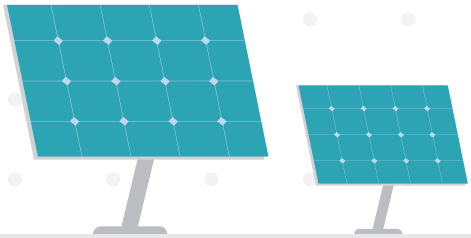
January, 2022

Climate Change and Environment Action Plan of

Indore District

Recommendations



Prepared By

VASUDHA FOUNDATION
Green ways for a good earth!

In Association with

SKMCCC, EPCO, Department of Environment
Government of Madhya Pradesh

Supported By

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. For Indore, the plan was developed in collaboration with the State Knowledge Management Centre on Climate Change (SKMCCC), Environmental Planning & Coordination Organisation (EPCO), Department of Housing and Environment, Government of Madhya Pradesh.

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.

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Indore, Madhya Pradesh

Cover page images

Top left image:
Bio-methanation facility at Chhoitram Mandi, Indore

Bottom right:
Material recovery facility, Indore (both sourced from Smart City Indore website)

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

Dense forest | Mixed forest | Shrubland | Cropland | Fallow Land | Built-up Land
Barren Land | Grassland | Wasteland | Waterbodies

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FOREWORD

Aniruddhe Mukerjee (I.A.S.)
Principal Secretary

D.O. Letter No.

Foreword

The recently concluded 26th convention of the UNFCCC at Glasgow has brought forth the need for tangible actions on emissions. India has made ambitious commitments at CoP26. As the second largest Indian state, with a population of more than 8 million, Madhya Pradesh's efforts in combating climate change would be of significant importance in the national context. The state currently has the largest area under forest cover, and is home to one of the largest solar power projects in India, with a 750 MW solar power plant at Rewa. The state has also been taking initiatives to tackle climate change as highlighted in its State Action Plan for Climate Change (SAPCC).

While national and state level initiatives lead the movement to address climate change, it is important to equip the districts and guide communities for the same at the local level. In this light, I would like to congratulate the State Knowledge Management Centre on Climate Change, Environmental Planning & Coordination Organisation and Vasudha Foundation, New Delhi for formulating this in-depth Action Plan for Indore district. I appreciate that a detailed study was undertaken in consultation with various stakeholders to develop the Climate Change Action Plan of Indore district. I am thankful to Shakti Sustainable Energy Foundation for supporting its preparation.

The action plan is a comprehensive assessment of the sectoral greenhouse gas emissions, current and future climate change scenarios, and climate change drivers in the district. Based on the assessment, the plan identifies various local level interventions, which are in line with the SAPCC, other state and national-level programmes, to tackle climate change at the district level in a sustainable manner.

I would encourage the district administration to adopt this Action Plan and take initiatives for its implementation on the ground.

(Aniruddhe Mukerjee)

PREFACE

Shriman Shukla, IAS
Executive Director
EPCO

Preface

District Climate Action Plan (DCAP) for Indore district has been developed by State Knowledge Management Centre on Climate Change, EPCO in collaboration with Vasudha Foundation, New Delhi with the support of Shakti Sustainable Energy Foundation to assess the transition in terms of both climate & policy, to address the key issues related to climate change in the district.

The Indore DCAP includes district-level baseline studies on climate variability and projections, an emissions profile, a budgetary analysis to estimate climate finance, and analysis of state and national level policies and programmes active in the district. It also incorporates a comprehensive set of recommendations, in alignment with Sustainable Development Goals (SDGs), for various climate-related sectors and environmental issues of Indore district, as well as case studies and estimates of mitigation potential.

I applaud the extensive efforts made towards developing this comprehensive DCAP for Indore district. I am proud to state that the Government of Madhya Pradesh is committed to long-term development. As a result, adopting a district plan that incorporates climate action is a key first step towards attaining state and national climate targets. I am certain that this action plan will serve as a roadmap for district-level planning efforts to integrate climate action and development.

I would like to thank my colleagues at State Knowledge Management Centre on Climate Change, Indore District Administration, Vasudha Foundation & Shakti Sustainable Energy Foundation, and appreciate the efforts of all for undertaking this study for Indore district.

(Shriman Shukla)

ACKNOWLEDGEMENTS

We would like to thank Shriman Shukla, IAS (ED, EPCO), Tanvi Sundriyal, IAS (previous ED, EPCO), Jitendra Singh Raje, IAS (previous ED, EPCO), Lokendra Thakkar (General Manager & Coordinator, EPCO), Prateek Barapatre and other team members from Environmental Planning and Coordination Organisation (EPCO), Government of Madhya Pradesh as their inputs and support have been vital in the development of the Climate Change and Environment Action Plan for Indore district.

We also extend our thanks to Manish Singh, IAS (Collector, Indore) for his inputs and appreciation of the CCEAP for Indore 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 Aditi Garg, IAS (CEO, Smart Cities Indore) and her team as their suggestions and inputs have helped shape the action plan for Indore district.

