# Sustainable Development and Infrastructure Growth of India

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https://doi.org/10.5281/zenodo.10615385

**ABSTRACT**

*Infrastructure is the entirety of the services and facilities required for a nation, state, city, or other area's residents, businesses, and economy to operate. It is the systems and facilities that support these entities. It is the foundation of every economy, developed or developing. Infrastructure facilities serve as the basis for several different operations. Nations frequently prioritize infrastructure construction and upkeep to boost economic expansion, increase connectivity, and raise the standard of living for all populations. Public and private physical constructions like roads, railroads, bridges, tunnels, water supplies, sewage systems, electrical grids, and telecommunications (including broadband and Internet access) are all considered infrastructure. For the development of any economy, infrastructure is crucial. Every society relies on infrastructure systems to provide essential services like energy, water, waste management, transportation, and telecommunications. Infrastructure, however, can also worsen social and environmental effects and make people more susceptible to natural disasters. As a result, many choices being taken today will ensure that development patterns continue. Infrastructure impacts all the Sustainable Development Goals (SDGs) in one way or another. It is one of the goals among the seventeen goals under Sustainable Development Goals. Infrastructure helps improve productivity, generate decent jobs, address inequalities, and build resilience. This paper focuses on the infrastructure growth in India since the inception of the sustainable development goal.*

*Keywords: Sustainable development, infrastructure, national highways, waterways, railways, telecommunication.*

## A. Introduction

At the 2012 Rio de Janeiro Council Meeting, the United Nations established the Sustainable Development Goals agenda to advance a prosperous and healthy future for people and the environment. In 2015, the Sustainable Development Goals came into effect. The Open Working Group on Sustainable Development

Goals of the United Nations General Assembly has set 17 goals and 169 agendato be accomplished by 2030. The Agenda for Sustainable Development Goal "Transforming Our World" was endorsed at the United Nations Sustainable Development Summit following the conclusion of discussions. Building resilient infrastructure is one of the goals of sustainable development. Sustainable development is the goal of meeting the current needs of the people without sacrificing the ability of future generations to meet their own. Developmental sustainability takes social, cultural, and environmental factors into account. The Sustainable Development Goals aim to ensure everyone lives in prosperity and peace, protect the environment, and end poverty by 2030. The 17 Sustainable Development Goals (SDGs) recognize the interdependence of many areas and the need for development to balance the sustainability of the environment, society, and economy. The SDGs seek to end poverty, hunger, AIDS, and discrimination against women and girls. Many interconnected issues are addressed by the Sustainable Development Goals (SDGs), including gender equality, clean water and sanitation, affordable and renewable energy, decent work, poverty, hunger, health, and education, as well as economic growth. Below is a summary of the 17 Sustainable Development Goals:

1. No Poverty
2. Zero hunger
3. Good health and well-being
4. Quality education
5. Gender equality
6. Clean water and sanitation
7. Affordable and clean energy
8. Decent work and economic growth
9. Industry, innovation, and infrastructure
10. Reduced inequalities
11. Sustainable cities and communities
12. Responsible consumption and production
13. Climate action
14. Life below water
15. Life on land
16. Peace, justice, and strong institutions
17. Partnership for the goals

The present paper focuses on the infrastructural development of India, which is the 9th goal of the SDGs. The following are the objectives of SDGs related to infrastructure:

- The main objective of SDG's Goal 9 is to create dependable, robust, sustainable, and high-quality infrastructure—including transnational and regional infrastructure—to promote human well-being and economic growth, emphasizing fair and inexpensive access for everyone.
- By 2030, all nations should take measures in line with their capacities to upgrade infrastructure and refit industries to make them sustainable, which includes increasing resource usage efficiency and adopting cleaner and ecologically sound technology and industrial processes.
- Encourage the development of resilient and sustainable infrastructure in developing nations by providing more financial, technical, and technological assistance to African nations, the least developed nations, landlocked nations, and small island developing states.
- By 2020, significantly expand the availability of information and communications technology and work toward granting all developing nations inexpensive, universal access to the Internet.

Nations have pledged to prioritize the least developed nations' development. India is also attempting to assess the SDGs' global success as well. The duty of organizing the SDGs, mapping initiatives relevant to the SDGs and their targets, and designating lead and supporting ministries for each target has been given to NITI Aayog, the think tank of the Indian Government. The Ministry of Statistics and Programme Implementation (MoSPI) has also led negotiations for creating national SDG indicators. Since they are in the best position to "put people first" and ensure that "no one is left behind," state governments are essential to India's progress toward the SDGs.

