

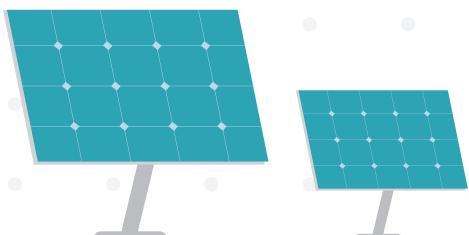
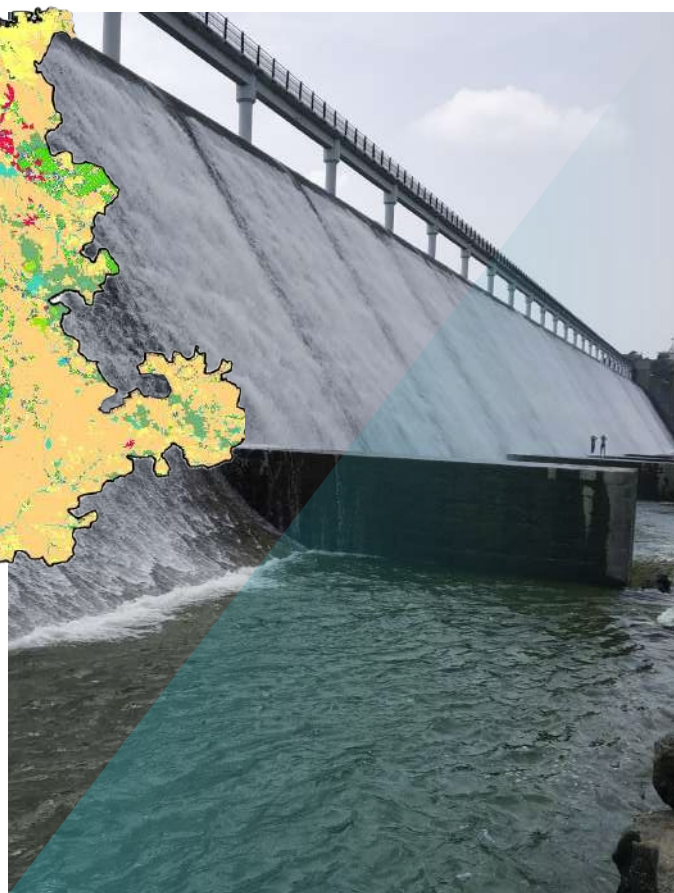
January, 2022



Climate Change
and Environment
Action Plan of

Rajkot District

Recommendations



Prepared By



In Association with



Supported By



The Climate Change and Environment Action Plans (CCEAP) have been developed for multiple districts of India by Vasudha Foundation with support from Shakti Sustainable Energy Foundation. For Rajkot, the plan was developed in collaboration with the Climate Change Department, Government of Gujarat and Gujarat Ecological Education and Research (GEER) Foundation, Forests and Environment Department, Government of Gujarat.

The CCEAP aims to complement the State Action Plan on Climate Change (SAPCC) version 2.0 as prescribed by the Ministry of Environment, Forest and Climate Change (MoEF&CC) and align it to India's latest climate commitments to the United Nations Framework Convention on Climate Change (UNFCCC). The rationale behind this action plan is to follow a bottom-up approach to climate-proof development priorities for the district.

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January, 2022

Rajkot, Gujarat

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Wind mills on Rajkot-Amreli highway (sourced from shutterstock)

Bottom right:

Reservoir on Aji dam, Rajkot (sourced from istock)

Land use map of Rajkot district:

Created using data from Landsat 8, secondary data from NRSC/ISRO Bhuvan portal, Google Earth and ORNL-DAAC

 Forest	 Crop-land	 Built-up Land	 Mixed Forest	 Shrubland
 Fallow-land	 Wasteland	 Water bodies	 Grassland	



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Kiritsinh Rana



No. M/F.&E.C.C.P.S./ 344 /2021

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Date : - 4 JAN 2022

Message

The state of Gujarat is a front-runner and significantly contributes to the national GDP through various sectors. In addition to this, Gujarat is working to combat climate change and take timely climate mitigation actions. The state currently ranks 1st in solar rooftop installed capacity and contributes to 25% of the total national solar rooftop installed capacity. Moreover, Gujarat also stands 3rd for total installed renewable power in India.

While state level policies and initiatives are being put in place, a first of its kind, Climate Change and Environment Action Plan for Rajkot district prepared by Vasudha Foundation will aid the district to effectively contribute in state's climate planning. I would like to congratulate Vasudha Foundation and all its partners for formulating a comprehensive district Action Plan that provides doable short, medium and long-term recommendations for various sectors.

I would encourage the district administration and relevant in-line departments to adopt this Action Plan and take initiatives that are climate cognizant.


(Kiritsinh Rana)

Jagdish Vishwakarma (Panchal)



No Co-Op.C.I.S.I.P.(Ind.)I.F.E.C.C.P.S.(Sta.Mi.)/ 249/2021

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MESSAGE

Climate change has emerged as a global threat, prompting nations to come together to tackle the challenge. Under the visionary leadership of the Hon'ble Prime Minister, Shri Narendra Modi, India announced its intention to achieve net zero emissions by 2070 at the 26th Conference of Parties (COP26) meet at Glasgow, in November, 2021. India has also vowed to reduce the total projected carbon emissions by one billion tonnes, from now onwards until 2030. To achieve these goals, it is imperative that appropriate actions are undertaken at the state level.

The state of Gujarat is a high performing state in terms of environment management besides leading in development and industrial output. The state ranked first in the Composite Water Management Index 2019 (NITI Aayog) for the third year in a row. The city of Rajkot, was in the top 10 'Cleanest Cities with more than a million population' in Swachh Survekshan, 2020. The SDG India Index and Dashboard 2020-21 by NITI Aayog, applauds Gujarat's performance in attaining the Sustainable Development Goals.

Gujarat was the first state in India and Asia, and globally the fourth to form an independent Department of Climate Change back in 2009. I take pride to say that Government of Gujarat believes in development that is sustainable in nature. I am thus delighted to see that a **Climate Change and Environment Action Plan has been developed for Rajkot district**. Developing a plan for the district that factors climate action is a crucial step in the bottom-up approach to meet the state and national climate targets. I am certain that this initiative would set the foundation for tangible actions towards climate conscious development.

I appreciate detailed study undertaken in consultation with various stakeholders to develop the **Climate Change and Environment Action Plan of Rajkot district**. I hope to see the implementation of this Action Plan soon.

Jagdish Vishwakarma (Panchal)



Shri S. J. Haider, IAS
Principal Secretary
Climate Change Department
Government of Gujarat

Message

Climate Change Department, Government of Gujarat has been actively engaged for over a decade to effectively address climate change. The concerted actions initiated so far have helped bring forth several innovative initiatives for climate mitigation measures, like the installation of solar panels on Narmada branch canals that help generate clean power, while reducing water loss from evaporation. Gujarat is one of the front-runners in renewable energy growth. It ranks first by contributing 25% of the total national solar rooftop installed capacity. Moreover, the Department undertakes different studies from time to time as well as initiatives to enhance State's measures to combat climate change.

In one such endeavour, the 'Climate Change and Environment Action Plans' (CCEAPs) of Ahmedabad & Rajkot Districts have been developed by Vasudha Foundation in collaboration with the Climate Change Department and GEER Foundation. I appreciate the collective efforts put in, for accomplishing this task.

These district Action Plans recognize that there are no universal solutions for climate change. Therefore, regionally appropriate and district-specific Action Plans have been prepared for both the districts. They take into account the district-level baseline studies on: climate variability and projections, emissions profile and budgetary analysis to estimate climate expenditure, and other crucial aspects. They also bring forth a comprehensive set of recommendations for various climate-relevant sectors and environmental issues of the districts, along with case examples and estimated mitigation potential. These Action Plans, I hope, will be of use and relevance in the exercise of district-level planning to integrate climate action with development activities.

(S. J. Haider)



सत्यमेव जयते



GEER FOUNDATION

Gujarat Ecological Education and Research Foundation

U. D. Singh, IFS
Director

Message

One of the most challenging threats today is climate change, which has caused regional level disturbances in rainfall, temperature, and extreme events. Countries across the world are realizing the danger posed by this threat and coming together to tackle it. In the most recent Conference of Parties held in Glasgow, India has made many ambitious commitments such as reducing the emissions intensity of its GDP by 45% by 2030 and meeting 50% of its energy requirements from renewable sources in the same timeframe. The most important of announcement was of India to achieve net zero target by 2070.

To meet these targets, particularly net zero by 2070, there is a need to understand the role that forestry sector can play not just as a sink of carbon emissions but also for its myriad ecosystem services for human well-being. The past few Forest Survey Reports have indicated that the recorded forest area in the state of Gujarat, currently standing at 11.03% of the geographical area, has been maintained. Further increase in forest cover, through strategic actions at local level, can reap multiple benefits for the state while combatting climate change in the long term.

In this context, I am pleased to see the efforts made by Vasudha Foundation, in association with the Climate Change Department and GEER Foundation towards developing the 'Climate Change and Environment Action Plan' (CCEAP) for the district of Rajkot. The CCEAP is a detailed study of the district and its priorities in alignment with state and national climate goals. The key takeaway from this action plan is a set of comprehensive recommendations, which can enable the district to mainstream climate action and contribute to India's climate goals. I hope the recommendations in the Action Plan are adopted and implemented by the respective departments.

(U.D. Singh)

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MESSAGE

Climate related catastrophic events are on the rise across the world, prompting nations to come together to tackle climate change, which has emerged as a global threat in the past few decades. India has established itself as a world leader in climate action as it recently announced its intention to achieve net zero emissions by 2070 among other ambitious targets at COP26 at Glasgow in November, 2021. To achieve these goals, it is imperative that all the states commence their climate actions immediately and contribute towards the national targets.

In a federal country like India, each state plays an instrumental role in contributing towards national climate goals. Gujarat is one of the leading states in the country in terms of climate action and sustainable development, as seen through several initiatives such as the launch of the latest State Action Plan on Climate Change. The state government has taken a strong stance to reduce emissions from high emitters by announcing curtailment on new thermal power plants. The state also has an all-inclusive EV policy (Gujarat Electric Vehicle Policy, 2021) which focuses not only on a major shift in the automobile segment from fossil-fuel based to electric, but also on supporting infrastructure.

Rajkot is one among the nine cities awarded four-star rating under the Climate Smart Cities Assessment Framework, 2021 by the Ministry of Housing and Urban Affairs. Rajkot city's efforts to reduce carbon dioxide emissions and tackle climate change were recognized by World Wide Fund for Nature as it was awarded the prestigious title of 'National Capital of India 2019-20' for reducing its conventional energy consumption by 17.26 million kWh; the city has won the title three years in a row.

The growing developmental needs in cities, and its peripheries within the district calls for comprehensive sectoral level analyses followed by interventions to curb emissions. Further, adopting a bottom-up approach to climate planning and action can contribute towards achieving the larger goals set by the state and the country. In this light, the Climate Change and Environment Action Plan (CCEAP) of Rajkot district was developed by Vasudha Foundation, in collaboration with Climate Change Department and GEER Foundation. The Action Plan has been developed in consultation with District Administration of Rajkot, officials from relevant departments, academia, civil society organizations and other key stakeholders through multiple rounds of consultation.

I appreciate the efforts made towards developing the CCEAP for Rajkot district. The recommendations given in this Action Plan can be implemented by the relevant departments for mainstreaming climate action in alignment with the district's development priorities.


(Arun Mahesh Babu)

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We are obliged to Arun Mahesh Babu, IAS (District Collector, Rajkot) as well as Remya Mohan, IAS (former District Collector, Rajkot) for their support and motivation to accomplish the completion of the action plan for Rajkot district.

We express our appreciation to V. Subramanian, IAS (Retd.) (former Secretary, MNRE, Gol), for sharing pearls of wisdom during the course of this research.

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We are grateful to Dr. Ashwini Kulkarni from IITM, Pune and Dr. Koteswar Rao Kundeti for developing the district climate profile and modelling climate change projections for the district.

We would also like to extend our thanks to participants from various academic institutions, CSOs and line departments who contributed to the development and refinement of CCEAP through their inputs during stakeholder consultations.

We are also grateful to Swati Prasad for proofreading and giving the finishing touches to the manuscript, and the team at Aspire Design, New Delhi for designing the final report.

We are thankful to our colleagues from the GIS team, and Energy team at Vasudha Foundation for providing their expertise to assist the research and development of the final action plan.

Last but not the least, we extend our gratitude to Shakti Sustainable Energy Foundation (SSEF), New Delhi, for supporting the endeavour and also to Shubhashis Dey and Aishwarya KS from SSEF.



RECOMMENDATIONS



Rajkot BRTS bus near Gondal Chowkdi

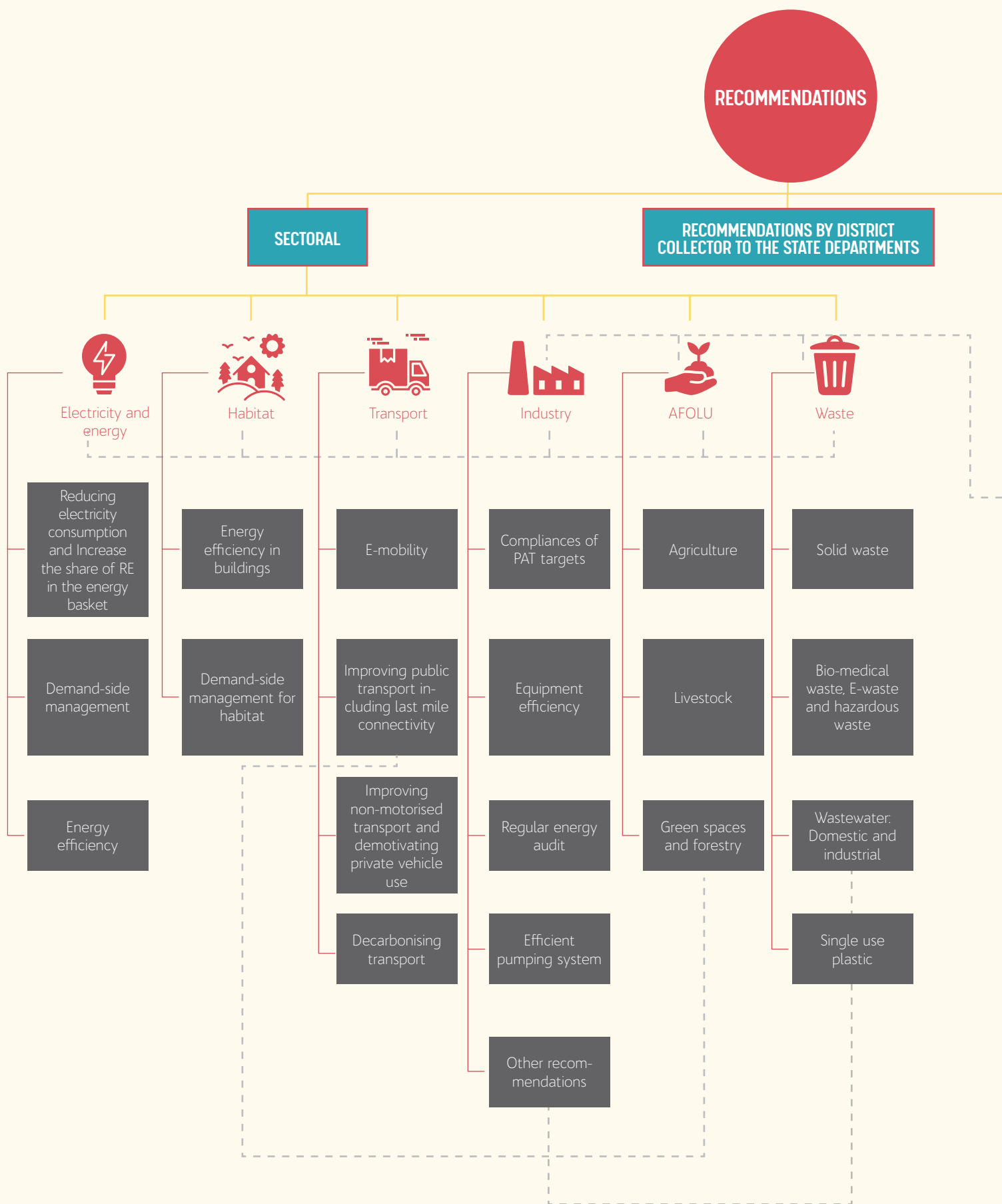
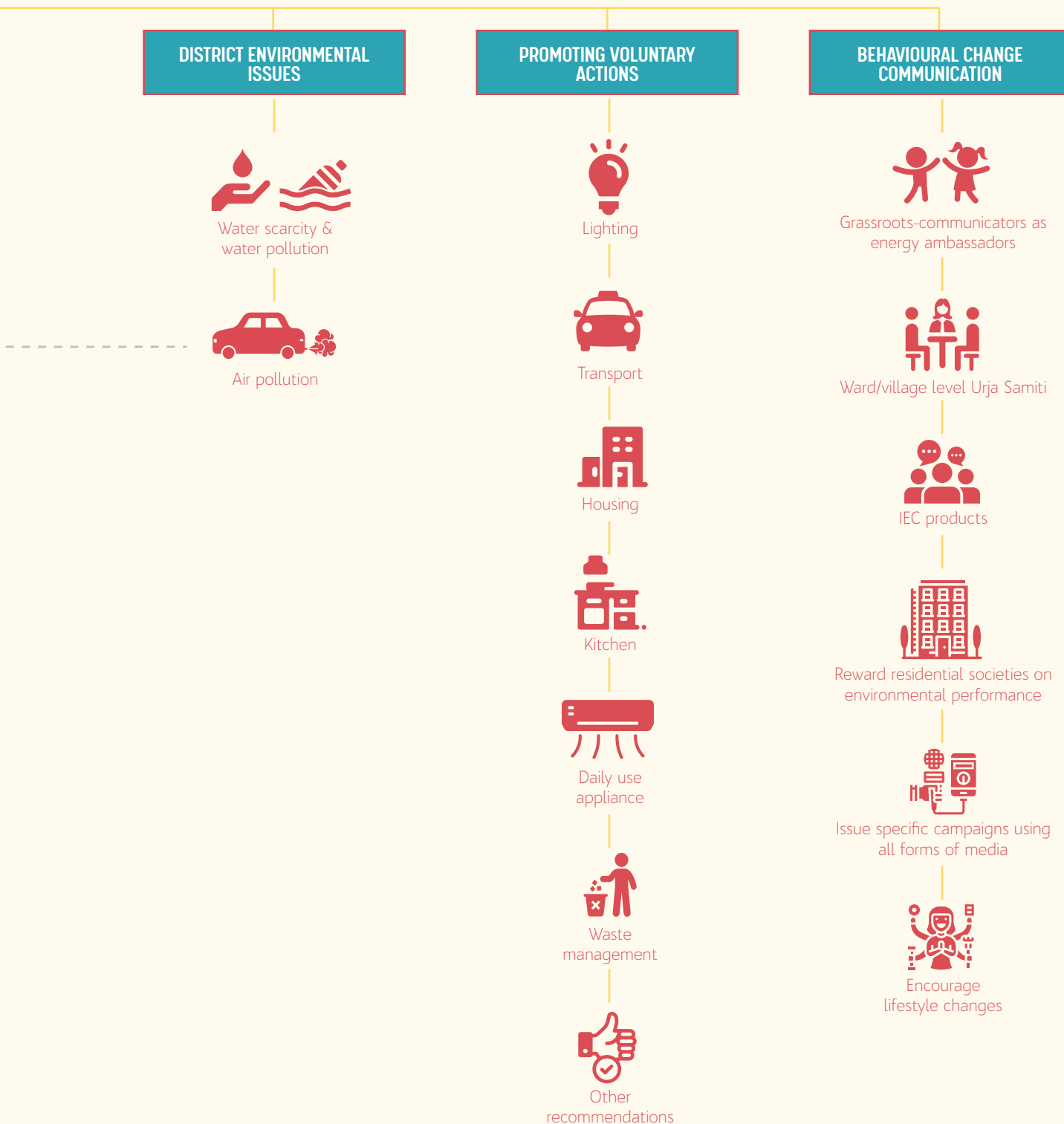