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


AC Bus
Smart Card

RECOMMENDATIONS

iBus, GPS-enabled Intelligent Transport System (ITS) in Indore

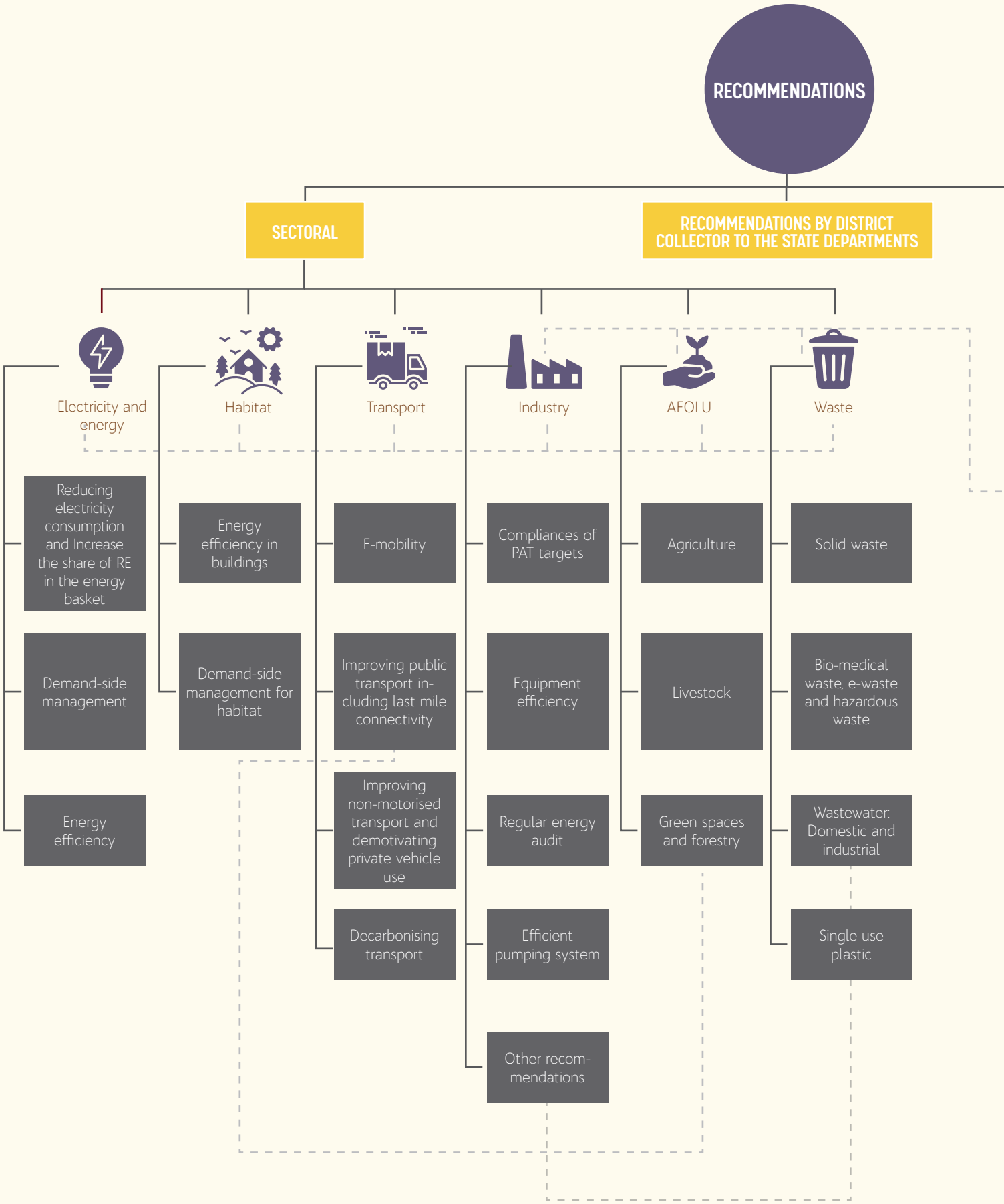
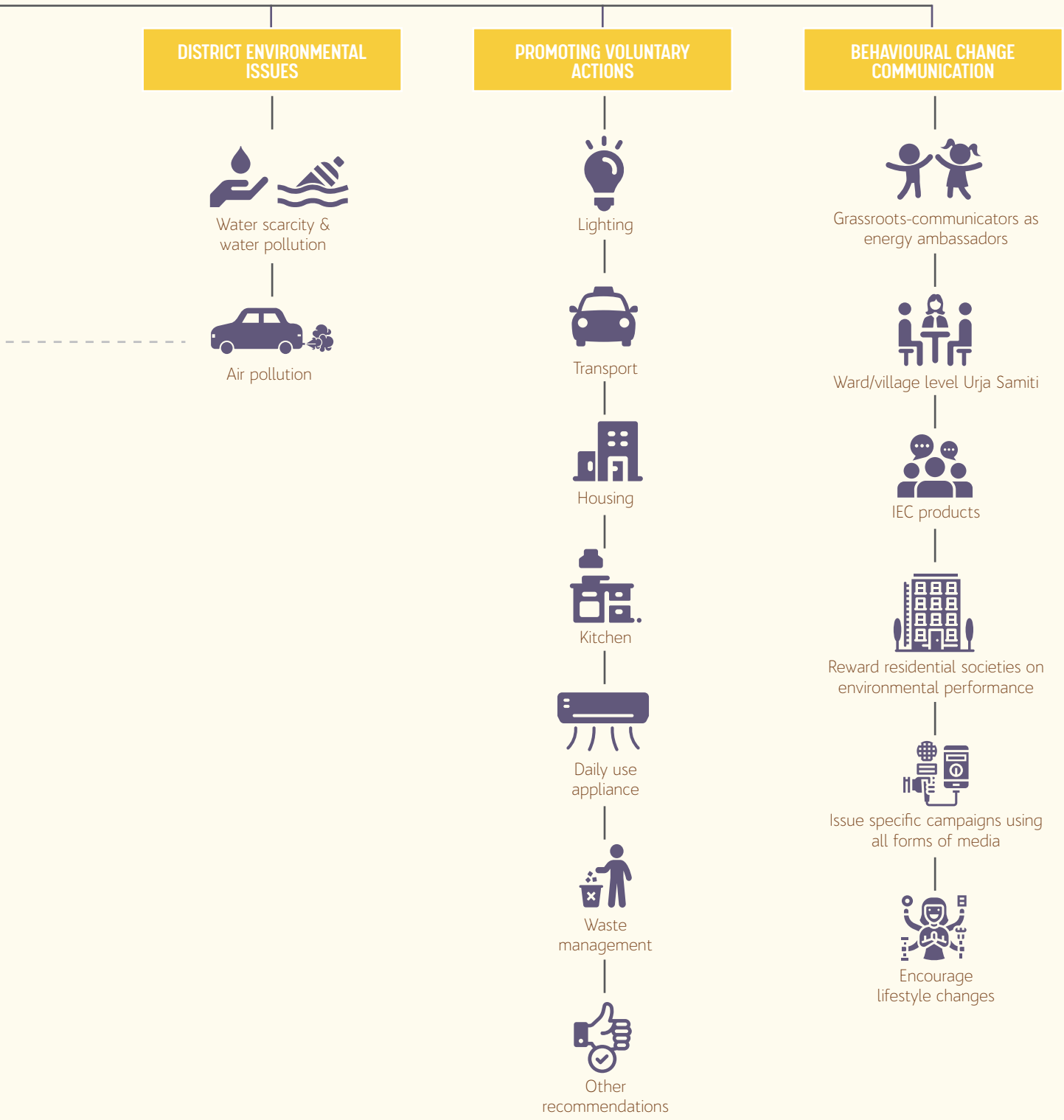


Figure 1 Recommendations for CCEAP Indore


DISTRICT ENVIRONMENTAL ISSUES
Water scarcity & water pollution
Air pollution
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)

RECOMMENDATIONS

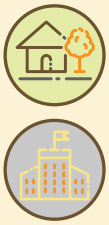
This section provides a comprehensive basket of sector-wise recommendations from a climate perspective, with an aim to complement India's 2030 NDC commitments through a district-level alignment in the form of this District Climate Change and Environment Plan. The salient features of these recommendations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

