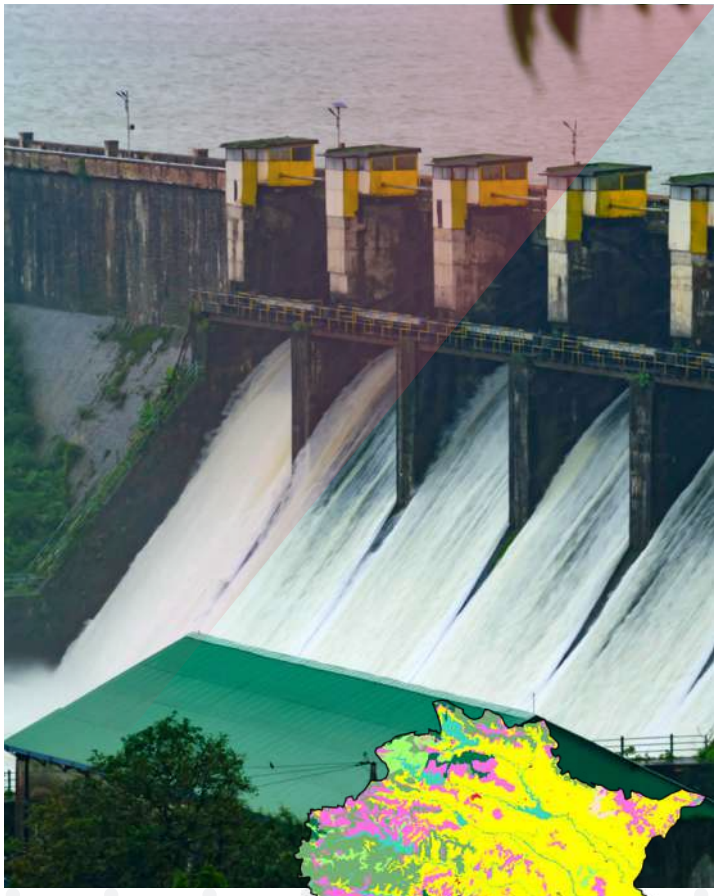
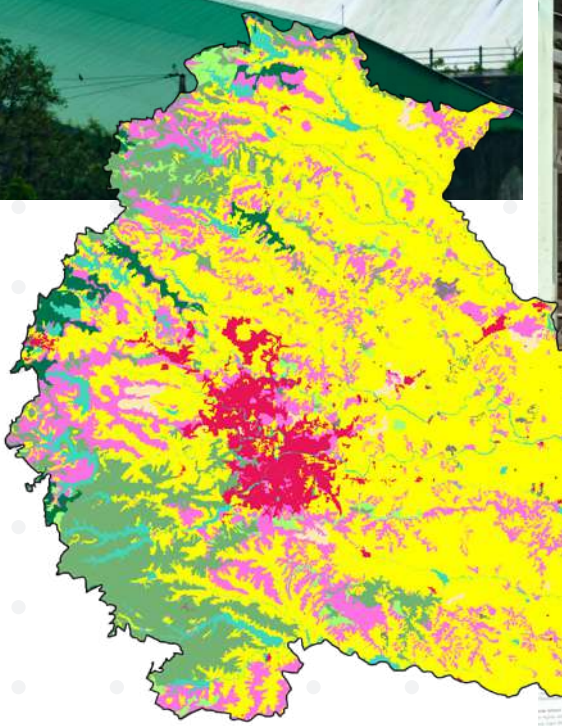
January, 2022

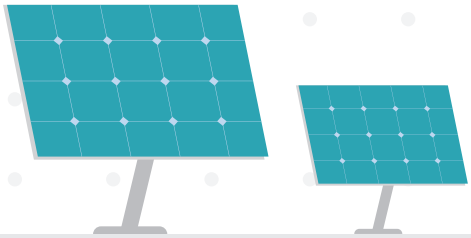


Climate Change and Environment Action Plan of

Pune District

Executive summary





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SHAKTI SUSTAINABLE ENERGY FOUNDATION

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.

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 under the United Nations Framework Convention on Climate Change (UNFCCC). The rationale behind this action plan is to follow a bottom-up approach to climate-proof development priorities for the district.

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January, 2022
Pune, Maharashtra

Cover page images

Top left image:
Pawna dam in Pune

Bottom right:
Car manufacturing unit of Mahindra, Pune

Land use map of Pune district:
Created using data from Landsat 8, secondary data from NRSC/ISRO Bhuvan portal, Google Earth and ORNL-DAAC

Forest (evergreen) | Forest (deciduous) | Forest (mixed) | Cropland | Fallow Land
Built-up Land | Shrubland | Barren Land | Waterbodies

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Environment Action Plan of

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RAJESH PATIL I.A.S

Municipal Commissioner
Pimpri Chinchwad Municipal Corporation

सत्यमेव जयते

Date : 12/01/~~2202~~ 2022

Message

Climate change has emerged as a global threat, prompting nations to come together to tackle the challenge. At the COP26 held in Glasgow, in November, 2021, India announced its intention to achieve net zero emissions by 2070, amongst other ambitious targets.

