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WHITE PAPER ON

SUSTAINABLE DEVELOPMENT GOALS UNDER CLIMATE CHANGE FOR GUJARAT

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AMRUT	Atal Mission for Rejuvenation and Urban Transformation
AFOLU	Agriculture, Forestry and Other Land Use
AB-PMJAY	Ayushman Bharat Pradhan Mantri Jan Arogya Yojana
ADP	Aspirational Districts Programme
BMW	Biomedical Waste
DIF	District Indicator Framework
DPO	District Planning Officer
DSC	District SDG Committee
GUDC	Gujarat Urban Development Company Limited
GNFC	Gujarat Narmada Valley Fertilizers & Chemicals Limited
GOG	Government of Gujarat
G-SWIFT	Gujarat State-wide Indicators Framework Tool
GEDA	Gujarat Energy Development Agency
GUVNL	Gujarat Urja Vikas Nigam
GAD	Gujarat Administration Department
GAIC	Gujarat Agro Industries Corporation
GSECL	Gujarat State Electricity Corporation Limited
GSIDS	Gujarat Social Infrastructure Development Society
GSVA	Gross State Value Added
GPCB	Gujarat Pollution Control Board
HLPF	High Level Political Forum
HPC	High-Powered Committee
HDI	Human Development Index
HOD	Head of Department
IPPU	Industrial Processes and Product Use
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Scheme
MPI	Multidimensional Poverty Index
MRV	Monitoring, Reporting and Verification
MDG	Millennium Development Goals
MOSPI	Ministry of Statistics and Programme Implementation
MEEP	Municipal Energy Efficiency Programme
M&E	Monitoring and Evaluation
NSVA	Net State Value Added
NITI	National Institution for Transforming India
NAPCC	National Action Plan on Climate Change
NHB	National Horticulture Board
NDC	Nationally Determined Contributions
NIF	National Indicator Framework
NHM	National Health Mission

PPP	Purchasing power parity
RGSA	Rashtriya Gram Swaraj Abhiyan
SAPCC	State Action Plan on Climate Change
SDG	Sustainable Development Goal
SEC	State Empowered Committee
SIF	State Indicator Framework
TWG	Thematic Working Groups
UNFCC	United Nations Framework Convention on Climate Change
UN	United Nations
VNR	Voluntary National Review

Executive Summary

Gujarat with its diverse landscapes and extensive coastline, faces increasing vulnerability to climate change, evident in rising greenhouse gas emissions. The state has initiated climate action, including the commitment to achieve net zero status by 2070. However, urgent challenges persist, affecting agriculture, fisheries, water resources, livestock, and communities. The impact of climate change on major sectors necessitates comprehensive strategies, as outlined in the State Action Plan on Climate Change (SAPCC) and district-specific plans. Gujarat's economic activities, industrial growth, and significant contribution to India's renewable energy capacity underscore the importance of addressing climate challenges while fostering sustainable development.

The white paper aims to map the goals and targets of sustainable development goals (SDG) that are linked to climate change action by using climate indicators in state of Gujarat and is broadly divided into five sections. In section 1, the interlinkages between the between SDGs and climate change is assessed against various climate indicators while providing a narrative on the synergies and trade-offs offered by climate action for various SDGs. The study revealed focusing on synergies far outweighs the trade-offs associated with climate action. Section 2 provides an overview of the Climate Change and SDG in regional context. This section provided information about India's institutional structure for SDG planning and monitoring, the indicator frameworks and India's performance SDG index. Section 3 provides details on Climate actions Initiatives by the Government of Gujarat with respect to the SDGs along with the Institutional Structure for SDG Planning, Monitoring, and Implementation. The schemes and policies of Government of Gujarat are reviewed to identify gaps in the SDG performance with reference to climate action. The white paper also placed focus on lagging indicators of Gujarat by showcasing some case studies gathered from the Aspirational Districts Programme in India as well as other programs across the country. Section 4 discussed on the monitoring, reporting and verification for relevant SDG goals and targets with an overview of indicative institutional structure that can play a key role in enhancing the data collection mechanism and strengthening the reporting framework, and section 5 assesses the present capacity of the nodal department in Gujarat for implementing relevant climate action schemes linked with SDGs while highlighting the significance of capacity building at grassroot level for SDG implementation

The white paper reviews the schemes and policies of Government of Gujarat by analysis of SAPCC and climate change and environment action plans for Ahmedabad and Rajkot which revealed barriers in policy implementation, including financial constraints, political and societal challenges, knowledge gaps, legal complexities, technological limitations, and information deficiencies. Gujarat's high rank in SDG 13 (Climate Action) indicates a strong commitment to climate-related initiatives. The establishment of a dedicated Department of Climate Change and increased budget allocations underscores the state's prioritization of climate action and requires continual effort by the GoG to secure the top spot among other states. The white paper identifies following focus areas which needs to be prioritized while planning a climate change linked regional development plan:

- **Absence of SDG Roadmap:** The Department of Health and Family Welfare, Government of Gujarat had developed and published a Roadmap for Health - SDG 3 in Gujarat which may have been instrumental in Gujarat securing 1st rank across it as per NITI Aayog India Index 3.0 report. However, similar roadmaps were not observed to be available for other lagging SDGs. The absence of comprehensive roadmaps may hinder SDG progress in areas like Zero Hunger (SDG 2) and Gender Equality (SDG 5) in Gujarat.
- **Climate Change Action Plans for all districts:** While Ahmedabad and Rajkot have Climate Change and Environment Action Plans, the absence of similar plans for other districts limits the comprehensive approach needed for addressing climate-related challenges across the state.
- **Localized committees:** Gujarat has established district level SDG Committees and thematic working groups. But there is an absence of an SDG committee at the Panchayat level and district level climate change committees, which suggests limited local engagement. It is important to

ensure active involvement of local communities and grassroots institutions for effective localization of SDGs.

- **Focus on Lagging Indicators:** The examination of SDG performance in areas like Zero Hunger (SDG 2) and Gender Equality (SDG 5) provides a foundation for strategic interventions. It identifies specific indicators where the state has room for improvement.
- **SDG Budgeting:** The absence of an SDG budget estimate for each SDG could hinder effective resource allocation and planning. A transparent budgetary process aligned with priority SDGs is crucial for successful implementation.
- **Budgetary Shifts:** The analysis of budget allocations reveals potential reductions in emphasis on climate action across some departments. This shift may impact the state's ability to meet climate-related targets.
- **Limited access to SDG monitoring tool and reports:** The limited visibility of G-SWIFT, action plans and updated SDG reports in the public domain may pose challenges for important stakeholders seeking information. This limited transparency may impede effective monitoring and public engagement.
- **Limited data on SDG Trainings and related resources:** SDG cells responsible for databases on capacity-building lack sufficient reporting as its observed there is limited structured reporting format or mechanism at the state level, leading to a dearth of publicly available data on SDG trainings. There is also limited availability of resource materials in local languages which may hinder capacity-building at the community level.

Last but not the least, the white paper outlines opportunities and challenges faced by Gujarat. Despite being a front runner in Climate action (SDG 13) and overall SDG performance, the state encounters challenges such as limited local engagement with respect to SDGs, inconsistencies in climate-related budget allocations, inadequate focus on lagging indicators, limited public visibility of G-SWIFT, District SDG reports, limited data on SDG trainings and related resources. It identifies the following activities as a way forward,

- **Strategic Roadmaps for Lagging SDGs:** Building on the success of the SDG Roadmap for Health, the state should develop similar roadmaps for lagging SDGs like Zero Hunger and Gender Equality. These roadmaps can guide targeted interventions and resource allocation.
- **Increased transparency in District-Level Reporting:** Effective deployment of tools like G-SWIFT and transparent district-level reporting can enhance accountability and facilitate evidence-based decision-making. Making this data publicly available will empower stakeholders at various levels.
- **Targeted Climate Action:** Recognizing the potential reduction in climate action emphasis of various schemes across line departments, the state shall reassess budget priorities and align more of its activities towards climate change. Engaging with industries and encouraging renewable energy projects, especially in bio-power can contribute to meeting SDG 12 and 13 targets together.
- **Mobilize SDG and Climate Change Committees:** The state should strengthen its present institutional infrastructure and form SDG committees at the Panchayat level and district level climate change and environment committees.
- **Capacity Building:** Investing in the capacity building of various stakeholders, including businesses, local communities, and government agencies, is crucial. This involves training programs, knowledge sharing, and awareness campaigns to ensure a smooth transition to sustainable practices.
- **Collaboration and learn from other leading states/ countries:** Actively engaging in international and national forums, agreements, and collaborations can enhance Gujarat's efforts in combating climate change. Sharing knowledge and best practices among regions facing similar challenges

can amplify the impact of sustainability initiatives, this has been done through the Aspiration District Programme, wherein NITI Aayog has compiled success stories and best practices with the aim to promote cooperative federalism, facilitating mutual learning among districts to accelerate progress towards achieving the SDGs. Also, activities and updates of SDG cells of other competing states can be studied to make improvements.

1. Introduction

1.1. Climate Change and Sustainable Development Goals

Climate change is a burning issue of our time. Disasters, both natural and man-made are their consequences. Even after our best efforts to mitigate climate change, future generations might face negative consequences. This means an increase in the frequency and intensity of the disasters we are already witnessing - storms, floods, wildfires, droughts, and the resulting displacement and damage to human health, economies and businesses is imminent. With the global scenario shaping and constantly changing, the need to work on climate crises is the need of the hour.

Climate change refers to long-term shifts in temperatures and weather patterns. It is an ongoing process that is already impacting ecosystems and communities around the world. The impacts of climate change on different sectors of society are interrelated. Indicative risks on various sectors due to climate change are provided in table below:

Table 1: Climate related risks in various sector

Sector	Indicative Risks
Coastal Regions	Rising sea levels, increased frequency and intensity of extreme weather events, coastal erosion, saltwater intrusion into freshwater resources, and loss of biodiversity
Rural Livelihoods	Decline in agriculture productivity, disruption of traditional livelihoods, reduced access to water and other natural resources, and increased frequency and severity of pests and diseases
Infrastructure	Damage to roads, bridges, buildings, and other infrastructure due to floods, cyclones, and other extreme weather events, increased costs of maintenance and repair, and reduced lifespan of infrastructure
Health	Increased spread of vector-borne diseases, such as malaria and dengue, higher incidence of respiratory and other illnesses due to air pollution, and increased risk of heat-related illnesses

The Sustainable Development Goals (SDGs) are a universal set of 17 Goals and 169 targets to help organize and streamline development actions for greater achievement of human wellbeing, while leaving no one behind – by 2030. They are a part of transforming our world, the 2030 Agenda for Sustainable Development, which was adopted by 193 Member States at the historic United Nations General Assembly Summit in September 2015 and came into effect on January 1, 2016. The spectrum of the 17 SDGs and 169 targets range from poverty eradication, human health, and sanitation to urban settlements and to safeguarding the global ecosystems on which humanity depends for its survival. Total number of indicators listed in the global indicator framework of SDG is 247 as indicated in table below. However, as certain indicators repeat under two or three different targets, the total number reduces to 231 unique indicators [1].

Table 2: The 17 SDGS with count of targets and indicators

Goals	Description	Targets	Indicators
Goal 1	**No poverty:** End Poverty in all its forms everywhere	7	13
Goal 2	**Zero hunger:** End hunger, achieve food security	8	14
Goal 3	**Good health and well-being:** Ensure healthy lives and promote wellbeing for all at all ages	13	28
Goal 4	**Quality education:** Ensure inclusive and equitable quality education	10	12
Goal 5	**Gender equality:** Achieve gender equality and empower all women and girls	9	14
Goal 6	**Clean water and sanitation:** Ensure availability and sustainable management of water	8	11
Goal 7	**Affordable and clean energy:** Ensure access to affordable, reliable, sustainable and modern energy	5	6
Goal 8	**Decent work and economic growth:** Promote sustained, inclusive and sustainable economic growth	12	16
Goal 9	**Industry, Innovation, and Infrastructure:** Build resilient infrastructure, promote inclusive and sustainable industrialization	8	12
Goal 10	**Reduced Inequalities:** Reduce inequality within and among countries	10	14
Goal 11	**Sustainable cities and communities:** Make cities and human settlements inclusive, safe, resilient, and sustainable	10	14
Goal 12	**Responsible consumption and production:** Ensure sustainable consumption and production patterns	11	13
Goal 13	**Climate action:** Take urgent action to combat climate change and its impacts	5	8
Goal 14	**Life below water (oceans):** Conserve and sustainably use the oceans, seas and marine resources	10	10
Goal 15	**Life on land (biodiversity):** Protect, restore and promote sustainable use of terrestrial ecosystems	12	14
Goal 16	**Peace justice and strong institution:** Promote peaceful and inclusive societies for sustainable development.	12	24
Goal 17	**Partnership for the goals:** Strengthen the means of implementation and revitalise the global partnerships for sustainable development	19	24
TOTAL		169	247

Figure 1: 17 SDGs clustered into three pillars: economic and governance, environmental, and social [1]

The SDGs emphasize on aspects which were merely touched upon by the MDGs, making them more inclusive and wider in scope. Two important global cornerstones of SDGs – missing in the MDGs – are evaluation and accountability. To address these, a global High-Level Political Forum (HLPF) was established. Its central role is to follow-up and review progress at the global level. Voluntary National Review is the mechanism through which such follow-ups can happen. As stipulated in paragraph 84 of the 2030 Agenda, regular reviews by the HLPF are to be "Voluntary, state-led, undertaken by both developed and developing countries, and shall provide a platform for partnerships, including through the participation of major groups and other relevant stakeholders". India presented its 1st Voluntary National Review report at the HLPF in 2017 and 2nd report on 2020.

1.2. Objectives of the White Paper

Global sustainable development goals are directly and indirectly connected to each other, and climate action is essentially part of the big picture. Throughout the review we identify that climate action is integral to the development of other SDGs, improving upon it will significantly enhance the others. This white paper potentially evaluates the significane of climate action in reshaping Gujarat's landscape, the present initiatives related to SDGs including climate action. The index reports allowed to draw valuable insights regarding the SDG performance of Gujarat and highlight areas for improvement.

The proposed white paper aims to comprehensively assess SDGs to identify goals and targets that are influenced by climate change using climate indicators which helps to understand which of the SDGs Goals and targets are directly affected by climate phenomena. The synergy and trade-offs between climate action and other SDGs are also presented as part of this study. The study also aims to conduct a review of the schemes and policies of Government of Gujarat and devise a matrix emphasizing the alignment of the climate actions with other major SDGs. A matrix encompassing key mitigation and adaptation programs is developed by mapping policies and strategies through specific keywords aligned for various SDGs. With due attention to the interlinked nature of climate action and SDGs, gaps were identified based on examination of publicly available sources, and recommendations were provided for better alignment of climate action plans with SDGs. The study also formulates an MRV framework for assessing and guiding the progress of state schemes for relevant SDG goals and targets and attempts to assess the present capacity of the nodal department in Gujarat for implementing relevant climate action schemes linked with SDGs while proposing a capacity building plan for them.

1.3. Interlinkages between SDGs and Climate Change

Recently, the World Meteorological Organization (WMO) has published a report on Climate Indicators and Sustainable Development wherein the document discusses the interconnections between climate change indicators and the SDGs. It highlights seven climate indicators and how they impact the achievement of the SDGs [2]. The section presents analysis for the associated risks to the SDGs via the climate indicators as indicated in the word cloud below. The WMO climate indicators serve as key metrics to monitor and understand climate change and are as following,

CO_2 Concentration – Ocean Acidification – Temperature –
Ocean Heat Content – Sea-Ice Extent – Glacier Mass Balance –
Sea-Level Rise

CO_2 Concentration and Risks to SDGs: Rising CO_2 concentrations due to human activities contribute to the greenhouse effect and global warming. This poses risks to climate action *SDG 13* and the rise of CO_2 concentration in ocean affects *SDG 14.3.1* and may reduce the nutrient content in crops, affecting food security *SDG 2.1.2*. It may also have health implications due to increased exposure, thus threatening related to health such as *SDGs 3.4.1 and 3.9.1*.

Ocean Acidification and Risks to SDGs: Ocean acidification, resulting from increased CO_2 absorption by the ocean, threatens marine life, particularly coral reefs and seafood supply, impacting *SDGs 14.2, 14.3*, and economic losses from lack of tourism *SDG 8.9*. Additionally reduced yields affect livelihoods and food security, impacting *SDGs 1.4, 2.1.2.* Furthermore, it can lead to conflicts, endangering regional peace and stability *SDG 16.1*.

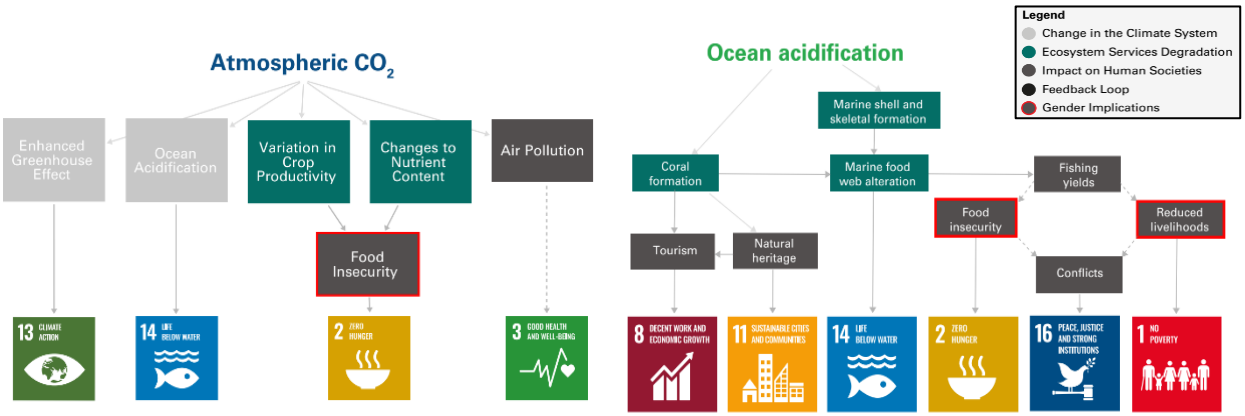


Figure 2: Associated risks from GHG Emissions and Ocean Acidification [2]

Global Mean Surface Temperature and Risks to SDGs: Rising temperatures and extreme events can lead to biodiversity loss, affecting land and marine ecosystems, livelihoods, and threatening *SDGs 14.2, 15.5, 1.5,* achievement of food security *SDGs 2.1.2 and 2.4.1.* Temperature rise also affects water resources causing water scarcity, posing risks to *SDG 6.1 and 6.4*. Additionally, extreme events increase health risks, displacement, infrastructure damage and conflicts, rise in fuel consumption impacting various *SDGs and targets such as 3.3, 3.4, 3.9, 11, 16.1, 1.5, 7.1, 9.1, 11b, 13, 13.2.*

Ocean Heat Content and Risks to SDGs: Rising ocean temperatures have multiple adverse effects on sustainable development. They lead to methane release, hinder carbon absorption, and contribute to harmful algal blooms, posing threats to climate action *SDG 13.2* and human health *SDG 3.9*. Additionally, impacts on marine biodiversity, coral reefs, heritage sites, tourism, and livelihoods pose risks to various SDGs, particularly *SDGs and targets 14.2, 11.4.1, 8.9, 1.5, 1.4, 2.1.2, and 16.1.*

Sea Ice Extent and Risks to SDGs: Melting Sea ice due to climate change has various consequences for the SDGs. It accelerates warming by reducing surface albedo (as the light-coloured ice melts, less light is reflected back, thus revealing the dark ocean beneath and causing it to absorb more heat), undermining progress on climate action *SDG 13.2*, threatens marine life and biodiversity on both land and water *SDG 15.5 and 14.2*, impacts livelihoods, food security *SDG 1.4 and 2.1.2*, and can lead to increased pollution due to fewer ice blockages *SDG 14.2, 14.c, and 6.6*, and potential conflicts *SDG 16.1*.

