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SUSTAINABLE DEVELOPMENT IN INDIA

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Abstract - Sustainable development refers to a process in which all available natural resources are utilised in a way that ensures future generations will also benefit from them. Sustainable development is a strategy for boosting the economy that takes into account both immediate needs and long-term goals. The goal of sustainable development is to enhance the standard of living for future generations by bolstering the economy and reducing environmental degradation. Sustainable development aims to promote social harmony as one of its primary outcomes.

Sustainable development promotes a progressive shift in how we create and utilise technology in order to preserve and improve our resource base.

The biggest obstacles to sustainable development include poverty, unemployment, climate change, armed conflict, and humanitarian help.

This paper outlines one of the major environmental issues. The study also focuses on techniques for sustainable development, which are essential for both the survival of the current generation and that of future generations.

Keywords: Sustainable development, Environment, Future Generation

I. INTRODUCTION

Balanced economic growth is a central tenet of the sustainable development idea. social progress, and environmental conservation, have gained considerable support in recent years (Mensah, 2019).

Conflicts, political and social unrest, and economic instability are only some of the negative outcomes of human development over the past several decades; worsening weather patterns and more frequent and intense natural disasters are others. The survival of the world and future generations is in peril due to the negative impact humans have had on the ecosystem. Changes in attitude and action towards less stressful and environmentally damaging resource management have been prompted by these conditions. The concept of sustainable development, which gained traction in the 1970s and 1980s of the previous centuries, takes into account the kind of responsible behaviour that would allow for the sustainable use of resources over the long term. Sustainable development is based on the following three ideas: development (social and economic progress that accounts for environmental constraints), needs (equitable distribution of resources that raises people's living standards), and future generations (the potential for resources to be used indefinitely, ensuring that future generations will have what they need to thrive). The Triple bottom line concept, from which the term "sustainable development" is derived, emphasises the

importance of striking a good balance among environmental sustainability (which prioritises protecting the natural resources essential to economic growth and human well-being), social sustainability (which seeks to protect people's fundamental freedoms and promotes social justice), and cultural sustainability (which prioritises preserving cultural identity and respecting traditional values). For sustainable development to be fully realised, all four pillars must be in harmony with one another. This is easier said than done, however, because advancing one aspect of sustainability without negatively impacting the others is counterproductive. In this way, the potential for development as a whole is tied to ecological sustainability, which might deteriorate even while other aspects of sustainable development improve (Klarin, 2018).

India, a country with one of the world's fastest expanding economies, understands the value of sustainable development in guaranteeing its people a bright and equitable future. India's goal of sustainable development is of worldwide importance because of the country's massive population and the wide variety of social, economic, and environmental difficulties it faces (United Nations, 2019).

The trajectory of India's development, with its rich cultural past, diverse ecosystems, and abundant people resources, is at a crossroads. Ecological destruction, climatic change, and socioeconomic disparities are just some of the negative outcomes of rapid industrialization, urbanisation, and population increase. The Indian government has made significant steps to promote sustainable development in a variety of areas in response to the pressing need for change.

The purpose of the paper is to investigate the current level of sustainable development in India, focusing on the most pressing environmental problems and the most promising long-term solutions.

• Sustainability and Sustainable Development Conceptually Related

Technically speaking, the two ideas are distinct. The goal of every development process should be to reach a sustainable level of development, and sustainability is the driving force or agenda that does just that. (Hodge, 1997) (Jabareen, 2008). All areas of development must be coordinated, and the tone, strategy, or guiding principles that do so are defined by sustainability (Hodge, 1997). In contrast, sustainable development refers to an end state

that is reached by adhering to a sustainability-focused code of conduct (Ruggerio, 2021). Figure offers a clear explanation of how sustainable development might result from growth that is guided by sound sustainability principles. The positive correlation seen in Figure 1 between sustainability and sustainable development is supported by the data, which may or may not be linear. According to the paradigm in Figure 1, sustainable development is only possible when it is prioritised along the route to progress.

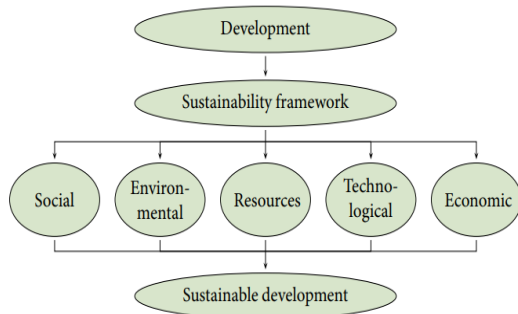


Figure 1: Conceptual Relationship between Sustainability and Sustainable Development (Ozili, 2022)

Sustainability in development is defined as any amount of progress made in accordance with a guiding sustainability framework. Conversely, development outcomes that are not sustainable are those that are obtained without a guiding sustainability framework.

