

# Climate Change and Environment Action Plan of **Ahmedabad 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 Ahmedabad, 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 change 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.

<b>Copyright/ citation:</b>	Climate Change and Environment Action Plan of Ahmedabad District, Vasudha Foundation, 2022
<b>Research leads:</b>	Rini Dutt, Manjusha Mukherjee
<b>Research support:</b>	Shivika Solanki, Archit Batra, Shubhi Gupta, Monika Chakraborty, Rahul K. P.
<b>GIS support:</b>	Akinchan Singhai, Amit Yadav
<b>Guided by:</b>	Srinivas Krishnaswamy, Raman Mehta
<b>Knowledge partner:</b>	Shri B. H. Talati, IAS, Joint Secretary and Shwetal Shah, Technical Advisor, Climate Change Department, GoG Mr. R. D. Kamboj (former Director) and Dr. Sweta Rajpurohit, Manager, GEER Foundation, Forest and Environment Department, GoG
<b>Copyediting:</b>	Swati Prasad
<b>Design and layout:</b>	Priya Kalia (Vasudha Foundation), and Aspire Design, New Delhi
<b>Photo credits:</b>	Shutterstock, iStock, various government departments websites

**January, 2022**  
**Ahmedabad, Gujarat**

The views/analysis expressed in this report/document do not necessarily reflect the views of Shakti Sustainable Energy Foundation. The Foundation also does not guarantee the accuracy of any data included in this publication nor does it accept any responsibility for the consequences of its use.

The material in this report is based on data points and information that we believe to be reliable and adequately comprehensive. However, we do not guarantee that such information is in all respects accurate or complete. Vasudha Foundation does not accept any liability for any losses resulting from the use of this report.

#### **Cover page images**

##### **Top left image:**









Torrent power plant, Sabarmati, Ahmedabad (sourced from shutterstock)

##### **Bottom right:**

Solar panels over Narmada canal, Vadodara (photograph credit: Climate Change Department, GoG)

##### **Land use map of Ahmedabad district:**

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

 Built-up land	 Crop-land	 Fallow-land	 Forest
 Shrub-land	 Grass-land	 Waste-land	 Water-bodies



Climate Change  
and Environment  
Action Plan of

# Ahmedabad District

## Recommendations

Prepared By



In Association with



Supported By









**Bhupendra Patel**

Chief Minister, Gujarat State

Apro/Jm/2022/01/17/rs

Dt: 17-01-2022

**MESSAGE**

*“The world agrees that lifestyle plays a very important role in Climate Change. I would like to suggest a one-word movement in context of climate which can become a key basis for one world. This word is LIFE – Lifestyle for Environment.”*

- **Narendra Modi**

Gujarat is having the only natural habitat and an empire of Asiatic Lions. It has various kinds of ecosystem, ranging from marine biodiversity, inland wetlands, saline deserts to tropical deciduous forest. Being conscious to its varied biodiversity, the State has always been actively engaged in natural resource management, biodiversity conservation and addressing to global environmental threats like Climate Change. Under the visionary leadership of the then Chief Minister of Gujarat and incumbent **Honourable Prime Minister Shree Narendrabhai Modi** has undertaken several innovative initiatives for Climate Change Mitigation Measures.

I am much pleased to learn that with direct consultation of all stakeholders, an all encompassing ‘**Climate Change and Environment Action Plan (CCEAP)**’ of Ahmedabad district has been developed by Vasudha Foundation with support from Shakti Sustainable Energy Foundation and in collaboration with the Climate Change Department and GEER Foundation, Government of Gujarat. I hope the district specific recommendations provided in this well curretted Action Plan are adopted and implemented in Ahmedabad, as this would help Gujarat and in turn India to reach the net-zero target of 2070.

**(Bhupendra Patel)**



**Kiritsinh Rana**



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

**Minister,  
Forest & Environment, Climate Change,  
Printing & Stationery  
GOVERNMENT OF GUJARAT**  
Swarnim Sankul-1, First Floor, Sardar Patel Bhavan,  
New Sachivalaya, Gandhinagar-382 010.  
Tel. : 079-232 50126 to 50128

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 1<sup>st</sup> in solar rooftop installed capacity and contributes to 25% of the total national solar rooftop installed capacity. Moreover, Gujarat also stands 3<sup>rd</sup> 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 Ahmedabad 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

**Minister of State,  
Co-operation, Cottage Industries, Salt  
Industries, Protocol (Independent Charge),  
Industries, Forest, Environment and  
Climate Change, Printing and Stationery  
(State Minister)**

**GOVERNMENT OF GUJARAT**

Swarnim Sankul-2, 1<sup>st</sup> Floor, Sachivalaya, Gandhinagar.

Phone No. : (O) : (079) 232 57012 to 15.

(Fax) : 232 57016

Date : 27.1.2021

**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 26<sup>th</sup> 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. Its most populated city, Ahmedabad, was awarded India's 'Cleanest Mega City' 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 Ahmedabad 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 Ahmedabad 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)**





**U. D. Singh, IFS**  
Director



**GEER FOUNDATION**

Gujarat Ecological Education and Research Foundation

### 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 Ahmedabad. 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)

---

GEER Foundation, Indroda Nature Park, PO Sector-7, Gandhinagar-382 007, Gujarat, INDIA

Phone: +91-79-23977300 Fax: +91-79-23977313

Email: [dir-geer@gujarat.gov.in](mailto:dir-geer@gujarat.gov.in); [geer.info@gmail.com](mailto:geer.info@gmail.com) Website: [www.geerfoundation.gujarat.gov.in](http://www.geerfoundation.gujarat.gov.in)





**Sandip J. Sagale** I.A.S.  
Collector & District Magistrate,  
Ahmedabad



Office of the Collector & District Magistrate,  
Subhash Bridge, Ahmedabad.  
Gujarat - 380 027.  
Phone : (O) 079-27551681 Fax : 079-27552144  
Email : collector-ahd@gujarat.gov.in

#### MESSAGE

The pervasive effects of Climate Change have been unfolding across the world, more so, in the recent decades. As each year passes, voices from countries around the world, especially the vulnerable ones and those at the brink, have only been growing louder and stronger, advocating robust actions to avoid climate catastrophes. With over one-sixth of world's population, and an extensive coastline of 7516 km, India's role in mainstreaming climate action remains vital. The ambitious targets announced in the recently concluded climate summit at Glasgow, COP26, which include achieving net zero emissions by 2070, stand as a testimony to the country's commitment.

In a federal country like India, the role of each State in contributing towards national goals is instrumental. Gujarat is one of the leading states in the country in terms of climate action, as seen through several initiatives such as the launch of the latest State Action Plan on Climate Change. The state government has also taken a strong stance to reduce emissions from major sources by restricting commissioning of new thermal power plants altogether. 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.

Ahmedabad is one among the nine cities awarded four-star rating under Climate Smart Cities Assessment Framework, 2021 by the Ministry of Housing and Urban Affairs. The city was also awarded India's 'Cleanest Mega City' in Swachh Survekshan, 2020. The growing developmental needs in the city, and its peripheries within the district calls for comprehensive sectoral level analyses and interventions to curb greenhouse gas emissions. It is thus viewed that, as a first step in this direction, the Climate Change and Environment Action Plan (CCEAP) developed for Ahmedabad district serves its purpose well.

The Action Plan has been developed in consultation with District Administration of Ahmedabad, officials from relevant departments, academia, civil society organizations and other key stakeholders through multiple rounds of consultation. I believe a bottom-up approach such as this, when implemented, would eventually contribute towards achieving the larger goals set by the state and the country.

I appreciate the efforts made towards developing the CCEAP for Ahmedabad 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.

  
(Sandip J. Sagale)



# ACKNOWLEDGEMENTS

We would like to thank S.J. Haider, IAS (Principal Secretary), Shwetal Shah (Technical Advisor) and other officials from the Climate Change Department, GoG, and U.D. Singh, IFS (Director), R.D. Kamboj, IFS (Retd.) (former Director), Dr. Sweta Rajpurohit (Manager), and Vibha Goswami (Deputy Director) from GEER Foundation, Forest Department, GoG, as their inputs and support have been vital in development of the Climate Change and Environment Action Plan for Ahmedabad district.

We are obliged to Sandip J. Sagale, IAS (District Collector, Ahmedabad) for support and motivation to accomplish the completion of the action plan for Ahmedabad 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.

We extend our gratitude towards other departments and civil organisations – Anis Mankad, IAS (Special Secretary, Revenue Department), A.B. Gor, IAS (CEA, AUDA), Mahesh Singh, IFS (former MD, UGVCL), R.J Bhrambhatt and Mubina Sheikh (WASMO, Ahmedabad), Kartikeya Sarabhai (Director, CEE), and Mahesh Pandya (Director, Paryavaran Mitra) for inputs and suggestions to refine the action plan.

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, 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.





# BRTS થી ઓફિસ કે BRTS થી ઘર હવે MYBYK પર

Drop & Pick at any Hub



DOWNLOAD, UNLOCK & RIDE

GET IT ON  
Google Play

Download on the  
App Store

TO KNOW MORE ☎ 7043 987 987

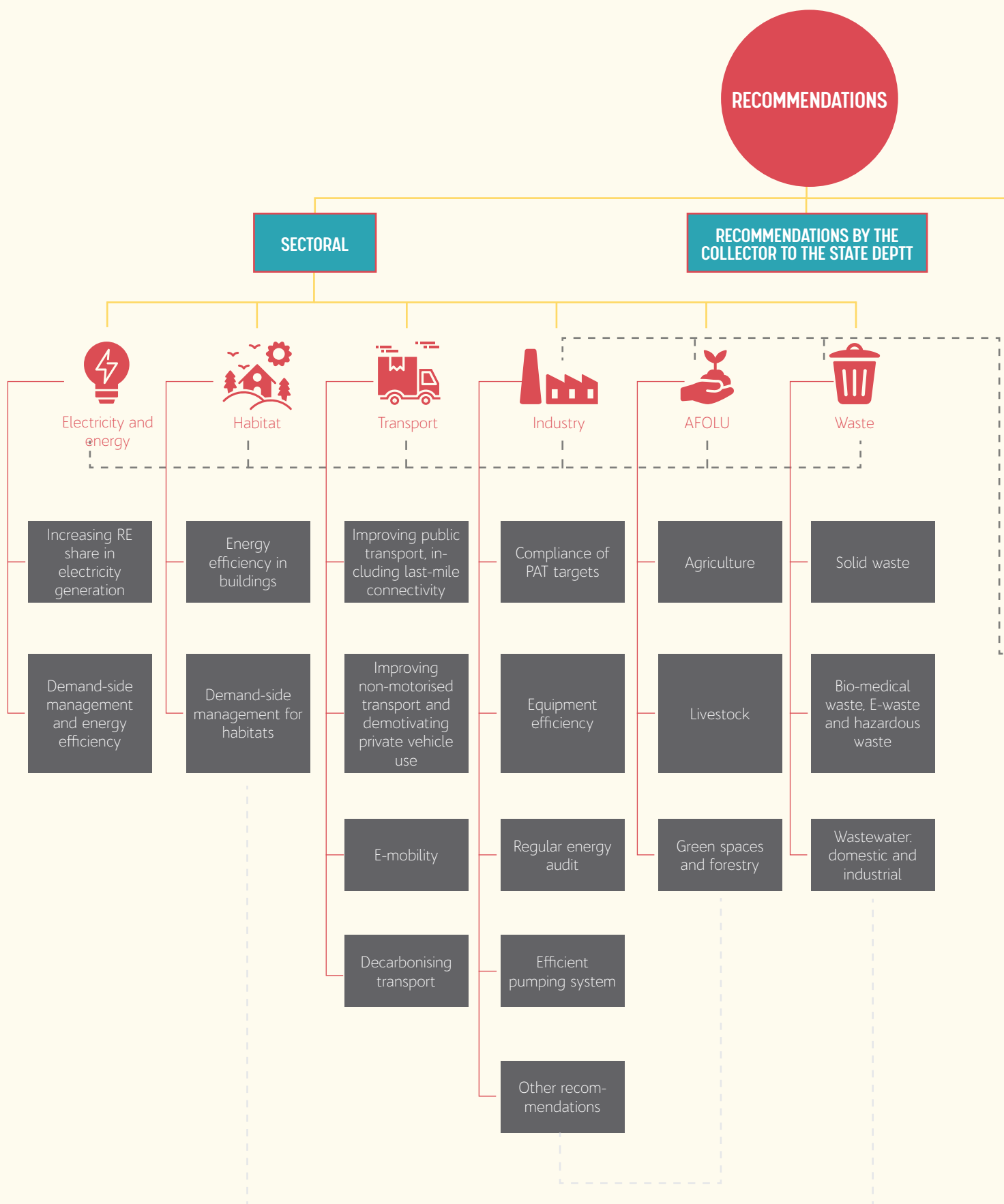




# RECOMMENDATIONS



















**Figure 1: Recommendations for CCEAP Ahmedabad**



## 6. 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.
- These 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 actions is provided along with the concerned primary and supporting departments in a 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.
- Sector-wise potential GHG mitigation of CCEAP recommendations for Ahmedabad district are:
  - a. 30,54,254 tCO<sub>2</sub>e from Energy recommendations (including power, habitats, transport and industries),
  - b. 13,66,129 tCO<sub>2</sub>e from AFOLU recommendations (agriculture, forestry and livestock),
  - c. 5,85,044 tCO<sub>2</sub>e from waste sector recommendations.
- 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)  Medium-term (commercial buildings)  Medium to long-term (residential and others)	Policy framework and RE targets exist. (section 6.1.1.1)  Need to create awareness in residential sector	India has a target of 40 GW for solar rooftop (2022). As of February 28, 2021, only 4.32GW has been achieved.  Gujarat has only 0.94GW (as of February 2021) of solar rooftop capacity.  Case example calculation: a) Just the government schools in Ahmedabad district, if equipped with solar rooftops, can generate 118 MUs of electricity, thereby avoiding 0.102 MtCO <sub>2e</sub> emissions, annually. b) Further, if 50% households are equipped with solar rooftops, total installed capacity will be 4,185 MW, which can help avoid 2.44 Mt CO <sub>2e</sub> emissions, annually.  Meeting the solar rooftop targets can be fast-paced by making it mandatory for hospitality industry/new construction (having a built-up area greater than 20,000 sq. ft) / private healthcare infrastructure (above certain bed-capacity).  Ground mounted solar: The current installed capacity of ground mounted solar in Gujarat stands at 3.11 GW (as of February 2021).  Ahmedabad district has a huge potential for solar power generation (rooftop and ground mounted).  In the highly urbanised and industrialised Ahmedabad city, solar rooftop installation can be promoted. For the remaining district, ground-mounted solar installations can be more viable.
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 batteries for a few solar projects and has proposed hybrid inverters for RE projects across Maharashtra. Hybrid inverters take power from battery/RE 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.







Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Encourage captive use of renewable energy, particularly, in rural areas for small industries and creation of local entrepreneurs.	 	Short to medium-term	<p>Policy framework exists</p> <p>Need to create awareness</p>	<p>By 2030, the electricity demand for Ahmedabad district is expected to be approximately 30,000 MUs annually. If all of this electricity demand were to be met from coal, it would cause around 25 Mt CO<sub>2</sub>e emissions, annually.</p> <p>Decentralised renewable energy (DRE) setups can power small/cottage industries, which in turn can play an important role in providing livelihoods in rural areas. Such setups would create new jobs and empower rural entrepreneurs.</p> <p>Cold storage and other rural non farm productive use appliances across the district can be powered by DRE. Such set-ups could also be used for reliable storage of vaccines besides farm produce.</p>

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Energy demand side management (DSM) and energy efficiency				
Encourage faster penetration of Street Lighting National Programme (SLNP). This would ensure that all street and public lighting fixtures are replaced with energy-efficient LED bulbs, prioritising premises and recreational areas of all government / public institutions.		Short-term	Policy framework and schemes exist	<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.</p> <p>SLNP had a national target of replacing 1.34 crore conventional street lamps with LED ones by March 2020. Till date, only 1.18 crore LED lamps have been installed.</p> <p>Replacement of the existing 1,31,281 conventional lamps in Ahmedabad district with LED lamps under SLNP can potentially avoid 64,286 tCO<sub>2</sub>e emissions, annually.</p>



Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
<p>Advanced metering infrastructure: Expedite installation of smart meters in collaboration with GUVNL in an effort to develop advanced metering Infrastructure (AMI).</p> <p>Smart meters, along with its associated IT infrastructure, would allow the DISCOM to 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 hours, etc.</p>	  	Short to medium-term	<p>Policy framework and targets exist (section 6.1.1.1)</p> <p>Need to create awareness</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>In Naroda (Ahmedabad), smart meters are being installed under the National Smart Grid Mission pilot project through UGVCL. This pilot project aims to cover 22,230 consumers.</p>
<p>Replace/upgrade existing inefficient pumping infrastructure with energy-efficient pumps/ solar pumps for supply of piped drinking water in both rural and urban pockets.</p>	 	Short to medium-term	<p>Relevant schemes and programmes can help achieve this (section 6.1.1.1)</p> <p>Inter-departmental collaboration.</p>	<p>GUDC 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>All the ULBs in Ahmedabad, in co-ordination with the relevant departments, can avail of the financial assistance/benefits under the scheme to make their systems energy-efficient.</p>

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
In agricultural sector, promote use of energy-efficient water pumps (provided by EESL), and solar pumps (through PM-KUSUM and SKY).	 	Short to medium-term	Policy framework exists (section 6.1.1.1)	According to BEE, agriculture can save 30-40% energy by adopting energy-efficient star-labelled pump sets.  Converting 50% of existing electricity/diesel operated tube-wells to solar can potentially reduce 24,288 tCO <sub>2</sub> e emissions annually.
Increase community awareness on and access to energy-efficient appliances and fixtures.  Provide additional incentives over and above existing schemes/programmes on energy efficient appliances.  (Other recommendations pertaining to energy efficiency are listed under sections: habitat, industry and other recommendations that can be made by Collector's office to the state departments)	 	Medium-term	Additional financial support can be created  Create awareness through dedicated IEC and long running campaigns	BSES Yamuna Power Ltd. (BYPL) launched an AC replacement scheme in Delhi with the objective of promoting energy efficiency among households. Under the programme, upfront rebate per air conditioner (BEE 5-star rated/inverter) was offered by BYPL to the consumer in exchange of their old non-star rated air conditioner.  UGVCL can implement a similar scheme in its area of supply.  The unutilised funds from the District Mineral Foundation (DMF) can render much-needed financial support (for subsidies to mining affected communities) to implement the scheme.


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




Sub-sectors	Policies and programmes <sup>1</sup> that can push forward the recommendation	Primary departments/agencies	Supporting departments/agencies
Increase RE share in electricity generation	<ol style="list-style-type: none"> <li>1) Gujarat Solar Power Policy, 2021</li> <li>2) Surya Urja Rooftop Yojana</li> <li>3) Policy for Development of Small-scale distributed solar projects, 2019</li> <li>4) Waste to Energy Policy, 2016</li> <li>5) National Solar Mission</li> <li>6) i-SMART Project</li> <li>7) PM KUSUM</li> <li>8) Surya-Shakti Kisan Yojana (SKY)</li> </ol>	<ol style="list-style-type: none"> <li>1) GEDA, GoG</li> <li>2) Energy and Petrochemicals Department, GoG</li> </ol>	<ol style="list-style-type: none"> <li>3) ALL ULBs</li> <li>4) Gujarat Electricity Regulatory Commission</li> <li>5) Rural Development Department, GoG</li> <li>6) Urban Development Department, GoG</li> <li>7) Climate Change Department, GoG</li> <li>8) Commissionerate of Cottage and Rural Industries</li> <li>9) GUVNL-UGVCL, GoG</li> <li>10) Department of Agriculture, GoG</li> <li>11) Proposed District level Committee on Climate Change and Environment</li> </ol>

<sup>1</sup> This column enlists information on policies, programmes, rules, schemes and other regulatory provisions pertaining to the sector


Sub-sectors	Policies and programmes <sup>1</sup> that can push forward the recommendation	Primary departments/agencies	Supporting 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 Kisan Yojana (SKY) 12) Gujarat Solar Power Policy, 2021 13) Policy for Development of Small-scale distributed solar projects, 2019	1) BEE (EESL) 2) GEDA, GoG 3) All ULBs 4) Panchayati Raj Institutions (PRIs) 5) Energy and Petrochemicals Department, GoG	1) Climate Change Department GoG 2) Department of Agriculture, GoG 3) District Mineral Foundation (DMF) 4) AUDA 5) Smart City Ahmedabad Development Limited (SCADL) 6) Proposed District level Committee on Climate Change and Environment












### 6.1.2 Habitat (urban and rural development): Recommendations, cross-cutting sectors, qualifying priority & 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 by-laws for all ULBs, as a pathway to buildings having net zero energy consumption.		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 are required	The residential and commercial sectors in Ahmedabad contribute around 24% of the total electricity consumed 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 could 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 to have a Cooling Action Plan, which seeks to:</p> <ul style="list-style-type: none"> <li>(a) Reduce cooling demand across sectors by 20% to 25% by 2037-38</li> <li>(b) Reduce refrigerant demand by 25% to 30% by 2037-38</li> <li>(c) Reduce cooling energy requirements by 25-40% by 2037-38</li> <li>(d) Recognise "cooling and related areas" as a thrust area of research under national S&amp;T programme</li> <li>(e) Training and certification of 100,000 servicing sector technicians by 2022-23, synergising with Skill India Mission.</li> </ul> <p>The plan aims to provide the following benefits (i) thermal comfort for all – provision for cooling for EWS and LIG housing, (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 Tec-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 60-85% of the energy used in conventional air conditioning.</p>
Replace diesel-powered backup with RE-powered backup in a phased manner. This can essentially be promoted in government / commercial / institutional buildings with built-up area >20,000 sqft.		<p>Short to medium-term (govt. 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>186 entities in Ahmedabad district use DG sets as power backup,</p> <p>If 50% of the DG sets are replaced with solar-powered backup of the same capacity, 43,680 tCO<sub>2</sub>e 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>		Medium-term	<p>Deploying public funding schemes like feed-in tariffs, leverage national and international funds</p> <p>Providing digital upskilling opportunities to citizens can help promoting the initiative.</p>	
<p>Upgrade public transport infrastructure 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 bye-laws</p>	Ahmedabad district can implement initiatives similar to the one in Lucknow, where the municipal corporation has said it would set up 200 solar-powered bus stops.
<p>Encourage fast penetration of UJALA scheme in every household of Ahmedabad district.</p>		Short to medium-term	<p>Schemes and programmes are available (section 6.1.2.1)</p>	<p>The UJALA scheme provides an LED bulb at a nominal price for replacement of incandescent lamps /conventional bulbs. By 2030, the UJALA scheme can potentially avoid emissions of 0.38 MtCO<sub>2</sub>e annually.</p>




Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
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 not only provides accommodation to more people per sq. m of space, but also averts loss of agricultural land and open spaces. It makes transport mechanism far more efficient.
Enhance public awareness towards energy-efficient BEE star-labelled home appliances.	 	Short-term and continuous	Needs collaborations and awareness	
Demand side management				
Promote and subsidise good practices for all ULBs, such as installing rainwater harvesting setups in buildings that can considerably reduce energy dependence on submersible motors for groundwater pumping.	  	Short-term	<p>Schemes and programmes exist (section 6.1.2.1)</p> <p>Awareness generation required</p>	According to the Comprehensive General Development Plan (2017) of AUDA, rainwater harvesting is mandatory for all buildings with ground coverage of 80 sq. m and above.
Implement individual water metering in residential sector to reduce water wastage, thereby bringing down energy consumption.	  	Medium-term	<p>Policy intervention is required</p> <p>Need to create awareness</p>	<p>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.</p> <p>Since 2016, around 2,800 'building use' permissions have been given in Ahmedabad to societies on the condition that they install water meters.</p> <p>Sixteen apartments in Mantri Residency, Bengaluru, installed with water meters, are consuming 25-30% less water every year.</p>










Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Encourage residential societies to adopt solar-thermal water heaters.	 	Short-term and continuous	<p>Schemes and programmes exist (section 6.1.2.1)</p> <p>Inter-departmental collaboration required</p> <p>Scheme to be implemented as a part of green buildings</p>	Multi-storey (up to 12 storeys) residential buildings can meet around 70% of the annual electricity requirement for water heating (BEE) through community solar water heating systems (assuming utilisation of 60% roof area).
Promote installation of automatic/smart water pumps to control overflowing of tanks.			Need to create awareness	
Water cess by municipal corporation to be revised and gradually increased.		Short-term	Policy framework to be revised	
<p>Digital tools, like, GIS, remote sensing can be used to identify opportunities to reduce energy demand as well as where energy efficiency interventions hold the most value, and 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.</p> <p>Digital tools can also help to identify where energy efficiency interventions hold the most value, and 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.</p>	 	Medium to long-term	Needs policy intervention and infrastructural development	By identifying optimal locations for water features or vegetation, Ahmedabad 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	<ol style="list-style-type: none"> <li>1) ECBC 2017</li> <li>2) India Cooling Action Plan, 2019</li> <li>3) UJALA Scheme, 2015</li> <li>4) Gujarat Solar Power Policy, 2021</li> <li>5) Surya Urja Rooftop Yojana</li> <li>6) Policy for Development of Small-scale distributed solar projects, 2019</li> <li>7) Smart Cities Mission</li> <li>8) Sustainable Habitat Mission</li> </ol>	<ol style="list-style-type: none"> <li>1) Urban Development and Urban Housing Department, GoG</li> <li>2) All ULBs</li> <li>3) Smart City Ahmedabad Development Limited.</li> <li>4) Panchayati Raj Institutions (PRIs)</li> </ol>	<ol style="list-style-type: none"> <li>1) GEDA, GoG</li> <li>2) BEE (EESL)</li> <li>3) Rural Development Department</li> <li>4) Road and Building Department</li> <li>5) Ports and Transport Department/GSRTC</li> <li>6) Proposed District level Committee on Climate Change and Environment</li> </ol>
Demand-side management	<ol style="list-style-type: none"> <li>1) Gujarat Domestic Water Supply Protection Bill, 2019</li> <li>2) ECBC</li> <li>3) Building by laws</li> <li>4) Comprehensive General Development Control Regulations, Urban Development and Urban Housing Development, Government of Gujarat.</li> </ol>	<ol style="list-style-type: none"> <li>1) Urban Development and Urban Housing Department, GoG</li> <li>2) All ULBs</li> <li>3) Rural Development Department</li> <li>4) Panchayati Raj Institutions (PRIs)</li> </ol>	<ol style="list-style-type: none"> <li>1) AUDA</li> <li>2) Gujarat Water Supply and Sewerage Board.</li> <li>3) Smart City Ahmedabad Development Limited</li> <li>4) Proposed district-level committee on climate change and environment</li> </ol>

### 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 disseminate information to encourage adoption of electric vehicles.		Short-term and continuous	Inter-departmental collaboration and dedicated long-running campaigns required	
Increase 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 can be made available through various schemes	In January 2020, the Gujarat government announced it will be installing charging stations at multi-level parking lots and public places across the state.
Make all public transport (PT) modes low carbon intensive, such as shifting current fossil fuel-based vehicles to electric powered or hybrid vehicles.		Medium to long-term	Policy framework (section 6.1.3.1) and budgetary provisions exist	Ahmedabad aims to become the first Indian city to convert its entire fleet of public transport buses into e-vehicles. The first phase of this endeavour was launched with the procurement of 19 EVs.  In 2019, Gujarat announced that 500 electric buses will be procured in Ahmedabad. Till March 2019, Ahmedabad had procured 350 e-buses.













Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
<p>Similarly, initiate transition of intermediate public transport (IPT) vehicles to electric by incentivising IPT operators through:</p> <ul style="list-style-type: none"> <li>a) subsidies</li> <li>b) separate lanes</li> <li>c) dedicated parking spaces</li> <li>d) Replacement of lead acid battery-powered electric IPT vehicles with more sustainable Li-ion battery e-vehicles in a phased manner.</li> </ul>	   	Medium-term	Policy framework exists (section 6.1.3.1)	At present, subsidies are being provided in Gujarat for Li-ion battery-operated rickshaw of ₹10,000, bringing the cost to approximately ₹40,000. However, lead-acid battery-based vehicles are still cheaper, costing around ₹30,000.
<p>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.</p>	 	Short to medium-term	Needs policy backing	The Gujarat EV Policy 2021 has recommended all government office parking areas to mandate installation of 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.
<p>Develop robust and widespread charging infrastructure.</p> <ul style="list-style-type: none"> <li>a) Charging infrastructure to be created at strategic locations – commercial hubs, public parking, airports and railway stations etc, preferably RE powered.</li> <li>b) Adoption of relevant policies.</li> <li>c) Prioritise land acquisition for setting up charging infrastructure.</li> <li>d) Dedicated parking spaces for EVs should be introduced with charging facilities.</li> <li>e) Restaurants and commercial spaces on highways can be incentivised to install charging infrastructure for e-vehicles to make long journeys with e-vehicles hassle-free.</li> <li>f) 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.</li> </ul>	  	Medium-term	<p>Policy framework exists (section 6.1.3.1)</p> <p>Inter-departmental collaboration required</p>	Energy Efficiency Services Limited (EESL) and Ahmedabad Municipal Corporation (AMC) have partnered to establish infrastructure for electric vehicles (EV) in Ahmedabad city over a 10-year period. They plan to establish 100 charging stations to promote renting and purchase of electric vehicles. AMC is expected to save over 4.46 tonnes of CO <sub>2</sub> emissions per EV per year.












Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
<p>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:</p> <p>a) exemptions on road tax</p> <p>b) exclusive parking</p> <p>c) continuation of the existing subsidy scheme for women and students</p>	 	Short-term	Some policy framework exists, needs to be enhanced towards holistic integration of e-vehicles in the district transport regime	The government of Gujarat is already providing subsidies of up to ₹ 12,000 (to students and women) to purchase electric two-wheeler, and a subsidy of ₹ 42,000 for e-autos.
Promote fast registration of EVs at RTO		Short-term	Existing policy framework can be enhanced	Gujarat EV Policy, 2021 has provisions to incentivize adoption of EVs in the state. Further enhancing the policy, by including other market mechanisms as incentives, can promote faster registration.
Encourage development of local network of rental e-vehicles across the district 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 and PP models to be explored	In Dec 2019, AMC made 500 electric scooters available for rent for limited hours 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	Currently, most delivery partners for food, courier and other kinds of services rely on self-owned fossil fuel-based two- or four-wheelers. In cities like Delhi, Mumbai and Bengaluru, e-commerce food delivery companies such as Zomato are working towards developing an EV fleet. Others can follow in suit.
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 identify charging points.		Medium to long-term	Needs support for digitalisation	



Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Smart lampposts can radically improve electrical efficiency and enable a number of new services, like, being equipped with PV modules to harvest and store solar energy during the day to power lighting at night and 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	
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> <ul style="list-style-type: none"> <li>a) Integrated ticketing and smart cards that works across all transport modes (IPT, cycle hire, etc) and tourist sites</li> <li>b) Integrating smart mobility applications with real-time service updates across modes, including car hire, public transit and shared micromobility schemes</li> <li>c) Increasing fleet strength</li> <li>d) Increasing frequency of PT</li> <li>e) Adding more stops</li> <li>f) Enhanced reach to low or non-served areas of peri-urban and rural areas</li> <li>g) Developing dedicated parking spaces for IPT.</li> </ul>	   	Medium to long-term	<p>Existing policy framework can be enhanced</p> <p>Interdepartmental collaboration required</p>	<p>Janmitra Card has been introduced by AMC for BRTS, AMTS, some tourist site entries, parking, property tax payments etc.</p> <p>Peri-urban areas are currently connected through GSRTC services. The frequency of services can be enhanced, as well as AMTS services can also be expanded to these areas.</p> <p>AMTS bus network covers 549 km, 187 routes, covering 92% of the city.</p> <p>BRTS network covers 19% of the city through its 12 routes, spanning 89 km.</p> <p>Metro network is currently operational for 6.5 km. Phase I stretch is planned to be 4003 km, while Phase II is planned to be 28.26 km.</p> <p>The IPT sector is predominantly informal and connectivity is limited to certain popular routes. The informal IPT modes operating in the peri-urban areas include shared autos, omni vans and jeeps. Residents in city outskirts/ peri-urban areas still rely on private vehicles or walking.</p>
District administration can collaborate with ULBs to develop fiscal measures to discourage the use of personal vehicles like variable parking charges for peak hours.	  	Short-term and continuous	Requires policy framework based on research and interdepartmental cooperation	

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Implement policy measures to discourage use of private vehicles a) Parking policy for vehicle ownership b) No car days on certain roads c) Parking allowed only in dedicated areas.	 	Short to medium-term	Policy framework required  Needs research and interdepartmental collaboration	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 (section 6.1.3.1) Stricter implementation required	
Awareness campaigns to popularise PT and IPT modes.		Short-term and continuous	Dedicated awareness campaigns required	
Augment non-motorised transport (NMT)				
Improve infrastructure to increase modal share of NMT transport in urban areas, such as by introduction of segregated cycle lanes.	 	Medium-term	Requires policy based on research and inter-departmental cooperation	Current modal split in Ahmedabad indicates that the share of NMT is approximately 34%. However, over the years, there has been a downward trend. Efforts need to be made to make NMT a preferred and viable option.
Regular O&M of NMT infrastructure: a) Developing and maintaining well-lit, clean and safe pathways for pedestrians and cyclists. b) Consulting and engaging local experts and community for development and maintenance. c) remove encroachments.	   	Short-term and continuous	Policy framework exists (section 6.1.3.1) Requires inter-departmental cooperation	
Promote cycle hire services in key locations across the district.	 	Short-term	Policy framework needs to be enhanced Further, PPP models can be explored for successful implementation.	'Amdabike' is SCADL's flagship project of public bike share system for Ahmedabad city. The services will be available at all BRTS bus stops in the western part of the city and will be connected to various colleges, offices and residential complexes, malls, lakes, gardens, etc within the vicinity. 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	Needs proper policy formulation, research, multi-stakeholder and inter-departmental cooperation	Ahmedabad district can adopt the following best practices to minimise congestion at peak hours.  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. Similar shifts have been planned in Bangalore.
a) Create additional dedicated parking zones for vehicles to deter encroachment of road space and pavements.  b) Encourage business/corporate centres to have mandatory private parking with sufficient slots to avoid parking in public spaces.	 	a) Medium-term  b) Short-term and continuous	Policy framework exists  Multi stakeholder and inter-departmental cooperation is required	Ahmedabad has multi-level parking spaces. However, since awareness is low, utilisation is poor. Municipal corporations and district authorities need to work towards building awareness and encouraging use of parking facilities.
Develop dedicated areas for street vendors in order to deter encroachment of pavements by them and avoid traffic congestion on roadsides.	 	Short to medium-term	While the policy framework exists, implementation is irregular and for short timeframes  Multi-stakeholder and inter-departmental cooperation is required	There are regular drives by the AMC and the city plans to clear encroachments. However, these 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 are 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"> <li>1) FAME II</li> <li>2) Gujarat EV Policy, 2021</li> <li>3) JNNURM</li> <li>4) National Electric Mobility Mission Plan</li> <li>5) Smart Cities Mission</li> <li>6) AMRUT</li> <li>7) Proposed e-vehicle Policy (as per 2021-22 union budget)</li> <li>8) National Urban Transport Policy, 2006</li> </ol>	<ol style="list-style-type: none"> <li>1) All ULBs</li> <li>2) RTOs (Ahmedabad, Bavala and Vastral)</li> <li>3) EESL</li> </ol>	<ol style="list-style-type: none"> <li>1) Urban Development and Urban Housing Department, GoG</li> <li>2) GEDA</li> <li>3) Transport Department GoG</li> <li>4) Roads and Buildings Department, GoG</li> <li>5) Climate Change Department, GoG</li> <li>6) Rural Development Department GoG</li> <li>7) Proposed district-level committee on climate change and environment</li> <li>8) AUDA</li> <li>9) Smart City Ahmedabad Development Limited</li> <li>10) PRIs</li> <li>11) Airport Authority</li> <li>12) Western Railways – Ahmedabad Division</li> </ol>
Public transport and intermediate public transport	<ol style="list-style-type: none"> <li>1) BRTS</li> <li>2) JNNURM</li> <li>3) ECBC</li> <li>4) Smart Cities Mission</li> <li>5) AMRUT</li> <li>6) National Urban Transport Policy, 2006</li> </ol>	<ol style="list-style-type: none"> <li>1) All ULBs</li> <li>2) Smart City Ahmedabad Develop Limited</li> <li>3) GSRTC</li> <li>4) GMRC</li> </ol>	<ol style="list-style-type: none"> <li>1) Urban Development and Urban Housing Department, GoG;</li> <li>2) Transport Department, GoG</li> <li>3) RTOs (Ahmedabad, Bavala and Vastral)</li> <li>4) Roads and Buildings Department, GoG</li> <li>5) Climate Change Department, GoG</li> <li>6) Rural Development Department, GoG</li> <li>7) GEDA</li> <li>8) AUDA</li> <li>9) Proposed District level Committee on Climate Change and Environment</li> </ol>
Augment non-motorised transport	<ol style="list-style-type: none"> <li>1) Smart Cities Mission</li> <li>2) AMRUT</li> <li>3) National Urban Transport Policy, 2006</li> </ol>	<ol style="list-style-type: none"> <li>1) All ULBs</li> <li>2) AUDA</li> <li>3) Smart City Ahmedabad Develop Limited;</li> </ol>	<ol style="list-style-type: none"> <li>1) Urban Development &amp; Urban Housing Department, GoG;</li> <li>2) Roads and Buildings Department, GoG;</li> <li>3) Climate Change Department, GoG</li> <li>4) Rural Development Department, GoG</li> <li>5) Proposed District level Committee on Climate Change and Environment</li> <li>6) PRIs</li> <li>7) GEDA</li> <li>8) Police Department</li> </ol>
Improving traffic flow	<ol style="list-style-type: none"> <li>1) BRTS</li> <li>2) JNNURM</li> <li>3) ECBC</li> <li>4) Smart Cities Mission</li> <li>5) AMRUT</li> <li>6) National Urban Transport Policy, 2006</li> </ol>	<ol style="list-style-type: none"> <li>1) All ULBs</li> <li>2) AUDA</li> <li>3) Smart City Ahmedabad Develop Limited</li> <li>4) RTOs</li> </ol>	<ol style="list-style-type: none"> <li>1) Urban Development &amp; Urban Housing Department, GoG;</li> <li>2) Roads and Buildings Department, GoG;</li> <li>3) Gujarat Infrastructure Development Board (GIDB)</li> <li>4) Climate Change Department, GoG</li> <li>5) Rural Development Department, GoG</li> <li>6) Proposed District level Committee on Climate Change and Environment</li> <li>7) Police Department</li> <li>8) Department of Industries</li> <li>9) PRIs</li> <li>10) GIDC</li> </ol>






### 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	
District can develop an incentive system, similar to a 'cap-and-trade' system at district level for enhancing energy efficiency of MSMEs, in coordination with the state energy department.		Medium-term	Requires 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 Need to create awareness to popularize the initiative	CHP systems can achieve system efficiencies close to 80% as compared to around 60% by conventional technologies.
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)	Gujarat Industrial Policy 2020 focusses on:  a) Strengthening the regulation and environmental compliance. 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. For implementation of cleaner production technologies, MSMEs can get assistance of up to 35% of cost of plant and machinery, with a ceiling of ₹ 35 lakh during the operative period of the scheme. Similarly, purchase of new equipment/system related safety, occupational health or for environment compliances for common use of industries located in cluster also get assistance up to 35% of cost of equipment, up to a maximum of ₹ 35 lakh. 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). d) Industrial buildings with green rating under Indian Green Building Council to be granted 50% exemption on consulting charges (up to ₹ 2.5 lakh) e) Encouraging existing industries to shift their units outside the urban agglomerations
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 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 is required for successful implementation	
Create appropriate district-level rules to enable and encourage industries to use recycled water from their plants rather than freshwater.	 	Short term	Policy framework exists. However, it needs to be upgraded in collaboration with 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"> <li>1) Gujarat Industrial Policy, 2020</li> <li>2) Gujarat Solar Policy, 2021</li> <li>3) National Mission on Enhanced Energy Efficiency</li> <li>4) Reuse of Treated Waste Water Policy, 2018 (GoG)</li> </ol>	<ol style="list-style-type: none"> <li>1) Industries and Mines Department, GoG</li> </ol>	<ol style="list-style-type: none"> <li>1) Industries Commissionerate</li> <li>2) Gujarat Industrial Development Corporation</li> <li>3) Gujarat Industrial Investment Corporation</li> <li>4) Energy and Petrochemicals Department, GoG</li> <li>5) District Industries Centre</li> <li>6) GIDC</li> <li>7) BEE</li> <li>8) GEDA</li> <li>9) GUVNL-UGVCL</li> <li>10) Proposed District level Committee on Climate Change and Environment</li> </ol>










#### 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 practices and programmes, like use of non-chemical fertilisers and 'zero budget natural farming' in the district.	  	Short to medium-term	Policy framework exists (section 6.1.5.1)  Budgetary provisions are available	<p>In 2017-18, Ahmedabad used approximately 1.3 lakh tonnes of urea in agriculture. Replacement of 10% of this current urea consumption with non-chemical fertilisers can help avoid 9,832 tonnes of CO<sub>2</sub>e emissions/ annum.</p> <p>This initiative will also contribute to:</p> <p>a) cutting down 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)</p> <p>b) lessen harmful agricultural run-off, thereby, reducing water pollution and eutrophication.</p>

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
<p>Promote adoption of alternative ways of managing crop residue, other than burning.</p> <p>Promote adoption of improved harvesting practices, like 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 such as paper, cardboard, furniture, organic fertiliser and animal fodder; which will act as an alternative source of income for the farmers.</p>	  	Short to medium-term	<p>Policy framework required</p> <p>Collaboration required</p> <p>Farmers to have easy access to markets/industries that would take crop residue/stubble</p> <p>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>	<p>Improved harvesting practices, such as the use of Happy Seeder, has the capacity to eliminate 78% of the GHG emissions (from crop residue burning). It can potentially increase farmers' profits by at least 10%. Feasibility studies may be undertaken for cost-benefit analysis to support the farmers with such improved harvesting machines and practices. Direct sowing of rice reduces the 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>
Farmers should be encouraged to follow the recommendation given in Soil Health Card Scheme.		Short to medium-term	Can be implemented by generating awareness	<p>According to the 'Soil Health Card' portal, 16,84,207 samples have been tested in Cycle-II in Gujarat. In Ahmedabad, 83% of the soil samples tested have reported very low nitrogen and 24% of them have reported very low phosphorus and potassium, as per the Soil Health Card information shared by the GoI.</p>
Promotion of 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>The district may consider to provide additional subsidies</p>	<p>Currently, Gujarat holds 12% of the total area under micro irrigation in India.<sup>2</sup> In Gujarat, all farmers – irrespective of social status, landholding, crops, and geographical location – are entitled to a 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, 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.<sup>3</sup></p> <p>According to PMKSY Achievement Report, 924 ha of land was covered under MI in Ahmedabad during 2019-20, which should have led to avoidance of approximately 781 tonnes of CO<sub>2</sub> emissions (due to savings in electricity consumption)</p>