Figure 1: Recommendations for CCEAP Rajkot



--- : Interlinkages across sectors and sub-sectors (cross-cutting aspects)

1. RECOMMENDATIONS



This section provides a comprehensive basket of sector-wise recommendations from a climate perspective, with an aim to complement India's 2030 NDC commitments through a district-level alignment in the form of this District Climate Change and Environment Plan. The salient features of these recommendations are as follows:







- Recommendations are grouped under four broad categories -- energy, agriculture, forestry and other land use (AFOLU), waste, and district-specific environmental issues.
- Actions under each category on which recommendations can be made by the district collector/committee to the relevant state departments as well as inputs on innovative financing have been identified.
- Recommendations are based on district-specific ground realities and situations.
- The state and district vision documents were factored in while developing the recommendations.
- Information provided on timeframe and framework for implementation would enable the district authorities and concerned departments to prioritise actions.
- List of existing policies, programmes and schemes that can help streamline the actions is provided along with the concerned primary and supporting departments in separate table following each sectoral recommendation matrix.
- Additionally, this section provides information on SDGs and other co-benefits that can be addressed through the mentioned recommendations in this action plan.
- GHG mitigation potential that can be achieved through these recommendations are:
 - Energy: 25,12,744 tCO₂e
 - AFOLU: 62,94,009.23 tCO₂e
 - Waste: 33,534 tCO₂e
- Further, the cross sectoral benefits of each recommendation have been identified and indicated using the icons as listed in the following table:

	Energy and electricity		Green space, forestry and allied activities and bio-diversity
	Habitat (residential)		Water resources and water conservation
	Commercial and public infrastructure		Solid waste
	Transport		Wastewater
	Industry		Air pollution
	Agriculture and allied activities		Awareness, communication and capacity building








6.1 Sector-specific recommendations



6.1.1 Electricity and energy: Recommendations, cross-cutting sectors, qualifying priority and district scenario

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Increasing RE share in the electricity generation basket				
Increase the share of renewable energy (RE) generation by advancing rooftop and ground mounted installations, and other RE installations.	 	Short to medium-term (government buildings)	Policy framework and RE targets exist. (section 6.1.1.1) Creating awareness in residential sector	India has a target of 40 GW for solar rooftop (2022) and as of February 28, 2021, the achievement is only 4.32GW. Gujarat has only 0.94GW solar rooftop capacity (as of February 2021).
		Medium-term (commercial buildings)		If equipped with solar rooftops, government schools in the district can generate 81.5 MUs electricity, thereby avoiding 71,000 tCO ₂ e, annually.
		Medium to long-term (residential and others)		The large commercial buildings (institutions and complexes) in Rajkot have a solar rooftop potential of 390 MW. If installed, solar equipment could help avoid 4,10,736 tCO ₂ e annually.
				Further, if 50% households are equipped with solar rooftops, total potential installed capacity would be 2,789 MW, which can help avoid 1.93 Mt CO ₂ e emissions annually.
				Meeting the solar rooftop targets can be fast-paced by making it mandatory for hospitality industry/new construction (having built-up area above 20,000 sq ft) / private healthcare infrastructure (above certain bed-capacity).
				Ground mounted solar: The current ground mounted solar installed capacity of Gujarat stands at 3.11 GW (as of February 2021).
				Rajkot district has a huge potential for solar power generation (rooftop and ground mounted).
				For Rajkot city, solar rooftop installation can be promoted. For the remaining district, ground mounted solar installations can be a more viable option.

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Aggressively promote battery storage for RE.	  	Short to medium-term	Additional financial support can be created	Case example: Maharashtra Energy Development Agency has installed 650 Ah (Ampere hour) batteries for a few solar projects and has proposed hybrid inverters for RE projects across Maharashtra. Hybrid inverters take power from RE/battery installation up to a particular load, and on increased demand, they switch to the grid supply. Similar initiatives can be taken up in the district by GEDA.
Encourage captive use of renewable energy, particularly in rural areas for small industries and local entrepreneurs.	 	Short to medium-term	<p>Policy framework exists. (section 6.1.1.1)</p> <p>Generate awareness</p>	<p>By 2030, the electricity demand for Rajkot district is expected to be approximately 16,000 MUs, annually. If this electricity demand is to be met from coal, it would cause annual emissions of around 14 MtCO₂e.</p> <p>Decentralised renewable energy (DRE) setups can power/boost small/cottage industries. This can play an important role in providing livelihoods in rural areas as well as support reverse-migration (that was recently witnessed during the COVID-19 pandemic). Such setups would also create new jobs and empower rural entrepreneurs.</p> <p>Cold storage network across the district can be powered through DRE setups. Such setups could be especially useful for reliable storage of vaccines, farm produce, and rural non-farm productive use appliances.</p>
Energy demand side management (DSM) and energy efficiency				
Encourage faster penetration of Street Lighting National Programme (SLNP). This will ensure all street and public lighting fixtures are replaced with energy-efficient LED bulbs, (by prioritising premises and recreational areas of all government / public institutions).		Short-term	Policy framework and schemes exist (section 6.1.1.1)	<p>Smart streetlighting can reduce electricity use by up to 80%. Around 320 million streetlighting poles are in use globally, but fewer than 3% of these are Smart enabled SLNP had a national target of replacing 1.34 crore conventional street lamps with LED lamps by March 2020. However, till date only 1.18 crore LED lamps have been installed.¹</p> <p>Replacement of the existing 52,000 sodium vapor street lamps in Rajkot district with LED lamps under SLNP can potentially avoid about 26,000 tCO₂e emissions annually.</p>

¹ International Energy Agency. 2021. Empowering Cities for a Net Zero Future: Unlocking resilient, smart, sustainable urban energy systems. Available at <https://iea.blob.core.windows.net/assets/4d5c939d-9c37-490b-bb53-2c0d23f2cf3d/G20EmpoweringCitiesforaNetZeroFuture.pdf>

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
<p>Expedite installation of smart meters in collaboration with GUVNL to develop advanced metering infrastructure (AMI). Install smart meters, along with accompanying IT infrastructure. This will help the DISCOM obtain real time energy consumption data of each consumer for subsequent analysis and will pave the way for initiating various smart measures like:</p> <p>(a) Time of day (TOD)/time of use (TOU) billing,</p> <p>(b) Prediction and management of peak demand,</p> <p>(c) Providing real time energy consumption data to consumer,</p> <p>(d) Prepaid billing facility,</p> <p>(e) Remote connection and disconnection of load,</p> <p>(f) Development and adoption of a differential pricing model to demotivate energy consumption during peak hour, etc.</p>	  	Short to medium-term	<p>Policy framework and targets exist (section 6.1.1.1)</p> <p>Generate awareness among consumer segment</p>	<p>Implemented by EESL (BEE), Smart Meter National Programme aims to replace 250 million conventional meters across the country with smart meters. However, under this programme no smart meter has been installed in Gujarat as of now.</p> <p>Smart meters are being installed under PGVCL's pilot project, Smart Village Distributed Renewable Energy generation with Smart Grid Concept, at village Nana Kajliyara and Shapur of Junagadh circle in Gujarat. As of now, a 480-kW grid-connected solar PV plant, two off-grid solar water pumping stations, an energy management centre and a weather station have been commissioned. The work of providing smart meters to the consumers of both the villages is on hand.</p> <p>PGVCL can consider implementing a similar project in Rajkot district as well.</p>
<p>Replace/upgrade existing inefficient pumping infrastructure by energy-efficient pumps/solar pumps (where possible) for supply of piped drinking water in both rural and urban pockets of Rajkot district.</p>	 	Short to medium-term	<p>Relevant schemes and programmes can help achieve this (section 6.1.1.1)</p> <p>Inter-departmental collaboration is required</p>	<p>GUDEC has been designated as the nodal agency for the Municipal Energy Efficiency Programme (MEEP). This programme aims to improve the energy efficiency of pumping stations in 139 municipalities across Gujarat through detailed energy auditing.</p>
<p>In agriculture sector, promote energy efficient water pumps (provided by EESL), and solar pumps, wherever possible (through PM-KUSUM and SKY).</p>	 	Short to medium-term	<p>Policy framework exists (section 6.1.1.1)</p>	<p>According to BEE, 30 to 40% energy savings is possible in agriculture by adoption of energy-efficient star labelled pump sets.</p> <p>Conversion of 50% of the existing electricity/diesel operated tube-wells in Rajkot to solar can potentially save 5,008 tCO₂e emissions annually.</p>


Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
<p>Increase community awareness on and access to energy-efficient appliances and fixtures.</p> <p>Provide additional incentives over and above existing schemes/ programmes on energy efficient appliances.</p> <p>(Other recommendations pertaining to energy efficiency are listed under sections: Habitat, Industry and other recommendations that can be made by the Collector's office to the State departments)</p>	 	Medium-term	<p>Additional financial support can be created</p> <p>Generate awareness through dedicated IEC and long-running campaigns</p>	<p>BSES Yamuna Power Ltd (BYPL) launched an AC replacement scheme in Delhi NCR, with the objective to promote energy efficiency and green initiatives among households and bring down power consumption. Under the programme, upfront rebate per air conditioner (BEE 5 star rated/ inverter) has been offered by BYPL to the consumer in exchange of their old non-star rated air conditioner.</p> <p>PGVCL can implement a similar scheme in its area of supply, with a pilot in Rajkot district.</p> <p>The unutilised funds from the District Mineral Foundation (DMF) can render much needed financial support (by providing subsidies to mining affected communities) to implement the scheme.</p>

6.1.1.1 Electricity and energy: Policy framework and concerned departments/agencies




Sub-sectors	Policies and programmes that can push forward the recommendation	Primary departments/agencies	Associated departments/agencies
Increase RE share in electricity generation	<ol style="list-style-type: none"> 1) Gujarat Solar Power Policy, 2021 2) Surya Rooftop Yojana 3) Policy for Development of Small-scale distributed solar projects, 2019 4) Waste to Energy Policy, 2016 5) National Solar Mission 6) i-SMART Project 7) PM KUSUM 8) Surya-Shakti Krishi Yojana (SKY) 	<ol style="list-style-type: none"> 1) GEDA, GoG 2) Energy and Petrochemicals Department, GoG 	<ol style="list-style-type: none"> 1) ALL ULBs 2) Gujarat Electricity Regulatory Commission. 3) Rural Development Department, GoG (reporting and monitoring) 4) Urban Development Department, GoG 5) Climate Change Department, GoG (monitoring and reporting) 6) Commissionerate of Cottage and Rural Industries. 7) GUVNL-PGVCL, GoG 8) Department of Agriculture, GoG 9) Proposed District level Committee on Climate Change and Environment




Sub-sectors	Policies and programmes that can push forward the recommendation	Primary departments/agencies	Associated departments/agencies
Energy demand side management (DSM) and energy efficiency	1) Smart Meter National Programme (SMNP) 2) National Smart Grid Mission 3) Streetlight National Programme (SLNP), 2015 4) UJALA Scheme, 2015 5) Standards and Labelling Programme 6) Sustainable Habitat Mission 7) Smart Cities Mission 8) National Mission for Enhanced Energy Efficiency 9) Municipal Energy Efficiency Programme (MEEP) 10) PM KUSUM 11) Surya-Shakti Krishi Yojana (SKY) 12) Gujarat Solar Power Policy, 2021 13) Policy for Development of Small-scale distributed solar projects, 2019	1) GEDA, GoG 2) All ULBs 3) Panchayati Raj Institutions (PRIs) 4) BEE (EESL) 5) Energy and Petrochemicals Department, GoG	1) Climate Change Department, GoG 2) Department of Agriculture, GoG 3) District Mineral Foundation (DMF) 4) RUDA 5) Rajkot Smart City Development Limited (RSCDL) 6) Proposed District level Committee on Climate Change and Environment







6.1.2 Habitat (urban and rural development): Recommendations, cross-cutting sectors, qualifying priority and district scenario










Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Energy-efficiency in buildings				
Energy Conservation Building Code (ECBC) to be incorporated in the building byelaws and green building rating programmes. For instance, the Indian Green Building Council (IGBC) rating programme can be encouraged by giving incentives. This will create a pathway for having 'net zero energy' consumption buildings.		Medium to long-term	Policy framework exists (section 6.1.2.1) Inter-departmental collaboration required Capital incentives/ relevant exemptions over and above the existing provisions from the district administration	Residential and commercial sectors in Rajkot contribute around 30% of the total electricity consumption in the district. GEDA is working with the Urban Development Department and the Climate Change Department to incorporate ECBC into building compliance systems.





Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
<p>District administration, in collaboration with the ULBs, can implement the India Cooling Action Plan (ICAP) and achieve its objectives, in tandem with the District Heat Action Plan.</p> <p>District administration can also explore the possibilities of piloting solar-passive architecture/other renewable energy technologies in a few of its iconic buildings.</p> <p>Implementing this at the district-level can help avoid significant GHG emissions.</p>	 	Medium-term	<p>Policy framework exists (section 6.1.2.1)</p> <p>Needs inter-departmental collaboration</p> <p>Capital incentives/ relevant exemptions from the district administration required</p>	<p>In September 2018, India became the first country in the world to have a Cooling Action Plan that seeks to: (i) reduce cooling demand across sectors by 20 to 25% by 2037-38; (ii) reduce refrigerant demand by 25% to 30% by 2037-38; (iii) reduce cooling energy requirements by 25% to 40% by 2037-38; (iv) recognise “cooling and related areas” as a thrust area of research under national S&T Programme; and (v) train and certify 1,00,000 servicing sector technicians by 2022-23, synergising with Skill India Mission.</p> <p>The plan aims to provide the following benefits: (i) Thermal comfort for all – provision for cooling EWS and LIG houses; (ii) Sustainable cooling – low GHG emissions related to cooling; (iii) Doubling farmers’ Income – better cold-chain infrastructure; (iv) Skilled workforce for better livelihoods and environmental protection; (v) Make in India – domestic manufacturing of air-conditioning and related cooling equipment and other benefits.</p> <p>The district cooling system in the Gujarat International Finance Tech-City (GiFT City) in Gandhinagar provides reliable cooling to residential, commercial and industrial buildings. The system regulated by advanced metering and supervisory control and data acquisition (SCADA) systems, is expected to consume 60% to 85% of the energy used in conventional air conditioning.</p>
<p>Replace diesel-powered backup with solar powered or other RE-powered backup in a phased manner. This can essentially be promoted in government/commercial / institutional buildings with built-up area >20,000 sq ft.</p>		<p>Short to medium-term (government buildings)</p> <p>Medium to long-term (privately owned, commercial, institutional, and others)</p>	<p>Policy intervention is required</p> <p>Proper policy backup can mitigate GHG emissions and align India with Paris targets</p> <p>Needs inter-departmental collaboration</p>	<p>In Rajkot district, 88 entities use DG sets as power backup. If 50% of the DG sets alone are replaced with solar powered backup, 23,000 tCO₂e. emissions can be averted annually.</p>

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
<p>Promoting formulation of energy communities in existing RWAs/other residential committees where residents have ownership over their energy supply. Energy communities can host wind and solar generation installations, or a self-sufficient system functioning as a microgrid/undergrid-minigrid.</p> <p>These committees can make agreements between the community, the private developer and the utility company. Digitalisation can create innovative billing mechanisms and generating data that will provide important investment information to the energy market.</p> <p>Deploying public funding schemes like feed-in tariffs; leverage national and international funds; and providing digital upskilling opportunities to citizens can help promoting the initiative.</p>		Medium-term	Can be pushed forward by aligning with existing policy framework	
<p>Upgrade public transport infrastructure such as bus depots, bus stops, railway stations etc. to include RE and ECBC compliance. Roadside hoardings near such infrastructure can also be powered through RE.</p>	 	Short to medium-term	<p>Can be pushed forward by aligning with existing policy framework for solar rooftop (section 6.1.2.1)</p> <p>ECBC compliance of public transport infrastructure needs to be mandated by building byelaws</p>	<p>Rajkot district can adopt and implement initiatives, similar to the initiative listed below, to green its transport-related infrastructure:</p> <p>In Lucknow, the municipal corporation has announced setting up of 200 solar powered bus stops.</p>

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Encourage fast penetration of UJALA scheme in every household of Rajkot district.		Short to medium-term	Schemes and programmes are available (section 6.1.2.1)	<p>The UJALA scheme provides an LED bulb at a nominal price for replacement of incandescent lamps /conventional bulbs.</p> <p>A projected estimated number of LED bulbs to be used in the households of Rajkot district through implementation of UJALA scheme by 2030 can potentially avoid emission of about 47,000 tCO₂e. annually.</p> <p>The Gram Ujala programme was recently launched by Convergence Energy Services Limited (CESL). Under the programme, 7-watt and 12-watt LED bulbs with three years of warranty will be given to rural consumers on submission of working incandescent bulbs, at a price of ₹ 10/LED bulb. Consumers can exchange a maximum of five incandescent bulbs with LED bulbs. In the first phase of this programme, 15 million LED bulbs will be distributed across villages of Aarah (Bihar), Varanasi (Uttar Pradesh), Vijaywada (Andhra Pradesh), Nagpur (Maharashtra), and villages in western Gujarat. The programme will be financed entirely through carbon credits and will be the first such programme in India.</p>
Energy-efficient, vertical urban development should be promoted instead of horizontal development to conserve green cover.	  	Medium to long-term	Policy-level intervention required.	Vertical urban growth contributes, not only in facilitating more people for living, but also towards the environment. It averts the loss of agricultural land and open space and makes the transport mechanism much more efficient.
Enhance public awareness for switching to energy-efficient BEE star-labelled home appliances.	 	Short-term and continuous	Needs collaborations and awareness.	









Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Demand-side management				
Promote and subsidise good practices for all ULBs. For instance, installing rainwater harvesting setups in buildings, can considerably reduce energy dependence on submersible motors for groundwater pumping.	  	Short-term	Schemes and programmes exist (section 6.1.2.1) Awareness generation required	Under Comprehensive General Development Control Regulation (2016) of RUDA, rainwater harvesting is mandatory for all buildings with ground coverage of 80 sq mt and above.
Implement individual water metering in residential sector to reduce water wastage and introduce other energy efficient measures for drinking water and wastewater plants (thereby reducing energy consumption).	  	Medium-term	Policy intervention is required Need to create awareness	In many cities, drinking water and wastewater plants are municipally owned and are among the largest municipal energy consumers, often accounting for 30% to 40% of total municipal energy consumption. By incorporating energy efficiency measures into their water and wastewater plants, municipalities can save 15% to 30% of their municipal budgets. During the FY 2016-17, RMC commenced the water metering project in Chandreshnagar water supply zone, targeting 12,000 subscribers in the area. Case example: 16 apartments in Mantri Residency, Bengaluru, installed with water meters, are consuming 25% to 30% less water every year.
Encourage residential societies to adopt solar-thermal water heaters.	 	Short-term and continuous	Schemes and programmes exist (section 6.1.2.1) Inter-departmental collaboration required Scheme to be implemented as a part of green buildings	As a rule, for multi-storey residential buildings up to 12 storeys, community solar water heating systems on the roof (assuming utilisation of 60% of the roof area) can meet around 70% of the annual electricity requirement for heating water (BEE).
Promote installation of automatic/smart water pumps to control overflowing of tanks.		Short-term	Need to generate awareness.	
Water cess/pricing by municipal corporation to be revised and gradually increased.		Medium-term	Policy framework to be revised	

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Digital tools, such as GIS, remote sensing can be used to identify opportunities to reduce energy demand and implement energy efficiency interventions where it holds most value, and identify where and how to set up mixed-use zones to flatten demand curves. Energy demands (for cooling) of the district can be mapped, combining weather data with demand data, to identify where efficiency interventions are needed.	 	Medium to long-term	Needs policy intervention and infrastructural development	By identifying optimal locations for water features or vegetation, Rajkot can counteract on heat islands through tree plantations that provide shade and reduce the power demand for cooling in buildings.






6.1.2.1 Habitat: Policy framework and concerned departments/agencies








Sub-sectors	Policies and programmes that can push forward the recommendation	Primary departments/agencies	Supporting departments/agencies
Energy efficiency in buildings	1) ECBC, 2017 2) India Cooling Action Plan, 2018 3) UJALA Scheme, 2015 4) Gujarat Solar Power Policy, 2021 5) Surya Rooftop Yojana 6) Policy for Development of Small-scale distributed solar projects, 2019 7) Smart Cities Mission 8) Sustainable Habitat Mission 9) Gram Ujala Programme, 2021	1) Urban Development and Urban Housing Department, GoG 2) All ULBs 3) Rajkot Smart City Development Limited (RSCDL) 4) Panchayati Raj Institutions (PRIs)	1) GEDA, GoG 2) BEE (EESL) 3) Rural Development Department 4) Road and Building Department 5) Ports and Transport Department/GSRTC 6) Proposed District level Committee on Climate Change and Environment
Demand-side management	1) Gujarat Domestic Water Supply Protection Bill, 2019 2) ECBC 3) Building byelaws 4) Comprehensive General Development Control Regulations- Urban Development and Urban Housing Development, GoG	1) Urban Development and Urban Housing Department, GoG 2) All ULBs 3) Rural Development Department 4) Panchayati Raj Institutions (PRIs)	1) RUDA 2) Gujarat Water Supply and Sewerage Board. 3) Rajkot Smart City Development Limited (RSCDL) 4) Proposed District level Committee on Climate Change and Environment







6.1.3 Transport: Recommendations, cross-cutting sectors, qualifying priority, and district scenario













Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Promote e-mobility				
Generate awareness and information dissipation to encourage adoption of electric vehicles.		Short-term and continuous	Inter-departmental collaboration and dedicated long-running campaigns required	The Gujarat EV Policy, 2021 plans for transition of the transport regime of Gujarat to electric mobility in a phased manner. Planned awareness campaigns can encourage widespread acceptance of EV in the district.
Increase the modal share of e-vehicles to achieve the target of National Electric Mobility Mission Plan (NEMMP) and FAME II.		Short-term and continuous	Policy framework exists (section 6.1.3.1) Budgetary provisions required	In January 2020, the Gujarat government announced it will be installing charging stations at multi-level parking lots and public places across the state. This will be a crucial step in transitioning to electric mobility in the state as well as the district.
Make all public transport (PT) modes low carbon intensive, such as shifting current fossil fuel-based vehicles to electric or hybrid vehicles.	 	Medium and long-term	Policy framework (section 6.1.3.1) and budgetary provisions exist	Under FAME II, Rajkot Municipal Corporation has approved 50 e-buses in 2019. These will be procured for both RMTS and BRTS services. In 2019, Gujarat CM had announced the procurement of 500 electric buses across the state.
Initiate transition of intermediate public transport (IPT) vehicles to electric by incentivising IPT operators through: a) subsidies, b) separate lanes, c) dedicated parking spaces, d) replacement of lead acid battery-powered electric IPT vehicles with more sustainable Li-ion battery e-vehicles in a phased manner.	   	Medium-term	Policy framework exists (section 6.1.3.1)	Currently, Gujarat provides subsidies of ₹ 10,000 for Li-ion battery-operated rickshaw, bringing their cost down to approximately ₹ 40,000. There is no subsidy for lead-acid battery-based vehicles. However, they are still cheaper, costing around ₹ 30,000.












Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
District administration, ULBs (for office use and solid waste transport activities) and all district-level government offices can adopt e-vehicle fleets. Additionally, all these offices need to install charging infrastructure at the earliest.		Short-term	Proper policy backing required.	The Gujarat EV Policy, 2021 has recommended all government office building parking areas to install charging infrastructure for both employees and visitors. The district can take advantage of this provision and build on the same to encourage government departments to transition their fleets to EV-based vehicles.
Develop robust and widespread charging infrastructure through: a) Installations at strategic locations – commercial hubs, public parking, airports and railway stations etc. b) Adoption of relevant policies: Amendments in Model Building Bye-Laws (MBBL - 2016) give guidelines for setting up charging infrastructure for e-vehicles. c) Prioritising land acquisition for setting up charging infrastructure. d) Introduction of dedicated parking spaces for EVs with charging facilities. e) Incentivising restaurants, fuel pumps and commercial spaces on highways for installation of EV charging infrastructures to make long journeys with e-vehicles hassle-free. f) Preference to development of RE-powered charging facilities. g) As a cost effective solution to reduce street clutter and to open access (particularly for those without garages), integrated EV charging points into lampposts can be evaluated as a trial solution for further implementation possibilities.	  	Medium-term	Policy framework exists (section 6.1.3.1) Inter-departmental collaboration required	RMC can consider collaboration with Energy Efficiency Services Limited (EESL) to establish wide-spread charging structure across the district. Example: In Ahmedabad, EESL has partnered with Ahmedabad Municipal Corporation (AMC) to establish infrastructure for electric vehicles (EV) in the urban area over a 10-year period to establish 100 charging stations and promoting electric vehicles on rental and purchase basis in AMC areas. Each EV is expected to avoid 4.46 tonnes of CO ₂ emissions per year.
The district administration, in collaboration with the ULBs and state officials, may explore options to provide incentives to e-vehicle owners over and above existing programmes through: a) exemption on road tax, b) exclusive parking for EVs, c) additional subsidy scheme for women and students.		Short-term	Policy framework needs to be enhanced	Government of Gujarat is already providing subsidies up to ₹ 12,000 to students and women for purchase of electric two-wheeler. Also, a subsidy of ₹ 42,000 is provided for e-autos.

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Promote fast registration of EVs at RTO and create awareness to popularise EVs.		Short-term	Existing policy framework can be enhanced Need for inter-departmental coordination	Can be modelled after Delhi's EV Policy that fast-tracks the integration of EV into the transport mix of the city and allows for fast tracked registration of EVs.
Encourage development of local network of rental e-vehicles, including cars and bikes as well as a battery rental network for faster adoption of EVs. Further, this can be integrated with smart cards.		Medium-term	Needs policy backing	Rajkot city may replicate the bicycle and electric two-wheeler renting models which are in practice in Ahmedabad. In December 2019, AMC made 1,000 bicycles and 500 electric scooters available for rent in various parts of the city.
Encourage and promote adoption of EVs for all delivery operations within the district.	 	Short to medium-term	Policy framework is required Need for inter-departmental coordination	Currently, most delivery partners for food, courier and other services rely on self-owned fossil fuel-based two- or four-wheelers. In some cities, certain companies are working towards developing an electric vehicle fleet. The district can recommend a transition to electric vehicles for such delivery persons.
Range anxiety is a key barrier to EV adoption. Mobile applications (local app, google map, etc) with real-time data availability of charging points and the cost of charging at various locations will be critical to ensure the popularity of EV by allowing the EV users to plan routes that have charging points.		Medium to long-term	Needs support for digitalisation	
Smart lampposts can radically improve electrical efficiency and enable a number of new services. Promoting smart lampposts using efficient LEDs, powered with electricity from the grid or can be equipped with PV modules to harvest and store solar energy during the day to power lighting at night. They may also be equipped with sensors and communication technologies that can adjust their output according to ambient light levels, monitor traffic, noise and air pollution, seismic activity and increase coverage of cellular and Wi-Fi networks.	  	Medium to long-term	Needs technological, infrastructural and policy interventions	

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Public transport (PT) and intermediate public transport (IPT)				
<p>Increase reliability, accessibility and enhance last mile connectivity of public transport (PT) and intermediate public transport (IPT) through:</p> <p>a) Integrated ticketing and smart cards that work across all transport modes (IPT, cycle hire, etc), entry to tourist sites, payment for rental vehicles among other things can make PT and IPT more popular with increased ease of use.</p> <p>b) Integrating smart mobility applications with real-time service updates across modes, including car hire, public transit and shared micromobility schemes.</p> <p>c) Increasing fleet strength.</p> <p>d) Increasing frequency of PT.</p> <p>e) Adding more stops.</p> <p>f) Enhanced reach to low or non-serviced areas, such as peri-urban and rural areas.</p> <p>g) Developing dedicated parking spaces for IPT.</p>	   	Medium to long-term	<p>Policy framework required</p> <p>Inter-departmental collaboration required</p>	<p>Rajkot is the second city in Gujarat to launch BRTS – Rajkot Rajpath Ltd (RRL)</p> <p>RMTS network covers 223 km stretch, 46 routes, 342 stops and 99 buses.</p> <p>BRTS network covers 10.7 km stretch, one route, 18 stops and 11 buses. Further network coverage of 63.5 km is planned.</p> <p>Rajkot can adopt the smart card initiative similar to the one introduced by AMC.</p> <p>Example: AMC has introduced Janmitra Card for BRTS, AMTS, some tourist site entries, parking, property tax payments, among others.</p> <p>This initiative (if implemented in Rajkot) can be expanded to other modes of transport for seamless connectivity.</p> <p>Currently, there is only 21% network coverage of PT in RUDA areas, which includes peri-urban areas of the district. These generally rely on hired autos and other IPT modes.</p> <p>At present, the IPT sector is not completely formalised, and connectivity is limited to certain routes (largely in and around popular commercial and residential areas). Residents in outskirts/ peri-urban areas still rely on private vehicles or walking for majority of their commute.</p>
District administration can collaborate with ULBs to develop fiscal measures to discourage the use of personal vehicles, through measures such as variable parking charges for peak hours.	 	Short-term and continuous	Proper policy backing, based on research and inter-departmental cooperation is required	Rajkot can adopt recommendations from Delhi Master Plan 2021, which provides a parking district management plan. The action plan suggests that the transport department, municipal corporations, traffic police and other agencies need to collaborate to develop and maintain parking areas. The plan also suggests that variable and time-based parking prices should be introduced.

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
<p>Implement policy measures to discourage use of private vehicles:</p> <p>a) Parking policy for vehicle ownership.</p> <p>b) No car days on certain roads.</p> <p>c) Parking allowed only in dedicated areas.</p>	 	Short to medium-term	Proper policy backing, based on research and inter-departmental cooperation is required	Example: Sikkim Parking Policy, 2010 mandates that only houses with parking slots can procure vehicles.
Improve enforcement of vehicular pollution control norms to minimise emissions from fossil fuel-based PT and IPT vehicles.		Short-term and continuous	Policy framework exists, needs stricter implementation.	
Awareness campaigns to popularise PT and IPT modes.		Short-term and continuous	Dedicated awareness campaigns required	
Augment non-motorised transport (NMT)				
<p>Improve infrastructure to enhance modal share of NMT transport options, through measures such as introducing segregated cycle lanes.</p>	 	Medium-term	Proper policy backing, based on research and inter-departmental cooperation is required	Current modal split in Rajkot indicates that the share of NMT is approximately 40%. However, it is decreasing over the years. Efforts are needed to make NMT a preferred and viable option.
<p>Regular O&M of NMT infrastructure:</p> <p>a) Developing and maintaining well-lit, clean, and safe pathways for pedestrians and cyclists.</p> <p>b) Consulting and engaging local experts and community for development and maintenance.</p> <p>c) Removing encroachments.</p>	   	Starting short-term and continuing throughout	Policy framework exists, timely inter-departmental cooperation is required	
Introduce cycle hire service in key locations across the district.	 	Short-term	<p>Requires proper policy backing and strategic awareness drives</p> <p>Further, PPP models can be explored for successful implementation</p>	Case example that can be adopted in Rajkot: 'Amdabike' is SCADL's flagship public bike share project for Ahmedabad city. The services are planned for all BRTS bus stops in the western part of the city and are to connect various colleges, offices and residential complexes, malls, lakes, gardens, etc. Currently, there are 30 hubs and a fleet of 500 bicycles with a plan of 500 additional bicycles and 30 more hubs.

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Improving traffic flow				
Promote staggered and flexible work timings to limit traffic movement at peak hours to and from key busy routes across the district.	  	Short-term	Proper policy backing based on research, and multi-stakeholder and inter-departmental cooperation required	<p>In 2019, the Delhi government decided to stagger working hours of its offices during the implementation of the 12-day odd-even scheme, a move aimed at reducing traffic congestion and pollution in the city.</p> <p>Similar shift is also being planned in Bengaluru.</p> <p>Rajkot too can adopt these best practices to minimise congestion at peak hours.</p>
a) Create additional dedicated parking zones for vehicles to deter encroachment of road space and pavements. b) Direct business/corporate centres to have mandatory private parking with sufficient parking slots, so as to avoid parking on roads, service lanes and other public spaces.	 	a) Medium-term b) Short-term and continuous	While the policy framework exists, implementation is poor Requires multi stakeholder and inter-departmental cooperation	Example: Ahmedabad has multi-level parking spaces available. However, since awareness is low, utilisation is poor. The municipal corporations and district authorities can work towards building awareness and encouraging use of parking. Similar structures can be developed at strategic locations in Rajkot district with special emphasis on popularising parking spaces for public use.
Develop dedicated areas for street vendors in order to deter encroachment of pavement and avoid traffic congestion on roadsides.	 	Short to medium-term	Policy framework exists; implementation is irregular and for short timeframes Requires multi-stakeholder and inter-departmental cooperation	There are regular drives by the RMC and the city police to clear encroachments. However, such measures can affect the livelihoods of the street vendors.
Regular maintenance of roads to ensure smooth flow of traffic as it can help reduce GHG emissions while extending the life of the road.	 	Short to medium-term and continuous	While the policy framework exists, implementation is lacking in some areas. Multi stakeholder and inter-departmental cooperation is required.	



6.1.3.1 Transport: Policy framework and concerned departments/agencies








Sub-sectors	Policies and programmes that can push forward the recommendation	Primary departments/agencies	Supporting departments/agencies
Promoting E-mobility	<ol style="list-style-type: none"> 1) FAME II 2) Gujarat EV Policy, 2021 3) JNNURM 4) National Electric Mobility Mission Plan 5) Smart Cities Mission 6) AMRUT 7) Proposed e-vehicle Policy (as per 2021-22 Union Budget) 8) National Urban Transport Policy, 2006 	<ol style="list-style-type: none"> 1) All ULBs 2) RTOs 3) EESL 	<ol style="list-style-type: none"> 1) Urban Development & Urban Housing Department, GoG 2) GEDA 3) Transport Department, GoG 4) Roads and Buildings Department, GoG (of infrastructure for public transport) 5) Climate Change Department, GoG 6) Rural Development Department 7) RUDA 8) Other ULBs 9) Smart City Rajkot Development Limited 10) Airport authority 11) Western Railways - Rajkot Division
Public transport and intermediate public transport	<ol style="list-style-type: none"> 1) BRTS 2) JNNURM 3) ECBC 4) Smart Cities Mission 5) AMRUT 6) National Urban Transport Policy, 2006 	<ol style="list-style-type: none"> 1) All ULBs 2) Rajkot Smart City Development Limited 3) GSRTC 4) GMRC 	<ol style="list-style-type: none"> 1) Urban Development & Urban Housing Department, GoG 2) Transport Department, GoG 3) RTOs 4) Roads and Buildings Department, GoG 5) Climate Change Department, GoG 6) Rural Development Department, GoG 7) GEDA 8) RUDA 9) Other ULBs
Augment non-motorised transport	<ol style="list-style-type: none"> 1) Smart Cities Mission 2) AMRUT 3) National Urban Transport Policy, 2006 	<ol style="list-style-type: none"> 1) All ULBs 2) RUDA 3) Smart City Rajkot Development Limited 	<ol style="list-style-type: none"> 1) Urban Development & Urban Housing Department, GoG 2) Roads and Buildings Department, GoG 3) Climate Change Department, GoG 4) Rural Development Department, GoG 5) GEDA 6) Police Department, GoG



Sub-sectors	Policies and programmes that can push forward the recommendation	Primary departments/agencies	Supporting departments/agencies
Improving traffic flow	1) BRTS 2) JNNURM 3) ECBC 4) Smart Cities Mission 5) AMRUT 6) National Urban Transport Policy, 2006	1) All ULBs 2) RUDA 3) Other ULBs 4) Smart City Rajkot Development Limited 5) RTOs	1) Urban Development & Urban Housing Department, GoG 2) Roads and Buildings Department, GoG 3) Gujarat Infrastructure Development Board (GIDB) 4) Climate Change Department, GoG 5) Rural Development Department, GoG 6) Police Department, GoG 7) Department of Industries, GoG 8) GIDC

6.1.4 Industry: Recommendations, cross-cutting sectors, qualifying priority and district scenario







Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
The district can develop an incentive system, similar to a 'cap and trade' system for enhancing energy efficiency of MSMEs, in coordination with the state energy department.		Medium-term	Requires formulation of policy framework based on research and inter-departmental cooperation	
Promote combined heat and power (CHP)/ co-generation for running captive power plants.		Medium-term	Policy framework exists Inter-departmental collaboration required Further awareness needed to popularise the initiative.	CHP systems can achieve system efficiencies close to 80% as compared to around 60% by conventional technologies.





Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Optimise equipment efficiency. Equipment that are not usually turned off during downtime, such as heating or cooling equipment, pumps, alarm systems, etc., need to be energy-efficient and strategies must be developed to switch them off whenever possible.	 	Medium-term	Policy framework exists (section 6.1.4.1)	<p>Gujarat Industrial Policy 2020 focusses on:</p> <p>a) Strengthening the regulation and environmental compliance</p> <p>b) Implementation of cleaner production technology in place of existing processes, such as substitution and optimisation of raw material, reduction in water consumption or energy consumption or waste generation, at 35% of cost of plant and machinery to MSMEs, and 10% of cost of plant and machinery to large enterprises, with a maximum support of up to ₹ 35 lakh. Similarly, purchase of new equipment/ system related to safety, occupational health or for environment compliances for common use of industries located in cluster also get assistance of up to 35% of cost of equipment, up to a maximum of ₹ 35 lakh.</p> <p>c) Encouraging green practices and environmental audit of MSMEs by exempting up to 75% of fees of audit services (up to a maximum of ₹ 50,000).</p> <p>d) Industrial buildings with green rating under Indian Green Building Council to be exempt by up to 50% of consulting charges, up to a maximum of ₹ 2.5 lakh.</p> <p>e) Encouraging existing industries to shift the unit outside the urban agglomerations.</p>
Invest in green projects – such as plantation drives and afforestation activities – within and around industrial areas in the district.	 	Short-term	Policy framework exists. Improved monitoring and evaluation will give the recommendation a further push.	
Target better M&E of energy audits to improve accountability.		Short to medium-term	Policy framework already exists Inter-departmental collaboration required for successful implementation	
Encourage industries to use recycled water from their plants, rather than freshwater.	 	Short-term	Policy framework exists. However, it can be upgraded in collaboration with the responsible agencies and departments.	

