, causing enormous smoke and an uncommon temperature rise. The death toll, vandalism, forced migration, scarcity of essential utilities, denudation and high carbon footprint stipulated that to manage with the uncommon climate disaster the mankind was not yet prepared. By 2030, dynamically, the planning done by the UN to manage huge tragedies in each country from the consequences like Death, injuries, internal mobility or housing insecurity caused by calamity should be minimised with full potential (United Nations 2021b).

Climate Action

Component	Description	Key Sources / Notes
Goal Definition	Do something right away to fight the threat of climate change and its effects.	United Nations official description of SDG 13. (United Nations)
Key Targets	• Make people more resilient and able to make adjustments to ecological dangers and catastrophes that occur. • Include steps to deal with climate change in national policies, plans, and strategies. • Make learning, promotion of awareness, and the ability of people and institutions to deal with the impacts of climate change better. • By 2020, raise a total of \$100 trillion a year from any source to meet the requirements of nations in need, and make the Green Climate Fund (GCF)	Official targets as defined in the SDG metadata. (mdgs.un.org)

Component	Description	Key Sources / Notes
	fully operational. • Encourage ways to improve the ability of less-developed nations (LDCs) and countries with small islands (SIDS) to prepare for and deal with climate change effectively, with a focus on women, youth, and marginalized populations.	
Key Indicators / Measures (examples)	- The percentage of deaths, missing people, and people who had their lives were impacted by disasters for every 100,000 people. - How many countries have plans or strategies to deal with climate change? - The amount of money raised for climate change on an annual basis. - How many weak countries are getting help in developing their ability to function?	As per the official SDG 13 global indicator framework. (SDGs)
Core Issues Addressed	Climate change impacts: extreme weather events, rising sea-levels, disasters, greenhouse gas emissions, vulnerability of poor and marginalised populations, need for climate-resilient development pathways.	Climate change is described as the “single biggest threat to development”; SDG 13 urges comprehensive mitigation, adaptation, and resilience-building. (United Nations)

Component	Description	Key Sources / Notes
Importance for Sustainable Development	Without climate action, progress on many other SDGs will be undermined – climate change affects poverty, hunger, health, water, infrastructure, inequality, ecosystems, and global stability. SDG 13 is thus central to the overall 2030 Agenda.	Emphasized in UN analyses and the SDG framework: climate risks threaten development gains globally. (United Nations)
Policy & Implementation Priorities	• Adoption of national climate policies, NDCs, adaptation and mitigation plans • Disaster risk reduction and resilience strategies at national and local levels • Climate education & awareness • Mobilization of climate finance, especially for developing countries • Support to vulnerable and marginalized groups & capacity-building for climate action	As recommended under SDG 13 and its targets (13.2, 13.a, 13.b). (SDGs)

Sustainable Development Goal 14:
Life Below Water (Oceans, Seas & Marine Resources)

The ocean is considered the heart of earth and is connected with all life. Thus, oceans are a valid and necessary part of life for human beings to survive-as are oceans themselves 70% of the surface is covered by them. Not only that but they also provide food, regulate climate systems around the world and boast a rich array of life. Nevertheless, pollution threatens these valuable resources; overfishing depletes fish stocks on which people depend for protein in many parts of the world; ocean acidification is already affecting corals and will be a problem for fish if allowed to go unchecked; also greenhouse gases (particularly CO₂) changes. Everyone is also considering the following goal of SDG 14 from a holistic perspective: less pollution in the sea, more protection for marine and coastal ecosystems. It also calls to the marine environment. Two strategically important prongs of such action are to restrict the scale and location of resource exploration further as well as to ensure rational fishing practices. Clean and protect our oceans with the latest research breakthroughs and by helping nations that cannot afford expensive pollution controls –viruses (was often Hey). So healthy oceans are not only a resource for the present, they are waters of life for future generations. That is why we have formulated SDG goal 14.

Figure 1.16: Life below Water (Oceans, Seas & Marine Resources)



Life Below Water

Component	Description	Key Sources / Notes
Goal Definition	For long-term growth, protect and use the seas, coastlines, and marine assets in a way that doesn't harm them.	United Nations SDG 14 official goal page. (UN, 2025) (SDGs)
Key Targets	By 2025, stop and drastically decrease the amount of marine pollution from land-based processes, marine waste, and contamination by nutrients. By 2020, responsibly shepherd	Metadata and official target list from UN. (UNSD)

Component	Description	Key Sources / Notes
	and safeguard marine and coastal ecosystems; maintain oceans that are vital and effective. Use science and partnerships to reduce the effects of ocean acid rain; By 2020, stop overfishing, illegal, unreported, and environmentally damaging aquaculture; By 2020, reserve at least 10% of the maritime and coastal regions (marine protected areas). Stop giving certain damaging subsidies to fisheries that lead to overcapacity and overfishing, and don't give new ones either. By 2030, the long-term preservation of marine ecosystems (fisheries, aquaculture, and tourism) should bring more economic advantages to islands in developing nations and least nations with advanced economies. Increase scientific understanding, investigation infrastructure, and the adoption of marine science and technology for enhanced ocean health and biological diversity benefits, particularly within	

Component	Description	Key Sources / Notes
	those in developing nations. Give small-time and artisanal fishermen improved the opportunity to access underwater resources and market opportunities. Put international conventions into effect (for example, by ratifying and taking effect the 1967 United Nations Convention on the Law of the Sea – UNCLOS) to safeguard and efficiently utilize the oceans.	
Key Issues / Problems Addressed	Ocean contaminants (plastics, trash, run off of nutrients, debris), shorelines and underwater environment degrading, acidification of the seawater due to emissions of carbon dioxide, inappropriate and unhealthy fisheries, degradation of biodiversity in the oceans, underdeveloped protected areas for marine life, dangerous subsidies, weak ability to access resources for independent commercial fishermen, underdeveloped academic and technological capabilities, weak legal and organizational regulatory structures.	UN and environment-focused analyses of SDG 14. (United Nations)
Importance for Global	About 70–75% of the land mass of the planet is covered by marine environments. They are	UN SDG 14 overview, environmental

Component	Description	Key Sources / Notes
Sustainability	essential to life because they control the climate, encourage species diversity, serve as food (fish protein), jobs (fisheries, tourism), soak up CO ₂ and heat, as well as providing us substances (food, pharmaceuticals, and biological byproducts). For the control of climate change, security of nutrition, lowering poverty rates, the preservation of biodiversity, and environmentally friendly growth, it is very important for us to safeguard aquatic environments.	and socioeconomic importance of oceans. (United Nations)
Global Progress / Current Challenges	As of the year 2025, only approximately 8.4% of the global ocean surface has been established as a marine zone of protection, which is significantly lower than the goal of 30% representation by 2030. Many important marine biodiversity regions are still not preserved, contaminants (particularly garbage and plastic) is still on the rise, acidification of the seawater and warming are still significant concerns, exploitation and illegal fishing techniques are still happening, small-scale fishing enterprises and communities along the	Recent SDG 14 factsheet and UN reporting

Component	Description	Key Sources / Notes
	coast often don't have enough access, benefits, and encouragement, and the introduction of financial support for fishing modifications and legislative structures is still uneven.	
Policy / Implementation Priorities	– Make international partnerships and laws for protecting the ocean stronger (for example, by ratifying and implementing UNCLOS) – Make marine protected areas (MPAs) bigger and better managed, and use ecologically focused oceanography and marine management – End destructive commercial fishing payments and make sure fishing is done in a way that is sustainable. – Cut down on harmful substances in the ocean by controlling garbage made from plastic, fertilizer discharge, and harmful substances from land; putting in place rules for managing garbage and shipping lanes; and putting money into marine research, study, development of technology, and equipment building (in particular for newly independent nations and island-based states) – Help small-scale and handcrafted fishermen by protecting their	Reflects the SDG 14 targets and guidance by UN & environmental agencies

Component	Description	Key Sources / Notes
	rights, giving them the opportunity to utilize merchandise and trade opportunities, and giving them protection from society and long-term job options. — Encourage the responsible use of marine ecosystems for food, getaways, and the economy of the sea, while making sure that the surroundings is protected.	

Sustainable Development Goal 15:

Life on Land (Protect, Restore & Sustain Terrestrial Ecosystems, Biodiversity & Forests)

Named "Life on Land", Goal 15 is to protect, restore and promote the sustainable use of terrestrial ecosystems. It aims at stopping loss or decline in variety of life, combating deforestation and ensuring habitats such as forests, wetlands and mountains are preserved. With more and more people squeezing into the earth 's increasingly limited space, ecosystem after ecosystem was put out of balance causing species extinction, soil degradation. Many of nature's indispensable services were lost in and its recover harder occupied much time indeed. SDG 15 calls for immediate efforts to conserve ecosystems, restore degraded land and ensure sustainable use of human activities.

Figure 1.17: Life on Land



It supports sustainable agriculture, killing fewer than 100 wild creatures and protecting wildlife more perfectly. By protecting life on land, goal 15 of the SDGs looks forward to a future in which human beings live in harmony with nature, forests, rivers and wildlife flourish and the bounty of nature will be enjoyed by all.

Figure 1.18: Life on Land (Biodiversity & Forests)



Life on Land

Component	Description	Key Sources
Goal Definition	Stop increasing desertification; safeguard, reconstruct, and advocate the environmentally friendly utilization of land ecosystems; responsibly oversee forests; stop and reverse degradation of the environment; and stop losing biodiversity.	United Nations description of SDG 15. (SDGs)
Primary Targets	Protecting, restoring, and using ecosystems that are both terrestrial and inland (forests, wetland environments, mountain ranges, and deserts) in a way that is good for the environment. • All different kinds of forests should be managed in a way that is good for the environment. Deforestation should stop, damaged forests ought to be saved, and more trees should be planted around the world. • By 2030, stop the development of deserts, revitalize the soil and vegetation that has been damaged (this includes land that has experienced damage by extreme weather or flooding), and work toward degradation of the environment neutrality in its entirety. • By 2030, make sure that mountain environments	Official SDG-15 targets list. (SDGs)

Component	Description	Key Sources
	(including their biodiversity) are protected. • Act quickly to stop the loss of ecosystem diversity, protect threatened animals and plants, and stop the devastation of environmentally sensitive habitats. Encourage equitable allocation of genetic resources; fight poaching and trafficking; keep invasive alien species in check; and include biodiversity and environmental values in national planning. • Get more money and people involved in protecting ecological diversity and managing forests in a way that is good for the environment; support emerging countries; and work together more to stop wildlife-related crimes around the world.	
Key Issues / Problems Addressed	Forest cutting, disappearance of biological diversity, degradation of the environment, increasing desertification, disappearing of cultural diversity, potential for extinction for species, the reduction of service to the environment, diminution of environmental resilience, and incompatible land and water consumption techniques.	The “triple crisis” of climate change, pollution, and biodiversity loss threatens terrestrial ecosystems globally
Global Importance &	Ecosystem-related services like retention of carbon, fertilization of soil, water consumption	United Nations emphasizes that life on land

Component	Description	Key Sources
Benefits	management, regulation of the climate, providing essential supplies, food security, and livelihoods (specifically for remote and ancestral villages), biological diversity, endurance to catastrophic events, and greater prosperity for humans depend on ecosystems that are healthy.	underpins sustainable development and supports livelihoods, health, and climate stability
Current Global Trends & Challenges	The amount of woodlands worldwide the world has been getting smaller. In 1990, it was about 31.7% of the world's overall land amount, and by 2015, it was about 30.7%. The eradication of forests keeps going on, but the velocity of loss has slowed down as time has passed. (SD Knowledge Platform) At least 100 million hectares of agricultural property were lost every single year from 2015 to 2019, resulting in about 1.3 billion people worldwide. the world. (UN) The decrease in biodiversity is still very bad, with numerous animal species at risk and natural ecosystems under a lot of stress. The United Nations	
Policy / Implementation Priorities	— Make areas under protection (forested areas, lagoons, mountain ranges, prairies, and and other aquatic habitats) safer and contain more land. — Encourage environmentally conscious forest management, planting new trees,	As defined under SDG 15 and recommended to reverse biodiversity loss and land

Component	Description	Key Sources
	and restoring hardwood forests. – Fight environmental degradation and erosion; restore damaged soils and environments – Take steps to stop destruction of habitat, trafficking in animals, and destructive species; protect biodiversity – Include biological and ecological intrinsic value in national planning, growth strategies, reducing inequality, and economic measurement – Get money (from both inside and outside the country) for preservation of biodiversity and sustainable conservation of ecosystems, particularly within economies that are developing – Promote global collaboration while developing capacity for land use that is both environmentally conscious and protects the environment.	degradation

Sustainable Development Goal 16: *Peace, Justice and Strong Institutions*

Justice and peace are the basic requirement of human beings. This objective aims for three years to help countries develop peace-loving, just and inclusive societies. Only by guaranteeing peace, upholding human rights and promoting strong, accountable institutions can sustainable development be realized. At the same time, there are too many people around the globe who suffer from violence, discrimination and at present have no way at all to enforce their rights. Sustainable Development Goal 16 testifies to

make all forms of violence a thing of the past. One has yet to see whether rule by law will prevail over science and apartheid, but SDG 16 deserves our warmest welcome because it is encouraging countries around the world to govern themselves well through. It helps rather than fight nation-building; Institution-building that can be trusted by civic society, and create obvious institutional frameworks for just development of every kind. It sees a world where institutions works for justice and people take centre stage.

Figure 1.19: Peace, Justice and Strong Institutions



Peace, Justice and Strong Institutions

Component	Description	Key Sources
Goal Definition	construct strong, responsible, and open agencies at all kinds of levels, make sure everyone has the opportunity for equity, and support inclusive and peaceful communities for long-term growth.	Official SDG 16 goal description. (The United Nations in Bangladesh)
Main Targets	• Make all kinds of violence and the deaths that come with it a lot less common. • Stop all kinds of harm committed contrary to children, including neglect, theft, trafficking, and other different kinds of violence. • Support the rule of law and make sure that everyone has the same access to the courts. • Greatly cut down on illegal money and ammunition transfers and fight the criminal underground. • Greatly cut down on all forms of corruption and corrupt practices. • Make sure that every rung of government	Full target list per UN SDG-16 metadata

Component	Description	Key Sources
	have mechanisms that are efficient, trustworthy, and open. • Make sure the decision-making process at all points is accessible, encompassing, open to input and unbiased. • Make it easier for developing countries to join and have a bigger role in global governance institutions. • Give everyone a legal identity, including registering their births. • Make sure that everyone can get details and protect basic rights. • Make national institutions stronger, including by working together, to stop violence and fight criminal activity and terrorist activities. • Support the implementation of regulations and regulations that don't discriminate for long-term growth.	
Key Issues / Challenges	Conflict and aggression (homicide, military	SDG 16 conceptual rationale and

Component	Description	Key Sources
Addressed	disputes), slavery, human trafficking, exploitation and mistreatment, criminal organization, bribery, organizational imperfections, not enough accountability and disclosure, insufficient opportunity for law and order, weak endorsement and accountability, lack of legal sense of identity, diminished access to details, unfair treatment, and incomplete international governance for countries that are developing.	global challenge analysis
Importance for Sustainable Development	Peace, equitable treatment, and powerful organizations are essential. In the absence of protection, the supremacy of law, equitable treatment, and open governance, accomplishment in other SDGs (reducing poverty, improving education, health, gender social justice, and environmental sustainability) will be less likely to last. SDG 16 is what makes it possible to leaving everyone else	UN description of SDG 16's central role in sustainable development

Component	Description	Key Sources
	further behind."	
Global Status & Trends	Crime rates have dropped in a variety of nations over the past several years. There has been some achievement in making budgets more open in addition to making organizations better around the world. However, deadly conflicts, human trafficking, money laundering, inadequate governance, and an abundance of evidence are still major problems. Development is still dissimilar between and across nations.	Global monitoring summary from UN SDG 16 report
Policy & Implementation Priorities	• Make the supremacy of law, the criminal justice procedure, and constitutional authorization stronger • Fight bribery, illegal money transfers, crime syndicates, and weapons trafficking • Encourage openness, responsibility, and excellent administration • Make sure that everyone can take part in the political process while safeguarding	Identified as core implementation pathways in UN and regional frameworks

Component	Description	Key Sources
	rights for humans and make sure everyone has the opportunity to obtain knowledge and exercise their basic freedoms • Encourage worldwide collaboration along with capacity establishment for governments, particularly within economies that are developing • Make it easier for governments to gather and keep track of evidence on criminal activity, criminal criminal justice, and indicators of government.	

Sustainable Development Goal 17:
Partnerships for the Goals

As a long-term strategy, the United Nations formulated the SDGs. Since 2000, the Millennium Development Goals (MDGs) have guided global and national public policies. They also have influenced donor aid patterns and are seen as a critical measure to judge where progress is being made. This novel approach makes each job seem much more important: the agenda is not only about how society spends its resources but also what it aims to achieve. Sustainability scholars have criticized standard definitions of sustainable development because they do not pay

enough attention to long-term growth prospects. They also fail to take into account what capabilities would exist for future generations and how likely it is that fruit. Today 'this cannot be critical' sustains development in rural Georgia as an example. At the global level, contrary to the current pattern of progress, "more arms are being made, more ships are being produced, and all the slowness is about going slow." --Financial resources should be liberated for peaceful uses such as the improvement of people's lives or healthy development prospects. Thus, this breakthrough civilization will provide us all with both spiritual fulfilment and bodily health so that there need no longer be any reason for failure, which will be eradicated from human life altogether. The word "development" means significant change and improvement. People either throw off their shackles or use their freedom to become lazy, as George Bernard Shaw wrote. In this regard, the United Nations has done much work to date. Its Organization of the Month series has included prominent experts and NGOs offering advice and counsel on subjects created by sustainable development. Implemented by all countries and for all countries, these goals are "the promise for the people and the planet," as they are described in Agenda 21. They specify that no nation should be excluded from regional schemes of cooperation. We recognize developing countries as the chief beneficiaries of these measures. Disciplinary systems can be given threefold support (especially in university education): research which does not place restraints on creativity; education which allows free expression of opinions about science or social problems; and wide-spread public awareness of findings being reached. Representatives from around the world discussed their progress on these goals during Earth Summit 2002.

The summit, called "Earth Summit II" by some, followed up two very successful international conferences held in 1992. Countries which aim to enter the ranks of developed nations must build their economies on a foundation of sound environmental policies. As the people of Western Europe entered the stage where they could do this--in particular in 1985 or 1986--their representatives worked hard to create an international meeting to follow up the 1972 Stockholm conference on poverty and the environment. Since that time, however, no progress has been made. If industrialized countries are really serious in attaining sustainability for all--both developed and developing countries alike--funds aggregates to help poor people in less developed countries, a desk set up by international agencies for enforcing sustainable practices and increased support for their efforts among these same agencies. Widespread and urgent cooperation should also be regarded as necessary. SDG 17 calls for a revitalized global partnership through shared responsibility, solidarity, and cooperation. It also stipulates the need for participation of all stakeholders, male and female. Based on these principles, SDG 17 aims to implement 15 unprecedented steps to facilitate better collaboration across all fields and regions in the world as well as among different organizations, within nations themselves or between various levels of governance. Only a unified international community led by the UN can ensure that necessary resources are forthcoming, effective partnerships form and both developing and developed countries are able to work together towards a common future.

Figure 1.20: Partnerships for the Goals



These efforts to strengthen global and regional cooperation will help mobilize resources, cultivate partnerships and enable all countries work together toward the same shared end. Individuals, companies and non-profit organizations must all contribute. This is a call for all sectors-public, private and nongovernmental to take on equal responsibility so that every goal is realized through collective action promoting a life for all.

Partnerships for the Goals

Component	Description	Key Sources
Goal Definition	Make the techniques of putting things into action stronger and bring the worldwide collaboration for environmental sustainability back to life. The target stresses the importance to collaborate together,	Official UN SDG 17 description.

Component	Description	Key Sources
	financial resources, technological advances, trade, along with information in order toward achieving all of the SDGs.	
Primary Targets (Implementation & Finance)	Get more country's assets and help with collecting taxes and other funds. Countries with advanced economies should keep their promises to give financial support for development (0.7% of GNI, with 0.15–0.20% going to the most impoverished nations); Get more money for nations that are struggling. Help countries that are developing make their medium-term debt sustainable and make their borrowing procedures work together.	Official SDG 17 targets list.
Primary Targets (Partnerships & Cooperation)	Improve international cooperation for environmentally friendly growth, which includes engagement between many stakeholders. Support along with cultivate collaboration between the broader public sector, the business community, and community organizations that work well.	Metadata on partnerships and cooperation targets.
Primary Targets (Data, Policy &)	Improve assistance in developing the ability to get	Official SDG 17 data &

Component	Description	Key Sources
Capacity)	accurate promptly and broken-down data. Create new ways of evaluating improvement besides GDP and help nations who are developing improve their data collection skills.	monitoring targets.
Key Issues Addressed	Lack of resources deficits (money, skills, and capacities), insufficient data collection mechanisms, not enough regional collaboration, insufficient enough technological exchange, debt problems in economies that are developing, and agreements that aren't working well.	Global SDG analyses emphasize partnerships as critical for achieving the 2030 Agenda.
Importance for SDGs	Every single one of the other SDGs depend on SDG 17 to be put into action. Absent significant monetary encouragement, systems for information, dissemination of technology, and interconnected collaborative efforts, the SDGs won't be met by 2030.	SDG 17 as a foundational goal for the entire 2030 Agenda.
Policy / Implementation Priorities	• Make official humanitarian assistance and worldwide lending stronger • Help and grow collaborations between many groups • Improve data collection, measurement systems, and broken-down information • Encourage the transfer of technologies and organizational	Implementation priorities align with SDG 17 targets and UN guidance.