For the development of any country, the essential organizational and physical structure is required. An essential component of sustainable development is infrastructure. Water, sewage, clean drinking water systems, transportation, education, and clean drinking water are the components of a nation's or organization's basic infrastructure. Infrastructure is the foundation of industrial and agricultural production and national and international trade. A country's social and economic advancement is directly impacted by its infrastructure development. The notable progress achieved in numerous industrialized countries can be attributed to the swift development of social and economic infrastructures. Work is facilitated by an adequate infrastructure, which results in positive and high production. The Government's initiatives to create infrastructure to support India's sustainable growth are the main topic of this essay, which is (goal 9) one of the 17 Sustainable Development Goals (SDGs) and is the cornerstone of domestic and

international trade and industrial and agricultural production. Infrastructure facilities benefits the economy and the society in the following way:

Economic Development: Well-planned and efficiently managed infrastructure is essential for economic growth. Transportation networks, energy systems, and communication infrastructure contribute to increased productivity, trade, and business development. Sustainable infrastructure development minimizes negative economic impacts, ensures long-term viability, and promotes inclusive economic growth.

Social Development: Infrastructure affects the quality of life of the people. Housing, healthcare, education, clean water, Etc. are social infrastructure. Sustainable development strongly emphasizes social justice and inclusivity, which means that infrastructure initiatives should help all societal groups— especially the weaker and neglected ones.

Environmental Sustainability: Sustainable development aims to reduce the detrimental effects of traditional infrastructure development, which frequently results in environmental deterioration. Reducing the environmental impact of infrastructure projects requires using green infrastructure, which includes sustainable water management, renewable energy initiatives, and eco-friendly urban design techniques.

Resilience and Adaptation: Sustainable infrastructure design aims to withstand environmental stresses, such as climate change, which entails considering possible hazards and implementing strategies to adjust to shifting circumstances, such as constructing infrastructure that can endure severe weather or developing energy systems that prioritize renewable sources.

Resource Efficiency:The goal of sustainable infrastructure is to maximize the utilization of renewable resources while avoiding waste, which entails using energy-saving technology, making the most use of water, and encouraging the application of circular economy ideas to building and maintenance.

Long-Term Viability: Sustainable Infrastructure is constructed with the long term in mind, which entails taking life-cycle costs, maintenance needs, and the capacity to adjust over time to changing requirements into account. To increase efficacy and efficiency, it also entails implementing cutting-edge technologies and creative ideas.

Businesses, governments, and international organizations increasingly realize the importance of integrating sustainability concepts into creating infrastructure. To provide long-term advantages for both the present and future generations, achieving sustainable infrastructure necessitates a comprehensive strategy that considers social, economic, and environmental considerations.

B. Literature Review:

Wang et al. (2018) found in their study that transportation infrastructure impacts sustainable development from multiple perspectives, such as economic, social, regional, and environmental. Cities are connected by transportation infrastructure, which also enables human activity to interact with social, economic, and environmental systems. They found that transportation infrastructure significantly impacts urban development, the city network, land, and human life. Through connections between or within cities, the transportation infrastructure improves the quality of life and stimulates socio-economic growth.

Beksultanova et al. (2021) studied in their research that infrastructure is essential for achieving sustainable development and provides the basis for stable economic development. Global campaigns are being created to promote sustainable infrastructure and criteria for evaluating its caliber. The shift in the infrastructure market from conventional to sustainable facilities—which take into account social, economic, and environmental factors—must be acknowledged by the international system. The infrastructure enables the accomplishment of numerous global community and business goals until 2030. In addition to promoting economic growth, it helps improve people's quality of life and lessens adverse environmental effects, such as emissions and waste pollution and the disturbance of natural ecosystems.

Aizawa (2019) analyzed that quality infrastructure can help projects avoid costly mistakes and benefit the country, people, and environment. Quality infrastructure that contributes to sustainable development and to achieving the SDGs. There should be a spreading of awareness regarding sustainable infrastructure.