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





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

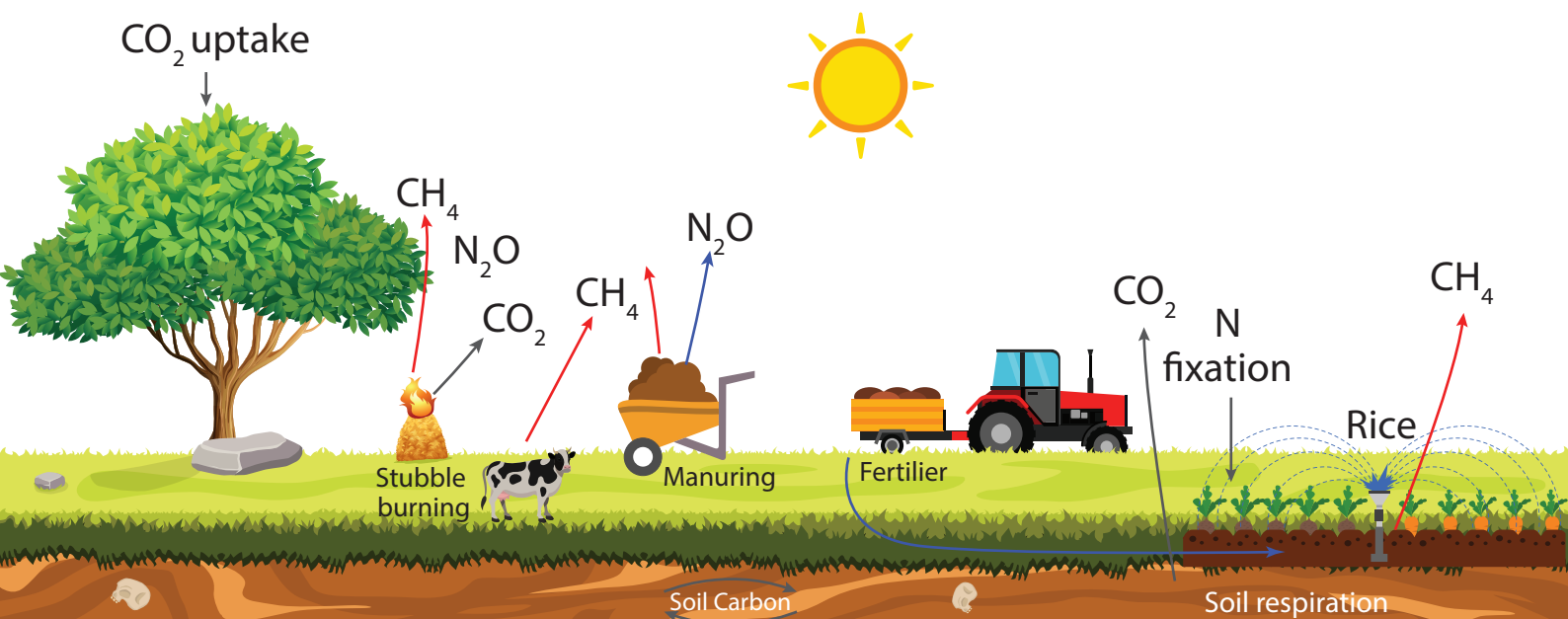
Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
<p>Encourage adoption of latest technologies, like:</p> <p>a) Solar pumps (under PM KUSUM Yojana and SKY)</p> <p>b) Star-rated energy efficient pump system (EEPS)</p> <p>c) Smart control panels and internet of things-based systems for optimum resource utilisation (water and energy).</p>	   	Short to medium-term	<p>Policy framework is available (section 6.1.5.1)</p> <p>Capital investment support, over and above the existing policy, can be considered</p>	<p>In 2018, GoG launched Suryashakti Kisan Yojana (SKY) with the objective of doubling 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 five 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 CO<sub>2</sub> emissions.</p> <p>These initiatives will increase farmers' income, provide reliable source for irrigation and reduce dependence on diesel in the farm sector.</p>
Enhance the efficiency/network of cold storage systems and initiate a gradual shift to RE-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%.<sup>4</sup></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 specie leads to better productivity and 30% reduction in emission.</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 Ahmedabad at the district level.<sup>5</sup></p>








<sup>4</sup> Earagariyanna MY. et. al, 2017, Fodder Resource Management in India-Critical Analysis







<sup>5</sup> <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	
<p>Promote cattle breeds with higher productivity. Productivity of indigenous cattle should also be improved (eg. through provision of Nand Ghars).</p> <p>However, the balance between resilience and productivity should be maintained. Currently, in most areas flock sizes are negatively impacting the climate and ecology.</p>		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>Awareness generation</p> <p>Monetary support to the pastoral community required</p>	<p>These initiatives will help meet growing demand of milk, while keeping the livestock headcount low. In Ahmedabad, a 10% decrease in the number of indigenous cattle over a period of five years, the loss in milk production will be 30 lakh litres and 1,86,752 tonnes of CO<sub>2</sub>e emission will be avoided. To compensate for this loss in milk production, a total of 1,88,518 new crossbred cattle would be needed, which will lead to 1,70,268 tonnes CO<sub>2</sub>e emissions. The net emissions avoided per year would be approximately 3,296.92 tonnes CO<sub>2</sub>e.</p>
<p>Promote use of waste from livestock and poultry as an important source of organic manure for various crops, such as, sugarcane, potato etc. for enhancing crop production.</p>	 	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>	<p>Poultry manure fertiliser is rich in nitrogen and contains all 13 essentials nutrients required for crop production. In comparison to cow manure, it is two to three times richer in inorganic fertiliser content.</p>
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</p>	<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.</p>



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 Ahmedabad</p> <p>a) Setting up of urban parks</p> <p>b) Adopting Miyawaki Urban Forestry method</p> <p>c) Transplanting trees with the help of tree transplanter 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) Plantation along village roads can be taken up under MGNREGS</p> <p>g) Development of green belt along the major terrain roads and surrounding the industrial areas</p> <p>h) Making the Tree Census data available to the public.</p>	  	Medium to long-term	<p>Policy framework is available (section 6.1.5.1)</p> <p>Requires capital investment</p> <p>Research collaboration and inter-departmental cooperation are required</p>	<p>As per the FSI report 2019, Gujarat has 11,984 sq km of 'trees outside the forest', which includes forest cover outside the recorded forest area/ green wash and tree cover.</p> <p>Miyawaki Urban Forestry method has reported 15% faster growth per year compared to other reforestation methods. Oxygen Park has been developed by adopting Miyawaki method in the Science City on Ahmedabad-Gandhinagar highway.</p> <p>Green belts help mitigate air pollution, increase urban green cover, thereby leading to carbon sequestration.</p> <p>The Tree Census reports of Gujarat are in public domain only till 2013.</p>
<p>Enhance forest cover by promoting agro-forestry and social forestry to increase forest biomass and soil moisture.</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 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 (Ficus religiosa), neem (Azadirachta indica), 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>Currently, the forest area in Ahmedabad district is only 1.62% of its total geographical area. If 7% of its geographical area (equivalent to state average forest cover) is converted to green cover, over a period of 10 years, 8.47 million tonnes of CO<sub>2</sub> emissions can be avoided.</p> <p>Ahmedabad has 'poor tree density' i.e., below 10 trees/ha as the tree cover has not improved due to development works.</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 the trees, post plantation.</p> <p>a) Undertake thorough study on the suitability of the site and survival ratio of species (majorly native species) before initiating any plantation drive</p> <p>b) Prepare an audit every year on the number of saplings that survive 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 is needed</p>	The current survival ratio of the plantation drives is 30-40% within AMC and is lower outside the AMC limits.
<p>Promote regeneration of degraded and open forest areas by developing awareness among locals on the importance of green spaces.</p>	  	Long-term	<p>Strengthen the existing policy framework</p> <p>Needs collaboration among different stakeholders</p>	In Ahmedabad circle, 1,181 ha area is under Concentrated Regeneration (as per the Annual Administration Report, Forest Dept., GoG)
<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 programs 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>	

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>Undertake research on flora specific to the region</p> <p>Exclusive communication strategy and IEC materials to be developed and used</p> <p>Requires funding, monitoring and evaluation, stakeholder collaboration</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.<sup>6</sup></p>
<p>Develop participatory forest fire management strategies such as:</p> <p>a) Collecting baseline forest fire data in respect to perceptions, beliefs, expectations and behaviour of local people with regard 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 capacities to develop an early warning system.</p>		Medium to long-term	<p>Provisions of monetary support</p> <p>Exclusive communication strategy and Information, Education and Communication (IEC) material to be developed and used</p> <p>Monitoring and evaluation required</p> <p>Requires collaboration among different stakeholders</p>	<p>According to FSI Report, 2019, about 6.39% of the total forest cover in Gujarat is categorised as high to extremely fire prone.</p>







<sup>6</sup> Solanki HA, 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"> <li>1) Rashtriya Krishi Vikas Yojana: Remunerative Approaches for Agriculture and Allied Sector Rejuvenation (RAFTAAR)</li> <li>2) National Mission for Sustainable Agriculture</li> <li>3) Pradhan Mantri Krishi Sinchayee Yojana</li> <li>4) PM KUSUM Yojana</li> <li>5) Soil Health Card</li> <li>6) National Mission on Food Security</li> <li>7) National Mission on Micro-irrigation</li> <li>8) Price Support Scheme</li> <li>9) AGR 2 (Farm Mechanisation) scheme of farmers other than SC/ST</li> <li>10) National Policy for Crop Residue Management</li> <li>11) Suryashakti Kisan Yojana</li> <li>12) Dinkar Yojana</li> </ol>	Agriculture, Farmers' Welfare and Co-operation Department, Government of Gujarat	<ol style="list-style-type: none"> <li>1) Gujarat Green Revolution Company (GGRC)</li> <li>2) Rural Development Department, GoG</li> <li>3) Irrigation Department, GoG</li> <li>4) Energy and Petrochemicals Department, GoG</li> <li>5) GEDA</li> <li>6) Animal Husbandry Co-operation</li> <li>7) Gujarat Water Resource Development Corporation (GWRDC)</li> <li>8) Climate Change Department (for reporting), GoG</li> <li>9) Forests and Environment Department, GoG</li> <li>10) GNFC, GSFC</li> <li>11) Commissionerate for Cottage and Rural Industries</li> <li>12) Gujarat Agro Industries Corporation (GAIC)</li> <li>13) Anand Agriculture University</li> <li>14) APMCs</li> <li>15) Proposed District level Committee on Climate Change and Environment</li> <li>16) Gujarat Urja Vikas Nigam Limited (GUVNL)</li> </ol>
Livestock	<ol style="list-style-type: none"> <li>1) National Livestock Mission</li> <li>2) Rashtriya Gokul Mission</li> <li>3) Kisan Credit Cards to Livestock farmers</li> <li>4) National Programme for Dairy Development</li> <li>5) Livestock Health and Disease Control</li> <li>6) National Programme for Dairy Development</li> <li>7) Intensive Cattle Development Programme</li> <li>8) National Mission on Food Security</li> <li>9) Rashtriya Krishi Vikas Yojana</li> </ol>	Animal Husbandry Department, GoG	<ol style="list-style-type: none"> <li>1) Forests and Environment Department, GoG</li> <li>2) Agriculture, Farmers' Welfare and Co-operation Department, GoG</li> <li>3) Climate Change Department, GoG</li> </ol>
Forestry and Green Spaces	<ol style="list-style-type: none"> <li>1) National Afforestation Programme (NAP)</li> <li>2) Project Tiger</li> <li>3) Compensatory Afforestation Fund Management and Planning Authority (CAMPA)</li> <li>4) Green India Mission (GIM)</li> <li>5) Integrated Development of Wildlife Habitat (IDWH)</li> <li>6) Intensification of Forest Management Scheme (IFMS)</li> <li>7) Pradhan Mantri Ujjwala Yojana</li> </ol>	Gujarat Forest & Environment Department, GoG	<ol style="list-style-type: none"> <li>1) Agriculture, Farmers' Welfare and Co-operation Department, GoG</li> <li>2) Climate Change Department, GoG</li> <li>3) All ULBs (AMC + other Municipalities)</li> <li>4) AUDA</li> <li>5) Industries &amp; Mines Department, GoG</li> <li>6) UDD &amp; RDD</li> <li>7) All PRIs</li> </ol>