Component	Description	Key Sources
	construction • Help keep the levels of debt stable and make sure that macroeconomic measures have been coordinated	

The 17 SDGs tackle social, economic, and environmental problems; together, they promote equitable and sustainable global development. Goal 2 of the Sustainable Development Goals is to end hunger and promote sustainable agriculture in order to guarantee food security, while Goal 1 is to end extreme poverty and guarantee equal access to resources. Goal 4 of the Sustainable Development Agenda (SDG) assures quality education for all, promotes inclusivity and equity in education, and equips individuals with knowledge and skills. Goal 3 focuses on good health and wellbeing, which promotes healthcare systems and overall quality of life. Goal 5 of the Sustainable Development Agenda (SDGs) is to ensure that all people, regardless of gender, have access to basic freedoms and choices. In order to improve public health, SDG 6 (Clean Water and Sanitation) makes sure that safe water and sanitation are available. In order to drive economic growth, SDG 7 (Affordable and Clean Energy) supports sustainable energy access. Industry, Innovation, and Infrastructure (SDG 9) promotes technical advancement and robust infrastructure, while SDG 8 (Decent Work and Economic Growth) promotes secure and job creation. The goal of Sustainable Development Goal 10 (Reduced Inequalities) is to eliminate economic and social inequality and promote equality and inclusion. Goal 11 of the Sustainable Development Agenda focuses on building resilient, environmentally friendly, and safe cities and communities;

Goal 12 of the Agenda calls for responsible consumption and production, which means making the most of what we have while minimizing waste. In order to safeguard ecosystems and ways of life, SDG 13 (Climate Action) deals with the effects of climate change. SDG 15 safeguards terrestrial ecosystems and biodiversity, while SDG 14 prioritizes the conservation of marine resources. For stability and trust, SDG 16 (Peace, fairness and Strong Institutions) fortifies government, social fairness, and the rule of law. Last but not least, Sustainable Development Goal 17 (Partnerships for the Goals) ensures global sustainable development by promoting partnerships across borders, exchange of materials, and working together across governments.

Chapter 2

Climate Action – Concept and Introduction

2.1 Introduction to SDG 13: Climate Action

Climate change is happening rapidly which affects sustainable development. World is trying to have a balance between development and environment. There are various strategies adopted by India which have a purpose of achieving goals suggested by United Nations Sustainable Development Goal 13 (SDG 13) – Climate Action. The United Nations organization (UNO) involved Climate Action as the Goal 13 in there set of 17 SDGs (United Nations, 2015). The sitting Panel on Climate Change (IPCC) concluded that Global temperature has already surpass by the temperature more than 1°C above pre-industrial levels, The statement support by NASA,s Goddard Institute for Space Studies (GISS) the mean global temperature of Earth risen by at 1.1°C since past 45 years. Greenhouse gas emissions cause by the human activities such as fossil fuel combustion and deforestation (IPCC, 2021). This news leads to be more frequent and concern with the period of time , including the heat wave, floods and droughts (IPCC,2021).

India worked on different parameters for attaining these goals. The focus of this study is for evaluating the impact created by policies adopted by India. The main concern is

understanding the impact of these policies with reference to the National Action Plan on Climate Change (NAPCC) and its subsidiary goals, as well as recent state-level and sectoral initiatives. India achieved a great height in development of renewable energy, finance related to green energy and implementation of these policies, and data requirement for green energy. SDG 13 is essential for developing the country in holistic way. International collaboration required for achieving SDG 13. Policy integration is also required for developing countries in a complete way. In this conceptual work, the existing situation was analyzed using secondary data. Government is also playing important role because government support is required for formulating essential policies. SDG13 highlights a significant value in boosting the capacity of institutions, promoting awareness, and implementing climate measures into policies. Global greenhouse gas (GHG) emissions remain on the increase, regardless of strengthening commitments; local as well as global action needs to be accelerated. Climate change manifests in every action of nature.

Figure 2.1: Climate Change



It's the midst of 2021, Germany experienced one of the deadliest and most destructive disasters from natural causes throughout its turbulent past, with history-breaking rainfall levels not seen in 500 to even 1000 years in some regions (The largest sign of a global crisis of 2021 is the European floods). On top of it, in 2021, wildfires grabbed attention worldwide, particularly in Siberia, Mediterranean countries and Canada. Since 1888, the driest weather has been experienced by Yakutia, whose temperature reached at its peak point of 39 °C in spite of the cold climate of Russia in its northern regions, causing enormous smoke and an uncommon temperature rise. The death toll, vandalism, forced migration, scarcity of essential utilities, denudation and high carbon footprint stipulated that to manage with the uncommon climate disaster the mankind was not yet prepared. By 2030, dynamically, the planning

done by the UN to manage huge tragedies in each country from the consequences like Death, injuries, internal mobility or housing insecurity caused by calamity should be minimised with full potential (United Nations 2021). These changes are not only affecting natural ecosystems but also creating major challenges for economic stability, food security, public health, and human livelihoods across the globe (IPCC, 2022). Agriculture, water availability, and biodiversity are especially vulnerable to climate variability. If appropriate actions are not taken, climate change may increase poverty levels, disrupt economic growth, and widen social inequalities. Addressing climate change has become an urgent priority for governments, international organizations, and policymakers worldwide. These goals provide a global framework to guide countries in promoting sustainable development. The SDGs encourage cooperation among nations that benefits people, the planet, and prosperity (United Nations, 2015). The objective of SDG 13 is to encourage countries to take urgent and meaningful steps to combat climate change and reduce greenhouse gas emissions. SDG 13 also encourages international cooperation, technological innovation, and financial support for climate mitigation and adaptation activities, especially in developing countries that face higher vulnerability to climate risks (Sachs, 2015). Although most countries have officially adopted the SDGs and committed themselves to addressing climate change, the actual progress toward achieving these goals has been uneven. Many governments have introduced climate-related policies, action plans, and environmental regulations to support sustainable development. However, in many cases the practical implementation of these policies remains slow, inconsistent, or ineffective. This situation

creates a gap between policy commitments and the real outcomes achieved in practice. Scholars and policymakers commonly refer to this difference as the implementation gap, which represents the challenges involved in translating climate policies into concrete actions and measurable results. One of the major factors contributing to this implementation gap is the limitation of financial resources. Climate action requires significant investment in various areas such as renewable energy infrastructure, climate-resilient agriculture, disaster risk management, sustainable transportation systems, and environmental conservation programs. Many developing countries face budget constraints and lack adequate funding to implement these large-scale initiatives effectively. Furthermore, accessing international climate finance and technological support can be complex and time-consuming, which slows down the implementation process. As a result, financial limitations remain a major obstacle in achieving SDG 13 at the national and global levels (OECD, 2021). Institutional and governance challenges also play an important role in influencing climate policy implementation. Effective climate action therefore requires coordination and collaboration among different government departments, policy institutions, and administrative bodies. However, lack of institutional capacity, weak governance structures, and poor coordination between agencies often create barriers that delay the execution of climate programs. Without clear policy frameworks and well-organized institutional mechanisms, it becomes difficult to implement climate initiatives efficiently (Nilsson et al., 2018). Another important aspect that affects the success of climate action is public awareness and stakeholder engagement. Public

support helps governments implement environmental regulations more successfully and encourages responsible consumption and production practices. However, in many regions, limited environmental awareness and lack of access to climate education reduce the willingness of people to adopt sustainable behaviors. Increasing public awareness through education, media campaigns, and community participation can therefore play a crucial role in supporting climate action efforts (UNESCO, 2017). Furthermore, a major challenge faced by many countries is the perceived conflict between economic growth and environmental protection. Governments often focus on industrial expansion, infrastructure development, and increased production to generate employment opportunities and improve economic performance. While these activities contribute to economic growth, they can also lead to higher carbon emissions, environmental degradation, and increased pressure on natural resources. As a result, policymakers sometimes face difficulties in balancing development goals with environmental sustainability objectives. Achieving SDG 13 therefore requires the integration of climate considerations into economic planning so that growth can occur without harming the environment (World Bank, 2020). Given these challenges, it is essential to carefully examine the implementation gap in achieving SDG 13 at the national level. Understanding the barriers that prevent effective climate action can help policymakers identify weaknesses in current policies and develop more practical strategies for sustainable development. By improving financial support, strengthening institutional coordination, enhancing public participation, and integrating environmental considerations

into economic planning, governments can accelerate progress toward climate action.

The following phenomena affect the food security, water availability, health system and livelihood (World Bank, 2020). More over the average raised temperature caused by GHG's effect result the rapid melting of galaxy on both the north and South Pole. SDG 13 direct the favorable adoption of process, and regulate the mitigation, The organization also promote the Early warning system (EWS), Specially to the least or developing country which are disproportionately affected. Although SDG 13 came under global awareness, but the process is still unsatisfactory, and lagging behind the set target. The report of SDP 2023, the commitments done on the Paris Agreement are inadequate to limit the temperature below 2 degrees Centigrade. Around the globe many least developed countries is still struggling with the implementation due to the least capital or lack of funds and political will (OECD, 2021). The COVID-19 pandemic hastens derailed climate efforts worldwide. Also it is at present seeing very serious climate issues which include rising sea levels, increased incidence of cyclones, and glacier retreat in the Himalayas (MoEFCC, 2021). To that end India has put forth broad scale initiatives like the National Action Plan on Climate Change (NAPCC) and a promise to reach net zero emissions by 2070 (Government of India, 2021). Educational institutions and young people's engagement is at the forefront of achieving SDG 13.

Climate education which includes awareness, behavior change, and innovation is a key to tackling environmental issues. As reported by UNESCO (2021) which notes that putting climate change in the core of what we teach our

youth is to arm the next generation to become the agents of sustainability and climate resilience. In total we can say that SDG 13 is a critical piece which is to put together the global response to the climate crisis. It is a call for action from all players governments, corporate world, non-profits and individuals. Also, that which is put forth as an environmental issue is also a moral and development issue. Also, that which is related to the success of all other SDGs is what makes it a very basic element of progress for the world.

The emergence of block chain-based technology, a type of technology for financial services, promises reliable and open trading of carbon emissions, which strengthens responsibilities. Fintech fosters environmentally sound ways of making payments, which foster environmentally friendly buying habits. Fintech uses sophisticated analytics for data to offer conclusions about how different actions affect the natural environment, thus encouraging decision-making based on data. Smart contractual arrangements driven by technology like banking and blockchain technologies ensure the achievement of sustainability; desired outcomes are met and simplify eco-friendly contracts. In the context of strengthening communities that are marginalised, technological innovation's advancement of financial empowerment advances environmentally conscious behaviour while rendering it less difficult for greater numbers of individuals to get excited about in environmental projects. Technology related to finance is an effective driving force that helps accelerate our worldwide transition to a carbon-neutral future by merging economic services with environmentally conscious methods. Reducing the detrimental impacts of revenue growth on the

natural environment depends on effective administration. Better organisational efficiency has a beneficial dampening impact on the size of the implications linked with financial growth and the implementation of energy from renewable sources. Despite this, a successfully implemented environmentally friendly approach can make global economy be at point in its development, at which point the environmental consequences of commercial operations diminish. Only by putting protection of the environment at the forefront of productive legislative efforts has this achieved its objectives.

The international initiative towards achieving a future without carbon footprints has been driven by Sustainable Development Goal 13 (SDG 13). By encouraging nations, businesses, and their citizens towards all-encompassing climate action that emphasises minimising the emission of carbon dioxide emissions and mitigation of the adverse consequences of the changing climate, it plays a crucial role. SDG 13 calls for and acknowledges the critical role of worldwide cooperation and alliances in combating in opposition to the impacts of climate change. The approach considerably improves clean technology and mitigates emissions of greenhouse gases by placing emphasis on policies designed to encourage energy from renewable sources. SDG 13 additionally imposes considerable value on increasing consciousness while establishing the ability to encourage a shared consciousness of how critically important it is for people to adopt environmentally friendly practices. Financial mobilisation for climate change initiatives is an essential component due to the substantial funds essential to create infrastructure that is climate-resistant and convert to alternative sources of energy.

Along with helping to make certain that communities with limited resources are not particularly impacted, the goal additionally supports social justice in the switch to zero carbon and promotes commitment to climate action. By establishing thorough tracking and providing information on climate indicators, SDG 13 sets up an infrastructure for evaluating the successful implementation of climate policies. The way people communicate with our natural surroundings is profoundly changed by technological advancement, encompassing tasks like the preservation of resources, sustainable development observation, and market and buyer habits guidance. We can successfully deal prepare for the adverse consequences of climate change, and guarantee the overall health of the earth and future generations to come by using technological innovations ethically. The accomplishment of environmental responsibility will be profoundly affected by green fintech, or the implementation of environmentally conscious procedures in the banking and insurance industry. The effort to fight in opposition to climate change depends on green Fintech activities, which include the formation of environmentally conscious investment funds, the creation of environmentally conscious bonds, and the commencement of environmental risk insurance policies by large businesses. By its very existence, fintech delivers a more environmentally conscious possibility than the conventional banking system. The acronym for "environmental administration" defines the laws, plans, and institutions that govern the ways that individuals communicate with the natural environment.

SDG13's primary objective is to successfully deal with climate change challenges and their impact on humanity.

This contributes to water management difficulties, even worse, diminishes yields from agriculture and the availability of food, increases health risks, causes harm to essential infrastructure, and causes problems with the distribution of fundamental services. The current research, which is exceedingly important, concentrates on how technological advancement, fintech, SDG13, administration, and normalisation efforts communicate to accomplish conservation of the environment in the Persian economic systems. It investigates ongoing worldwide problems, such as rising carbon dioxide emissions and environmental degradation, through an examination of how ecological sustainability has been affected by improvements in technology and green laws. With a concentration on its constantly changing economy, this research project seeks to shed light on the chosen newly emerged economies' role in alleviating threats to the environment and moving towards a low-carbon, economically viable future.

2.2 SDG 13: Targets and Indicators

SDG 13 sets down five universal goals in order to achieve the goal of accomplishing right away measures that will mitigate climate change and its detrimental effects. Six national indicators have been established by the Ministry of Statistics and Programme Implementation (MoSPI) to appraise the advancement of India regarding successfully accomplishing Sustainable Development Goal 13 targets 13.1, 13.2, and 13.3.

Goal 13.1: Bolster each nation's ability to withstand natural disasters and climate-related threats.

13.1.1 The proportion of fatalities, reported missing persons, and people directly impacted by emergencies per 100,000 people.

13.1.2 The total number of nations that have national disaster risk mitigation strategies in line with the Sendai Framework for Disaster Risk Reduction.

13.1.3 The percentage of municipalities that use regional risk mitigation strategies and actually follow them.

Goal 13.2: National policies, plans, and programs should include climate change mitigation solutions.

13.2.1 Number of countries with long-term plans consistent with the Paris Agreement, change techniques and nationally determined contributions (NDCs).

13.2.2 The annual total of released greenhouse gases.

Goal 13.3: Boost capacity of institutions, knowledge, and public awareness regarding early detection of reduction of impact preparation and prevention of the impacts of climate change.

13.3.1 The extent to which syllabuses, teacher preparation, and assessments for pupils incorporate instruction on warming temperatures and environmental sustainability.

13.3.2 The total number of nations that have reported enhancing communal, comprehensive, and personal environmental advocacy building capacities.

Table 2.1: SDG 13 – Targets and Indian National Indicators

SDG 13: Climate Action& Target	Indian National Indicators
13.a Implement UNFCCC commitments on climate finance	<i>Not relevant in the Indian national context</i>
13.b Develop capabilities to implement successful climate-related planning and administration in developing countries	No specific national indicator listed
13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters	13.1.1 Fatality due to extreme weather events 13.1.2 Disaster preparedness
13.2 Integrate climate change measures into national policies, strategies, and planning	13.2.1 Proportion of renewable energy in total installed generation capacity 13.2.2 Disability-adjusted life year (DALY) rate due to air pollution
13.3 Improve education, awareness, and institutional capacity for climate mitigation, adaptation, impact reduction, and early warning	13.3.1 Mainstreaming (i) global citizenship education and (ii) education for sustainable development into: (a) national education policies, (b) curriculum, (c) teacher education, and (d) student assessment

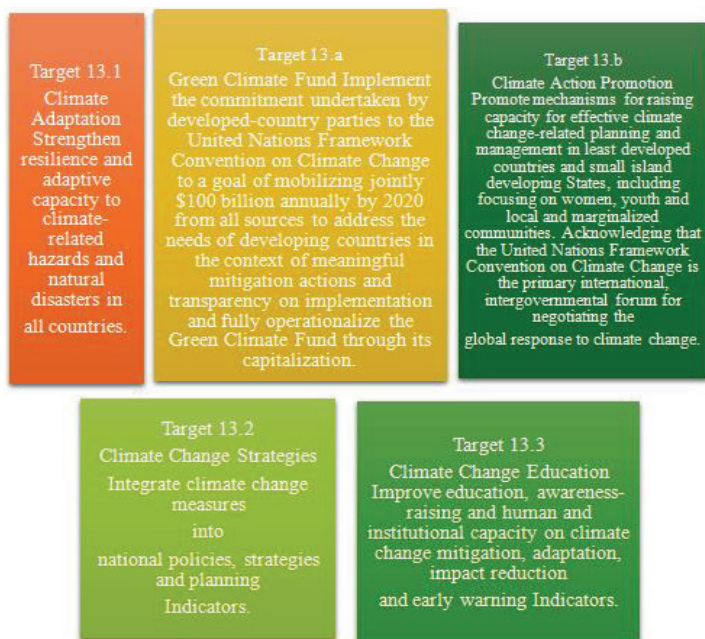
Goal 13.a: Execute the prosperous nations' pledge to raise \$100 billion a year by 2020 to operationalize the Green Climate Fund's operations and meet the needs of developing nations.

13.a.1 The annual amount of the financing of climate change raised for the \$100 billion commitment.

Goal 13.b: Encourage strategies to increase the ability of women, young people, and local communities for the purpose of organizing climate change in those countries that are least developed and small island developing states.

13.b.1 The number of islands in developing and least developed nations that receive specialized assistance for planning and managing climate change.

Figure2.2: Climate Action – Targets



2.3 Linkages of SDG 13 with Other SDGs

Sustainable development Goal is closely linked to many other sustainable development Goal because climate change effect human well-being, economic growth and environment balance. By reducing neglected communities will suffer from climate related casualty like dry spell, overflow, and extrema weather, climate related action put up to the achievement of Sustainable development Goal 1. Due to Farming the food supply and rural living are influence by climate change, it also contributes Sustainable development Goal 2. By dealing with climate risks and reducing pollution, climate action also improves public health and advances Sustainable Development Goal 3.

Additionally, climate initiatives that encourage the use of environmentally friendly and renewable energy sources aid to the achievement of SDG 7 and foster sustainable growth in industry, which is linked to Sustainable Development Goal 9. Addressing global warming is critical to creating resilient, lasting societies.

Table 2.2: Linkages of SDG 13 with Other SDGs

Integrating Climate Action with Other SDGs

SDG 13 interconnects with almost all other goals:

Related SDG	Connection with SDG 13
SDG 1 (No Poverty)	Vulnerable populations are dragged into poverty by climate shocks.
SDG 2 (Zero Hunger)	Crop yield and food security have been influenced by climate variability.
SDG 7 (Affordable and Clean Energy)	Emissions are minimised by shifting to sustainable energy.
SDG 11 (Sustainable Cities and Communities)	Resilient living is guaranteed by urban climate adaptability.
SDG 15 (Life on Land)	Carbon sequestration is made feasible by ecosystem preservation.

These initiatives also support Sustainable Development Goal 12. In addition to endangering biodiversity and ecological systems, preventing climate change is essential to achieving Sustainable Development Goals 14 and 15. To combat climate change, governments must cooperate, use the internet, and receive funding to different countries. This demonstrates the significance of Sustainable Development Goal 17.

Figure 2.3: Linkages of SDG 13 with Other SDGs



Thus, SDG 13 is an integrated goal which ensures sustainable development is carried out in an equitable way and aids in the advancement of numerous other SDGs. If proper actions have taken for the climate then this can enhance the productivity of the agriculture. Production of food grains increased can help to minimize the hunger. The quality of crops and modified crops can be improved to meet the quality standard of the required crops.

Chapter 3

Global Climate Governance and Action: Institutions and Agreements

3.1 Global Climate Change Scenario

There are multiple global issues which can be resolved by working on achieving 17 Sustainable development goals (SDGs). Countries are working hard together toward these 17 goals of economic growth, and environmental sustainability. By 2030, nations hope to have improved the world via concerted effort to make progress that benefits all people.

The Hunter Valley, Climate Change Floods and SDG

“Australia's State of New South Wales (NSW) encompasses the region of the Hunter Valley as a geographical region. The local government areas (LGAs) of Cessnock, Dungog, Lake Macquarie, Maitland, Mid-Coast, Muswellbrook, Newcastle, Port Stephens, Singleton, and the upper Hunter Region constitute the entire region”. The City of Liverpool, Newcastle, Hunter, and coastline separating Ranges indicate the flow of water territories, while the Sydney Basin and the Hunter-Mooki fault form the Valley's boundaries within it. It is slightly 210 km east-west and 230 km north-south long. “The Hunter River drainage area in the eastern region, the river systems of Manning and

Karuah in the northern part of the state, and Lake Macquarie and Hawkesbury-Nepean rivers, which represent the larger rivers that flow within these LGAs, make up the greater Hunter, which is located in NSW's largest coastline geographic region". The major mineral exploration and agriculture industries are more vulnerable to the adverse consequences of climate change.

Climate Change and Rising Flood Dangers in the Hunter Valley

"Since March 2020, an unprecedented triple tropical depression phenomenon has led to consecutive catastrophes and extreme rainfall occasions across the Hunter Valley in addition to the vast majority of the nation in general. The interaction of several distinct climate drivers, consisting of the La Nina phenomenon, Southern Annular Mode (SAM), Southern Oscillation Index (SOI), Indian Ocean Dipole (IOD) and anomalies in temperature in the marine environments close to the Australian continent, all bring about to these atmospheric trends and may be contributing to the configuration of East Coast Lows (ECLs), which are most frequently connected with in the possibility of flooding in the Hunter Valley. In conjunction with this, it seems that the frequency of extremes in rainfall has been rising, with Australian data demonstrating a boost in exceptionally high every hour and daily rainfall assessments, even though there is additionally a drop in the general highest points of infiltration, which corresponds to worldwide trends. The principles related to integrated vapour of water transports (IVTs) and atmospheric rivers (ARs) have additionally been implemented into the weather and environment vocabulary, and the probability of IVTs is being closely

researched for what they bring to weather, alongside the consequences of catastrophes.