6.1.4.1 Industry: Policy framework and concerned departments/agencies

Sectors	Policies and programmes that can push forward the recommendation	Primary departments/agencies	Supporting departments/agencies
Industry	<ol style="list-style-type: none"> 1) Gujarat Industrial Policy, 2020 2) Gujarat Solar Policy, 2021 3) National Mission on Enhanced Energy Efficiency 4) Reuse of Treated Waste Water Policy, 2018 (GoG) 	<ol style="list-style-type: none"> 1) Industries and Mines Department, GoG 	<ol style="list-style-type: none"> 1) Industries Commissionerate, GoG 2) Gujarat Industrial Development Corporation 3) Gujarat Industrial Investment Corporation 4) Energy & Petro-Chemicals Department, GoG 5) District Industries Centre 6) GIDC 7) BEE 8) GEDA 9) GUVNL-PGVCL 10) Proposed District level Committee on Climate Change and Environment










6.1.5 Agriculture, forestry and other land use (AFOLU): Recommendations, cross-cutting sectors, qualifying priority and district scenario

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
AFOLU: Agriculture				
Promote sustainable farming through practices and programmes, such as the use of non-chemical fertilisers and by adopting zero budget natural farming.	  	Short to medium-term	Policy framework exists (section 6.1.5.1) Budgetary provisions are available	In 2017-18, Rajkot used approximately 1.2 lakh tonnes of urea in agriculture. Replacement just 10% of this urea with non-chemical fertilisers can help avoid 9,000 tCO ₂ e emissions/annum. This initiative will also contribute towards: a) cutting down of compostable solid waste from landfilling/dumping and converting it to organic waste that can further be used to make organic fertilisers (thereby, reducing emission from waste sector), b) lessening of harmful agricultural run-off, thereby, reducing water pollution and eutrophication.
<p>Promote adoption of alternative ways for crop residue management, other than burning.</p> <p>Promote adoption of improved harvesting practices such as land leveller, direct seeding, nutrition management, etc. through agricultural extension programme and financial assistance/formation of cooperatives, etc.</p> <p>Stubble can be used as feedstock for different industries to make products including paper, cardboard, furniture, organic fertiliser and animal feed, which will act as an alternative source of income for the farmers.</p>	  	Short to medium-term	Policy framework required Collaboration required Farmers to have easy access to markets/industries that would take crop residue/stubble This also helps meet the following targets of SDG #8 (Decent Work and Economic Growth): 8.2 and SDG#12 (Responsible Consumption and Production): 12.5, 12.a	<p>Improved harvesting practices, such as the use of Happy Seeder, has the capacity to eliminate 78% of the GHG emission (from crop residue burning). It has the potential to increase farmers' profits by at least 10%. Feasibility studies may be undertaken for a cost-benefit analysis to support farmers with such improved harvesting machines and practices. Direct sowing of rice reduces soil disturbance, enabling it to retain more nutrients, moisture, and organic content. It also removes the need to burn rice stubble, thereby reducing air pollution.</p> <p>Other feasibility studies or projects can be initiated. Such as the development of biofuel pellets from crop residue.</p>

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Farmers should be encouraged to follow the recommendation given in Soil Health Cards.		Short to medium-term	Can be implemented by generating awareness	<p>According to Soil Health Card Portal progress report, so far 16,84,207 samples have been tested in Cycle- II in Gujarat.</p> <p>In Rajkot, soil nitrogen status has been found to be very low for all the samples tested across the district, and micronutrient (Zn, Fe, Cu, Mn, B, S) status is reported to be sufficient by Soil Health Card information under Department of Agriculture, Cooperation & Farmers' Welfare, Ministry of Agriculture & Farmers Welfare, GoI.</p>
Promote micro-irrigation (MI) to improve water use efficiency. It saves water, energy, and fertiliser consumption.	  	Short to medium-term	<p>Policy framework is available (section 6.1.5.1)</p> <p>Enable swift procedures and subsidy disbursement for adoption of micro-irrigation</p> <p>District may consider providing additional subsidies</p>	<p>Currently, Gujarat holds 12% of the total area under micro irrigation in India² All farmers, irrespective of social group status, landholding, crops, and geographical location, are entitled to get subsidy of 50% of capital cost of MI or ₹ 60,000/ha, whichever is lower, of which, 40% is provided by the national government, and the state government bears the remaining 10%. In addition to this, more subsidy is provided to dark zone blocks and tribal blocks (talukas) as well as to SC/ST farmers. In March 2015, additional subsidy was announced for small and marginal farmers. However, it varies for non-dark zone and dark zone blocks.³</p> <p>As per PMKSY District Irrigation Plan (2019-20) for Rajkot, the proposed area under MI is 8,084 ha. By attaining this target of irrigating the proposed area through MI, Rajkot should have avoided approximately 6834.12 tonnes of CO₂ emissions (due to savings in electricity consumption).</p>





² A. Suresh and Manoj P. Samuel, Micro-irrigation development in India: challenges and strategies, Current Science

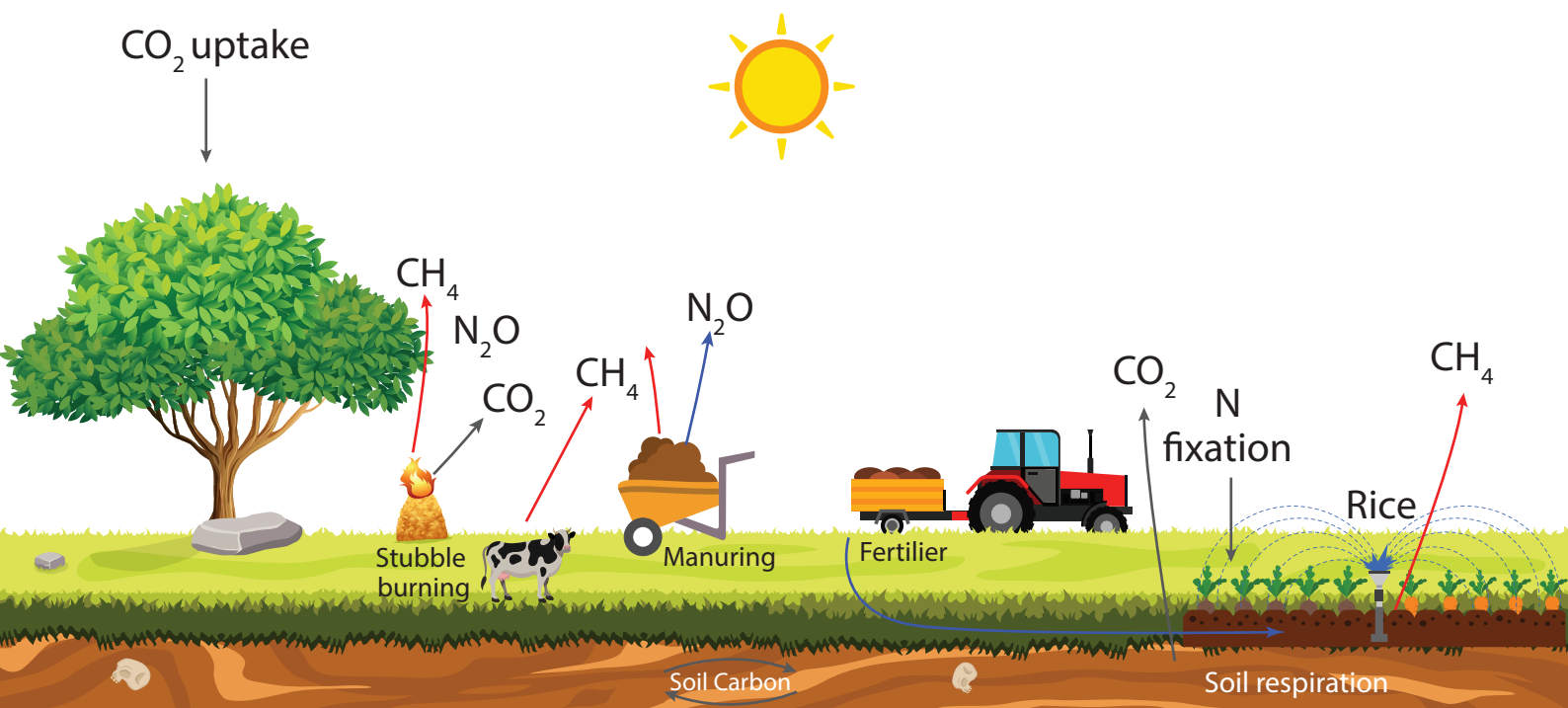
³ Chandra Sekhar Bahinipati and P.K. Viswanathan, Adoption and Diffusion of Micro-irrigation Technologies in Gujarat, Western India: Do Institutions and Policies Matter?








Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
<p>Encourage adoption of latest technologies, such as:</p> <p>a) Solar pumps (under PM KUSUM Yojana and SKY)</p> <p>b) Star-rated energy efficient pump system (EEPS)</p> <p>c) Smart control panels and Internet of Things (IoT) based systems for optimum resource utilisation (water, energy)</p>	   	Short to medium-term	<p>Policy framework is available (section 6.1.5.1)</p> <p>Support in capital investment over and above the existing policy can be considered</p>	<p>In 2018, Gujarat government launched Suryashakti Kisan Yojana (SKY) with an objective of doubling the farmers' income by generating their own power and selling the surplus back to the state.</p> <p>Replacement of 1 lakh diesel pumps with solar pumps over a period of 5 years can cut 900 million litres of diesel consumption over the lifecycle of solar pumps, which can potentially save ₹ 840 crore of diesel subsidy and 2.53 million tonnes of CO₂ emissions.</p> <p>These initiatives will increase farmers' income, provide reliable source for irrigation and reduce dependence on diesel/grid in the farm sector.</p>
Enhance the efficiency/network of cold storage systems and initiate a gradual shift to renewable energy powered cold storages.	 	Medium to long-term	<p>Policy framework exists and can be enhanced (section 6.1.5.1.)</p> <p>Capital investment required</p> <p>Align with solar rooftop policies and ECBC</p>	Under PMKSY, 969 cold storage facilities with a capacity of 38,22,112 tonnes are proposed for Gujarat, to avoid post-harvest losses. These new cold storages can be solar powered.
AFOLU: Livestock				
Promote grasslands and cultivation of cattle feedstock for good quality forage and to manage fodder scarcity.	  	Short to medium-term	<p>Policy framework exists (section 6.1.5.1)</p> <p>Research inputs required</p> <p>Collaboration between different communities (farming and pastoral) is needed</p>	<p>Intensive cultivation of <i>Sesbania grandiflora</i> which produces about 7.8 kg/tree/year or 93.6 MT/year/ha when fed to lactating crossbred cows leads to an increase in milk yield by 11.97%.⁴</p> <p>Straws from millets, corn and maize have better feeding quality than straws from rice, barley and wheat. This change in quality of forage species leads to better productivity and a 30% reduction in emission is estimated.</p> <p>ICAR-NIANP has recently developed a feed supplement - Harit Dhara and Tamarin Plus, for cattle, buffalo and sheep. It is found effective in cutting down methane emissions by 20%. Use of this feed supplement can be encouraged by Rajkot at the district level.⁵</p>






⁴ Earagariyanna M.Y. et. al., 2017, Fodder Resource Management in India-Critical Analysis



⁵ <http://nianp.res.in/harit-dhara-tamarin-plus>

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Promote cattle breeds with higher productivity. Productivity of indigenous cattle should also be improved (eg: through provision of Nand Ghars). However, the balance between resilience and productivity should be maintained. Currently, in most areas, flock sizes are negatively impacting the climate and ecology.		Medium to long-term	<p>Policy framework exists (section 6.1.5.1)</p> <p>Research collaboration required (to ensure biodiversity of the region is not impacted)</p> <p>Generate awareness</p> <p>Provide monetary support to the pastoral community</p>	These initiatives will help meet the growing demand of milk while keeping the livestock headcount low. If there is a 10% decrease in the number of indigenous cattle over a period of five years, the loss in milk production will be 36 lakh litres and 2,27,100 tonnes of CO ₂ e emission will be avoided. To compensate for this loss in milk production, a total of 2,29,248 new crossbreed cattle would be needed, which will lead to 2,07,000 tonnes CO ₂ e emissions. The net emissions avoided per year would be approximately 4,009.23 tonnes CO ₂ e.
Promote use of waste from livestock and poultry as an important source of organic manure for various crops, such as sugarcane and potato, for enhancing crop production.	 	Short to medium-term	<p>Collaboration between different communities (farming and pastoral) is needed</p> <p>Policy framework is available (section 6.1.5.1)</p>	Poultry manure fertiliser is rich in nitrogen and contains all the 13 essentials nutrients required for crop production. In comparison to cow manure, it is two to three times richer in inorganic fertiliser content.
AFOLU: Forestry and green spaces				
<p>Ensure minimum diversion of forest land for any activity or project and promote compensatory afforestation (of the same species) from the funds given by the user agency.</p> <p>Funds for continuous tree improvement and tree breeding programmes can be ensured through CAMPA.</p>		Short to medium-term	<p>Policy framework and budget provisions exist (section 6.1.5.1)</p> <p>Policy implementation required</p> <p>Stringent monitoring and evaluation needed</p>	In 2019, Gujarat received ₹ 1,484.60 crore from the Compensatory Afforestation Fund Management and Planning Authority (CAMPA), which aims to promote afforestation and regeneration activities as a way of compensating for forest land diverted to non-forest uses.



Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
<p>Measures to increase trees outside forest area and green spaces in Rajkot.</p> <p>a) Setting up of urban parks.</p> <p>b) Adoption of Miyawaki Urban Forestry method.</p> <p>c) Transplanting trees with the help of tree transplanting machines.</p> <p>d) Setting up of floating gardens, butterfly gardens etc.</p> <p>e) Initiate afforestation activities on wastelands and fallow lands.</p> <p>f) Plantations along village roads can be taken up under MGNREGS.</p> <p>g) Tree census should be conducted periodically.</p> <p>h) Development of green belt along the major terrain roads and surrounding the industrial areas.</p>	  	Medium to long-term	<p>Policy framework is available (section 6.1.5.1)</p> <p>Capital investment, research collaboration and inter-departmental cooperation is required</p>	<p>As per the FSI report 2019, Gujarat has 11,984 sq km of 'trees outside forest' which includes both forest cover outside the recorded forest area/green wash and tree cover.</p> <p>Currently, the forest area in Rajkot district is only 1.38%. If 7% of geographical area of Rajkot (equivalent to state average forest cover) is converted to forest and tree cover, over a period of 10 years, 12.21 million tonnes of CO₂e emissions can be avoided.</p> <p>Miyawaki urban forestry method has reported 15% faster growth rate per year, compared to other reforestation methods. (Example: Oxygen Park has been developed by adopting Miyawaki method in the Science City on Ahmedabad-Gandhinagar highway)</p> <p>A similar pilot projects can be adopted in Rajkot as well.</p> <p>Green belts help mitigate air pollution, increase urban green cover, thereby leading to carbon sequestration.</p>
<p>Enhance forest cover by promoting agro-forestry and social forestry to increase forest biomass and soil moisture along with adoption of the following measures.</p> <p>a) Control illegal timber trade.</p> <p>b) Carry out mapping of agroforestry area to monitor the coverage.</p> <p>c) Create provisions of financial instruments/relaxation in other taxes (over and above the existing schemes) to encourage the farming community to adopt agroforestry.</p> <p>d) Encourage plantation of most found local, fast-growing species, particularly key stone species, fodder trees, fruit bearing trees, like, peepal (<i>Ficus religiosa</i>), neem (<i>Azadirachta indica</i>), etc. to aid increase of tree density.</p>	   	Medium to long-term	<p>Policy framework and budget is available, implementation is required</p> <p>Stringent monitoring and evaluation are necessary</p>	<p>According to the 2019 Forest Survey of India Report, there is an increase in forest cover by 13.32 sq km in Rajkot from 2017, which is a positive sign.</p> <p>Moreover, tree density in the district has significantly increased from 7.87 trees/ha (2003) to 10.45 trees/ha in 2013.</p>

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
<p>Ensure ULBs regularly monitor survival of trees, post plantation.</p> <p>a) A thorough study needs to be done on suitability of the site and survival ratio of species (mainly native species) before initiating any plantation drive.</p> <p>b) Prepare an audit every year on the number of saplings surviving after plantation drives.</p> <p>c) Ensure geo-tagging of trees (along with site and species) for proper monitoring.</p>		Short to medium-term	<p>Monitoring and evaluation required</p> <p>Collaboration among different stakeholders required</p>	
<p>Promote regeneration of degraded and open forest areas by developing awareness among locals regarding the importance of green spaces.</p>	  	Long-term	<p>Strengthen the existing policy framework.</p> <p>Collaboration among different stakeholders required</p>	
<p>Various aspects of joint forest management (JFM) need to be promoted.</p> <p>a) Capacity building and skill development of JFM committees in tribal and non-tribal areas by conducting workshops and training.</p> <p>b) Initiate participatory forest management programmes at micro scale.</p>		Short to medium-term	<p>Exclusive communication strategy and information, education, and communication (IEC) material to be developed and used</p> <p>Provisions of monetary support</p>	<p>Total area covered under JFM in Rajkot is 5,976 ha with about 57 JFM committees in the district.</p>









Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
<p>Prevent invasion of non-indigenous species</p> <p>a) Develop a database and update information on invasive species and their management.</p> <p>b) Raise awareness at regional levels.</p> <p>c) Strengthen and maintain institutions to coordinate invasive species programmes.</p>		Medium to long-term	<p>Research studies on flora specific to the region</p> <p>Provisions of monetary support</p> <p>Exclusive communication strategy and IEC material to be developed and used</p> <p>Monitoring and evaluation required</p> <p>Collaboration among different stakeholders required</p>	<p><i>Prosopis juliflora</i>, <i>Lantana camara</i>, <i>Parthenium hysterophorus</i> are some major invasive species in Gujarat.</p> <p>Preventing seed production helps in managing spread of invasive species. Removing flower heads prior to seed set will reduce the number of seeds available for spread by birds or other animals.⁶</p>
<p>Develop participatory forest fire management strategies such as:</p> <p>a) Collecting baseline forest fire data with respect to perceptions, beliefs, expectations, and behaviour of local people (pertaining to forest fires).</p> <p>b) Training local communities to tackle forest fires.</p> <p>c) Organising awareness programmes in local schools.</p> <p>d) Building capacity for an early warning system.</p>		Medium to long-term	<p>Provisions of monetary support</p> <p>Exclusive communication strategy and IEC material to be developed and used</p> <p>Monitoring and evaluation required</p> <p>Collaboration among different stakeholders required</p>	<p>According for Technical Information Series Volume-I, FSI (2019), 0.25%, 8.43% and 85.18% of the total forest cover area of Gujarat is extreme fire prone, moderately fire prone and least fire prone, respectively.</p>










⁶ Solanki H.A., 2018, Checklist of invasive plants of Gujarat and some most insidious plants of Gujarat, their hazards, its management and public perspective

