



Analyzing Climate Action Strategies for Sustainable Development in Gujarat (Sdg-13)

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Abstract

Gujarat, a state in western India, faces significant challenges due to climate change. This paper investigates the state's progress towards achieving Sustainable Development Goal (SDG) 13: Climate Action. It analyzes Gujarat's climate action strategies, policies, and their effectiveness in mitigating climate impact and fostering adaptation. The paper explores specific areas like water resource management, agricultural practices, and coastal protection in the context of SDG 13 implementation. The indicators set aside by the SDG goals are studied under the Indian context. The paper also describes the existing policies/practices actively pursued by the state government. By examining some of the recent incidents and areas for improvement, the paper aims to contribute valuable insights for policymakers and stakeholders working towards climate action in Gujarat, on the gaps that need to be achieved in fulfilling the goals by 2030.

Keywords

Sustainable Development, Climate Change, Gujarat, Mitigation

1. Introduction

Climate change is a global crisis demanding urgent action. Sustainable Development Goal 13 (SDG 13) calls on us to tackle this challenge head-on by taking comprehensive steps to curb greenhouse gas emissions and adapt to our changing climate. Our planet's health and the well-being of future generations depend on it.

The far-reaching impacts of climate change are undeniable. Extreme weather events, from scorching heatwaves to devastating floods, are becoming increasingly common. These disasters wreak havoc on economies, displace communities, and disrupt our way of life. Rising sea levels pose a serious threat to coastal cities and small island nations.

Let us first understand the focus of the SDG-13 goal. The climate records (UN, 2024) show that earth is facing an ever-serious concern to deal with – rising temperatures that break all past records. Livelihoods face a direct impact because of these changes. As reported in the indicator progress, 2024 was the

warmest year on record for the globe. In context to the above, it must be noted that adherence to the Paris Agreement is a key component of this goal. Several countries, including India have shown a promise to deliver their commitments to mitigate the negative effects of Climate change.

The following can be considered to be the negative impacts of climate change as presented in the chart:

Figure 1: Negative Impacts of Climate Change



Underdeveloped Countries: These nations often bear the brunt of climate change's impact due to limited resources and infrastructure. They face heightened risks from extreme weather events, rising sea levels, and disruptions to their agricultural sectors and livelihoods.

Women & Children: Climate change disproportionately affects women and children. Social and economic factors often leave them more vulnerable. They may face increased challenges in accessing vital resources, food security, and healthcare in the face of climate-related issues.

Island Nations: Island nations are particularly susceptible to the impacts of climate change, including rising sea levels, coastal erosion, and extreme weather events. These threats endanger their populations, infrastructure, and economic viability.

Tourism & Ecosystem: Climate change poses significant risks to tourism-dependent economies and ecosystems. Changes in weather patterns, rising sea levels, and damage to natural resources can negatively impact tourism revenue and biodiversity.

Mitigation Costs: Addressing climate change requires substantial investments in mitigation efforts. These costs present a challenge for both developed and developing countries, potentially impacting economic growth and development.



Labor Productivity: Climate change can negatively impact labour productivity through factors such as extreme heat, reduced agricultural yields, and disruptions to infrastructure. This can hinder economic growth and development.

As a developing nation with a large and growing population, India is particularly vulnerable to these climate risks. The country faces a complex interplay of challenges, including unpredictable rainfall patterns, melting glaciers, and coastal erosion. Recognizing the gravity of the situation, India has made significant strides in adopting clean energy sources and building resilience.

A robust early warning system and effective first responder network have been instrumental in reducing loss of lives and property due to cyclones and heatwaves. The National Disaster Management Plan (NDMP) and ongoing efforts to improve coordination among agencies further strengthen India's disaster management capabilities. These initiatives underscore the importance of preparedness, coordination, and effective response systems in building resilience against climate change impacts. (PIB, 2023-24)

Gujarat, a state known for its economic dynamism, must also navigate the path to a sustainable future. This research delves into Gujarat's progress towards SDG 13, examining its climate actions, accomplishments, and the obstacles that lie ahead. By understanding the challenges and opportunities, we can work towards a Gujarat that thrives in harmony with the environment.