Figure 3.1: Rising Flood Dangers in the Hunter Valley



"Source:https://www.abc.net.au/news/2023-07-05/hunter-valley-flooding-anniversary-rebuilding-damage-baby-romeo/102562742?utm_campaign=abc_news_web&utm_content=link&utm_medium=content_shared&utm_source=abc_news_web"

SDG Localisation Efforts in the Hunter Valley Locally

Hunter Valley authorities are commencing their journey of implementing the SDGs into their procedures and policies. Table listed below illustrates these conferences, as well as councils that are still grappling with implementing SDGs. There are nevertheless shortcomings in all of these methods. For example, Singleton Shire Council is carrying out initiatives aimed at certain SDGs but fails to incorporate

activities connected with SDG 13. Even though MidCoast Council's campaigns to take steps on SDG 13 mainly concentrate on reducing greenhouse gas emissions and streamlining utilisation of energy and do not encompass activities on decreasing catastrophe risk. With the objective to fully implement SDG 13, "Strengthen resilience and adaptive abilities to associated with climate catastrophic events," Cessnock, Lake Macquarie, and Newcastle Council will be concentrating on comprehension of local risks of disasters as well as encouraging homeowner preparedness and emergencies probability comprehension. These pieces of legislation however fail to offer precise recommendations for disastrous risks associated with actions to combat climate change. In conclusion but not least, the councils of Upper Hunter, Port Stephens, Dungog, Maitland, and Muswell brook have either avoided making those details accessible to everyone on their official web pages or have not formally integrated the SDGs into their strategic plans. This is not to demonstrate, of course, that such councils failed in their attempts to mitigate the risk of disasters while dealing with climate change. By way of example, even though not immediately connected to SDG 13, the Muswellbrook Community Strategic Plan presents techniques for hitting zero emissions of greenhouse gases.

The Environmental Management Policy summarises the fundamental concepts of "Ecologically Sustainable Development (ESD)", but Singleton Shire Council fails to encompass strategies for SDG 13 on addressing climate change. Since such councils are trying to incorporate developing resilience and climate change adaptation into the lives of their residents, it may be desirable to hyperlink these efforts to SDG 13, its targets, and its measurement

criteria for the reason community-level setting of priorities that localises SDG 13 can lead to measurable municipal climate actions. For references to locate the source documents from every website, searching with keywords for "SDGs, sustainable development goals, sustainability, climate action" was performed in the Council's document library collections. The press releases on each of the websites have been reviewed by applying similar terms.

Integration of SDG Strategies across Community Councils, along with a Particular Focus on Flood Risk Management and SDG 13 (Climate Action)

Council	In addition, is there an SDG Strategy or Policy?	Implementation of SDG 13: Climate Action	What's involved in Flood Risk Management?
Singleton Shire Council	Yes – <i>Singleton Sustainability Strategy 2019–2027</i>	No – Includes SDGs 7, 11, 12, 15 only	No
Cessnock City Council	Yes – <i>Community Strategic Plan</i>	Yes – References SDG 13; focuses on climate resilience	No – No benchmarks for flood-related climate actions
Dungog Shire Council	No	No	No
Lake Macquarie City Council	Yes – <i>Community Strategic Plan 2017–2027</i>	Yes – Includes climate preparedness actions	Yes – Flood studies and floodplain risk management, including climate predictions
Maitland City	No (Sustainability)	Not yet	No

Council	In addition, is there an SDG Strategy or Policy?	Implementation of SDG 13: Climate Action	What's involved in Flood Risk Management?
Council	plan expected 2023)		
City of Newcastle	Yes – <i>Community Strategic Plan</i>	Yes – Addresses SDG 13 via climate risk management and community preparedness	Yes – Integrated within climate risk management
Muswellbrook Shire Council	No	No	No
MidCoast Council	Yes – <i>Climate Change Strategy</i>	Yes – Strong SDG 13 alignment (emissions reduction, energy efficiency)	No – Does not include actions for Target 13.1
Port Stephens Council	No	No	No
Upper Hunter Shire Council	No	No	No

3.2 International Climate Change

Worldwide temperatures at the surface were somewhat predictable before 1850. Accelerated growth in manufacturing after 1850 contributed to greenhouse gas (GHG) emissions, which boosted international temperature levels at the surface. The highest temperature years, according to the World Meteorological Organisation, were 2015–2022 (WMO, 2022). The present-day surface temperature of the planet is 1.14° Celsius warmer than it was before the beginning of the industrial age. In order to

avoid the disastrous consequences of climate change, researchers and government officials are making attempts to keep global warming to 1.5°C. Nevertheless, the challenges posed by warming temperatures have become more readily apparent in the last few decades (ibid.). Compared with 100 related to climate change, natural catastrophes were recorded annually in 1970, but by 2021, the number had risen to over 300 (International Disaster Database 2022). Extreme weather circumstances such as extreme temperatures, hurricanes, droughts, heavy rainfall, flooding, and wildfires are becoming increasingly frequent around the globe. Extreme weather circumstances include the disastrous flood in Pakistan in 2022. Approximately 33 million individuals were impacted by the water crisis, over 2.2 million homes suffered harm or were ruined, and about 1700 people lost their lives because of it. Due to the powerful monsoon rainfall, the flooding got underway in mid-June 2022 and continued until November, forcing more than 15% of the population of the nation to relocate (UNICEF 2023). Every single person experiences equal harm from climate-induced catastrophic events. Impoverished neighbourhoods are more seriously disadvantaged than those who belong to the political and financial elite, and youngsters are disadvantaged more than older individuals (Ibid.). The financial consequences linked to climate change have increased nearly sevenfold over the past 50 years, irrespective of the fact that the average number of individuals killed from catastrophes caused by nature has been decreasing over time as a result of warning systems for emergencies (World Meteorological Organisation 2021; World Bank 2023).

Since 1880, the sea level around the world has risen by 8 to 9 inches annually on average. The precipitous rise in economic damage is a sign of how environmental degradation continues to have a growing, detrimental impact on our social and environmental well-being. The increase in sea levels has been caused by high pollution from greenhouse gases, the rapid deposition of polar ice sheets and glaciers, and the rapid expansion in temperature of water in the ocean since the 1870s. The worldwide sea level increased by a record-extending 3.8 inches in 2021, far exceeding 1993 levels (Ibid.). The worldwide average sea level would rise by no more than 0.3 meters, or 1 foot, above 2000 levels by 2100, according to NOAA (2022); even the emission of greenhouse gases would proceed on a lower trajectory. An increase in sea levels has become an increasing danger to urban centres along the worldwide seacoasts increase in levels of seawater are an immediate danger to ecosystems along the coast because it may devastate marine life's habitat in its natural state, cause coastal erosion, destroy residential neighbourhoods and livelihoods, and contaminate aquifers that contain freshwater. Destructive tropical storms can now move farther inland simply because of rising sea levels (Ibid.). Catastrophic breakdown of infrastructure and persistent impoverishment are two consequences of the changing climate.

According to estimates, 132 million people will live in impoverished circumstances by 2030 as the outcome of low worker productivity and inadequate nutrition brought on by climate change. The degrading of at least a hundred million acres of land used for agriculture annually between 2015 and 2019 experienced a negative effect on the supply

of food on an international basis (UN SDG Report 2023). Deterioration of land accelerated with greater velocity in certain geographical areas than other regions, which included Africa north of the Sahara, Western Asia, Latin America, and Southern Asia (Ibid.). More than 200 million individuals will be compelled to move within the nations they represent due to a lack of easily accessible and economically viable resources (World Bank 2021). Several environmental hazards are expected to develop immediately in the future, raising the general threat to human societies and the environment, according to the sixth Assessment Report of the IPCC (2022), which estimates the outcomes and hazards related to climate change on an international basis. Based on varying levels of greenhouse gas emissions over a number of generations, the risks have been determined for three distinct periods of time: near term (2021–2040), midterm (2041–2060), along with the long term (2081–2100). In addition, by specialising on "other than climate-related international trends" such as unsustainable use of resources from the earth, fast urbanisation, inequality in socioeconomic status, biodiversity loss, and degradation of the environment, the assessment explores the interdependent nature of these risks (IPCC 2022, p. 5).

3.3 United Nations Framework Convention on Climate Change

The UNFCCC's Convention of States Parties (COPs) is a determining body that examines the nation-specific assessments of emissions and their advancement on mitigating the impact of climate change (UNDP). About 200 different nations took part in the 2021 edition of COP26, which happened in the Scottish city of Glasgow. In

cooperation with Italy, the United Kingdom hosted and executed it. Prior to accepting hosting COP26, the UK adopted the following goals (The National Archives, UK 2021):

1. By gradually phase out coal, preventing forests being cut down, promoting the use of battery-powered cars, and putting money into alternative sources of energy, we can accomplish a worldwide net zero by the halfway point of the century's middle and stay within 1.5° C. Worldwide carbon emissions must be cut by 45% by 2030 for the world to attain that objective.
2. By maintaining and restoring landscapes, developing early alert systems, and developing resilient buildings and structures, you can adapt to protecting neighbourhoods and ecological systems while minimising damage to property and accidental deaths.

Figure 3.2: United Nations Framework Convention on Climate Change



Source: <https://www.climate-chance.org/en/comprehend/blog-observatory-global/unfccc-recognition-accountability-framework/>

3. With the convergence of advanced economies and global financial institutions, we can raise at least \$100 billion USD in finance for climate change annually.
4. Governments, corporations, and community groups must collaborate to hurry up climate action.

Technology like the utility of satellite navigation is a very important capacity when faced with instances of limited water by furnishing timely information to acknowledge the keys like rainfall, transpiration of water, moisture levels in the soil, and the general wellness of the greenery. While conventional sole parameter indicators such as the standardised precipitation index (SPI), Normalised Difference Vegetation Index (NDVI), etc., have been in use, their constraint gave rise to the development of composite indices which present the complete alert by combining various sources of data through new weighting techniques. In addition, predicting the process of a precipitation deficit spreading through the environment and causing progressively more severe impacts on crops and vegetation. Numerous regions of the world, like the U.S. Drought Monitor, the South Asia Drought Monitoring System, etc., examine various universal agricultural dry spells and provide advanced notice. India also executes its own dry spell monitoring and a declaration system that utilises scientifically based parameters and a decision tree approach. Although India still misses its well-made agricultural dry shell prediction system, fit to its specified needs for various regions. Demonstrating one example of such a system is critical to offering prompt notifications and holding up its administration plan.

3.4 Kyoto Protocol

The Kyoto Protocol: A Global Framework for Climate Action

“The Kyoto Protocol is a historic international environmental treaty designed under the United Nations Framework Convention on Climate Change (UNFCCC). The Protocol, adopted on 11 December 1997 in Kyoto, Japan, and which entered into force on 16 February 2005, is one of the first legally binding global efforts to reduce climate change”. Today, nearly every country in the world has ratified it to show their commitment to environmental sustainability. The Kyoto Protocol aims primarily to control greenhouse gas (GHG) emissions that induce global warming. While the UNFCCC called for voluntary action, only binding emission reduction targets were set out in the Kyoto Protocol, which applied to developed countries. Kyoto Protocol was one of the first legal measures to try to tackle climate change on a global scale by requiring countries reduce their emissions of greenhouse gases. In recognition of the fact that historically industrialized countries have been responsible for most emissions, the protocol imposed legally binding targets on developed countries for emissions reductions. These countries came to a collective agreement to reduce greenhouse gas emissions by around 5% below 1990 levels during the first commitment period (2008-2012). The agreement's innovative mechanisms helped countries to meet their goals at less cost: emissions trading, Clean Development Mechanism (CDM), and Joint Implementation (JI). These helped countries to invest in emission-reduction projects in other nations. As a result, they received carbon credits. The Kyoto Protocol was an international convention to combat

global climate change. It aimed at reducing national greenhouse gas (GHG) emissions by a certain percentage from 2008 to 2012. The Protocol was built on the success of the United Nations Framework Convention on Climate Change (UNFCCC)—a treaty adopted in 1995 in Berlin that set an overall framework for intergovernmental efforts to tackle global warming. The Kyoto Protocol also set up a system of monitoring, reporting, and verification so as to ensure transparency and accountability. It was an important step in global climate governance history, yet due to its limited power, not all the big greenhouse gas-generating countries were able to take part, or they stepped out.

Figure 3.3: Kyoto Protocol



Core Principles and Structure

At its base, the Kyoto Protocol is built upon shared but differential obligations and capacities (CBDR-RC). Likewise, this is why the legally binding obligations to reduce emissions are only placed on developed and

transition economies under the terms of the Protocol with no obligatory form for developing capital flow reducers.

The deal is basically an annex that classifies countries by a three-tier level of development and responsibilities (a developing, semi-developing group ratio). Emission reduction commitments from those developed nations that participate are specified in Annex B.

Emission Reduction Targets

The Kyoto Protocol contains a uniquely defined system of quantified emission limitation and reduction commitments.

- In the first commitment period (2008–2012), signatory nations promised to decrease their combined emissions by 5% from what they were in 1990.
- The Protocol, first applied to 37 industrialized nations and the European Union of that time, binds each nation separately on a basis set by their economic states v. historical emissions output.

These targets were the first legally binding international limits on greenhouse gas emissions.

Doha Amendment and Second Commitment Period

In 2012, the Doha Amendment was passed in order to extend climate action globally. To this end, the amendment set a second commitment period (2013–2020), with stronger targets.

- In that timeframe, nations vowed to lower emissions by a minimum of 18% compared with the mid-1990s baseline.

- This amendment also repealed the category of greenhouse gases as well as amended other articles from the protocol.

Following the necessary number of ratifications, the Doha Amendment came into force on 31 December 2020.

Flexible Market Mechanisms

The Kyoto Protocol is notable for the provision of market-oriented mechanisms, which are intended to decrease the cost of meeting emissions reduction targets and facilitate international collaboration. These include:

- **International Emissions Trading (IET)**
Emission allowances can be traded; one country offloads 'spare' credits to others that may have overshot their targets.
- **Clean Development Mechanism (CDM)**
Wealthy nations can fund emissions-reduction efforts in poorer countries and receive credit for these reductions.
- **Joint Implementation (JI)**
This will enable developed countries to work together towards the emission-reduction projects and trade off credits earned.

They incentivize the cheapest mitigation pathways and stimulate technology investments – particularly in developing markets.

Monitoring, Reporting, and Compliance

Kyoto then set up a powerful system for adherence to standards and reporting standards. Some of the most important parts are the following:

- Monitoring systems to monitor actual emissions
- National reporting requirements such as annual emissions inventories
- Transaction records across borders to validate outsourcing emissions
- Mechanisms for compliance to ensure that countries uphold their commitments

This is an internationally recognized framework where emission reductions are measurable and verifiable at that level.

Adaptation and Financial Mechanisms

We have also seen the Kyoto Protocol, which is referred to as climate adaptation with mitigation. It helps in managing the adverse impacts of climate change to developing countries with technology and financial support. The Adaptation Fund is familiar to those who work with initiatives under the Protocol and includes a broad spectrum of climate-resilient projects in vulnerable countries. The fund was originally funded with funds from CDM projects, but emissions trading and joint implementation revenues were added later.

Significance and Legacy

When the Kyoto Protocol was adopted, it marked a milestone in global environmental governance everywhere. It transformed over-climate commitments from voluntary pledges into binding obligations and created new avenues for international cooperation. The Protocol, however, laid important groundwork for subsequent agreements like the Paris Agreement, which broadened climate commitments beyond just wealthy countries to also penalize poor ones. In

summary, the Kyoto Protocol has come to signal a blanket shift in global climate governance. It created a major shift in global environmental policy by setting legally binding targets for emissions reductions, promoting market-based approaches to address the climate change, and facilitating adaptation. It even influences contemporary climate deals and global sustainability.

The Doha Amendment to the Kyoto Protocol

Introduction

“The Doha Amendment is a big step forward in how the world deals with climate change. It is part of the ongoing worldwide effort to combat climate change under the Kyoto Protocol, one of the first legally enforceable commitments to cut the release of greenhouse gases”.

“The amendment was adopted on 8 December 2012 during the 8th session of the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol (CMP 8) held in Doha, Qatar”.

Its primary objective was to establish a second commitment period for emission reduction after the first phase of the Kyoto Protocol ended in 2012.

Background of the Doha Amendment

The Doha Amendment effectively established a second commitment period from 1 January, 2013, until the end of December, 2020, to cover what would otherwise be an emissions gap.

Second Commitment Period

It set an 8-year pledge period (2013-2020) during which countries had to participate.

Emission Reduction Targets

- During this period, developed countries (Annex 1) made commitments for emissions to be reduced by at least 18% compared with 1990 levels.
- Targets were to be largely aimed at developed countries and economies in transition.

Continuation of Kyoto Mechanisms

The amendments kept key arrangements such as the following:

- Emissions Trading
- Clean Development Mechanism (CDM)
- Joint Implementation
- Such mechanisms enable countries to enjoy cost-effective access to targets.

Strengthening Climate Action

It reinforced international collaboration and called on nations to ramp up ambition, even reviewing targets over time.

Adoption and Legal Process

The Doha Amendment went through the formal international treaty process:

- Adopted pursuant to Articles 20 and 21 of the Kyoto Protocol
- Required acceptance (ratification) by countries

- Required acceptance by three-fourths of the Parties (144 countries) to take effect.

Entry into Force

- Required threshold: 144 countries
- Achieved: 148 countries accepted
- Entry into force: 31 December 2020

This was the point in time when the second commitment period really started.

Significance of the Doha Amendment

Continuity in Climate Governance

This change made sure that all of the world's climate dedication were linked to each other without any gaps, which helped keep the forward motion of emission reduction pledges going.

Strengthening Multilateral Cooperation

This indicated that the world was determined to fight climate change by working together.

Precursor to the Paris Agreement

The Doha Amendment linked the Kyoto Protocol and the Paris Agreement, and that kept things from happening prior to 2020.

Support for Developing Countries

It was meant to help countries that are developing that desperately require it, like those that are most affected by climate change.

Limitations and Criticism

Even if it is a significant matter, some criticisms were made against the Doha Amendment:

- Limited participation by major emitters
- Targets deemed insufficient to achieve global climate 2023 goals
- Delayed ratification slowed implementation.

Members and Joint Commitments under the Doha Amendment

Members of the Agreement

Under the Doha Amendment, a joint negotiating group was established—called the "joint agreement" group (which includes states from within or associated with two parties), namely, the EU & its member states & Iceland. Moreover, all these entities are also Parties to the Kyoto Protocol.

European Union Member States

“At the time of the agreement, the EU consisted of the following countries:

- Belgium
- Bulgaria
- Czech Republic
- Denmark
- Germany
- Estonia
- Ireland
- Greece
- Spain
- France
- Croatia

- Italy
- Cyprus
- Latvia
- Lithuania
- Luxembourg
- Hungary
- Malta
- Netherlands
- Austria
- Poland
- Portugal
- Romania
- Slovenia
- Slovakia
- Finland
- Sweden
- United Kingdom”

Joint Fulfilment of Commitments

Under Article 4 of the Kyoto Protocol, these members committed to jointly achieve their emission reduction targets during commitment period two (2013–2020).

Collective Emission Responsibility

- The members collectively ensure that:
- Your total greenhouse gas emissions must be less than a designated threshold.
- Emissions in (carbon dioxide equivalent, CO₂e).

It discusses the treatment of aviation and shipping emissions.

Treatment of Aviation and Shipping Emissions

- This includes only emissions from domestic aviation and shipping.
- There are no international emissions, as there is agreement on the globe.

3.5 Paris Agreement

“The Paris Agreement is an international climate agreement adopted in 2015 at the United Nations Climate Change Conference (COP21) in Paris, France”. It was designed to add formal steps of action at climate summit talks, setting renewed majority view agreements and under “the United Nations Framework Convention on Climate Change”. The Paris Agreement is a historical global commitment to battle climate change and mitigate its effects through joint international efforts. Unlike other climate treaties in the world, this hands-on combined approach almost brings all the parties together. “The main goal of the agreement is to keep the global average temperature rise well below 2 °C above pre-industrial levels and to pursue efforts to limit the increase to 1.5°C”. The system of Nationally Determined Contributions (NDCs), a key element in the Paris Agreement, has each country establish their own climate targets and action programs for reducing emissions as well as adapting to climate impacts. Countries must revise strong and repeat these commitments continuously as time goes by ensuring that they are always. Developed countries have an obligation to provide financial support, expertise and technology for developing countries so they can move towards low-carbon development paths and become more climate-resilient in their future growth.

Introduction to the Intergovernmental Panel on Climate Change

“The United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) established the Intergovernmental Panel on Climate Change (IPCC) as an international scientific body in 1988”. The main aim of this group is to assess scientific information related to climatic change, its effects, potential future risks and how we might respond.

Figure 3.4: Intergovernmental Panel on Climate Change (IPCC)



The IPCC plays a crucial role in providing regular scientific assessments for decision-makers on this vital issue. Instead of conducting its own research, it reviews and evaluates thousands of scientific studies from around the world. The result is that it produces comprehensive assessment reports that summarize all knowledge up until then about climate science, trends in climate impact, and carbon mitigation strategies. Through these reports, governments can understand why and therefore what the effect of climate change may be. This greatly affects the development of international policies and agreements on climate change.

The IPCC is generally accepted as the world's most prestigious authority on climate science. As well as its main work of research into climate change and report writing, it is divided into three areas which consist of pure science on changing weather patterns, impacts and adaptation of changing weather patterns, and finally policies and procedures by which we might change this farrago.

3.6 Global Impact of Climate Action

Increased temperatures, unpredictable weather, diminished biodiversity, and inadequate nutrition are all indicative of climate change. Without substantial downfalls in emissions, the UN Intergovernmental Panel on Climate Change (IPCC) points out it global warming could rise above critical limits in a matter of decades.