- Recommendations are grouped under four broad categories – energy; agriculture, forestry and other land use (AFOLU); waste; and district-specific environmental issues.
- The recommendations in the action plan can potentially mitigate 51,23,069 tCO_2e in Energy sector, 12,31,468 tCO_2e in AFOLU, and 99,613 tCO_2e in Waste sector.
- 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 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 recommendations mentioned in this action plan.
- Further, the cross-sectoral benefits of each recommendation have been identified and indicated using the icons as listed in the table below:

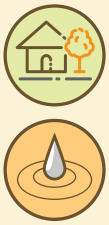
	Energy and electricity		Green space, forestry and allied activities and bio-diversity
	Habitat (residential)		Water resources and water conservation
	Commercial and public infrastructure		Solid waste
	Transport		Wastewater
	Industry		Air pollution
	Agriculture and allied activities		Awareness, communication 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 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). However, as of February 28, 2021, only 4.32 GW has been achieved. The state of Madhya Pradesh has a solar rooftop capacity of only 76.91 MW (as of February 2021). Case example calculation: a. If equipped with solar rooftops, the government schools in Indore district alone can generate 56.83 MUs electricity, thereby avoiding $MtCO_2e$ emission annually. b. If 50% of the commercial buildings in Indore district are equipped with solar rooftops (having a potential of 870 MW), 0.91 $MtCO_2e$ emission can be avoided annually. c. Further, if 50% households in the district are equipped with solar rooftops, total potential installed capacity would be 2,304 MW, which can help avoid 2.95 Mt CO_2e emission 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 health-care infrastructure (above certain bed-capacity). Ground mounted solar: The current installed capacity of ground mounted solar in Madhya Pradesh stands at 2.38 GW (as of February 2021). Indore district has a huge potential for solar power generation (rooftop and ground mounted). In Indore city, which is highly industrialised and urbanised, solar rooftop installation can be promoted, while for the rest of the district, ground-mounted solar installations can be a more viable option.

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Battery storage to be promoted aggresively.		Short to medium-term	Additional financial spport 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.
Encourage captive use of renewable energy, particularly, in rural areas for small industries and creation of local entrepreneurs.		Short to medium-term	Policy framework exists Need to generate awareness	By 2030, the district's electricity demand is expected to be around 7,000 MUs, annually. If all of this is supplied from coal, around 6 $MtCO_2e$ would be emitted, annually. Decentralised renewable energy (DRE) setups can power/boost small/cottage industries and can play an important role in providing livelihoods in rural areas as well as support reverse-migration (that was recently witnessed during the COVID-19 pandemic). Such setups would also create new jobs and empower rural entrepreneurs. Cold storage network across the district can be powered through DRE. Besides storing farm produce, such set-ups can also be useful for storing vaccines.
Energy demand-side management (DSM) and energy efficiency				
Encourage faster penetration of Street Lighting National Programme (SLNP). This would ensure all street and public lighting fixtures are replaced with energy-efficient LED bulbs. Priority must be given to premises and recreational areas of all government / public institutions.		Short-term	Policy framework and schemes exist	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 (International Energy Agency, 2021). SLNP had a national target of replacing 1.34 crore conventional street lamps with LED lamps by March 2020, but till date only 1.18 crore LED lamps have been installed. In Indore district, under the SLNP, if 20,000 existing conventional lamps are replaced by LED lamps, about 10,533 tCO_2e emission can be avoided, annually.

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Expedite the installation of smart meters in collaboration with MPPMCL in an effort to develop advanced metering infrastructure (AMI). Smart meters 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: a. Time of day (TOD)/time of use (TOU) billing b. Prediction and managemen t of peak demand c. Providing real time energy consumption data to consumers d. Prepaid billing facility e. Remote connection and disconnection of load f Development and adoption of a differential pricing model to demotivate energy consumption during peak hour, etc.		Short to medium-term	Policy framework and targets exist (section 6.1.1.1) Awareness generation for consumer segment	Implemented by EESL (BEE), Smart Meter National Programme aims to replace 25 crore conventional meters across the country with Smart Meters. MPPKVVCL's smart metering project, commenced in 2019, entailed the installation of about 1,40,000 smart meters in Indore Smart City at a cost of around ₹ 60 crores. The project, one of the biggest in terms of smart metering installations in the country, made Indore the first city in the country to have more than 1 lakh smart meters installed.
Replacement/upgradation of existing inefficient pumping infrastructure by energy-efficient pumps/solar pumps (where possible) for supply of piped drinking water in both rural and urban pockets of Indore district.		Short to medium-term	Relevant schemes and programmes can help achieve this (section 6.1.1.1) Inter-departmental collaboration Is required	MPUVNL has been designated as the nodal agency for the Municipal Energy Efficiency Programme (MEEP) in Madhya Pradesh. This programme aims to save 120 MW through energy efficiency projects in 134 ULBs.
In agriculture sector, promote energy efficient water pumps (provided by EESL), and solar pumps, wherever possible (through PM-KUSUM and CM's Solar Pump Scheme).		Short to medium-term	Policy framework exists (section 6.1.1.1)	According to BEE, 30% to 40% energy savings are possible by adoption of energy-efficient star-labelled pump sets. Conversion of 50% of the existing electricity/diesel operated tube-wells to solar in the district can save 83,144 tCO_2e emissions annually.

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
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 the collector's office to the state departments)		Medium-term	Additional financial support can be created Creating awareness through dedicated IEC and long-running campaigns	Case example: BSES Yamuna Power Ltd (BYPL) launched an AC replacement scheme in Delhi NCR 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. MPPKVVCL can implement a similar scheme in its area of supply, with a pilot in Indore district.