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

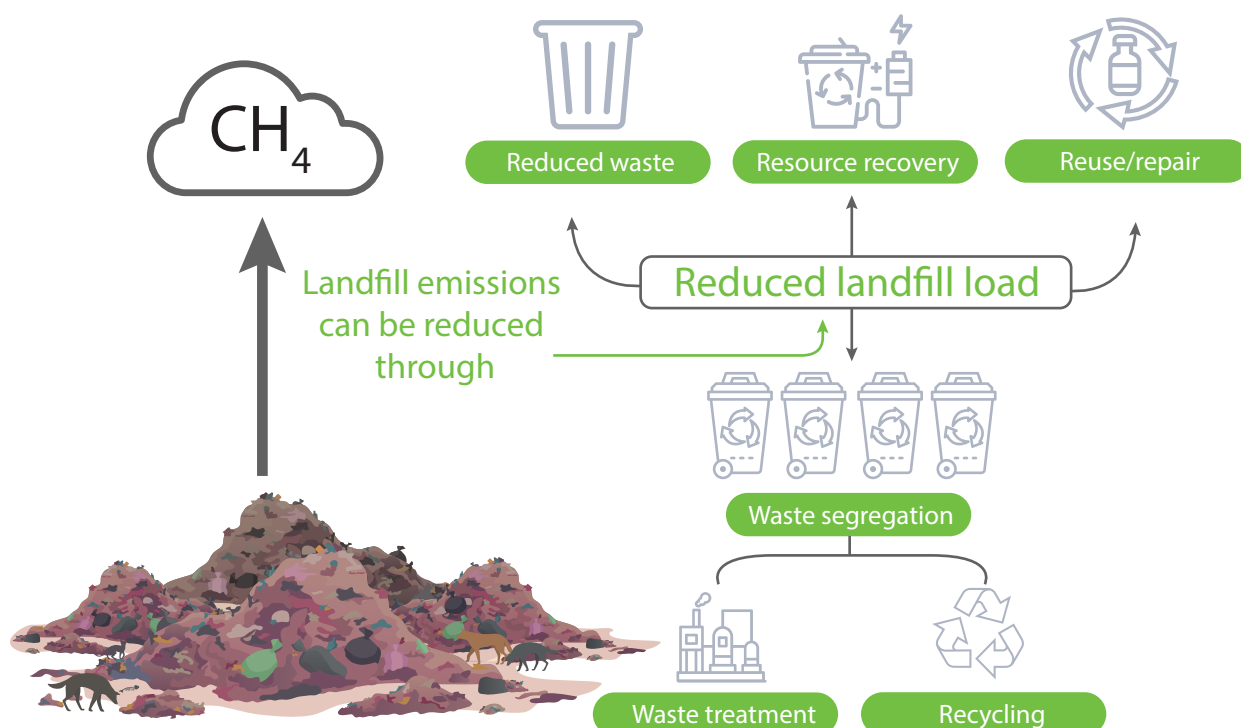
Recommendations	Cross-cutting with	Qualifying priority		District scenario/ case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Solid waste				
Waste prevention: Reducing Landfilling				
<p>Minimise landfill waste disposal by:</p> <p>a) Promoting waste reduction at source through measures such as product reuse, lifetime extension (maximum use of resources) and putting in place consumers' 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 that do not segregate waste</p> <p>c) Ensuring and maximising recycling, recovery, optimum resources utilisation throughout the 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) Needs policy intervention, awareness generation, incentivisation</p> <p>b) Policy framework exists (section 6.1.6.1);</p> <p>c) and d) Need policy intervention and execution (Resource Efficiency Policy drafted by NITI Aayog but not implemented as of now)</p>	<p>Landfills are one of the largest anthropogenic source of methane emissions contributing to 11% of all global CH<sub>4</sub> emissions. Hence, reducing landfill load and emissions is critical in achieving India's NDCs. Here are some initiatives adopted by Ahmedabad (mostly the city area) which can be undertaken for the district as well:</p> <p>Waste collection efficiency is reported to be 100% within AMC.</p> <p>AMC has an SWM Master Plan (2031) for becoming a 'zero waste' city.</p> <p>AMC has a waste to energy (W2E) plant functioning with 1000 TPD waste to 14 MW energy capacity, another W2E plant is coming up at Pirana with a capacity of converting 1000 TPD waste to 11 MW energy.</p> <p>AMC has initiated a biomining project at the Pirana dumping ground with 36 trommels installed currently, each having 300 TPD waste processing capacity since 2019. This will reduce the landfill legacy waste and emissions.</p> <p>A compressed biogas plant is also being set up in Ahmedabad.</p>

Recommendations	Cross-cutting with	Qualifying priority		District scenario/ case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Minimise single use plastic (SUP): detailed information and recommendations on SUP are given in section 6.1.6.2.	 	Short to medium-term	Already a national priority Policy framework exists (section 6.1.6.2)	Disposable SW take-back has not been implemented in Gujarat as of now.  25% of the total waste generated in Ahmedabad is inert waste and 23% is paper waste, and much of this can be treated/ recycled, resulting in a huge landfill waste reduction.  Currently, 300 TPD construction and demolition (C&D) waste is being treated in AMC.
Implementing producers (manufacturer/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, like 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 MSW Rules (2016) District level policy formulation and interventions required	
Ensure 100% recycling of recyclables at landfill through material recycling facilities (MRFs), refuse derived fuel (RDF), waste to energy, etc. Encourage use of LDPE and HDPE plastic waste in road construction. <sup>7</sup>	 	Short to medium-term	Capacity enhancement of existing facilities	
Management of construction and demolition (C&D) waste: a) Ensure segregation, collection, transport and proper management b) Facilitate processing and recycling facility 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 SWM Rules CPCB guidelines exist (section 6.1.6.1) Implementation and enforcement required Investment in infrastructure required	
Increasing consumer awareness and access to recycling facilities and repair options within the district.		Short to medium-term	Dedicated campaign required	
Education and awareness drives for 100% at source segregation of biodegradable, non-biodegradable, domestic hazardous and household biomedical wastes		Short-term	Dedicated campaign required	Segregation of domestic hazardous waste and household waste is not practiced in the district.












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



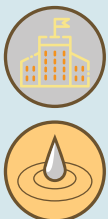
Recommendations	Cross-cutting with	Qualifying priority		District scenario/ case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Introduce fiscal instruments to encourage waste reduction, such as, mandatory carry bag charges, pay-per-bin schemes (charging residents for each community refuse bin).	  	Short-term	Needs district-level scheme/ notification and community participation	About 10-15 percent 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.
Conduct behavioural change communication workshops targeting corporates, educational institutes, PSUs, government offices to influence behaviour at both individual and organisational level to better manage resources and reduce waste generation. For example, conducting weekly workshops at all public schools for waste reduction and recovery. These workshops can also address issues such as, energy efficiency and water conservation.	  	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 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  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> <ol style="list-style-type: none"> <li>promoting local circular business models</li> <li>mainstreaming alternative sustainable business models for the consumers to have a basket of choices.</li> </ol>	  	Medium-term and continuous	Needs alternative business models, collaborations and awareness	
<p>Reduce emissions from waste transportation:</p> <ol style="list-style-type: none"> <li>Encourage shifting 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 in all treatment, storage and disposal facilities (TSDFs).</li> <li>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.</li> </ol>	 	Medium to long-term	Needs capital investments	<p>AMC has 1,500 vehicles/ equipment engaged in SWM. Out of this, 600 small vehicles and 130 heavy vehicles used for primary and secondary transport of SW with significant transport emission potential can be converted to ZEVs.</p> <p>Though several specifications exist for CBWTF vehicles to ensure efficient management and monitoring of BMW, it does not consider emissions reduction 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				
Ensure 100% conversion of organic waste to biological waste processing (composting, bio-gas, etc.).	   	Short to medium-term	Policy framework exists (section 6.1.6.1),  Needs awareness and infrastructure	Organic treatment of compostable waste initially leads to emissions but reduces GHG emissions drastically in the long run as 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: a) avoid loss of carbon content in long route organic waste transport; and b) reduce emissions from waste transport vehicles.	  	Medium-term	Needs land and infrastructural investment at ULB level	Several best practices and technologies are available for reducing GHG emissions from composting. Even in the absence of a gas management system, composting is a more environmentally sustainable practice as opposed to methane capturing from landfilling of organic waste. Composting also avoids multi-layered pollution potentials and reduces landfill loads.
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  Research collaboration required	Composting emission potential (for 39.5 TPD reported by GPCB AR): 1,211 tCO <sub>2</sub> e/year No gas management system at composting units.  Composting with gas management of 100% organic waste going to landfill can reduce emission by 46,081 tCO <sub>2</sub> e/year in Ahmedabad.

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 wastewater and industrial wastewater, etc. is important for accurately estimating city or district level emissions from the waste sector.		Short-term	Needs research collaboration	
Ensure better compliance to 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 framework exists in most cases (section 6.1.6.1)	
Bio-medical waste and hazardous waste				
Promote installation of modern incinerators with energy-recovery facilities (like, use of recovered heat for preheating of waste to be burnt or use of incinerator steam to generate electricity) for new common bio-medical waste treatment facilities (CBWTFs) and upgradation of the existing ones 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.		Long-term	Needs policy formulation and investment in infrastructure	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.  TSDFs within the Ahmedabad district are shut and have been shifted out of the district. However, hazardous waste from the district gets incinerated elsewhere.
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 BMW Rules (section 6.1.6.1) Needs monitoring by district level BMW committee	
Ensure 100% segregation, collection and treatment of bio-medical waste through coverage and registration of all healthcare facilities with CBWTFs.		Short-term and continuous	Mandated by the BMW Rules (section 6.1.6.1)	

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)				
As per the provisions of the E-waste Management Rules, 2016, a state level e-waste inventory with district level category-wise e-waste generation information needs to be developed.  For Ahmedabad district, the existing inventory (by GEMI for Ahmedabad city) can be extrapolated with inclusion of fluorescent and mercury containing lamps.		Short to medium-term	Mandated by the rules (section 6.1.6.1)  Research collaboration required	About 95% of e-waste in India is processed informally (including rudimentary operations like open burning, acid wash, open smelting, etc.)  City-based studies show efficient management and recycling of electrical and electronic waste (WEEE) can significantly contribute to emission reduction targets.
Ensure stringent policy implementation: Trace informal routing, ensure copper 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	    	Short-term and continuous	Mandated by the rules (section 6.1.6.1)  Needs monitoring manufacturer collaboration and consumer awareness	
Tapping into the informal e-waste collection network and formalisation of the same to channelise e-waste disposal to the formal sector.	 	Short to medium-term	Can be achieved through the producers/ recyclers/ producer responsibility organisations (PROs)	According to an e-waste inventory prepared by GEMI, Ahmedabad city is projected to generate an annual WEEE amount of 17,004 MT from consumers and 11,213 MT from bulk consumers by 2025. However, this inventory estimation does not consider all categories of WEEE. Most of the current e-waste generated in the district is routed informally.
Improve consumer awareness on responsible e-waste disposal and make information available on e-waste collection points, recyclers, producers (manufacturer), producer responsibility organisations or e-waste collection drives at the district level.	 	Short-term and continuous	Mandated by the rules for the producers (section 6.1.6.1).  Dedicated campaign required, can be achieved through collaborating with producers	There are three formal e-waste recycling industries in Ahmedabad.

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 management programmes.	  	Short to medium-term	Needs inter-departmental collaboration	
Wastewater: Domestic and industrial				
<p>Achieve 100% domestic wastewater treatment through:</p> <p>a) In both urban and rural areas of the district set up 100% closed and underground sewer collection network.</p> <p>b) Shift 100% domestic wastewater treatment (STP) to aerobic setups by having only aerobic STPs for new constructions and transitioning of old anaerobic STPs to aerobic setup</p> <p>c) Regular maintenance of 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 CH<sub>4</sub>. Closed underground sewers are an insignificant source of CH<sub>4</sub>.</p> <p>AMC has 9 STPs (3 anaerobic, 6 aerobic with capacity of 1075 MLD), 45 sewage pumping stations and 2,500 km sewerage network accounting for 60% to 70% of the AMC area.</p>
Development of rural wastewater disposal and treatment plan for the district.	 	Medium to long-term	Requires capital investment and inter-departmental collaboration.	<p>The Comprehensive Development Plan for 2021 by AUDA proposes to cover the entire AMC along with fringe areas to meet an estimated requirement of 1627 MLD by 2031 through 2 new STPs, 22 new sewage pumping stations and an additional sewerage network of 154.21 sq km within AMC, 106 sq km within AUC and 55 sq km within growth centres.</p>
<p>Create appropriate connecting infrastructure for the industries to utilise treated industrial and domestic wastewater.</p> <p>Provide subsidy/tax rebate to industries, healthcare, hospitality sectors for implementation of smart, recycled water investments.</p>	   	Medium to long-term	<p>Policy implementation required</p> <p>Needs capital investment in infrastructure and technology upgradation</p>	

Recommendations	Cross-cutting with	Qualifying priority		District scenario/ case examples
		Timeframe for the action to be accomplished	Framework for implementation	
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 needs to be ensured.	   	Medium to long-term	Needs ULB level implementation and capital investment in infrastructure	<p>Extension of network coverage and STPs of combined capacity of 209 MLD are under installation (AUDA-GWSSB) in Dhandhuka, Kharej, Viramgan and Babla.</p> <p>No information is available on rural sewerage coverage and treatment.</p> <p>100% closed and underground sewer connection and centralised aerobic well-managed STPs can potentially reduce 538,963 tCO<sub>2</sub>e emissions from STPs to negligible in Ahmedabad.</p>
Develop a policy mandate for data transparency and availability of waste and wastewater generation, treatment and discharge information for the industrial sector.	 	Medium to long-term	<p>Needs policy intervention</p> <p>Inter-departmental collaboration required</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.</p>
Encourage data transparency by the industries for wastewater generation, treatment and discharge information including those of CETPs.	 	Short to medium-term	Needs collaborative efforts	<p>Data transparency on wastewater generation by industries is key to reducing water pollution, which can be achieved through ratings based on emission and effluent discharge and the treatment done by them.</p> <p>For example, under its Star Rating Programme, the Odisha State Pollution Control Board gives star rating to industries and presents 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"> <li>1) Solid Waste Management Rules, 2016 &amp; Amendment, 2018</li> <li>2) Plastic Waste Management Rules, 2016 and Amendment Rules, 2021</li> <li>3) Construction &amp; Demolition Waste Management Rules, 2016</li> <li>4) Integrated Solid Waste Management Project</li> <li>5) Swachh Bharat Mission - Urban &amp; Rural</li> <li>6) Ahmedabad District Urban Development Plan, 2021</li> <li>7) Ahmedabad Smart Cities Mission</li> <li>8) National Resource Efficiency Policy (draft)</li> <li>9) Guidelines on Environmental Management of C&amp;D Waste Management in India, CPCB</li> <li>10) GPCB Annual Report</li> </ol>	<ol style="list-style-type: none"> <li>1) Urban Development and Urban Housing Department, GoG</li> <li>2) All ULBs,</li> <li>3) Panchayats, Rural Housing &amp; Rural Development Department, GoG</li> <li>4) All Gram Panchayats</li> <li>5) Gujarat Pollution Control Board (GPCB)</li> </ol>	<ol style="list-style-type: none"> <li>1) Ahmedabad District Administration &amp; the proposed District Level Climate Change &amp; Environment Committee</li> <li>2) Gujarat Urban Development Company Ltd (GUDC)</li> <li>3) Climate Change Department, GoG</li> <li>4) Forest and Environment Department, GoG</li> <li>5) Ahmedabad Urban Development Agency (AUDA)</li> <li>6) District Rural Development Agency (DRDA) – Ahmedabad</li> <li>7) Community or residential associations</li> </ol>
Bio-medical waste and hazardous waste	<ol style="list-style-type: none"> <li>1) Bio-medical Waste Management Rules, 2016</li> <li>2) Hazardous and Other Waste (Management &amp; Transboundary Movement) Rules, 2016</li> <li>3) Batteries (Management &amp; Handling) Rules, 2001</li> <li>4) GPCB Annual Reports (for data availability)</li> <li>5) Revised Guidelines for Common Bio-medical Waste Treatment and Disposal Facilities, 2016, CPCB</li> </ol>	Research funding can be obtained from Department of Forest and Environment, GoG, Climate Change Department, GoG, GPCB, etc. <sup>8</sup>	<ol style="list-style-type: none"> <li>1) GPCB</li> <li>2) Ahmedabad district administration and the proposed District Level Climate Change and Environment Committee</li> <li>3) Healthcare facilities</li> <li>4) CBWTF</li> </ol>
Waste-electrical and electronic (WEE)	<ol style="list-style-type: none"> <li>1) E-waste Management Rules, 2016</li> <li>2) Implementation Guidelines for</li> <li>3) E-Waste (Management) Rules, 2016, CPCB</li> </ol>	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. <sup>9</sup>	<ol style="list-style-type: none"> <li>1) GPCB</li> <li>2) Ahmedabad district administration and the proposed District Level Climate Change and Environment Committee</li> <li>3) Electronic and electrical manufacturers/brand owners, producer responsibility organisations</li> </ol>