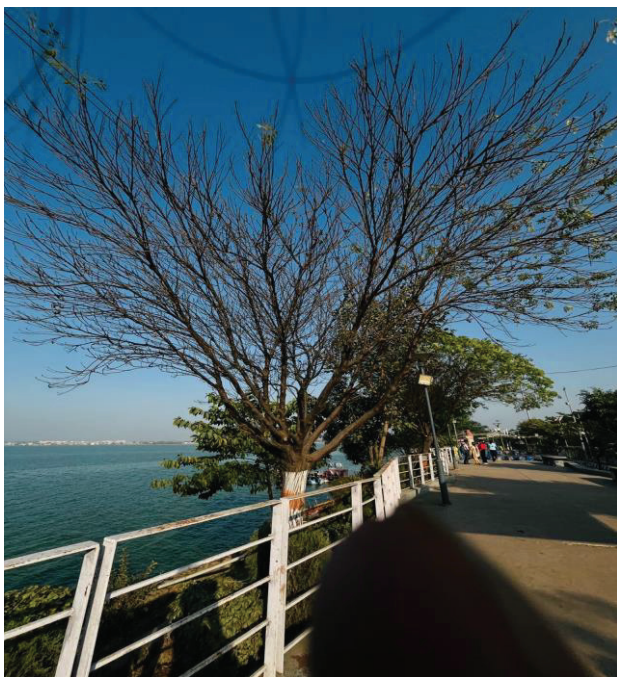
1. Sea levels are increasing as a consequence of thawing polar ice caps and glaciers, hazardous coastal environment.
2. Water supplies and agriculture have been negatively impacted by an upsurge in the occurrence of floods and droughts.
3. Coral reefs and aquatic creatures are being endangered by the acidification of the seafloor. Socio-economic Impacts
4. For the reason that they have inadequate ability for adaptation, nations that are developing have become more dependent on vulnerability.
5. Health outcomes, food systems, and labour productivity are all influenced by excessive heat.
6. More socio-political tensions are triggered by migration brought on by climate change.

- Global GHG emissions set a new record in 2023 (approximately 57.1 GtCO₂e), and despite ambition and fulfilment drastically increasing, projected warming under current legislation and NDCs remains well above the 1.5°C target. The UNEP Emissions Gap Report 2024 underscores how urgent and significant further mitigation is.
- Multiple countries have submitted more ambitious NDCs. Analyses illustrate a quantifiable implementation gap: enacted measures and policy coverage fall short of what is needed to meet both unconditional and conditional NDC commitments for 2030. This gap is acknowledged in the UNFCCC NDC synthesis and recent assessments, which point out the urgent need for heightened policy delivery at the national and sub-national levels.
- The adaptation process lacks trustworthy monitoring systems and globally recognised indicators, in contrast to mitigation (where emissions are quantified). Weak M&E systems for adaptation have been criticised in technical papers and reviews (UNFCCC guidance, academic assessments), which call for standardised, contextually appropriate indicators.
- In spite of pledges and approvals from developed nations and multilateral funds (like the GCF) that have increased overall finance flows, allocation of mitigation and adaptation funds, certainty, and accessibility to local resources are still insufficient in comparison to needs, in particular for LDCs and SIDS. Progress may have been made, but there has also been volatility and unequal access, according to data from the OECD, GCF, and media.

- Several pilot projects are beneficial locally, but there are few scalable pathways and thorough long-term consequences assessments. In the literature from 2024–2025, new frameworks (like SCALE up) and demands for longitudinal impact evaluation are becoming more prevalent.

Complexity in government as well as time lag: It takes time and coordination among ministries, municipalities, and private actors to turn diplomatic pledges (NDCs) into national laws, budgets, and projects. This translation gets slowed down via limitations on capacity, especially in LDCs/SIDS. Finance + delivery mismatch: Due to transaction costs, co-financing requirements, and complex application procedures, aggregate finance pledges might rise while the quantity of funds that goes to implementers (local governments, community organizations) remains small. In contrast to adaptation (measured in resilience outcomes), mitigation is easier to measure (measured in tonnes of CO₂e). As a result, adaptation is inadequately funded and does not have sufficient proof, all while mitigation is held more accountable. In contrast to adaptation (measured in resilience outcomes), mitigation is easier to measure (measured in tonnes of CO₂e). As a result, adaptation is lacking in funding and does not have sufficient proof, while mitigation is held more accountable making sure that there are now distinct lines of duties and budget commitments at the national and sub-national levels, as well as enhancing the MRV and enforcement mechanisms for NDCs. Make climate finance simpler to obtain and more readily available:

Figure 3.5: Global Impact of Climate Action



Donors and multilateral funds need to make it simpler to get funds, ease rigid funding requirements for SIDS and LDCs, provide preference to grants, and support locally led, adaptation-focused initiatives. Advance adaptation measurement and evidence-building: To shift adaptation from project anecdotes to solid proof, invest in standardised—but flexible—adaptation indicators, mixed methods (remote sensing + community monitoring), and longitudinal impact evaluations. Invest funds in standardised but versatile adaptation indicators, a number of methods (such as community monitoring and remote sensing), and long-term effects assessments with the goal of transforming adaptation from project narratives to solid

proof. Promote integrated planning to manage trade-offs: Find trade-offs and synergies (like energy vs. land) through integrating SDG co-benefit analyses into national development plans and NDC updates by means of the use of systems models and spatial planning. Emphasise just and equitable transitions: participatory governance so that transitions are politically feasible and socially inclusive. In order to make transitions socially inclusive and politically feasible, policies ought to combine mitigation/adaptation with social protection, retraining, and participatory governance.

Climate Action Inequality and Human Vulnerability

Current social and economic disparities have been exacerbated by climate change. Disproportionate effects: Extreme weather, droughts, and food insecurity disproportionately affect poor, isolated, and indigenous communities, who comprise the smallest portion of worldwide carbon emissions. Concern for climate justice: The global demand for "climate justice," which promotes equal treatment in both obligations and results, is a result of unequal danger exposure and remodelling capacity. For example, smallholder farmers in South Asia and Sub-Saharan Africa are experiencing an increase in crop losses and displacement, whereas wealthy countries are better equipped to adapt. Health and Well-being Direct effects: Millions of lives are at risk due to the rise in extreme temperatures, air pollution, and diseases transmitted by insects like dengue and malaria. Indirect effects: dehydration, food and water insecurity, and mental health disorders like "eco anxiety" and post-disaster trauma are all manifestations of climate stress. Healthcare systems: There is pressure on developing nations to improve their

infrastructure and healthcare systems to be more climates resilient. Migration and Displacement: Displacement imposed by warming temperatures is getting worse because of catastrophic events, expanding deserts, and surges in sea levels. Without substantial action, the World Bank anticipates that over 200 million individuals around the globe may become climate migrants by 2050.

Goals and Targets Sustainable Development Goal 13 (SDG 13) aim to address climate change and take immediate action to solve it. It's analysed that climate change is not just an atmosphere issue but an important warning of a sustainable development, prudential value and cosmic stability. Rise in global temperature, rapid changes in weather, rise in sea level, and species loss reflect a climate emergency that affects all actions. SDG13 thus look to combine climate action into every detail of setting guidelines and creating a detailed strategy. The goal closely aligns with the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement (2015), which combine to form international climate governance.

To make in action these objectives, SDG 13 highlights five main targets (13.1- 13.b) which lead global and national efforts: Target: build up flexibility and a versatile range to natural disasters and climate-related risks This goal highlights the privilege of developing flexibility- the capability of groups, environment, and finance, commerce, and political economy that cope with and recover from climate-related disasters. Flexible - building involves combining disaster risk reduction (DRR) into nationwide and localised approaches. Developing early warning systems and enhancing emergency response mechanisms.

Countries are motivated to accept climate-flexibility infrastructure, protect negative environments like mangroves and wetlands, and improve water and agricultural management practices to resist drought, cyclones and floods. For example, national frameworks like the Sendai Framework for Disaster Risk Reduction (2015-2030), promote SDG13 by highlighting awareness and flexibility. By nourishing flexible capacity, societies can reduce vulnerability, safeguard livelihoods, and decelerate economic losses from climate disasters. Target: combining measures of utilising climate change in national planning, legislation, and techniques. This target calls to render mainstreaming consideration of climate change in every level of public law and planning development. It includes implementing climate objectives into national development agendas, regional policies (like energy, transport, agriculture, and health), and financial processes. The goal is to make sure that climate reduction (minimise the discharge of greenhouse gases) and adaptation (adjusting to climate impacts) are not considered as remote issues but instead treated as the main components of sustainable development. For example, many countries have undertaken Nationally Determined Contributions (NDCs) under the Paris Agreement, which highlight the specific measures and aims to decrease emissions and intensify flexibility. In India, the National Action Plan on Climate Change (NAPCC) and state-level climate action plans represent this inclusion, a focus in on environmentally friendly growth, conservation of energy, and clean energy use of land. Such actions make sure that climate policies are standardised and executed through long-term national strategies. Target: enhance learning, consciousness raising, human and organisational

capability, on climate change, lightning and habituation. This target centres on the learning strength of climate action. It was analysed that informed citizens, skilled professionals, and capable institutions are required to achieve relevant changes. Education systems should comprise climate learning, which helps people understand the impact, causes and solutions related to climate change. Populations can be empowered to embrace beneficial environmental behaviours like waste elimination, energy conservation, and sustainable consumption by enhancing the public's understanding. To implement adaptation and mitigation projects, institutions make sure that capable building like local government, NGOs, and community organisations, are equipped with the skills and resources. The UNESCO Global Action Programme on Education for Sustainable Development (ESD) supports this target by promoting climate education and environmental awareness worldwide.

Chapter 4

SDG 13 Climate Change in India: Trends, Impacts, and Policy Responses

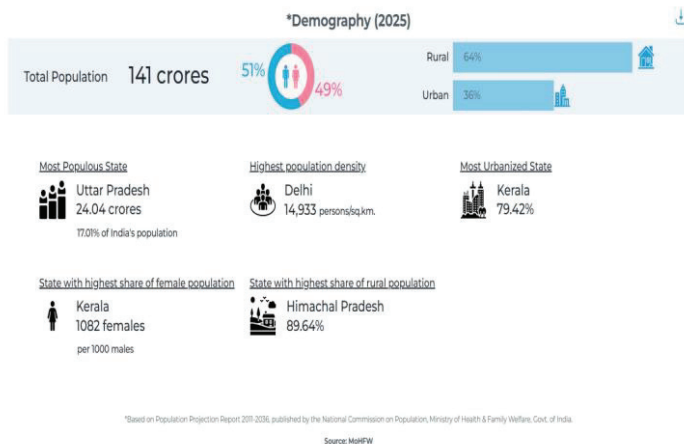
4.1 Climate Change Vulnerability in India

India contributes around 8% of global biodiversity--and this may be even more. The country is making a substantial contribution toward maintaining global ecological Balance. India ranks 10th in terms of bird endemism with about 69 endemic species, 5th in reptiles and 156 endemic species and 7th in amphibians: there are nearly 110 endemic Indian species. The data come from bodies such as the Malinowski Institute and Environmental Protection Bureau of Wildlife Protection's Ministry. Overall, such information makes one aware of how rich India is in terms of life and also led to the conservation of these biodiversity hot-spots will protect unique species as well as maintain ecological Balance. This infographic, the source of which is the Ministry of Health and the Family Welfare (MoHFW), gives a panoramic picture of India's 2025 demographic development. The information was all derived from the official report of the National Commission on Population "Population Projection Report 2011-2036". On the level of macro population, India's whole proportion has been said to reach 141 crores. As the graphic shows, there are more men than women—the male population accounts for 51% (shown in blue), and

the female population accounts for 49% (shown in pink) in this example of a pie chart that illustrates this aspect of its contents. Anticipation over time: A central donut chart illustrates gender distribution. Low bars easily show that India is still heavily dependent on agriculture. In narrow reaches of land like those all around you, two-thirds of the population, or 72%, remain; only 28% live in the cities (seen by modern building icons).

The second half of the picture highlights sharp demographic contrasts only with specific icons showing different trends for various states and union territories. Uttar Pradesh is the most populous state, at an estimated 24.04 crore people, constituting 17.01% of India's total projected population. Delhi has the highest population density in Asia, only slightly closely followed but still a poor second at 14,933 persons per square kilometer. Kerala is the most urbanized state, with 79.42% of its residents living in cities and towns. Himachal Pradesh has a higher share of rural people (89.64%) than anywhere else in India. Keyla achieves a positive sex ratio of 1082 females for every 1000 males, which is far higher than the national average.

Figure 4.1: Projected Demographic Overview of India (2025)

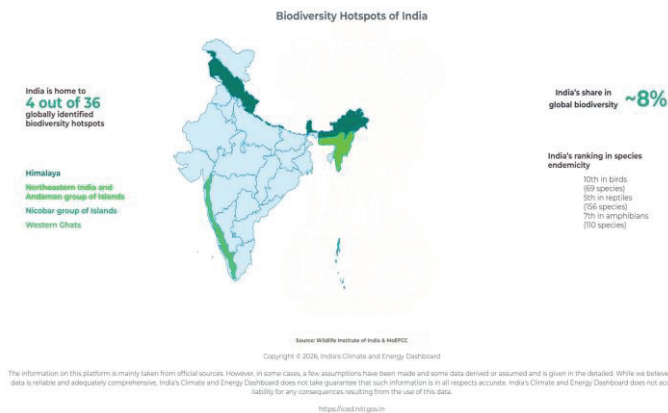


In the map "Biodiversity Hotspots of India", these regions are recognized worldwide for their unparalleled natural variety and high proportions of endemic species.

India is home to four of the 36 world's biodiversity hotspots, the Himalaya as well as Indo-Burma Biodiversity Hotspot (incorporating Northeastern India and Andaman Islands), Sundaland Biodiversity Hotspot (in India represented by the Nicobar Islands), and Western Ghats.

These areas have rich ecosystems, unique animals and plants, and a lot of living things found nowhere else on Earth. The map serves to provide a clear representation of these areas throughout India, illustrating their ecological importance and value from a conservation perspective.

Figure 4.2: Biodiversity Hotspots of India



A few of the biggest environmental problems that confront every nation worldwide is the impact of climate change, and these continue to have an extensive impact on the systems of nature as well as humanity. The phenomenon of worldwide climate change is correlated with change in precipitation patterns, altered water resources accessibility and melting glaciers decreasing in numerous areas of the world. Freshwater, terrestrial, marine, and freshwater species are additionally being affected by climate change, as they are coming to terms with what is happening through modifications to their seasonal operations, migration patterns, and geographic distribution (IPCC 2014). The General Assembly of the United Nations announced its 17 Sustainable Development Goals (SDGs) during the year 2016 as part of an international effort that seeks to eliminate poverty, safeguard the environment, and guarantee economic security for every individual by 2030. SDG 13 tackles the problem regarding climate change out of these 17 objectives. SDG 13's subgoals encompass: improving all countries' capacities to adapt to climate

changes that cause challenges and natural catastrophes; implementing climate change prevention measures into national policies; enhancing public and institutional knowledge concerning prevention, mitigation, adaptation, and mitigation and adaptation strategies; and advocating for effective preparation for and handling of problems associated with climate change in countries with fewer resources that prioritise women, youth, local communities, and marginalised populations (United Nations 2015). Using substantial national and international financial backing, these kinds of development campaigns should be undertaken in an environmentally conscious manner (United Nations 2015). India's environmental legislation theory has switched from one of structural instability to one of underlying liberal regulation. Over time, India's method for handling climate policy has altered. The country was operating in an ideological confrontation mode at the beginning of its history, as illustrated by its staunch detractors to internationally coordinated climate conference discussions and action. This lack of agreement illustrates that Indian diplomats seemed fiercely centred around domestic demands and hesitated to give in to unreasonable demands from overseas supporters to alter their positions. This shift in behaviour illustrates India's preparedness to readily adjust to climate change on its own time frame, while assuring that its intended objectives for sustainable growth were not negatively impacted.

Beginning in the 1990s until 2007, India reached agreements on climate change by applying an ecological conflict mitigation method of negotiation. India and other nations with poor infrastructure argued in the very beginning stages of the sustainability talks that nations with advanced

economies were obliged to encourage struggling territories and acknowledge wholehearted accountability for previous greenhouse gas emissions. This was established on the assumption that underdeveloped nations' emissions nonetheless remained relatively low and that advanced economies were principally to be held accountable for worldwide greenhouse gas emissions. More importantly, they were required to mature according to social and developmental prerequisites for development.

Figure 4.3: Climate Change Vulnerability in India



India resisted extensive locally caused climate changes in spite of constant encouragement brought about by industrialised countries. As an illustration, economically disadvantaged countries were encouraged to hand over responsibility for future Dioxide in the atmosphere during the period of the Kyoto Protocol's period of implementation (1997–2005), but members of the G77 and China strongly

refrained from this. Indian negotiation teams adopted suggestions concentrated on equity and fairness throughout worldwide climate exchanges, which called for nations with advanced economies to contribute to a large portion of the financial costs of dealing with climate change and helping those in developing countries in their endeavours to do the similar things. India had the opportunity to create a ripple effect on the central tenets of the UNFCCC and its enforcement mechanisms.

Indigenous attitudes towards climate action have been influenced by certain global developments. Since 2007, India's involvement towards international climate talks has undergone changes. Comprehensive engagement with and backing for environmentally friendly efforts has been caused by the shift in the climate policy conceptual framework towards an incorporated liberal order. The nation showcased its intention to use its own financial assets to make noteworthy climate improvements. Indian Territory may be particularly affected by the detrimental consequences of warming temperatures due to its unique geographic characteristics. Median temperature in India increased by 0.7°C throughout 1901 and 2018. The surface water temperatures of the Indian Ocean also increased by 1° Celsius throughout 1951 and 2015 (The Tribune 2020; India Today 2022). In 2022, the standard seasonal global temperature was around 1.15° Celsius higher than the previous industrial level. According to the World Meteorological Organization (WMO), temperatures increased by no more than 1° Celsius over before-industrial temperatures since 2022 for the eighth year in a row (from 2015 to 2022) (WMO 2023). In addition, 2022 was India's fourth warmest instance since meteorological tracking

started in 1901. When in relation to the usual time, March and April 2022 saw an extraordinary surge of accumulation in India, affecting the western Himalayan Mountains, the northern Punjab and Haryana southern plains, Delhi, Rajasthan, and Uttar Pradesh. Several states, including Odisha, Madhya Pradesh, Gujarat, Chhattisgarh, Telangana, and Jharkhand, had catastrophic thunderstorms during the end of March with temperatures ranging from 40° to 44° Celsius. These blistering temperatures lasted till the end of April, affecting over 70% of India.

By the end of April, scorching temperatures also hit the eastern and the coastal areas of India. In India, severe thunderstorms in 2022 also caused fires in the forests. Heat waves brought about approximately 300 large-scale fires in India on April 28, 2022, with Uttarakhand responsible for at least 1/3 of those fires. The rise in catastrophic weather conditions, including cyclones, heavy rainfall, floods, landslides, lightning, thunderstorms, and droughts, additionally emphasises India's vulnerable status to climate change. 15 stormy fluctuations—three cyclonic hurricanes and 13 depressions—were observed over the north-eastern Indian Ocean in 2022, something that was unprecedented.

The rainfall during the monsoon season in the southwest region was above average in 2022. Total 12 of the total 36 meteorological classifications had excess rainfall, eighteen had normal rainfall, and the remainder of 6 had insufficient amounts of rain. Parts of Arunachal Pradesh, Assam, Meghalaya, Sub-Himalayan West Bengal, Sikkim, entirety of the westward shoreline of East Madhya Pradesh, and the Andaman and Nicobar Islands encountered record-breaking precipitation (more than 2000 mm). A total of over 3000 mm of rain fell on the west coast of the country as well

as in parts of Assam and Meghalaya (IMD 2022 Annual Report).

Southern India encountered its lowest June rainfall in 122 years. Simply 88.6 millimetres of rain fell on this region in the exact same month, which is 45% lower than what had been measured from 1971 to 2020 (Sangomla 2023).

There were additionally substantial precipitation deficiencies in Telangana (53% deficiency), Kerala (52% deficit), Karnataka (44% deficiency), and Andhra Pradesh (26% deficit).

Kerala's temperate humid rainforests weren't receiving excessive precipitation on account of the severe pre-monsoon (34% deficit) and monsoon deficit (Ibid.).

Whenever the floods devastated Delhi on July 19, 2023, the northeast corner of the nation was also experiencing the effects of climate change. It was reported that the Yamuna River's level of water rose to 208.66 meters as a consequence of the intense downpours, overrunning the embankments and submerging the city. Over 27,000 people were forced from their properties due to the flooding which caused severe destruction of organisations and belongings (Ibid.). The region having been designated as a region susceptible to flooding by the Irrigation and Flood Control Department, east Delhi has seen explosive growth as well as significant expanding into the flood plains. In the Yamuna flood plains, 2,480 hectares of land have been encroached since 2009 (The Hindu 2023). For the purpose of to map environmental hotspots in Indian forest areas that have the potential to be experiencing significant effects from climate change, the Forest Research Institute of India recently worked together with BITS Pilani (Goa campus). In

accordance with the characteristics of both precipitation and temperature fluctuation during the three separate time periods—2030, 2050, and 2085—these environmental anomalies have been identified as high, very high, extremely high, and critical in importance. West Bengal, Tamil Nadu, Goa, and Andhra Pradesh are all expected to see the smallest degree of an annual temperature increase, while Ladakh, Jammu and Kashmir, Himachal Pradesh, and Uttarakhand are estimated to see the greatest rise in temperature. The amount of moisture is predicted to rise most in Indian's northeastern regions, in addition to the northwestern Malabar peninsula coast. The amount of rain will possibly not improve at any point or even decrease in the northeast countries of the nation of India, such as Ladakh, Jammu and Kashmir, and Himachal Pradesh (Govt. of India, Ministry of Environment, Forest, and Climate Change, India State of Forest Report 2021).

On average, 315,667 km² of forest territory, or 45% of Indian forests, will be recognised as climate-damaging regions by 2030. The dense forests and biological communities of the western and northwestern regions of the Himalayas will be particularly susceptible to the effects of climate change. Himalayas with dry temperate woodlands, Himalayan moist temperate forests, Sub-Alpine forests, Moist Alpine scrub, and Dry Alpine scrub are some examples of these forest types and ecological communities (Ibid.). India's land has been severely contaminated as a result of increased population growth and climate change.