To achieve these goals, it is imperative that all the states commence their climate actions immediately and make their best contributions towards the national targets. Maharashtra is leading by example through its ambitious initiatives to combat climate change, such as the Majhi Vasundhara Abhiyan, the Project on Climate Resilient Agriculture (PoCRA), and the latest Electric Vehicle Policy, among many others. Further, Maharashtra has joined the Race to Resilience, and 43 cities in the state, including Pune, have announced their commitment for Race to Zero, both international pledges aimed at sustainable and low carbon development. In recognition of its efforts, the Maharashtra government received an award for 'Inspiring Regional Leadership' at the COP26 summit.

While state level policies and initiatives are being put in place, I am happy to share, a first of its kind, 'Climate Change and Environment Action Plan' (CCEAP) for Pune district prepared by Vasudha Foundation with support from Shakti Sustainable Energy Foundation. This Action Plan has been developed in consultation with Pimpri Chinchwad Municipal Corporation, district administration, and other stakeholders, with an aim to contribute towards state and national climate actions. The action plan is a comprehensive assessment of the climate variability and projections, sectoral greenhouse gas emissions, and climate change drivers in the district. Based on the assessment, the plan identifies various local level interventions, which are in line with state and national-level policies and programmes. It also incorporates a comprehensive set of recommendations, in alignment with the Sustainable Development Goals (SDGs), for various climate-related sectors and environmental issues of Pune district, as well as estimates mitigation potential of each sector.

I applaud the extensive efforts made towards developing the CCEAP for Pune district. This Action Plan can serve as a roadmap for mainstreaming climate action in alignment with the district's development priorities.

(Rajesh Patil)

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अतिरिक्त महापालिका आयुक्त
पुणे महानगरपालिका

Dr. Kunal Khemnar I.A.S.
Additional Municipal Commissioner
Pune Municipal Corporation

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Preface / Message

The recently concluded United Nations climate summit, COP26 at Glasgow, was a much-awaited conference specially for climate vulnerable countries seeking tangible action on anthropogenic GHG emissions. India has made ambitious commitments of generating 500 GW energy from non-fossil fuel sources and achieving net zero by 2070 at COP26.

Owing to its sheer size and diversity, India is one of the most climate vulnerable countries in the world. In the past few decades, India has witnessed an alarming rise in the frequency and intensity of extreme events such as floods, droughts and heatwaves among others. To tackle these emerging threats, India formulated its National Action Plan for Climate Change more than a decade ago and has since then also taken many initiatives and participated in multiple international commitments to combat climate action.

In addition to this, formulation of State Action Plans for Climate Change has helped streamline action at the state level. The Government of Maharashtra has made several proactive commitmentsto ensure low carbon growth and sustainable development in its various initiatives. Following the concept of a bottom-up approach a "Climate Change and Environment Action Plan" for Pune district has been developed. This Action Plan captures the ground realities of the district as well as provides region specific recommendations for various climate relevant sectors.

I am certain that this Action Plan will serve as a roadmap for the district and municipal level planning efforts to integrate climate action and development.I appreciate that Vasudha Foundation with support from Shakti Sustainable Energy Foundation has undertaken this detailed study in consultation with the Pune Municipal Corporation, district administration and other stakeholders.

Khemnar
(Dr.Kunal Khemnar)

ACKNOWLEDGEMENTS

We would like to thank Dr Rajesh Deshmukh, IAS (Collector & DM), Ram Kishore Naval, IAS (previous Collector, Pune), Dr. Kunal Khemnar, IAS (Additional Commissioner, PMC), Mangesh Dighe, Environmental Conservation Officer, PMC and Sanjay Kulkarni (Environment Head, PCMC) as their inputs and support have been vital in the development of the Climate Change and Environment Action Plan for Pune district.

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

We extend our gratitude towards other departments and civil organisations – officials from MEDA, Forest Department, MPCB, PSCDCL and Sanskriti Menon (CEE Maharashtra) for inputs and suggestions to refine the action plan.

We are grateful to Dr. Ashwini Kulkarni from IITM, Pune and Prof. Koteshwar 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.