Glacial Mass Balance and Risks to SDGs: Melting glaciers in high-mountain regions have diverse impacts on the SDGs. It disrupts ocean circulation, hindering CO_2 absorption and climate action *SDG 13.2*, altering global weather patterns, threatening terrestrial ecosystems *SDG 15.1 and 15.3.* Additionally, it affects safe drinking water *SDG 6.1* and *6.3*. Increases flooding and water scarcity, impacting agriculture, livelihoods, and food security *SDG 1.5, 2.1.2, and 2.4.1*, and as glacier melt, they pose risks like landslides and avalanches threatening lives and infrastructure, *SDG 11.5 and 8.8*, causing economic losses and setbacks in development *SDG 1.5 and 11.b*. Moreover, it threatens tourism and cultural services livelihoods *SDG 8.9, 11.4* with varying impacts due to socioeconomic and gender inequalities around the world.

Sea Level Rise and Risks to SDGs: Rising sea levels and coastal flooding have multifaceted impacts on the SDGs. They damage infrastructure, disrupt access to clean water, transportation, and cause economic losses *SDGs 1.5, 9.1, 11.b, 6.1, 11.2, 11.5, 11.b,* potentially leading to displacement, which undermines poverty reduction, social inclusion, and labour rights *SDGs 1.4.2, 10.2, 8.8.* Furthermore, they harm coastal ecosystems, soil, crops, food security, livelihoods, and can lead to conflicts *SDGs 14.1, 14.2, 15.1, 1.4, 1.5, 2.1.2, 2.4.1, 3.9* while disproportionately affecting regions due to socioeconomic and gender inequalities.

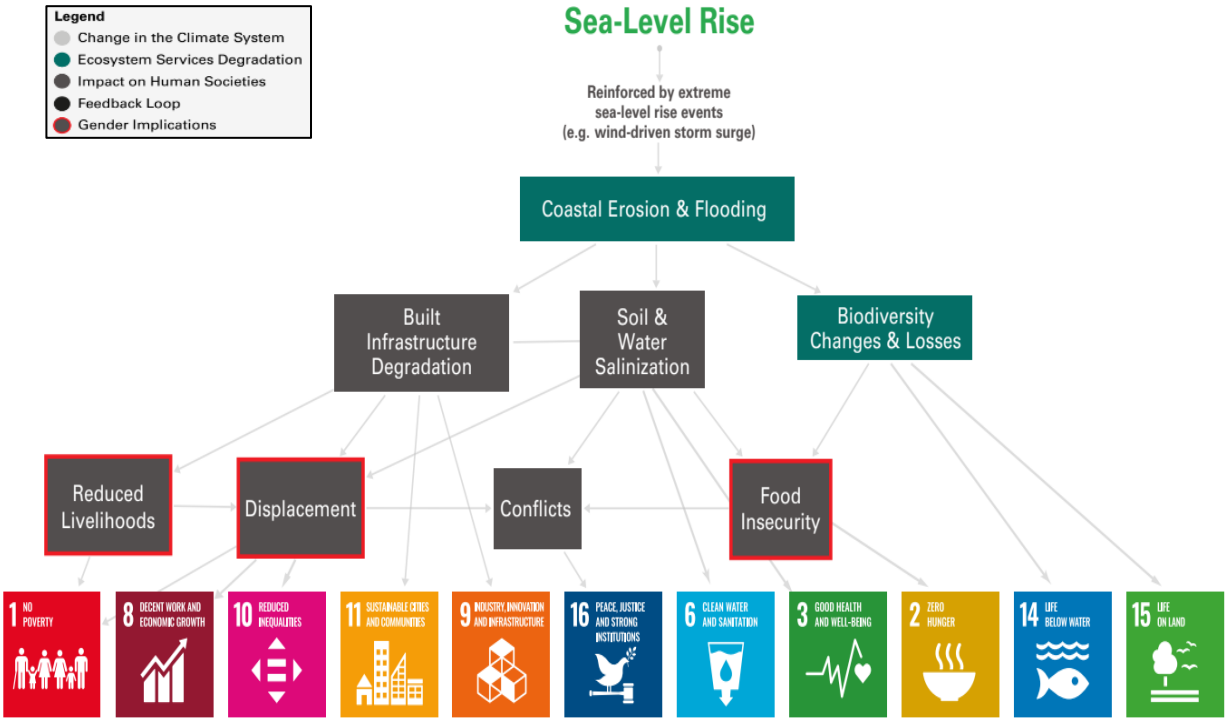


Figure 3: Associated risks from Sea level rise [2]

Table 3: Linkage matrix between Climate change and SDGs [2]

Climate Indicators and SDGs	CO_2 concentration	Ocean acidification	Global warming	Glacier melt	Sea-level rise	Sea-ice extent	Ocean heat content
SDG1							
SDG2							
SDG3							
SDG6							
SDG7							
SDG8							
SDG9							
SDG10							
SDG11							
SDG13							
SDG14							
SDG15							
SDG16							

	Direct Linkages		Indirect linkages

1.4. SDG 13: Climate Action

Climate change is a pressing global issue with severe consequences, and climate action is crucial to mitigate its impacts. The Earth's climate is rapidly changing, disrupting economies and causing people to experience changing weather patterns, rising sea levels, and extreme weather events. Greenhouse gas emissions continue to rise, reaching unprecedented levels. Addressing climate change is essential to protect our planet and ensure the well-being of future generations. The relationship between each target of SDG 13 and other SDG is as follows through keyword analysis and context of target,

Figure 4: Relation among targets of Climate Action and the SDGs. Figure source: Filho et al., [4]

- **Disaster Risk Reduction (Target 13.1):** Covered directly by some targets of SDGs 1 (No Poverty), 2 (Zero Hunger), and 11 (Sustainable Cities and Communities) focus on building resilience for vulnerable populations, implementing resilient agriculture, and reducing the impact of disasters, while promoting policies for mitigation and adaptation to climate change.
- **Integration of Climate Change Measures (Target 13.2):** This target emphasizes the importance of policies and plans integrating climate change measures to benefit all SDGs and is relevant to all SDGs, although not all SDGs explicitly reference climate change. SDG 7 (Affordable and clean energy), SDG 9 (Industry, innovation, and infrastructure), and SDG 12 (Responsible consumption and production) play crucial roles in fostering sustainable strategies to reduce greenhouse gas emissions, promote renewable energy, and encourage innovative approaches in production, consumption, and industrial services. Numerous impacts on aquatic and terrestrial ecosystems, including desertification, ocean acidification, and effects on biodiversity relevant for SDGs 14 (Life below water) and 15 (Life on land) are also relevant here.
- **Building Knowledge and Capacity (Target 13.3):** This target focuses on the advantages of integrating climate issues into educational curricula and capacity-building programs. Associated with SDGs 4 (Quality Education) and 8 (Decent Work and Economic Growth), emphasizing the acquisition of knowledge and skills for sustainable development and resource efficiency.
- **Means of Implementation (Targets 13.a and 13.b):** Target 13a relies on strong institutions and international partnerships (SDGs 16 and 17) for mobilizing resources associated with the UNFCCC. Target 13b highlights the importance of mechanisms supporting climate change planning and management, contributing to SDGs 5 (Gender Equality) and 10 (Reduced Inequalities).

  Indirect SDG influences are not directly mentioned in the target's description and are not immediately apparent but may exist. Furthermore, climate actions may also positively impact (synergy) other SDGs, such as SDG 7, SDG 11, SDG 15, and SDG 14 while negatively (trade-offs) impact some. The nature of interaction is provided in the Sankey diagram below. The thickness of line depends on the no. of publications that record the interlinkages existing at SDG 13 goal with other pair of SDGs.

Synergies: 296 | Trade-offs: 128 | Not Specified: 31 | Total Interlinkages: 455

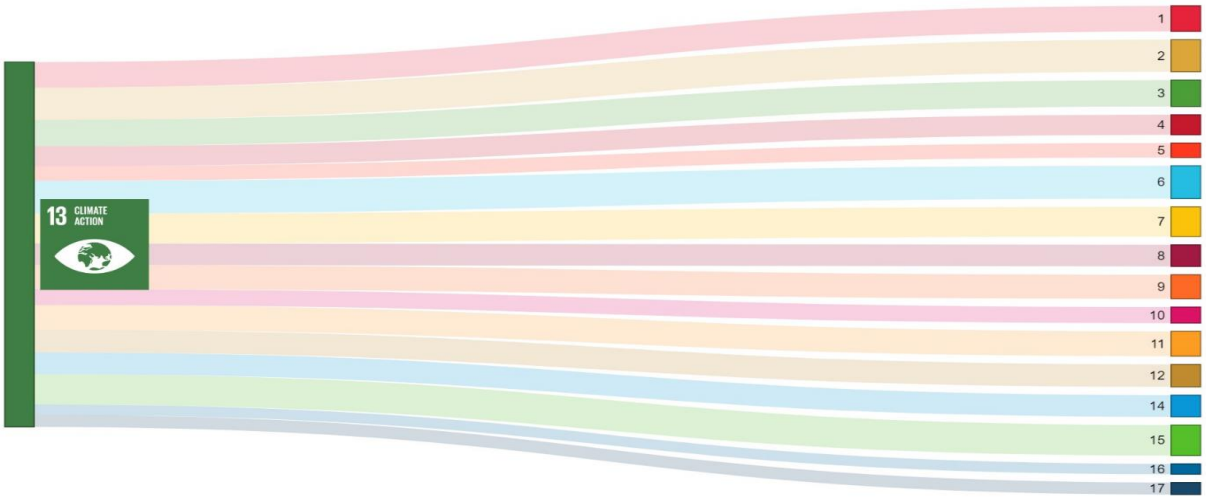


Figure 5: Sankey Diagram: Overview of interlinkages between SDG 13 and other SDGs [3]

1.5. Synergies and Trade-offs among SDGs against climate action

Climate action and the SDGs are mutually interlinked. Climate action can help to achieve many of the SDGs, and progress on the SDGs can make it easier to achieve climate goals but there are both synergies and trade-offs among them. Synergies refer to the positive outcomes that can be achieved by addressing climate change and the SDGs simultaneously, while trade-offs refer to the negative outcomes that can arise when pursuing one goal at the expense of another.

In some cases, there may be synergy between climate action and the SDGs. For example, investing in renewable energy can help to improve access to clean energy (SDG 7), reduce air pollution (SDG 11), and mitigate climate change (SDG 13). Some examples are as follows,

- **SDG 1: No Poverty:** Climate change can exacerbate poverty by reducing agricultural productivity, displacing people from their homes, and increasing the frequency and severity of natural disasters. Climate action, such as investing in renewable energy and climate-resilient agriculture, can help to reduce poverty by creating jobs, improving livelihoods, and building resilience to climate change.
- **SDG 2: Zero Hunger:** Climate change is already having a negative impact on food security. Climate action, such as sustainable land management and climate-smart agriculture, can help to improve food security by increasing agricultural productivity and building resilience to climate change.
- **SDG 3: Good Health and Well-being:** Climate change is projected to lead to an increase in the number of deaths from heat stress, air pollution, and malnutrition. Climate action, such as investing in renewable energy and clean transportation, can help to improve health by reducing air pollution and mitigating climate change.

In some cases, there may be trade-offs between climate action and the SDGs. For example, investing in renewable energy may require upfront costs that could divert resources from other important development goals. Some examples are as follows,

- **SDG 1: No Poverty:** Climate policies, if not properly designed can be socially and economically regressive, exacerbating inequality and poverty.
- **SDG 2: Zero Hunger**: Certain climate policies can impact land and food prices thus increasing the risk of leaving behind small agricultural holders.

- **SDG 10: Reduced Inequalities**: Climate change is likely to disproportionately impact the poorest and most vulnerable communities, which could exacerbate existing inequalities.

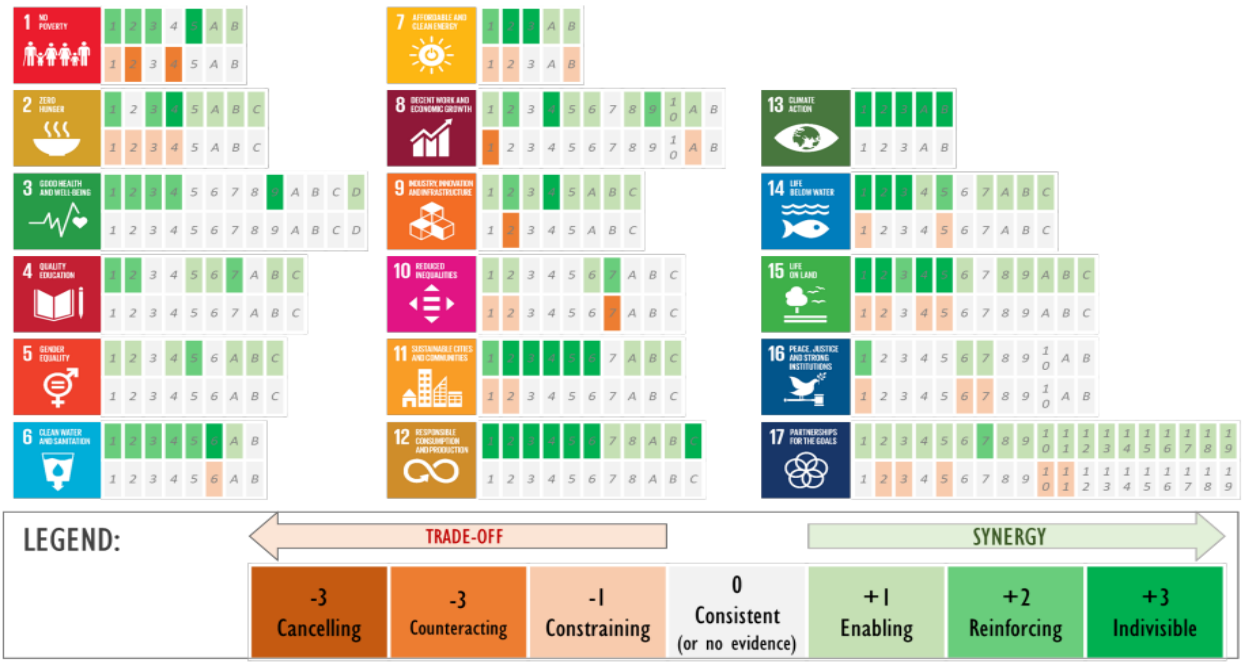


Figure 6: Synergies and trade-offs along with strengths between climate action and the SDGs [5]

The figure indicates there is increasing evidence of strong interlinkages, both positive (synergy), and negative (trade-offs) between climate action and the SDGs but that a significant knowledge gap exists. The figure also indicates that trade-offs are often observed for some SDGs that can impede the adoption of a synergistic approach. However, research suggests that co-benefits/ synergies outweigh trade-offs in most cases, with the positive impacts of climate action far outweighing the negative aspects associated. [5]

2. Climate Change and SDG in regional context

2.1. SDGs In Indian Context

2.1.1. The Sustainable Development Goals and India

With a population more than 1.4 billion, India has become the world's most populous country in 2023, accounting for more than one-sixth of humanity. With 17.76% of share in the total world population, India has a very high degree of responsibility towards achievement of world SDGs. The SDGs are designed to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity. In September 2015, 193 countries including India committed to the SDGs as detailed in the UN resolution, transforming our world: the 2030 Agenda for Sustainable development. The agenda includes 17 SDGs, and each SDGs have their individual targets and indicators leading to 169 targets at its core. For instance, the targets to combat climate change include strengthening resilience and the adaptive capacity to climate-related hazards, among other.

India, the third-highest carbon dioxide emitter after China and United States. India has committed to reducing its emissions intensity and has implemented various climate-focused schemes, including the National Action Plan on Climate Change and the National Mission for Green India. These efforts align with global commitments to address climate change and contribute to a more sustainable future.

2.1.2. India's performance on the Millennium Development Goals (MDGs)

The Sustainable Development Goals (SDGs) which came into effect on 1st January 2016 is an improvement on the Millennium Development Goals (MDGs), which covered the earlier 15-year period from 2000 to 2015 and consisted of 8 goals with 21 targets [6]. According to the report published by United Nations in 2014 [7] that tracked India's progress in achieving the MDGs by the target December 2015. India had made remarkable progress in achieving the MDGs but area for more improvement across various indicators remained. A final country report has also been released by MOSPI in 2017 which provides an overview of progress achieved by India as of the target year of MDGs (2015) in respect of the 8 MDGs disaggregated into 12 targets and 35 indicators relevant for India and the table below indicates that India was not able to meet some of the MDGs by the target year. [8]. With the SDGs now in place, the Indian government has now integrated the efforts taken towards achieving MDGs with SDGs.

Table 4: MDGs and Targets –Summary of Progress achieved by India [8]

MDGs and Targets –Summary of Progress achieved by India	
MDG 1: ERADICATE EXTREME POVERTY AND HUNGER	
TARGET 1: Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day	Achieved.
TARGET 2: Halve, between 1990 and 2015, the proportion of people who suffer from hunger	In progress.
MDG 2: ACHIEVE UNIVERSAL PRIMARY EDUCATION	
TARGET 3: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling	In progress.
MDG 3: PROMOTE GENDER EQUALITY AND EMPOWER WOMEN	
TARGET 4: Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015	Achieved.
MDG 4: REDUCE CHILD MORTALITY	
TARGET 5: Reduce by two-thirds, between 1990 and 2015, the Under- Five Morality Rate	Nearly achieved.
MDG5 5: IMPROVE MATERNAL HEALTH	
TARGET 6: Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio	In progress.
MDG 6: COMBAT HIV/AIDS, MALARIA AND OTHER DISEASES	
TARGET 7: Have halted by 2015 and begun to reverse the spread of HIV/AIDS	Achieved.

MDGs and Targets –Summary of Progress achieved by India	
TARGET 8: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases	Achieved.
MDG 7: ENSURE ENVIRONMENTAL SUSTAINABILITY	
TARGET 9: Integrate the principle of sustainable development into country policies and programmes and reverse the loss of environmental resources.	In progress.
TARGET 10: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation	Partially achieved.
TARGET 11: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers	Not statistically discernible.
MDG 8: DEVELOP A GLOBAL PARTNERSHIP FOR DEVELOPMENT	
TARGET 18: In cooperation with the private sector, make available the benefits of new technologies, especially information and communications	Achieved.

2.1.3. India's Progress against Global benchmarks

The SDGs, which evolved from the dialogue on the post-2015 development agenda, measure and compare the progress of a country on economic, social and environmental dimensions. India ranks 112 out of 166 countries with a score of 63.45 by an index measuring progress of countries towards the SDG 2023 [9], It is maybe more relevant in the context to see how India places itself among other South Asian countries. The average score for East and South Asian countries is 67.2 and India is ranked 16 out of the total 19 countries in this region which have been scored. The global SDG Dash-board uses a 'traffic light colour scheme', with green, yellow, orange and red indicating distance from achieving each goal. India is colour-coded red or orange on all SDGs, except Goal 4 (quality education) where it is color-coded yellow, and Goals 13 (climate action) and 12 (responsible consumption and production) are color-coded green for maintaining SDG achieved status.

India's progress is on track for only 2 out of 17 goals**.** In terms of trends, India gets the symbol for 'on track or maintaining SDG achievement' only for Goal 1 (no poverty) and Goal 12 (responsible consumption and production) while majority of other indicators are moderately improving. Sadly, the country is stagnant in its position across three goals (peace justice and strong institutions, zero hunger and climate action), and moving backward with respect to two goals (life on land and gender inequalities). Around 34.3% of the SDG targets for India have been achieved or on track, 42.9% have limited progress, and 22.9% have been worsening. Although the country has achieved the climate action goal, it has been tagged to take urgent action to combat climate change and its impacts.