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

Sub-sectors	Policies and programmes[1] that can push forward the recommendation	Primary departments/ agencies	Supporting departments/agencies
Increase RE share in the electricity generation basket	1. MP Solar Policy, 2012 2. MP Policy for Decentralised Renewable Energy Systems, 2016 3. Waste to Energy Policy, 2016 4. National Solar Mission 5. i-SMART Project 6. PM KUSUM	1. MPUVNL, GoMP 2. Energy Department, GoMP	1. ALL ULBs 2. Madhya Pradesh Electricity Regulatory Commission (MPERC) 3. Rural Development Department, GoMP 4. Urban Development and Housing Department, GoMP 5. State Knowledge Management Centre on Climate Change (SKMCC) - EPCO 6. Department of Cottage and Rural Industries, GoMP 7. MPPMCL-MPPKVVCL, GoMP 8. Department of Agriculture, GoMP 9. Proposed District-level Committee on Climate Change and Environment
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, BEE 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. MP Solar Policy, 2012 12. MP Policy for Decentralised Renewable Energy Systems, 2016	1. MPUVNL, GoMP 2. BEE (EESL) 3. All ULBs 4. Panchayati Raj Institutions (PRIs) 5. Energy Department, GoMP	1. State Knowledge Management Centre on Climate Change (SKMCC)- EPCO 2. Department of Agriculture, GoMP 3. Urban Development and Housing Department, GoMP 4. Indore Smart City Development Corporation Limited (ISDCL) 5. Proposed District-level Committee on Climate Change and Environment

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

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

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Energy efficiency in buildings				
Incorporate Energy Conservation Building Code (ECBC) in the building bye-laws and encourage green buildings rating programme.		Medium to long-term	Policy framework exists (section 6.1.2.1) Inter-departmental collaboration required Need for capital incentives over and above the existing provisions from the district administration	The residential and commercial sectors consume around 27% of the total electricity in the district. MPUVNL is working towards incorporating ECBC into building compliance systems in MP. By 2025, if 23% of the existing residential area becomes ECBC compliant, 1.08 $MtCO_2e$ emission can be avoided.
District administration, in collaboration with the ULBs, can implement the India Cooling Action Plan (ICAP) and achieve its objectives. District administration can also explore the possibilities of piloting solar-passive architecture/other renewable energy technologies in a few of its iconic buildings. Implementing this at the district level can help avoid significant GHG emissions.		Medium-term	Policy framework exists (section 6.1.2.1) Needs inter-departmental collaboration Requires capital incentives from the district administration	In September 2018, India became the first country in the world to have a Cooling Action Plan, which seeks to (i) reduce cooling demand across sectors by 20% to 25% by 2037-38, (ii) reduce refrigerant demand by 25% to 30% by 2037-38, (iii) reduce cooling energy requirements by 25% to 40% by 2037-38, (iv) recognise "cooling and related areas" as thrust area for research under national S&T Programme, (v) training and certification of 1,00,000 servicing technicians by 2022-23, in synergy with the Skill India Mission. 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 through 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; among other benefits.

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Replace diesel-powered backup with solar-powered or any other RE powered backup in a phased manner. This can essentially be promoted in government / commercial/ institutional buildings with built-up area >20,000 sq ft.		Short to medium-term (government. buildings) Medium to long-term (privately owned, commercial, institutional, and other buildings)	Policy intervention is required Needs inter-departmental collaboration	A diesel generator (DG) of 200 kW (used in industries/huge commercial buildings) operating at full-load consumes approximately 45 litres diesel/hour. This results in usage of around 117 $kgCO_2e$/hour. Replacing DG sets with solar-powered backup can help in avoid these emissions.
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. 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. Deploying public funding schemes like feed-in tariffs; leverage national and international funds; and providing digital upskilling opportunities to citizens can help promoting the initiative.		Medium-term	Can be pushed forward by aligning with existing policy framework	
Upgrade public transport infrastructure such as bus depots, bus stops, railway stations etc. to include RE and ECBC compliance. Further, roadside advertising near such infrastructure can also be powered through RE. This can eventually be scaled up for hoardings across the district.	 	Short to medium-term	Can be pushed forward by aligning with existing policy framework for solar rooftop (section 6.1.2.1) ECBC compliance of public transport infrastructure to be mandated by building bye-laws	Indore district can adopt and implement initiatives, similar to the one in Lucknow, where the municipal corporation has said it would set up 200 solar-powered bus stops.

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Encourage fast penetration of UJALA scheme in every household.		Short to medium-term	Schemes and programmes are available (section 6.1.2.1)	The UJALA scheme provides an LED bulb at a nominal price for replacement of incandescent lamps /conventional bulbs. A projected number of LED bulbs to be used in Indore households by 2030 can potentially avoid 49,392 tCO_2e emissions, annually.
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 facilitates settlement of more people per sq m, but also contributes towards the environment. It averts the loss of agricultural land and makes the transport system much more efficient. India has high-rise buildings in Mumbai, Delhi NCR and Bengaluru. Other cities like Kolkata, Chennai, Hyderabad and Ahmedabad are also catching up.
Enhance public awareness for switching to 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. For instance, installing rainwater harvesting (RWH) in buildings can considerably reduce energy dependence on submersible motors for pumping groundwater.		Short-term	Schemes and programmes exist (section 6.1.2.1) Need to generate awareness	Indore Municipal Corporation (IMC) has mandated RWH in all new buildings with an area of 250 sq m or more. Above this, a rebate of 6% on property tax is provided as an incentive to install RWH. Government of Madhya Pradesh is planning to scale-up the Indore model across the state.

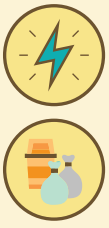
Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Implement individual water metering in residential sector to reduce water wastage and introduce other energy efficient measures for drinking water and wastewater plants, thereby, bringing down energy consumption.		Medium-term	Policy intervention is required Need to generate awareness	In many cities, drinking water and wastewater plants are municipally owned and are among the largest municipal energy consumers, often accounting for 30% to 40% of total municipal energy consumption. By incorporating energy efficiency measures into their water and wastewater plants, municipalities can save 15% to 30% of their municipal budgets. To check wastage of drinking water, IMC has linked water distribution to a supervisory control and data acquisition (SCADA) system. IMC has installed water meters in nearly 1,000 houses to record the units of water utilised per house. It is planning to scale-up the practice across the city. Narmada river water supplied to the city is the costliest in the country. It costs IMC ₹ 30/1,000 litres to collect, purify and transport drinking water from Jalud pumping station to houses in Indore.
Encourage residential societies to adopt solar-thermal water heaters.		Short-term and continuous	Schemes and programmes exist (section 6.1.2.1) Inter-departmental collaboration is required Scheme to be implemented as a part of green buildings	As a general rule, for multi-storey residential buildings (up to 12 storeys) community solar water heating systems on the roof (assuming utilisation of 60% of the roof area) can meet around 70% of the annual electricity requirement for heating water (BEE).
Promote installation of automatic/ smart water pumps to control overflowing of tanks.		Short-term	Need to generate awareness	
Water cess/pricing by the municipal corporation to be revised and gradually increased.		Medium-term	Policy framework needs to be updated	
Digital tools, like, GIS, remote sensing can 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.		Medium to long-term	Needs policy intervention and infrastructural development	Reduced energy demand example: by finding the optimal locations for water features or vegetation to counteract heat islands, or trees to provide shading and reduce cooling demand in buildings