• Sustainable Development Goals

The Brundtland Commission's proposals led to the adoption of 17 Sustainable Development Goals (SDG) by the UN in 2015 (Fig. 2). The first twelve and the last two (16 and 17) of these objectives can be viewed as human development objectives. The objectives 13 through 15 might be viewed as environmental protection objectives (United Nations, 2021). The UN has recognised these objectives as a global call to action to "promote prosperity while protecting the environment." (Bava, 2022).



Figure 2: Sustainable Development Goals (United Nations, 2021)

II. LITERATURE REVIEW

Sustainable Development in India

In this work, (Hussain, Pal and Villanthenkodath, 2023) studied the influence of urbanisation, mobile phone use, energy consumption, and economic growth, as well as public sector expenditure on transport infrastructure, on India's environmental impact. This study employs the ARDL limits testing approach to integration to investigate the connection between the variables selected from 1990 to 2018 in light both the immediate and far future associations of the developed ecological footprint function. The developed result verified the persisting connection between the investigated factors. Also, the conclusion shows that spending on travel and economic growth might lessen one's ecological footprint, whereas urbanisation, mobile usage, and power use do the opposite. In light of these findings, policy ramifications are proposed to increase funding for transport infrastructure and promote long-term

economic expansion. Similarly, it stresses the importance of sustainable urbanisation, environmentally responsible mobile phone use, and powering homes with electricity generated from renewable sources in India.

In (Pandey, 2023) compiled the available empirical research on India's progress towards the SDGs into a coherent whole, highlighting research gaps and offering a path forward for filling them. It also takes into account potential avenues for further research and policy frameworks. The SDGs in India were the subject of a systematic literature review (SLR), which analysed 100 scholarly publications published between 1995 and 2022. Some important findings emerge from an examination of the literature on the SDGs in India. The report highlights both India's successes and failures in its efforts to achieve the SDGs. Some areas have seen significant progress, such as poverty reduction and education, while others, such as inequality, gender equality, environmental sustainability, and healthcare, still have a long way to go.

In this work, (Patel and Patel, 2023) presented the factual analysis of estimated potential, major initiatives so far, progress, achievements, and prospects of future development of wind energy sector in India. The estimated potential in prospective states of the country and their achievements against these are also presented. Paper also presents the analysis on emergence of India and its current position among the leading country's of the world in wind power installation. India is blessed with immense wind energy resources. The National Institute of Wind Energy (NIWE), by using advanced LiDAR/SiDAR techniques to collect data through more than 800 monitoring stations installed across the country, estimated the country's wind energy potential as 302 GW at the height of 100m from the ground level. India's cumulative installed capacity of wind energy as on 31 March 2020 was 37.69 GW accounting only 12.47% of the estimated potential. With this generation capacity, India is ranked fourth in the world, but the percentage of capacity utilisation is inadequate and this indicates the slow pace of wind energy development in the country. Study reveals that the auspicious target of affordable clean energy for all can be achieved through the faster development of the wind energy sector. Paper also suggests that to accelerate the pace of wind projects installation and establish wind power as one among the prospective sources of energy for sustainable development, there is the need to ease the process of land availability, develop the necessary transmission facility, ensure more financing to the wind sector and promote hybrid technologies.

To evaluate India's progress towards a sustainable future by the year 2030, (Bhanja and Roychowdhury, 2020) strives to comprehend how far behind India is in terms of attaining the SDGs on a national and subnational level. With the use of a composite index, the current situation of India's main SDG objectives is examined in this study. The issues of sustainable development in India were also examined using cluster analysis to look at region- and issue-specific issues. The subnational composite index shows that 14 of the 29 states have performed well. India must concentrate on these areas to attain sustainability by 2030, according to this analysis.

Strategies for Sustainable Development

In (Lohani *et al.*, 2023) researched pertinent material in order to give a general assessment of Nepal's present renewable energy condition and energy mix, and have a conversation about the likelihood that the nation will make a transition to sustainable energy. Many articles and research from scholarly journals and government agencies were included since they discussed renewable energy and offered suggestions for Nepal's future

energy policy and development objectives. However, fewer than 3% of Nepal's power comes from renewable sources, despite the falling cost of solar PV. Based on their findings, the researchers recommend that Nepal implement favourable and proactive policies and initiatives to promote the use of renewable energy. Solar power, backed up by batteries and other forms of storage like pumped hydroelectricity, would play a significant role in this scenario.