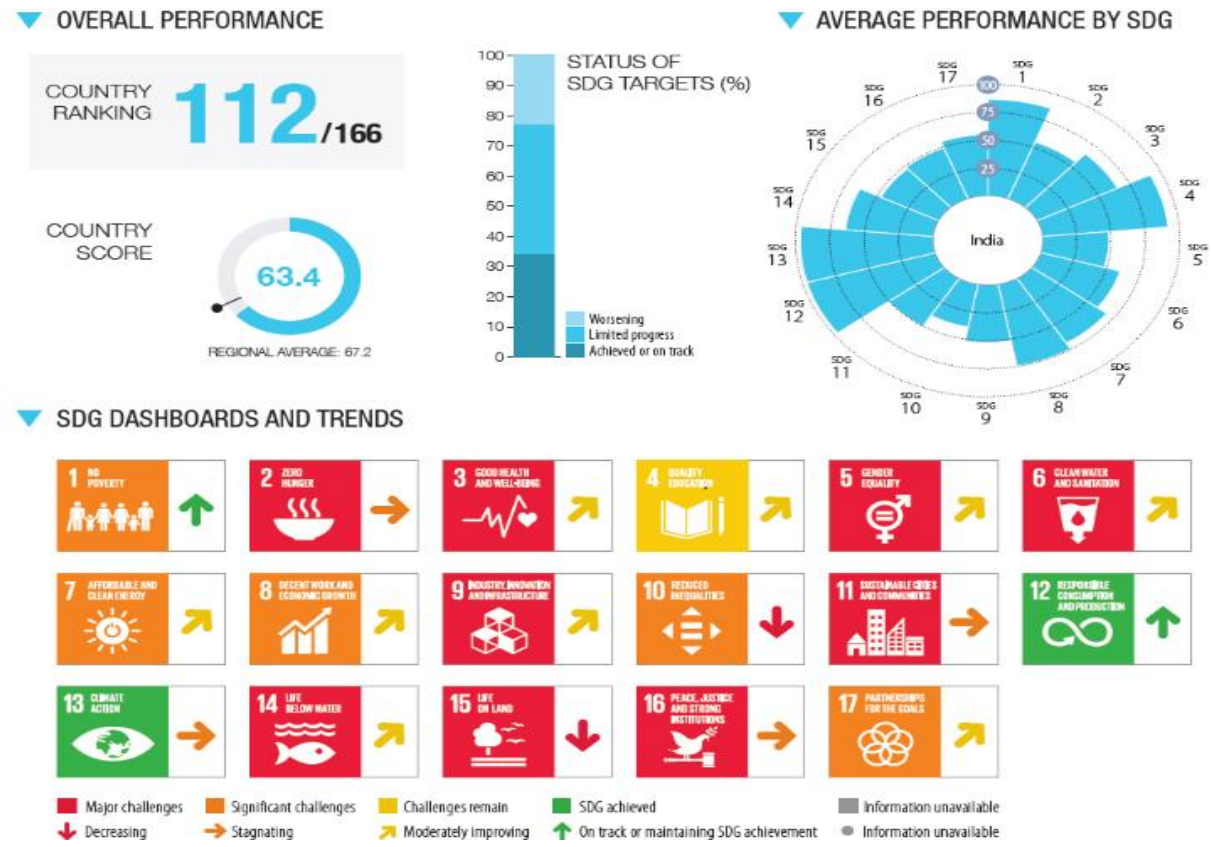


Figure 7: Snapshot of SDG Performance – India [9]

The report also published a spill over index, which indicates transboundary impacts generated by one country on others. India ranked 8 with a score of 99.4 on the Spill over Index, indicating the country has significantly more positive and fewer negative impacts on other countries in achieving their sustainable development goals. The Spill over Index assesses such spill overs along three dimensions: environmental and social impacts embodied in trade, economy and finance, and security.

The Human Development Index (HDI) report ranks India at 132 in 2021 against 130 in the year 2020 out of 191 countries [10]. The HDI is a summary measure for assessing long-term progress in three basic dimensions of human development: a long and healthy life (SDG 3), access to knowledge (SDG 4) and a decent standard of living (SDG 8) and is expressed as a value between 0 and 1, with higher values indicating higher human development. Ninety percent of countries have registered a reduction in their Human Development Index (HDI) value in 2020 or 2021, reversing much of the progress toward the Sustainable Development Goals. The last two years have had a devastating impact on billions of people worldwide when crises like COVID-19 and the war in Ukraine hit back-to-back and interacted with sweeping social and economic shifts.

India fell in the list of medium human development category with the HDI value of 0.633, lower than its value of 0.645 in the 2020 report. Between 1990 and 2021, India's HDI value changed from 0.434 to 0.633, registering a change of 45.9 percent. India's HDI value has been steadily catching up to the world average of 0.732 since 1990 - indicating a faster than the global rate of progress in human development. This is a result of policy choices made by the country over time, including investments made in health and education.

Table 5: HDI score of India - 1990 and 2021

Parameters	1990	2021
HDI Value	0.434	0.633
Life expectancy at birth	58.7 years	67.2 years
Expected years of schooling	8.0 years	11.9 years
Mean years of schooling	2.8 years	6.7 years
Gross National Income per capita	1,790 (2017 PPP$)	6,590 (2017 PPP$)

Based on the Global Multidimensional Poverty Index (MPI) 2023 which is a measure that helps to monitor progress towards SDG 1. The MPI illuminates for policymakers who is poor, how they are poor. It is reported that over the last decade, India has lifted a staggering 415 million people out of poverty. The incidence of poverty in India declined significantly, from 55.1% in 2005-2006 to 16.4% in 2019-2021 [11].

2.1.4. India's Institutional Infrastructure for implementation of SDGs

India has set up a strong institutional mechanism for policy guidance, implementation and monitoring of the SDGs [12]. At the national or central level, two agencies are involved in monitoring the SDGs, viz. Ministry of Statistics and Programme Implementation (MoSPI) and NITI Aayog. The MoSPI is engaged in the process of developing national indicators to monitor the SDG progress, 284 national indicators have been established as of June 2023 annual progress report of the ministry, and the ministry brings out publications titled 'Sustainable Development Goals National Indicator Framework Progress Report', while the National Institution for Transforming India (NITI Aayog), the Government of India's premier think tank, has been entrusted with the task of coordinating the SDGs, mapping schemes related to the SDGs and their targets, and identifying lead and supporting ministries for each target. has been entrusted with the task of coordinating the SDGs and brings out SDG monitoring reports based on national indicators, titled 'SDG India Index report.

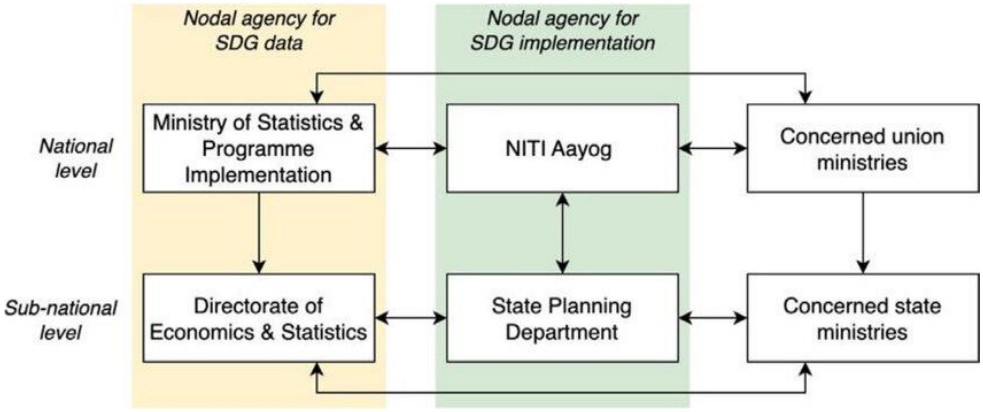


Figure 8: Institutional framework for SDG planning and localization in India [13]

At the sub-national or state level, the State governments and UT administrations are equal partners in implementing the SDGs. States have also been advised to undertake a similar mapping of their schemes, including centrally sponsored schemes. Below the State level, the district administration, and the Local Self Government (LSG) bodies-Panchayati Raj Institutions in rural areas and Urban Local Bodies in urban areas- have been taking necessary actions for implementing SDGs.

2.1.5. Global, National and District Indicator Frameworks

The Global Indicator Framework (GIF) for SDGs is a framework of indicators that facilitates the global monitoring of the 169 targets of the 17 SDGs and allows guiding actions towards the achievement of the goals by 2030. It consists of a total of 248 indicators of which 231 are unique as some indicators may be used to measure progress towards multiple goals [14]. These indicators are designed to be measurable, easily understandable, and relevant to the specific targets of each goal. They cover a wide range of topics from poverty eradication, education, health, gender equality, clean energy, and climate action, to sustainable consumption and production.

The Ministry of Statistics and Programme Implementation (MoSPI), Government of India developed a National Indicator Framework (NIF) in 2018, recognizing the significance of monitoring & tracking the progress of SDGs, and the need for reliable data for the same. This monitoring and evaluation framework initially consisted of 306 national indicators. The data sources for the indicators used in the NIF include official government statistics from different surveys, administrative data, and various censuses. The responsibility for collecting and reporting data lies with various line Ministries & Departments. In 2019, the Ministry also issued a circular with guidelines for states to develop their own State Indicator Framework [15]. Most states have developed the same. Just like the GIF, NIF too is evolving in nature. MoSPI constituted a High-Level Steering Committee (HLSC) to regularly review and refine the NIF with a view to including additional indicators and modifying or deleting the existing indicators.

Number of indicators dropped from 306 in 2019 to 284 in 2023 - As of June 2023 [16], there are 284 indicators in the NIF. Every year, indicators are added or removed from the NIF as part of refining by the HLSC committee. For instance, under Goal 17: *Partnership for the Goals*, there were no indicators in 2019 when the total number of indicators considered was the highest – 306 indicators. However, in the subsequent year, in 2020, 13 indicators were considered, and in 2023, only 12 were included. Likewise, in the case of Goal 15: *Life on Land,* the number of indicators dropped from 21 to 14 in the five years while for Goal 8: *Decent Work and Economic Growth*, 16 indicators were dropped in the same period. Of the 284 indicators, about 140 can be partially or exactly mapped with the global indicators. 37 indicators are partially related to the global indicators while the remaining 103 are the same as the global indicators [13]. There are 126 DIFs for Gujarat for 14 Goals which are developed based either from SIF or NIF and availability of data at district level from official statistical systems [17].

284 Indicators in the National Indicator Framework (NIF) and 126 Indicators in the District Indicator Framework (DIF)

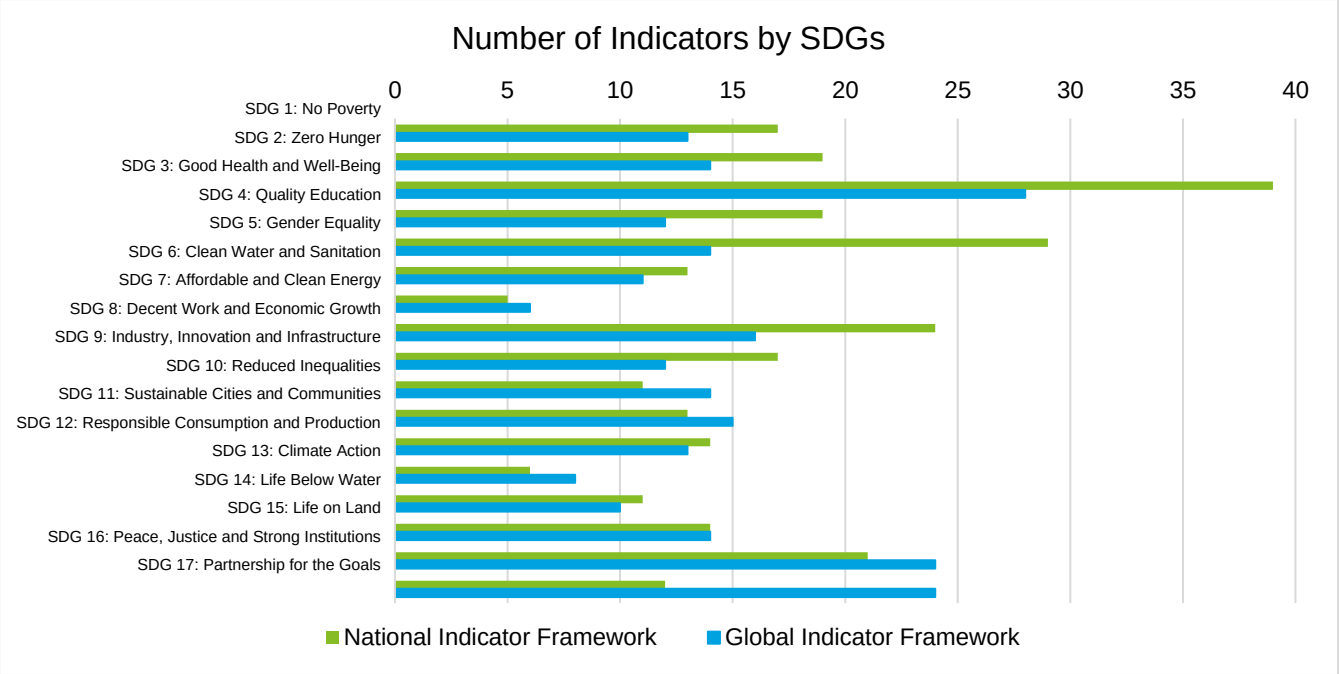


Figure 9: No. of Indicators by SDGs – Global vs National indicator frameworks. 2023

2.1.6. SDG and linkages to climate change action for schemes of Government of India

The SDGs, adopted by all United Nations Member States in 2015, consist of 17 interconnected goals aimed at addressing global challenges and improving the well-being of people and the planet by 2030. One of the most critical goals in this context is SDG 13: Climate Action, as India grapples with a range of climate-related challenges. India has made significant efforts in achieving Goal 13 of the SDGs. The UK hosted the 26th UN Climate Change Conference of the Parties (COP26) in Glasgow from 31 October 2021 to 13th November 2021. The COP26 summit ("the Summit") brought parties together to accelerate action towards the goals of the Paris Agreement and the UN Framework Convention on Climate Change. The Government of India made its pledge towards achieving "net zero" by 2070. India recently submitted its updated Nationally Determined Contributions (NDC) to the UNFCCC with the following commitments [18]: Prime Minister Narendra Modi, as part of the national statement delivered at the 26th Conference of the Parties (COP 26), announced ambitious targets to be achieved by 2030 to enable further reduction in emissions. India's national statement at COP26 was more aggressive in its goals than the intended NDC the country submitted in 2015. The major polices and plans include,

- India is implementing the National Action Plan on Climate Change (NAPCC) launched in 2008, which provides an overarching policy framework for all climate actions, including mitigation and adaptation. It comprises eight core missions in specific areas of solar energy, enhanced energy efficiency, sustainable habitat, water, sustaining Himalayan ecosystems, Green India, sustainable agriculture, and strategic knowledge for climate change.
- At the sub-national level action plans, there are the State Action Plan on Climate Change (SAPCC) in India, which are an essential way to achieve NDCs and SDGs and promote climate-resilient development. So far, 33 States/ UTs have prepared their SAPCCs.
- India launched the Coalition for Disaster Resilient Infrastructure, the International Solar Alliance, and Global Biofuel alliance to leverage global partnerships for climate action, renewable energy and disaster risk reduction.
- The country has also linked centrally sponsored schemes against the SDGs, some of which have been indicated in the table below.

Table 6: Brief description of some important Government Schemes mapped against SDGs and concerned ministry [19]

Scheme Name	Ministry	Core SDG	Alignment to climate Action
Pradhan Mantri Jan Dhan Yojana (PMJDY)	Ministry of Finance	1, 5	**Low**
Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY)	Ministry of Finance	1	**Low**
Pradhan Mantri Suraksha Bima Yojana (PMSBY)	Ministry of Finance	1	**Low**
Pradhan Mantri Mudra Yojana (PMMY)	Ministry of Finance	1,2,8,9,10	**Low**
Stand Up India Scheme	Ministry of Finance	8,9,10	**Moderate**
Pradhan Mantri Kaushal Vikas Yojana (PMKVY)	Ministry of Skill Development and Entrepreneurship	4,8,10	**High**
Pradhan Mantri Fasal Bima Yojana (PMFBY)	Ministry of Agriculture and Cooperation	2	**High**
Pradhan Mantri Awas Yojana (PMAY)	Ministry of Housing and Urban Affairs, Ministry of Rural Development	11	**High**
Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY)	Ministry of Consumer Affairs, Food and Public Distribution	2	**Moderate**
Ayushman Bharat Pradhan Mantri Jan Arogya Yojana (AB-PMJAY)	Ministry of Health and Family Welfare	1,3	**High**
Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGA)	Ministry of Rural Development	1,10	**High**
National Health Mission (NHM)	Ministry of Health and Family Welfare	1,2,3,5	**High**
National Mission for a Green India	Ministry of Environment, Forest and Climate Change	12,13,15	**High**

- Timeline of key events in India with relation to SDGs and climate change are provided in figure below:

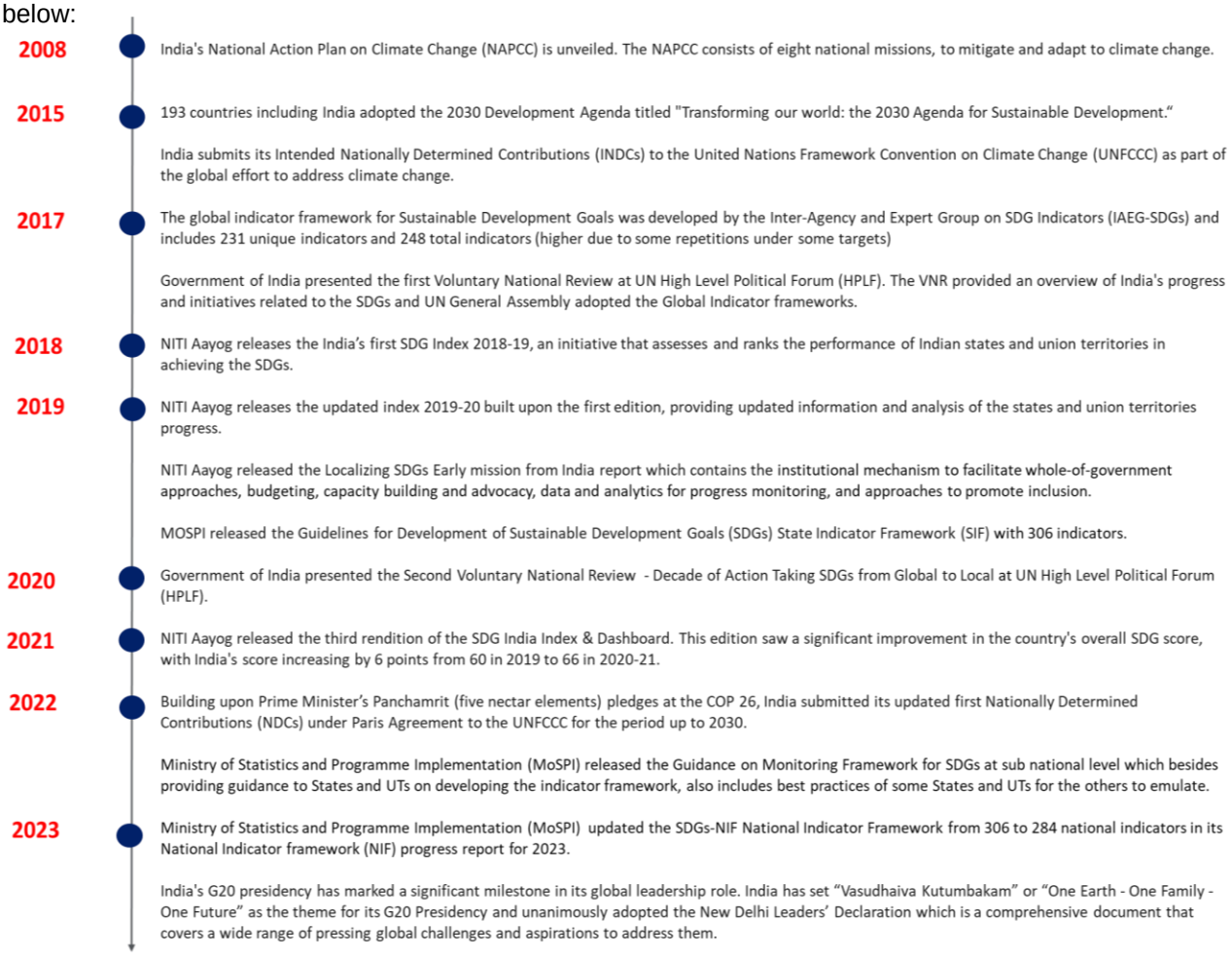


Figure 10: SDGs relevant milestones in India

2.1.7. Monitoring India's performance in SDGs

As reported in NITI Aayog SDG India index, India has improved from an overall score of 60 in 2019-20 to 66 in 2020-21. Despite 2020-21 being a pandemic year, India performed well in 8 of the 17 indicators and lagged across 7.