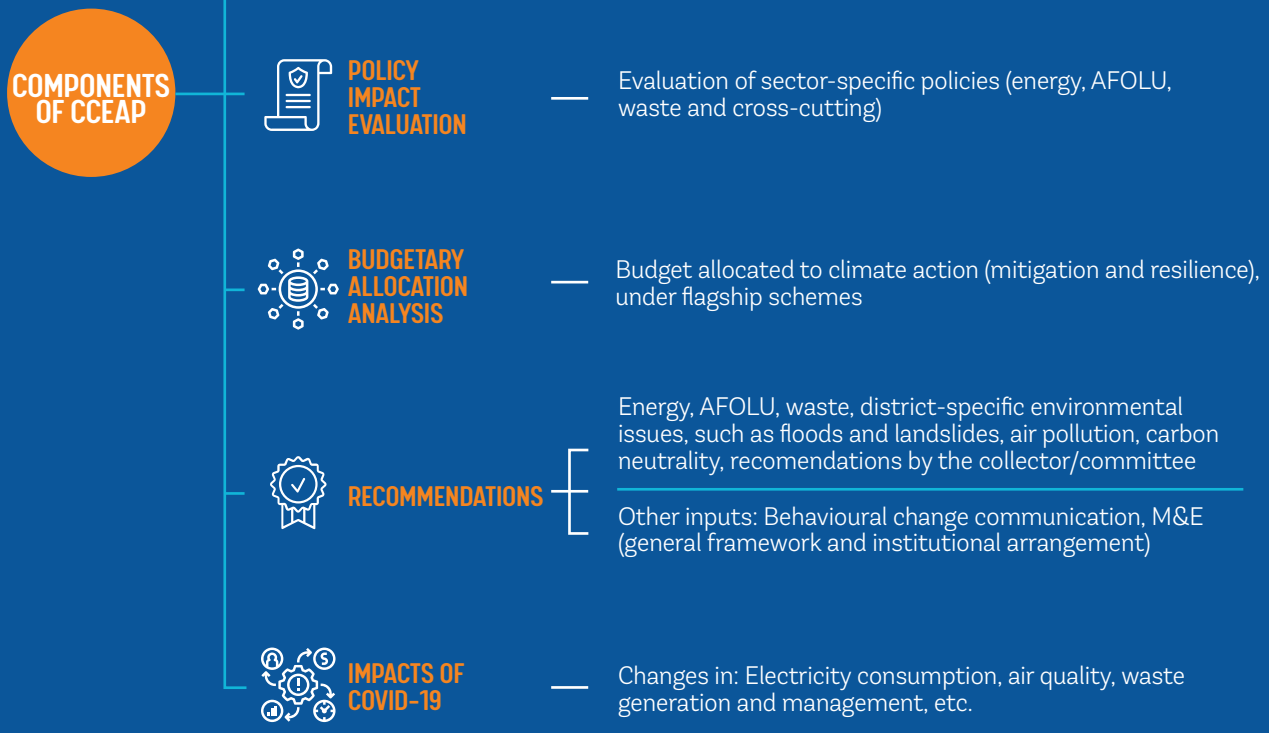
EXECUTIVE SUMMARY

This Climate Change and Environment Action Plan studies the past, present and the future of the district of Pune from both the climate and policy perspective to know where the district stands in terms of meeting India's climate commitments. Based on the findings, it evolves concrete recommendations and the way forward for the district collector and other in-line departments.

The ongoing COVID-19 pandemic, which began with a strict national lockdown, made it abundantly evident that anthropogenic activities have a far-reaching impact on the environment. On the flip side though, climate action has received a setback. A number of mitigation and adaptation-centric sectors have experienced unforeseen shifts. For instance, an overburdened health infrastructure has not been able to accommodate climate-related health issues. Considerable job losses have further diminished the adaptive capacities of the poor and vulnerable. Moreover, there has been a substantial spike in waste sector emissions with the rise in disposals of single use plastic and covid-related waste incineration.

This action plan, therefore, takes a holistic view of the current policies and recommends steps that need to be taken in the short-, medium- and long-term to bring about the necessary changes that are in compliance with India's overall climate goals and commitments.

The key components of this action plan are summarised in the chart below:



CLIMATE PROFILE AND PROJECTIONS

In this section, the historical data and projected changes in rainfall and temperature for Pune district were analysed using IMD and NASA's NEX-GDDP datasets, following the multi-modal mean (MMM) approach.

- **Warm days have gone up by 10 percent:** The maximum temperature has been observed to show a significant increasing trend in April and May. The trend has accelerated over the last two decades. The mean percentage of warm days is more pronounced and has increased by 10 percent. Pune district is projected to experience warming of 1°C to 2°C under RCP4.5 and 1.2°C to 3.9°C under RCP8.5. The percentage of warm days is projected to increase by more than 65 percent.
- **Cold days are decreasing:** There is no trend in minimum temperatures in the wintertime. The cold days show a large variability and may decrease in all the epochs under changing climate conditions.
- **Rainy days are projected to increase:** The monsoon rainfall does not show any significant trend, other than a slight increase in the recent decade in individual months and also during the season as a whole. The number of rainy days has been highly variable in July and August in the recent decade, also showing a slightly decreasing trend in monsoon months during the period 1951-2018. The seasonal rainfall of the district is projected to increase by 6 to 17 percent under RCP4.5 and 10 to 33 percent under RCP8.5 emission scenarios. The number of rainy days is also projected to increase during the monsoon season, particularly in July and August.

SECTORAL GREENHOUSE GAS EMISSIONS PROFILE: CLIMATE CHANGE DRIVERS

- **Greenhouse gases have increased 2.5-folds since 2005:** Between 2005 and 2019, the total greenhouse gas (GHG) emissions of Pune district increased by 264 percent (from 2.75 Mt CO_2e. in 2005 to 9.99 Mt in 2019) with a CAGR of 9.66 percent. These estimates represent GHG emissions from 13 categories covering three major sectors – energy, agriculture, forestry and other land use (AFOLU), and waste.
- **Energy sector is the highest contributor of emissions:** Energy sector (direct fuel combustion in transport, agriculture, residential categories, etc.) is the highest contributor of GHG emissions. Although energy emissions of Pune district increased at a CAGR of 7.58 percent, its share has decreased from 89 percent in 2005 to 82 percent in 2019 due to increase in AFOLU emissions.
- **AFOLU sector was a net sink until 2011:** The agriculture, forestry and other land use (AFOLU) sector became an emitter post 2011. Its emissions peaked in 2013 and then started to decline again. Between 2012 and 2019, AFOLU emissions have reduced by 18 percent.
- **Waste sector's contribution to GHG emissions is decreasing:** Emissions from the waste sector have grown at a slow rate (CAGR of 2.66 percent) and its contribution has dropped from 11 percent (in 2005) to 6 percent (in 2019).
- **Business-as-usual scenario will be disastrous:** In business-as-usual scenario (i.e., no actions/policies are put in place to mitigate emissions), the total emissions of Pune district are likely to increase 168 percent by 2030, with respect to 2015 levels.