6.1.5.1 AFOLU: Policy framework and concerned departments/agencies













Sectors	Policies and programmes that can push forward the recommendation	Primary departments/agencies	Supporting departments/agencies
Agriculture	<ol style="list-style-type: none"> 1) Rashtriya Krishi Vikas Yojana: Remunerative Approaches for Agriculture and Allied Sector Rejuvenation (RAFTAAR) 2) National Mission for Sustainable Agriculture 3) Pradhan Mantri Krishi Sinchayee Yojana 4) PM KUSUM Yojana 5) Soil Health Card 6) National Mission on Food Security 7) National Mission on Micro-irrigation 8) Price Support Scheme 9) AGR 2 (farm mechanisation) scheme of farmers other than SC/ST 10) National Policy for Crop Residue Management 11) Suryashakti Kisan Yojana/Supply of Solar Agricultural Pumpsets-Gujarat Urja Vikas Nigam 12) Dinkar Yojana 	<ol style="list-style-type: none"> 1) Agriculture, Farmers' Welfare and Co-operation Department, GoG 	<ol style="list-style-type: none"> 1) Gujarat Green Revolution Company (GGRC) 2) Rural Development Department, GoG 3) Irrigation Department, GoG 4) Energy and Petrochemicals Department, GoG 5) GEDA 6) Animal Husbandry Co-operation 7) Gujarat Water Resource Development Corporation (GWRDC) 8) Climate Change Department (for reporting), GoG 9) Forests and Environment Department, GoG 10) GNFC, GSFC 11) Commissionerate for Cottage and Rural Industries 12) Gujarat Agro Industries Corporation (GAIC) 13) Junagadh Agriculture University and other Agriculture Universities of Gujarat 14) APMCs 15) Proposed District-level Committee on Climate Change and Environment
Livestock	<ol style="list-style-type: none"> 1) National Livestock Mission 2) Rashtriya Gokul Mission 3) Kisan Credit Cards to Livestock farmers 4) National Programme for Dairy Development 5) Livestock Health and Disease Control 6) National Programme for Dairy Development 7) Intensive Cattle Development Programme 8) National Mission on Food Security 9) Rashtriya Krishi Vikash Yojana 	<ol style="list-style-type: none"> 1) Animal Husbandry Department, GoG 	<ol style="list-style-type: none"> 1) Forests and Environment Department, GoG 2) Agriculture, Farmers' Welfare and Co-operation Department, GoG 3) Climate Change Department, GoG
Forestry and green spaces	<ol style="list-style-type: none"> 1) National Afforestation Programme (NAP) 2) Project Tiger 3) Compensatory Afforestation Fund Management and Planning Authority (CAMPA) 4) Green India Mission (GIM) 5) Integrated Development of Wildlife Habitat (IDWH) 6) Intensification of Forest Management Scheme (IFMS) 7) Pradhan Mantri Ujjwala Yojana 	<ol style="list-style-type: none"> 1) Gujarat Forest & Environment Department, GoG 	<ol style="list-style-type: none"> 1) Agriculture, Farmers' Welfare and Co-operation Department, GoG 2) Climate Change Department, GoG 3) All ULBs (RMC + other Municipalities) 4) RUDA, GoG 5) Industries & Mines Department, GoG 6) UDD & RDD 7) All PRIs






6.1.6 Waste management: Recommendations, cross-cutting sectors, qualifying priority and district scenario

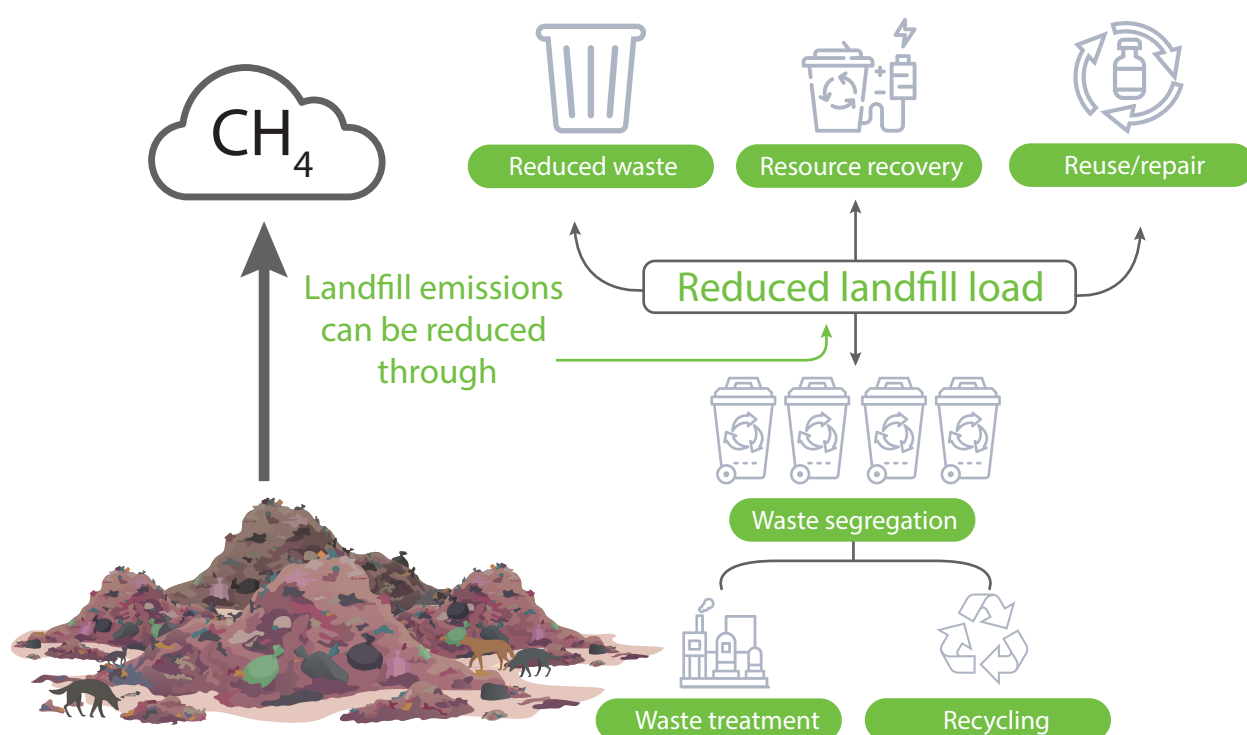
Recommendations	Cross-cutting with	Qualifying priority		District scenario/ case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Solid waste				
Waste prevention: Reducing landfilling				
<p>Minimising landfill waste disposal by:</p> <p>a) Promoting 'at source reduction of waste' through product reuse, extending lifetime (maximum use of resources) and right to repair.</p> <p>b) Ensuring efficient and 100% segregated waste collection from across the district (both urban and rural) by distributing colour coded bins, monitoring waste collected from household and penalising households not practicing segregation.</p> <p>c) Ensuring and maximising recycling, recovery, optimum resources utilisation throughout product lifecycle and treatment.</p> <p>d) Promoting resource efficiency and circular economy practices across sectors.</p>	     	<p>a) Medium to long-term</p> <p>b) Short to medium-term</p> <p>c) Medium-term</p> <p>d) Long-term</p>	<p>a) Need policy intervention, awareness generation and incentivisation</p> <p>b) Policy framework exists (section 6.1.6.1); needs resource allocation and execution</p> <p>c) and d) Need policy intervention and execution (Resource Efficiency Policy drafted by NITI Aayog; not implemented as of now)</p>	<p>Landfills are one of the largest anthropogenic source of methane emissions, contributing 11% of all global CH₄ emissions. Hence, reducing landfill load and emissions are critical in achieving India's NDCs. Following are the initiatives towards the same adopted in Rajkot (mostly the city area) which will reduce the emission from landfill eventually and can be planned for the district as well:</p> <p>Rajkot has one of the 29 regional landfill clusters of Gujarat for the ULBs of Chotila, Thangadh, Jasdan and Gondal.</p> <p>RMC has its own landfill sites at Sokhada (11 acres; 12 km from the city) and at Manda Dungar (2.5 acres; 7 km from the city). Both are operating at maximum capacity. There is a proposed landfill site at Nakarwadi (40 acres; 15 km from the city)</p> <p>Primary and secondary waste collection and transport have been privatised for 12 out of 23 wards of RMC, with 80% coverage of door-to-door collection.</p> <p>Rajkot has one W2E plant with a capacity of processing 850 tons of solid waste and reduces GHG emissions by 1,474.38 tonnes CO₂e per day. It replaces fossil fuels and stops waste from going to landfill.</p>
<p>Minimising single use plastics (SUPs): Detailed information and recommendations on SUPs is given in section 6.1.6.2</p>	 	<p>Short to medium-term</p>	<p>Already on national priority. Policy framework exists (section 6.1.6.2).</p> <p>Can be accelerated with district-level interventions / implementation.</p>	<p>Disposable SW take-back (a policy mandate already) needs to be implemented through the producers/ brand owners.</p>












Recommendations	Cross-cutting with	Qualifying priority		District scenario/ case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Implementing producers' (manufacturers, brand owners, etc.) take-back mechanism (SWM Rules, 2016) either through financial assistance by the producers or a defined collection system facilitated by the producers for disposables, such as tin, glass, plastics packaging, sanitary napkins, and diapers, for efficient management of these waste materials, thereby reducing landfill inert waste load.	 	Short to medium-term	Mandated by the SWM Rules (2016); needs district-level policy formulation and interventions	45% of the total waste generated in Rajkot is inert waste and 5% is paper waste, much of which can be treated/ recycled, which will lead to huge landfill waste reduction. There is no SUP ban in the state as of now. The new 2021 Plastic Waste Management Amendment Rules need to be implemented. Rajkot has submitted a Plastic Control Action Plan.
Ensure 100% recycling of recyclables at landfill through measures such as a material recycling facility (MRF), refuse derived fuel (RDF), waste to energy (W2E), etc. Encourage use of LDPE and HDPE plastic waste in road construction. ⁷	 	Short to medium-term	Requires capacity enhancement of existing facilities	
Management of construction and demolition (C&D) waste: a) Ensure segregation, collection, transportation and proper management. b) Facilitate processing and recycling facilities. c) Incentivise initiatives for C&D waste reuse in non-structural concrete, paving blocks, lower layers of road pavements, colony and rural roads. d) Mandatory procurement of C&D materials (10% to 20%) in municipal and government contracts (subject to quality control).	  	Short to medium-term	Mandated by the rules; CPCB guidelines exist (section 6.16.1) Implementation and enforcement required Capital investment in infrastructure required	
Increasing consumer awareness and access to recycling facilities and repair options.		Short to medium term	Dedicated awareness campaign required	
Education and awareness drives for 100% at source segregation of biodegradable, non-biodegradable, domestic hazardous and household biomedical wastes.		Short-term	Dedicated awareness campaign required	Segregation of domestic hazardous waste and household waste is not practiced in the district.






⁷ Guidelines given by Indian Roads Congress in this regard can be followed. <https://pib.gov.in/PressReleasePage.aspx?PRID=1736774>








Recommendations	Cross-cutting with	Qualifying priority		District scenario/ case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Introduce fiscal instruments to encourage waste reduction, such as mandatory carry bag charges, pay-per-bin schemes (charging residents for each community refuse bin).	  	Short-term	Needs district-level scheme/ notification and community participation	About 10% to 15% of global GHG emissions could be reduced through improved waste management, following a lifecycle assessment approach (Global Waste Management Outlook - UNEP/ ISWA, 2015). Prevention and recovery of waste (as secondary material or energy) can significantly save GHG emissions from across the sectors of the economy including energy, forestry, agriculture, mining, transport and manufacturing sectors.
Conduct behavioural change communication workshops targeting corporates, educational institutes, PSUs, government offices to influence behaviour at both individual and organisational level to better manage resource and reduce the waste generated. For example, conducting weekly workshops at all public schools for waste reduction and recovery. These workshops can also address issues, such as, energy efficiency, water conservation etc.	  	Short-term and continuous	Needs sustained campaign for the target groups	
Consumer awareness for demand-side management of product choices with a) sustainable packaging, b) displayed higher product lifespan, c) displayed recycling/ resource recovery efforts and information.		Short-term and continuous	Dedicated awareness campaign required	
Conduct waste audits at household level, corporate offices, institutes, etc. to identify scope of waste minimisation and promote the same as an evidence-based practice.	 	Short to medium-term	Needs research collaboration	
Ensure segregation, collection, and treatment of sanitary waste (sanitary napkins and diapers) to reduce landfill load.	  	Short to medium-term	Mandated by the SWM Rules, 2016, CPCB guidelines exist. Capital investment in infrastructure development (for treatment) is required, which can be obtained from the producers.	










Recommendations	Cross-cutting with	Qualifying priority		District scenario/ case examples
		Timeframe for the action to be accomplished	Framework for implementation	
<p>Transitioning the district to a 'green market' approach by:</p> <p>a) promoting local circular business models,</p> <p>b) mainstreaming of alternative sustainable business models for the consumers to have a basket of choices.</p>	  	Medium-term and continuous	Needs alternative business models, collaborations, and awareness	
<p>Reduce emissions from waste transportation:</p> <p>a) Encourage shift to electric or 'zero emission vehicles' (ZEVs) for all kinds of waste transport, including municipal solid waste (in all ULBs), bio-medical waste (in all common bio-medical waste treatment facilities/ CBWTFs) and hazardous waste (all treatment, storage and disposal facilities/TSDFs).</p> <p>b) Installation of waste bins with sensors to monitor volume and optimise the routes of collection vehicles to reduce consumption of fuels for waste transport and related emissions.</p>	 	Medium to long-term	Needs capital investments	<p>Solid waste is transported over long distance for common landfill disposal of ULB clusters under ISWM.</p> <p>Petrol or diesel-driven trucks and smaller vehicles are being used for primary and secondary transport of SW with significant transport emission potential, which could be avoided by switching to ZEVs.</p> <p>Garbage transfer stations are constructed to transfer garbage from smaller primary collection vehicles to bigger secondary collection vehicles, thereby reducing the number of vehicles transporting waste.</p> <p>Although, several specifications for CBWTF vehicles already exist (that ensure efficient management and monitoring of BMW), they do not consider reducing emissions from transport.</p>









Recommendations	Cross-cutting with	Qualifying priority		District scenario/ case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Waste treatment – composting				
Full conversion of organic waste to biological waste processing (composting, biogas, etc).	   	Short to medium-term	Policy framework exists (section 6.1.6.1); needs awareness and infrastructure	Organic treatment of compostable waste though initially leads to emissions, reduces GHG emissions drastically over the long run, when compared to landfill emissions. It takes at least three decades of landfill emissions to balance with those from aerobic composting.
Develop composting facilities at ULB level (in addition to cluster level) to avoid a) loss of carbon content in long route organic waste transport and b) reduce waste transport emission.	  	Medium-term	Needs land and infrastructural investment at ULB level	
a) Equip new composting units and upgrade/convert existing composting units with gas management systems for gas capture after conducting feasibility studies. b) Biomethane produced from wastewater and solid waste processing can be used as a fuel for industrial production, to provide energy services in buildings or as a transport fuel. A benefit of biomethane is that existing gas infrastructure can be utilised for transport and distribution. As a local, sustainable source of power and heat, biomethane offers communities and municipalities a flexible option that can contribute to lowering emissions.	   	Long term	Needs policy intervention Needs district-level capital investment and research collaboration	45% of solid waste generated in Rajkot is biodegradable, of which 10% is sent for composting. Composting emission potential (@ current 10% processing of the total waste generated): 812 tons CO ₂ e/year. Currently, there are no gas management systems at composting units. Composting with gas management of the entire organic waste going to landfill can reduce emission by 12,021 tonnes CO ₂ e/year in Rajkot.

Recommendations	Cross-cutting with	Qualifying priority		District scenario/ case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Emission profiling and reduction				
Facilitating research and documentation on characteristics and percentage share of waste, moisture content, localised BODs for domestic and industrial wastewater is important for accurate city or district-level emission estimations from the waste sector.		Short-term	Needs research collaboration	
Ensure better compliance of the waste management rules in terms of maintaining segregated waste collection and treatment data (solid waste, bio-medical waste, e-waste, and hazardous waste) in the public domain (annual reports/websites), particularly at the district level.		Short-term and continuous	Policy frameworks exist in most cases (section 6.16.1)	
Bio-medical waste and hazardous waste				
<p>a) Promote installation of modern incinerators with energy-recovery facilities (such as use of recovered heat for pre-heating of waste to be burnt or use of incinerator steam to generate electricity) for new common bio-medical waste treatment facility (CBWTFs) and upgradation of the existing ones.</p> <p>b) Using smart controls, waste treatment plants equipped with energy recovery incineration facilities can be integrated as distributed energy sources into the electricity grid and as heat sources into the district energy network.</p>	 	Long-term	Needs policy formulation and investment in infrastructure	<p>Incineration is not recommended due to its emission potential. However, to prevent manual scavenging and further contamination from certain kinds of infectious waste (particularly the anatomical, contaminated waste, discarded medicines and chemical waste), incineration is the recommended practice in India.</p> <p>At present, BMW incineration emission in Rajkot district stands at 135 tCO₂e/year.</p> <p>The 2016 BMW Management Rules mandate the formation of a district biomedical waste monitoring committee for strict monitoring of adherence to rules by both healthcare facilities and CBWTFs.</p>
Strict monitoring of adherence to recommended incineration technologies and practices through regular monitoring by District Bio-medical waste Management Monitoring Committee.		Short-term and continuous	Mandated by the rules (section 6.16.1) Needs monitoring by district level BMWM committee	<p>There are no TSDFs within the Rajkot district. However, hazardous waste from the district gets incinerated elsewhere.</p>
Ensure 100% segregation, collection, and treatment of bio-medical waste through coverage and registration of all healthcare facilities to CBWTFs.	 	Short-term and continuous	Mandated by the rules (section 6.16.1)	

Recommendations	Cross-cutting with	Qualifying priority		District scenario/ case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Waste electrical and electronic equipment (WEEE)				
<p>As per the provisions of E-waste Management Rules, 2016, a state level e-waste inventory with district-level category-wise e-waste generation information needs to be developed.</p> <p>Ensuring inclusion of lighting infrastructures, particularly, fluorescent and mercury containing lamps (as per the provisions of the rules) in the inventory and their proper treatment is critical as this waste mostly goes to landfills at present, due to the absence of separate collection and treatment infrastructures.</p>		Short to medium-term	<p>Mandated by the rules (section 6.1.6.1)</p> <p>Needs research collaborations</p>	<p>About 95% of the e-waste in India is processed informally (including rudimentary operations like open burning, acid wash, open smelting, etc).</p>
<p>Ensure stringent policy implementation: Trace informal routing, ensure proper collection, restrict informal processing of e-waste (open burning, metal smelting, etc.), ensure proper disposal of electrical waste (lighting infrastructure including mercury containing lamps) and strict monitoring to stop landfilling of the same.</p>	<div></div> <div></div> <div></div> <div></div> <div></div>	Short term and continuous	<p>Mandated by the rules (section 6.1.6.1)</p> <p>Needs monitoring, manufacturer collaboration and consumer awareness</p>	<p>City-based studies show that efficient management and recycling of WEEE can significantly contribute to emission reduction.</p> <p>The e-waste inventory by GEMI estimates WEEE generation by only bulk consumers for the city (not the district). The estimates also do not consider all WEEE categories. According to the inventory, 2,674.75 MT of annual WEEE is projected to be generated from bulk consumers by 2025 in Rajkot city. Most of the current e-waste is routed informally. No information on e-waste inventory or WEEE generation and treatment is available.</p> <p>Rajkot has one formal e-waste recycling industry, which can be effectively used in the city's e-waste collection and formal disposal.</p>
<p>Tapping into the informal e-waste collection network and formalisation of the same to channelise e-waste disposal to the formal sector.</p>	<div></div>	Short to medium-term	Can be achieved through the producers/ recyclers/PROs	
<p>Improve consumer awareness on responsible e-waste disposal and make information available on e-waste collection points, recyclers, producers (manufacturer), producer responsibility organisations (PROs) or e-waste collection drives at the district level.</p>	<div></div>	Short-term and continuous	<p>Mandated by the rules for the producers (section 6.1.6.1).</p> <p>Dedicated awareness campaign required; can be achieved through collaborating with producers</p>	

Recommendations	Cross-cutting with	Qualifying priority		District scenario/ case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Formulation of district level e-waste policy with district level action and implementation plans.	  	Short to medium-term	Needs state and district-level collaboration	
Wastewater: Domestic and Industrial				
<p>Achieve 100% domestic wastewater treatment through:</p> <p>a) 100% closed and underground sewer collection network coverage of both rural and urban areas of the district.</p> <p>b) Complete shifting of domestic wastewater treatment plants (STP) to aerobic set ups by having only aerobic STPs for new constructions. Transition old anaerobic STPs to aerobic set ups.</p> <p>c) Operation and regular maintenance of periodical sludge removal facilities of all STPs. The sludge can be used again for the bio-methanation of compost.</p>	   	Medium to long-term	Policy intervention and capital investment required	<p>Wastewater, if treated anaerobically, can be a huge source of methane and even nitrous oxide emissions. Open sewers being stagnant and subject to heating cause anaerobic conditions to emit CH₄. Closed underground sewers are an insignificant source of CH₄.</p> <p>Rajkot has aerobic STPs of 95.5 MLD capacity in operation (at Madhapar and Raiya).</p> <p>58% sewerage coverage with 60 sq km covered area and 1500 km network out of 104.86 sq km city limit of RMC.</p> <p>STPs of 48.8 MLD combined capacity under installation in Jetpur, Jasdan and Gondal.</p>
Development of rural wastewater disposal and treatment plan for the district.	 	Medium to long term	Requires capital investment and inter-departmental collaboration.	16 MLD of combined capacity STPs in Dhoraji and Bhayavandar. 150 km collection network planned under RUDA covering 3000 ha of land.