Forest fires in India

The table shows the regional distinctions between the country's forest fires (FF) incidents. The combination of happenings taking place through the dry preceding the monsoon period that lasts from February to June, with an elevated level in March and April, the FF peak season has developed. Due to dense forest cover and rising climatic variability, spatial patterns show that central India, the foothills of the Himalaya, the Western Ghats, and the Eastern Ghats have shown increased vulnerability to FFs. The findings from the Forest Survey of India (FSI) between 2000 and 2020 show a growing pattern in FF incidents, at their highest during El Niño-related severe precipitation years like 2009 and 2016. The susceptibilities of India's diverse woodland environments to FFs are made worse by the effects of CC. In accordance with the FSI (2021), 4.89% of India's forest cover has been determined to be exceptionally FF-prone, and 35.47% of the forest cover in the nation is prone to FFs.

Table 4.1: Climate change and forest fires in India

Region	States/UTs	Average Annual Incidents	Peak FF Season	Dominant Vegetation Type	Key Climatic Drivers	Relevance	Source
Himalayan Region	Jammu and Kashmir, Ladakh, Himachal Pradesh, Uttarakhand	687	March–May	Temperate coniferous and broad-leaved forests	Rising temperatures, dry periods, reduced snowfall	Frequent FF, affecting biodiversity, loss of vegetation cover	Negi , Raw (2019)
Northeast India	Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, Sikkim	2195	February–April	Tropical evergreen and sub-tropical forests	Shifting cultivation, production of wood products	Slash-and-burn (Jhum) cultivation is the main driver	Debnath et al., (2024)
Northern India	Punjab, Haryana, Delhi,	244	March–May	Dry deciduous forests, agro-forestry, and	Stubble burning, heatwaves,	High FF incidence due to	Dutta et al. (2024)

	Chandigarh, Uttar Pradesh, Bihar			scrub/degraded forests	extreme dry conditions	anthropogenic factors, urban expansion impacts, forest fragmentation	
Central India	Madhya Pradesh, Chhattisgarh, Jharkhand	1636	March-June	Tropical dry deciduous forests	Temperature extremes, low humidity, dry conditions, high winds, cyclones, anthropogenic land use	High FF incidents due to flammable deciduous biomass	Kumar et al. (2022)
Eastern India	West Bengal, Odisha, Andhra Pradesh, Telangana	1987	March-May	Tropical moist and dry deciduous forests	Heatwaves, erratic monsoon, low humidity, extreme heat	Increasing FF incidents	Sagar et al. (2024)
Western India	Rajasthan, Gujarat, Dadra and Nagar Haveli, Daman and Diu, Maharashtra, Goa	479	March-May	Arid scrub, dry deciduous, semi-evergreen	Extreme heat, lower rainfall, high wind speed	Large tracts are lost through FF spread due to density	Sahana et al. (2022)
Southern India	Tamil Nadu, Puducherry, Karnataka, Kerala	498	January-April	Tropical dry and moist forests	Rising temperatures, dry conditions, low humid	Increased FF frequency in dry conditions, high wi	Prasad et al. (2016)
Coastal Island	Andaman and Nicobar Islands, Lakshadweep	18	March-May	Tropical rainforests, mangroves, and coastal vegetation	Temperature anomalies, dry spells, human induced FF	Sensitive ecosystems, slow recovery, severe degradation from FF damages	Seema et al. (2015)

Figure 4.4: Forest Fires in India



Throughout the intervening couple of decades, both natural and human-made influences have been responsible for an upsurge in FF events in India. demonstrated an increasing pattern in FF incidents, and predictive modelling techniques determined that up to 20.14% of specific Odisha geographical areas have been identified as "Very High FF" categories. In a comparable direction, Kumar & Kumar determined that changes in land temperatures on the surface substantially exacerbated FF occurrences at greater elevations in the occidental Himalayas. Sahu et al. conducted an additional investigation. High-risk neighbourhoods have been observed in Madhya Pradesh's Khandwa Province and North Betul regions in Central India, where roughly 50 per cent of the land is highly susceptible to FFs.

Nearly 97.85 million square kilometres (mha) of land have been deteriorated, with 3.32 mha being added over the last 15 years, corresponding to the Global Desertification and Land Deterioration Atlas of India (ISRO 2018). Permanently rainfall-soaked land for agriculture makes up the vast majority of India's degraded countryside. There is a layer of greenery on top of the land with irrigation. On the other hand, during multiple crop cycles, rainfed farmland exposes the uppermost soil to erosion from wind and water.

4.2 Improvements in India's Key Climate Indicators

By accomplishing ambitious goals for achieving and with sustaining economic growth, India is now recognised as an international authority in climate action. By means of targeted missions on solar energy, energy efficiency, sustainable habitats, water, agriculture, and ecosystems, the

National Action Plan on Climate Change (PIB, 2024) brings together environmental worries from every sector and level of government. The whole country accomplished its targets for decreasing the production of greenhouse gases per GDP unit while still keeping dioxide emissions per person far below the global average (PIB, 2024).

Table 4.2: Improvements in India's Key Climate Indicators

Climate Indicator	2015	2017	2019	2021	2023	2024
Forest Cover (%)	21.3	21.5	21.7	21.9	22.5	24.6
GHG Emissions (Mt CO ₂ e)	2,650	2,720	2,790	2,720	2,850	2,920
Renewable Energy (GW)	39	57	82	110	180	220
Carbon Sink (Mt CO ₂)	485	495	510	522	535	550
EV Sales (Units)	25,000	56,000	1.2L	3.3L	8.5L	12.8L

Source: Ministry of Environment, Forest and Climate Change; MNRE; MoRTH (2025)

Table: illustrates the manner in which the Green India Mission's afforestation and forest management operations have contributed to the amount of forest cover continuous rise from 21.3% to 24.6%. The efficient operation of the collection and storage of carbon increased from 485 Mt CO₂ in 2015 to 550 Mt CO₂ in 2024, which at first contributed to Nationally Determined Contributions. Regardless of this, greenhouse gas emissions climbed from 2,650 Mt CO₂e in 2015 to 2,920 Mt CO₂e in 2024 due to higher revenue generation and demand for electricity. Greenhouse gas emissions briefly reduced in 2021 due to the COVID-19 contraction, but they soon jumped again, illustrating how

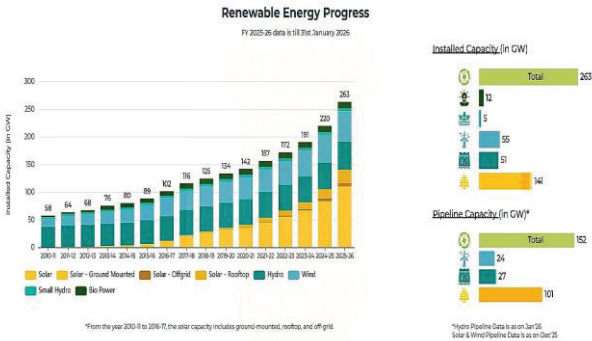
difficult it is to make the distinction between emissions and economic growth. In order to assist populations, adapt to the implications of severe precipitation and long-term climate change, the Indian government encourages state-level initiatives, systems for early notification, and climate-resilient practices (PIB, 2025).

Sustainable Utilization of Renewable Energy Resources

The progression of renewables takes the form of snaps: from 2010–11 to 2025–26. At the same time, the installed renewable energy capacity in India increased significantly. It moved from just 58 GW in 2010–11 to 263 GW in 2025–26. The increase is primarily a result of solar power. It makes up the largest part at 141 GW, followed by wind with 55 GW, large hydro at 51 GW, bio-power at 12 GW, and small hydro at an additional 5 GW. The chart also shows the strong future pipeline of renewable projects that are things like solar power (101 GW), wind (45 GW), and hydroelectric power (24 GW). This steady, upward movement reflects India's intention of increasing clean energy infrastructure and lowering its carbon emissions; it is also backed by various policies, regulations, and oversight from government bodies like the Ministry of New and Renewable Energy (MNRE) as well as the Central Electricity Authority (CEA). The overall data demonstrates that transitioning to a sustainable and renewable energy environment in India has achieved substantial progress. Refineries process the imported crude oil and natural crude that is produced at home into petroleum products, which are mainly used for transport and industrial needs, apart from some units of output left for export. In the same way, city gas adjustments for industries and factories go pure into non-natural gas flows. In addition, bifurcations occur

when natural gas is reinjected and burnt. Some is also flared off. Describing further details in this chart, the contribution of renewable energy and nuclear and hydropower all enter electricity generation with fewer emissions. China has become the world's largest coal importer and that more than 90% of Chinese transportation oil comes from overseas markets all around the globe. It is a visualization whose main purpose is to help policymakers, scientists, and other researchers appreciate how energy is allocated throughout all sectors of life in India.

Figure 4.5: Renewable Energy Progress



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<https://indiaclimateandenergydashboard.in>

Groundwater Resources Chart

The "Groundwater Resources" chart, based on the Central Ground Water Boards most recent assessment of this key natural resource in India presents a picture of groundwater availability and consumption. Groundwater assessment units are divided into five major categories according to the degree of extraction and sustainability. The largest portion,

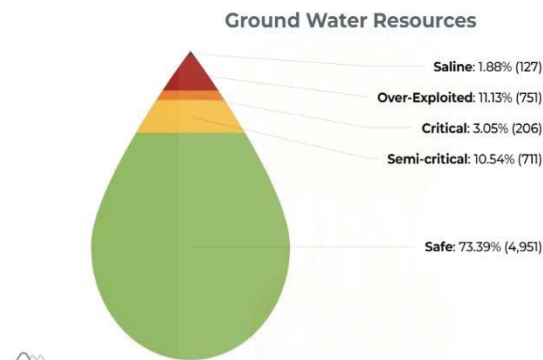
which accounts for 73.39% (4,951 units), is "Safe," indicating these areas have sustainable levels of groundwater extraction and adequate recharge. It represents 10.54% (711 units), where groundwater extraction is approaching the limit and careful monitoring and conservation measures are required. In all fairness, 274.46% of the total number of assessment units belongs to this category. These hydrogeological units, with one exception—minor moderation of extraction levels noted in certain reports (not enough information was forthcoming to allow assignment to any one other category)—all lie within renewable limits.

Grey areas make up the smallest category, with 3.05% of the total (206 units). These stats refer to land where people are taking more than their fair share in irrigation groundwater and quite likely need an immediate remedy. More desperate circumstances can be found in the over abstracted category, where 751 units or 11.13% of the total area are over-abstract. Here pumping exceeds replenishment, resulting ultimately in a sinking groundwater table and fears over long-term sustainability. Moreover, saline groundwater areas make up 1.88% of the total (127 units). Here groundwater quality is deteriorated by salinity, unfit to normal living and unsuitable for drinking or agriculture without desalinization.

Although most of India's groundwater resources still fall into one of three safety categories, there are yet substantial parts where over extraction has led them to be stressed or even worse. Especially in urban and agricultural areas, it indicates that both local communities and national governments must act now if their supply is not to dry up one day. The numbers also resonate with calls for sustainable management of groundwater, efficient

irrigation techniques, and measures to put water back into aquifers. The future water security of India is precisely revealed on this graph.

Figure 4.6: Groundwater Resources Chart



*Based on National Compilation on Dynamic Ground Water Resources of India, 2023 | Figures in brackets denote assessment units owned/managed by Central Ground Water Board.

Source: Central Ground Water Board

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The information on this platform is mainly taken from official sources. However, in some cases, a few assumptions have been made and some data derived or assumed and is given in the detailed. While we believe that the data is reliable and adequately comprehensive, India's Climate and Energy Dashboard does not take guarantee that such information is in all respects accurate. India's Climate and Energy Dashboard does not accept any liability for any consequences resulting from the use of this data.

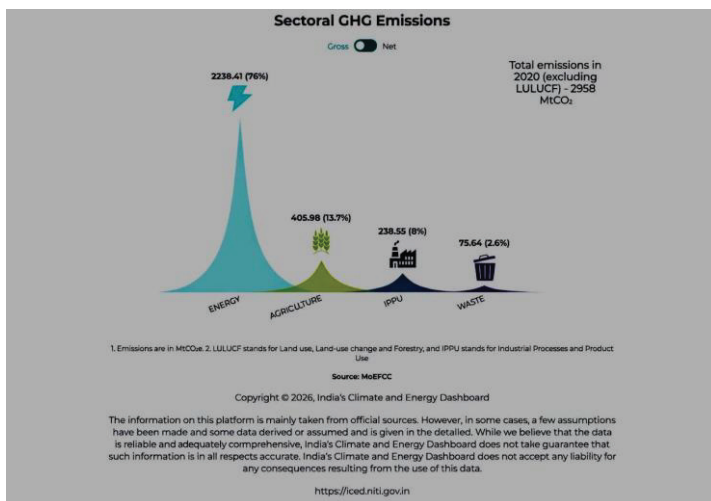
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4.3 Sector-wise Distribution of Greenhouse Gas Emissions in India

In the figure of "Sectoral GHG emissions", the percentage distribution of greenhouse gas emissions of different major sectors in India was introduced for year 2020. According to data from the Ministry of Environment, Forest and Climate Change, total greenhouse gas emissions in 2020 were about 2,958 MtCO₂e (this figure excludes emissions and removals from LULUCF = Land Use, Land Use Change and Forestry). The chart shows that the energy sector is the largest

contributor, emitting 2,238.41 MtCO₂e or 76% of total emissions. These emissions mainly come from for example activities of electricity generation, Industry fuel combustion, transport and other energy-consuming uses. In addition to being a huge money spinner, the agricultural industry is also responsible for 405.98MtCO₂e of emissions, accounting for an astonishing 13.7 percent. Pollution in this sector chiefly stems from agronomy--For example breeding livestock and cultivating rice--and also from chemical fertilizers.

Figure 4.7: Sectoral Green House Gas Emission



The industrial sector's Industrial Processes and Product Use (IPPU) produces 238.55MtCO₂e of total emissions or 8%. These emissions occur during the processing stages of industrial goods, for example the production of cement, manufacturing of chemicals, and releasing other greenhouse gases from industry (most likely carbon dioxide). Finally, the waste sector produces 75.64MtCO₂e

total emissions every year, covering 2.6 percent of all pollution in that area. It is made up primarily solid waste disposal, sewage treatment, and decomposition of organic matter in landfills. The energy sector produces huge amounts of greenhouse gas emissions in India; these are followed by agriculture and industry. This breakdown by sector has implications for climate policy and mitigation planning. It enables us to see which sectors are top priorities where emission reduction strategies, renewable energy expansion, sustainable agricultural practices and better waste management can make a major difference to how close our country comes towards meeting its climate target.

4.4 Net Zero Emissions and Climate Action

As the world confronts the urgent concerns of climate change, the pursuit of Net Zero emissions has emerged as a vital objective for countries globally. India's goal of "Viksit Bharat" (Developed India) strongly connects with the ambition to establish a sustainable, inclusive, and affluent future. The journey to Net Zero is essential for tackling environmental issues and presents a chance to foster innovation, stimulate economic development, and enhance energy security. Through the use of renewable energy sources, the enhancement of energy efficiency, and the promotion of green technology, India may establish a green economy. Transitioning to Net Zero presents India with an opportunity to establish itself as a worldwide pioneer in sustainable practices, enhancing both quality of life and international stature. This endeavor for a developed India is predicated on harmonizing economic advancement with ecological stewardship, guaranteeing a prosperous and resilient future for everyone. In recent decades, the concept

of Net Zero has seen significant transformation. The concept of regulating Earth's temperature was first introduced to the scientific community. The 2015 Paris Agreement urged governments to limit global warming to below 2 °C above pre-industrial levels, with aspirations to restrict it to 1.5 °C, therefore prioritizing this issue in international policy. As of 2020, around 130 countries, including major emitters such as the United States and China, have committed to attaining Net Zero by mid-century. The energy industry in India is crucial for attaining its Net Zero objective. India's extensive potential for solar and wind energy, which may be used to diminish dependence on coal. The expense of green technology and insufficient infrastructure are significant obstacles. The shift to a green economy presents India with several socio-economic advantages, such as employment generation and enhanced public health. The transition to green employment would not only reduce carbon emissions but also mitigate poverty in rural regions. An equitable transition, accompanied by assistance for displaced workers in fossil fuel industries, would be crucial.

Net Zero inside the Indian Framework

India, although being a developing nation, is one of the largest emitters of carbon dioxide (CO₂) due to its dependence on coal and other fossil fuels for energy production. The country has made significant progress in adopting renewable energy, setting ambitious targets for wind and solar power output. A study from the Council on Energy, Environment, and Water (CEEW) (2021) indicates that India's transition to a low-carbon economy requires a transformation in energy sources, technical advancements, infrastructure renovation, and significant legislative

changes. The report emphasizes that attaining Net Zero involves not just carbon reductions but also climate resilience and fair development.

The Indian government has included climate objectives into its national development strategy. The National Action Plan on Climate Change (NAPCC), initiated in 2008, established the framework for tackling climate change via mitigation and adaptation initiatives. In 2020, Prime Minister Narendra Modi proclaimed India's ambitious objective of attaining Net Zero emissions by 2070, establishing India as a frontrunner in the global climate initiative while recognizing its historical role in climate change and its developmental requirements. India's Energy Conservation Building Code (ECBC), Perform, Achieve, and Trade (PAT) program, and the National Electric Mobility Mission Plan (NEMMP) are essential governmental efforts designed to mitigate emissions from the industrial and transportation sectors.

Obstacles and Prospects

Attaining Net Zero poses several hurdles for India, considering its distinct socio-economic and energy requirements. Significant obstacles recognized in the literature comprise:

1. **Economic Growth against Sustainability:** Reconciling fast economic expansion with the need for carbon reductions is a substantial problem for emerging nations such as India.
2. **Energy Transition:** India's significant dependence on coal, accounting for over 70% of its electricity output, makes the shift to renewable energy a challenging endeavor.

3. **Technological and Financial Limitations:** The expense of renewable energy technology and the absence of adequate finance methods provide considerable obstacles.
4. **Policy and Governance:** Although policies are established, their execution and enforcement at state and local levels are uneven.

India also has prospects in the emerging green economy. The solar power industry is among the fastest-growing businesses worldwide, and India has the potential to emerge as a global leader in solar energy generation. India's burgeoning electric vehicle (EV) industry has the potential to decrease emissions from the transportation sector.

The Current State of Net Zero in India

India's Climate Obligations

India's pledge to achieve Net Zero by 2070 is a crucial breakthrough in tackling the global climate emergency. The nation's nationally determined contributions (NDCs), presented to the United Nations Framework Convention on Climate Change (UNFCCC), encompass objectives to elevate the proportion of non-fossil fuel energy capacity to 50% by 2030, diminish carbon intensity of GDP by 45% by 2030, and attain a goal of 500 GW of non-fossil fuel energy capacity by 2030.

Expansion of Renewable Energy Capacity and Advancement of Solar Power

India is among the globe's most rapidly expanding renewable energy markets. The Ministry of New and Renewable Energy (MNRE) reported that India's renewable energy capacity reached 169 GW by 2021, accounting for

around 24% of the total installed power capacity. Solar energy constitutes more than 50 GW, with the government targeting the installation of 175 GW of renewable power by 2022 and 500 GW by 2030. Notwithstanding these lofty objectives, India's dependence on coal-fired electricity is a substantial obstacle to attaining Net Zero.

Policy Assistance and Sustainable Finance

In recent years, the Indian government has implemented many initiatives to promote the green economy. These encompass:

1. The Atmanirbhar Bharat Scheme encompasses incentives for renewable energy technology.
2. Green bonds: India has seen an increase in the issue of green bonds to fund renewable energy initiatives.
3. The Perform, Achieve, and Trade (PAT) Scheme: Designed to enhance energy efficiency in energy-intensive sectors.

These measures have facilitated the augmentation of renewable energy investments and propelled the transition to a more sustainable economy.

Government's Role in Attaining Net Zero

The Indian government is crucial in establishing the policy direction and legal frameworks necessary for the transition to Net Zero. Enhancing the National Action Plan on Climate Change (NAPCC) and synchronizing it with international climate accords like the Paris Agreement is essential. The Energy Conservation Act (2001) and the Renewable Energy Development Act (2008) are essential

instruments for promoting energy efficiency and the use of renewable energy.

The establishment of a resilient energy infrastructure specifically a smart grid, battery storage systems, and electric car charging stations is crucial for India to attain Net Zero. Government expenditures in infrastructure and urban planning, linked with sustainability objectives, are essential for aiding this shift.

The government must promote public understanding of climate change and include residents, companies, and industries in collaborative efforts. Cooperative initiatives between the public and commercial sectors will be essential for advancing sustainable technology and innovation.

Obstacles in Attaining Net Zero

Economic and Political Obstacles

India's developmental strategies often emphasize economic growth, poverty reduction, and job creation, which may sometimes clash with climate objectives. Moreover, political opposition at both state and national levels may impede the execution of essential climate policy.

Energy Security

India's dependence on coal for electricity production, coupled with the limited potential for fast advancement of renewable energy technology, raises apprehensions over energy security. Despite investments in renewable energy, a significant component of the country's energy balance will remain reliant on fossil fuels in the medium future.

Monetary Limitations

Attaining Net Zero requires substantial expenditures in renewable energy infrastructure, technology, and research. Despite increasing backing for green finance, the money required remains insufficient to fulfill India's lofty objectives.

Technological Obstacles

Despite advancements in renewable energy technology, India continues to encounter technical obstacles in large-scale energy storage, grid integration, and the expansion of electric vehicle infrastructure. The government must reassess and fortify current climate measures to guarantee alignment with India's Net Zero objectives. Policies must prioritize the establishment of enduring incentives for renewable energy initiatives, green financing, and the diminution of reliance on fossil fuels.

Capital Allocation in Innovation

India needs to allocate resources towards the study and development of innovative technologies, including carbon capture and storage (CCS), energy storage systems, and sustainable transportation options such as hydrogen fuel cells. Public-private collaborations may expedite innovation and the uptake of technologies.

Advocating for Sustainable Employment

To facilitate an equitable transition, it is imperative to advocate for green employment in renewable energy, energy efficiency, and sustainable agriculture. Skills development programs facilitate the workforce's transfer from conventional industries to sustainable ones.