6.1.2.1 Habitat: Policy framework and concerned departments/agencies

Sub-sectors	Policies and programmes that can push forward the recommendation	Primary departments/ agencies	Supporting departments/agencies
Energy efficiency in buildings	1. ECBC, 2017 2. India Cooling Action Plan, 2018 3. UJALA Scheme, 2015 4. MP Solar Power Policy, 2012 5. MP Policy for Decentralised Renewable Energy systems, 2016 6. Smart Cities Mission 7. Sustainable Habitat Mission	1. Urban Development and Housing Department, GoMP 2. All ULBs 3. Indore Smart City Development Corporation (ISDCL) 4. Panchayati Raj Institutions (PRIs)	1. MPUVNL, GoMP 2. State Knowledge Management Centre on Climate Change (SKMCC)-EPCO 3. BEE (EESL) 4. Rural Development Department 5. MP Road Development Corporation Limited (MPDCL) 6. MP Transport Department 7. Proposed District-level Committee on Climate Change and Environment
Demand-side management	1. MP Jal Viniyaman Adhiniyam, 2013 2. ECBC 3. Building Bye-laws 4. Comprehensive General Development Control Regulations – Urban Development and Housing Development	1. Urban Development Housing Department, GoMP 2. All ULBs 3. Rural Development Department 4. Panchayati Raj Institutions (PRIs)	1. MP Jal Nigam. 2. Indore Smart City Development Corporation (ISDCL) 3. MPPCB 4. Proposed District-level Committee on Climate Change and Environment 5. State Knowledge Management Centre on Climate Change (SKMCC)-EPCO

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 to encourage adoption of electric vehicles.		Short-term and continuous	Inter-departmental collaboration and dedicated, long-running campaigns are required	MP EV Policy 2019 plans to declare Indore as model electric mobility (EM) city. Planned awareness campaigns can encourage widespread acceptance of EV in the district.
District should endeavour to increase the modal share of e-vehicles to achieve the target of National Electric Mobility Mission Plan (NEMMP) and FAME II.		Short-term and continuous	Policy framework exists (section 6.1.3.1) and budgetary provisions can be made available through various schemes	The MP Electric Vehicle Policy 2019 aims to increase the modal share of electric vehicles in major cities of Madhya Pradesh, including Indore, through the introduction of electric buses, two-wheelers, three-wheelers and cars in the cities.

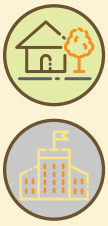
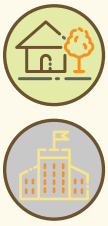
Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Make all public transport (PT) modes low carbon-intensive, such as shifting current fossil fuel-based vehicles to electric-powered or hybrid vehicles.		Medium to long-term	Policy framework (section 6.1.3.1) and budgetary provisions exist	In November 2019, NTPC announced plans to procure and operate 250 electric buses for three cities in MP – Jabalpur, Bhopal and Indore. Atal Indore City Transport Service Limited (AICTSL) procured 40 electric buses in the city as part of its public bus service in 2019. The MP EV Policy 2019 aims to achieve 25% new EV registrations in public transport by 2026. It also targets 100% conversion of current public transport bus fleet into electric buses by 2028. Further, the policy also states that electric buses procured in the first five years will be charged 1% motor tax and will be exempted from vehicle registration fees.
Initiate transition of intermediate public transport (IPT) vehicles to electric by incentivising operators through: a. subsidies, b. separate lanes, c. dedicated parking spaces, d. replacement of lead acid battery powered electric IPT vehicles with more sustainable Li-ion battery e-vehicles in a phased manner.		Medium-term	Policy framework for the recommendation exists (section 6.1.3.1)	Currently, there are more than 1,800 electric rickshaws in Indore. In MP, subsidies are being provided for electric autos and other IPT vehicles under FAME II. The MP EV Policy, 2019 also states that for the first five years, e-rickshaws and e-autos will be charged only 1% motor tax. The vehicle registration fee will also be exempted for the period. Further, these vehicles will not be charged parking fee at ULB-run parking facilities for the initial five years. In addition, the district can provide dedicated parking spaces and plan for separate lanes for electric IPT vehicles.
District administration, ULBs (for office use + solid waste transport activities) and all district-level government offices can adopt e-vehicles. Additionally, all these offices need to install charging infrastructure at the earliest.		Short to medium-term	Needs policy backing	The MP EV Policy, 2019 has recommended all government office buildings to install charging infrastructure. Indore can lead by example and encourage government departments to transition their fleets to EV-based vehicles. Atal Indore City Transport Service Limited (AICTSL) has partnered with EESL and TATA Motors to deploy a fleet of 50 electric cars in the city. Further, in December 2020, the Power Department in Indore announced its plans to transition to electric vehicles. A charging station is also being set-up at Polo Ground to ease this transition.

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Develop robust and widespread charging infrastructure. a. Charging infrastructure to be set up at strategic locations, such as commercial hubs, public parking, airports, railway stations etc., preferably RE powered. b. Adoption of relevant policies. c. Prioritise land acquisition for setting up charging infrastructure. d. Dedicated parking spaces for EVs should be introduced with charging facilities. 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. 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.		Medium-term	Policy framework exists (section 6.1.3.1) Inter-departmental collaboration required	Indore city has charging stations at select locations. AICTSL has planned further expansion of charging infrastructure in the city. District authorities can promote EV charging infrastructure installation at key locations such as local markets and recreational areas near lakes where they can collaborate with/incentivise business owners to set up charging points.
The district administration, in collaboration with the ULBs and state officials, may explore options to provide incentives to e-vehicle owners over and above existing programmes through: a. exemptions on road tax, b. exclusive parking, c. additional subsidy scheme for women and students.		Short-term	Enhancing the existing policy frameworks towards holistic integration of EVs	The MP EV Policy, 2019 has a target of increasing the modal share of EVs and has recommended means to promote EV, as listed in the points above. Indore can lead by example by easing transition to EV through these additional incentives.
Promote fast registration of EVs at RTO		Short-term	Need to generate awareness in order to popularise EVs Inter-departmental coordination required	MP EV Policy 2019 has provisions to incentivise adoption of EVs, including exemption from vehicle registration charges and road tax (for the first five years).