Recommendations	Cross-cutting with	Qualifying priority		District scenario/ case examples
		Timeframe for the action to be accomplished	Framework for implementation	
<p>Create appropriate connecting infrastructure for the industries to utilise treated industrial and domestic wastewater.</p> <p>Provide subsidy/tax rebate to smart recycled water investments for industries, healthcare, hospitality sectors.</p>	 	Medium to long-term	<p>Policy implementation required</p> <p>Needs capital investment in infrastructure and technology upgradation</p>	<p>No information is available on rural sewerage coverage and treatment.</p>
<p>Implement and operationalise the guidelines and regulations of the National Policy on Faecal Sludge and Septage Management, 2017 to reduce emissions from faecal sludge. Regular collection and appropriate disposal of sludge shall also be ensured.</p>	 	Medium to long-term	<p>Needs ULB level implementation and capital investment in infrastructure</p>	<p>100% closed and underground sewer connection and centralised aerobic well-managed STPs can potentially reduce 21,513 tCO₂e emission from STPs to negligible or almost non-existent in Rajkot.</p> <p>AMC has set up the first sewage sludge hygienisation plant in the country at Pirana (operational from 2019), which can convert 100 tonnes of dry sludge into fertiliser per day. A similar plant can be developed for Rajkot district.</p>
<p>Develop a policy mandate for data transparency and availability of waste and wastewater generation, treatment, and discharge information for the industrial sector.</p>		Medium to long-term	<p>Needs policy intervention, inter-departmental collaboration</p>	
<p>Encourage data transparency by the industries for wastewater generation, treatment and discharge information including those of CETPs.</p>		Short to medium term	<p>Needs collaborative efforts</p>	<p>Data transparency on wastewater by industries is key to reducing water pollution, which can be achieved through rating of industries based on their emission and effluent discharge and treatment.</p> <p>For example, under its Star Rating Programme, the Odisha State Pollution Control Board gives star rating to industries and highlights it through their website. This can help in environmental compliance and encourage public participation.</p>

6.1.6.1 Waste management: Policy framework and concerned departments/agencies

Sectors	Policies and programmes that can push forward the recommendation	Primary departments/agencies	Supporting departments/agencies
Solid waste	<ol style="list-style-type: none"> 1) Solid Waste Management Rules, 2016 & Amendment 2018 2) Plastic Waste Management Rules, 2016 and Amendment Rules, 2021 3) Construction & Demolition Waste Management Rules, 2016 4) Integrated Solid Waste Management Project 5) Swachh Bharat Mission – urban and rural 6) Comprehensive District Urban Development Plan 2031 of Rajkot 7) Rajkot Smart Cities Mission 8) National Resource Efficiency Policy (draft) 9) Guidelines on Environmental Management of C&D Waste Management in India, CPCB 10) GPCB Annual Report 	<ol style="list-style-type: none"> 1) Urban Development and Urban Housing Department, GoG 2) All ULBs 3) Panchayats, Rural Housing & Rural Development Department, GoG 4) All Gram Panchayats 5) Gujarat Pollution Control Board (GPCB) 	<ol style="list-style-type: none"> 1) Rajkot District Administration and the proposed District Level Climate Change & Environment Committee 2) Gujarat Urban Development Company Ltd (GUDC) 3) Climate Change Department, GoG (research) 4) Forest and Environment Department, GoG (research) 5) Rajkot Urban Development Agency (RUDA) 6) District Rural Development Agency (DRDA) – Rajkot 7) Community or residential associations
Bio-medical waste and hazardous waste	<ol style="list-style-type: none"> 1) Bio-medical Waste Management Rules, 2016 2) Hazardous and Other Waste (Management & Transboundary Movement) Rules, 2016 3) Batteries (Management & Handling) Rules, 2001 4) GPCB Annual Reports (for data availability) 5) Revised Guidelines for Common Bio-medical Waste Treatment and Disposal Facilities, 2016, CPCB 	<p>Research funding can be obtained from the Department of Forest and Environment, GoG, Climate Change Department, GoG, GPCB, etc.⁸</p>	<ol style="list-style-type: none"> 1) GPCB 2) Rajkot District Administration and the proposed District Level Climate Change & Environment Committee 3) Healthcare facilities 4) CBWTF
Waste-electrical and electronic equipment (WEEE)	<ol style="list-style-type: none"> 1) E-waste Management Rules, 2016 2) Implementation Guidelines for E-Waste (Management) Rules, 2016, CPCB 	<p>Only implementation monitoring and research needs resources, which can be obtained from the Department of Forest and Environment, GoG, Climate Change Department, GoG, GPCB, etc.⁹</p>	<ol style="list-style-type: none"> 1) GPCB 2) Rajkot District Administration and the proposed District Level Climate Change & Environment Committee 3) Electronic and electrical producers/ manufacturers/ brand owners/PROs

⁸ Bio-medical and hazardous waste management is profitable and not funded by govt except for providing the land, which usually belongs to the Industrial Development Corporation

⁹ E-waste management (collection, transport, disposal, treatment – dismantling or recycling) is profitable and is the responsibility of the producers, recyclers, producer responsibility organisations (PROs).

Sectors	Policies and programmes that can push forward the recommendation	Primary departments/agencies	Supporting departments/agencies
Wastewater: Domestic	<ol style="list-style-type: none"> 1) Atal Mission for Rejuvenation and Urban Transformation (AMRUT) 2) Jawaharlal Nehru National Urban Renewal Mission on Urban Infrastructure and Governance (JNNURM) 3) National River Conservation Plan 4) Integrated Urban Sanitation Programme 5) Swachh Bharat Mission (Urban) – Gujarat 6) Swachh Bharat Mission (Rural) – Gujarat 7) Rajkot Smart City Mission 8) Comprehensive District Urban Development Plan, 2031 of Rajkot 	<ol style="list-style-type: none"> 1) Urban Development and Urban Housing Department, GoG 2) All ULBs 3) Panchayats, Rural Housing & Rural Development Department, GoG 4) Gujarat Water Supply & Sewerage Board 	<ol style="list-style-type: none"> 1) RUDA 2) Commissionerate of Rural Development 3) District Rural Development Agency (DRDA) 4) GUDC 5) Rajkot Smart City Development Corporation 6) All gram panchayats
Wastewater: Industrial	<ol style="list-style-type: none"> 1) Common effluent treatment plant system 2) Online Continuous Emission Monitoring System 3) GPCB Annual Report 	<ol style="list-style-type: none"> 1) Gujarat Pollution Control Board (GPCB) 2) Gujarat Industrial Development Corporation (GIDC) 	<ol style="list-style-type: none"> 1) Industries and Mines Department, GoG

Single use plastics (SUPs) – critical to replace

Definition

- SUPs are often referred to as disposable plastics and are commonly used for plastic packaging. They include items intended to be used only once before they are thrown away or recycled, such as grocery bags, food packaging, bottles, straws, containers, cups, and cutlery (UNEP).

Concerns

- Since SUPs are made for single use, they increase waste load and are resource intensive.
- SUPs often get out of the collection and treatment network and a) are one of the biggest ocean polluters and ingested by aquatic animals; b) stay in the environment for forever leading to microplastic pollution; and c) block waterways and intensify natural disaster.
- They have high carbon footprint and high cost for collection, transport, and treatment/recycling.
- SUPs release harmful toxic chemical additives at their end-of-life disposal (unscientific) and further contaminate soil, water and the food chain.



Easily replaceable SUP, their alternatives and key user industries

SUPs	Type of plastic majorly used	Key user industries	Alternatives	Pros and cons
Polythene bags	Low density polyethylene (LDPE)	Fast moving consumer goods (FMCG)	Cotton bags, jute bags, bioplastics	<p>Cloth (cotton)</p> <ul style="list-style-type: none"> Pros: Natural fibre, durable, reusable, biodegradable, profitable and non-food crop Cons: High consumption of chemical fertilisers and pesticides in cotton farming, high cost, water intensive crop, not moisture resistant, needs to be reused many times to offset high degradation/recycling carbon footprint <p>Jute</p> <ul style="list-style-type: none"> Pros: Natural fibre, durable, reusable and biodegradable, high carbon assimilation rate Cons: Expensive, water intensive crop, highly dependent on rainfall, product not moisture resistant <p>Bioplastics</p> <ul style="list-style-type: none"> Pros: Bio-degradable, moisture resistant, inexpensive, light weight Cons: Most contain significant number of plastic polymers leading to microplastic pollution; needs commercial composting facility to degrade; can mistakenly be mixed with plastic recyclables in municipal solid waste; needs quality check and control <p>Paper</p> <ul style="list-style-type: none"> Pros: Bio-degradable, low manufacturing cost, can be made from recycled paper Cons: Water intensive, high carbon footprint, not durable, not moisture resistant <p>Glass</p> <ul style="list-style-type: none"> Pros: Inert, infinitely recyclable, no toxic chemical additives, low manufacturing carbon footprint Cons: Fragile, higher cost, injury and health risk, weight <p>Metal</p> <ul style="list-style-type: none"> Pros: Renewable resource, durable, can be recovered and infinitely recycled Cons: Expensive, higher transportation carbon footprint, tin-coated steel can leach into food and contaminate, heat conductor
Plastic packaging a) Food packaging b) Insulated food packaging, fragile item protective packaging c) Multi-layered packaging (chips, biscuits, noodle, etc) d) Packaging for online delivery	a) LDPE b) Expanded Polystyrene (EPS) c) Paper + foil + LDPE/ PE + foil + paper/ PET + foil + LDPE, etc. d) LDPE	FMCG (food and beverages), hospitality, e-commerce	Bioplastics, recycled paper	
Plastic bottles, tubes for household, personal care and cosmetics, sanitisers, toiletries, etc	High density polyethylene (HDPE)	FMCG (personal care and cosmetics products /PCCP, food, household, and toiletries), beauty, hospitality	Glass, metal (tin-plated steel, aluminium), bamboo, pottery and other ceramics	
Plastic sachet	LDPE	FMCG, (food & beverages, PCCP), hospitality	Cellophane/ another bio-degradable alternative	
Styrofoam products (plates, tray, cups)	Expanded polystyrene (EPS)		Bioplastic, recycled paper, leaf, bamboo	
Biscuit tray, plastic box, air seal for food, etc.	Polypropylene (PP)	FMCG (food & beverages), hospitality	Bioplastic	
Plastic water & other drink bottle	Polyethylene Terephthalate (PET)	Hospitality, FMCG (food & beverages)	Glass, metal, ceramics, bulk vending	
Plastic cutlery, plates, cups, & stirrers	Polystyrene (PS)	Hospitality	Bioplastic, recycled paper, steel	
Plastic use and throw pens	Polypropylene (PP)	FMCG (stationary)	Paper, bamboo, refillable pens	
Straws, stirrers, balloon sticks	Polypropylene (PP)	FMCG (stationary)	Bamboo, recycled paper	
Milk packets	LDPE	FMCG (food & beverages), hospitality	Tetra pack, bottling & bulk vending	
Face shields	Polycarbonate and polyester (PET)	Healthcare	Compostable/ bio-degradable face shield	
Cotton buds		FMCG (PCCP)	Recycled paper, other eco-designed materials, bamboo	
Cigarette butts	Cellulose acetate	Tobacco industry	--	
Freezer bags	LDPE	Hospitality, healthcare, R&D	Glass container, sealable stainless steel	

Microplastics

- Definition: Microplastics are defined by UNEP as solid phase materials, particulates < 5mm, water insoluble, nondegradable and made of plastic. European Commission defines them as consisting of man-made, conventional plastics including bio-degradable plastics, bio-based analogue plastics and bio-based alternative plastics with a particle size below 5 mm and include nanometer sized plastics as well (nanoparticles).
- Major sources: a) vehicle tyres; b) fishing gear, rope, painting and maintenance of ships and boats; c) loss from plastic manufacturing industry; d) painting, construction and road marking; e) fibres from synthetic textile; f) microbeads in personal care and cosmetic products; g) breakdown of plastic products.
- Out of all the sources, intentionally added microbeads in cosmetics and personal care products are 'designed to drain' single use plastics. Though replacement of microbeads in PCCPs come under central regulation, at a district level, consumer awareness can make a change through shifting of demand to sustainable alternatives.

Regulatory provisions in India for SUPs

- Plastic Waste Management (Amendment) Rules, 2021 (announced on March 11, 2021): a) The manufacture, import, stocking, distribution, sale and use of the SUP commodities: Ear buds with plastic sticks, plastic sticks for balloons, plastic flags, candy sticks, ice-cream sticks, polystyrene (thermocool) for decoration shall be prohibited from January 1, 2022, b) The manufacture, import, stocking, distribution, sale and use of the SUPs (including polystyrene and expanded polystyrene) items – such as plates, cups, glasses, cutlery such as forks, spoons, knives, straw, trays, wrapping/packing films around sweet boxes; invitation cards; and cigarette packets, plastic/PVC banners less than 100 micron, stirrers -- shall be prohibited from July 1, 2022.
- Plastic Waste Management Rules, 2016 and Amendment Rules, 2018: a) Extended producer responsibility of the producers to collect plastic waste involving State Urban Development Department either individually through their own distribution channel or collectively with the concerned local body; b) Primary responsibility for collection of used multi-layered plastic sachet or pouches or packaging is of producers, importers and brand owners who introduce the products in the market; c) Manufacture and use of multi-layered plastic which is non-recyclable or non-energy recoverable or with no alternate use of plastic if any should be phased out in two years.
- Solid Waste Management Rules, 2016: a) Extended producer responsibility for manufacturers or brand owners of disposable products including plastic packaging and sanitary napkins and diapers to provide financial assistance to local authorities for waste management system and to set up a collection/take back system for packaging waste.
- Different policy frameworks for SUP ban or restrictions (of different kind) exist in at least 23 states and five union territories of India. Gujarat does not have any policy directive at the state level as of now.

Recommendations¹⁰

- Implement the ban (as specified by the Plastic Waste Management Amendment Rules, 2021) on manufacture, import, stocking, distribution, sale and use of the single use plastic.
- Formulate policies with provisions to: a) mandate producer responsibility for awareness, labelling requirement on disposal, clean-up, collection and treatment of SUP products/packaging; b) mandate collection target (can be a differential target for different products) for SUP producers as part of extended producer responsibility (EPR); c) penalise consumers for accepting banned SUP carrier bags or products; d) strict and random monitoring for implementation of bans in supermarkets, street vendors, shopping malls, large organised markets, etc.; e) gradual phasing out (giving the transition time) of other selected categories of SUP products; can be achieved by sensitising the key producers for voluntary action.
- Promote eco-friendly alternatives to SUPs through: a) identifying alternative sustainable products; b) identifying micro-enterprise and cottage industries for the products; c) integrating them into the mainstream business models through connecting/cross-cutting policies; d) providing financial incentives for the alternative industries and for integrating sustainable products into mainstream business models, such as in the hospitality industry; e) strict quality control and certification requirement for plastic-free alternatives, such as no resin or plastic powder mixed product in the name of alternative.

¹⁰ Note: A sustainable solution to SUP products needs both state and district level collaborations at all levels including policy formulations and implementations

UNEP. 2018. Single use plastics: a roadmap for sustainability. Available at http://www.indiaenvironmentportal.org.in/files/file/singleUsePlastic_sustainability.pdf






Toxics Link. 2020. Single use plastic, the last straw: a watershed moment in the anthropogenic era.

MoEF&CC. 2016. Solid Waste Management Rules, 2016.










MoEF&CC. 2018. Plastic Waste Management (Amendment) Rules, 2018

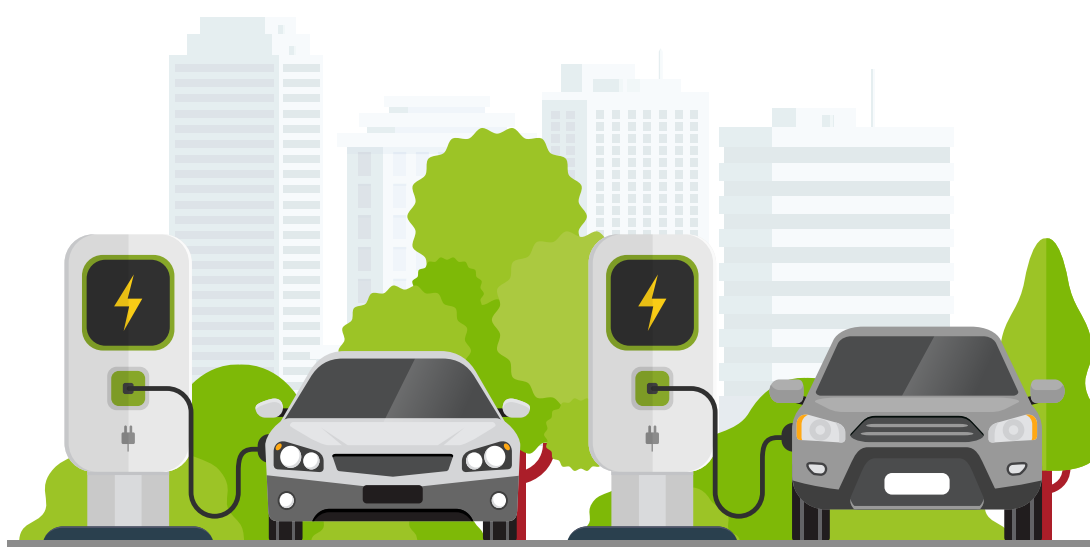
- Promote extended lifespan and reuse of products, even for the sustainable alternatives through continued and lasting campaign for 'no single use' to ensure public participation. Replacing the concept of 'single use' is critical as biodegradability or recyclability have 'time' and 'conditions' (energy & water footprint, transport requirement, etc.) attached to them.
- Introduce economic incentives/support: a) Invest into R&D of alternatives to different SUP products; b) Support technology incubation and stimulate creation of micro-enterprises to drive job creation; c) Introduce livelihood support schemes or have special provisions in the existing schemes to accommodate the job loss from plastic industry; d) Tax rebate to alternative models, public-private partnerships, etc.; e) Incentivise plastic industries for shifting to sustainable alternatives.