Ciminello (2019) explored the issue of sustainable resource usage and economic culture. It enhances the functionality of existing infrastructure, such as roads that connect two cities; energy transport networks in areas with factories, offices, or other energy-dependent activities; water and sewerage networks or waste disposal networks in areas with significant urban populations and lower-level infrastructure, including hospitals, schools, universities, and other places where people congregate; and technological systems, including virtual communications, the internet, and phone networks, for both social and commercial purposes. As a result, to ensure that the population's standard of living continues to rise, it is imperative to assess factors like energy, water, transportation, and ICT. For this reason, the territory's growth and population density requirements must also be considered when building a railway.

Singh and Ru (2023)examined that SDG focuses on enhancing road connectivity in rural regions, increasing internet penetration, encouraging mobile broadband connection subscriptions, and allocating more funds for boosting Internet penetration in society is influenced by many factors, including income, education, demography, telephone and broadband subscriptions, ownership of computers and

mobile phones, networks, political climate, media, forex laws, tariffs, and competition policy. The widespread use of the Internet has been shown to provide several benefits, including increased economic growth, local financial development, stock market efficiency, and foreign travel.The widespread use of the internet raises essential issues about inclusive financial growth, income and environmental policies, and penetration. Besides internet penetration, the trend in mobile broadband subscriptions is another critical aim and indicator of SDG 9. Increased rates of broad brand subscriptions for mobile devices have a good impact on international tourism, environmental sustainability, and energy efficiency. They also dramatically lower carbon emissions. They also find that swiftly achieving these objectives depends on educational reforms. Enhancing educational quality has a significant effect on the SDGs.

## C. Objectives of the study

- To study infrastructure growth from the inception of Sustainable Development Goals till date.
- To assess the Government initiatives for the sustainable development of the country.

## D. Methodology

The study uses secondary data for research purposes, such as various journals, magazines, websites, etc.

In addition to focusing on affordable, universal access, India is working to enhance environmental sustainability and infrastructure to build a stable, resilient, and sustainable system that promotes human welfare and economic prosperity. India is improving its communication, transportation, rivers, roadways, and telecommunication to achieve this goal.

Highways: Highways are the dominant mode of transportation. Make travel more accessible and practical for work, play, or transporting goods.Make expansion possible and provide a convenient means to travel. To facilitate conveyance of people, goods, raw materials, manufactured articles, Etc, speedily and efficiently in different parts of a country—act as the only source of communication in regions of high altitude, i.e.,mountainous areas.

Table 1 depicts the length of national highways from 2015-16 to 2021-22.

| Year | National Highways (Km) |
|---|---|
| 2015-16 | 1,01,010 |

| | |
|---|---|
| 2016-17 | 1,14,158 |
| 2017-18 | 1,26,500 |
| 2018-19 | 1,32,500 |
| 2019-20 | 1,38,346 |
| 2020-21 | 1,41,345 |
| 2021-22 | 1,44,955 |