ASSESSMENT OF POLICIES THROUGH THE LENS OF CLIMATE CHANGE

A number of major national/state level policies and programmes of energy, AFOLU and waste sector were evaluated for their climate mitigation potential.

- **Power and energy:** For this sector, 12 policies/programmes were evaluated, (UDAY/IPDS/R-APDRP scheme and clean energy schemes are the biggest contributors to GHG emissions mitigation).
  - Policies related to clean energy generation mitigated 8,37,400 tCO_2e. emissions.
  - Policies focusing on energy-efficient buildings and processes helped avoid, 41,65,724 tCO_2e. emissions.
  - Transportation interventions have led to an emission avoidance of 4,65,000 tCO_2e.

- **AFOLU and cross-cutting:** 13 policies were assessed.
  - Forestry policies alone led to a mitigation of 13,72,638 tCO_2e.
  - Policies pertaining to livestock, proved to be beneficial for climate action and helped in avoiding 11,819.71 tCO_2e/annum.
  - GHG impact of agricultural policies could not be computed due to lack of availability of required information/ data.
  - Cross-cutting sector: The National Mission on Micro Irrigation resulted in avoiding 914.45 tonnes of CO_2e emissions (from reduction in use of urea + reduction in energy consumption). The Pradhan Mantri Ujjwala Yojana has helped mitigate 12,14,393 tonnes of CO_2e.
- **Waste:** 15 policies were assessed.
  - Policies pertaining to sanitation added 4,78,590 tCO_2e. emissions.
  - Composting as a part of solid waste management practices has mitigated 38,927 tCO_2e.
  - Domestic wastewater treatment interventions have led to 2,11,430 tCO_2e. emissions.

BUDGETARY ANALYSIS TO ESTIMATE EXPENDITURE ON CLIMATE ACTION

This section analyses the district expenditure to estimate spending on climate action. District budgets from the Planning Department, Government of Maharashtra for the years 2016-17 to 2018-19 were analysed to understand expenditure on climate action in Pune district. For the three years, the expenditure on climate relevant actions is 24.69 percent, 28.76 percent and 26.76 percent, respectively, of the total district budget. The distribution of expenditure on climate action in the district over the three years, i.e., from 2016-17 to 2018-19 is summarised in Figure 1a. The distribution of schemes reveals that most climate relevant schemes over 2016-17 to 2018-19 fall under the marginal category, indicating the scope for increasing commitment to climate action at the district level (see Figure 1b). Further, Figure 1c gives the budgetary allocation attributed to climate action by level of climate relevance (direct, indirect, marginal, potential) of the schemes listed in the district budget.