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Encourage development of local network of e-vehicle rentals 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	The successful rental model of Yulu bikes in Bengaluru can be emulated to develop hour-based electric bike rentals for key routes. These bikes can be a part of an integrated ticketing system that utilise smart cards for payments. MP EV Policy, 2019 also promotes battery swapping stations for ease of transition to EVs.
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 some cities, certain companies are working towards developing an electric vehicle fleet. The district can recommend a transition to electric vehicles for such delivery persons.
Range anxiety is a key barrier to EV adoption. Mobile applications (local app, google map, etc) with real-time data availability of charging points and the cost of charging at various locations will be critical to ensure the popularity of EV by allowing the EV users to plan routes that identify charging points.		Medium to long-term	Needs support for digitalisation	
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	

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Public transport (PT) and intermediate public transport (IPT)				
Increase reliability, accessibility and enhance last mile connectivity of public transport (PT) and intermediate public transport (IPT) through: a. integrated ticketing and smart cards that work across all transport modes (IPT, cycle hire, etc), b. integrating smart mobility applications with real-time service updates across modes, including car hire, public transit and shared micro-mobility schemes, c. increasing fleet strength, d. increasing frequency, e. adding more stops, f. enhancing reach to low/ non-serviced areas, peri-urban and rural areas, g. developing dedicated parking spaces for IPT.		Medium to long-term	Existing policy framework needs to be enhanced Inter-departmental collaboration required	Public transport services in Indore include AICTSL and Indore Bus Rapid Transport System (IBRTS), called iBus and Skybus, as well as private buses operating on 24 routes. iBus: Route length 12 km, one route, fleet strength 88 buses. Atal City Bus: Route length 277km, >16 routes, fleet strength 110 buses, 120 stops. The option of smart card, called Chalo Card, for PT payments is available. However, it has not been popularised. Further, introducing a smart card that works across all transport modes (IPT, cycle hire etc), entry to tourist sites, payment for rental vehicles among other things can make PT and IPT more popular with increased ease of use. Peri-urban areas are currently connected through MPRTC services. The frequency of services can be enhanced. iBus and Atal City Bus services can also be extended to these areas. The share of IPT by ridership in Indore city is 54% with majority of the population opting for private vehicles for commuting. Currently, IPT sector is largely an informal sector, and is limited to certain routes. The informal IPT modes operating in the peri-urban areas of the district include mini buses, shared autos, omni vans and jeeps. Residents in city outskirts/ peri-urban areas majorly rely on private vehicles or walking. Formalising this mode and transitioning it to a low-carbon regime is essential to reducing GHG emissions from the transport sector in Indore.
District administration can collaborate with ULBs to develop fiscal measures to discourage the use of personal vehicles through measures like variable parking charges for peak hours.		Short-term and continuous	Requires policy framework based on research and inter-departmental cooperation	Indore can adopt recommendations from Delhi Master Plan 2021, which provides a parking district management plan. The action plan suggests that the transport department, municipal corporations, traffic police and other agencies need to collaborate to develop and maintain parking areas. The plan also suggests that variable and time-based parking prices should be introduced.

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
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	Requires proper policy backing based on research and inter-departmental cooperation	For example: 1) Sikkim Parking Policy, 2010, mandates that only houses with parking slots can procure vehicles. 2) In February 2016, Gujarat University had announced that the first and the 15th of each month will be observed as no vehicle days when only public transport and pedestrian movement would be allowed.
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) and needs stricter implementation	
Awareness campaigns to popularise PT and IPT modes		Short-term and continuous	Dedicated awareness campaigns required	The Swachh Bharat Abhiyan – Indore campaign has been a success, with the city consistently making it to the top for four consecutive years in the Swachh Survekshan. The campaign design encouraged people's participation in making Indore the cleanest city in India. A similar campaign design – with catchy slogans, road paintings, appropriate messaging on social media, local channels and news – can be adopted to encourage the use of public transport.
Augment non-motorised transport (NMT)				
Improve infrastructure to enhance modal share of NMT transport options in urban areas, by introducing measures such as segregated cycle lanes.		Medium-term	Policy based on research and inter-departmental cooperation required	Current modal split in Indore indicates that the share of NMT is approximately 10%. However, it has been decreasing over the years. Efforts are needed 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. removing encroachments.		Short-term and continuous	Policy framework exists Requires inter-departmental cooperation	

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Promote cycle hire service in key locations across the district.		Short-term	Proper policy backing and strategic awareness drives required Further, PPP models can be explored for successful implementation	The iBike initiative, a bicycle rental service, was launched in 2017. However, its popularity is low. Indore can emulate the Bhopal Smart Bike Sharing Service, which was introduced in 2017. In the first phase, 50 locations were chosen to set up rental stations in the city. In the second phase, the network expanded, and users can now register for the bikes through the website or an app. Strategic placement of cycle hiring stations, ease of use and reasonable pricing schemes can help popularise the programme.
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 policy based on research, along with multi-stakeholder and inter-departmental cooperation	Indore 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 shift in work timing is also being planned in Bengaluru.
a. Create additional dedicated parking zones for vehicles in order to deter encroachment of road space and pavements. b. Encourage business/ corporate centres to have mandatory private parking with sufficient parking slots to avoid parking on roads, service lanes and other public spaces.		a. Medium-term b. Short-term and continuous	Policy framework exists Multi stakeholder and inter-departmental cooperation is required.	Indore has multiple parking spaces available. However, since awareness and maintenance of these spaces is poor, usage is also low. The municipal corporations and district authorities need to work towards building awareness and encouraging the use of parking facilities.
Develop dedicated areas for street vendors to deter them from encroaching upon pavements that cause traffic congestion along the roadsides.		Short to medium-term	While the policy framework exists, implementation is irregular and for shorter time-frame. Multi-stakeholder and inter-departmental cooperation are required.	There are regular drives by the IMC and the city police to clear encroachments. However, these affect the livelihoods of street vendors.