Source: Annual Report (The Ministry of Road Transport and Highways) 2023

Table 1. Highways

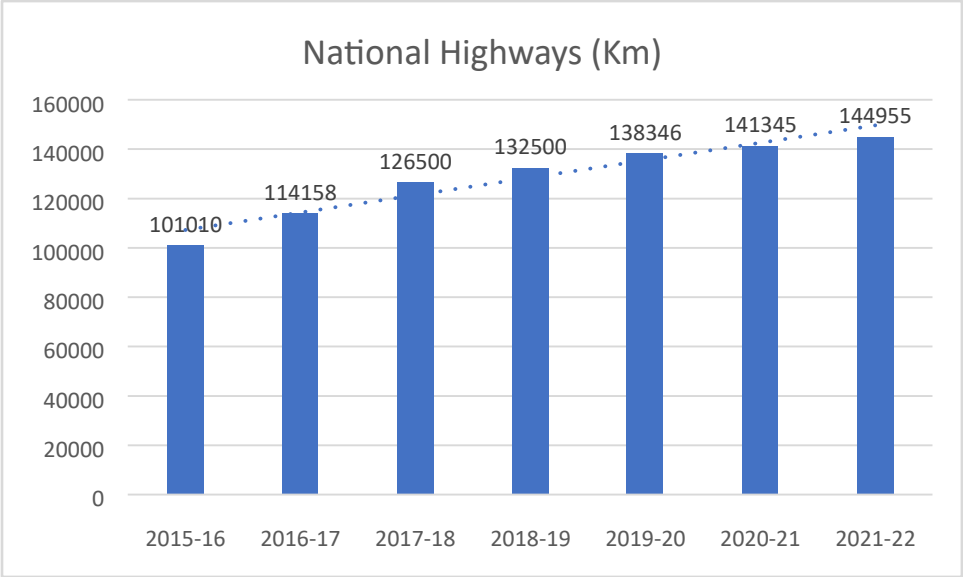


Figure 1. Highways

Table 1 and Figure 1 depict that in 2015-16, the length of the highway in India was 101010 km, which has increased to 114158 km in 2016-17, 126500 km in 2017-18, 132500 km in 2018-19, 138346 km in 2019-20, 141345 km in 2020-21 & 144955 km in 2021-22. The table and figure show that the length of highways has continuously increased since the inception of the Sustainable Development goal in 2015.

Waterways:Waterways are essential for recreation and tourism. It is vital to the country's sustainable development as they are cheaper, fuel-efficient, and less polluting. Waterways are essential for the transportation of goods, resources, and people throughout the world. They provide access to the islands. They are most suitable for carrying heavy goods. They offer a high-income level, employment, and gateways for international trade.

Table 2 depicts India's port capacity since the inception of sustainable development goals till date.

| Year | Port Capacity (in Million Tonnes) |
|---|---|
| 2015-16 | 965.36 |
| 2016-17 | 1359.00 |
| 2017-18 | 1451.19 |
| 2018-19 | 1514.09 |
| 2019-20 | 1534.91 |
| 2020-21 | 1560.61 |
| 2021-22 | 1597.59 |

Source: Annual Report (The Ministry of Ports, Shipping & Waterways) 2023

Table 2. Waterways

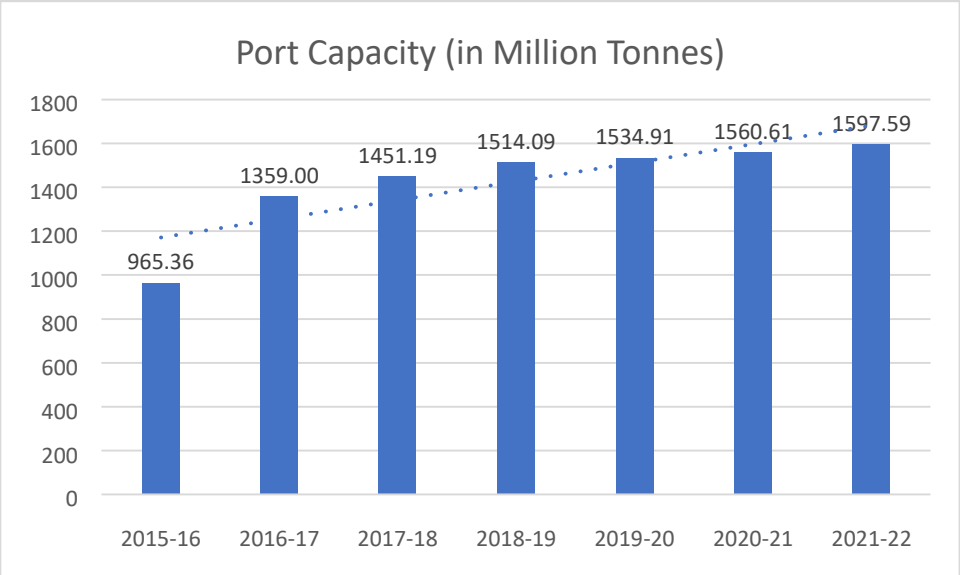


Figure 2. Waterways

From Table 2, the growth of port capacity in India can be analyzed. The port capacity in India was 965.36 million tones in 2015-16, which was 1359.00 million tones in 2016-17, 1451.19 million tones in 2017-18, 1514.09 million tones in 2018-19, 1534.91 million tones in 2019-20, 1560.61 million tones in 2020-21, and 1597.59 million tones in 2021-22. There is an increasing trend in the growth of waterways in India.