The state of Gujarat has been prone to disasters. The memories of one of the deadliest earthquakes that occurred in 2001, is still fresh in the people's minds. Floods and cyclones are also common to this area. In summers, temperatures soar extremely high, leading to heat wave cases.

2. Literature Review

To spur progress and guide states towards achieving the Sustainable Development Goals (SDGs), NITI Aayog created the Composite SDG India Index. This report benchmarks states' performance, helping them identify strengths and weaknesses. Given India's diverse population and socioeconomic conditions, the involvement of all states is crucial for a comprehensive assessment. NITI's role is examined and talked about in this paper. It also talks about state level initiatives in this measure, more in attention towards district wise data measurement in Gujarat on SDGs. (Dighe & Majumdar, 2021)

In the paper, (Bandhopadhyaya, 2021) states that "Climate Change impact may be categorized into two segments, i.e. first sort involves extreme events, such as floods and storms, as they impact on rural infrastructure and cause direct loss of life and second sort will involve impacts on agriculture or on ecosystems on which rural people depend." The research then goes on to examine the reasons and impacts on Rural & Urban areas along with a discussion on India's policy on climate change.

In a scientific paper on examining the impact of varying rainfalls in Gujarat & its impact on yield of crops (wheat), (Pandey, Patel, & Karande) reported that "The temporal variability in rainfall indicated variable trend in different regions of the state. Impact of climate change study revealed that increase in temperature significantly reduced the wheat yield while decrease in temperature increased the yield."

By examining the Environment Sustainability Index, (Datta & Jaiswal, 2019) shows that "a few states like Uttarakhand, Jammu and Kashmir are areas of concern as far as Environment Sustainability is concerned." It talks about environment sustainability in these states, how they can be localized to Himalayan States of India, especially in the context of SDG-13 Goals. It studies indicators & data from



the Niti Aayog & MOSPI data sources by studying suitable indicators relevant for localizing the study in the above context.

According to (Shiyani & Deepa: 2012), “to reduce the climate change impact or to adapt with it, the first and foremost is livelihood security through income diversification. The need to reduce the dependence solely on agriculture, by encouraging other non-farm sources of income, must be considered.” The paper also examines and talks about rainfall patterns, adoption strategies and charts a vulnerability index of districts of Gujarat. It also talks about problems such as water-scarcity issues and how it impacts certain districts like Kachchh.

3. Objectives of Study

The objectives of the study include:

- i. To analyze performance of Gujarat in target indicators relevant to Sustainable Development Goals – 13 (SDG-13)
- ii. To study existing state of practices and discuss areas of improvement.

4. Methodology & Coverage

The data pertaining to SDG-13 sub indicators were collected by secondary data. The data sources include disaster management portals, Gujarat government websites, reports on disasters and a few case studies. This paper carries out a theoretical approach to understanding the responses of Gujarat & steps taken by it so far in terms of Climate Change-Action is concerned.

Following aspects of SDG-13 are examined as mentioned below:

1. Impact of Disasters
2. Strategies adopted for Disaster Management
3. Adoption at lower levels (local governments)
4. Total greenhouse gas emissions per year
5. Coverage in Education/Curriculum.

These factors were kept with suitable modifications as per actual SDG Goals & those decided by NITI Aayog in its' SDG India Index to suit state level considerations. Some goals are relevant only at National/International levels and therefore are kept out of the purview of this study.

The research involves a collation of facts, existing reports and a discussion on the above metrics. Some of the data is unavailable at aggregate levels and therefore not suitable for further statistical treatment.

The focus is more on recent years, and more critical incidents or calamities that could be accrued to climate change in Gujarat state.