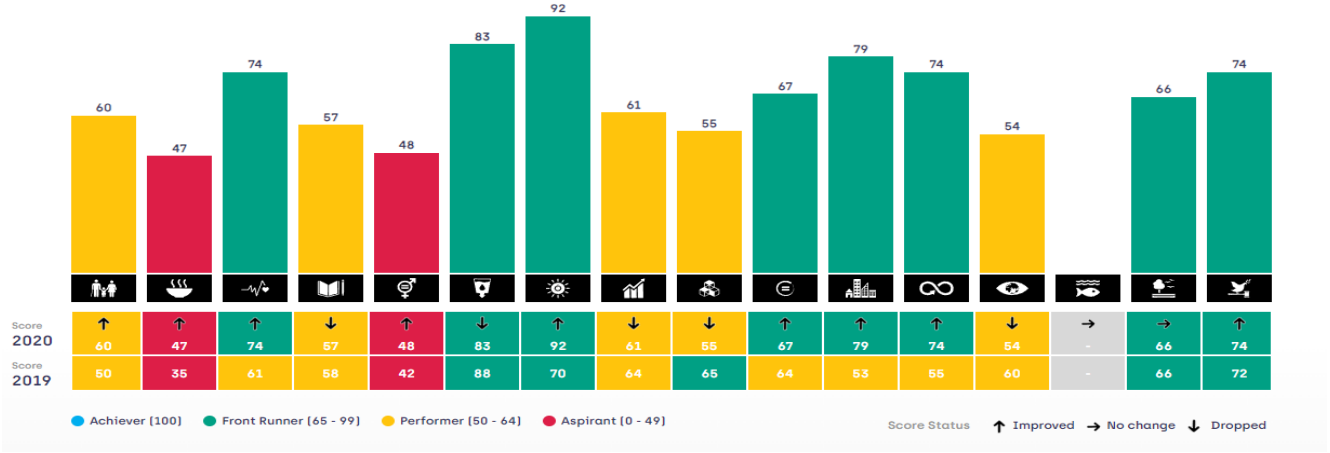


Figure 11: Goal-wise Performance of India in 2019 and 2020 [20]

2.2. SDGs Index- Gujarat

2.2.1. NITI Aayog SDG India Index and Dashboard: Gujarat

NITI Aayog prepared and released the country's official and principal tool for SDG progress monitoring at the national and sub-national levels. They also highlight the country-level performance on each goal. The Index dashboard hosts visualizations and representations that make data-based decision making easier for policy makers, it also serves as an advocacy tool to propagate the messages of sustainability, resilience and partnerships. Index 3.0 is based on the framework of 17 SDGs and 169 targets. The Index estimation is based on data on indicators for the first 16 goals while a qualitative assessment has been made for Goal 17. The SDG Index 3 is constructed using 115 indicators which cover 70 targets from 16 Goals [21].

2021 India Index 3.0

In the 2021 India Index report-3.0,The score of Gujarat was 69, falling in Front Runner (65-99) category. In this report the rank of Gujarat was as follows: 1st in Goal 3 (Good Health and Well-being) and 9 (Industry, Innovation, and Infrastructure), 2nd in Goal 16 (Peace, Justice and strong Institutions). However, the state continues to be among the poorest performing ones in zero hunger parameter (SDG 2) and gender equality (SDG 5).

2019 India Index 2.0

In the 2019 India Index report-2.0, the score of Gujarat was 64, falling in Performer (50-64) category. In this report the rank of Gujarat was as follows: 1st in Goal 3 (Good Health & Well-being) & Goal 9 (Industry, Innovation, and Infrastructure), 2nd in Goal 11 (Sustainable Cities and Communities), 4th in Goal 6 (Clean Water and Sanitation) and Goal 8 (Decent Work and Economic Growth). The state performed poorly in no poverty (SDG 1), zero hunger (SDG 2), Quality education (SDG 4), gender equality (SDG 5), sustainable consumption and production (SDG 12) and life below water (SDG 14).

2018 India Index 1.0

In the 2018 India Index report-1.0, the score of Gujarat was 64, falling in Performer (50-64) category. In this report the rank of Gujarat was as follows: 1st in Goal 6 (Clean Water and Sanitation), 3rd in Goal 8 (Decent Work and Economic Growth) and Goal 9 (Industry, Innovation and Infrastructure), 4th in Goal 11 (Sustainable Cities and Communities)

Figure 12: Assessment of Gujarat's SDG Performance based on reports from NITI Aayog

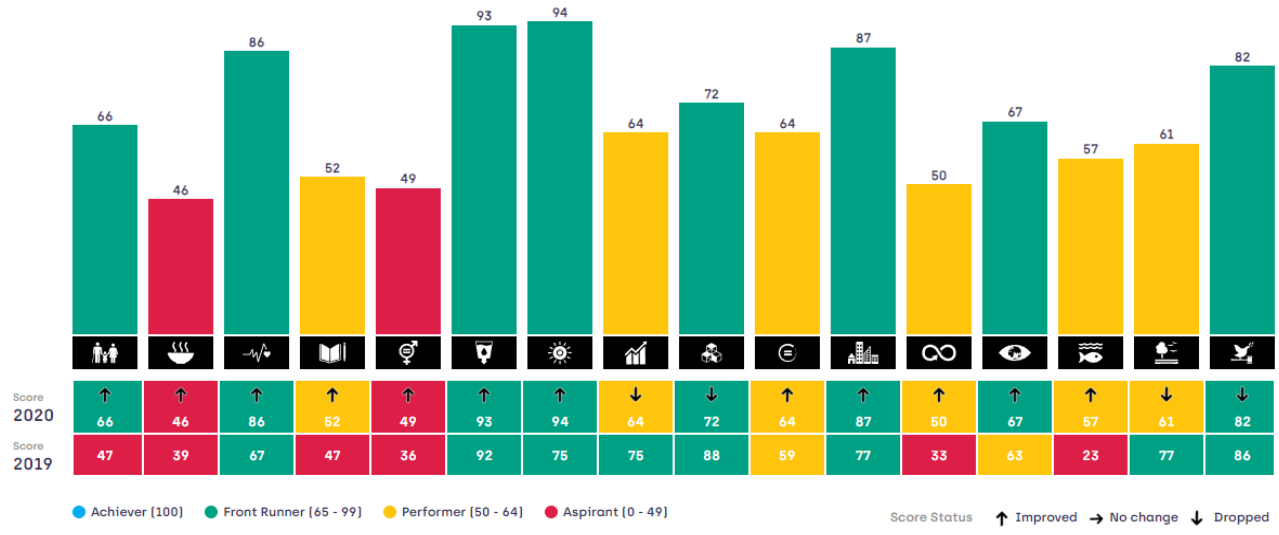


Figure 13: Goal wise performance of Gujarat in SDG India Index 2019 & 2020 [21]

3. Sustainable Development Goals under Climate Change, Government of Gujarat

Gujarat is one of the states in India, and it has taken steps to localize the SDGs. Gujarat's climate policies and initiatives align with SDG 13, aiming to reduce greenhouse gas emissions, promote renewable energy, and build climate resilience. Government of Gujarat has developed 'Gujarat Sustainable Vision 2030', which allocates responsibility to various key organs of the Government of Gujarat to develop roadmaps for meeting Sustainable Development Goals in the State. A key activity under this initiative was to map existing policies, schemes of the Government with specific Sustainable Development Goals, a snapshot update on the mapping of schemes with goals is indicated in the table below,

Table 7: Mapping of Government Policies/ Schemes with SDGs by Department of Planning, Government of Gujarat (Dec 2018) [22]

SDG No.	Name of SDG	Total nos. of Departments	Total nos. of schemes
1	End Poverty	13	60
2	Zero Hunger	10	129
3	Ensure Health Lives	10	93
4	Ensure Quality Education	10	127
5	Gender Equality and Women Empowerment	8	26
6	Ensure Sustainable Management of Water and Sanitation	7	27
7	Access of Affordable and Sustainable Energy	4	18
8	Promote Sustainable Economic Growth Productive Employment and Decent Work	14	131
9	Resilient Infrastructure and Sustainable Industrialization	13	70
10	Reduced Inequality	10	55
11	Make Cities and Human Settlements Safe, Resilient, and Sustainable	4	10
12	Ensure Sustainable Consumption and Production Patterns	8	54
13	Urgent Action to combat Climate Change and its effects	3	7
14	Conserve and Sustainable use of Ocean, Sea, and Marine Resources	3	13
15	Protect, Restore and Promote Sustainable use of Terrestrial Ecosystem	2	35
16	Access To Justice for All	5	43
17	Global Partnerships for Sustainable Development	7	36

SDG 8 (Promote Sustainable Economic Growth) has the highest number of associated schemes and departments which underscores a strong emphasis on sustainable economic growth, productive employment, and decent work. SDGs such as 11 (Sustainable Cities) and 13 (Climate Action) have a relatively lower number of associated departments and schemes. While there is presence of substantial schemes being allocated towards lagging SDGs such as SDG 2 (Zero Hunger) and SDG 4(Quality Education), there is limited schemes on other lagging SDGs such as SDG 5 (Gender Equality and Women Empowerment), SDG 12 (Sustainable Consumption and Production Patterns). A measure would generally involve either allocating more schemes or strengthening the existing schemes to improve the SDG performance. This can be seen in SDG 6 (Clean water and sanitation) and SDG 7 (Affordable and clean energy) where the state has shown stellar performance despite having less number of schemes allocated towards it.

3.1. Climate actions Initiatives of Government of Gujarat with the SDGs

Mainstreaming Climate change has been a priority area for Government of Gujarat having been the first state in India to have established a climate change department over a decade back on September 17, 2009, to build a sustainable and climate resilient future for the people of Gujarat. The department is the nodal entity for the subject of climate change in Gujarat and coordinates all actions that are directly or indirectly linked with climate change. State governments are the key to India's progress on the SDG

agenda which, inter alia, incorporates goals of clean water and sanitation, affordable and clean energy, sustainable cities and communities, responsible consumption and production, climate action, life below water and life on land.

The state has prioritized to focus on promoting renewable energy, clean fuel, and energy efficiency measures, reducing pollution from all possible sources, adapting to climate change, raising awareness, and including climate change as part of education, promoting research on climate change, clean energy and technology, improved disaster management to save life and assets. This is reflected in its 3rd rank in achieving Goal 13- Climate Action as per the NITI Aayog's SDG India Index 3.0 2020-21. [23], [24].

At the state level, The General Administration Department, Planning Division is the nodal department for the SDGs. The Government of Gujarat has constituted a High-Power Committee (HPC) under the chairmanship of Hon. Chief Secretary to monitor the progress SDG at state level and the activities of Thematic Working Groups (TWGs) on SDGs and the reports of the Thematic Groups are discussed in the committee which eventually lead to the development of Gujarat Vision 2030 document aligned with SDGs (July 2018). The report customized state specific 328 indicators (state indicator frameworks) with 2030 targets. Based on reference to state order dated 06th September 2016 on constitution of TWGs on SDGs, the state has clubbed the 17 SDGs into 7 themes rather than undertaking a sectoral approach. The group 6 here is dedicated to climate action [25].

Table 8: Focus areas of Working Group 6

SDGs	Description of Goal
	Take urgent action to combat climate change and its impact
	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

3.1.1. Institutional Structure in Gujarat for SAPCC Implementation

The Climate Change Department has played a vital role as a nodal agency representing Government of Gujarat for coordination and implementation of the SAPCC. A State Level Steering Committee was established to oversee and approve the planning and implementation of the SAPCC. The committee comprises representatives from various state line departments. The committee guides the formulation and implementation of the revised State Action Plan in alignment with the state's 2030 vision and the guidelines of the National Action Plan on Climate Change (NAPCC).

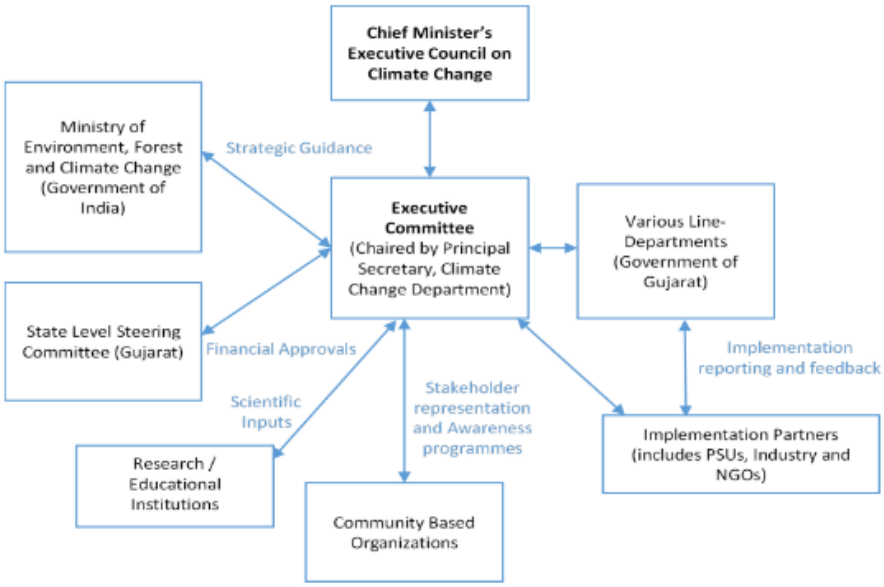


Figure 14: Institutional Co-ordination Mechanism for SAPCC of Gujarat

3.1.2. Institutional structure for SDG Planning, Monitoring, and Implementation

Table 9: State level and District level Institutional Framework [26]

State Empowered Committee (SEC) A state level committee formed under the Chairpersonship of the Chief Secretary. Secretaries from various departments are the members of the committee. They are associated with State SDG cell.	**District SDG Committee (DSC)** District level committees chaired by the District Collector. They are associated with District Level SDG cells.
State SDG Cell - The state level SDG cell has been chaired by the Director, Gujarat Social Infrastructure Development Society, Planning Division, General Administration Department and is also the nodal department for SDGs.	**District Level SDG Cells** - All 33 district SDG cells of Gujarat are headed by its District Planning Officers. The DSC regularly reviews the district level progress and implements instructions and guidelines provided by SEC.
ACTIVITIES	ACTIVITIES
▪ Collection, compilation, verification and analysis of information related to SDGs. ▪ Conduct state level seminars/workshops ▪ Provide technical support to district level SDG cells ▪ Responsible for preparing vision document, mapping SDG indicators, preparing metadata of the indicators.	▪ Coordinating with district level offices for SDGs (collection and verification of data) ▪ Providing data/information to State Level SDG Cell ▪ Preparing quarterly, half-yearly and annual SDG reports ▪ Work under guidance of District collectors and SEC.

Sub-national institutional infrastructures are also developed to highlight climate integration. Additional information on the institutional structure and specific responsibilities at both the state and district levels, can be found in the resolution dated 20.05.2019 by the General Administration Department (GAD), Planning Division. [27].

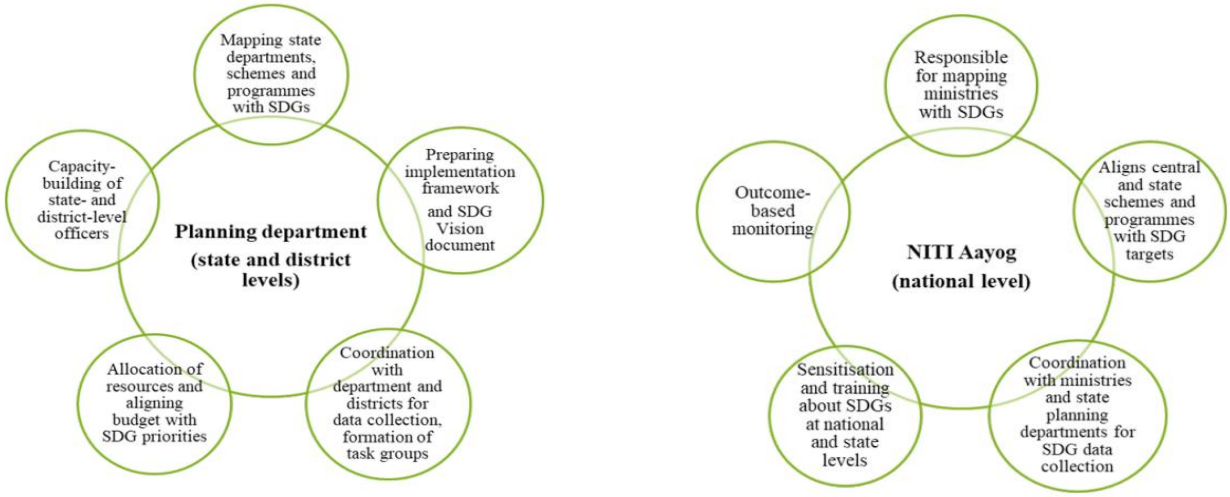


Figure 15: Key responsibilities of Nodal Departments at different levels [27]

Gujarat State-wide Indicators Framework Tool (G-SWIFT):

The state has developed a dynamic and interactive online dashboard which includes district ranking as well. The state is planning to publish District SDG reports based on the DIF data available through the SDG dashboard on a regular basis. These reports will help district administrations to take action to achieve the Goals on time.

Figure 16: G-SWIFT Portal

Climate change-based budgeting in Gujarat

The outcome budget of the Gujarat government is aligned with the SDGs. The schemes and programmes of outcome budget have been linked with State Indicator Framework. The outcome budget for 2023-24 also states that a dashboard is prepared to monitor the progress and schemes of the budget [28].

Furthermore, in 2017, the Climate Change Department in Gujarat established a dedicated budget scheme known as the Climate Change Budget Scheme. The Government of Gujarat took the initiative to consolidate the schemes of different line departments related to climate change actions and integrated them into a unified document called the "Climate Change Scheme" which was included in the Climate Change Department's budget application. The document provides a clear overview of the state's financial commitments and plans for addressing climate change and its associated challenges. This scheme allocated funds to support specific programs within various line departments, with a focus on climate change mitigation and adaptation efforts [29].

The table below (Table-10) reveals changes and trends in budget allocations across various sectors and departments in Gujarat, indicating shifts in financial priorities and government investments between the two specified periods. It reflects both areas of increased investment and areas where funding has decreased. The estimated budget allocations as indicated in the table below, the budget allocation for 2023-24 is compared with 2020-21 (release year of 2nd SAPCC). The budgets varied significantly between the two periods, for instance, the Water Resources Department reported a substantial increase in the second period, from 475.00 crore rupees to 3169.93 crore rupees towards climate change activities. The Climate Change Department has significant budget allocations in both periods, indicating a strong commitment to climate change initiatives, but has marginally reduced since the previous period. The increased budget by energy and petrochemical department represents the importance to climate change being put forth in collaboration with industries in Gujarat. There is notable increase of 90% since 2020-21 in overall budget which signifies increased climate change application and migration actions across schemes of various line departments.