Railways: Railways are a climate-smart and efficient way to move people and freight. They promote economic growth while cutting greenhouse gas emissions. Railways make it possible to conduct diverse activities like business, sightseeing,

and pilgrimage, along with the transportation of goods. Railways are suitable for long-distance travel. Railways play an essential role in national integration. Railways are necessary for the development of a country because they Provide an affordable and efficient way to move people and goods, Promote economic growth and international trade by connecting different regions and markets, and reduce greenhouse gas emissions.Table 3 depict the length of railway trackin India since the inception of sustainable development goal till date.

| Years | Total tracks Km |
|---|---|
| 2015-16 | 119,630 |
| 2016-17 | 121,630 |
| 2017-18 | 122,873 |
| 2018-19 | 123,542 |
| 2019-20 | 126,366 |
| 2020-21 | 126,611 |
| 2021-22 | 128,305 |

Source: www.railways.gov.in Table

3. Railways

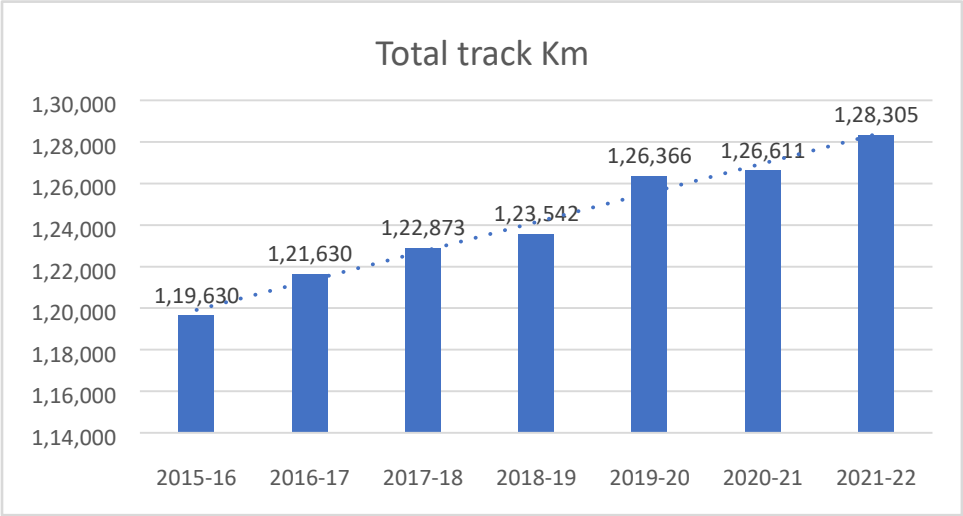


Figure 3: Railways

The table and figure 3 depict that in 2015-16, the length of railway track in India was 119630 km, which has increased to 121630 Km in 2016-17, 122873 km in 2017-18, 123542 km in 2018-19, 126366 km in 2019-20, 126611 km in 2020-21 &128305 km in 2021-22. The table and figure show that the length of railway trackshas continuously increased since the inception of the Sustainable Development Goal in 2015.

Communication:The contacts essential to the economic system's overall functioning are the communication methods. They effectively provide their portion of the total output but also impact other industries, which raises productivity throughout the economy. The endowment of communication infrastructure is a crucial component in explaining economic progress. It is commonly acknowledged that information and communications technologies (ICTs), which include telecommunications as a component of the infrastructure, are crucial to the economic success of nations. A table showing the expansion of communication in India is provided below.

| Years | Wireless Subscribers (in million) | Wireline Subscribers (in a million) | Internet users (in a million) |
|---|---|---|---|
| 2016-17 | 1170.18 | 24.40 | 197.85 |
| 2017-18 | 1183.41 | 22.81 | 269.62 |
| 2018-19 | 1161.81 | 21.70 | 395.87 |
| 2019-20 | 1157.75 | 20.22 | 518.92 |
| 2020-21 | 1180.96 | 20.24 | 639.47 |