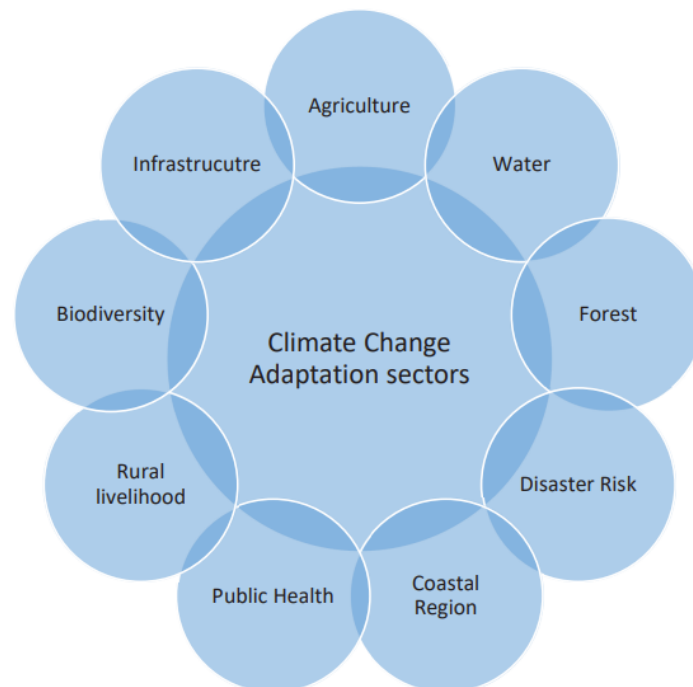
5. Discussion

The SDG Indicator Website (UN, 2024), reflects a grim situation of the impacts of climate change. It points out how the experience & the impact gets magnified in proportions for vulnerable areas, where mortality rates could jump to 1.5x. The economic cost of such measures, for developing countries, amounts to a financing requirement of 6 Trillion Dollars by 2030.

The National level measurement of framework of achievement of policies is carried out by NITI in its SDG-Index. In context of Gujarat, we firstly provide a brief discussion on some recent events and calamities.

As per the Gujarat Action Climate Change Report (Gujarat Gov), “The costs of such climate-induced natural disasters may be insignificant compared to the benefits achieved through economic development in the case of a country like India.”

Figure 2: Adaptation Centres as per Gujarat Climate Action Report

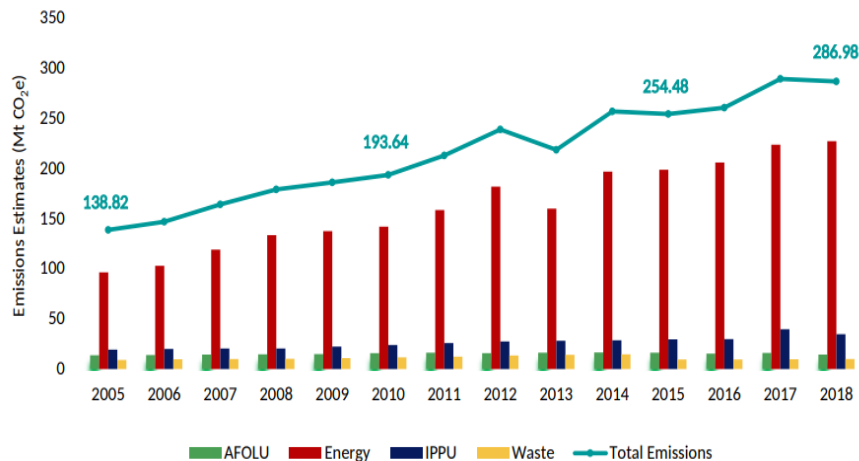


These sectors were identified as priority areas for attention by the Gujarat Government. Policies such as Solar subsidies, Wind Power Policy, Ujala Scheme, BRTS system, Irrigation, Metros project and other renewables, an estimated 35.74 mt-CO₂ emissions would be mitigated by Gujarat in 2024. (Gujarat Gov)

6. Greenhouse Gas Emissions

In its trend analysis report (GHG Platform India, 2022) on Greenhouse Gas Emissions by Gujarat during 2005-2018, “The per capita emissions of Gujarat increased from 2.56 t CO₂e/capita in 2005 to 4.28 t CO₂e/capita in 2018 at a CAGR of 4.02%, which was higher than India’s CAGR”. This is a significant jump in per capita emissions.