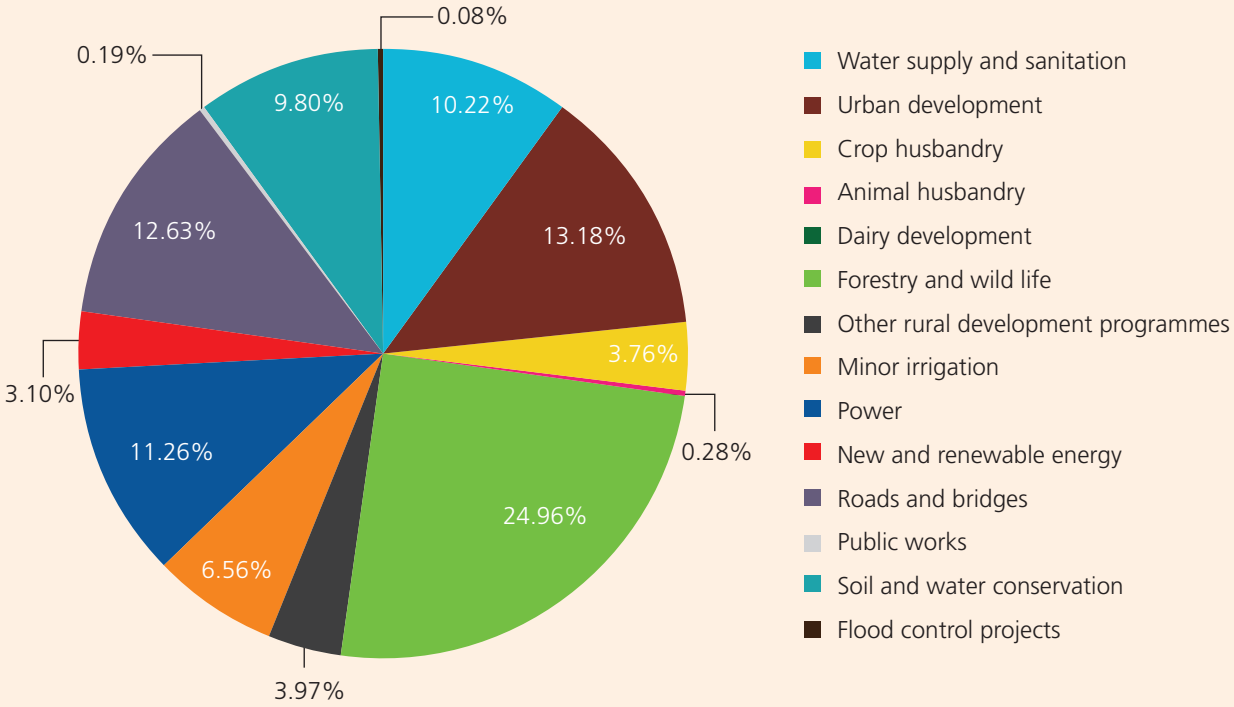


Figure 1a: Pune district: distribution of expenditure on climate action

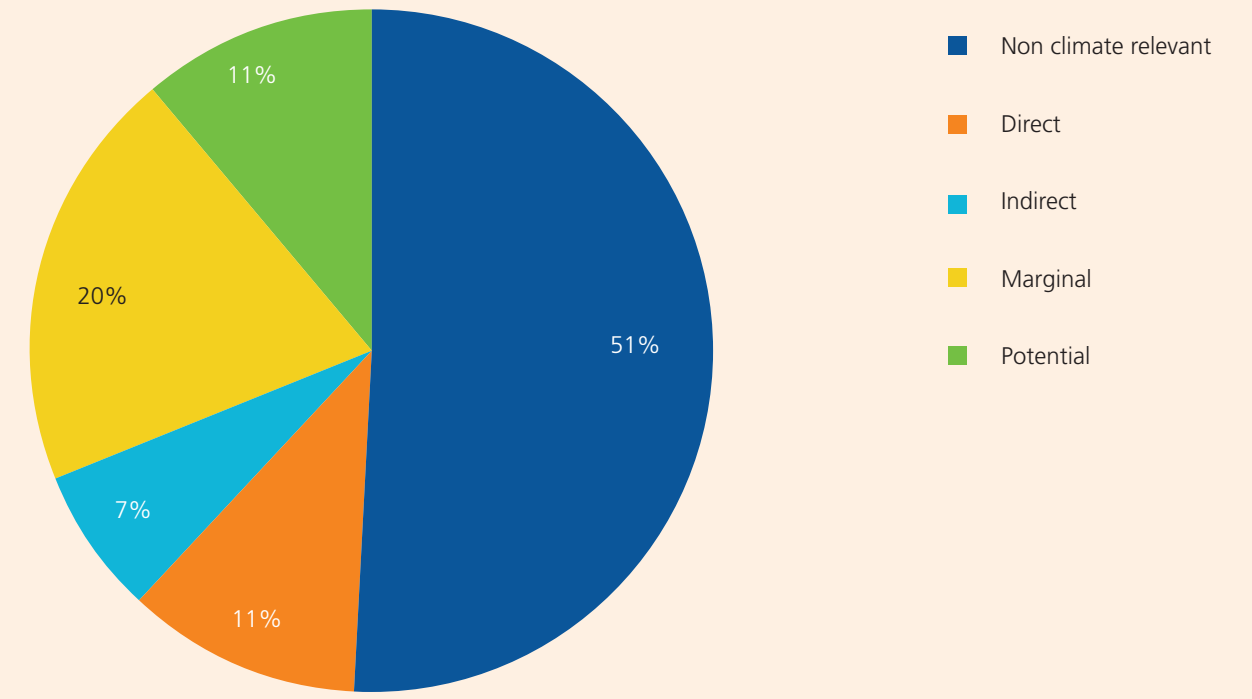


Figure 1b: Distribution of schemes by relevance to climate action in Pune district between 2016-17 and 2018-19