Another study by (Sivaranjani *et al.*, 2023) concentrated on a thorough analysis of the biohydrogen generation at pilot size and numerous parameters influencing the experiment design. Biohydrogen is a sustainable alternative to traditional fuels like coal and oil. Biohydrogen has the highest energy content of all currently utilised fuels while also being carbon-neutral or carbon-zero, renewably sourced, produced in an ecologically sound manner (through biological techniques), and converted in an environmentally sound manner. Synthesis of biohydrogen on a pilot scale is currently constrained by the need for a deeper knowledge of the various interactions within the process. In this research, many distinct reactor designs were analysed for their viability as biohydrogen generators. Several other types of reactors are available, such as the stirred tank reactor, packed bed reactor, fluidized bed reactor, and trickling filter reactor. The primary challenge with large-scale biohydrogen production is its comparatively high cost compared to fossil fuels due to expensive feedstock and manufacturing costs. However, this problem has been addressed in recent years. To make this biofuel more competitive than its rival, cost-efficient and environmentally friendly biohydrogen production methods must be created and constantly enhanced. Biohydrogen is extremely renewable and has a higher energy output than fossil fuels. It can meet the need for transportation fuel in the future.

In this work, (Pramanik *et al.*, 2023) examined the various biofuels' origins, production processes, and effects on sustainability. Many methods are present for harnessing energy derived from renewable sources from plant material with a wide range of characteristics and origins (including the food industry, agriculture, and forestry) in The stirred tank reactor, packed bed reactor, fluidized bed reactor, and trickling filter reactor are just a few of the different reactor types out there. The main problem with producing biohydrogen on a big scale is that, when compared to fossil fuels, it is prohibitively expensive due to high feedstock and production costs. This issue, however, has been resolved recently. A potential answer to this pressing problem is the next generation of bio-fuels. Second-generation bio-fuel, maybe the bio-fuel of the future, is mostly sourced from agricultural lignocellulosic waste. The major considerations for effectively utilising a renewable energy mix are the use of sustainable practises to cultivate biomass, and then its production of high-quality ethanol through a comprehensive conversion process.

The United Nations' sustainable development goals (SDGs), approved in 2015, are gaining traction across all major manufacturing sectors. Attaining the SDGs will improve people's lives, the environment, and the economy all at the same time. That's why it's more important than ever to incorporate the SDGs into supply chain (SC) operations. The existing SC literature on SDGs requires analysis in this regard. A study by (Agrawal *et al.*, 2022) examines the literature on SDGs in SC throughout the past six years (2015-2021). A total of 144 articles have been chosen for further examination. In order to generate a topographical overview of the topic and to depict the interconnections between authors and terms, researchers employ bibliometric and network studies. Using bibliometric coupling analysis, we may spot a wide range of

developing topics in the field of study. The articles' content has been analysed taking into account the various SC processes and phases. In addition, articles are mapped on many Sustainable Development Goals. Sustainable development goals (SDGs) and the methods for achieving them through the adoption of sustainable practises in SC have been explained. The paper concludes with suggestions for future studies that might aid in the SC's pursuit of the SDGs.

Key Issues Related to Sustainable Development

'Sustainable development' is one of the most urgent and popular terms in the environmental context. Sustainable development entails a balance between economic growth and environmental conservation. However, the challenge of attaining quicker economic development is closely tied to climate change and is currently the world's most pressing issue. Massive use of natural resources and the introduction of new technologies are major contributors to the exponential increase in atmospheric carbon dioxide levels brought about by the increasing global need for food, energy, and mineral resources. We all know that the environment in about 15 to 20 years will be determined by our actions right now. So, (Devi and Phil, 2021) key issues in sustainable development with a country focus on India. Important challenges to sustainable development in the global context include eradicating extreme poverty, promoting responsible consumption and production, and handling Earth's wealth of natural resources for the good of all sectors of society. Many obstacles need to be overcome before the Sustainable Development Goals (SDGs) can be effectively implemented, and this is especially true in the case of India. The Indian government has launched a variety of initiatives to maintain sustainable development, including Agenda 30, the SDGs and MDGs, NITI AAYOG, the Make in India and Digital India programmes, the Jan Dhan Yojana, the Swachh Bharat Abhiyan, and others. However, in order to generate inclusive growth, combat climate change, and lower the risk of climate change, sustainable development necessitates the participation of everyone in the global community. The Indian economy is growing at a rapid rate. Growth in this region, however, is unsustainable and lacks a competitive edge. The relationship between economic progress and human development is maintained as complimentary. Therefore, there needs to be a good relationship between social, economic, and environmental growth for there to be sustainable development.