Figure 3: GHG emissions Gujarat (2005-2018)



Source: GHG Platform India Report

The provided emissions data for Gujarat reveals a disconcerting upward trajectory between 2005 and 2018. The energy sector emerges as the dominant contributor to this growth, signaling a heavy reliance on fossil fuels for the state's energy needs. While the energy sector takes precedence, the substantial increase in emissions from agriculture, forestry, and other land use (AFOLU), industrial processes and product use (IPPU), and waste management underscores the multifaceted nature of the challenge. In 2005, the share of Energy sector in Gujarat's economy-wide emissions was approximately 70% while Industrial Processes and Product Use (IPPU) accounted for 14% of the total.

7. Gujarat Floods 2017 Case

One of the badly affecting calamities was heavy rainfall that occurred in the month of July in 2017 in Gujarat, leading to reservoirs being overfull and flooding in cities & nearby localities. Amongst the badly hit districts were Banaskantha, Patan, Morbi, Surendranagar & Aravalli. Significant damage was reported to life & property, with houses being washed away due to rain.

There was a significant awareness on the state government front, along with continuous forecasts from the Indian Meteorological Department (IMD), and therefore about 1,12,878 people of which 68,672 people were from Banaskantha and Patan, were evacuated in time thus preventing a huge loss of life. (NDMA)

Also one needs to note the kind of impact these floods can have on nearby areas, since the first ones to get impacted due to natural calamities are the poor and those with 'Kutch Houses'. The dam storage in such cases becomes unable to handle the capacity flowing on to the areas nearby. Although, in such cases, the teams of Disaster Management Teams are always ready on stand-by mode, for any emergencies & rescue operations, it is also important to stay in touch with real time updates of the localities for precise help to be provided. Use of Technology and applications like Video-Conferencing & Whatsapp Channels facilitated this transfer of information timely to prevent any casualties.

The economic packages to Banaskantha & Patan costed around 1500 crores in estimates as per the Report. (NDMA). Other Economic reliefs were also provided by the state government for adaptation and restoration purposes. However, loss of animal life was reported.



At such times, health/sanitation becomes necessary to prevent any outbreak of diseases or contamination of drinking water sources.

8. Cyclone Biparjoy 2023

Cyclone Biparjoy, a severe cyclonic storm, made landfall in Gujarat and impacted parts of Rajasthan, causing substantial infrastructure damage, livestock losses, and human casualties. The storm's intensity underscored the vulnerability of coastal regions. Cyclonic storms pose multifaceted flood risks, including storm surges and intense rainfall. Early warnings from the India Meteorological Department (IMD) and timely evacuations mitigated potential damage.

To enhance resilience against such extreme weather events, India has initiated a project aimed at implementing both structural and non-structural measures to safeguard vulnerable coastal communities from cyclones and other hazards.

Thatched homes were entirely destroyed, while mud-brick houses suffered extensive damage. Even concrete structures sustained some structural damage. Loose objects posed a serious threat to people and property. Power and communication lines were toppled or severely damaged, disrupting essential services. Several areas remained without power for days. Both unpaved and paved roads were heavily impacted, making transportation & rescue ops challenging.

As per a report (Inter Agency Group Gujarat, 2023), as mentioned in at as State Government estimates, approximately 16.76 lakh people in 441 villages across eight coastal districts were likely affected by Cyclone Biparjoy. The first report provided an update by Day one, 3 casualties & 2 missing persons were reported. Significant loss also happened to the salt panes across the coastal regions.

Around 47 people were injured, roughly 700 homes across coastal areas suffered severe damages, and 1.07 lakh people were shifted to safer locations. (Baidya, 2023) It was marked with an abnormally high rainfall that state's current infrastructure and drainage in urban areas couldn't sustain well.