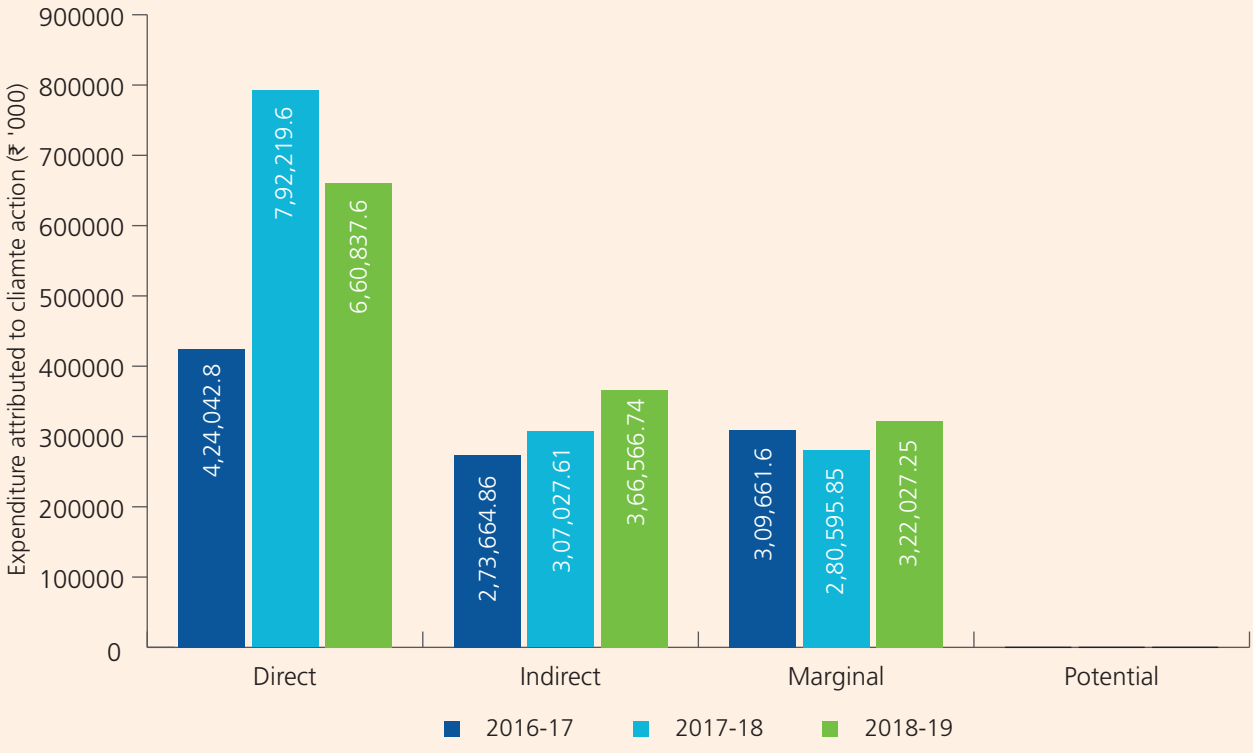


Figure 1c: Expenditure attributed to climate action by category of climate relevance in Pune district between 2016-17 and 2018-19

Further, a total of 39 flagship schemes were reviewed to identify those with climate resilience and mitigation relevance. Of these, based on availability of information across districts as well as relevance to climate actions, five schemes were selected for further analysis.

Table 1: Summary of flagship schemes budgetary analysis for Pune district

Scheme	Climate relevant activities	Year	Total allocation to district under scheme (₹ lakh)	Allocation to climate action (₹ lakh)	% of total scheme budget for climate action at district level
MGNREGS	Eleven out of 17 activities identified as climate relevant: Drought proofing, fisheries, flood control and protection, land development, micro-irrigation, renovation of traditional water bodies, rural connectivity, drinking water, sanitation, water conservation and water harvesting	2018-19	2,034.78	459.25	22.57
		2019-20	1,476.80	330.95	22.41
PMKSY	Micro-irrigation activities	2016-17	1,058.00	730.00	69*
		2019-20	617.00	425.00	
GIM	Enhancing forest cover, ecosystem restoration, agro-forestry, social forestry, wetland restoration, promoting alternative fuels	2017-18	165.24	165.24	100*
		2018-19	107.57	107.57	
		2019-20	40.00	40.00	
AMRUT	Water supply, sewage and septage management, urban transport, drainage, green spaces	2015-16	12,084.00	776.00	54*
		2016-17	12,670.00	626.00	
DDUGJY + Saubhagya	New and upgradation of substations, LT lines, feeder segregation, consumer metering, DTR metering, etc	Up to April 2020	8,577.00	4,288.00	50*

*Percentage has been attributed by using Climate Public Expenditure and Institutional Review (CPEIR) methodology of UNDP

RECOMMENDATIONS

The action plan provides comprehensive, sector-wise recommendations from a climate perspective. The aim is to align the district with India's 2030 NDC commitments through this Climate Change and Environment Action Plan (CCEAP).

The recommendations factor-in state/district vision documents/development plans. They also list the current policies, programmes and schemes and identify concerned departments that can help streamline the actions. This section also provides information on SDGs and other co-benefits that will be addressed through these recommendations.

Further, the action plan is created in congruence with the Majhi Vasundhara programme of the government of Maharashtra. In fact, the themes of *Bhumi*, *Vayu, Jala, Agni,* and *Akash* find multiple cross linkages in the sectoral buckets of the CCEAP.

Overall, the mitigation actions suggested in the recommendations can help mitigate 11.4 Mt CO_2e. per annum. The sectoral breakdown of the same is as following:

GHG mitigation potential of CCEAP recommendations (tCO_2e)