Table 10: Comparison of GoG Climate Change Budget [30], [31]

		Department-wise allocation	
S. no.	**State Department**	**2020-21 (In Rs crore)**	**2023-24 (In Rs crore)**
1	Agriculture, Farmers welfare & Co-operation Department	367.18	271.87
2	Women and Child Development Department	12.10	35.99
3	Narmada, Water Resources, Water Supply & Kalpsar Department	475.00	3169.93
4	Industries and Mines Department	42.50	556.29
5	Road and Building Department	1.00	640.06
6	Urban Development and Urban Housing Department	152.22	1192.76
7	Food, Civil supplies & Consumer affairs Department	0.01	530.02
8	Health and Family Welfare Department	12.40	17.90
9	Forest and Environment Department	628.59	818.17
10	Revenue Department	78.99	117.05
11	Panchayat, Rural Housing and Rural Development Department	998.13	249.01
12	Education Department	0.66	504.16
13	Energy and Petrochemicals Department	692.00	1558.55
14	Labour, Skill Development and Employment Department	53.34	7.80
15	Science and Technology Department	1.00	2.50

S. no.	State Department	Department-wise allocation	
		2020-21 (In Rs crore)	2023-24 (In Rs crore)
16	Social Justice and Empowerment Department	14.40	1.25
17	Home Department	3.52	128.42
18	Ports & Transport Department	-	150.00
19	Sports, Youth and Cultural Activities Department	-	9.88
20	Tribal Development Department	-	387.24
21	Climate Change Department	1019.00	937.00
	GRAND TOTAL	**5922.02**	**11285.87**

The distribution of expenditure for the year 2023-24 across different ministries has been provided in figure below. Three departments - Urban Development and Urban Housing, Narmada, Water Resources, Water Supply and Kalpsar, Energy and Petrochemicals together constitute roughly more than half of the budget for expenditure. Several schemes within them such as assistance in implementing scheme of Solar Agriculture Pumps, development of solar PV projects on government waste lands, aid towards Mahatma Gandhi Swachhata Mission, Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Smart City projects, irrigation Schemes. Implementation of Water Supply Scheme for Saurashtra, Kutchh and Rural Water Supply Programme are provided in the budget estimate. Despite agriculture providing livelihood to more than half of Gujarat's workforce and contributing 20% of the state's GDP, it has obtained 2.4 per cent of the estimated allocations.

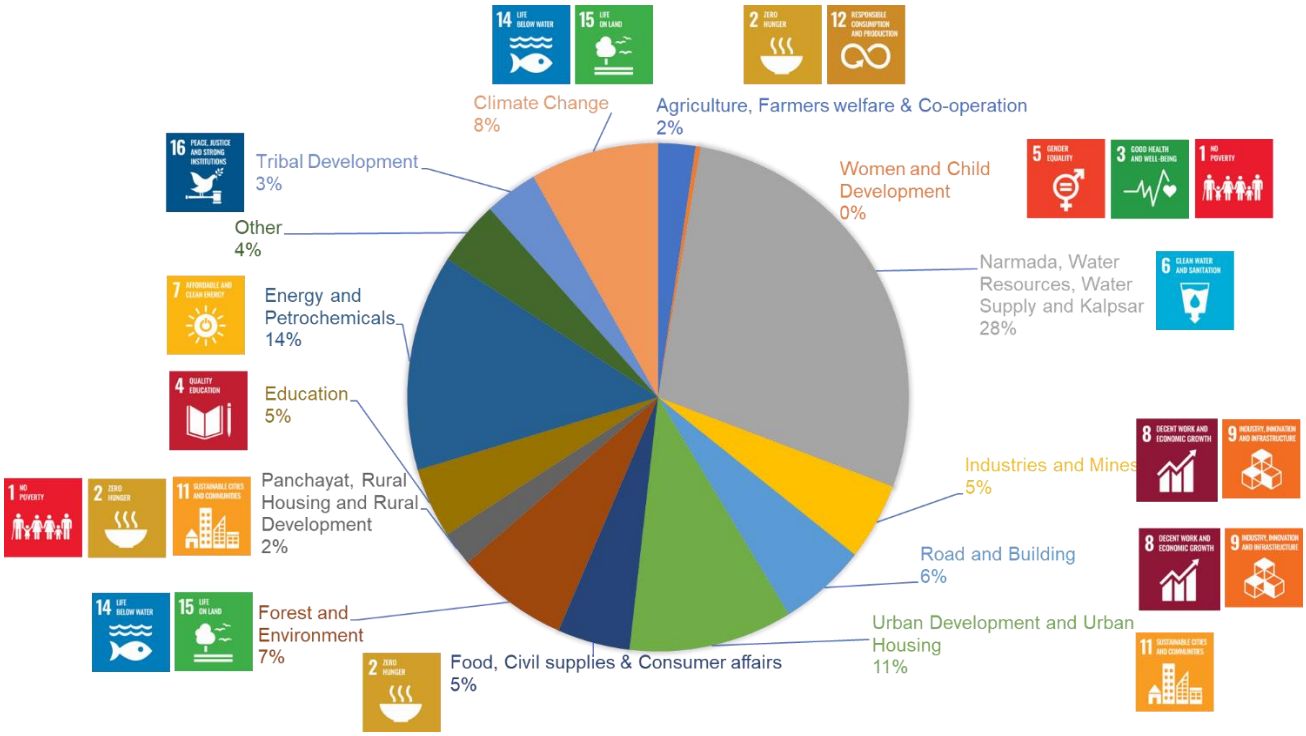


Figure 17: Distribution of budget for schemes related to climate change in 2023-24 by state departments

3.2. Review of SDG performance of Government of Gujarat with reference to climate action

An in-depth perspective of which SDGs and specifically indicators Gujarat is lacking at and key departments responsible for them is required to derive at a linkage of schemes with SDGs. Building upon the SDG performance of Gujarat, for the purpose of this study we are looking at index scores around 50 and climate action (adaptation and mitigation). The colours **red** represents aspirant status, **orange** represents performer status and **green** represents front runner status as per the index of NITI Aayog.

Table 11: Providing food security as climate change adaptation measure

SDG 2: Zero Hunger (SDG Index Score – 46)					
Target	National Indicator	2019	2020	National Target	Concerned HoD
2.1	Percentage of beneficiaries covered under National Food Security Act,2013	-	100	100	Department of Food & Public Distribution, Ministry of Agriculture and Farmer's Welfare
2.2	Percentage of children under five years who are underweight	34.20	34.20	1.9	Ministry of Health and Family Welfare [Comprehensive National Nutrition Survey]
2.2	Percentage of children under five years who are stunted	39.10	39.10	6.0	Ministry of Health and Family Welfare [Comprehensive National Nutrition Survey]
2.2	Percentage of pregnant women aged 15-49 years who are anaemic	51.30	51.30	25.2	Ministry of Health & Family Welfare
2.2	Percentage of adolescents aged 10–19 years who are anaemic	-	33.40	14.2	Ministry of Health and Family Welfare [Comprehensive National Nutrition Survey]
2.3	Rice and wheat produced annually per unit area (Kg/Ha)	2640.10	2640.10	5322.08	Directorate of Economics and Statistics, Ministry of Agriculture and Farmer's Welfare
2.3	Gross Value Added (constant prices) in agriculture per worker (in Lakhs/worker)	1.03	1.05	1.22	Ministry of Statistics and Programme Implementation [GSVA/NSVA Database], Ministry of Agriculture and Farmers Welfare

Various non-periodically assessed data indicators are observed as same values repeat through 2019 and 2020. Moreover, higher value of most of targets in 2.2 and 2.3 except gross value added and rice and wheat produced means lower performance of the indicators. The state ranks 13th across this SDG indicating a significant room for improvement especially for children who are stunted and underweight (child who has failed to reach their growth potential because of disease, poor health and malnutrition) and a great proportion of pregnant female who are anaemic (condition that develops when your blood produces a lower-than-normal amount of healthy red blood cells).

Table 12: Gender Mainstreaming for climate change mitigation and adaptation

SDG 5: Gender Equality (SDG Index Score – 49)					
Target	National Indicator	2019	2020	National Target	Concerned HoD
5.1	Sex ratio at birth (Per 1,000 male livebirths)	855	866	950	Ministry of Home Affairs
5.1	Ratio of female to male average wage/salary earnings received among regular wage/ salaried employees	0.72	0.81	1	Ministry of Statistics and Programme Implementation [Periodic Labour Force Survey]
5.2	Rate of crimes against women per 1,00,000 female population	27	27.10	0	National Crime Records Bureau, Ministry of Home Affairs
5.2	Per lakh women who have experienced cruelty/physical violence by husband or his relatives during the year	-	11.17	0	National Crime Records Bureau, Ministry of Home Affairs
5.5	Percentage of elected women over total seats in the state legislative assembly	7.14	7.56	50	Election Commission of India
5.5	Ratio of female to male Labour Force Participation Rate (LFPR) (15-59 years)	-	0.28	1	Ministry of Statistics and Programme Implementation [Periodic Labour Force Survey]
5.5	Proportion of women in managerial positions including women in board of directors, in listed companies (per 1,000 persons)	-	190	245	Ministry of Corporate Affairs
5.6	Percentage of currently married women aged 15-49 years who have their demand for family planning satisfied by modern methods	-	67.4	100	Ministry of Health and Family Welfare [National Family Health Survey-4]
5.a	Operational land holding gender wise (percentage of female operated operational holdings)	16.49	16.49	50	Ministry of Agriculture and Farmers Welfare [Agriculture Census - 2015-16]

The higher value of indicators in 5.2 signifies low performance while higher value of indicators in 5.6, 5a, 5.5, 5.1 signifies higher performance. The state ranks 11th across this SDG indicating a significant room for improvement especially with respect to the operational land holding for women, participation of women in labour force, more representation of women in legislative assembly, and reduction in crime rate against them.

Table 13: Sustainable Resource management

SDG 12: Responsible Consumption and Production (SDG Index Score – 50)					
Target	**National Indicator**	**2019**	**2020**	**National Target**	**Concerned HoD**
12.2	Per capita fossil fuel consumption (in kg.)	-	351.4	64.1	Ministry of Petroleum and Natural Gas
12.4	Percentage use of nitrogenous fertilizer out of total Nitrogen, Phosphorous, Potassium.	71.27	71.03	57	Ministry of Agriculture and Farmers Welfare [Agricultural Statistics at A Glance 2019]
12.5	Hazardous waste generated per 1,000 population (Metric tonnes/ Annum)	44.76	50.12	4.04	Ministry of Environment Forest and Climate Change [Central Pollution Control Board], Ministry of Health and Family Welfare
12.5	Quantity of hazardous waste recycled/utilized to total hazardous waste generated (%)	2.93	33.10	100	Ministry of Environment Forest and Climate Change [Central Pollution Control Board]

SDG 12: Responsible Consumption and Production (SDG Index Score – 50)					
Target	**National Indicator**	**2019**	**2020**	**National Target**	**Concerned HoD**
12.5	Plastic waste generated per 1,000 population (Tonnes/ Annum)	-	5.30	1.27	Ministry of Environment Forest and Climate Change [Central Pollution Control Board], Ministry of Health and Family Welfare
12.5	Percentage of BMW treated to total quantity of BMW generated	-	100	100	Ministry of Environment Forest and Climate Change [Central Pollution Control Board]
12.a	Installed capacity of grid interactive bio power per 10 lakh population (MW)	1.19	1.12	21.81	Ministry of New and Renewable Energy, Ministry of Health and Family Welfare

The state ranks 19th across this SDG. Due to a presence of various industries across the state of Gujarat, the state annually produces hazardous waste that is more than 10 times the national target with the emphasis on recycling also gaining importance, but the state appears to be far away from the national target. Grid-connected biopower, form of renewable energy generation that involves the conversion of biomass, such as organic materials like wood, agricultural residues, and municipal solid waste, into electricity fed into the electrical grid has a low score and a decreasing trend signifying room for improvement.

Table 14: Creating awareness and building capacity

SDG 4: Quality Education (SDG Index Score – 52)					
Target	**National Indicator**	**2019**	**2020**	**National Target**	**Concerned HoD**
4.1	Adjusted Net Enrolment Ratio (ANER) in elementary education (class 1-8)	91.05	85.38	100	Ministry of Education [Unified-District Information System for Education - Plus (UDISE+)
4.1	Average annual dropout rate at secondary level (class 9-10)	24.08	23.84	8.8	Ministry of Education [Unified-District Information System for Education - Plus (UDISE+)
4.1	Gross Enrolment Ratio (GER) in higher secondary (class 11-12)	-	41.20	100	Ministry of Education [Unified-District Information System for Education - Plus (UDISE+)
4.1	Percentage of students in grade VIII achieving at least a minimum proficiency level in terms of nationally defined learning outcomes to be attained by the pupils at the end of the grade	81.10	81.10	100	Department of School Education and Literacy
4.3	Gross Enrolment Ratio (GER) in higher education (18-23 years)	20.40	20.40	50	Department of higher Education, Ministry of Education [All India Survey on Higher Education]
4.5	Percentage of persons with disability who have completed at least secondary education (15 years and above)	-	22.80	100	Ministry of Statistics and Programme Implementation
4.5	Gender Parity Index (GPI) for higher education (18-23 years)	0.85	0.85	1	Department of Higher Education, Ministry of Education
4.6	Percentage of persons who are literate (15 years and above)	-	80.70	100	Ministry of Statistics and Programme Implementation
4.a	Percentage of schools with access to basic infrastructure (electricity, drinking water)	-	99.95	100	Ministry of Education
4.b	Percentage of trained teachers at secondary level (class 9-10)	-	91.80	100	Ministry of Education
4.c	Pupil Teacher Ratio (PTR) at secondary level (class 9-10)	-	33	30	Ministry of Education

The state has shown remarkable progress in mapping various indicators which were otherwise unavailable across the previous index in 2019. However, the state ranks 12th among other states in India which signifies remarkable room for improvement across persons with disabilities who have completed secondary education, gross enrolment ratios and reduction in the annual dropout rate among students.

Table 15: Climate Action Initiatives

SDG 13: Climate Action (SDG Index Score – 67)					
Target	National Indicator	2019	2020	National Target	Concerned HoD
13.1	Number of human lives lost per 1 crore population due to extreme weather events	36	10.70	0	Ministry of Statistics and Programme Implementation, Ministry of Health and Family Welfare
13.1	Disaster preparedness score as per Disaster Resilience Index	-	27.0	50	Ministry of Home Affairs
13.2	Percentage of renewable energy out of total installed generating capacity (including allocated shares)	31.69	34.51	40	Ministry of Power [Central Electricity Authority]
13.2	CO_2 saved from LED bulbs per 1,000 population (Tonnes)	66.10	62.16	103.22	Ministry of Power, Ministry of Health and Family Welfare
13.2	Disability Adjusted Life Years (DALY) rate attributable to air pollution (per 1,00,000 population)	-	3102	1442	Ministry of Health and Family Welfare

The state holds the 3rd rank among other states which signifies the importance the state gives to climate action which is evident from the government's recent allocation of climate change budget, and it is also the first state in Asia to start a department of climate change in 2009 but the state needs to increase the renewable energy mix, alleviate the higher disability adjusted life years rate attributable to air pollution which indicates that air pollution is causing a greater burden of disease and disability among the population and improve its disaster resilience

3.3. Review of schemes and policies of Government of Gujarat

Various schemes and policies observed in the SAPCC and the climate change action plans of Ahmedabad and Rajkot, the analysis reveals that there are informational gaps and various barriers in implementation of policies. Addressing climate change concerns requires not only a well-developed action plan but also overcoming barriers through efficient implementation. Some barriers observed are,

Financial Barriers: There are challenges related to access to funds, funding mechanisms and budget limitations, especially for actions requiring significant financial resources.

Political, Social, and Cultural Barriers: Hindrances like a lack of political will, public acceptance issues, and cultural and behavioural influences on policy enforcement.

Knowledge and Capacity Barriers: Specific and contextual knowledge and capacity requirements for climate change policy implementation, varying based on spatial scale, geography, and sectors. Thus, policy implementation may be highly impacted by the lack of key skills and expertise

Legal and Institutional Barriers: Limitations on legal powers, complexities in roles and responsibilities among departments, and coordination challenges impacting efficient implementation.

Technological Barriers: Practical limitations related to technology, including access, costs, management, and availability of the best technology.

Informational Barriers: Data gaps hinders the assessment of renewable energy, energy efficiency, transport, livestock, feed and fodder development, food production attribution, soil health cards, sanitation infrastructure, waste generation, and industrial wastewater treatment policies' impact on climate due to missing year-on-year and generation data across public domain**.**

Policy and implementation Barriers: Absence of progress reports for schemes like Surya Shakti Kisan Yojana and PM KUSUM Yojana. Limited policy interventions to reduce emissions across public transport network, agriculture, urban forest conservation. Limited data reporting and lack of guidelines for monitoring and reporting waste-related data poses another challenge.

Despite such barriers, the climate mitigation and adaptation strategies in Gujarat aligns with multiple SDGs. demonstrating a holistic approach to climate resilience while supporting broader sustainable development objectives. Successful implementation of these strategies can contribute significantly to achieving these SDGs and enhancing overall well-being in the state. As indicated in the SAPCC, the state has identified 128 key policies and programmes which have direct impact on climate change mitigation, adaptation and vulnerability, some of which have been indicated in the matrix table below. By default, the policies, and programmes in SAPCC correspond to SDG 13 (climate action) by virtue of the policy document, and major SDGs have also been linked in matrix but are not limited to as indicated in the table below

Table 16: Indicative Matrix of key climate mitigation policies and key institutions with major SDG linkages

Sr. No	Policy	Department	SDG 1	SDG 2	SDG 4	SDG 5	SDG 6	SDG 7	SDG 9	SDG 11	SDG 12	SDG 13	SDG 14	SDG 15
1	Wind Power Policy (2007, 2009, 2013, 2016)	GEDA/GUVNL						■				■		
2	Solar Power Policy (2009, 2015)	GEDA/GUVNL						■				■		
3	Solar Roof Top Scheme (2016)	GEDA/GUVNL						■				■		
4	5 MW Gandhinagar Rooftop Programme	GEDA/GUVNL/GMC						■				■		
5	Green Solar Projects (2010-11)	GEDA/GUVNL						■				■		
6	Solar and Carbon Neutral City (Gandhinagar) (2010-11)	GEDA/GUVNL/GUDC						■		■		■		
7	Rooftop solar for 5 cities (2012-2014)	GEDA/GUVNL						■		■		■		
8	Suryashakti Kisan Yojana Scheme (2018)	GEDA/GUVNL, Agriculture and Cooperation		■				■				■		
9	Gujarat Solar Park (Under solar power policy)	GEDA/GUVNL						■		■		■		
10	Installation of Solar Photovoltaic Power Pack for Anganwadis (2013-14)	GEDA						■				■		
11	Installation of Solar Pumps for small farmers in Gujarat (KUSUM)	GEDA/GUVNL, Agriculture and Cooperation		■				■				■		
12	Solar Photovoltaic Power Plant at Gandhinagar TPS	GEDA, GSECL						■				■		
13	Solar plant on the premises of GNFC	GEDA/GUVNL/GNFC						■				■		
14	Wind Solar Hybrid Policy (2018)	GEDA/GUVNL						■				■		
15	Wind Repowering Policy (2018)	GEDA/GUVNL						■				■		
16	Waste to Energy Policy (2016)	GEDA/GUVNL/GUDC						■		■	■	■		
17	Mini Hydel Power Policy (2016)	GEDA/GUVNL						■				■		
18	Grid connected biomass-based power projects in the state	GEDA/GUVNL						■		■	■	■		
19	Renewable Purchase Obligation (RPO)	GEDA						■				■		
20	Renewable Energy Certificate (REC)	GEDA						■				■		
21	Industrial Policy, 2015, 2020	Industries and Mines							■			■		
22	GHG reduction by implementing energy efficient plough share mixer (PSM) technology in soap manufacturing at Hindustan Lever Limited (HLL), India	Industries and Mines						■	■		■	■		
23	Amine Circulation Pumps Energy Efficiency at Hazira works of ONGC	Industries and Mines						■				■		