<sup>8</sup> Bio-medical and Hazardous waste management is profitable and not funded by Government except for providing the land, which generally are the Industrial Development Corporation lands

<sup>9</sup> 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"> <li>1) Atal Mission for Rejuvenation and Urban Transformation (AMRUT)</li> <li>2) Jawaharlal Nehru National Urban Renewal Mission (JNNURM)</li> <li>3) National River Conservation Plan</li> <li>4) Integrated Urban Sanitation Programme</li> <li>5) Swachh Bharat Mission (Urban) – Gujarat</li> <li>6) Swachh Bharat Mission (Rural) – Gujarat</li> <li>7) Ahmedabad Smart City Mission</li> <li>8) Ahmedabad District Development Plan</li> </ol>	<ol style="list-style-type: none"> <li>1) Urban Development and Urban Housing Department, GoG</li> <li>2) Gujarat Urban Development Company Limited (GUDC)</li> <li>3) Gujarat Water Supply &amp; Sewerage Board</li> <li>4) All ULBs</li> <li>5) Panchayats, Rural Housing &amp; Rural Development Department, GoG</li> </ol>	<ol style="list-style-type: none"> <li>1) AUDA</li> <li>2) Commissionerate of Rural Development</li> <li>3) District Rural Development Agency (DRDA)</li> <li>4) Ahmedabad Smart City Development Corporation</li> <li>5) All gram panchayats</li> </ol>
Wastewater: Industrial	<ol style="list-style-type: none"> <li>1) Common Effluent Treatment Plant System</li> <li>2) Online Continuous Emission Monitoring System</li> <li>3) GPCB Annual Report</li> </ol>	<ol style="list-style-type: none"> <li>1) Gujarat Pollution Control Board (GPCB)</li> <li>2) Gujarat Industrial Development Corporation (GIDC)</li> </ol>	<ol style="list-style-type: none"> <li>1) Industries and Mines Department</li> </ol>

### 6.1.6.2 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 are ingested by aquatic animals; b) stay in the environment forever, leading to microplastic pollution; and c) block waterways and intensify natural disasters.
- They have high carbon footprint and cost for collection, transport and treatment/recycling requirement.
- 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 of various alternatives
Polythene Bags	Low Density Polyethylene (LDPE)	Fast Moving Consumer Goods (FMCG)	Cotton bags, jute bags, bio-plastics	<p><b>Glass</b></p> <ul style="list-style-type: none"> <li>Pros: Inert, infinitely recyclable, no toxic chemical additives, low manufacturing carbon footprint</li> <li>Cons: Fragile, higher cost, injury and health risk, weight</li> </ul> <p><b>Cloth (cotton)</b></p> <ul style="list-style-type: none"> <li>Pros: Natural fibre, durable, reusable, biodegradable, profitable and non-food crop</li> <li>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</li> </ul> <p><b>Metal</b></p> <ul style="list-style-type: none"> <li>Pros: Renewable resource, durable, can be recovered and infinitely recycled</li> <li>Cons: Expensive, higher transportation carbon footprint, tin-coated steel can leach into food and contaminate, heat conductor</li> </ul> <p><b>Bioplastics</b></p> <ul style="list-style-type: none"> <li>Pros: Bio-degradable, moisture resistant, inexpensive, light-weight</li> <li>Cons: Contains 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</li> </ul> <p><b>Jute</b></p> <ul style="list-style-type: none"> <li>Pros: Natural fibre, durable, reusable and biodegradable, high carbon assimilation rate</li> <li>Cons: Expensive, water-intensive crop, highly dependent on rainfall, product not moisture-resistant</li> </ul> <p><b>Paper</b></p> <ul style="list-style-type: none"> <li>Pros: Bio-degradable, low manufacturing cost, can be made from recycled paper</li> <li>Cons: Water intensive, high carbon footprint, not durable, not moisture resistant</li> </ul>
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/ Polyethylene Terephthalate (PET) + foil + LDPE, etc. d) LDPE	FMCG (food & beverages), hospitality and e-commerce	Bio-plastics, 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 and other drink bottles	Polyethylene terephthalate (PET)	Hospitality, FMCG (food & beverages)	Glass, metal, ceramics, bulk vending	
Plastic cutlery, plates, cups, and 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 Pak, bottling and bulk vending	
Face shields	Polycarbonate and polyester (PET)	Healthcare	Compostable/ bio-degradable face shield	
Sticks of 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, non-degradable and made of plastic. The European Commission defines them as 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 industries 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 these sources, intentionally-added microbeads in cosmetics and personal care products are 'designed to drain' SUPs. Replacement of microbeads in PCCPs come under central regulation. However, at a district level, consumer awareness can make a change through shifting of demand to sustainable alternatives.

## Regulatory provisions in India for single-use plastics

- 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 – 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) Puts the onus on the producers, through extended producer responsibility (EPR), to collect plastic waste either individually or through the concerned local body, b) The primary responsibility is on producers, importers and brand owners (who introduce the products in the market) to collect used multi-layered plastic sachet, pouches and other packaging, c) Manufacturing and use of multi-layered plastic, which is non-recyclable or non-energy recoverable or with no alternate use, should be phased out in two years.
- Solid Waste Management Rules, 2016: a) Introduces EPR for manufacturers or brand owners of disposable products (including plastic packaging, 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 state level as of now. AMC has banned plastic cups, water pouches, *paan masala* polythene in 2018. AMC notified plastic waste management bylaws in December 2018.

## Recommendations<sup>10</sup>

- 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 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 of other selected categories of SUP products (by granting the producers some transition time). The phasing out can be achieved by sensitising key producers and sectors and encouraging them to take voluntary action.
- Promote eco-friendly alternatives to SUPs through: a) identifying alternative sustainable products, b) identifying micro-enterprises 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,

<sup>10</sup> 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](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

e) strict quality control and certification requirement for plastic-free alternatives (for instance, resin or plastic powder should not be mixed in the product as an alternative).

- Promote extended lifespan and reuse of products (including sustainable ones) through continued and lasting campaigns for 'No Single Use' to ensure public participation. Replacing the concept of 'single use' is critical as biodegradability or recyclability have 'time' and 'conditions' (such as energy and water footprint, transport requirement, etc) attached to them.
- Introduce economic incentives/support: a) Invest in R&D to develop alternatives to different SUP products, b) Support technology incubation and stimulate creation of micro-enterprises to drive job creation, c) Introduce livelihood support schemes and/or include 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 development, waste management etc.	    	Medium to long-term	<p>Needs policy formulation</p> <p>Collaboration among various stakeholders required</p> <p>Create specific financial instruments</p>	In 2019, AMC issued public bonds (five-year maturity) worth ₹ 200 crore, directed towards AMRUT for urban infrastructure development. Gaining massive attention, AMC obtained ₹ 1,085 crore worth of subscriptions, with the additional bids being rejected to retain the targeted size at ₹ 200 crore.
Voluntary carbon market mechanism can be developed for the district to motivate industries, ULBs and other sectors to lower their emission levels through monetary incentives.	All sectors	Medium-term	<p>Need feasibility studies, research and interdepartmental and multi-stakeholder collaboration</p> <p>Institutional structure needs to be established for the same</p>	<p>Case example: In 2020, Smart City Indore collected carbon credit of around ₹ 50 lakh through the city's two bio-methanisation plants. The gas generated from these plants is used by city buses – City Bus and iBus.</p> <p>Through these projects, Indore has avoided emissions of 1,70,000 tCO<sub>2</sub> since 2019 and generated carbon credits.</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 for the action to be accomplished	Framework for implementation	
Water pollution and scarcity				
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>	Through Water and Sanitation Management Organisation (WASMO), GoG 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 can be tapped for capacity building of the beneficiaries on efficient water management and conservation.
<p>Implement recommendations given in the Heat Action Plan (for heat alert days), particularly:</p> <p>a) to settle the suspended road dust,</p> <p>b) provision of water for cooling, public and institutional distribution,</p> <p>c) promotion of micro-irrigation,</p> <p>d) releasing water in canals during summer,</p> <p>e) ensuring efficient potable 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>	Ahmedabad is one of the first cities in India to introduce a Heat Action Plan (AMC and NRDC, 2018) to strengthen response towards heat stress conditions in the city.















Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
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 in the old city area (including individual harvesting cisterns)</p> <p>b) ensuring inclusion of rainwater harvesting in new construction of residential buildings, institutional, commercial centres, and industries in the district, as per building bye-laws</p> <p>c) Mandatory rainwater harvesting at the upstream to halt run-off and recharge groundwater</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 &amp; UHD, GoG, rainwater harvesting is mandatory for all buildings with ground coverage 80 m<sup>2</sup> and above.</p> <p>According to the Gujarat Development Control Regulations, for buildings with area between 500 and 1,500m<sup>2</sup>, the owner or developer shall have to undertake rainwater harvesting as per the specifications. For buildings with area between 1,500 and 4,000 m<sup>2</sup> owner/developer has to provide percolation wells with rainwater harvesting system with one percolating well for every 4,000 m<sup>2</sup> or part thereof of building unit.</p>
Ensure minimum non-revenue water (NRW), i.e., technical loss due to leakage, seepage or unauthorised use (theft).	 	Medium-term	Research collaboration required	<p>The average non-revenue water (NRW) across all classes of ULBs in Gujarat ranges between 26% and 34%, indicating that nearly one-third of water is lost in distribution.</p> <p>One ward – Sabarmati – is losing up to 9.78 million litres of water every year.</p> <p>Over 42% of the water in the water supply system of Ahmedabad is unaccounted for.</p> <p>Reducing NRW through leakage repairs can help the district meet the national average of 20% NRW.</p>
Water billing based on water metering rather than fixed charges.	  	Medium to long-term	Awareness generation and collaboration	<p>Ahmedabad city has already put the water metering system into practice. Since 2016, 2,800 'buildings use' permissions have been given to societies on the condition that they will install water metres.</p> <p>In 2019, high-precision water meters were installed in two wards of the district on a pilot basis, emulating Rajasthan's Water Policy.</p>

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Promote dual-flush systems to reduce water consumption, energy consumption and waste-water generation.	  	Short to medium-term	<p>Align with the existing policies</p> <p>Can be implemented as a part of green buildings</p>	<p>As a step towards this direction, UDD has implemented an amendment (through a notification dated March 31, 2018) in the Comprehensive General Development Control Regulation (CGDCR). The inclusion states: "In every water closet or toilet it shall be mandatory to provide double button cistern (dual flush tank)".</p> <p>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).</p>
Prevent dumping of untreated effluent from industries, commercial and residential sector into open water bodies or groundwater.	  	Short to medium-term	<p>Policy framework available</p> <p>Strict monitoring and reporting required</p>	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.
Nalsarovar wetland				
Promote use of RE-powered sources for recreational activities around the wetland (including lighting, electricity to stalls etc.). RE can be sourced from decentralised solar panels around the periphery of the lake.	  	Short to medium-term	<p>Sector-specific policy framework is available</p>	<p>Nalsarovar was declared as a Ramsar site on September 24, 2012. Following practices are being undertaken as conservation measures under the Ramsar Convention:</p> <p>a) The staff of the sanctuary regularly patrols the area to prevent poaching</p> <p>b) Habitat improvement measures, eco-tourism activities and eco-development activities are undertaken</p> <p>c) Attempts are being made to reduce people's dependence on the wetland by providing alternatives</p> <p>d) Monitoring of water quality of the industry effluents has been proposed</p> <p>e) Preservation measures of satellite water bodies around the main wetland</p> <p>f) Ban on fishing, restrictions on movement of human and cattle etc. within the sanctuary area is being undertaken.</p>
Phase out diesel-run boats and introduce RE-based options.	 	Medium-term	<p>Mandate required to ensure compliance</p> <p>Research and multi-stakeholder collaboration required</p>	
Carrying capacity of the wetland and surrounding ecosystem must be taken into consideration before permitting any new construction / recreational activity around its periphery.		Short-term and continuous		