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Regular maintenance of roads to ensure smooth flow of traffic, since it can help reduce GHG emissions while also 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	1. FAME II 2. Madhya Pradesh EV Policy, 2019 3. JNNURM 4. National Electric Mobility Mission Plan 5. Smart Cities Mission 6. AMRUT 7. Proposed e-vehicle Policy (as per 2021-22 Union Budget) 8. National Urban Transport Policy, 2006	1. All ULBs 2. RTOs 3. EESL	1. Urban Development and Housing Department, GoMP 2. MPUVNL 3. Transport Department, GoMP 4. Roads and Buildings Department, GoMP 5. State Knowledge Management Centre on Climate Change 6. Rural Development Department, GoMP 7. Indore Smart City Development Corporation Limited 8. PRIs 9. Airport Authority of India 10. Central Railways – Indore Division 11. Proposed District-level Committee on Climate Change and Environment
Public transport (PT) and intermediate public transport	1. BRTS 2. JNNURM 3. ECBC 4. Smart Cities Mission 5. AMRUT 6. National Urban Transport Policy, 2006	1. All ULBs 2. Indore Smart City Development Corporation Limited 3. MPSRTC	1. Urban Development and Housing Department, GoMP 2. Transport Department, GoMP 3. RTOs 4. Roads and Buildings Department, GoMP 5. State Knowledge Management Centre on Climate Change (SKMCC)- EPCO 6. Rural Development Department, GoMP 7. MPUVNL 8. Proposed District-level Committee on Climate Change and Environment
Augment non-motorised transport	1. Smart Cities Mission 2. AMRUT 3. National Urban Transport Policy, 2006	1. All ULBs 2. Indore Smart City Development Corporation Limited;	1. Urban Development and Housing Department, GoMP 2. Roads and Buildings Department, GoMP 3. State Knowledge Management Centre on Climate Change (SKMCC)- EPCO 4. Rural Development Department, GoMP 5. PRIs 6. MPUVNL 7. Police department, GoMP 8. Proposed District-level Committee on Climate Change and Environment

Sub-sectors	Policies and programmes that can push forward the recommendation	Primary departments/ agencies	Supporting departments/agencies
Improving traffic flow	1. BRTS 2. JNNURM 3. ECBC 4. Smart Cities Mission 5. AMRUT 6. National Urban Transport Policy, 2006	1. All ULBs 2. Indore Smart City Development Corporation Limited; 3. RTOs	1. Urban Development and Housing Department, GoMP 2. Roads and Buildings Department, GoMP 3. Madhya Pradesh Housing and Infrastructure Development Board (MPHIDB) 4. State Knowledge Management Centre on Climate Change (SKMCC)- EPCO 5. Rural Development Department, GoMP (implementation support outside urban areas) 6. Police department 7. Department of Industry Policy and Investment Promotion, GoMP 8. PRIs 9. MPIDC 10. Proposed District-level Committee on Climate Change and Environment

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

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
The district can develop an incentive system, similar to a "cap and trade" system, for enhancing energy efficiency of MSMEs, in coordination with the state energy department.		Medium-term	Requires 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 Awareness to popularise the initiative	CHP systems can achieve system efficiencies close to 80% as compared to around 60% by conventional technologies.

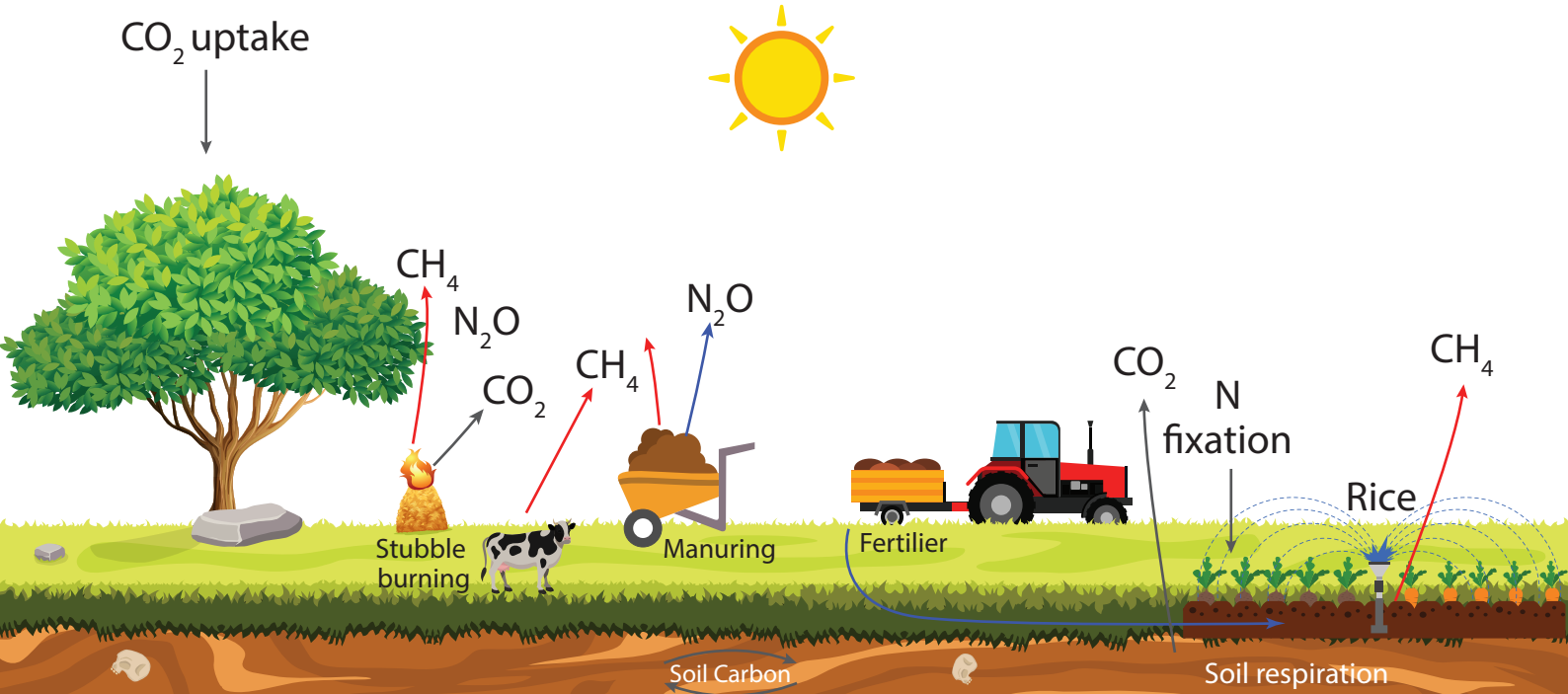
Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Optimise equipment efficiency. Equipment that are not usually turned off during downtime, such as heating or cooling equipment, pumps and alarm systems, need to be energy-efficient. Strategies must be developed to switch them off whenever possible.		Medium-term	Policy framework exists (section 6.1.4.1)	MP Industrial Promotion Policy, 2014 undertakes the following measures: 1. Creates a level-playing field for all investors that helps them conduct their business with ease. 2. Strengthens the single-window system to make it more effective under the provisions of the Madhya Pradesh Investment Facilitation Act 2008. 3. Provides competitive fiscal incentives and exemptions to attract investment. 4. Provides support to the investors in making government and private land available for industrial projects across different scales of investments. 5. Upgrades industrial infrastructure in existing industrial growth centres. 6. Promotes the creation of ancillaries to strengthen local vendors. 7. Enhances the employability of youth by focused skill development efforts. 8. Strengthens MSMEs through an attractive package of incentives and concessions. 9. Ensures harmony between private sector investors and local citizens through an enhanced dispute settlement mechanism. 10. Promotes thrust sectors through sector-specific promotion policies; 11. Establishes a 'land bank' keeping in mind future requirements of land for industries. 12. Develops world-class infrastructural facilities for industries with active participation of the private sector. 13. Provisions for the protection of the environment and encourages water conservation measures in the industry through go-green strategies. 14. Promotes industrial parks for cluster development of similar micro and small-scale industries in regions that are rich in the raw material being used by that particular industry.
Invest in green projects – such as plantation drives and afforestation activities – within and around industrial areas in 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	
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 the responsible agencies and departments	