Sr. No	Policy	Department	SDG 1	SDG 2	SDG 4	SDG 5	SDG 6	SDG 7	SDG 9	SDG 11	SDG 12	SDG 13	SDG 14	SDG 15
24	Demand side energy conservation & reduction measures at Indian Petrochemicals Corporation (IPCL) – Gandhar Complex	Industries and Mines						■				■		
25	Urban Transport	Urban Development & Urban Housing/ GUDC								■		■		
26	Urban Waste Management	Urban Development & Urban Housing/ GUDC/GPCB								■	■	■		
27	Street Light National Programme-MEEP	Urban Development & Urban Housing/GUDC						■				■		
28	Swarnim Jayanti Mukhya Mantri Shaheri Vikas Yojana	Urban Development & Urban Housing/GUDC								■		■		
29	Smart Cities	Urban Development & Urban Housing/GUDC					■			■		■		
30	AMRUT Cities	Urban Development & Urban Housing/GUDC	■							■		■		
31	Wastewater Recycling in Rural Areas	Rural Development & Panchayati Raj	■				■					■		
32	Irrigation development through Micro Irrigation Systems	Agriculture and Co-operation/ Narmada, Water Resources, Water Supply and Kalpsar					■					■		
33	SAUNI Yojana (Saurashtra Narmada Avataran Irrigation Project)	Narmada, Water Resources, Water Supply and Kalpsar					■					■		
34	Agro Industry- Ministry of Food Processing Industries schemes	Agriculture and Co-operation / GAIC		■					■			■		
35	Horticulture Mission	Agriculture and Co-operation		■								■		
36	Biogas subsidy scheme - National Horticulture Board, Government of India (NHB)	Agriculture and Co-operation		■				■				■		
37	NHB scheme on cold storage development	Agriculture and Co-operation		■				■				■		
38	Agri-implements Subsidies	Agriculture and Co-operation	■	■								■		
39	Soil Health Improvement through use of Biofertilizers	Agriculture and Co-operation		■								■		
40	National City Compost Policy, 2016	Agriculture and Co-operation									■	■		
41	Climate Change Implications on Crop Growth in Gujarat	Agriculture and Co-operation										■		
42	Animal Hostels in various districts of Gujarat	Agriculture and Co-operation/ Livestock board										■		■
43	Cattle Breading farms (including sheep)	Agriculture and Co-operation/ Livestock board		■								■		■
44	National programme for bovine breeding	Agriculture and Co-operation/ Livestock board		■								■		
45	Gokul Gram Yojana	Agriculture and Co-operation/ Livestock board		■								■		■
46	AGR-2/3/4 Scheme	Agriculture and Co-operation/ Livestock board	■	■					■			■		■
47	Joint Forest Management	Forest and Environment										■		■
48	Soil and Moisture Conservation	Forest and Environment		■								■		■

Sr. No	Policy	Department	SDG 1	SDG 2	SDG 4	SDG 5	SDG 6	SDG 7	SDG 9	SDG 11	SDG 12	SDG 13	SDG 14	SDG 15
49	Social Forestry Programme	Forest and Environment										■		■
50	National Agroforestry Policy, 2014	Forest and Environment		■								■		■
51	Mangrove Conservation	Forest and Environment										■	■	
52	State Bamboo Mission	Forest and Environment							■	■		■		■

Table 17: Indicative Matrix of climate adaptation strategies and key implementing institutions with major SDG linkages

Sr. No.	Adaptation strategies	Department Responsible	SDG 1	SDG 2	SDG 3	SDG 4	SDG 5	SDG 6	SDG 7	SDG 9	SDG 11	SDG 13	SDG 14	SDG 15
1	Wetland restoration	Forests and Environment										■		■
2	Change irrigation patterns from flood irrigation to drip or sprinkle irrigation	Agriculture						■		■		■		
3	Change in Crop pattern	Agriculture		■						■		■		
4	Early warning system	Revenue	■								■	■		
5	Village level awareness about new strategies to conserve water	Panchayat, Rural Housing and Rural Development/Information				■		■				■		
6	Proper drinking water supply	Narmada and Water Resources, Water Supply and Kalpsar						■				■		
7	Water shed management	Panchayat, Rural Housing and Rural Development/ Narmada and Water Resources, Water Supply and Kalpsar Agriculture/ Industries and Mines						■				■		■
8	Mandating water harvesting and artificial recharge							■			■	■		
9	Optimizing water use efficiency							■		■	■	■		
10	Plantation in coast area like mangroves	Forests and Environment										■	■	■
11	Wastewater treatment	Forests and Environment						■				■	■	
12	Proper flood warning management systems	Revenue	■								■	■		
13	Proper planning of drainage systems	Urban Development and Urban Housing/Municipalities/ Municipal Corporations									■	■		
14	Dam construction and improved reservoir capacity	Narmada and Water Resources, Water Supply and Kalpsar						■	■			■		
15	River linking to supply water from wet region to dry region	Narmada and Water Resources, Water Supply and Kalpsar						■				■		
16	Altering planting and harvesting time	Agriculture		■								■		
17	Collection of crops with short life cycles	Agriculture		■								■		
18	Crop rotation & cultivation of new crops	Agriculture		■								■		
19	Modern irrigation techniques	Agriculture						■		■		■		
20	Preparedness of disasters beforehand	Revenue	■								■	■		
21	Community level awareness for local level activities based on previous experience and local knowledge	Revenue/ Information/ Panchayat, Rural Housing and Rural Development/	■			■						■		

Sr. No.	Adaptation strategies	Department Responsible	SDG 1	SDG 2	SDG 3	SDG 4	SDG 5	SDG 6	SDG 7	SDG 9	SDG 11	SDG 13	SDG 14	SDG 15
22	Mapping and environmental trend analysis in community level	Urban Development and Urban Housing									■	■		■
23	Maintaining water quality of wetlands and marshlands	Forests & Environment						■				■	■	■
24	Incorporating wetland protection into the planning of new infrastructure	Forests & Environment/ Gujarat Infrastructure Board									■	■		■
25	Reduce marine pollution (due to ships)	Forests & Environment/ Ports and Transport										■	■	
26	Protection of marsh and wetlands	Forests & Environment										■	■	■
27	Enhance efforts to restore dead coral reefs	Forests & Environment										■	■	
28	Monitoring of forest health, dryness to prevent forest fires	Forests & Environment										■		■
29	Joint Forest Management	Forest and Environment										■		■
30	Soil and Moisture Conservation	Forest and Environment		■								■		■
31	Social Forestry Programme	Forest and Environment										■		■
32	National Agroforestry Policy, 2014	Forest and Environment		■								■		■
33	Mangrove Conservation	Forest and Environment										■	■	■
34	State Bamboo Mission	Forest and Environment								■	■	■		■
35	Extend, strengthen, repair or rehabilitate infrastructure over time	Roads & Building/ Ports & Transport								■		■		
36	Adjust operation and maintenance of infrastructure assets	Roads & Building/ Ports & Transport								■		■		
37	Use more resilient materials, construction methods,	Roads & Building/ Ports & Transport								■		■		
38	Design and build to allow for future upgrades, extensions or regular repairs	Roads & Building/ Ports & Transport								■		■		
39	Relocate sensitive facilities or resources from direct risk	Roads & Building/ Ports & Transport									■	■		
40	Timely provision of health services	Health			■							■		
41	Climate resilient health Infrastructure development	Roads & Building/ Health	■		■							■		
42	Sanitary Education and awareness	Health/Information			■	■						■		

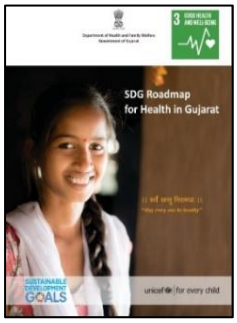
The mapping of state policies follows the use of SDG-specific keywords which may interact with the policy. We have utilized keyword mapping which is a technique used to identify the relationships between different concepts or topics, in the context of the Sustainable Development Goals. The mapping involves mapping policy documents with the SDGs / targets through specific keywords to better understand how policies relate to the SDG framework. To support this study, we used the SDG keyword dictionary project developed by the University of Auckland that includes an SDG keyword dictionary which helped in mapping keywords with respect to the strategies and policy. Words and programs in Indian dialect were translated into western dialect for ease of mapping, for instance: Kisan translated to farmers. The mapping does not imply that schemes and policy are not related to other SDGs.

The tables 16-17 demonstrates that the state of Gujarat has implemented various policies and strategies related to climate change adaptation and mitigation that aligns with multiple SDGs, contributing to sustainable development, clean energy, clean water and sanitation, and improved infrastructure, among other goals. These efforts showcase a comprehensive approach to addressing key sustainability challenges [25]. While the table represents only the core linkage between SDG 13

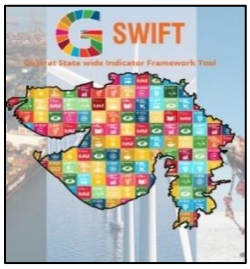
and other SDGs, more direct and indirect linkage between different SDGs can be arrived at based on reference of the mapping developed by NITI Aayog for Central government schemes. Based on examination of the alignment of some SDGs against SDG 13, we have observed the following,

- Moderate alignment was observed for SDGs – 2, 6, 7, 9, 11 and 15.
- Limited alignment was observed for SDGs - 1, 3, 4, 5, 12 and 14.

3.4. Identification of gaps in SDG Implementation in reference to climate action



- Climate change impacts poses significant risk to human health and very less attention is paid to the climate change, food security, and human health nexus, resulting in knowledge gaps. The Department of Health and Family Welfare, Government of Gujarat had developed roadmap for achieving SDG 3 - SDG Roadmap for Health in Gujarat [32] which has resulted in 1st rank of Gujarat in the NITI Aayog 2020 Index report. A similar roadmap focusing on the SDG 2 (Zero Hunger), SDG 5 (Gender Equality), SDG 13 (Climate action) etc. was not observed by the state-level ministries such as Gujarat Education Department, Agriculture Department of Gujarat (Agriculture, Farmers welfare and co-operation Department, Gujarat Pollution Control Board etc. This document indicates that developing roadmaps play a crucial role in helping identify lagging targets and indicators with strategic focus areas. This approach may have helped Gujarat improve more across SDG 2 (Zero Hunger) and SDG 5 (Gender Equality).



- The approach to climate change adaptation and mitigation is highly dependent on data availability. The reliable data is the backbone for better monitoring of SDGs and climate action-based decision making. It is observed across NITI Aayog reports that a dynamic & interactive online dashboard for tracking SDG progress at district level, namely, 'Gujarat State-wide Indicators Framework Tool' (G-SWIFT) has been developed. However, there is limited visibility on functionality of this tool across the public domain to get the gist of real time data monitoring.
- It is understood that Districts of Gujarat were asked to prepare District level SDG reports on October 2021. Basis literature review and all 33 districts have prepared, and approved District SDG Report in District Level SDG Committee headed by District Collectors in March-2022 to measure their progress against the state targets which will help to develop better strategies and prepare action plan to achieve the SDGs by 2030. All the districts have prepared action plan based on District SDG Report to align with state target by end of March 2022 [33]. However, there is limited availability of action plans and the updated SDG reports across public domain.
- Upon comparison of the outcome-based SDG budget developed by Gujarat with other states such as Karnataka [34] and Meghalaya [35], the approach differs significantly between the states. Even though the polices and initiatives of Gujarat Government are well aligned to SDGs goals and targets. However, it was noted that the specific budget allocations are required over the poor performing indicators. The SDG budget may also indicate the district wise performance and rankings of each SDG should be used in estimating the budgetary requirements. The SDG India Index can form the basis for analysing the SDG requirements for the state.
- Based on the climate change budget analysis, the decrease in allocations and the reducing trend towards climate action from some of the departments such as Agriculture, Farmers Welfare & Co-operation Department from 367.18 crore rupees to 271.87 crore rupees, The Panchayat, Rural Housing, and Rural Development Department from 998.13 crore rupees to 249.01 crore rupees and Labour, Skill Development and Employment Department, signals a potential reduction in climate action measures from these departments.

- Various lagging indicators have been observed across the SDG 2, SDG 5, SDG 12, SDG 4 leading to lower index scores, have been summarized in the preceding sections and the scores have been indicated in the table11-15, the indicators across these SDGs are also affected by climate change and serve as basis to case studies and necessary recommendations in the paper.
- Based on the index 3.0 there is limited focus in bio-power renewable energy production (SDG 12a). Although SAPCC identifies biomass utilization for energy generation as possible research and demonstration projects, but the score for the installed capacity of grid interactive bio power per 10 lakh population (MW) is 1.12 (2020) which is significantly far more the national target of 21.81. The state government should increase its focus on renewable energy production to align with SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action). The SAPCC already includes aims towards increasing biomass energy production, but more action is needed to achieve results on ground.
- Honourable Chief Minister Bhupendra Patel launched Climate Change and Environment Action Plans (CCEAPs) for Ahmedabad and Rajkot districts on Feb 21, 2022. to address climate variability, emissions, and propose recommendations [36]. Similar plans need to develop and implemented for other districts of Gujarat.
- Gujarat has SDG committee at the state and district levels for the purpose of coordinating and implementing activities related to the SDGs. However, SDG committee at the Panchayat (local governance) are required towards enhanced local engagement for implementation and monitoring of SDGs. The capacity development of these SDG committees for alignment with climate action also needs to be conducted. As indicated in the report by the Ministry of Panchayati Raj, the level of awareness among rural communities about SDG development planning is comparatively low and there is lack of coherence with regards to planning related to SDGs and development initiatives thereto at the local levels [37]. The report also suggests various actions which includes steps to create an in depth understanding of the term climate change and its impacts among the Panchayat committee.
- Ministry of Panchayati Raj Government of India has identified 9 thematic areas covering 17 goals for localization of Sustainable Development Goals in Panchayats, following which a draft action plan for localizing SDGs at Panchayat level has been developed by the General Administration Department (GAD), Planning Division, GoG. The Ministry has also implemented the Centrally Sponsored Scheme of Rashtriya Gram Swaraj Abhiyan (RGSA) during 2018-19 to 2022-22 and has extended the timeline recently, the scheme mandates to capacitate elected representatives and functionaries to deliver on SDGs through participatory local planning at the Gram Panchayat level. It has been observed no funds had been allocated to Gujarat during the span of 2019-2023, as noted in the recent press release dated 13.12.2022 [38] and the annual report 2023 of Ministry of Panchayati Raj.
- With reference to the Vibrant Gram Sabha portal where all the major performance parameters of the key focus areas at the Gram Panchayat / Village levels are tracked and displayed in the public domain, the no. of Gram Panchayats and Equivalents with Localizing SDG (LSDG) themes prioritized have also been identified by the Ministry of Panchayat Raj [39] and has been indicated in the table below for Gujarat.

Table 18: Gram Panchayat in Gujarat prioritized with SDG themes

Year	Total Gram Panchayats and Equivalent	Gram Panchayats and Equivalents with LSDG Priority	Gram Panchayats and Equivalents without LSDG Priority
2022-23	14619	14,412	207
2021-22		3	14,616
2020-21		1	14,618

There is a notable increase in the number of entities with LSDG priority from 1 in 2020-21 to 14,412 in 2022-23. This indicates a growing focus on incorporating LSDG priorities into local governance structures.

3.5. Recommendations for aligning Gujarat state climate action with SDGs

- **Development and Implementation of the SDG Roadmap:** The General Administration Department (Planning Division) is the state nodal agency for coordinating and monitoring the state SDG progress. The nodal agency along with the concerned state departments may develop an SDG Roadmap with priority being given to the lagging SDGs and their alignment to climate action.
- **Development of indicator's mapped SDG Budget**: The objective of SDG Budgeting is to capture the state's allocation to the improvement of SDGs and link it to expected results. The allocation of budget requires a deep level analysis over the lagging indicators. With reference to Odisha's SDG Budget, a goal wise budget allocation and expenditure various departments would help understanding priorities among the stakeholders involved. The illustration below represents the process and methodology taken by the state in developing the SDG Budgeting Report.[1]

Figure 18: Indicative methodology for mapping SDGs for SDG based budgeting

- **Development and implementation of Climate Change and Environment Action Plans across all Districts of Gujarat:** The District specific Climate Change and Environment Plan like Ahmedabad, and Rajkot offers sector-wise recommendations to align with India's 2030 NDC commitments, SAPCC 2.0 implementation, focusing on energy, agriculture, AFOLU, waste, and district-specific issues [40]. Grounded in district realities and state vision documents, the plan includes recommendations for various sectors, policy framework that can push forward those recommendations, a timeframe for implementation and some case examples. The plan also integrates SDGs within the plan. These plans will be of use and relevance in the exercise of district-level planning to integrate climate action with development activities. A similar plan needs to be put forward for other districts to localize the efforts at district-level environmental challenges and promote sustainable practices. The plan also serves as a roadmap for governments,

[1] https://finance.odisha.gov.in/sites/default/files/2021-02/20-SDG%20Budget.pdf

organizations, or communities to implement effective measures that contribute to environmental protection and conservation within a defined timeframe.

- **Mobilization and formalization of Panchayat level SDG Committee:** There are presently two SDG committees in Gujarat, and a more micro level SDG committee at the Gram Panchayat level may need to be formalized by GoG. Either a committee can be formed, or steps can be taken to strengthen already existing Panchayat level committees such as Disaster Management Task Force, Village Health and Family Welfare Committee, Village Level Child Protection Committee, School Management Committee, Village Water Sanitation Committee etc.
- **Proposed Institutional set-up:** The recommended approach for effective climate mitigation involves establishing a district-level climate cell or committee, either as a standalone entity or by integrating climate perspectives into the existing District Environment Committee. This committee is tasked with assigning responsibilities based on stakeholder analysis and engagement. The proposed monitoring and evaluation committee at the district level should include representatives from relevant administrative bodies, sectoral experts, civil society organizations, and civic or other associations, depending on applicability. Similar committees are also suggested at the taluka, village, town level and urban-ward levels.

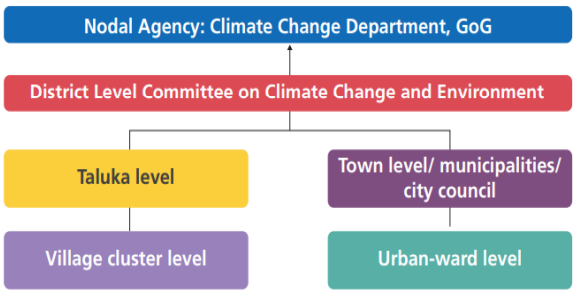


Figure 19: Proposed Institutional arrangement

- **Publishing reports:** Annual or periodic SDG status reports can be developed and published to inform the public about the progress made towards achieving the SDGs.
- **Creating and distributing booklets:** Small booklets can be published for citizens to provide them with information about the SDGs.
- **Organizing more workshops and conferences:** Workshops and conferences can be arranged at different levels especially Panchayat level to raise awareness about the SDGs and discuss strategies for their implementation. It should be mandatory to organize conferences related to SDGs in universities.
- **Providing training:** Training modules, workshop materials, capacity building materials and massive open online courses shall be developed in Gujarati for ready reference. These documents shall be made available in public domain for easier access and implementation across districts. Training should be made mandatory for all government officials to ensure that they are equipped with the necessary knowledge and skills to implement the SDGs. In the state SDG dashboard, a separate section can be created on capacity-building initiatives on the SDGs. Publishing this data will serve the following functions:
  - ✓ Provide visibility to the institutes involved in SDG trainings at the sub-national and local levels,
  - ✓ Act as an incentive for all other institutes to proactively participate in SDG trainings and
  - ✓ Serve as a database for the state as well as for the centre.
- **Generating progress reports:** Quarterly reports of the progress work of each state can be generated and published.
- **Giving awards and incentivization:** Awards or incentives should be given to those states which have achieved good scores in the scorecard generated by NITI Aayog, better incentivization will motivate the state government to perform better. It is noted that Deen Dayal Upadhyay Panchayat Sashaktikaran Puraskar is being replaced with localization of SDG awards, the correlation of awards with localization is going to bring more focus towards local efforts at Panchayat level, it is

observed that awards are being given at the National, State, Block and district levels in the country. [43].

- **Mobilizing state-specific dashboards:** Dashboards which are prepared to monitor the data and indicators related to the SDGs can be kept open for public access. It is understood that Gujarat has dashboards at the district level, however, local level dashboard at the Panchayat can also be developed to monitor progress at local levels and interlinked with the state dashboard.
- **Hiring a separate team:** A separate team for the collection of data at the district level can be hired for better facilitation of the work. It is noted that Gujarat Social Infrastructure Development Society (GSIDS) that a professional agency had been hired for "SDG Cell & Integration with outcome Budget" for implementing SDGs roadmap, competent and trained personnel can be hired for effective monitoring and evaluation or other allied efforts.

3.6. Case studies best practices from India (for the lagging indicators)

To provide relevant case studies, we have drawn inspiration for the Aspirational Districts Programme (ADP) which was initiated in January 2018 by Prime Minister Narendra Modi to bring about inclusive and holistic growth in 112 backward districts of India. The program focuses on driving outcomes on the ground through behavioural insights and innovative initiatives. NITI Aayog, the governing body, has documented success stories and best practices that demonstrate the potential for impact, replicability, innovation, sustainability, use of behavioural principles, and evidence-based approaches. By sharing these ideas, the program aims to foster cooperative federalism and enable districts to learn from each other, accelerating the achievement of SDGs.