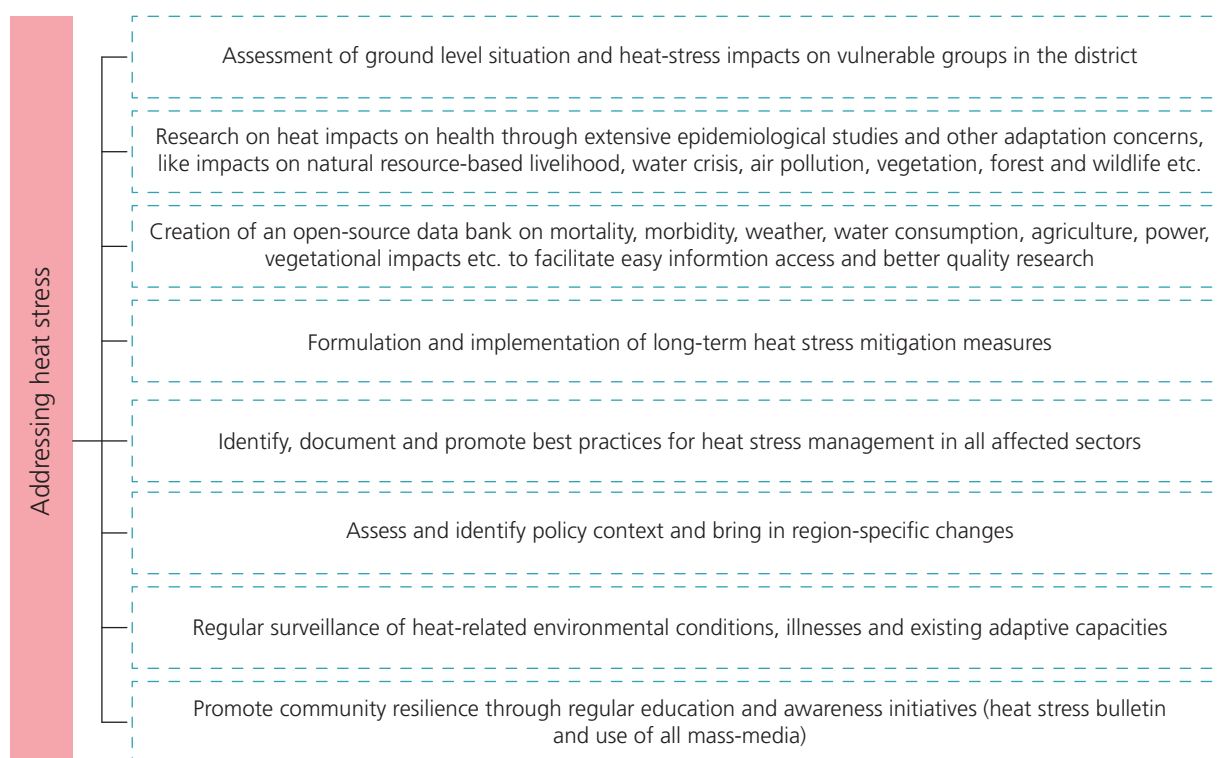
Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Demotivate excessive ground water pumping around the wetland. Incentivise rainwater harvesting systems for the nearby resorts/ commercial areas/villages.	  	Short-term and continuous		
Restrict direct dumping of untreated domestic solid waste, wastewater (both domestic and industrial) and agricultural run-off in the lakes.  Effective functioning of CETPs, STPs around the wetland must be ensured.	   	Short to medium-term and continuous		
RE-powered aerators can be installed to avoid eutrophication in different pockets of the wetlands.		Short-term		
Promote use of native species for any upcoming infrastructure development near wetland habitat to protect native biodiversity.		Short-term and continuous		
Promote more focused research on the Nalsarovar wetland biodiversity and its interactions with the habitat, hydrology, soils and landform.		Medium to long-term		
Ensure that all the principles/ wetland practices according to the Ramsar Convention are followed	 	Short to medium-term		

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Making brick kilns sustainable				
Adopt cleaner kiln technologies like zig-zag kilns and vertical shaft brick kiln (VSBK) to replace fixed chimney bull trench kilns (FCBTKs) and down draught kiln (DDKs).	    	Medium to long-term	Needs to be aligned with existing standards  Mandate required to ensure compliance	Zig-zag kilns appear to be the logical replacement for FCBTKs because of low-capital investment, easy integration with the existing production process and the possibility of retrofitting FCBTKs into zig-zag firing.
Promotion of mechanised coal stoking systems in brick manufacturing.		Medium term	Capital investment required	High particulate matter and black carbon emissions in FCBTKs occur during the period of fuel feeding. Continuous feeding of properly sized fuel, using a coal stoker in an FCBTK or a zig-zag kiln can reduce the emissions significantly.
Promote sustainable brick types (eg. clay-fly ash bricks and fly ash bricks).		Long-term	Need to generate awareness  Needs to be aligned with existing policies  Market/ demand needs to be generated	Preparing clay-fly ash bricks with around 30% fly ash content (when using black soil) can:  a) prevent consumption of around 30-40 tonnes of alluvial soil or 100-125 tonnes of black soil per lakh bricks, thereby reducing land-degradation and retaining the carbon content in soil  b) save 3-7 tonnes of coal per lakh bricks produced  c) increase the strength of the brick by 30%-40%.
Promote modern RE technologies in brick-making. Also, enhance communication through media engagement and outreach, mass awareness, engaging public, health and academic institutions, stakeholder discussions, etc.		Long-term	Research collaboration needed  Capital investment required	
Managing air pollution				
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.  Increase the number of air quality display facilities in public places.	  	Short to medium-term	Policy framework and budgetary provisions available	Ahmedabad has 1 CAAQMS by GPCB at Maninagar, 10 CAAQMS by SAFAR (Ministry of Earth Sciences) at Navrangpura, Pirana, Rakhiyal, Raikhad, Chandkheda, Bopal, Sattelite, Airport, Lekhwada and GIST City and 14 manual stations operated as per CPCB guidelines under National Air Quality Monitoring Programme (NAMP) and State Air Quality Monitoring Programme (SAMP).  Ahmedabad is categorised as one of the 124 non-attainment cities in India for particulate matter concentration (PM10 & PM2.5) exceeding the prescribed norms by CPCB under the National Clean Air Programme (NCAP) with multiple timelines to clean air.
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 create awareness  Capital investment required  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  Implementation of existing rules/ policies  Capital investment	



Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Increase/create green cover or green buffers along the major traffic corridors, roundabouts and industrial areas.	  	Medium to long-term	Inter-departmental coordination required Efficient maintenance and monitoring of plantation sites	Major sources for air pollution in Ahmedabad are road dust, vehicular emission, domestic fuel burning, open waste burning, construction activities and industrial emissions.  GPCB has an action plan to control air pollution in Ahmedabad.  A source apportionment study is currently being conducted by GEMI, sponsored by the Department of Forests and Environment.  Union Budget 2020-21 (15th FC report for 2021-2026) has allocated ₹ 2,217 crore for 42 urban agglomerations (with million-plus populations) that will be provided as performance-based grants to ULBs to tackle air pollution.  Ahmedabad has three multi-layered parking facilities – one each at Navrangpura (capacity: 250 cars, 350 two-wheelers), Kankaria (capacity: 400 cars, 200 two-wheelers) and Relief Road (185 cars, 221 two-wheelers) – but operates at much lower capacity. Vehicles are often parked on-street near these facilities.
Enforcement of environmental standards and exhaust fumes for industrial sector.		Short-term and continuous	Robust monitoring and evaluation required	
Sprinkling of water (preferably recycled grey water) for road dust suspension during peak pollution episodes.	  	Short-term and continuous	Inter-departmental coordination required	
Open waste burning (of solid waste, biomass, plastic, horticulture waste etc.) should be regulated by the municipal corporations/nagar panchayats.	  	Short to medium-term	Implementation of existing regulations	
Implementation of the action plan for construction and demolition waste (as per the CPCB guidelines).	  	Short to medium-term	Implementation of existing regulations	
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)	
Ensure installation and operation of air pollution control devices in industries and adhere to emission standards.		Medium to long-term	Implementation of existing rules/regulations Robust monitoring and evaluation	

## Heat stress in Ahmedabad and Heat-Health Action Plan<sup>11</sup>









### 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"> <li>1) Model Bill for the Conservation, Protection, Regulation, Management of Ground Water, 2016</li> <li>2) Water Prevention and Control of Pollution Act, 1974</li> <li>3) National Water Mission</li> <li>4) Reuse of Treated Waste Water Policy, 2018 (GoG)</li> <li>5) Gujarat Domestic Water Supply (Protection) Act, 2019</li> <li>6) Comprehensive State Water Policy, 2015</li> </ol>	<ol style="list-style-type: none"> <li>1) Water Resources Department, GoG</li> <li>2) Water Supply Department, GoG</li> <li>3) GPCB</li> </ol>	<ol style="list-style-type: none"> <li>1) Proposed District Level Climate Change &amp; Environment Committee</li> <li>2) WASMO (Ahmedabad DWSU)</li> <li>3) All ULBs</li> <li>4) AUDA</li> <li>5) Urban Development Department</li> <li>6) Rural Development Department</li> <li>7) Commerce and Industries Department</li> <li>8) GIDC</li> <li>9) GAIC</li> <li>10) CGWB</li> </ol>





<sup>11</sup> District scenario about Ahmedabad's heat stress is given in Chapter-2

Sectors	Policies and programmes that can push forward the recommendation	Primary Departments/ Agencies	Supporting Departments/ Agencies
Nalsarovar wetland	<ol style="list-style-type: none"> <li>1) Ramsar Convention Wetland (Conservation &amp; Management) Rules, 2017</li> <li>2) National Water Missions Wildlife (Protection) Act of 1972</li> </ol>	<ol style="list-style-type: none"> <li>1) Forest and Environment Department, GoG</li> <li>2) GPCB</li> <li>3) Biodiversity Board Gujarat</li> </ol>	<ol style="list-style-type: none"> <li>1) Proposed District Level Climate Change &amp; Environment Committee</li> <li>2) Urban Development Department</li> <li>3) Rural Development Department,</li> <li>4) Agriculture Department, GoG</li> <li>5) Fisheries Department, GoG</li> <li>6) Revenue Department, GoG</li> <li>7) Tourism Department, GoG</li> <li>8) Water Resources Department, GoG</li> <li>9) All ULB</li> <li>10) All PRIs</li> </ol>
Making brick kilns sustainable	<ol style="list-style-type: none"> <li>1) Energy Efficient Enterprise (E3) Certification Scheme for Burnt Clay Brick Manufacturing Industry</li> <li>2) Gujarat Industrial Policy 2020</li> <li>3) Environment Protection Act, 1986 – Section 6 and 25.</li> <li>4) Air (Prevention and Control of Pollution) Act, 1981 – Section 18(1)(b) for the prevention and control of air pollution in different types of brick kilns</li> </ol>	<ol style="list-style-type: none"> <li>1) Industries and Mines Department, GoG</li> </ol>	<ol style="list-style-type: none"> <li>1) Proposed District Level Climate Change &amp; Environment Committee GPCB</li> <li>2) District Industries Centre</li> <li>3) MSME Development Institute, Ahmedabad</li> <li>4) Land and Revenue Department</li> </ol>
Managing air pollution	<ol style="list-style-type: none"> <li>1) Air (Prevention and Control of Pollution) Act- 1981</li> <li>2) Environment (Protection) Act, 1986</li> <li>3) National Clean Air Programme, 2020</li> <li>4) Solid Waste Management Rules, 2016 &amp; Amendment 2018</li> <li>5) Construction &amp; Demolition Waste Management Rules, 2016</li> </ol>	<ol style="list-style-type: none"> <li>1) GPCB</li> <li>2) System of Air Quality and Weather Forecasting and Research (SAFAR), IMD</li> <li>3) All ULBs</li> </ol>	<ol style="list-style-type: none"> <li>1) District administration and the proposed District Level Climate Change &amp; Environment Committee</li> <li>2) Department of Climate Change, GoG</li> <li>3) Commissionerate of Transport, GoG</li> <li>4) Energy and Petrochemicals Dept, GoG</li> <li>5) RTO</li> <li>6) All ULBs</li> </ol>

## 6.4 Actions district authorities can recommend to state departments










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	
<b>POWER SECTOR:</b> 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	Policy framework and targets exist (section 6.4.1)  With optimum push, this initiative can help India align with the Paris Agreement targets	UGVCL is one of the best performing DISCOMs in the country and its AT&C losses (6.73%) are well within the international standard range of 6% to 8%.  The private player DISCOM in Ahmedabad, TPL –D, can aim to do the same.  The Smart Grid Pilot Project was launched by the UGVCL on Feb 25, 2019 (under the National Smart Grid Mission) for Naroda, Ahmedabad. UGVCL is the first DISCOM in India that has commissioned the Smart Grid Project.
<b>HABITAT:</b> Provide subsidies/ tax rebates to builders/ building owners to encourage adoption of ECBC or IGBC (such as 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).
<b>TRANSPORT:</b> 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.
<b>TRANSPORT:</b> 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	
<b>TRANSPORT:</b> Use fiscal instruments to discourage the use of personal vehicles. For example: a) Increase charges on registration of Internal combustion engines (ICE) vehicles. b) Levy congestion charges and other green taxes. c) Phase out of older, more polluting vehicles.	  	Short-term and continuous	Policy formulation based on research and inter-departmental cooperation needed	In January 2021, the Ministry of Road Transport and Highways announced additional taxes on old vehicles that are unfit for roads and has termed them as 'green taxes'.
<b>TRANSPORT:</b> Shift key commercial / business centres outside city limits to reduce traffic load.	 	Long-term	Requires policy backing based on research and inter-departmental cooperation	Development of areas outside AMC limits through AUDA in areas like, Bopal, South Bopal and Gota etc.
<b>INDUSTRY:</b> a) Ensure regular PAT compliance of DISCOMs and other designated consumers (DCs) in the district; b) Increase the number of DCs for PAT scheme in the district 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	Till PAT Cycle VI (2020-21), only 12 DCs have volunteered under the scheme in Ahmedabad district.  Over the years, various DCs from Ahmedabad district have helped avoid around 0.85 MtCO <sub>2</sub> e by improving their systemic energy efficiency under the PAT scheme.
<b>INDUSTRY/ENERGY:</b> Ensure compliance of renewable purchase obligations (RPO) 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%.
<b>AGRICULTURE:</b> Encourage millet cultivation (requires less 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 SDG#2 targets: 2.1, 2.3, 2.4	In Ahmedabad, jowar and bajra production has continuously decreased (jowar – from 9,600 tonnes in 2011-12 to 538 tonnes in 2017-18 and bajra – from 27,100 tonnes in 2011-12 to 4,569 tonnes in 2017-18).