Source:TRAI Annual Report 2020-21

Table:4 Communication

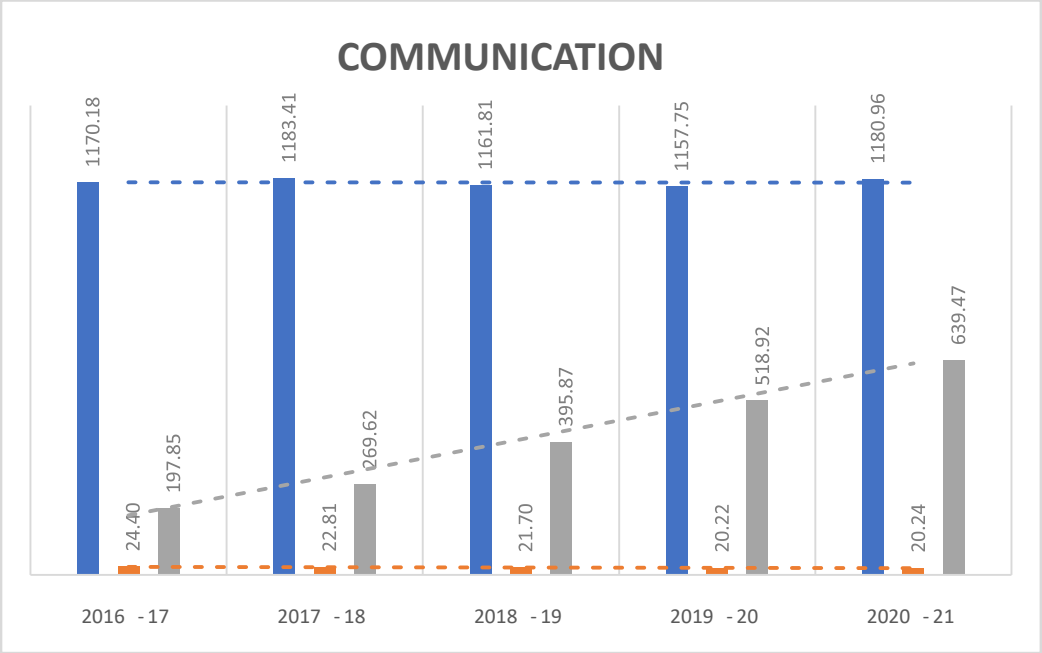


Figure 4. Communication

The figure and Table 3 depict that in 2016-17, there were 1170.18 million wireless subscribers, 1183.41 million in 2017-18, 1161.81 million in 2018-19, 1157.75 million in 2019-20, and 1180.96 millionwireless subscribers in 2020-21, and shown an increasing trend. There were 24.40 million wireline subscribers in 2016-

17,22.81 million in 2017-18, 21.7 million in 2018-19, 20.22 million in 2019-20, and 20.24 million in 2020-21.The number of internet users is also increasing day by day. In 2016-17, there were 197.85 million internet subscribers; in 2017-18, there were 269.62; in 2018-19, there were 395.87 million; in 2019-20, there were 518.92 and 639.47 million in 2020-21.

Education: The determinants of education are crucial for the economic development of any country. The economy is impacted by educational attainment and quality. A key component in boosting and encouraging economic growth is education. Building human capital is aided by high-quality education. Education is a significant contributor to our economy's development. Highly educated citizens make more money and contribute more taxes to the Government's operating budget. Employability is also increased by education. Individuals with low levels of education are more likely to be unemployed or underemployed than those with higher achievement levels.

| Years | Enrollment | GER (Gross Enrollment Ratio) |
|---|---|---|
| 2015-16 | 34584781 | 24.5 |
| 2016-17 | 35705905 | 25.2 |
| 2017-18 | 36642378 | 25.8 |
| 2018-19 | 37399388 | 26.3 |
| 2019-20 | 38536359 | 27.1 |

Source: The Ministry of Education, Department of School Education & Literacy, All India Survey on Higher Education

Table 5. Education

Table5 depicts the enrollment and gross enrollment ratio. In 2015-16, there were 34584781 students enrolled; in 2016-17, 35705905; in 2017-18, a total of students registered 366422378; 37399388 students in 2018-19, and 38536359 in 2019-20. The Gross Enrollment ratio in 2015-16 was 24.5; in 2016-17, it was 25.2; 25.8 in 2017-18, 26.3 in 2018-19, and 27.1 in 2019-20, with an increasing trend.

## E. Conclusion

Every economy needs infrastructure to grow and thrive.Infrastructure development boosts business and entrepreneurial potential while multiplying demand and transportation efficiency. It positively affects long-term output and growth, fosters positive economic transformation, and increases in infrastructure result in higher productivity and lower costs, all of which improve human wellbeing. The above findings laid the factual information of the Government's promotion of infrastructure. Infrastructure development facilitates a country's economic growth, leading to poverty reduction, and both are essential goals of the Sustainable Development 2030 Agenda. From the above study, it can be concluded

that India is investing in better infrastructure, such as roadways, railways, waterways, internet, and education, to accommodate its growing population, develop the Indian economy, and meet the SDGs goal 9 (Industry, Innovation, and Infrastructure), since the inception of the Sustainable Development Goals.

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