Global Collaboration

Considering the worldwide implications of climate change, India must pursue more international collaboration on climate legislation, technological transfer, and sustainable financing. Collaboration with industrialized countries in attaining Net Zero might provide India with the necessary resources for success.

4.5 Government Schemes for Climate Action and Sustainable Development

National Mission for Green India (GIM)

- Recommends carbon sequestration, rehabilitation of ecosystems, and afforestation.
- Concurs with the forest conservation and biodiversity goals of the SAPCC.

National Adaptation Fund for Climate Change (NAFCC)

- Provides funding for ecological adaptation initiatives at the state level.
- Finances SAPCC pilot project funding straight away.

National Clean Air Programme (NCAP)

- Helps accomplish environmental mitigation aims through enhancing the quality of air in excess of 131 towns and cities.

National Solar Mission / National Wind Mission

- States need to have integrated these responsibilities into their ambitions for energy production from renewable sources.

PM-KUSUM Scheme

- Propagates the implementation of sunlight for electricity generation and pumps to provide irrigation in the farming industry.

Atal Mission for Rejuvenation and Urban Transformation (AMRUT)

- Strengthens resilient urban communities and preserves water.

4.6 National Action Plan on Climate Change (NAPCC)

In order to steer within-country Mitigation and adaptation to climate efforts, the first encompassing weather plan, the national climate action plan, was put forward. With emphasis on the agricultural sector, energy, water, forests, cities, the Himalayas, and critical scientific understanding, the proposal uses the mission-oriented methodology in order to focus on the most critical problems (GoI, undated). Besides that, the National Action Plan on Climate Change (NAPCC) has been established to address India's economic growth and climate issues (GoI 2008). The plan's strategies are accompanied by domestic resources; if foreign assistance were made accessible, then domestic attempts would be improved (Saran 2019). The Indian government had previously begun directing over 2.6% of its GDP to adaptation efforts that were predominantly related to food production, water resources, health and sanitation, forests, coastal zone infrastructure, and adverse weather conditions, according to the climate action plan (GoI, undated). The NAPCC is an extensive framework that includes mitigation and adaptation techniques designed to

tackle environmental effects and preserve the nation's renewable energy base, in contradiction to previous legislation (like as the Integrated Energy Policy 2006) (GoI 2009; 2014). The management framework encountered many adjustments with the official launch of the NAPCC. A handful of key ministries at the national level partnered with the effort to help implement the plan. In addition, the nodal department appointed to handle oversight of the actualisation of the climate action plan was the Ministry of Environment and Forests (MoEF). The Indian authorities started providing funding for climate conservation efforts as part of the Five-Year Plans. The inauguration of the NAPCC, subsequently, after 2008, the MoEF gained a considerable rise in financial resources, as demonstrated by the 11th Five-Year plan (which climbed by 57.86 per cent between 2007 and 12) (GoI 2008b) and the 12th plan (which increased by 109.17 per cent between 2012 and 17) (GoI 2013). Another benefit is that India's Five-Year Plans (GoI) stipulated an entirely separate section on climate change. With the goal of taking on climate change, mitigating carbon emissions, and boosting both human well-being and the natural environment, the Paris Agreement was started in 2015.

Governments across the globe are being urged to implement the objectives and regulations put forth by COP26, COP27, and COP28 in order to lower greenhouse gas emissions while bettering the general condition of the economy, environment, and energy. The primary aspect of disagreement revolves around keeping the median ambient temperature between 1.5 and 2 degrees Celsius while demonstrating an advantageous relationship between energy, environmental sustainability, and economic expansion. As a consequence, the general and broad

objectives that compose the SDGs, including quality education (SDG-4), gender equality (SDG-5), and peace and justice (SDG-16), have raised numerous uncertainties about the rules that regulate this conventional element. Several economically prosperous nations that are developing excessively utilise the resources they have, contributing to damage to the environment and the so-called "resource curse," or "resource dependency," in which reliance on mineral exports causes complementary sectors, like manufacturing and service industries, to be ignored, thereby putting at risk economic stability. Mineral-rich countries may put the immediate financial benefits from exploiting their resources ahead of sustainability over the long term. Wholehearted and various strategies that incorporate technological innovations in finance, growth in the economy, SDG 13, environmental sustainability, and technological advancement have to be developed for sustainable development in emerging economies.

Salient Features of the National Action Plan on Climate Change (NAPCC)

1. **National Solar Mission:** With the long-term goal of bringing solar power on par with fossil fuels, the NAPCC is actively working to advance solar energy's growth and usage for a variety of purposes, including power generation. For achieving this growth, holistic approach was adopted such as the creation of a solar research center, more international cooperation on technology development, stronger domestic manufacturing capability, and more government funding and international support.
2. **National Mission for Enhanced Energy Efficiency:** The NAPCC strictly working on particular energy

consumption decreases specifically for large industries. It includes both private and public industries.

3. National Mission on Sustainable Habitat: This plan make conscious steps for encouraging energy efficiency.
4. National Water Mission: This plan also work for enhancing the water utilization efficiency by keeping price and other factors in mind. Total 20 percent improvement in water utilization efficiency is a purpose of this plan.
5. National Mission for Sustaining the Himalayan Ecosystem: Himalayas are melting due to global warming. This plan also works for taking steps to minimise the melting of Himalayas.
6. National Mission for Sustainable Agriculture: This plan also work for improving the quality of crops and crops conditions in agriculture.

The challenges that exist pose significant risks to the ecological system's whole fitness and strength, as well as that of the residents of the area. The specifications of the laboratory have altered as a result of the COVID-19 computerisation examination. For the safeguarding of human life and economic growth, multiple nations have adopted technological advancement. As consequence, this field has been thoroughly investigated for its strengths and weaknesses. Digital transformation will therefore be more prevalent in the years following COVID monetary systems. assists with mundane chores, money management, and economic advancement in regions that are developing. Fortunately, contemporary digital economies, environmental sustainability, and energy efficiency have all developed. Digital transformation has both immediate and secondary impacts on the utilisation of energy, reliability,

and environmental sustainability. Data centre buildings are an essential component of electricity use in the economy of the internet. Data centre operations consumed 206 terawatt-hours (TWh) of electricity in 2021, more than the United Kingdom's total usage of energy, according to the International Energy Agency. Meanwhile, the International Energy Agency, also known as the IEA, indicates that the power expenditure of data processing centres will go up four times by 2030. The manufacturing and distribution of electronic devices and machinery have an enormous impact on the ecosystem.

In 2018, 54.6 million metric tonnes (MT) of electronic waste, or "e-waste," had been generated around the globe. This is believed to be comparable to the weight of about 350 cruise ships or the size of the British luxury passenger ship Titanic. Only 17.4% of the electronic debris was acquired and put towards beneficial use. For an understanding of the developing significance of technological advancement in long-term sustainability, this relationship must be continuously strengthened and assessed. China emphasised establishing several types of regulations regarding the environment, as well as developing an economic framework that designated projects that promoted the environment the highest priority during the transition period. In the context of sustainable development, the above efforts have generated significant improvements. In order to accomplish aggressive environmental goals, China has continually encouraged the banking and finance sector, alongside society, to implement environmentally sound and environmentally responsible approaches. The Chinese government has succeeded in creating a robust and flexible green financial system. An emerging technology in finance company strategy has

emerged as a result of Chinese commercial organisations' use of the latest information technologies to improve their financial product innovation and service in the digital age. With the goal of developing environmentally conscious finance in China, fintech plays an important role. Studies have shown how fintech can promote sustainable development. Fintech can significantly decrease the imbalance of information in green project investment and financing, as well as decrease moral danger following a grant and choose adverse risk prior to funding.

4.7 State Action Plan on Climate Change (SAPCC)

One of the largest and most significant challenges that influences India's long-term sustainable growth trajectory is the effects of climate change (Government of India, 2008; Ministry of Environment, Forest and Climate Change, 2015). India mandates every individual state and territory under its jurisdiction to formulate a State Action Plan on Climate Change (SAPCC) to understand the particular weaknesses recognised all throughout its many different environmentally sensitive regions. These initiatives are intended to help our nation advance towards reaching Sustainable Development Goal (SDG) 13: Climate Action along while remaining in keeping with its national vision expressed in the National Action Plan on Climate Change (NAPCC) (Government of India, 2020; Intergovernmental Panel on Climate Change, 2022). SAPCCs are tactical structures assisting jurisdictions in localising global climate endeavours by incorporating adaptation to climate change, adaptation, mitigation, and rebuilding resilience into their planning for development (NITI Aayog, 2021; United Nations, 2015).

Purpose and Significance of SAPCC

The Aspirations and Vitality of SAPCC

State- particular documents of policy identified as SAPCC assessments are those that:

- ❖ Investigate climate-related vulnerabilities in significant domains like building construction, ecosystems at the coast, forests, watersheds, food production, power generation, and medical care.
- ❖ Implement industry-specific adaptation as well as mitigation strategies determined by geographical dangers from climate change.
- ❖ At both the national and regional levels, implement climate considerations into development planning, budgeting, and administration.
- ❖ Encourage nations like India towards attaining their SDG 13 goals and Nationally Determined Contributions (NDCs).
- ❖ Easy access to the accumulation of resources for projects at the state level from national and international climate funding sources.

SAPCCs cooperate with national governments to establish coordinated initiatives that augment resilience to hazards, safeguard ecosystems, reduce greenhouse gas emissions, and strengthen the capacity of institutions for combating climate change.

4.8 National Solar Mission

As a renewable energy initiative of the Indian Government, the National Solar Mission (officially known as the Jawaharlal Nehru National Solar Mission or JNNSM) is a major policy emphasis on solar energy development and

market change. In 2010, the plan was approved as part of the National Action Plan on Climate Change (NAPCC). Its main goal is to make India a world leader in solar power and facing energy security, environmental protection and climate change issues. The country is undergoing swift economic development and the growing energy demand is price to utilize traditional fossil types of such as coal, oil. This long-term usage problem on the one hand exacerbates environmental damage and leads to ever more carbon dioxide emissions from our fuel combustion. The country firmly recognizes the necessity for its future economic development in natural resources to move toward renewable and sustainable energy. With this in mind, Government introduced National Solar Mission at home; here India has an immense number of sunshine hours each year which can be transformed into customers' electricity. It makes many days that are pretty dry!

Objectives of the Mission

One of the main aims of the National Solar Mission is to raise significantly the share of solar energy in India overall energy portfolio. The goals of the mission are mainly to: develop more solar technologies; lower the cost of producing solar energy; and stretch India solar infrastructure across the whole country. The mission also enables both large-scale solar power plants and decentralized solar systems, including rooftop installations in peoples' homes, industries, institutions and communities.

One of its main objectives is to foster research, development and innovation in solar technology. By reinforcing home solar panel manufacturing and related equipment production capability, the mission wants to bring solar

power within reach of more people. This helps to create jobs, by developing sustainable renewable energy industry for India.

Phases of Implementation

Initially, the National Solar Mission was designed to go through three phases:

1. Phase I (2010–2013): This phase was aimed at establishing the policy framework and launching initial solar projects. It aimed to develop grid-connected solar power, as well as support off grid applications in rural areas.
2. Phase II (2013–2017): Encouraging private investment and improvement in technical efficiency were the focal points of this second phase. It stressed scaling up solar power rapidly as well as encouraging private investment to improve technology efficiency.
3. Phase III (2017–2022): With commercial solar power at its main goal, this final phase tried to achieve large-scale implementation and make off-grid solar power competitive with conventional sources of energy.

Key Components of the Mission

National Solar Mission is composed of several key components, such as:

1. Large-scale solar power stations to enhance grid-connected renewable power supply capacity.
2. Rooftop solar programs for distribution electricity generation.
3. A place where different provinces/nations can come together in one large solar installation development venture. Hit solar power stations in different states

4. For rural electrification and isolated areas where grid power does not reach, this includes solar-powered lighting systems and other products of this industry. Off-grid solar applications
5. Projects to study and improve solar technology. Research and development of solar projects such as these help in lowering the cost-to-manufacturing angle.

Significance and Global Impact

The National Solar Mission has a significant part to play in turning India's renewable energy around. It has gotten solar power up operating to a level where the technology is considered economically viable, drawn in investments towards clean energy infrastructure and made substantial cuts in the cost of an electricity produced by solar. The mission also conforms to commitments. India has made at international climate meetings (such as those under the Paris Agreement). It is thus a model to other countries for both development and reforming their industries. Better living is everyone's goal-but every industry faces these same problems too, whether they can solve them is another matter entirely! By promoting clean energy and reducing greenhouse gas emissions, the mission is contributing to global climate action. This is in line with both the targets of Sustainable Development Goal 7 ("affordable and clean energy") and Sustainable Development Goal 13. The National Solar Mission stands as a milestone in India's transition to renewable energy. The mission is not only clean and energy-efficient, but it also contributes to environmental protection, economic development and long-term energy security.

4.9 National Bio-Energy Mission

The National Bio-energy Mission is under the joint cooperative effort of GOI India and one goal is to retrieve new sources of alternative (Renewable) energy resources (MIN). The object promoted by National Bio-energy Mission aims to explore and develop biomass energy as a sustainable form of clean power. To accomplish this ultimate purpose, it cooperates actively with Institute of International Transport and Development (IITD).

The National Bio Energy Mission aims to transform raw materials such as agricultural and forestry residues, organic wastes, and industrial rejects into cleaner forms of energy, including biogas, biofuels, bioelectricity and bio-CNG. India produces an enormous quantity of agricultural and organic waste each year. Most of this is simply abandoned, or, if burned, causes environmental pollution along with wasted resources. The mission, therefore, is to turn these resources into useful energy, causing less harm to the environment and leading to greater security in energy supply. Bioenergy is key to India's mix of renewable energies because it offers a dependable and sustainable alternative fuel other than the fossil fuels. Many of the ideas come from local people who develop their own practices, test them, publish their results, and push on traditional ways as, for example, in forest farming. The mission is also contributing to rural development feed from small profits to make big ones and new sources of income for farmers are sought in promoting decentralized energy systems.

Objectives

1. In order to fulfill its functions, this mission has a number of key targets of work:
2. To promote biomass and organic waste for renewable energy production.
3. To reduce dependence on oil or gas by increasing the production and use of bioenergy.
4. To implants new technologies such as waste-to-energy techniques that can dispose effectively agricultural and other organic wastes, or develop and apply cheaper methods.
5. Support regional development encourage new sources of employment and income for farmers and. Contain environmental pollution Prevent grain such as crop residue burning

Key Components of the Mission

The National Bioenergy mission is composed of multiple programs that aim to expand Bioenergy production:

- **Biogas and Bio-CNG Programs**
Biogas technology can turn organic waste into gas for cooking, electricity generation or transportation.
- **Biomass Power and Cogeneration Projects**
A biomass power plant uses rice husk, straw or bagasse (the fibrous part of sugarcane after sugar is extracted) to make electricity.
- **Waste-to-Energy Projects**
These projects transform trash, specifically oddly sewage waste into electric power Or so-called “biofuels,” that are cleaner than fossil fuels and help improve garbage handling.

- **Support for Advanced Bio fuels**

Supported by the Mission, research in technologies for producing advanced bio fuels from non food biomass such as grass is very important.

Importance of the Mission

The National Bioenergy Mission helps achieve a number of national and worldwide sustainability objectives. It contributes to India's rise in renewable energy, improves air quality by converting crop residue burning into usable energy, and aids the circular economy through waste conversion to energy. It assists the country in meeting its Paris Agreement commitments and aligns with the United Nations' seventeenth and fourteenth Sustainable Development Goals, respectively. What this means for you is that the mission will allow India to become the world's first sustainable energy superpower.

The National Bioenergy Mission is a milestone in India's energy development toward sustainability. By turning waste into energy resources with value, it breaks through the energy bottlenecks and blesses us with both clean environmental protection and development of environment-friendly power sources.

4.10 Faster Adoption and Manufacturing of Electric Vehicles Scheme (FAME)

The Indian government's Faster Adoption and Manufacturing of Electric Vehicles Scheme, also known as the FAME Scheme is really useful. The project aims to promote the adoption of electric vehicles (EVs) and support countrywide development in electric mobility. The plan is being carried out by the Ministry of Heavy Industries in

accordance with the larger vision articulated under a broader National Electric Mobility Mission Plan (NEMMP).

Introduction to the FAME Scheme

Launched in 2015, the FAME Scheme aimed to promote electric cars and thus ease India's dependence on fossil fuels. The transportation sector is a key source of air pollution and greenhouse gas emissions, which contribute to climate change. To tackle these problems, the government created the FAME Scheme as a way of introducing environmentally friendly transport technologies. It is intended to help speed up the process of switching over to more sustainable ways of living. Electric vehicles utilize electricity instead of the standard gas, petrol, or diesel fuels. Through promoting the use of EVs, the FAME Scheme helps lower carbon emissions, clean up city air, and save energy. The scheme also supports local production for electric vehicle components, thereby strengthening India's electric mobility sector.

Phases of the FAME Scheme

The FAME II scheme is designed in two parts.

1. FAME Phase I (2015-2019)

The first phase was mainly aimed at driving the early popularization of electric and plug-in vehicles. It provides buyers of electric bicycles, tricycles, electric thrust cars in financial incentives. This phase also supported pilot projects, charging infrastructure development, and electric mobility technology research and development.

2. Phase II: The present

The second phase was basically an extension to the program's scope with more focus on public transport and sharing transportation. The government granted a lot of money to electric buses, electric tricycles, and charging infrastructure. Phase II also seeks to create the conditions for the large-scale popularization of electric vehicles and strengthen our domestic capacity in manufacturing these products.

Significance of the FAME Scheme

The FAME Plan is an important turning point in India's conversion to clean and sustainable mobility. It works in the direction of reducing carbon emission by promoting electric mobility and reduces air pollution in cities, which are so central to people's lives all over India. It will further reduce dependence on imported oil (the source of today's environmental liability) and promote energy self-reliance for everyone at all levels of society. Far from being just an environmental program, it is also a driver behind technological innovation in newer areas like electric vehicles and creates jobs there. Moreover, it helps to fulfill India's obligations under international climate framework agreements like the Paris Agreement and will help meet the objectives of Goal 7: a world with sustainable energy for all, which is clean and modern. It will also meet some of Goals 11 and 13. This FAME Scheme initiative is set to have transformative effects on the speed of electric vehicle adoption in India. By advancing the green transportation technology use and technological innovation posts connected to electric vehicles, the scheme has made great contributions to environmental protection. It also enables energy security and sustainable development.

4.11 Unnat Jyoti by Affordable LEDs for All (UJALA) Scheme

The UJALA Scheme (Unnat Jyoti by Affordable LEDs for All) is a major energy-efficiency initiative launched by the Government of India to address in the prime our country, promote the use of energy-efficient LED lighting. Officially introduced in 2015, the scheme is carried out by Energy Efficiency Services Limited (EESL) under the guidance of the Ministry of Power.

Introduction to the UJALA Scheme

The UJALA Scheme aims for domestic homes and public places across India to replace traditional incandescent and CFL bulbs with energy-efficient LED bulbs. Traditional lighting consumes a huge amount of electricity and involves a lot of carbon. Whereas LED bulbs consume significantly less electricity and have a notably longer life span.

To this end, LED bulbs are distributed by the government at subsidized and affordable prices, making energy-saving lighting accessible to every man, woman, young person, and middle-aged shopper all throughout the area of rural and city. The program also promotes the wide-scale use of energy-efficient household appliances so that electricity bills for houses are cut and less money is spent on providing this essential daily need in life. With Lower Bills, People Do More

Objectives of the Scheme

Promote energy conservation through LEDs, which are already widely used in street lighting and are still to be accepted in homes.

Aiming at reducing the electric power that households and public buildings consume from the grid Lowering the sum consumers pay in electricity charges for households by saving energy.

Making greenhouse gas emissions go down, thereby helping environmental sustainability.

Support the development. Light emitting diodes (LED) for domestic manufacturing in India

Key Features of the Scheme

Some elements of the UJALA plan:

1. Low Cost LED Distribution: Distribution centers for the UJALA scheme provide an excellent price on LED bulbs.
2. Energy Savings: When compared to traditional light bulbs, and LED uses only 1/5th or less of the electricity.
3. Long Lifespan: With an average lifespan 25 to 50 times longer than conventional lighting products, LED bulbs have become popular fast and are now widely used in offices, factories, or homes today.
4. Bulk Procurement: UJALA can buy more LEDs with the bulk of government purchasing, which means lower costs and passed benefits to consumers.

Impact of the UJALA Scheme

One of the biggest LED sales network acts is UJALA scheme. Hundreds of millions of LED bulbs have been distributed to families throughout India, which means such reductions in greenhouse gas emissions also release a solid flow of electrical power and corresponding burdens on existing capacity. The scheme has also helped to reduce peak electricity demand in India. It has contributed to the

rise of the country's LED manufacturing industry. The scheme also serves India's wider climate and sustainable development goals. It is in line with international commitments such as those made through the Paris Agreement. Moreover, it corresponds to Sustainable Development Goal 7 and Sustainable Development Goal 13.

4.12 Perform Achieve and Trade Scheme

A portable air conditioner is a machine that chills an indoor space. These days, space coolers can be purchased in many different shapes and sizes, but they are all really just mobile, stand-alone refrigeration units. Of course, because an air conditioner not only avoids the problem of in-lap dry cleaning but also operates silently, some people actually use them as far as even putting their feet out after their baths and drying them. It is 'Drying', Some air conditioners are not merely cooling the air in the room you're in but ventilating cool outdoor air into that space from another and warm inside air out. It is also worth mentioning that air conditioners commonly take up very tight spaces. When it's hot, air coolers are used to help the indoors feel like it has been cooled down more. Due this then these air conditioners became my way to a hot unsanitary kind of washing, and also noisy.

Introduction to the Perform Achieve and Trade (PAT) Scheme

The scheme was launched in 2012. It aims to reduce energy consumption for large energy-consuming industries. According to statistics compiled by the Indian Government's National Development and Reform Commission (NDRC), India's industrial sector uses a significant portion of the country's total energy. As a result,

this leads to greater net emissions of greenhouse gases and intensified environmental burden. In response to the problem, PAT encourages industries to improve their energy efficiency with a target-mechanism that is industry-led and market-driven. In the plan, certain industries which are known as "Designated Consumers (DCs)" -- steel, cement, aluminum, fertilizer and power generation, are given energy-cut targets based on their current level of energy use. These industries are supposed to make use of advanced technologies, raise their efficiency and adopt energy management measures in order to hit the target in a specified period of time.