6.2 Innovative financing












Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Promote green municipal bonds to mobilise untapped investments towards green projects, such as RE infrastructure, waste management etc.	    	Medium to long-term	<p>Needs policy formulation</p> <p>Collaboration among various stakeholders</p> <p>Create-specific financial instruments</p>	For example: In 2017, Rajkot Municipal Corporation had planned to issue municipal bonds worth ₹ 200 crore, in order to raise money for installing smart meters in the city and ensuring round-the-clock water supply in the city.
Voluntary carbon market mechanism can be developed for the district of Rajkot to motivate industries, ULBs and other sectors to lower their emission levels through monetary incentives.	All sectors	Medium-term	<p>Needs feasibility studies, research, and inter-departmental and multi-stakeholder collaboration</p> <p>Institutional structure needs to be established for the same</p>	<p>For example: In 2020, Smart City Indore collected carbon credit of around ₹ 50 lakh through the city's two bio-methanisation plants. The smart city has avoided emissions of 1,70,000 tCO₂e since 2019 and generated these credits.</p> <p>Gas generated from these plants is used in the city buses – City Bus and iBus.</p>







6.3 Recommendations based on district-specific environmental problems: Recommendations, cross-cutting sectors, qualifying priority and district scenario











Recommendations	Cross-cutting with	Qualifying priority		District scenario / case examples
		Timeframe to attain the recommendation	Ease of implementation	
Water scarcity (decline in groundwater) and pollution				
Conduct assessment and mapping of zone-wise water challenges in the district.	   	Short-term	Stakeholder and research collaboration required	Gujarat has provided Aquifer Vulnerability Index (AVI) information to Central Ground Water Board and identified areas for mapping.
<p>Prepare a comprehensive district action plan for integrated water resource management with a bottom-up approach.</p> <p>Establish sustainable and inclusive water governance in the district to develop, implement, evaluate as well as share information on programmes for water resource management in a transparent and inclusive manner with mandatory stakeholder engagement and public participation.</p>	    	Short to medium-term	<p>Policy intervention required</p> <p>Stakeholder and research collaboration required</p>	GoG through Water and Sanitation Management Organisation (WASMO) has presence in all the villages of the state and involves community for in-village water supply network. Their programmes instill community ownership. This initiative can be scaled for urban areas, and it can be tapped for capacity building of the beneficiaries on efficient water management and conservation.



Recommendations	Cross-cutting with	Qualifying priority		District scenario / case examples
		Timeframe to attain the recommendation	Ease of implementation	
<p>Implement recommendations given in different heat action plans for heat alert days, particularly:</p> <p>a) suspension of non-essential use of water;</p> <p>b) provision of water for cooling, public and institutional distribution;</p> <p>c) promotion of sprinkler irrigation;</p> <p>d) release water in canals during summer;</p> <p>e) ensuring efficient portable water supply;</p> <p>f) provision of water in reserved/protected forests, zoos for wildlife and human habitations.</p>	    	Short-term and ongoing	<p>Action plans and studies exist</p> <p>Policy level interventions required</p>	The Report 'Climate Adaptive Heat Action Plans to Manage Heat Stress in Rajkot City' by IRADe in collaboration with IIPH gives insights and recommendations for managing heat stress in Rajkot.
Promote net zero water construction and infrastructure upgradation in urban areas, in alignment with ECBC norms.	  	Medium-term	Policy level interventions required	
<p>Promote rainwater conservation through:</p> <p>a) renovation of existing rainwater harvesting structures,</p> <p>b) ensuring rainwater harvesting in new construction of residential buildings, institutional, commercial centres, and industries in the district, as per building bye-laws.</p>	   	Short to medium-term	<p>Policy framework exists</p> <p>Align with existing regulations</p>	<p>As per the Comprehensive Development Control Regulations, 2017, UD & UHD, GoG, rainwater harvesting is mandatory for all buildings with ground coverage of 80 sqm and above.</p> <p>According to the Gujarat Development Control Regulations, for buildings with area between 500 and 1,500 sq mt, the owner or developer shall have to undertake rainwater harvesting as per the specifications. For buildings with area between 1,500 to 4,000 sq mt, the owner or developer has to provide percolation wells with rainwater harvesting system with one percolating well for every 4,000 sq mt or part thereof of building unit.</p>

Recommendations	Cross-cutting with	Qualifying priority		District scenario / case examples
		Timeframe to attain the recommendation	Ease of implementation	
Ensure minimum non-revenue water (NRW), i.e., technical loss due to leakage, seepage or unauthorised use (theft).	 	Medium-term	Research collaboration needed	The average NRW across all classes of ULBs in Gujarat ranges between 26% and 34%, indicating that nearly one-third of the water is lost in distribution.
Water billing based on water metering rather than fixed charges.	  	Medium to long-term	Awareness generation and collaboration	Under a pilot project, water meters were installed in Chandernagar water supply zone by the RMC with the objective of reducing water wastage.
Promote dual-flush systems to reduce water consumption, energy consumption, and wastewater generation.	  	Short to medium-term	Aligns with the existing policies Could be implemented as part of 'green buildings'	As a step towards this direction, UDD has recently implemented an amendment (through issuing a notification dated March 31, 2018) in the Comprehensive General Development Control Regulation (CGDCR). The inclusion states that "in every water closet or toilet it shall be mandatory to provide double button cistern (dual flush tank)". For now, it is mandatory for all new constructions to install dual-flush systems. The initiative can be scaled up by retrofitting in old buildings (starting with government and public buildings).
Prevent dumping of untreated effluent from industries, commercial and residential sector into open water bodies or groundwater.	  	Short to medium-term	Policy framework exists Strict monitoring and reporting required	Re-use of Treated Wastewater Policy, 2018 mandates that all power plants and large industries within 50 km of a sewage treatment plant must use recycled wastewater to relieve the burden on groundwater and surface water.



Recommendations	Cross-cutting with	Qualifying priority		District scenario / case examples
		Timeframe to attain the recommendation	Ease of implementation	
Managing air pollution				
Facilitate source apportionment studies to identify the sources and take specific containment measures.		Short to medium-term	Support to enhance the ongoing study (by GEMI)	Rajkot has two manual air quality monitoring stations (not continuous) that do not give a fair idea on the district's air quality status. The manual stations' reports – run under the National Air Quality Monitoring Programme (NAMP) by CPCB in Rajkot – show: a) Annual average PM ₁₀ concentrations have been exceeding the standard every year since 2004, b) The maximum 24-hourly average PM ₂₅ concentration exceeds the standards in recent years. But Rajkot is not listed as a non-attainment city by CPCB. According to an emission inventory of Rajkot city, the particulate matter emission sources as per their share of contribution are as follows: industrial emissions, transport, road re-suspension and construction, open waste burning, residential emissions and diesel generator sets.
Increase the number of Continuous Ambient Air Quality Monitoring Stations (CAAQMS) to statistically, spatially, and temporally, represent the mix of sources and range of pollution in the city. Also, increase the number of air quality display facilities in public places.		Short to medium-term	Policy framework and budgetary provisions exist	
Increase the modal share of public and non-motorised transportation. Further, promote e-vehicles (detailed recommendation under Transport Sector).		Medium to long-term	Policy framework available Need to raise awareness Capital investment required Needs inter-departmental coordination	
Better traffic management, re-direction of traffic movement, development of multi-layered parking and ban on-street parking within specific perimeters of the multi-layered parking to ensure parking inside the facility.		Short to medium-term	Feasibility studies needed Requires implementation of existing rules/policies Needs capital investment	
Increase/create green cover or green buffers along the major traffic corridors, roundabouts, and industrial areas.	 	Medium to long-term	Inter-departmental co-operation required Needs efficient maintenance and monitoring of plantation sites	
Enforce environmental standards for stack emissions in industrial sector.		Short-term and continuous	Requires robust M&E	








Recommendations	Cross-cutting with	Qualifying priority		District scenario / case examples
		Timeframe to attain the recommendation	Ease of implementation	
Sprinkling of water (preferably recycled grey water) for road dust suspension during peak pollution episodes	  	Short-term and continuous	Needs inter-departmental co-operation	<p>Major industrial clusters in Rajkot are the foundries. They are also contributing most to the city's air pollution problem.</p> <p>Public transport services in Rajkot are already inadequate and challenged by limited last mile connectivity. This is leading to an increased use of private vehicles, which in turn are increasing air pollution.</p> <p>Union Budget 2020-21 (Fifteenth FC Report for 2021-2026) allocated ₹ 2,217 crore for 42 urban agglomerations with million-plus populations for air pollution; to be provided as performance-based grants to ULBs.</p>
Open waste burning (of solid waste, biomass, plastic, horticulture waste, etc) should be regulated by the municipal corporation/nagar panchayats.	  	Short to medium-term	Needs implementation of existing rules/regulations	
Implementation of the action plan for construction and demolition waste (as per the CPCB guidelines)	  	Short to medium-term	Needs implementation of existing rules/regulations	
Ensure installation and operation of air pollution control devices in industries and adherence to emission standards.		Medium to long-term	<p>Implementation of existing rules/regulations required</p> <p>Robust M&E required</p>	





6.3.1 Recommendations based on district-specific environmental problems: Policy framework and concerned departments/agencies









Sectors	Policies and programmes that can push forward the recommendation	Primary departments/ agencies	Supporting departments/ agencies
Water scarcity (decline of groundwater) and water pollution	<ol style="list-style-type: none"> 1) Model Bill for the Conservation, Protection, Regulation, Management of Ground Water, 2016 2) Reuse of Treated Waste Water Policy, 2018 3) Gujarat Domestic Water Supply (Protection) Act, 2019 4) Comprehensive State Water Policy, 2015 5) National Water Mission 6) Water Prevention and Control of Pollution Act, 1974 	<ol style="list-style-type: none"> 1) Water Resources Department, GoG 2) Water Supply Department 3) GPCB 	<ol style="list-style-type: none"> 1) District administration and the proposed District Level Climate Change & Environment Committee 2) WASMO (Ahmedabad DWSU) 3) All ULBs 4) RUDA 5) Urban Development Department, GoG 6) Rural Development Department, GoG 7) Commerce and Industries Department 8) GIDC 9) GAIC 10) CGWB
Managing Air pollution	<ol style="list-style-type: none"> 1) Air (Prevention and Control of Pollution) Act, 1981 2) Environment (Protection) Act, 1986 3) National Clean Air Programme 4) Solid Waste Management Rules, 2016 & Amendment 2018 5) Construction and Demolition Waste Management Rules, 2016 	<ol style="list-style-type: none"> 1) GPCB 2) System of Air Quality and Weather Forecasting and Research (SAFAR), IMD 3) All ULBs 	<ol style="list-style-type: none"> 1) District administration and the proposed District Level Climate Change & Environment Committee 2) Department of Climate Change, GoG 3) Commissionerate of Transport, GoG 4) Energy & Petro-chemicals Department, GoG 5) RTO 6) All ULBs

6.4 Actions district authorities can recommend to state departments: Recommendations, cross-cutting sectors, qualifying priority and district scenario





Recommendations that could be pursued by the district collector/committee at the state level	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
POWER SECTOR: Upgrade DISCOM infrastructure and their supply network to reduce AT&C losses, billing inefficiencies etc. Furthermore, introduction of smart billing system would help curtail power thefts, and increase billing efficiency, helping the DISCOM generate more revenue.	 	Short to medium-term	<p>Policy framework and targets exist (section 6.4.1).</p> <p>With optimum push, this initiative can help India align with the Paris Agreement targets.</p>	<p>For FY 18-19, AT&C losses of PGVCL were 20.17%, well over the international standard range of 6% to 8%.</p> <p>PGVCL can work towards reducing the AT&C losses.</p> <p>Under PGVCL's pilot project, smart meters are being installed under Smart Village Distributed Renewable Energy generation with Smart Grid Concept at village Nana Kajliyara and Shapur of Junagadh Circle.</p> <p>PGVCL can consider implementing a similar project in Rajkot district.</p>

Recommendations that could be pursued by the district collector/committee at the state level	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
HABITAT: Provide subsidies/ tax rebates to builders/building owners to encourage adoption of ECBC or IGBC (e.g., property tax/water cess/IT rebate).		Medium to long-term	Policy framework exists (section 6.4.1), but targets need to be set Needs inter-departmental collaboration.	ECBC buildings deliver 20% to 25% of energy savings in different climates, when compared with the conventional buildings (BEE, 2017). Gujarat Tourism Policy 2021-25 offers reimbursement of 50% of certification fee, with a maximum limit of ₹ 10 lakh, to hotels / wellness resorts obtaining green rating from Indian Green Building Council (IGBC).
TRANSPORT: Energy efficiency of infrastructure in railways can be enhanced through the following measures: a) Installing solar panels along electrified tracks and on railway station rooftops. b) Installing optimal light control systems and appliances, smart sensors and building management systems at station buildings. c) Equipping electric traction rolling stock with regenerative capability and feedback to the grid.		Medium-term	Needs inter-departmental collaboration	Rail Land Development Authority and National Building Construction Corporation have signed an MoU for redevelopment of 10 railway stations across India as 'smart railway stations.' Railway stations in the district can also be developed along similar lines.
TRANSPORT: Use fiscal means to discourage the use of personal vehicles, such as: a) Increasing charges on registration of internal combustion engines (ICE) vehicles, b) Levy congestion charges and other green taxes. c) Phasing out of older, more polluting vehicles.	 	Short-term and continuous	Proper policy backing based on research and inter-departmental cooperation is needed	In January 2021, the Ministry of Road Transport and Highways announced additional taxes on old vehicles that were unfit for roads, terming them as 'green taxes'.
TRANSPORT: Identification and planned shift of key commercial / business centres from all the ULBs to outside city limits to reduce traffic load.	 	Long-term	Policy backing based on research and inter-departmental cooperation is needed	Requires development of areas outside RMC limits through RUDA.
District authorities while gradually rolling out EV infrastructure, can advocate to state and national governments for standardised EV cables and infrastructures for easier integration and interoperability for implementation of smart charging on a large scale.		Medium to long-term	Needs policy intervention	

Recommendations that could be pursued by the district collector/committee at the state level	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
INDUSTRY: a) Ensure regular PAT compliance of DISCOMs and other designated consumers (DCs) in the district; b) Increase the number of DCs for PAT scheme and ensure the compliance of targets.		a) Short-term and continuous b) Medium to long-term	Policy framework exists (section 6.4.1), but targets need to be revised gradually Ensure M&E Collaboration required	Until PAT Cycle VI (2020-21), only two DCs had volunteered under the scheme in Rajkot district. Over the years, various DCs from Rajkot district have helped avoid around 2,93,123 tCO ₂ e by improving their systemic energy efficiency under the PAT scheme.
INDUSTRY/ENERGY: Ensure compliance to renewable purchase obligations (RPOs) and increase the RPO targets gradually.		Medium to long-term	Policy framework exists (section 6.4.1)	Currently, the RPO target in Gujarat for industries is 15.65%.
AGRICULTURE: Encourage millet cultivation (it requires little water to grow, shows good productivity under extreme climate conditions and is nutritionally rich).		Medium to long-term	Needs creation of appropriate financial mechanisms to encourage farmers to grow millets Requires research collaboration This would also help meet the following targets of SDG#2 (Zero Hunger): 2.1, 2.3, 2.4	In Rajkot, jowar and bajra production has continuously decreased (jowar from 2,300 MT in 2010-11 to 830 MT in 2018-19; and bajra from 11,300 MT in 2010-11 to 1,602 MT in 2018-19).
AGRICULTURE: To compensate for predicted decrease in crop productivity, initiate research on high yield, drought and temperature resilient genotypes for various food and cash crops in association with agricultural institutes/universities.		Medium to long-term	Needs research collaboration and capital investment This would also help meet the following targets of SDG#2 (Zero Hunger): Targets 2.1, 2.3, 2.4, 2.a	Cotton and groundnut are two major crops of the district. Production of cotton decreased in Gujarat. In Rajkot alone, it reduced from 16.57 lakh MT in 2010-11 to 5.7 lakh MT in 2018-19. The area under cotton cultivation also decreased (from 3,56,900 ha in 2010-11 to 2,60,249 ha in 2018-19), thereby, resulting in 52.06% lower yield. Wide variation is observed in groundnut production throughout the years and overall, it decreased from 6.5 lakh MT (2010-11) to 2.52 lakh MT (2018-19). Low rainfall can be one of the key reasons for the reduced yield. Annual rainfall for Rajkot has significantly reduced from 853mm (2011) to 365mm (2018) as per district-wise rainfall data published in Gujarat Forest Statistics 2018-19.