According to (Cramer *et al.*, 2018) Recent climate change acceleration has greatly exacerbated the environmental issues in the Mediterranean Basin, which were previously caused by a confluence of changing land use, increasing pollution, and decreasing biodiversity. Water, ecosystems, food, health, and security are five major impact categories that are all interrelated, and both present change and future scenarios indicate to large and growing dangers over the next several decades. There is a lack of information, especially for those most susceptible southern the Mediterranean. communities, when less systematic evaluation schemes and influence algorithms are based, which are essential for developing effective strategies for the long-term progress of Mediterranean nations. There is now an attempt to better comprehend the full scope of the threats by synthesising scientific knowledge from a variety of fields.

In (Omisore, 2018) explored the significance of environmental factors in the progress of sub-Saharan Africa toward the SDGs; all three are important and interconnected. This article provides an overview of the SDGs, discusses Africa's progress towards MDG 7, and examines the interplay between Africa's environmental potential and challenges in the context of the SDGs. Relevant data was culled from scientific studies and worldwide and African

MDG/SDG reports. Sub-Saharan Africa is home to a wealth of natural resources, but the region is also threatened by deterioration of the ecosystem and rising temperatures. The environment is fundamental to her growth and change, yet the circle of poor environmental management, poverty, and unsustainable development shows little signs of being broken. Constant awareness of environmental concerns that provide a significant barrier to development is essential if governments in sub-Saharan Africa and other stakeholders are to pool their limited resources to find solutions and form effective partnerships. In sub-Saharan Africa, environmentalists can be a threat to the SDGs. To achieve real progress towards the SDGs, stakeholders must give environmental concerns their full attention.

III. DISCUSSION

This paper summarises the findings of a handful of recent sustainability studies in India. (Hussain, Pal and Villanthenkodath, 2023) conducted the first study of its kind, which controlled for factors including urbanisation, mobile phone use, electricity use, and economic growth to determine the ecological effects of funding transport infrastructure. In contrast, (Pandey, 2023) examined the previously conducted empirical studies on the SDGs in India and pinpointed the gaps in knowledge that need to be filled. Wind energy in India was the subject of another recent study (Patel and Patel, 2023), which concluded that the country should speed up the installation of wind projects if it wants to meet its goal of providing cheap, clean energy to all of its citizens. Researchers have concluded that India has achieved certain strides towards sustainable development, but that it still faces significant obstacles in other areas. More investigation into the SDGs in India and funding for renewable energy have both been highlighted by the studies.

Sustainable development strategies relevance to India are also discussed in this paper. The feasibility of a sustainable energy transition in Nepal was explored, along with policies and measures to encourage the uptake of clean energy (Lohani *et al.*, 2023). The difficulties and potential benefits of expanding biohydrogen generation were analysed and discussed (Sivaranjani *et al.*, 2023). The different kinds of bio-fuels, where they come from, how they're made, and how they affect sustainability were all examined in another study by (Pramanik *et al.*, 2023). Finally, (Agrawal *et al.*, 2022) examined the existing literature on SDGs in supply chain (SC) and identifies a number of new lines of inquiry. These studies argue that India has to implement sustainable practises throughout the board, from SC to energy to agriculture. These studies offer some guidance on how India might realise its potential as a global leader in sustainable development.

According to some studies (Devi and Phil, 2021) (Cramer *et al.*, 2018) (Omisore, 2018), for India, achieving sustainable development is a formidable obstacle. Poverty, climate change, environmental degradation, and inequality are some of India's most pressing problems. All of these problems are harmful to the ecosystem and exacerbate one another. Poor people, with little options, frequently turn to utilizing dirty energy sources like burning wood or dung for cooking and heating. It is clear that climate change is having a negative impact on India's ecosystem, and experts predict that this trend will continue. The water supply and biodiversity in India are both threatened by environmental degradation. Those who are already at a disadvantage suffer the most from environmental deterioration because of inequality. In addition to these issues, there is a need for reliable methods of monitoring and assessment, as well as transparent and broadly accepted indicators of sustainable development. India may make

significant progress towards a more sustainable future if it accepts and addresses these problems.

IV. CONCLUSION

In this work, we review literature examining sustainable development in India. According to the data utilised in this analysis, India has advanced in certain areas of sustainable development but faces serious challenges in others. India needs to increase its funding for renewable energy and SDG-related research. Sustainable practises in SC, energy, and agriculture are just few of the many areas where India has to make progress.

The following are some suggestions for how India might move towards sustainable development:

- Solar, wind, and hydroelectric power are just few of India's many sustainable energy options. Using these assets, the country's energy needs can be met while simultaneously lowering environmental impact.
- Soil quality, pollutants, and harvests can all benefit from more sustainable agricultural practises. The safety of India's food supply depends on this.
- India must maintain its environment by doing things like cutting down on pollution, preserving forests, and controlling water usage.
- To encourage sustainable development, education, and awareness are crucial. India must fund education and awareness initiatives to inform its citizens about sustainable development and their role in achieving it.

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