Two districts in Gujarat, Dahod and Narmada, are among those being monitored under the program [41]. The selection criteria for case studies include their potential for impact, replicability, innovativeness, sustainability, use of behavioural principles, and evidence-based approaches. ADP leverages the strengths of local governments to drive progress and uplift communities, households, and individuals, particularly those at risk of lagging in development [4], [42].

1. Health and Nutrition

Kilkari, Mobile health updates for women and child in Bihar

Children, elderly and women are among most vulnerable group to climate change and the SDG 3 and 5 are closely interdependent. To address gaps in hap to health-related issues including childbirth and childcare in rural Bihar. A behavioural insights-based solution, Kilkari (Hindi for a baby's gurgle) along with the traditional approaches are being delivered weekly time-sensitive audio information about reproductive maternal new-born child health directly to families' mobile phones from the 4th month of pregnancy until a child is a year old.

Tackling anaemia and building habits via calendar and counselling cards in Madhya Pradesh

Anaemia affects 53% of women aged 15-49 in India, leading to negative effects during pregnancy, low birth weight, and maternal mortality. A behavioural insight-based solution identified a goal tracker for mothers and counselling card aid for front line workers. The goal tracker initiative through the use of calendars was launched to address these barriers and improve adherence to Anaemia treatment. The program uses calendars with 30 scratchable blocks to remind women to take the pill, highlighting the progress towards a healthy baby, the picture of a happy baby after scratching the calendar keeps mothers motivated.

Figure 20: Counselling Card

Counselling card were designed to aid frontline workers in counselling pregnant women about iron and folic acid supplements, and associated side effects of deficiency. Its visual aids in the cards made the information more salient and easier to remember, resulting in increased compliance with the medication.

The card also mentions the time to take the pills and explains difficult concepts more clearly hence leading to improved adherence.

2. Education

Using buildings as a learning aid in Bihar, Madhya Pradesh

Absenteeism in schools and remote districts in Bihar became a significant issue, with students often working to support their families. To address this, a learning aid was launched, which uses the entire physical structure as a learning aid, including the inside and outside spaces by painting them with subjects and grade specific learning aids. This approach emphasizes the importance of making learning fun and children friendly, creating resource awareness efficiently and effectively.

School Enrolment through mass mobilization in Uttar Pradesh

30 million children in Indian schools are not attending school, largely due to poverty and socioeconomic factors. The government needs to focus on increasing enrolment and decreasing dropout rates. To address this issue, a customized campaign was implemented in Chitrakoot district of Uttar Pradesh, targeting high-priority areas via heat mapping for students in the form of green (zero to seven days absent) yellow (7 to 14 days absent) and red (more than 15 days absent) categories and understanding the reasons for absenteeism. This strategy was driven by local administration using a top to bottom approach by engaging all key stakeholders including district administration. Other activities like student led rallies, plays, slogan writing etc. were also used.

3. Agriculture and Rural Development

System for Rice Intensification in Nalanda District of Bihar

Rice, a staple food crop in India, has seen significant growth since the Green Revolution, but its cultivation relies heavily on surface and ground water. Climate change and erratic rainfall are causing further stress on water resources. The System for Rice Intensification (SRI) is a technology that reduces water requirements in rice cultivation by 25% to 50%, increasing yield and reducing the need for inputs like seeds, chemical fertilizer, and pesticides. Depending on current yield levels, the output per hectare is increased usually by 50 percent. The minimal capital costs make System for Rice Intensification technique more accessible to poor farmers. This technique has been applied to rainfed agriculture and other crops like wheat, finger millet, and sugarcane. In the Nalanda District of Bihar, five farmers demonstrated the technique, which recorded the highest yield in 2011. The technique's agronomic practices, such as a smaller plant population and organic soil amendments, have been shown to improve yields [43]

4. Financial Inclusion of women

Use of Women Empowerment Center in Chhattisgarh

Livelihood diversification is the one of the key climate change adaptation approaches which reduces the dependency on rain fed agriculture. The Asha Centre, established in February 2018, in Kondagaon, Chhattisgarh, aims to empower local women through awareness, training, and employment. It comprises five units: Garments Stitching, Handloom Weaving, Sanitary Pads Production, Glass Bangles Designing, and LED Bulb Repair, Assembling Training cum production unit. Over 300 women are currently working at the centre. Skill development training is provided free of cost under various schemes such as Pradhan Mantri Kaushal Vikas Yojana (PMKVY). The main objectives are to increase women's employability, raise awareness about government schemes, empower women as many have started earning livelihoods, and connect remote areas with the mainstream.

5. Renewable Energy

Waste Monetization programs in Bihar

Husk Power Systems (HPS) converts rice husks into electricity and operates the gasifiers in the range 25-100 kWe using rice husk, wheat husk, mustard stems, corn cobs and wood chips. A standard 32 kW plant needs 50 kg of fuel per hour and can power about 700 typical rural households [44].

Solar Village - Modhera Village of Mehsana District, Gujarat

Modhera village in Gujarat, India is the first solar-powered village in the country. The village has a ground-mounted solar power plant and over 1,300 rooftop solar systems with 1kW capacity installed on houses to generate electricity. The system generates about 6,332 kWh of power a day, of which about 6,000 kWh is used by Modhera, and the rest goes back to the grid, making the village a net energy-generator, the first of its kind in India [45].

3.7. Policy Frameworks for Climate-Integrated Development in Gujarat

A policy framework for climate-integrated development in Gujarat refers to a set of guidelines, principles, and initiatives put in place by the government of Gujarat to address the challenges of climate change while promoting sustainable and inclusive development. Key policy frameworks that have been implemented in Gujarat include the State action plan on climate change (SAPCC) that identifies and prioritizes interventions across sectors to mitigate and adapt to climate change. Gujarat already has a comprehensive policy framework with respect to climate change. The relevant policies and programmes focussed on climate mitigation and adaptation efforts have been pointed out in the tables 16-17 as per SAPCC 2.0. Furthermore, climate integrated policies across various sectors and departments have been indicated in the climate change action plan for Ahmedabad and Rajkot district of Gujarat [36], some policies across various sectors are indicated below,

Electricity and Energy: Gujarat Solar Power Policy, 2021, Surya Urja Rooftop Yojana, Policy for Development of Small scale distributed solar projects, 2019, Waste to Energy Policy, 2016, National Solar Mission, i-SMART Project, PM Kisan Urja Suraksha evam Utthaan Mahabhiyan (KUSUM), Surya-Shakti Kisan Yojana (SKY), Smart Meter National Programme (SMNP), National Smart Grid Mission, Streetlight National Programme (SLNP), 2015, Unnat Jyoti by Affordable LEDs for All (UJALA) Scheme, 2015, Standards and Labelling Programme, Sustainable Habitat Mission, Smart Cities Mission, National Mission for Enhanced Energy Efficiency and Municipal Energy Efficiency Programme (MEEP).

Agriculture: Rashtriya Krishi Vikas Yojana: Remunerative Approaches for Agriculture and Allied Sector Rejuvenation (RAFTAAR), National Mission for Sustainable Agriculture, Pradhan Mantri Krishi Sinchayee Yojana, PM Kisan Urja Suraksha evam Utthaan Mahabhiyan (KUSUM) Yojana, Soil Health Card, National Mission on Food Security, National Mission on Microirrigation, Price Support Scheme, AGR 2 (Farm Mechanisation) scheme of farmers other than SC/ST, National Policy for Crop Residue Management, Suryashakti Kisan Yojana, Dinkar Yojana, National Livestock Mission, Green India Mission (GIM).

Transport: Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) II, Gujarat Electric Vehicle Policy, 2021, Jawaharlal Nehru National Urban Renewal Mission (JNNURM), National Electric Mobility Mission Plan, Smart Cities Mission, AMRUT, National Urban Transport Policy, 2006, Bus rapid transit System (BRTS).

Industrial: Gujarat Industrial Policy, 2020, Gujarat Solar Policy, 2021, National Mission on Enhanced Energy Efficiency, Reuse of Treated Waste-Water Policy, 2018.

4. MRV framework on relevant SDG goals and targets

4.1. What is MRV framework

The concept of MRV, or Measurement, Reporting, and Verification, was first introduced during the thirteenth Conference of the Parties (COP) held in Bali in 2007. It serves as a crucial component of the United Nations Framework Convention on Climate Change (UNFCCC) reporting framework, specifically in relation to efforts aimed at mitigating climate change [46]. The process of mitigation involves the establishment of greenhouse gas (GHG) emission reduction targets, followed by the implementation of actions aimed at decreasing emissions. Subsequently, the emission levels are measured to assess the achievement of the targeted reduction. This evaluation informs the setting of new targets, thereby perpetuating the cycle of mitigation efforts.

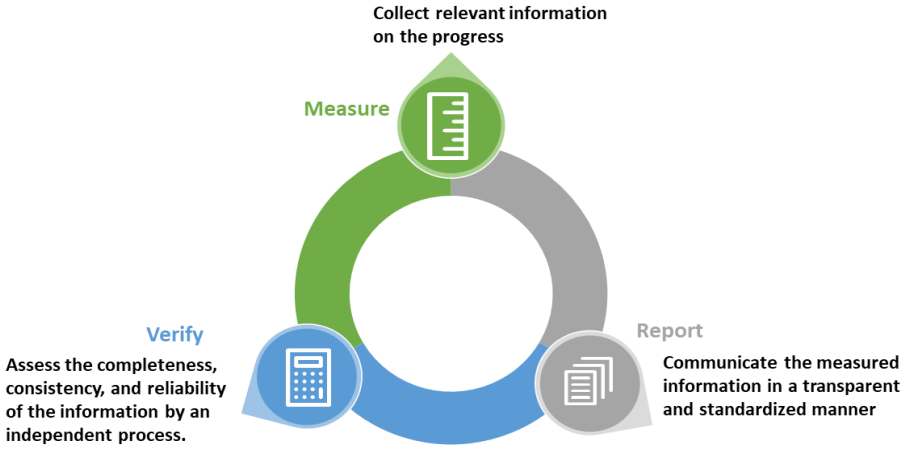


Figure 21: About MRV framework

What is measured:

Data and information on emissions, steps to mitigate them or adapt to them, and assistance. This may involve measuring GHG emissions directly and comparing the reductions in emissions (or removals by sinks) caused by mitigation measures to a baseline situation. In order to reach the sustainable development goals and get other benefits, the goal is to monitor the progress made in reducing risk and mitigating climate change.

What is reported:

Reporting is meant to make information available to a wide range of users by putting it together in lists that are made from measurements. This includes information on greenhouse gas (GHG) emissions and reductions, by mitigation and adaptation actions compared to the baseline scenario, and how far along the mitigation actions are in being put into place.

What is verified:

Review and verify (and have independent assessments) on the given information on a regular basis to ensure sure completion and accuracy. Verification can provide feedback on course correction and future improvements. This includes verification of the measured and reported information on GHG emissions and removals, mitigation and adaptation actions and their effects, and support needed and received for calculating changes relevant to sustainable development and collecting information about support for climate change mitigation and adaptation.

4.2. MRV framework in India

India is developing an overall MRV system to track policy development and the impact on NDCs, as well as a particular integrated domestic MRV system for GHG reduction efforts [47]. The framework is

aimed to monitor progress on the Sustainable Development Goals, provide data for national policy decisions, build national capacity, ensure transparency, good governance, accountability, and credibility of results, engage the private sector, improve access to funding, and contribute to broader national reporting on the state of the environment, climate issues, and policy effects.

India being a party to the UNFCCC aim to conducts MRV at regional level (district) to state-level (for example Gujarat) that will provide data to assess the country's overall performance in mitigating and adapting to climate change. When the data from each nation is pooled, it will reveal worldwide progress on climate change mitigation, adaptation, NDC progress, and assistance needed and received to achieve higher climate goals.

4.3. MRV framework for SDG in Gujarat State

Monitoring and evaluating government policies and activities is an important aspect of determining funding allocations in Gujarat State [48]. This encompasses both financial and physical goals. Furthermore, processes for reviewing overall consequences at the highest governing levels exist. Furthermore, it stipulates national climate change programmes and other related national programmes, such as energy efficiency, renewable energy, agricultural and forestry sector programmes, and projects, include monitoring and reporting systems. However, these monitoring and evaluation systems do not perform any MRV for GHG emissions and mitigation, even though data acquired through such systems might be useful in identifying impacts and outcomes.

4.3.1. MRV framework for assessing and guiding the progress of state schemes for relevant SDG goals and targets

This section describes the planning for monitoring, reporting and verification (MRV) of the state schemes for relevant climate change mitigation measures that the district may adopt for the sectors identified in the report. The Gujarat State Government has envisaged to develop and publish MRV-related technical guidance as necessary for stakeholders involved in the process, following the rules and procedures agreed at the international level. The framework for monitoring and evaluation for SDGs is implicitly in place as indicated in table 11-15, the key performance indicators are being tracked and the distance from the target has been indicated are prepared with reference to the data table from the NITI Aayog Index Report. A similar activity done for the state schemes is being proposed here. The framework proposes to first incorporate thematic areas which the district should place focus upon. Then the measures that the district intends to take across those thematic areas needs to be set up, this also involves identifying and mapping the relevant policies with respect to the priority SDGs and its associated targets and indicators, policy gap identification and recommended measures for aligning the state progress with respect to SDGs. This will be followed by implementation of the adaptation and mitigation plans and verification of the results from the concerned stakeholders.

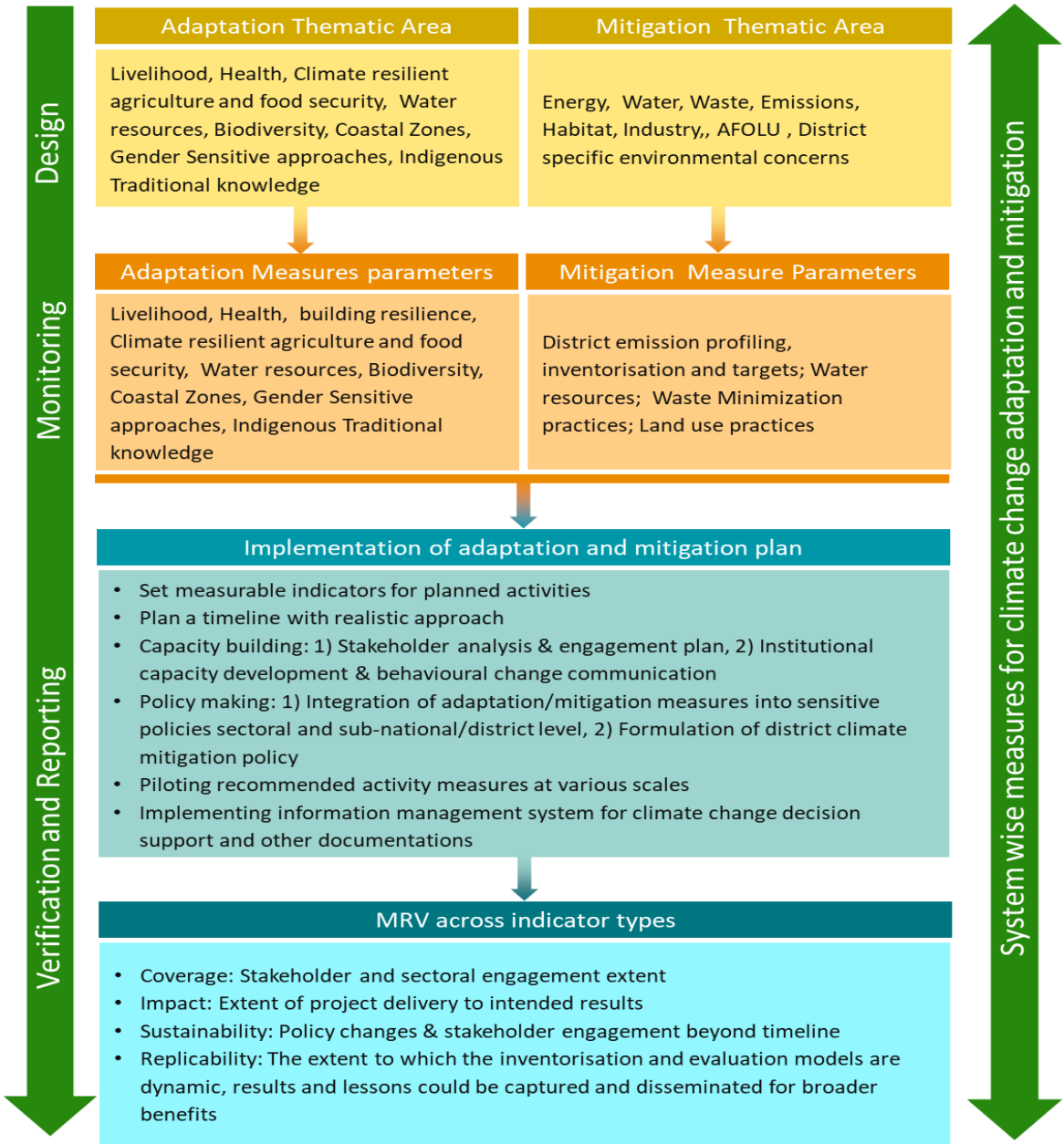


Figure 22: MRV for climate change mitigation and adaptation in Gujarat [36]

MRV on Sustainable Development Goals under Climate Change for Gujarat will require a richer and broader set of harmonized monitoring indicators. Many of these indicators, particularly those pertaining to the environment, health, poverty, and economic development, are currently being gathered by various line departments of the GoG, but in certain areas, new indicators, as well as information-gathering mechanisms, must be created. Complex difficulties must be tackled throughout a wide variety of sectors and theme areas, such as health, education, agriculture, nutrition, the water-energy nexus, sustainable consumption and production patterns, and infrastructure design, to achieve this. Lessons gathered from other states' successes may be localized to meet GoG requirements. Similarly, implementation issues and technological limitations are frequently shared throughout India's numerous states, therefore key theme groups must be mobilized nationwide in support of the SDGs.

The information required for SDG progress of state schemes is often widely dispersed and collected at various sources. Collating all relevant data for is a challenge. In order to make the framework more robust, roles of state departments with respect to SDGs and their associated schemes should be developed and should complement the efforts of nodal agencies such as state level and district level

SDG cells and a specific time frame for data collection and monitoring should also be taken into account. Considering the scope of MRV is mainly from the perspective of SDGs and schemes, it is important that the governing institutes should have the necessary expertise and experience to enhance data collection. While policy formulation will continue to happen at national level and states are subsequently going to adopt these policies along with their own interventions. There is also a difference in terms of institutions responsible for policy formulation and entities that will bear the responsibility for collecting data. It is important to note that a nodal agency such as the planning department shall be responsible for collecting data from various district SDG cells and state departments and submitting data annually to the data analysis wing of MoSPI/ NITI Aayog.