The National & State (NDRF & SDRF) teams were available for rescue and emergency operations along with healthcare workers for prompt support.

9. Climate Change Education

In past, (Gov of Gujarat, n.d.) The Climate Change Department in association with Government Arts College, Gandhinagar had organized series of trainings on Climate Change for teachers from various parts of Gujarat. The factors responsible and steps to take were discussed about in making them more proactive in this challenge of climate change. Such seminars and workshops are part of active consideration of the department to involve teachers & people associated with education, to help them pass on this knowledge to the younger generations.

The CBSE curriculum has progressively incorporated the tenets of sustainable development and climate change into its framework for students in grades 8 to 12. Subjects spanning the sciences, social sciences, and humanities have been instrumental in cultivating environmental awareness and a sense of responsibility among young learners. While the depth of coverage varies across disciplines, the overarching goal is to equip students with the knowledge and skills necessary to address contemporary environmental challenges.

The Gujarat State Education Board also has framed textbooks in line with CBSE curriculum and the NEP. The textbooks focus on bringing attention of students from an early age on issues of environment & climate change. Topics such as Sustainable Development & Disaster Management can be found in Social Science Textbook of Class 10, and awareness about Environment, Natural Resources, Management of Resources, Climate Change, Global warming can be found in textbooks from as early as Class 5 onwards in Science & Environment textbooks. The theme then becomes recurrent every year in all classes.

In continuation of the initiative of the Swachh Bharat Mission by Government of India, Gujarat continues to comply with cleanliness measures & waste disposal mechanisms, in a way trying to inculcate more awareness about the need for such measures among adults.

10. Findings & Strategies

- ✓ Data-Driven Policymaking: To enhance the precision of climate policies, there is a critical need for detailed, disaggregated emissions data at the district level. This information will enable policymakers to identify hotspots and tailor interventions accordingly.
- ✓ Economic Diversification: While economic growth is essential, it should be decoupled from carbon emissions. Promoting sectors with lower carbon intensity and investing in green jobs can foster sustainable development.
- ✓ Research and Innovation: Continued research and development in clean technologies and climate adaptation strategies are crucial for long-term sustainability.
- ✓ Energy Transition and Industrial Transformation: Given the significant contribution of the energy sector to Gujarat's emissions, a rapid shift to renewable energy sources is imperative. The state's geographical advantage, particularly its solar and wind potential, must be harnessed to accelerate this transition. Simultaneously, industries should prioritize energy efficiency and adopt cleaner production processes to reduce their carbon footprint.
- ✓ Sustainable Land Management: Gujarat should integrate sustainable land use practices into its regional planning. This includes initiatives like afforestation, agroforestry, and soil carbon sequestration to mitigate emissions from agriculture, forestry, and other land use activities.
- ✓ Disaster Risk Reduction: To enhance resilience against climate-induced disasters, Gujarat must invest in early warning systems, disaster preparedness plans, and robust infrastructure. Strengthening coastal barricades, improving flood management systems, and promoting climate-resilient agriculture are crucial steps.

12. Conclusion

Gujarat's substantial progress in renewable energy (RE) is largely due to supportive government policies and financial incentives. To accelerate RE investments, the state has refined its regulations for solar, wind, and hydro power. While the state has made significant strides, certain regions like Dang-Narmada-Dahod and Banaskantha require focused attention to ensure equitable access to affordable clean energy.

Gujarat's industrial landscape, particularly in manufacturing and petrochemicals, contributes significantly to its carbon footprint. A comprehensive approach is necessary to mitigate these emissions. To gain a more complete picture, the study should expand its analysis to include hydro, wind, and nuclear energy. Lowering the initial costs of RE equipment and guaranteeing reliable, affordable energy to consumers are crucial for promoting RE over traditional energy sources.



Gujarat's renewable energy share has grown from 13% in 2011 to approximately 25% in 2017. Achieving the 2030 target is feasible with continued government support. A data-driven strategy is essential to address climate change challenges and build a sustainable future for the state.

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