Energy
79,50,325

AFOLU
32,87,303

Waste
2,42,797

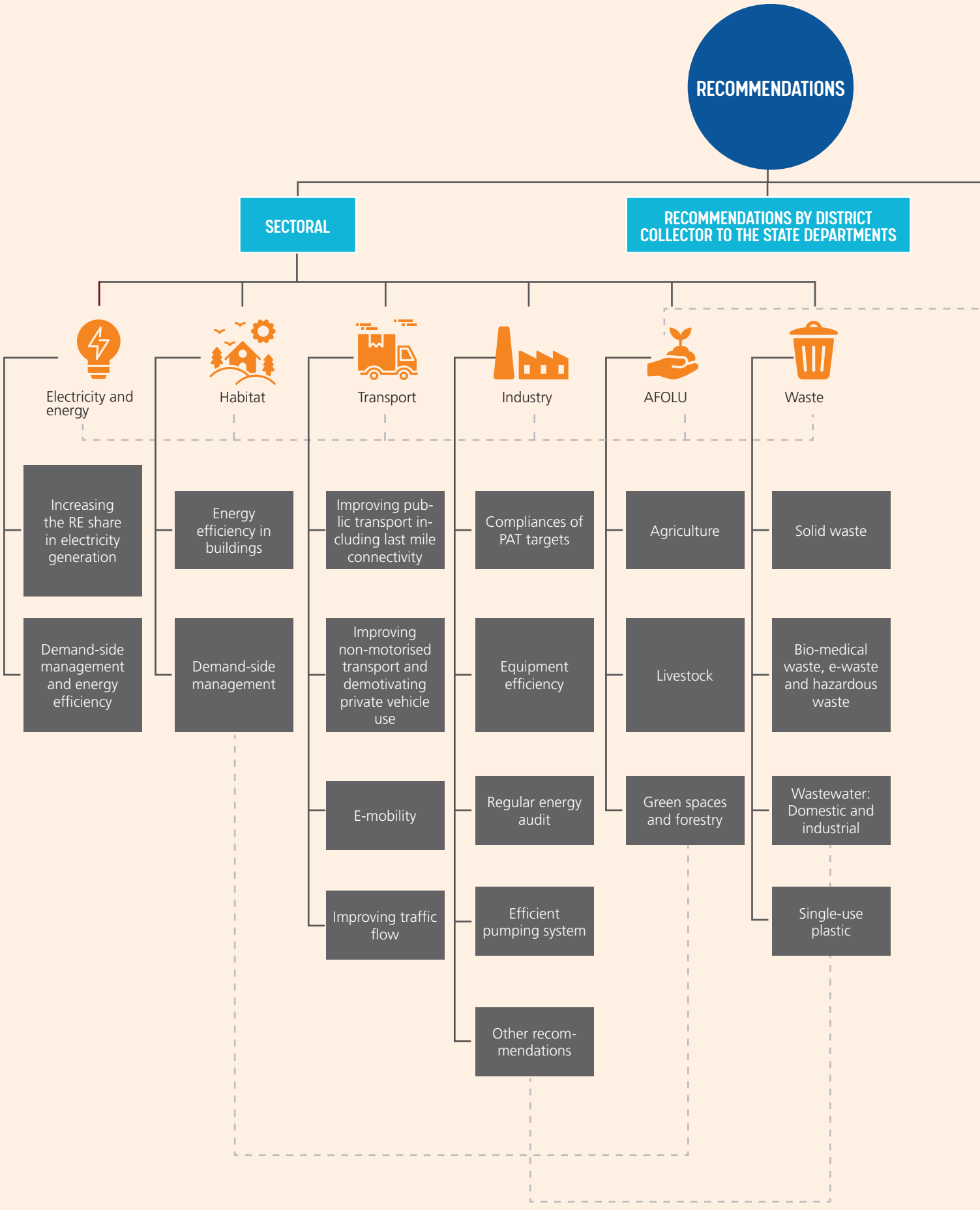
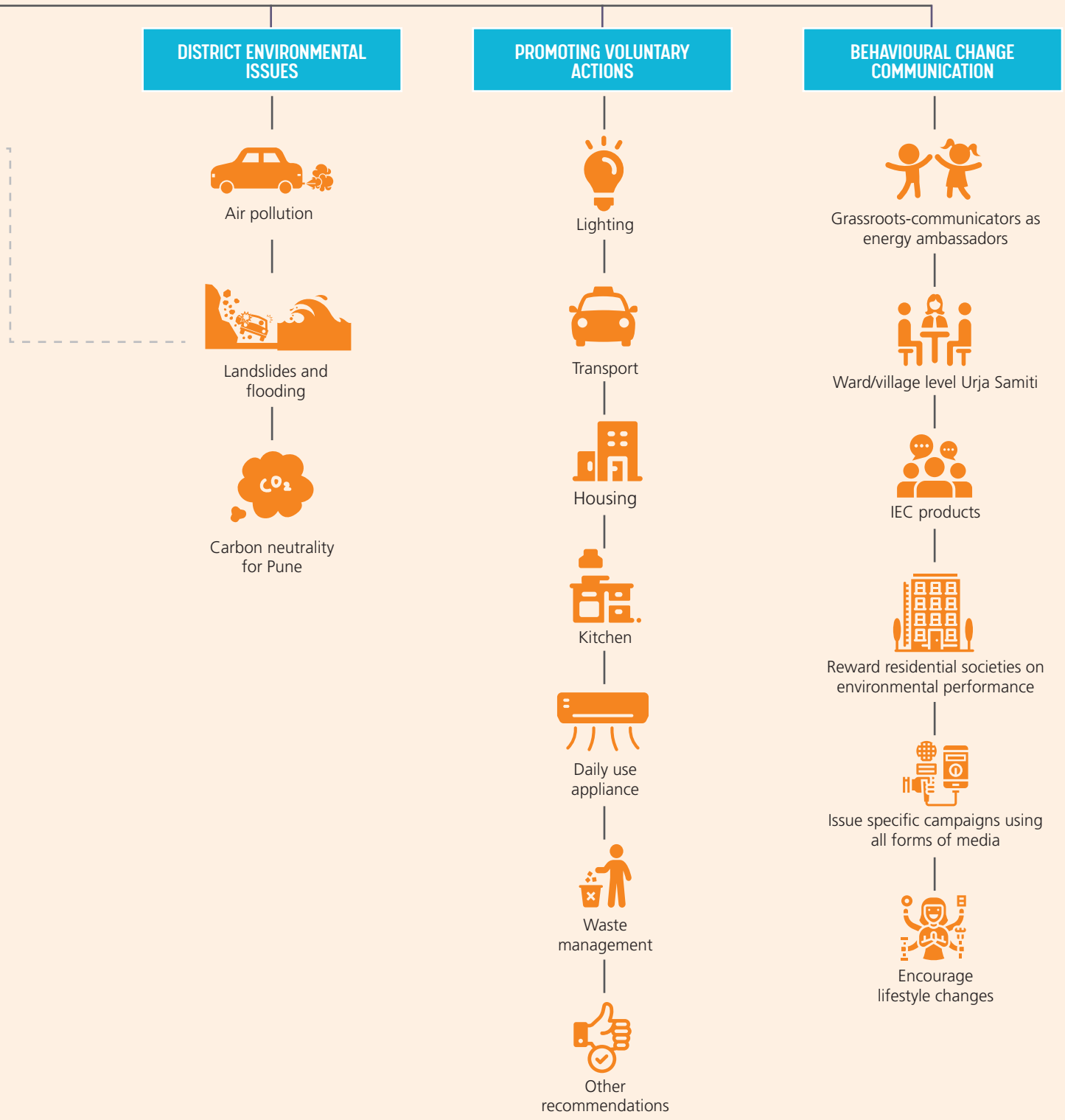