Mechanism of the PAT Scheme

The PAT scheme works in three steps:

1. Setting Energy Efficiency Targets.

Then, the National Bureau of Energy Efficiency (N.B.E.E.) designates certain industries and gives them concrete targets for reducing energy consumption.

2. Implementation and Monitoring.

At the industrial level, energy-saving measures are put into place and regularly reported.

3. Energy Saving Certificates (ESCs).

Should an industry surpass its target and save more energy than is necessary, then it will be issued ESCs (Energy Saving Certificates). It can trade these certificates among those who fail to meet the targets on the market rather easily now! In this way the trading system is money-making for everyone.

Key Objectives of the PAT Scheme

The major goals of the PAT Plan, according to its 2016 annual report can be summed up in 5 points:

- 1) Energy intensity reduction in energy-intensive sectors.
- 2) All -round savings in energy use and CO₂ emissions.
This is an essential target for Japan as it seeks to design its energy systems in line with the 3D perspective.
- 3) Spreading usage of economically sound and environmentally friendly energy conservation technologies.
- 4) Encouraging methods based on market principles to improve energy use.
- 5) Industrial sustainable development.

It has been considered that the Scheme of Production Advanced Technological Transformation (PAT) is the most vivid tool for improving industrial energy efficiency in India. By cutting energy consumption at the source, it helps industries to lower operational costs and may also contribute towards achieving national climate goals. It also brings in modern technology and management of energy in the industrial sector. The PAT scheme serves India in meeting its targets under the Paris Agreement and also satisfies Sustainable Development Goal 7 (SDG7) of the United Nations 's Agenda 2020 through 2030, Sustainable Development Goal 9 (SDG9), and Sustainable Development Goal (SDG) 13 (SDG13).

References

Bose, A. (2021). Equitable Transition in India: Climate Policies and Societal Implications. *Journal of Environmental Economics*, Volume 42, Issue 4, Pages 213-228.

Chakravarty, P. (2022). Obstacles and Prospects in India's Transition to Renewable Energy. *Energy Policy*, Volume 53, Issue 5, Pages 199-210.

Ghosh, R. (2021). The Significance of Global Cooperation in Attaining India's Climate Objectives. *Journal of Global Environmental Policy*, Volume 34, Issue 2, Pages 98-111.

Hepburn, C., Stern, N., Stiglitz, J. E., & Zenghelis, D. (2020). *A Worldwide Green New Deal: Climate Initiatives in the 21st Century*. Policy Press.

Khan, A., Gupta, P., & Sharma, N. (2022). Green Employment in India: Prospects and Obstacles. *Sustainable Development*, Volume 45, Issue 3, Pages 185-198.

Patel, M., Agarwal, S., & Singh, V. (2023). Funding India's Energy Transition: Obstacles and Remedies. *Renewable Energy*, Volume 68, Issue 2, Pages 112-127.

Somanathan, E., Dutta, S., & Sahu, P. (2021). Energy Transition in India: Policy, Technology, and Infrastructure. *Energy Economics*, Volume 35, Issue 4, Pages 210-225.

United Nations Framework Convention on Climate Change. (2021). India's Nationally Determined Contribution (NDC). United Nations Framework Convention on Climate Change. Obtained from <https://unfccc.int/india-ndc>

Hou, K., & Waqas, M. (2024). Assess the economic and environmental impacts of the energy transition in selected Asian economies. *Energies*, 17, 5103.

<https://doi.org/10.3390/EN17205103>

Erbach G, Roniger J (2023) COP28 climate change conference: Outcomes. a glance-Towar. *Clim. Neutrality*

Ameer, W., Ali, M. S., Farooq, F., et al. (2023). Renewable energy electricity, environmental taxes, and sustainable development: empirical evidence from E7 economies. *Environmet Science and Pollution Resource*. <https://doi.org/10.1007/S11356-023-26930-5/METRICS>

Zhong, S., Chen, J., Ur, Z., & Faiz, R. (2024). Quantifying digital economy and green initiatives for carbon neutrality targets: A Kilian bias-adjusted bootstrap model evaluation of China economy. *Environmental Science and Pollution Research*.

<https://doi.org/10.1007/s11356-023-31445-0>

Zhang, H., Yang, F., Chandio, A. A., et al. (2023). Assessing the effects of internet technology use on rural households' cooking energy consumption: Evidence from China. *Energy*.

<https://doi.org/10.1016/j.energy.2023.128726>Return

Peng, L., Li, Y., Raza, S. A., & Shahzadi, I. (2023). Natural resources and environmental sustainability: COP26 targets from resources-based perspective. *Resource Policy*.

<https://doi.org/10.1016/j.resourpol.2023.103623>

Zhao, S., Zhang, L., Peng, L., et al. (2024b). Enterprise pollution reduction through digital transformation? Evidence from Chinese manufacturing enterprises. *Technology in Society*, 77, 102520.

<https://doi.org/10.1016/J.TECHSOC.2024.102520>

Martinez, A., & Iglesias, G. (2024). Global wind energy resources decline under climate change. *Energy*, 288, 129765.

<https://doi.org/10.1016/J.ENERGY.2023.129765>

Raihan, A., & Mainul Bari, A. B. M. (2024). Energy-economy-environment nexus in China: The role of renewable energies

toward carbon neutrality. *Innovation and Green Development*, 3, 100139. <https://doi.org/10.1016/J.IGD.2024.100139>

Tiwari, C. K., Bhat, M. A., Khan, S. T., et al. (2023). What drives students toward ChatGPT? An investigation of the factors influencing adoption and usage of ChatGPT. *Interactive Technology and Smart Education*. <https://doi.org/10.1108/ITSE-04-2023-0061/FULL/XML>

Xi, X., Xi, B., Miao, C., et al. (2022). Factors influencing technological innovation efficiency in the Chinese video game industry: Applying the meta-frontier approach. *Technological Forecasting and Social Change*, 178, 121574. <https://doi.org/10.1016/J.TECHFORE.2022.121574>

Singh, S. P., Sajnani, M., & Arora, G. K. (2023). Tourism industry and circular economy: Deep Interlinkages. *Prabandhan: Indian Journal of Management*, 16(5), 8. <https://doi.org/10.17010/pijom/2023/v16i5/172822>

Qin, L., Aziz, G., Hussan, M. W., et al. (2024). Empirical evidence of fintech and green environment: Using the green finance as a mediating variable. *International Review of Economics & Finance*. <https://doi.org/10.1016/j.iref.2023.07.056>

Cruz Rambaud, S., & López Pascual, J. (2023). Insurtech, proptech, and fintech environment: sustainability global trends and opportunities. *Sustainability*, 15(12), 9574.

Ashta, A. (2023). How can fintech companies get involved in the environment? *Sustainability*. <https://doi.org/10.3390/su151310675>

Zhou, P., Abbas, J., Najam, H., & Alvarez-Otero, S. (2023). Nexus of renewable energy output, green technological innovation, and financial development for carbon neutrality of Asian emerging economies. *Sustainable Energy Technologies and Assessments*, 58, 103371. <https://doi.org/10.1016/J.SETA.2023.103371>

Liu, Y., Yang, Y., Zheng, S., et al. (2022). Dynamic impact of technology and finance on green technology innovation efficiency: Empirical evidence from China's provinces. *International Journal of Environmental Research and Public Health*.

<https://doi.org/10.3390/ijerph19084764>

Saqib, N., Ozturk, I., & Usman, M. (2023). Investigating the implications of technological innovations, financial inclusion, and renewable energy in diminishing ecological footprints levels in emerging economies. *Geoscience Frontiers*.

<https://doi.org/10.1016/j.gsf.2023.101667>

Melati, R. G. (2022). The strategies of united nations development programme (UNDP) with global environmental facility (GEF) to promote sustainable land management. *Syntax Lit; J Ilm Indones*.

<https://doi.org/10.36418/syntax-literate.v7i1.5690>

You, Z., Li, L., & Waqas, M. (2024). How do information and communication technology, human capital and renewable energy affect CO2 emission; new insights from BRI countries. *Heliyon*.

<https://doi.org/10.1016/J.HELİYON.2024.E26481>

Fan, M., Zhou, Y., Lu, Z., & Gao, S. (2024). Fintech's impact on green productivity in China: Role of fossil fuel energy structure, environmental regulations, government expenditure, and R&D investment. *Resources Policy*, 91, 104857.

<https://doi.org/10.1016/J.RESOURPOL.2024.104857>

Lin, B., & Ullah, S. (2024). Modeling the impacts of changes in nuclear energy, natural gas, and coal in the environment through the novel DARDL approach. *Energy*, 287, 129572.

<https://doi.org/10.1016/J.ENERGY.2023.129572>

Chen, X., Chen, W., & Lu, K. (2023). Does an imbalance in the population gender ratio affect FinTech innovation? *Technological Forecasting and Social Change*, 188, 122164.

<https://doi.org/10.1016/J.TECHFORE.2022.122164>

Liu, W., & Waqas, M. (2024). Green innovation at the crossroads of financial development, resource depletion, and urbanization:

Paving the way to a sustainable future from the perspective of an MM-QR approach. *Sustainability*, 16, 7127.

<https://doi.org/10.3390/SU16167127>

Wu, S., Cheng, P., & Yang, F. (2024). Study on the impact of digital transformation on green competitive advantage: The role of green innovation and government regulation. *PLoS ONE*, 19, e0306603. <https://doi.org/10.1371/JOURNAL.PONE.0306603>

Cinquepalmi, F., Paris, S., Pennacchia, E., & Tiburcio, V. A. (2023). Efficiency and sustainability: The role of digitization in re-inhabiting the existing building stock. *Energies*. <https://doi.org/10.3390/en16093613>

Xu, A., Jin, L., & Yang, J. (2024). Balancing tourism growth, Fintech, natural resources, and environmental sustainability: Findings from top tourist destinations using MMQR approach. *Resources Policy*, 89, 104670. <https://doi.org/10.1016/J.RESOURPOL.2024.104670>

PCC (2014) Climate Change 2014 Synthesis Report: Summary for Policymakers.

https://www.ipcc.ch/site/assets/uploads/2018/02/AR5_SYR_FINAL_SPM.pdf. Accessed 28 Nov 2023

United Nations (2015) Transforming Our World: The 2030 Agenda for Sustainable Development.

<https://sdgs.un.org/sites/default/files/publications/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf>.

WMO (2022) Past eight year confined to be the eight warmest on record.

<https://wmo.int/media/news/past-eight-years-confirmed-be-eightwarmest-record>.

International Disaster Database (2022) 2022 Disasters in Numbers. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwj1q_LlsrGDAxVFcmwGHT2DB8QQFnoECA0QAQ&url=https%3A%2F%2Fcred.be%2Fsites%2Fdefault%2Ffiles%2F2022_EMDAT_report.pdf&usg=AOvVaw0F38Wsj1GDK6RMZqfLw_ds&opi=89978449.

UNICEF (2023). Devastating floods in Pakistan.

<https://www.unicef.org/emergencies/devastating-floods-pakistan-2022>.

Lindsey R (2022) Climate change: global sea level. NOAA, April 19.

<https://www.climate.gov/news-features/understanding-climate/climate-change-global-sea-level>. Accessed 21 Aug 2023

NOAA (2022) Climate Change: Global Sea Level.

<https://www.climate.gov/news-features/understanding-climate/climatechange-global-sea-level>

World Bank (2021) Millions on the move in their own countries: the human face of climate change.

<https://www.worldbank.org/en/news/feature/2021/09/13/millions-on-the-move-in-their-own-countries-the-human-face-of-climate-change>.

pdf. Accessed 28 Nov 2023 IPCC (2022) Summary for Policy Makers.

https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_SummaryForPolicymakers.pdf,

Athal K (2022) Never-ever-seen climate changes in India – the concerns and solutions. The Times of India, February 4. <https://timesofindia.indiatimes.com/blogs/krishna-athal/never-ever-seen-climate-changes-in-india-the-concerns-and-solutions/>.

The Tribune (2020) Average temperature over India projected to rise by 4.4 degrees Celsius: Govt report on impact of climate change in country.

<https://www.Tribuneindia.Com/news/nation/average-temperature-over-india-projected-to-rise-by-4-4-degrees-celsius-govt-report-on-impact-of-climate-change-in-country-99583>.

India Today (2022) Indian Ocean hit by six heatwaves in 2021, temp rising by 0.15 degrees Celsius per decade.

<https://www.indiatoday.in/science/story/climate-change->

ocean-temperature-rising-heatwave-bay-of-bengal-indian-ocean-1929111-2022-03-24.

WMO (2023) Past eight year confined to be the eight warmest on record

<https://wmo.int/media/news/past-eight-years-confirmed-be-eight-warmest-record>.

MD (2022) Annual Report 2022.

https://mausam.imd.gov.in/imd_latest/contents/ar2022.pdf

Sangomla A (2023) South India records its lowest June rainfall in 122 years. Down to Earth, July 5.

<https://www.downtoearth.org.in/news/climate-change/south-india-records-its-lowest-june-rainfall-in-122-years-90421>.

The Hindu (2023) Yamuna water level breaches danger mark amid rains in Delhi. The Hindu, July 19.

<https://www.thehindu.com/news/cities/Delhi/yamuna-water-level-breaches-danger-mark-amid-rains-in-delhi/article67096789.ece>

Government of India, Ministry of New and Renewable Energy (2022) Women in renewable energy (RE): call for action, February 17.

https://mnre.gov.in/img/documents/uploads/file_s-1663738338619.pdf.

ISRO (2018) Desertification and land degradation atlas of India. ISRO, Ahmedabad.

Sengupta R (2021) Land degradation in India hurts farmers and forest dwellers the most. Down to Earth, August 27.

<https://www.downtoearth.org.in/news/environment/land-degradation-in-india-hurts-farmers-and-forest-dwellers-the-most-78701>

Arora NK, Mishra I (2021) COP26: more challenges than achievements. Environ Sustain 4:585–588

Singleton Council. Singleton Sustainability Strategy 2019–2027. 2019. Available online: <https://www.singleton.nsw.gov.au/Live/>

Sustainability-Hub/Sustainability-Strategy (accessed on 18 December 2022).

Hunter Central Coast Region Emergency Management Committee. Hunter-Central Coast Regional Emergency Management Plan, March 2021; Hunter Central Coast Region Emergency Management Committee: Central Coast, Australia, 2021.

Australian Bureau of Statistics. Hunter Valley excluding Newcastle: 2021 Census All Persons QuickStats. Available online: <https://abs.gov.au/census/find-census-data/quickstats/2021/106> (accessed on 18 December 2022).

State of New South Wales. Hunter Regional Economic Development Strategy; Greenwood Publishing Group: Greenwood, IN, USA, 2018.

Deloitte Access Economics. Prospects and Challenges for the Hunter Region: A Strategic Economic Study; Deloitte Access Economics: Sydney, Australia, 2013.

King, A. La Niña, 3 Years in a Row. In the Conversation. 2022. Available online: <https://theconversation.com/la-nina-3-years-in-a-row-a-climate-scientist-on-what-flood-weary-australians-can-expect-this-summer-190542> (accessed on 18 December 2022).

Twomey, C. Historical Variability of East Coast Lows (ECLs) and their Impact on Eastern Australia's hydroclimate. Unpublished Ph.D. Thesis, University of Newcastle, Newcastle, Australia, 2017.

Williams, D. Predicting the Next Major Flood on the Hunter River. In Proceedings of the FMA Conference, Boston, MA, USA, 11-14 October 2017.

Wasko, C.; Nathan, R.; Stein, L.; O'Shea, D. Evidence of shorter more extreme rainfalls and increased flood variability under climate change. *J. Hydrol.* 2021, 603, 126994. [CrossRef]

Reid, K.; O'Brien, T.; King, A.; Lane, T. Extreme Water Vapor Transport During the March 2021 Sydney Floods in the Context of

Climate Projections. *Geophys. Res. Lett.* 2021, 48, e2021GL095335. [CrossRef]

Singleton Council. Singleton Sustainability Strategy 1019–2027. 2019. Available online:

<https://www.singleton.nsw.gov.au/Live/Sustainability-Hub/Sustainability-Strategy> (accessed on 18 December 2022).

Mid Coast Council. Community Strategic Plan MidCoast 2030: Shared Vision, Shared Responsibility. 2018. Available online: <http://www.midcoast.nsw.gov.au/files/assets/public/document-resources/have-your-say/community-strategic-plan/midcoast-2030-shared-vision-shared-responsibility.pdf> (accessed on 18 December 2022).

Cessnock City Council. Draft Community Strategic Plan. 2022. Available online: <https://www.cessnock.nsw.gov.au/Council/Forms-and-documents/Integrated-planning-and-reporting/Community-Strategic-Plan> (accessed on 18 December 2022).

Lake Macquarie City Council. Our Future in Focus, Lake Macquarie City Community Strategic Plan 2017–2027; Lake Macquarie City Council: Speers Point, Australia, 2017.

Muswellbrook Shire Council. Community Strategic Plan. 2017. Available online: <https://www.lakemac.com.au/files/assets/public/council/strategies-and-plans/for-adoption-community-strategic-plan-2022-2032-version-25-web.pdf> (accessed on 18 December 2022).

Singleton Council. Environmental Management Policy: Integrated Risk Management. 2021. Available online: <https://www.singleton.nsw.gov.au/Council/Governance-and-Transparency/Policies/Integrated-Risk-Management-Policy> (accessed on 18 December 2022).

Reckien, D.; Salvia, M.; Pietrapertosa, F.; Simoes, S.G.; Olazabal, M.; De Gregorio Hurtado, S.; Geneletti, D.; Lorencová, E.K.; D'Alonzo, V.; Krook-Riekkola, A.; et al. Dedicated versus

mainstreaming approaches in local climate plans in Europe. *Renew. Sustain. Energy Rev.* 2019, 112, 948–959. [CrossRef]

Cuevas, S.C. The interconnected nature of the challenges in mainstreaming climate change adaptation: Evidence from local land use planning. *Clim. Change* 2016, 136, 661–676. [CrossRef]

PIB. (2024). Crore Indians escape multidimensional poverty in last 9 years. Press Information Bureau, Government of India.

<https://www.pib.gov.in/PressReleaseframePage.aspx?PRID=1996271>

PIB. (2024). Progress of flagship programs under SDG framework. Press Information

Bureau, Government of India. <https://pib.gov.in>

PIB. (2024). Progress and challenges in gender equality. Press Information Bureau,

Government of India. <https://pib.gov.in>

PIB. (2025). India's progress outpaces global averages in maternal mortality. Press

Information Bureau, Government of India.

<https://www.pib.gov.in/PressReleaseframePage.aspx?PRID=2128024>

PIB. (2025). India's renewable energy capacity achieves historic growth in FY 2024-25.

Press Information Bureau, Government of India.

[https://pib.gov.in/PressReleasePage.aspx/pib.gov.in/Pressrelease.aspx?PR](https://pib.gov.in/PressReleasePage.aspx/pib.gov.in/Pressrelease.aspx?PRID=2120729)

[ID-2120729.](https://pib.gov.in/PressReleasePage.aspx/pib.gov.in/Pressrelease.aspx?PRID=2120729)

Dhanurkar T, Budamala V, Das Bhowmik R (2024) Understanding the association between global forest fire products and hydrometeorological variables. *Sci Total Environ* 945:173911. <https://doi.org/10.1016/j.scitotenv.2024.173911>

Gupta A, Roy A, Chauhan P (2023) Space-based observation of early summer wildfire event and its environmental proxies during 2021 in Eastern Peninsular India. *Arab J Geosci* 16(7):433. <https://doi.org/10.1007/s12517-023-11544-5>

Gupta SK, Kanga S, Meraj G, Kumar P, Singh SK (2023) Uncovering the hydro-meteorological drivers responsible for forest fires utilizing geospatial techniques. *Theor Appl Climatol* 153(1–2):675–695. <https://doi.org/10.1007/s00704-023-04497-y>

Mishra M, Guria R, Baraj B, Nanda AP, Santos CAG, da Silva RM, Laksono FAT (2024) Spatial analysis and machine learning prediction of forest fire susceptibility: a comprehensive approach for effective management and mitigation. *Sci Total Environ* 926:171713. <https://doi.org/10.1016/j.scitotenv.2024.171713>

Sagar N, Suresh KP, Naveesh YB, Archana CA, Hemadri D, Patil SS, Archana VP, Raaga R, Nandan AS, Chethan AJ (2024) Forest fire dynamics in India (2005–2022): unveiling climatic impacts, spatial patterns, and interface with anthrax incidence. *Ecol Indic* 166:112454. <https://doi.org/10.1016/j.ecolind.2024.112454>

Sahu V, Khan MA, Madguni OD (2024) Assessing forest fire dynamics and risk zones in Central Indian forests: a comparative study of the Khandwa and North Betul forest divisions of Madhya Pradesh. *Environ Monit Assess* 196(9):810. <https://doi.org/10.1007/s10661-024-12960-0>

Uthappa AR, Das B, Raizada A, Kumar P, Jha P, Prasad PVV (2025) Forest fire susceptibility mapping using multi-criteria decision making and machine learning models in the Western Ghats of India. *J Environ Manage* 379:124777. <https://doi.org/10.1016/j.jenvman.2025.124777>

Prabhakaran A, Srivastava P (2025) Analysis of prevailing atmospheric conditions during wildfire events in the Indian Himalayan region. *Q J Royal Meteorol Soc*. <https://doi.org/10.1002/qj.4918>

Ray T, Malasiya D, Verma A, Purswani E, Qureshi A, Khan ML, Verma S (2023) Characterization of spatial-temporal distribution of forest fire in Chhattisgarh, India, using MODIS-based active fire data. *Sustainability* 15(9):7046. <https://doi.org/10.3390/su15097046>

Sati VP (2024) Forest fires in the Indian Central Himalaya: major drivers, implications, and mitigation measures. *Environ Hazards* 23(4):390–404. <https://doi.org/10.1080/17477891.2024.2304211>

Khatua R, Nanda A, Mohapatra AKB, Guhan V, Srivastava RK (2025) Addressing the role of forest fire in global climate change context: a critical examination. Springer, Cham. https://doi.org/10.1007/978-3-031-75968-0_5

Kumar S, Kumar A (2022) Hotspot and trend analysis of forest fires and its relation to climatic factors in the western Himalayas. *Nat Hazards* 114(3):3529–3544. <https://doi.org/10.1007/s11069-022-05530-5>.