The figure illustrates an indicative MRV structure of key institutions, emphasizing the role of a nodal agency, like the planning department, responsible for collecting, analysing, verifying and submitting data to the central bodies such as NITI Aayog or Ministry of statistics and Programme Implementation for further validation and verification and later publish the MRV report for the state schemes on SDG

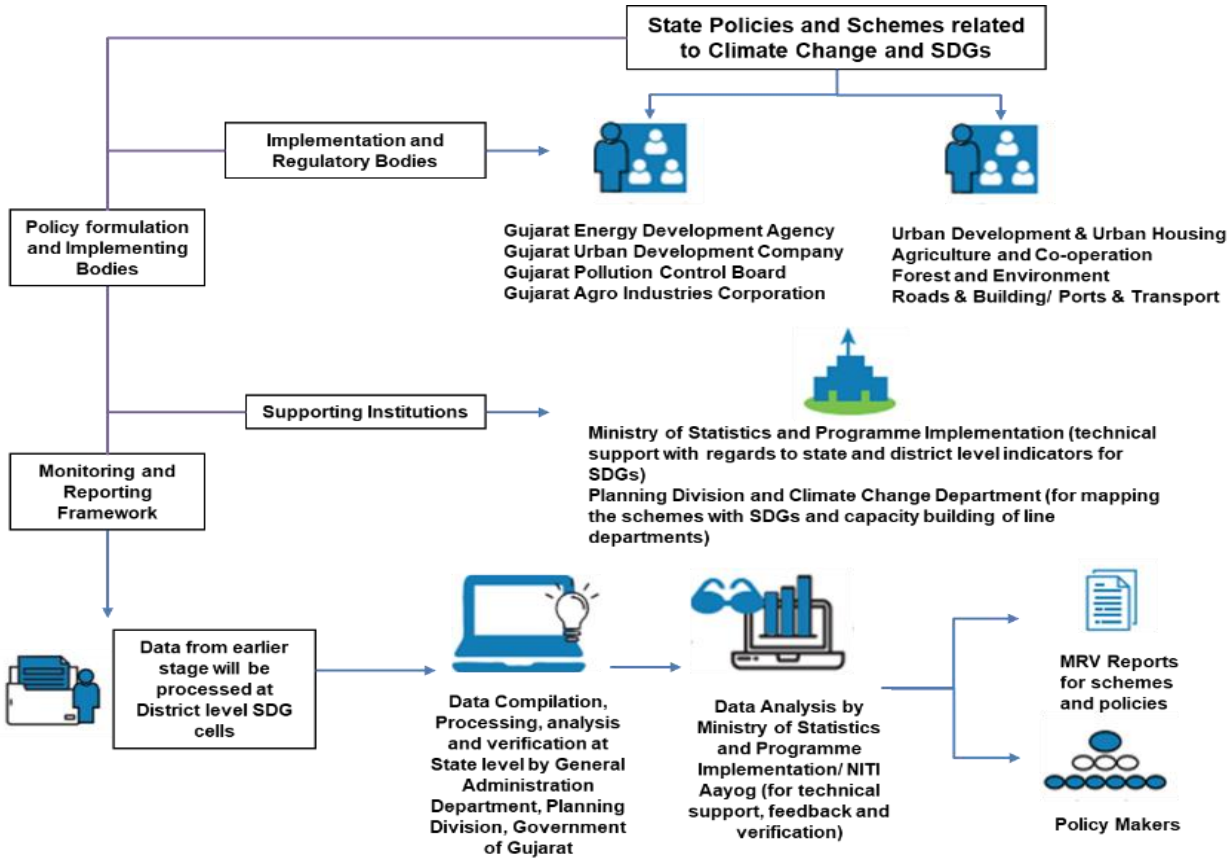


Figure 23: Institutions that can play a key role in enhancing the data collection mechanism and strengthening the reporting framework

progress. [66].

The thematic or epistemic communities should focus on monitoring progress and challenges in implementation. To align with state planning and budgetary processes, SDG monitoring needs to operate on an annual cycle, and an indicative schedule for preparing the annual report is provided below:

- The identified agencies gather the required data to complete the national reports on that indicator, (first six months of the reported year)

- The inventories are then forwarded to the identified organization tasked with preparing the Annual SDG Report on Climate Action (Six to eight weeks). This may be the District SDG Cells.
- The draft report would be presented to the nodal agency of Government of Gujarat which may analyse, compile, and verify the reports and also seek assistance of national bodies for review, verification and a cover statement (Four to six weeks).
- The report would be prepared for publication and translation in Gujarati.

4.3.2. Community engagement and capacity building for MRV

The Coastal Regulation Zone 2011 Notification of Government of India has declared the Gulf of Kachchh and Gulf of Khambhat as Critically Vulnerable Coastal Areas (CVCA), identified as an ecologically sensitive area that shall be managed through a process of consultation with local inhabitants who depend on its resources for their livelihood [49]. Under the Integrated Coastal Zone management programme, these areas have been given priority by involving community in decision making Community Based Management (CBM) a success. Furthermore, the afforestation activities of GoG to increase green cover and carbon sequestration potential has active participation from the local communities including women.

Participatory MRV engages relevant stakeholders in the MRV by providing them with the skills and capacities to monitor and report on their forest and carbon resources and greenhouse gas mitigation potential. Involvement increases the sense of ownership and responsibility. Participatory MRV can communities with the relevant line department of GoG to ensure the monitoring and reporting efforts are fully aligned and interactive.

4.3.3. Role of technology and innovation

Quite often the conventional data collection and monitoring is associated with low efficiency and high manhour requirement for the MRV of projects. Approx 50 billion IoT devices exist across the world the world connecting over ¾ of the global population. There are several digital solutions being used in the nonprinting and measurement across the world. Tools like calculators (spreadsheets), GHG inventory software and data management systems, databases, Emission factor databases, Remote sensing, CEMS (Continuous Emissions Monitoring Systems), Online reporting and registries are used widely. Government of Gujarat has developed Online MIS/Dashboard for monitoring of SDGs indicators by the SSC/Planning Division which involves integration of multiple tools for MRV.

5. Framework for capacity development/ Capacity building Plan

5.1. Capacity building and training of trainers

Some of the capacity building programmes on SDG implementation and monitoring undertaken by Government of Gujarat recently include workshops on:

- SDG based Scheme monitoring framework,
- Strategy and action plan to improve the performance of Gujarat,
- Gap analysis based on SDGs and geo-tagging with districts,
- Localization of SDG and review of decentralized district planning,
- Training of trainers and GSWIFT dashboard.

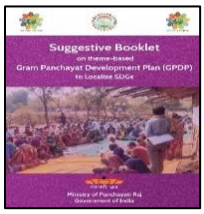
The efforts on capacity building across various stakeholders is indicated below,

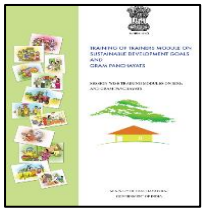
Table 19: Types of capacity building initiatives by GoG

S. No.	Type of capacity building	Stakeholders
1	Training of Trainers program	District administration level officials
2	Regional workshops	Nodal officers from district
3	Sensitization of SDGs district level functionaries	District Level Officials
3	Sensitization of SDGs taluka level functionaries	Taluka Level Implementers
4	Sensitization of SDGs village level functionaries	Village Level Functionaries
5	Training on data quality and validation for SDGs	HOD's from state line departments

These activities showcase a comprehensive approach to engaging various stakeholders, from state departments to grassroot level functionaries, in implementing and monitoring SDGs in Gujarat. The focus on sensitization, training, and assessment reflects a commitment to achieving sustainable development goals at both state and local levels. It is noted that more than 71,000 district and taluka level functionaries have been sensitized against a target of training 1 lakh functionaries during 2019-2020.

Government of India recognizes that Panchayats play an important role in effective and efficient implementation of flagship schemes on subjects of national importance for transformation in rural India. Various efforts such as following are undertaken,





- A suggestive booklet on theme-based Gram Panchayat Development Plan has been developed by Ministry of Panchayati Raj to localize SDGs [50].
- A handbook for trainers and Gram Panchayat has been made available by the Government of India. The handbook provides information on the SDGs which are directly related to Gram Panchayats and is meant for elected Gram Panchayat representatives and functionaries, and for resource persons supporting the planning process at the grassroots, to use as a ready reference [51].
- A manual is created by UNDP and Ministry of Panchayati Raj, Government of India on Training of Trainers Module on SDGs and Gram Panchayats with the aim to support an electronic training module that simplifies the Sustainable Development Goals (SDGs) for local representatives and trainers. It includes organized modules and presentations, aiding trainers in planning and delivering effective instructional sessions on the SDGs [52].
- In addition to this a training manual on SDGs is also developed in Gujarati language to localize the efforts [53].

These concerted efforts underscore a commitment to ensuring that SDGs are effectively understood, implemented, and localized at the Gram Panchayat level in India, fostering sustainable development practices within the community.

5.1.1. Gaps Analysis in Capacity building effort by Government

Basis a study conducted in 2022 to understand the role of government in capacity building on SDGs in the country, various gaps and recommendations may be applicable across various states including Gujarat have been presented as part of the study and are as following [54],

- **Unorganized frequency of SDG Trainings:** The frequency of SDG trainings organized across states is not uniform, a training calendar if not available needs to be developed for uniformity in approach through each of the districts.
- **Limited Coverage of Training Programs at Local-level:** To effectively integrate SDGs into community-level activities, there is a need to expand the coverage of training programs. Collaboration between National Institute of Rural Development, State Institutes of Rural Development and community-level organizations is suggested for better localization of the SDGs.
- **Inadequate Data on SDG Trainings:** SDG cells are responsible for creating databases on capacity-building for the SDGs, but the analysis of their websites reveals inadequate reporting. The lack of monitoring mechanisms contributes to insufficient or inconsistent reporting, making it challenging to determine the number of trainings and assess the extent of SDG awareness among government officials.
- **Absence of Systematic Reporting:** There is limited systematic reporting about capacity-building for the SDGs for government officials on the websites of SDG cells. The absence of a structured reporting format or mechanism at the state level results in a lack of publicly available data on SDG trainings for government officials. The lack of a comprehensive reporting mechanism undermines the ability to measure progress and identify areas for improvement in SDG implementation efforts.
- **Limited Resource Materials in Local Languages:** Insufficient resource materials available in local languages hinder the capacity-building of officials at the community level. There is a need to develop more materials in local languages to facilitate better understanding and alignment of local development plans with the SDGs.

5.1.2. Assessment of the present capacity of nodal department (implementing relevant climate action schemes linked with SDGs)

In the context of assessing the present capacity of a nodal department - Gujarat Social Infrastructure Development Society (GSIDS), capacity encompasses a range of resources, skills, and capabilities that enable an organization to achieve its objectives. This assessment considers the human resource capacity.

Upon examination, there is limited information available regarding the total number of trainers available in Gujarat while Kerela maintains a record of total trainers based on the themes identified by the Ministry of Panchayati Raj is indicated in the table below.

Table 20:Master Level Training (Training of Trainers) for resource persons in Kerela

Theme	Total number of master trainers in Kerela
Theme 1: Poverty Free and Enhanced Livelihoods Panchayat	117
Theme 2: Healthy Village	119
Theme 3: Child Friendly Panchayat	111
Theme 4: Water Sufficient village	106
Theme 5: Clean and Green Village	128
Theme 6: Self Sufficient Infrastructure Gram Panchayat	168
Theme 8: Village of Good Governance	
Theme 7: Socially Secured Village	110
Theme 9: Engendered development in Village	84
Theme 10: Quality Education	96

With reference to the details of Participants trained since 2018-19 to 2021-22 under Rashtriya Gram Swaraj Abhiyan (RGSA) for Gujarat and Kerela is as follows [55],

Table 21: Details of Participants trained in Gujarat and Kerela since 2018-19 to 2021-22

State	2018-19	2019-20	2020-21	2021-22
Gujarat	5,43,094	22,159	0	10,455
Kerela	1,09,057	1,07,216	0	1,50,634

The detail in the table 21 reflects the decreasing trend in the number of participations trained in Gujarat in comparison with Kerela, this indicates the lesser enhancement of the capacities of rural local bodies to deliver SDGs, compelling the need to mobilize trainers locally to promote participation.

5.1.3. Proposed capacity building plan

Since more than 68% of the country's population lives in rural areas and panchayats are local governments in these areas, so localization of SDG goals at Gram Panchayats level is essential. For localization of SDGs at Gram Panchayat level, Panchayati Raj representatives, community-based women organization members and various departments are required to have adequate information about these. Ministry of Panchayati Raj Government of India has identified 9 thematic areas covering 17 goals for localization of SDGs in Panchayats. Through the below mentioned themes, Ministry of Panchayati Raj is progressing in attaining the SDGs. Those 9 themes are:

Table 22:Themes by Ministry of Panchayati Raj

S No.	Theme Description	Connected SDGs
Theme 1	Poverty free and enhanced livelihoods village	SDG - 1,2,8
Theme 2	Healthy village	SDG - 2,3
Theme 3	Child friendly village	SDG - 1, 2, 3, 4, 5
Theme 4	Water sufficient village	SDG - 6,15
Theme 5	Clean and Green village	SDG – 6, 7, 12, 13, 14, 15
Theme 6	Self-sufficient infrastructure in village	SDG - 1, 2, 4, 5, 6, 9, 11
Theme 7	Socially secured village	SDG – 1, 2, 5,10,16
Theme 8	Village with Good Governance	SDG – 16
Theme 9	Engendered Development in village	SDG - 1,2,3,4,5,8

The Government of India revamped the Rashtriya Gram Swaraj Abhiyan (RGSA) scheme for implementation during the period from 01.04.2022 to 31.03.2026. The main aim of the scheme is to develop the governance capabilities of Panchayati Raj Institutions to deliver on SDGs through inclusive local governance by capacitating elected representatives and functionaries to deliver on SDGs through participatory local planning at the Gram Panchayat level. Capacity Building and Training activities shall be based on the National Capability Building Framework developed by Ministry of Panchayati Raj. States are required to prepare detailed annual state capacity building plans for Panchayati Raj Institutions in accordance with the guidelines and submit them to the Ministry of Panchayati Raj for appraisal and approval of funds [56]. Seeking inspiration from Kerela, the following phase-wise approach is being proposed to mobilize SDG dialogues at local-level [57].

Phase 1: Preliminary assessment

Before the finalization and preparation of a capacity building plan, activities to be taken up before the preparation of the plans should include:

- ✓ Training Needs Assessment
- ✓ Consultation with Elected Representatives, Panchayat Functionaries, and other stakeholders
- ✓ Assessment of Trainers
- ✓ Plan for training of Master Trainers

- ✓ Impact assessment of training programmes

Phase 2 – Module Preparation Workshop and Master Level Training

We propose to conduct a comprehensive Module Preparation Workshop focused on distinct thematic areas, with a particular emphasis on the 9 key themes. The goal is to develop separate modules and training materials tailored to the unique context of Gujarat. Training modules such as handbooks on training of trainers on SDGs and Gram Panchayats has been made available by the Government of India and more relevant material is made available with the ministry of Panchayati Raj can be utilized for the module preparation workshop.

Following the workshop, Master Level Training shall be organized at the state level. This training initiative aims to empower resource persons with the requisite skills and knowledge for the effective localization of SDGs within the Gujarat framework. The Training of Trainers will need to be meticulously designed and implemented in alignment with the specific needs and challenges of Gujarat. We anticipate that this initiative will not only enhance the capacity of the participants but also contribute significantly to the state's sustainable development goals. Pilot testing of prepared training modules and changes based on feedback, will first put in place a more meaningful communication content and method.

Phase 3 – Dissemination of Panchayat Level Training

Following extensive awareness campaigns among officials and key stakeholders. The aim must now be to spread this training theme wise target groups as identified in the report titled Localization of Sustainable Development Goals in Panchayat Raj Institutions [58] and conduct Gram Panchayat level trainings to localize the SDGs by the Master trainers and key resource persons.

6. Conclusion

6.1. Opportunity and Challenges on SDG under Climate Constraints

Gujarat's high rank in SDG 13 (Climate Action) indicates a strong commitment to climate-related initiatives. The establishment of a dedicated Department of Climate Change and increased budget allocations underscores the state's prioritization of climate action and requires continual effort by the GoG to secure the top spot among other states. The white paper identifies following focus areas which needs to be prioritized while planning a climate change linked regional development plan:

- **Absence of SDG Roadmap:** The Department of Health and Family Welfare, Government of Gujarat had developed and published a Roadmap for Health - SDG 3 in Gujarat which may have been instrumental in Gujarat securing 1st rank across it as per NITI Aayog India Index 3.0 report. However, similar roadmaps were not observed to be available for other lagging SDGs. The absence of comprehensive roadmaps may hinder SDG progress in areas like Zero Hunger (SDG 2) and Gender Equality (SDG 5) in Gujarat.
- **Climate Change Action Plans for all districts:** While Ahmedabad and Rajkot have Climate Change and Environment Action Plans [36], the absence of similar plans for other districts limits the comprehensive approach needed for addressing climate-related challenges across the state.
- **Localized committees:** Gujarat has established district level SDG Committees and thematic working groups. But there is an absence of an SDG committee at the Panchayat level and district level climate change committees, which suggests limited local engagement. It is important to ensure active involvement of local communities and grassroots institutions for effective localization of SDGs.
- **Focus on Lagging Indicators:** The examination of SDG performance in areas like Zero Hunger (SDG 2) and Gender Equality (SDG 5) provides a foundation for strategic interventions. It identifies specific indicators where the state has room for improvement.
- **SDG Budgeting:** The absence of an SDG budget estimate for each SDG could hinder effective resource allocation and planning. A transparent budgetary process aligned with priority SDGs is crucial for successful implementation.
- **Budgetary Shifts:** The analysis of budget allocations reveals potential reductions in emphasis on climate action across some departments. This shift may impact the state's ability to meet climate-related targets.
- **Limited access to SDG monitoring tool and reports:** The limited visibility of G-SWIFT, action plans and updated SDG reports in the public domain may pose challenges for important stakeholders seeking information. This limited transparency may impede effective monitoring and public engagement.
- **Limited data on SDG Trainings and related resources:** SDG cells responsible for databases on capacity-building lack sufficient reporting as its observed there is limited structured reporting format or mechanism at the state level, leading to a dearth of publicly available data on SDG trainings. There is also limited availability of resource materials in local languages which may hinder capacity-building at the community level.

6.2. Way forward

Last but not the least, the white paper outlines opportunities and challenges faced by Gujarat. Despite being a front runner in Climate action (SDG 13) and overall SDG performance, the state encounters challenges such as limited local engagement with respect to SDGs, inconsistencies in climate-related budget allocations, inadequate focus on lagging indicators, limited public visibility of G-SWIFT, District

SDG reports, limited data on SDG trainings and related resources. It identifies the following activities as a way forward,

- **Strategic Roadmaps for Lagging SDGs:** Building on the success of the SDG Roadmap for Health, the state should develop similar roadmaps for lagging SDGs like Zero Hunger and Gender Equality. These roadmaps can guide targeted interventions and resource allocation.
- **Increased transparency in District-Level Reporting:** Effective deployment of tools like G-SWIFT and transparent district-level reporting can enhance accountability and facilitate evidence-based decision-making. Making this data publicly available will empower stakeholders at various levels.
- **Targeted Climate Action:** Recognizing the potential reduction in climate action emphasis of various schemes across line departments, the state shall reassess budget priorities and align more of its activities towards climate change. Engaging with industries and encouraging renewable energy projects, especially in bio-power can contribute to meeting SDG 12 and 13 targets together.
- **Mobilize SDG and Climate Change Committees:** The state should strengthen its present institutional infrastructure and form SDG committees at the Panchayat level and district level climate change and environment committees.
- **Capacity Building:** Investing in the capacity building of various stakeholders, including businesses, local communities, and government agencies, is crucial. This involves training programs, knowledge sharing, and awareness campaigns to ensure a smooth transition to sustainable practices.
- **Collaboration and learn from other leading states/ countries:** Actively engaging in international and national forums, agreements, and collaborations can enhance Gujarat's efforts in combating climate change. Sharing knowledge and best practices among regions facing similar challenges can amplify the impact of sustainability initiatives, this has been done through the Aspiration District Programme, wherein NITI Aayog has compiled success stories and best practices with the aim to promote cooperative federalism, facilitating mutual learning among districts to accelerate progress towards achieving the SDGs. Also, activities and updates of SDG cells of other competing states can be studied to make improvements.

6.3. Concluding remarks

Gujarat's journey towards becoming a net-zero state presents both opportunities and challenges. By strategically embracing renewable energy, green technologies, and climate-resilient practices, the state can not only mitigate the impact of climate change but also stimulate economic growth. However, a successful transition requires a balanced approach, considering the social, economic, and environmental dimensions. Gujarat's commitment to a sustainable future, combined with effective policies, international collaboration, and innovation, can serve as a model for regions grappling with the complex interplay between development and climate constraints. Gujarat's current performance on SDGs reveals a mixed picture of progress and challenges. While the state has demonstrated a commitment to climate action and initiated data-driven approaches, addressing disparities and focusing on lagging indicators are critical for holistic development. The upcoming period should witness a strategic shift, emphasizing targeted interventions, transparent reporting, and a renewed commitment to sustainable development across all sectors.

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