Figure 2 Recommendations for CCEAP Pune


DISTRICT ENVIRONMENTAL ISSUES
Air pollution
Landslides and flooding
Carbon neutrality for Pune
PROMOTING VOLUNTARY ACTIONS
Lighting
Transport
Housing
Kitchen
Daily use appliance
Waste management
Other recommendations
BEHAVIOURAL CHANGE COMMUNICATION
Grassroots-communicators as energy ambassadors
Ward/village level Urja Samiti
IEC products
Reward residential societies on environmental performance
Issue specific campaigns using all forms of media
Encourage lifestyle changes
: Interlinkages across sectors and sub-sectors (cross-cutting aspects)

Power and energy

Though the energy sector is crucial to achieving India's growth ambitions, it is also responsible for around 70 percent of the country's annual GHG emissions. This calls for a paradigm shift in the energy sector.

Therefore, the action plan recommends (a) increasing the share of RE generation in the district by advancing on-grid and off-grid solar rooftop, ground-mounted installations and other RE installations, (b) encouraging faster penetration of energy-efficient and star-labelled fixtures and upgrading existing power-grid infrastructure to advanced metering infrastructure (in public, institutional and commercial setups), (c) promoting energy efficiency in the residential sector by encouraging the incorporation of ECBC in the building bye-laws, implementation of India Cooling Action Plan, 2018, etc., and (d) promoting energy conservation in the industrial sector by introducing measures such as a "cap and trade" system for MSMEs at the district level.

Transport

Being one of the fastest growing sectors in India, transport contributes 12 percent to India's total GHG emissions. The action plan recommends (a) promoting e-mobility through awareness, increase of e-vehicles' modal share, transition of public transport (PT) and intermediate public transport (IPT) to electric-powered or hybrid vehicles, developing widespread charging infrastructure, incentivising e-vehicle owners, etc., (b) ensuring last-mile connectivity and promoting increased use of PT and IPT, (c) augmenting non-motorized transport through dedicated cycle lanes, and (d) improving traffic flow.

AFOLU

For agriculture, forestry and other land use (AFOLU) sector, it is important to promote climate-conscious practices that do not have an adverse impact on the ecosystem, biodiversity and natural resource dependent communities. Our recommendations include: (a) promoting the use of organic fertilizers, solar pumps and practices such as micro-irrigation and alternative ways to manage crop-residue under agriculture, (b) having a good mix of high-yielding cross-breed cattle and indigenous cattle, and encouraging the use of good quality fodder to bring down enteric fermentation emissions, and (c) maintaining the forest area and the tree cover of Pune through strict M&E, afforestation in fallow and wasteland, use of alternative funding like CSR, adoption of Miyawaki urban forestry and study on suitability of plantation sites/species, etc. The action plan also recommends involvement of regional agriculture universities to initiate research on high yielding, drought- and temperature-resilient genotypes for various crops, among other measures.

Waste

With the waste sector being one of the biggest contributors of methane emissions globally, major recommendations revolve around reducing landfill disposal of waste and managing wastewater to reduce GHG emissions from them through measures such as: (a) reducing waste at source, (b) proper segregation, collection and channelization of different categories of waste (including bio-medical waste and e-waste) for recycling and treatment, (c) 100 percent conversion of organic waste to compost and gas management of composting units, (d) recycling, recovery and reuse of 100 percent inert waste (plastic, construction waste, etc.), and (e) setting up of centralised aerobic wastewater treatment plants with closed sewer networks and periodical sludge removal facility.

Given the unique environmental issues of the district, the action plan recommends developing extensive infrastructure to monitor air pollution and interventions for preventive measures. It also identifies need to promote and practice sustainable land use plan and management, hazard mapping and implementation of early warning system in order to mitigate flooding and landslide incidences.

COVID-19 IMPACT

This section presents an assessment of how the COVID-19 pandemic has impacted various sectors and the development measures that can be adopted. During the national lockdown in 2020, the total energy demand in India went down considerably. The pandemic has only underscored the need to increase focus on renewable energy and strengthen its integration into the grid. Pune district needs to increase implementation of RE generation through solar rooftops, biogas, solar pumps for agriculture and water supply.

Overall, the pandemic resulted in significant reduction in air pollution owing to reduced transport and industrial activities during the lockdown and unlock period. A comparative study of the district air pollution ($PM_{2.5}$, PM_{10}, NO_2 and SO_2) for the period of January to October shows significant variation between 2019 and 2020.

Waste management has been the most impacted sector, with single use plastic waste and bio-medical waste from both households and healthcare sector increasing manifold leading to increased incineration, landfilling and single-use product consumption.

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'.

Vasudha Foundation

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