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	
<b>AGRICULTURE:</b> 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	<p>Needs research collaboration and capital investment</p> <p>This would also help meet SDG#2 targets: Targets 2.1, 2.3, 2.4, 2.a</p>	<p>Production of cotton decreased in Gujarat. In Ahmedabad alone, it reduced from 2.7 lakh bales in 2017-18 to 1.7 lakh bales in 2018-19. However, the area under cotton cultivation has remained the same (1,05,400 ha in 2017-18 and 1,03,200 ha in 2018-19), thereby resulting in reducing the yield by 33.6%. Low rainfall can be one of the key reasons for the reduced yield.</p> <p>Area under rice cultivation increased in Ahmedabad from 1.47 lakh ha to 1.51 lakh ha (between 2016-17 and 2017-18) resulting in higher methane emissions. However, production reduced from 3.1 MT to 2.5 MT (between 2016-17 and 2017-18 respectively) and the yield reduced by 18%. Therefore, temperature and drought-resilient rice varieties having climate-friendly irrigation practices/ water regimes should be preferred. Moreover, avoid rice cultivation in non-traditional rice areas.</p> <p>Climate change impacts are likely to reduce rice yield in Ahmedabad by 29.7% and other crops will also be affected.</p>
<b>AGRICULTURE:</b> For overall reduction in electricity and water consumption, subsidies can be reduced by some percentage in a phased manner.	  	Medium to long-term	<p>Policy intervention needed</p> <p>Awareness needs to be created among the farming communities, followed by collaborations</p>	<p>The tariffs are as per different consumption slabs as well as the horsepower of pump being used. Currently, power 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 as well as massive financial losses to power utilities and governments – both state and central.<sup>12</sup></p> <p>Flat tariffs lead to more equitable distribution between high-income and marginal consumers but fail to encourage water 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.</p>

<sup>12</sup> Sindhu B.S. et. al, Power tariffs for groundwater irrigation in India: A comparative analysis of the environmental, equity, and economic tradeoffs







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	
<b>FORESTRY/GREEN SPACES:</b> Promote regeneration of degraded and open forest areas through corporate social responsibility (or similar mandates) and encourage corporates to dedicate some percent of their profit for greening the spaces around their units/factories.	  	Long-term	Needs strengthening of the existing policy framework  Needs different stakeholder collaboration	In Ahmedabad circle, 1,181 ha area is under Concentrated Regeneration (as per the Annual Administration Report, Forest Dept., GoG).  Green belts help mitigate air pollution, increase urban green cover, leading to carbon sequestration.
<b>E-WASTE:</b> Adopting green marketing approach; Promoting green products by displaying product lifespan on the label of e-products to influence purchase decisions, thereby, using the labels as behavioural intervention.	 	Medium to long-term	Needs policy intervention, collaborations and awareness	
<b>WATER SCARCITY &amp; POLLUTION:</b> 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	Gujarat is the highest performing state in the composite water management indexing (CWMI).  Gujarat has a comprehensive water policy that has led to setting up of institutions like the state regulatory authority, state policy council and implementation committee, river basin organisations, water research and training institutes, integrated water data centre, etc.  However, establishing a regulatory framework can help the state boost water levels in more wells (as compared to the present achievement of a rise in 33% of wells).






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

Sub-sectors	Policies and programmes that can push forward the recommendations	Primary departments	Associated departments/agencies
Power sector	<ol style="list-style-type: none"> <li>1) National Smart Grid Mission</li> <li>2) Smart Metering National Programme</li> <li>3) Integrated Power Development Scheme (IPDS)</li> <li>4) Restructured Accelerated Power Development and Reforms Programme (R-APDRP)</li> <li>5) UDAY Scheme, 2015</li> <li>6) National Mission on energy Efficiency, specifically PAT (Perform, Achieve and Trade) Scheme</li> <li>7) Gujarat Solar Power Policy, 2021</li> <li>8) Policy for Development of Small-scale distributed solar projects, 2019</li> <li>9) Standards and Labelling Programme</li> </ol>	<ol style="list-style-type: none"> <li>1) GUVNL-UGVCL, GoG</li> <li>2) MNRE, GoI</li> <li>3) GEDA, GoG</li> <li>4) BEE(EESL)</li> </ol>	<ol style="list-style-type: none"> <li>1) Proposed District Level Climate Change and Environment Committee</li> <li>2) Climate Change Department, GoG</li> <li>3) DMF</li> <li>4) Western Railways – Ahmedabad Division</li> </ol>
Habitat	<ol style="list-style-type: none"> <li>1) ECBC 2017</li> </ol>	<ol style="list-style-type: none"> <li>1) Urban Development and Urban Housing Department, GoG</li> <li>2) All ULBs</li> <li>3) Smart City Ahmedabad Development Ltd.</li> </ol>	<ol style="list-style-type: none"> <li>1) Proposed District Level Climate Change and Environment Committee</li> <li>2) AUDA</li> <li>3) GEDA</li> </ol>
Transport	<ol style="list-style-type: none"> <li>1) ECBC</li> <li>2) JNNURM</li> <li>3) Smart Cities Mission and AMRUT</li> </ol>	<ol style="list-style-type: none"> <li>1) Ports and Transport Department</li> <li>2) All RTOs</li> <li>3) ALL ULBs</li> </ol>	<ol style="list-style-type: none"> <li>1) GSRTC</li> <li>2) GEDA</li> <li>3) Smart City Ahmedabad Development Limited</li> <li>4) Western Railways – Ahmedabad Division</li> </ol>
Industry	<ol style="list-style-type: none"> <li>1) PAT Scheme</li> <li>2) Gujarat Industrial Policy, 2020</li> </ol>	<ol style="list-style-type: none"> <li>1) Industries and Mines Department, GoG</li> </ol>	<ol style="list-style-type: none"> <li>2) Industries Commissionerate</li> <li>3) District Industries Centre</li> <li>4) Proposed District Level Climate Change and Environment Committee</li> </ol>
AFOLU	<ol style="list-style-type: none"> <li>1) National Mission on Food Security</li> <li>2) Rashtriya Krishi Vikas Yojana: Remunerative Approaches for Agriculture and Allied Sector Rejuvenation (RAFTAAR)</li> <li>3) National Mission for Sustainable Agriculture</li> <li>4) Price Support Scheme</li> <li>5) National Afforestation Programme (NAP)</li> <li>6) Green India Mission</li> <li>7) CSR Act</li> </ol>	<ol style="list-style-type: none"> <li>1) Agriculture, Farmers' Welfare and Co-operation Department, GoG</li> <li>2) Gujarat Forest &amp; Environment Department, GoG</li> </ol>	<ol style="list-style-type: none"> <li>1) Proposed District level Committee on Climate Change and Environment</li> <li>2) Gujarat Agro Industries Corporation (GAIC)</li> <li>3) Anand Agriculture University, Ahmedabad</li> <li>4) APMCs</li> <li>5) Energy and Petrochemicals Department, GoG</li> <li>6) GIDC</li> </ol>
Waste	<ol style="list-style-type: none"> <li>1) E-waste Management Rules, 2016</li> </ol>	<ol style="list-style-type: none"> <li>1) Science and Technology Department, GoG</li> </ol>	<ol style="list-style-type: none"> <li>1) Proposed District Level Climate Change and Environment Committee</li> </ol>

## 6.5 Sustainable Development Goals being addressed

SDGs	Targets	Sector (sub-sectors) addressing the recommendation
<b>SDG 1: No Poverty</b> 	Target 1.4: Ensure that all men and women, in particular the poor and the vulnerable, have access to basic services	Waste, water
<b>SDG 2: Zero Hunger</b> 	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 10.3.e: Development of sustainable irrigation programmes for both crops and livestock.	AFOLU (agriculture & livestock)
<b>SDG 3: Good Health &amp; Well-being</b> 	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 (through cleaner neighbourhood, better access to sanitation)
	Target 3.4: Reduce by one-third premature mortality from non-communicable diseases through prevention	Co-benefits from waste (by reducing pollution and providing better hygiene)
	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 water pollution and air pollution
<b>SDG 6: Clean Water &amp; Sanitation</b> 	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 minimising 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 & green spaces) water scarcity
	Target 6.5: Implement integrated water resources management at all levels	AFOLU (agriculture & green spaces/forestry), water scarcity & pollution
	Target 6.8: Support and strengthen the participation of local communities	AFOLU (agriculture, livestock & forestry), transport, wetland
	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

SDGs	Targets	Sector (sub-sectors) addressing the recommendation
<b>SDG 7: Affordable &amp; Clean Energy</b> 	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 & industry), wetland
	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)
	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), AFOLU, wetland (RE-powered recreational activities)
<b>SDG 8: Decent Work &amp; Economic Growth</b> 	All targets	AFOLU (agriculture & livestock)
	Target 8.2: Achieve higher levels of economic production through diversification, upgradation and innovation	AFOLU (agriculture & livestock); energy
	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	Wetland, agriculture (forestry/ green spaces)
<b>SDG 9: Industry, Innovation &amp; Infrastructure</b> 	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 industrialisation	Energy (industry)
	Target 9.3: Improving access and connectivity to industries/other enterprises	Energy (transport)
	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, sustainable brick kiln
	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 & industry), waste
	Target 9.b: Research and innovation in developing countries, including by ensuring a conducive policy environment	Waste, energy (power & industry)

SDGs	Targets	Sector (sub-sectors) addressing the recommendation
<b>SDG 11: Sustainable Cities &amp; Communities</b> 	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 & habitat: energy-efficient building), all district specific sectors
	Target 11.4: Strengthen efforts to protect and safeguard the world's cultural and natural heritage	AFOLU (forestry/green spaces), wetlands, 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; habitat, transport, industry), sustainable brick kiln and 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)
	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
<b>SDG 12: Responsible Consumption &amp; Production</b> 	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, water pollution
	Target 12.5: Substantially reduce waste generation through prevention, reduction, recycling and reuse	Waste, habitat, 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 & livestock)
<b>SDG 13: Climate Action</b> 	All targets	All sectors and sub-sectors
<b>SDG 14: Life under Water</b> 	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)

SDGs	Targets	Sector (sub-sectors) addressing the recommendation
<b>SDG 15: Life on Land</b> 	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 and wetland
	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	Wetland, AFOLU (forestry)
	Target 15.9: Integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies	AFOLU (agriculture, livestock & forestry), water
	Target 15.a and 15.b: Mobilise and significantly increase financial resources from all sources to conserve and sustainably use biodiversity, ecosystems and sustainable forest management	AFOLU (agriculture, livestock & forestry), wetland, water
<b>SDG 17: Partnerships for the Goals</b> 	Target 17.7: Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries	Energy, AFOLU, waste, air pollution, wetlands, heat stress, individual action & behavioural change communication
	Target 17.16: Enhance the global partnership for sustainable development, complemented by multi-stakeholder partnerships that mobilise 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 action

### Waste management



- 1 Practice source segregation and handover segregated waste: biodegradable, non-biodegradable, domestic hazardous waste 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 Rain Water 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



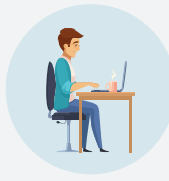
Be mindful of water consumption. Use bucket instead of shower. Use bucket instead of hose for cleaning cars/ porch/back-yard. Opt for dual-flush toilets. Close the tap while brushing. Reuse RO reject water.



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 25-26° 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

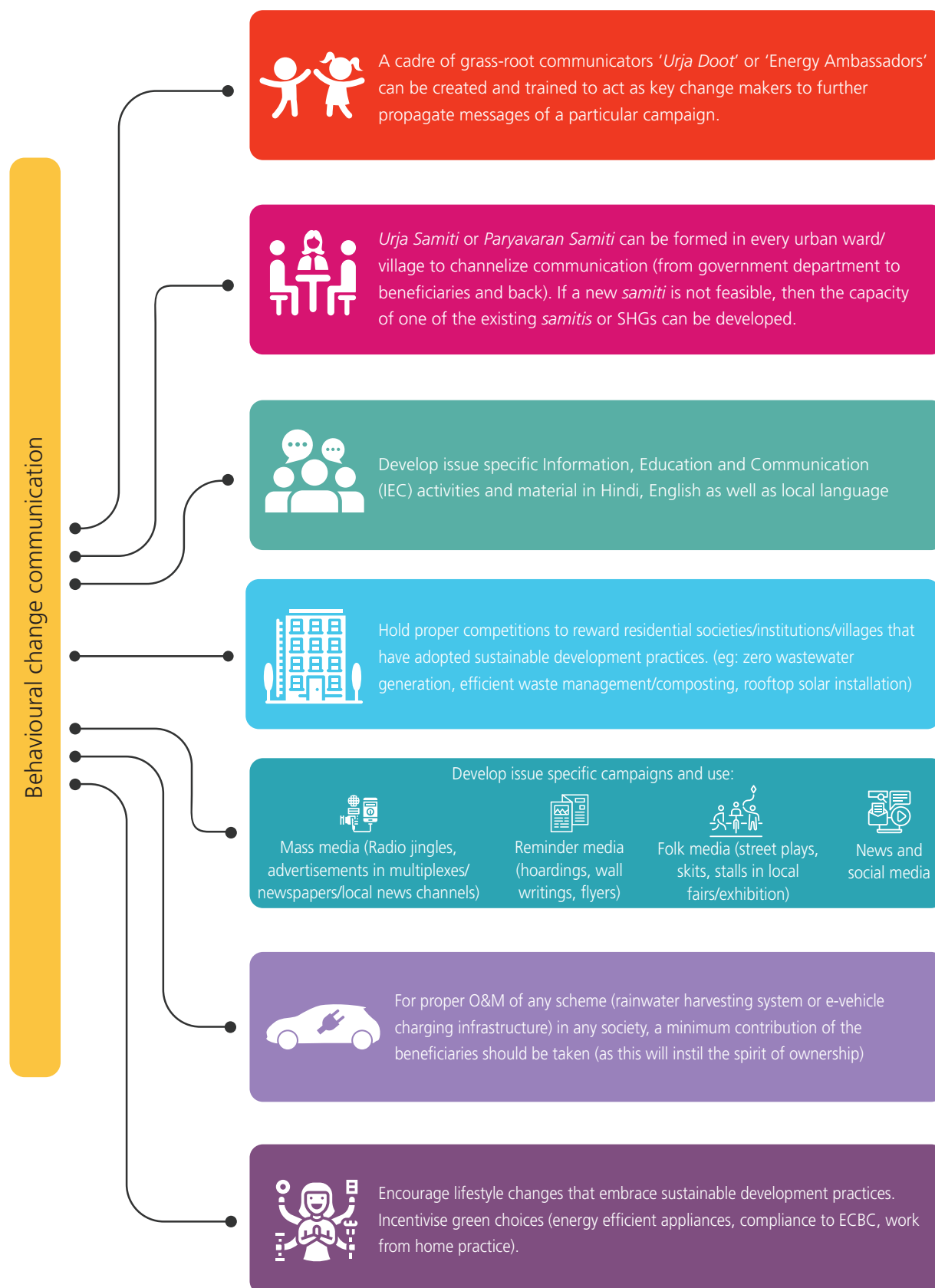
Car pool to work, Use bicycles, park and ride



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.



**Vasudha Foundation**

CISRS House, 14 Jangpura B, Mathura Road,  
New Delhi, Delhi 110014

Phone: 011 2437 3680 | [www.vasudha-foundation.org](http://www.vasudha-foundation.org)