Recommendations that could be pursued by the district collector/committee at the state level	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
AGRICULTURE: For overall reduction in electricity consumption and water savings in agriculture, subsidies can be reduced in a phased manner.	  	Medium to long-term	Policy intervention needed Requires awareness and collaboration with the farming communities	<p>Power tariffs are as per different consumption slabs as well as the horsepower of pump being used. Currently, the tariff for farmers is at 60 to 80 paise/unit in Gujarat.</p> <p>Electricity tariff policies, in conjunction with large subsidies for agricultural power, have caused rapid groundwater depletion in many regions, along with massive financial losses to power utilities and governments (both central and state).</p> <p>Flat tariffs lead to more equitable distribution of water between high-income and marginal consumers but fail to encourage conservation. Metered tariffs have the potential to promote water conservation but are difficult to manage and are expensive for low-income farmers. Western states like Gujarat, with rapidly depleting aquifers, should promote tariffs to enhance water conservation.¹¹</p>
FORESTRY/GREEN SPACES: Promote regeneration of degraded and open forest areas through corporate social responsibility (CSR) or similar mandates and encourage corporates to dedicate some percent of their profits towards greening the spaces around their units/factories.	  	Long-term	Needs strengthening of the existing policy framework Needs different stakeholder collaboration	<p>Green belts help mitigate air pollution, increase urban green cover, leading to carbon sequestration</p>
E-WASTE: Adoption of 'green marketing' approach: Promoting green products by displaying product lifespan on the label on e-products to influence purchase decisions, thereby, using the labels as behavioural intervention.	 	Medium to long-term	Needs policy intervention, collaborations, and awareness	

11 Sindhu B.S. et. al., Power tariffs for groundwater irrigation in India: A comparative analysis of the environmental, equity, and economic trade-offs




Recommendations that could be pursued by the district collector/committee at the state level	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
WATER SCARCITY & POLLUTION: Enactment of the 'Model Bill for the Conservation, Protection, Regulation, Management of Ground Water, 2016' as an act in the state and ensuring strict regulation of private groundwater abstraction.	   	Short-term	Requires policy implementation	<p>Gujarat is the best performing state in the Composite Water Management Index (CWMI), 2018 by Niti Aayog.</p> <p>Gujarat has a comprehensive State Water Policy which has set up institutions, such as the state regulatory authority, state policy council and implementation committee, river basin organisations, water research and training institutes, integrated water data centre, etc.</p> <p>However, establishing a regulatory framework can help the state boost water levels in more wells than the present achievement of a rise in 33% of wells.</p>





6.4.1 Actions district authorities can recommend state departments: Policy framework and concerned departments/agencies




Sub-sectors	Policies and programmes that can push forward the recommendation	Primary departments/agencies	Supporting departments/agencies
Power sector	1) National Smart Grid Mission 2) Smart Metering National Programme 3) Integrated Power Development Scheme (IPDS) 4) Restructured Accelerated Power Development and Reforms Programme (R-APDRP) 5) UDAY Scheme, 2015 6) National Mission on energy Efficiency specifically PAT (Perform, Achieve and Trade) Scheme 7) Gujarat Solar Power Policy, 2021 8) Policy for Development of Small-scale distributed solar projects, 2019 9) Standards and Labelling Programme	1) GUVNL-PGVCL, GoG 2) MNRE, GoI 3) GEDA, GoG 4) BEE (EESL)	1) Proposed District Level Climate Change and Environment Committee 2) Climate Change Department, GoG 3) Western Railways – Rajkot Division
Habitat	1) ECBC, 2017	1) Urban Development and Urban Housing Department, GoG 2) All ULBs 3) Rajkot Smart City Development Limited (RSCDL)	1) Proposed District Level Climate Change and Environment Committee 2) RUDA 3) GEDA
Transport	1) ECBC 2) JNNURM 3) Smart Cities Mission and AMRUT	1) Ports and Transport Department 2) All RTOs 3) All ULBs	1) GSRTC 2) GEDA 3) Rajkot Smart City Development Limited 4) Western Railways – Rajkot Division






Sub-sectors	Policies and programmes that can push forward the recommendation	Primary departments/agencies	Supporting departments/agencies
Industry	<ol style="list-style-type: none"> PAT Scheme Gujarat Industrial Policy, 2020 	<ol style="list-style-type: none"> Industries and Mines Department, GoG 	<ol style="list-style-type: none"> Industries Commissionerate District Industries Centre Proposed District Level Climate Change and Environment Committee
AFOLU	<ol style="list-style-type: none"> National Mission on Food Security Rashtriya Krishi Vikas Yojana: RAFTAAR National Mission for Sustainable Agriculture Price Support Scheme National Afforestation Programme (NAP) Green India Mission CSR Act 	<ol style="list-style-type: none"> Agriculture, Farmers' Welfare and Co-operation Department, GoG Gujarat Forest & Environment Department, GoG 	<ol style="list-style-type: none"> Proposed District level Committee on Climate Change and Environment Gujarat Agro Industries Corporation (GAIC) Junagadh Agriculture University and other Agriculture Universities of Gujarat APMCs Energy and Petrochemicals Department, GoG GIDC
Waste	<ol style="list-style-type: none"> E-waste Management Rules, 2016 	<ol style="list-style-type: none"> Science and Technology Department, GoG 	<ol style="list-style-type: none"> Proposed District Level Climate Change and Environment Committee

6.5 Sustainable Development Goals being addressed

SDGs	Targets	Being addressed through recommendation given in sector (sub-sectors)
SDG 1: No Poverty 	Target 1.4: Ensure that all men and women, in particular the poor and the vulnerable, have access to basic services	Waste water
SDG 2: Zero Hunger 	Target 2.1: End hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round	AFOLU (agriculture)
	Target 2.3: Double Agricultural Productivity	AFOLU (agriculture)
	Target 2.4: Implement resilient agricultural practices that increase productivity and production	AFOLU (agriculture)
	Target 2.a: Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research	AFOLU (agriculture)
	Target 2.a: Article 10.3e: Development of sustainable irrigation programmes for both crops and livestock.	AFOLU (agriculture and livestock)
SDG 3: Good Health & Well-being 	Target 3.3: End the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases	Water pollution; co-benefits from waste
	Target 3.4: Reduce by one third premature mortality from non-communicable diseases through prevention	Co-benefits from waste
	Target 3.9: Substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	Waste; water scarcity and pollution; air pollution

SDGs	Targets	Being addressed through recommendation given in sector (sub-sectors)
SDG 6: Clean Water & Sanitation 	Target 6.1: Achieve universal and equitable access to drinking water	Water scarcity and water pollution
	Target 6.3: Improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	Waste; energy (industry); water pollution
	Target 6.4: Substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals	Energy (habitat -- demand side management, industry); AFOLU (agriculture and green spaces); water scarcity
	Target 6.5: Implement integrated water resources management at all levels	AFOLU (agriculture and green spaces/forestry); water scarcity and pollution
	Target 6.8: Support and strengthen the participation of local communities	Waste; AFOLU (all three); transport
	Target 6.a: Expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including wastewater treatment, recycling and reuse technologies	Waste
SDG 7: Affordable & Clean Energy 	Target 7.1: Ensure universal access to affordable, reliable and modern energy services	Energy (power, habitat); AFOLU (agriculture)
	Target 7.2: Increase share of renewable energy in energy mix	Energy (power, transport, habitat, Energy efficiency in buildings and bye-laws for new construction, industry)
	Target 7.3: Double the global rate of improvement in energy efficiency	Energy (power, habitat, industry)
	Target 7.a: Enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology	Energy (power and energy)
	Target 7.b: Expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries in accordance with their respective programmes of support.	Energy (power and energy); AFOLU
SDG 8: Decent Work & Economic Growth 	All targets	AFOLU (agriculture and livestock)
	Target 8.2: Achieve higher levels of economic production through diversification, upgradation and innovation	Energy; AFOLU (agriculture and livestock)
	Target 8.4: Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production	Waste
	Target 8.9: Devise and implement policies to promote sustainable tourism	Agriculture (forestry/green spaces)
SDG 9: Industry, Innovation & Infrastructure 	Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure	Energy (habitat -- energy-efficiency in building, transport); waste
	Target 9.2: Promote inclusive and sustainable industrialization	Energy (industry)
	Target 9.3: Improving access and connectivity to industries/other enterprises	Energy (transport)

SDGs	Targets	Being addressed through recommendation given in sector (sub-sectors)
SDG 9: Industry, Innovation & Infrastructure 	Target 9.4: Upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes	AFOLU (agriculture-cold chains/water pumps etc.); waste; energy (industry); water scarcity
	Target 9.5: Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending	Energy (power); waste
	Target 9.b: Research and innovation in developing countries, including by ensuring a conducive policy environment	Waste; energy (power and energy, industry)
SDG 11: Sustainable Cities & Communities 	Target 11.1: Ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums	Waste; habitat; water
	Target 11.2: Safe, affordable, accessible and sustainable transport systems for all	Energy (transport, habitat) air pollution
	Target 11.3: Enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management	Waste; energy (power and energy, habitat -- energy efficient buildings); all district-specific sectors
	Target 11.4: Strengthen efforts to protect and safeguard the world's cultural and natural heritage	AFOLU (forestry); water scarcity
	Target 11.6: Reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	Waste; energy (power and energy, transport, habitat, industry); air pollution
	Target 11.7: Provide universal access to safe, inclusive and accessible, green and public spaces	AFOLU (green spaces); habitat; air pollution
	Target 11.a: Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening regional development planning	Energy (transport -- improving traffic flow)
SDG 12: Responsible Consumption & Production 	Target 11.b: Substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change,	Energy; AFOLU; waste
	Target 12.1: Implement the 10-year framework of programmes on sustainable consumption and production, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries	Energy; waste
	Target 12.2: Achieve the sustainable management and efficient use of natural resources	Energy; AFOLU; waste; air pollution and water pollution
	Target 12.3: Halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses	AFOLU; waste
	Target 12.4: Achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil	AFOLU; waste; air pollution and water pollution

SDGs	Targets	Being addressed through recommendation given in sector (sub-sectors)
SDG 12: Responsible Consumption & Production 	Target 12.5: Substantially reduce waste generation through prevention, reduction, recycling and reuse	Waste; habitat and industry
	Target 12.6: Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle	Waste; industry
	Target 12.8: Ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature	Individual action and behavioural change communication
	Target 12.a: Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production	Waste; AFOLU (agriculture and livestock)
SDG 13: Climate Action 	All targets	All sectors and sub-sectors
SDG 14: Life under Water 	Target 14.1: Prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.	Waste (single use plastic)
SDG 15: Life on Land 	Target 15.1: Ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements	AFOLU; waste; water pollution
	Target 15.2: Promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation	AFOLU (forestry/green spaces)
	Target 15.3: Combat desertification, restore degraded land and soil	AFOLU (forestry/green spaces)
	Target 15.5: Take urgent and significant action to reduce degradation of natural habitats, halt loss of biodiversity	AFOLU (forestry)
	Target 15.9: Integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies	AFOLU (all three) and water scarcity
	Target 15.a and 15.b: Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity, ecosystems and sustainable forest management	AFOLU (all three) and water scarcity
SDG 17: Partnerships for the Goals 	Target 17.7: Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries	Energy; AFOLU; waste; individual action and behavioural change communication
	Target 17.16: Enhance the global partnership for sustainable development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the sustainable development goals in all countries, in particular developing countries	Energy; AFOLU; waste

6.6 Promoting voluntary individual climate actions

Waste management



- 1 Practice source segregation and handover segregated waste: biodegradable, non-biodegradable, domestic hazardous and household clinical waste
- 2 Go for sustainable tourism/eco-tourism or tourism efforts for lowered waste footprint
- 3 Ensure formal recycling of your electronic products by going through the collection points information on the same are provided in electronic brand websites.
- 4 Responsibly dispose your e-waste: send them to a recycler, producer (manufacturer), producer responsibility organisation or dispose during local e-waste collection drives.
- 5 Say no to personal care products using microplastics/microbeads, read the labels before buying.
- 6 Say no to easily avoidable single use plastic products, like, plastic cutlery, straws, plastic carry bags, pouch products, food wraps, multi-layered packaging products
- 7 Choose products with: a) less packaging waste, b) sustainable packaging, c) displayed higher product lifespan, d) displayed recycling/resource recovery efforts and information.

Housing

- 1 Insulate the building as much as possible, ensure proper sealing of doors and windows to avoid cooling/heating leakage.
- 2 Develop and maintain provision for rainwater harvesting.
- 3 Install solar rooftop panels, if feasible.
- 4 Adopt wastewater recycling and reuse.
- 5 Rooftop gardens can considerably reduce space cooling requirement.



Lighting



- 1 Switch off lights and fans when not required.
- 2 Replace incandescent bulbs with LEDs.
- 3 De-dust lighting fixtures to maintain illumination.
- 4 Smart LEDs are even more convenient-they can be controlled even when the person is not at home.

Kitchen

- 1 When cooking on gas stove, use moderate flame setting to conserve LPG
- 2 Prefer the use of pressure cookers
- 3 Keep the burner clean
- 4 Use lids to cover the pan while cooking
- 5 Use flat bottomed pan on electric stove
- 6 Turn off electric stove several minutes before the specified cooking time



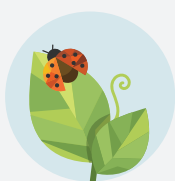
Other climate-conscious precepts



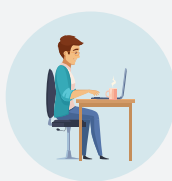
Be mindful of water consumption. Use bucket instead of shower. Use bucket instead of hose for cleaning cars/ porch/back-yard. Opt for dual-flush toilets. Close the tap while brushing. Reuse RO reject water.



Carry your own water bottle, adopt minimalist lifestyle to reduce overconsumption of resource, purchase only when necessary



Go for climate conscious producers/ manufacturers. Develop a knowledge and preference for locally available and sustainably produced and designed products



If possible then opt for work from home options for a few days in a week



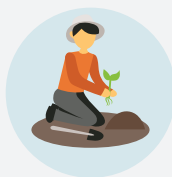
Encourage elected representatives and policy makers to opt for green choices/deals/decisions



Choose standard shipping when ordering online



Buy locally available produces especially food/vegetables and other perishable products



Invest time and effort in greening local areas through collective community action



Develop a habit of repair and reusing appliances and products at home instead of buying new ones. Follow reduce, reuse and recycle principles in the household to reduce footprint



Include more meat-free meals and limit food wastage



Buy local and organic food items not only for health but also to cut down emissions from transport and chemical fertilizers



Opt for water saving fittings and fix any leakages in the house

Daily use appliance



1

Purchase BEE star-rated energy efficient appliances



2

Shift consumption to off-peak hours (i.e. other than 10 am to 8 pm)



3

Replace electric water heater with a solar water heater, if feasible



4

Unplug idle devices/appliances.



5

A power strip can be used to reduce plug load. Devices such as desktops, TVs, microwaves, etc. use standby power even when off. Switching off the power strip has the same effect as unplugging all devices



6

Proper maintenance of air conditioners helps to increase efficiency



7

Do not overload the refrigerator



8

Set the AC thermostat at 25° to 26° C, for optimum cooling

Transport



1

Choose direct flights to reduce carbon footprint



2

Travel light to reduce carbon emissions



3

Strictly abide by pollution norms



4

Put on your shoes for short trips



5

Ensure regular maintenance of vehicles



6

Choose inter-modal transport (private + public)



7

Reduce demand for vehicle travel by expanding personal mobility choices such as car sharing and bike sharing



8

Shift to clean, non-petroleum fuels such as electricity to power vehicles



9

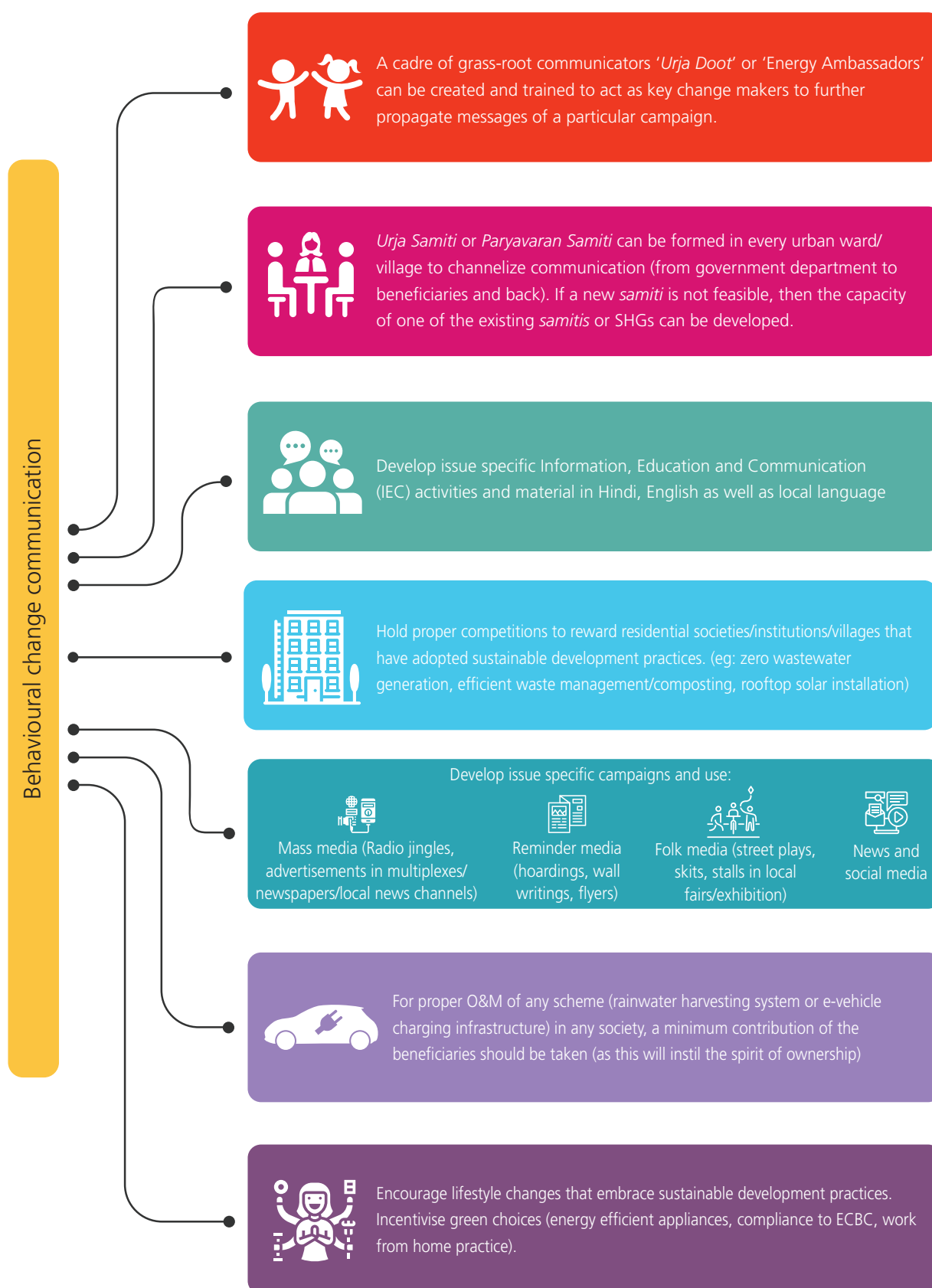
Car pool to work, Use bicycles, park and ride



10

Switch off the ignition at traffic signals

6.7 Behavioural change communication (BCC) techniques





Shakti Sustainable Energy Foundation (SSEF) seeks to facilitate India's transition to a sustainable energy future by aiding the design and implementation of policies in the following sectors: clean power, energy efficiency, sustainable urban transport, climate policy and clean energy finance.



Vasudha Foundation is a not for profit organization set up in April 2010 with the belief in conservation of Vasudha, which in Sanskrit means the Earth, the giver of wealth and with the objective of promoting sustainable consumption of its bounties.

The core mission is to promote environment -friendly, socially just and sustainable models of energy by focusing on renewable energy and energy efficient technologies and lifestyle solutions. Climate change mitigation is one of the key verticals of the organization. The focus is to bring about reduction in greenhouse gas emissions in the environment and ensure energy efficiency, energy security, energy independence, and sustainable development as well as simultaneously, promoting the concept of "Low Carbon Solutions" and "Green Economies".



Climate Change Department
Government of Gujarat

The Climate Change Department, established in 2009, acts as a bridge within the Government, and between the Government and the Society to address Climate Change. Gujarat is the first and only State in India, the first in Asia and fourth in the world to form an independent department for Climate Change. 'Enabling a low carbon pathway for Gujarat's economic growth that would meet people's aspirations with equity and inclusiveness' is among the department's key objectives. The Department works to address the concerns of Climate Change at State Level by following a multi-pronged strategy, while suitably factoring in National Action Plan on Climate Change (NAPCC), Nationally Determined Contributions (NDCs), Sustainable Development Goals (SDGs), State Action Plan on Climate Change (SAPCC).



Gujarat Ecological Education and Research (GEER) Foundation is an autonomous organization set up in 1982 by the Forests and Environment Department, Government of Gujarat. The Foundation undertakes scientific research and studies on various aspects of ecology and nature conservation, including - wildlife, forests, biodiversity and climate change, together with ecological education and extension. The ecological studies and research carried out by the Foundation have created an important source of scientific information and decision making for the Government and other stakeholders. GEER Foundation is also the designated State Center on Climate Change of Gujarat under the aegis of the DST, MoST, GoI.



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