Government of India. (2008). *National Action Plan on Climate Change (NAPCC)*. Prime Minister's Council on Climate Change. Ministry of Environment, Forest and Climate Change. <https://moef.gov.in/en/division-climate-change-napcc/>

Government of India. (2015). *India's Intended Nationally Determined Contribution: Working Towards Climate Justice*. Ministry of Environment, Forest and Climate Change. <https://moef.gov.in>

Government of India. (2020). *Revised State Action Plans on Climate Change (SAPCCs): Guidelines for State Governments*. Ministry of Environment, Forest and Climate Change. <https://moef.gov.in>

Intergovernmental Panel on Climate Change. (2022). *Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press.

<https://www.ipcc.ch/report/ar6/wg2/>

NITI Aayog. (2021). *SDG India Index & Dashboard 2020–21*. Government of India.

<https://www.niti.gov.in>

United Nations. (2015). *Transforming Our World: The 2030 Agenda for Sustainable Development*. United Nations General Assembly. <https://sdgs.un.org/2030agenda>

United Nations Development Programme. (2019). *Climate Action: Sustainable Development Goal 13*. UNDP.

Dubash, N. K., Raghunandan, D., Sant, G., & Sreenivas, A. (2015). *Indian climate change policy: Exploring a co-benefits-based approach*. *Climate Policy*, 15(5), 596–616.

Mahapatra, S., & Dubey, A. (2020). *Strengthening India's climate planning: A critical review of State Action Plans on Climate Change*. *Environmental Research Letters*, 15(10), 1–12.

Singh, C., Gupta, J., et al. (2019). *Climate change adaptation in Indian states: The evolution of SAPCCs as policy tools*. *Regional Environmental Change*, 19(7), 2085–2097.

Allen, C., Metternicht, G., & Wiedmann, T. (2018). Initial progress in implementing the Sustainable Development Goals (SDGs): A review of evidence from countries. *Sustainability Science*, 13(5), 1453–1467. <https://doi.org/10.1007/s11625-018-0572-3>

Bebbington, J., & Unerman, J. (2018). Achieving the United Nations Sustainable Development Goals: An enabling role for accounting research. *Accounting, Auditing & Accountability Journal*, 31(1), 2–24. <https://doi.org/10.1108/AAAJ-05-2017-2929>

Hák, T., Janoušková, S., & Moldan, B. (2016). Sustainable Development Goals: A need for relevant indicators. *Ecological Indicators*, 60, 565–573. <https://doi.org/10.1016/j.ecolind.2015.08.003>

Kumar, S., Kumar, N., & Vivekadish, S. (2016). Millennium Development Goals (MDGs) to Sustainable Development Goals

(SDGs): Addressing unfinished agenda and strengthening sustainable development. *Indian Journal of Community Medicine*, 41(1), 1–4. <https://doi.org/10.4103/0970-0218.170955>

Le Blanc, D. (2015). Towards integration at last? The Sustainable Development Goals as a network of targets. *Sustainable Development*, 23(3), 176–187. <https://doi.org/10.1002/sd.1582>

Sachs, J. D., Kroll, C., Lafortune, G., Fuller, G., & Woelm, F. (2022). *Sustainable Development Report 2022: From crisis to sustainable development*. Cambridge University Press.

Sachs, J. D., Schmidt-Traub, G., Kroll, C., Durand-Delacre, D., & Teksoz, K. (2019). Six transformations to achieve the SDGs. *Nature Sustainability*, 2(9), 805–814.

<https://doi.org/10.1038/s41893-019-0352-9>

United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development*. United Nations.

Alkire, S., & Jahan, S. (2018). The new global MPI 2018: Aligning with the Sustainable Development Goals. *UNDP Human Development Report Office*.

Alkire, S., Kanagaratnam, U., & Suppa, N. (2022). The global Multidimensional Poverty Index (MPI) 2022: Unpacking deprivation bundles to illustrate intrahousehold and spatial poverty. *World Development*, 157, 105926.

<https://doi.org/10.1016/j.worlddev.2022.105926>

Devereux, S. (2021). Social protection for poverty eradication: Reframing the debate. *Development Policy Review*, 39(2), 147–165. <https://doi.org/10.1111/dpr.12489>

Le Blanc, D. (2015). Towards integration at last? The Sustainable Development Goals as a network of targets. *Sustainable Development*, 23(3), 176–187. <https://doi.org/10.1002/sd.1582>

Sumner, A., Hoy, C., & Ortiz-Juarez, E. (2020). Estimates of the impact of COVID-19 on global poverty. *WIDER Working Paper* 2020/43. <https://doi.org/10.35188/UNU-WIDER/2020/800-9>

United Nations. (2023). *The Sustainable Development Goals Report 2023*. UN.

<https://www.un.org/sustainabledevelopment/poverty/>

Béné, C., Fanzo, J., & Prasad, A. (2021). The good, the bad and the ugly of resilience in food systems. *Nature Food*, 2(10), 693–700. <https://doi.org/10.1038/s43016-021-00344-3>

Development Initiatives. (2023). *Global Nutrition Report 2023*.

FAO. (2023). *The state of food security and nutrition in the world 2023*. Food and Agriculture Organisation.

Laborde, D., Herforth, A., Headey, D., & Wieser, C. (2021). The COVID-19 pandemic has led to a greater depth of food insecurity. *Nature Food*, 2(7), 476–478. <https://doi.org/10.1038/s43016-021-00319-4>

Rockström, J., Williams, J., Daily, G., Noble, A., Matthews, N., Gordon, L., ... Smith, J. (2017). Sustainable intensification of agriculture for human prosperity and global sustainability. *Ambio*, 46(1), 4–17. <https://doi.org/10.1007/s13280-016-0793-6>

United Nations. (2023). *The Sustainable Development Goals Report 2023*. United Nations.

Hogan, D. R., Stevens, G. A., Hosseinpour, A. R., & Boerma, T. (2018). Monitoring universal health coverage within the Sustainable Development Goals: Development and baseline data for an index of essential health services. *The Lancet Global Health*, 6(2), e152–e168. [https://doi.org/10.1016/S2214-109X\(17\)30472-2](https://doi.org/10.1016/S2214-109X(17)30472-2)

Karamagi, H. C., Tumusiime, P., Titi-Ofei, R., Droti, B., Kipruto, H., & Barasa, E. (2021). Towards universal health coverage in the WHO African Region: Progress, gaps and opportunities. *BMJ Global Health*, 6(1), e004618. <https://doi.org/10.1136/bmjgh-2020-004618>

Kruk, M. E., Gage, A. D., Joseph, N. T., Danaei, G., García-Saisó, S., & Salomon, J. A. (2018). Mortality due to low-quality health systems in the era of SDGs. *The Lancet*, 392(10160), 2203–2212. [https://doi.org/10.1016/S0140-6736\(18\)31668-4](https://doi.org/10.1016/S0140-6736(18)31668-4)

Rajan, D., Mathurapote, N., Namagingo, E., & Gutierrez, J. (2020). Health system resilience: Learning from the COVID-19 pandemic. *Health Policy and Planning*, 35(10), 1331–1336. <https://doi.org/10.1093/heapol/czaa116>

United Nations. (2023). *The Sustainable Development Goals Report 2023*.

World Health Organisation. (2022). *World Health Statistics 2022*.

Azevedo, J. P., Hasan, A., Goldemberg, D., Iqbal, S. A., & Geven, K. (2021). Simulating the potential impacts of COVID-19 school closures on schooling and learning outcomes. *The World Bank Research Observer*, 36(1), 1–40. <https://doi.org/10.1093/wbro/lkab003>

Psacharopoulos, G., & Patrinos, H. A. (2018). Returns to investment in education: A decennial review of the global literature. *Education Economics*, 26(5), 445–458. <https://doi.org/10.1080/09645292.2018.1484426>

Schleicher, A. (2018). *World-class: How to build a 21st-century school system*. OECD Publishing.

UNESCO. (2021). *Global Education Monitoring Report 2021*. UNESCO.

United Nations. (2023). *The Sustainable Development Goals Report 2023*.

World Bank. (2022). *The State of Global Learning Poverty 2022*

Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2022). *The Global Findex Database 2021: Financial inclusion, digital payments, and resilience in the age of COVID-19*. World Bank. <https://doi.org/10.1596/978-1-4648-1897-4>

Duflo, E. (2012). Women's empowerment and economic development. *Journal of Economic Literature*, 50(4), 1051–1079. <https://doi.org/10.1257/jel.50.4.1051>

Heise, L., Greene, M. E., Oppen, N., Stavropoulou, M., Harper, C., Nascimento, M., & Zewdie, D. (2019). Gender inequality and

restrictive gender norms: Framing the challenges to health. *The Lancet*, 393(10189), 2440–2454. [https://doi.org/10.1016/S0140-6736\(19\)30652-X](https://doi.org/10.1016/S0140-6736(19)30652-X)

UNICEF. (2021). *State of the world's children 2021*. UNICEF.

UN Women. (2022). *Progress on the Sustainable Development Goals: The gender snapshot 2022*.

United Nations. (2023). *The Sustainable Development Goals Report 2023*.

Boretti, A., & Rosa, L. (2019). Reassessing the projections of the World Water Development Report. *Science of the Total Environment*, 657, 1343–1351.

<https://doi.org/10.1016/j.scitotenv.2018.12.270>

Daher, B., Mohtar, R. H., Saad, W., & Pistikopoulos, E. (2021). Water–energy–food nexus: A platform for implementing the Sustainable Development Goals. *Current Opinion in Environmental Science & Health*, 5(1), 1–12.

<https://doi.org/10.1016/j.coesh.2020.100254>

Kaza, S., Yao, L., Bhada-Tata, P., & Van Woerden, F. (2018). *What a waste 2.0: A global snapshot of solid waste management to 2050*. World Bank.

United Nations. (2022). *The Sustainable Development Goals Report 2022*. United Nations Publications.

United Nations World Water Development Report (UN-WWDR). (2023). *Partnerships and cooperation for water*. UNESCO.

WHO & UNICEF. (2021). *Progress on household drinking water, sanitation and hygiene 2000–2020: Five years into the SDGs*. World Health Organisation.

Deichmann, U., Meisner, C., Murray, S., & Wheeler, D. (2011). The economics of renewable energy expansion in rural Sub-Saharan Africa. *Energy Policy*, 39(1), 215–227.

<https://doi.org/10.1016/j.enpol.2010.09.034>

International Energy Agency. (2022). *World energy outlook 2022*. IEA Publications.

Jäger-Waldau, A. (2020). Snapshot of photovoltaics—February 2020. *Renewable and Sustainable Energy Reviews*, 125, 109775. <https://doi.org/10.1016/j.rser.2020.109775>

Kuzemko, C., Bradshaw, M., Bridge, G., Goldthau, A., Jewell, J., Overland, I., Scholten, D., Sareen, S., & Westphal, K. (2020). Covid-19 and the politics of sustainable energy transitions. *Energy Research & Social Science*, 68, 101685. <https://doi.org/10.1016/j.erss.2020.101685>

Newell, P., & Simms, A. (2020). Towards a fossil fuel non-proliferation treaty. *Climate Policy*, 20(8), 1043–1054. <https://doi.org/10.1080/14693062.2019.1636759>

Sovacool, B. K., Ryan, S. E., Stern, P. C., Janda, K., Rohling, T., Spreng, D., & Pasqualetti, M. J. (2020). The clean energy revolution: Policy and societal implications. *Nature Energy*, 5, 705–715. <https://doi.org/10.1038/s41560-020-0666-9>

Blanchard, O., & Rodrik, D. (2021). *Combating inequality: Rethinking policies to reduce inequality in advanced economies*. MIT Press.

Chen, M. A. (2016). The informal economy: Recent trends, future directions. *New Solutions*, 26(2), 155–172. <https://doi.org/10.1177/1048291116652613>

International Labour Organisation. (2020). *World employment and social outlook: Trends 2020*. ILO Publications.

International Labour Organisation. (2021). *World employment and social outlook: The role of digital labour platforms*. ILO Publications.

Razzak, W. A. (2021). Does social protection improve labour market outcomes? *Journal of Economic Studies*, 48(4), 751–770. <https://doi.org/10.1108/JES-06-2020-0304>

Aghion, P., Antonin, C., & Bunel, S. (2021). *The power of creative destruction: Economic upheaval and the wealth of nations*. Harvard University Press.

Calderón, C., & Servén, L. (2014). Infrastructure, growth, and inequality: An overview. *World Bank Policy Research Working Paper* No. 7034.

Rotolo, D., Hicks, D., & Martin, B. R. (2017). What is an emerging technology? *Research Policy*, 44(10), 1827–1843.
<https://doi.org/10.1016/j.respol.2015.06.006>

United Nations Industrial Development Organisation (UNIDO). (2020). *Industrial development report 2020: Industrialising in the digital age*. UNIDO Publications.

The role of innovation and industrial dynamics in growth and development by Giovanni Dosi, M. C. Pereira, M. E. Virgillito & A. Zeli (2021) — via the link below:

<https://www.econstor.eu/bitstream/10419/243513/1/2021-17.pdf>

Department of Economic and Social Affairs. (n.d.). *Goal 10: Reduced Inequalities*. United Nations. Retrieved from <https://sdgs.un.org/goals/goal10> SDGs

International Labour Organisation / United Nations. (n.d.). *What is Goal 10 – Reduced Inequalities [Fast Facts]?* United Nations.

United Nations. (2019). *Sustainable Development Goal 10 – Reduced Inequalities: Concept Note*.

UNICEF Data. (n.d.). *SDG 10: Reduced Inequalities*. UNICEF. Retrieved from <https://data.unicef.org/sdgs/goal-10-reduced-inequalities/>

UN – Nigeria. (n.d.). *Sustainable Development Goal 10: Reduced Inequalities*. Retrieved from <https://nigeria.un.org/en/sdgs/10> The United Nations in Nigeria

The Cambridge Handbook of the Sustainable Development Goals and International Law. (2022). “SDG 10: Reduce Inequality within and among Countries.” In *The Cambridge Handbook of the Sustainable Development Goals and International Law* (pp. 258–280).

Cambridge University Press. Cambridge University Press & Assessment

World Bank. (2018). *Reducing Inequalities: Progress and Prospects*. World Bank Event.

United Nations. (n.d.). *Sustainable Development Goal 11: Sustainable cities and communities*. Retrieved from <https://sustainabledevelopment.un.org/sdg11>

United Nations. (2023). *Goal 11: Sustainable Cities and Communities – Fast Facts*. Retrieved from https://www.un.org/sustainabledevelopment/wp-content/uploads/2023/09/Goal-11_Fast-Facts.pdf, United Nations

United Nations. (2016, March). *Metadata – Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable*. UN Statistics Division.

UN-Habitat. (2018). *SDG 11 Synthesis Report: Cities and human settlements*. UN-Habitat.

Planning Department, Uttar Pradesh (or relevant Indian planning document). (2024–2025). *Goal 11: Sustainable Cities and Communities – National/State Report (India)*. (Example of national implementation reference.)

United Nations. (2023). *Goal 12: Responsible Consumption & Production – what it means*. Retrieved from <https://sdgs.un.org/goals/goal12SDGs>

United Nations. (2016, March). *Metadata – Goal 12: Ensure sustainable consumption and production patterns*. UN Statistics Division. https://unstats.un.org/sdgs/files/metadata-compilation/metadata-goal-12.pdf?utm_source=chatgpt.com

United Nations. (n.d.). *Sustainable Development Goal 12: Responsible Consumption and Production*. Retrieved from

<https://www.un.org/development/desa/dpad/sustainable-development-goal/goal-12-responsible-consumption-and-production/>

United Nations Environment Programme. (n.d.). *SDG 12: Responsible Consumption & Production – Why it matters*. https://sdgs.unep.org/article/goal-12?utm_source=chatgpt.com

World Health Organization. (2022). *SDG 12: Responsible Consumption and Production*. Retrieved from WHO resource materials. https://www.who.int/tools/your-life-your-health/a-healthy-world/planet/SDG-12-Responsible-Consumption-and-Production?utm_source=chatgpt.com

United Nations. (2023). *What is Goal 12 – Responsible Consumption & Production? (Fast Facts)*. https://www.un.org/sustainabledevelopment/wp-content/uploads/2023/09/Goal-12-Fast-Facts.pdf?utm_source=chatgpt.com

United Nations. (2025). *Goal 13: Climate Action*. Retrieved from <https://www.un.org/sustainabledevelopment/climate-change/>

United Nations. (n.d.). *SDG 13: Climate Action – Targets and Indicators*. Metadata-Goal-13. Retrieved from <https://unstats.un.org/sdgs/files/metadata-compilation/Metadata-Goal-13.pdf>

United Nations. (n.d.). *Sustainable Development Goal 13: Climate Action*. Retrieved from <https://sdgs.un.org/goals/goal13>

United Nations. (2018). *Taking Urgent Action to Combat Climate Change – SDG 13 and the Paris Agreement*. Retrieved from <https://www.un.org/en/chronicle/article/goal-13-taking-urgent-action-combat-climate-change-sdgs-and-paris-climate-agreement>

United Nations Environment Programme. (n.d.). *Why SDG 13 – Climate Action matters*. Retrieved from <https://sdgs.unep.org/article/sdg-13>

United Nations. (2025). *SDG 14: Life Below Water – Fact Sheet 2025*. Retrieved from https://unstats.un.org/sdgs/report/2025/extended-report/Extended-Report-2025_Goal-14.pdf

United Nations. (n.d.). *Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development*. UN Sustainable Development. Retrieved from <https://sdgs.un.org/goals/goal14>

United Nations Environment Programme (UNEP). (n.d.). *SDG 14: Life Below Water – Global Manual on Measuring SDG 14.1.1, 14.2.1 and 14.5.1*. Retrieved from <https://sdgs.unep.org/article/goal-14>

United Nations. (2018). *What is Goal 14 – Life Below Water? (Fast Facts)*. United Nations. Retrieved from https://www.un.org/sustainabledevelopment/wp-content/uploads/2023/09/Goal-14_Fast-Facts.pdf

United Nations. (2016). *Metadata – Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development*. UN Statistics Division. Retrieved from <https://unstats.un.org/sdgs/files/metadata-compilation/Metadata-Goal-14.pdf>

United Nations. (n.d.). *Goal 14: Oceans*. Retrieved from <https://www.un.org/sustainabledevelopment/oceans/>

United Nations. (n.d.). *Goal 15: Life on Land*. In Sustainable Development Goals. Retrieved from <https://sdgs.un.org/goals/goal15>

United Nations. (n.d.). *Goal 15: Forests, desertification and biodiversity*. Retrieved from <https://www.un.org/sustainabledevelopment/biodiversity/>

United Nations. (2019). *What is Goal 15 – Life on Land? (Fast Facts)*. Retrieved from <https://www.un.org/sustainabledevelopment/wp-content/uploads/2019/01/Goal-15-Fast-Facts.pdf>

United Nations Environment Programme. (n.d.). *Goal 15: Life On Land*. Retrieved from <https://sdgs.unep.org/article/goal-15>

United Nations. (n.d.). *Sustainable Development Goal 16: Peace, Justice and Strong Institutions*. Retrieved from <https://sdgs.un.org/goals/goal16>

United Nations Statistics Division. (2016). *Metadata – Goal 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*. Retrieved from <https://unstats.un.org/sdgs/files/metadata-compilation/Metadata-Goal-16.pdf>

United Nations. (2017). *SDG Indicators: Goal 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*. Retrieved from <https://unstats.un.org/sdgs/report/2017/goal-16/>

United Nations. (n.d.). *SDG 16 – The Rule of Law and Human Rights*. Retrieved from <https://www.un.org/ruleoflaw/sdg-16/>

Asia-Pacific UNDP. (2024, February). *SDG 16: Peace, Justice and Strong Institutions – Goal Profile*. Retrieved from ESCAP-UNDP publication. https://www.undp.org/asia-pacific/publications/sdg-16-peace-justice-and-strong-institutions-promote-peaceful-and-inclusive-societies?utm_source=chatgpt.com

United Nations. (n.d.). *Goal 17: Partnerships for the Goals*. Retrieved from <https://sdgs.un.org/goals/goal17>

United Nations. (n.d.). *Goal 17 Targets and Metadata*. UN Statistics Division. Retrieved from <https://unstats.un.org/sdgs/files/metadata-compilation/Metadata-Goal-17.pdf>

United Nations Environment Programme. (n.d.). *SDG 17: Partnerships for the Goals*. Retrieved from <https://sdgs.unep.org/article/goal-17>

UNICEF Data. (n.d.). *SDG 17 – Partnerships for the Goals*. Retrieved from <https://data.unicef.org/sdgs/goal-17-partnerships-for-the-goals/>

United Nations. (2025). *Goal 17: Partnerships for the Goals – Goal of the Month*. Retrieved from <https://www.un.org/sustainabledevelopment/gotm-july-2025/>

Hanushek, E. A., & Woessmann, L. (2015). *The knowledge capital of nations: Education and the economics of growth*. MIT Press.

UNESCO. (2022). *Global education monitoring report 2022: Non-state actors in education*. UNESCO Publishing. <https://www.unesco.org>

United Nations. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development*. United Nations. <https://sdgs.un.org/2030agenda>

World Bank. (2018). *World development report 2018: Learning to realize education's promise*. World Bank. <https://doi.org/10.1596/978-1-4648-1096-1>

UN Women. (2023). *Progress on the Sustainable Development Goals: The gender snapshot 2023*. UN Women. <https://www.unwomen.org>

United Nations. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development*. United Nations. <https://sdgs.un.org/2030agenda>

United Nations Development Programme (UNDP). (2023). *Gender equality strategy 2022–2025*. UNDP. <https://www.undp.org>

World Economic Forum. (2023). *Global gender gap report 2023*. World Economic Forum. <https://www.weforum.org>