6.1.4.1 Industry: Policy framework and concerned departments/agencies

Sectors	Policies and programmes which can push forward the recommendation	Primary departments/ agencies	Supporting departments/agencies
Industry	1. MP Industrial Promotion Policy, 2014 2. MP Solar Policy, 2021 3. National Mission on Enhanced Energy Efficiency	1. Department of Industry Policy and Investment Promotion, GoMP	1. MP Audyogik Vikas Nigam (MPIDC) 2. Energy Department, GoMP 3. District Industries Centre 4. BEE 5. MPUVNL, GoMP 6. MPPMCL-MPPKVVCL 7. Proposed District-level Committee on Climate Change and Environment

6.1.5. AFOLU: Recommendations, cross-cutting sectors, qualifying priority and district scenario

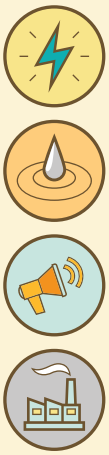
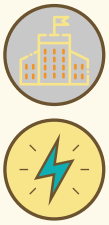
Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
AFOLU: Agriculture				
Promote sustainable farming by using non-chemical fertilisers, including programmes like zero budget natural farming in the district.		Short to medium-term	Policy framework exists (section 6.1.5.1) Budget provisions are available	In 2017-18, Indore used approximately 72,521 tonnes of urea (for agriculture). Replacement of 10% of this current urea consumption with non-chemical fertilisers can help avoid 5,300 tonnes of CO_2e emissions/annum. This initiative will also contribute towards: a. cutting down of compostable solid waste from landfilling/dumping and converting it to organic waste, which can further be used to make organic fertilisers, thereby, reducing emission from the waste sector; b. lessening of harmful agricultural run-off, thereby reducing water pollution and eutrophication.



Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Promote adoption of alternative ways for crop residue management other than burning. Promote adoption of improved harvesting practices, such as land leveller, direct seeding, nutrition management, etc. through agricultural extension programme and financial assistance/ formation of cooperatives, etc. Stubble can be used as feedstock for different industries to make products including paper, cardboard, furniture, organic fertiliser and animal feed, which will also act as an alternative source of income for farmers.		Short to medium-term	Policy framework required Collaboration required Farmers to have easy access to markets/industries that would take crop residue/ stubble Helps meet the following targets: -- SDG#8 8.2; -- SDG#12 12.5, 12. a	Improve harvesting practices through means such as the use of happy seeder, which has the capacity to eliminate 78% of GHG emissions (from crop residue burning). It can potentially add to farmers' profits by at least 10%. Feasibility studies for a cost-benefit analysis of such improved harvesting machines and practices need to be undertaken. Direct sowing of rice reduces soil disturbance, enabling it to retain more nutrients, moisture and organic content. It also, removes the need for stubble-burning, thereby reducing air pollution. Other feasibility studies or projects can be initiated. Such as the development of biofuel pellets from crop residue.
Farmers should be encouraged to follow the recommendation given in the soil health cards.		Short to medium-term	Awareness generation required	According to Soil Health Card Portal, 23,15,844 samples have been tested in Cycle-II in MP. In Indore, 11%, and 1% of all the samples tested reported very low nitrogen and phosphorus, respectively. However, micronutrients were found to be sufficient (as per information provided by the Department of Agriculture Cooperation and Farmers' Welfare, Ministry of Agriculture and Farmers' Welfare, GoI).
Promote micro-irrigation (MI) to improve water use efficiency. It saves water, energy and fertiliser consumption.		Short to medium-term	Policy framework is available (section 6.1.5.1) Enable swift procedures and subsidy disbursement for adoption of micro-irrigation District may consider providing additional subsidies	Currently, MP holds 4.99% of the total area under micro-irrigation in India.[2] Under the prevailing subsidy regime in the state, the extent of subsidy varies between 70% and 80% of the cost of the drip system. While the central government provides for 50% of the equipment cost as subsidy in the case of small and marginal farmers (belonging to both general category as well as SC/ST category), the extent of subsidy is 40% in the case of other category of farmers. The state government additionally provides between 20% to 30% of the cost as subsidy.[3] MI helps attain greater water-use efficiency, thereby reducing the pressure on groundwater sources with reduced GHG emissions. Drip systems have 95% water use efficiency. According to PMKSY Achievement Report, 601.30 ha of land was covered under MI in Indore during 2019-20, which should have led to avoidance of approximately 508.33 tonnes of CO_2 emissions. (w.r.t to conventional irrigation through groundwater).

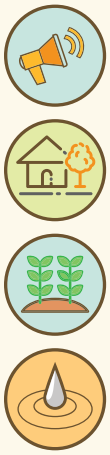
2 Suresh A. and Samuel M. P., 2020, Micro-irrigation development in India: challenges and strategies

3 Towards Accelerating Adoption of Drip Irrigation in Madhya Pradesh, International Water Management Institute Centre for Environment and Development Studies, Jaipur

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Encourage adoption of latest technologies, such as: a. Solar pumps (under PM KUSUM Yojana and CM's Solar Pump Scheme) b. Star-rated energy efficient pump system (EEPS) c. Smart control panels and internet of things (IoT) based systems for optimum resource utilisation (water, energy)		Short to medium-term	Policy framework is available (section 6.1.5.1) Support in capital investment over and above the existing policy can be considered	According to MNRE, Madhya Pradesh has achieved 92.4% of the target of installing solar pumps under PM-Gramin Kalyan Yojana (as on January 21, 2021 MP has installed 3,224 solar pumps). Replacement of 1 lakh diesel pumps with solar pumps over a period of 5 years can cut 900 million litres of diesel consumption over the life cycle of solar pumps, which can potentially save ₹ 840 crore of diesel subsidy and 2.53 million tonnes CO_2 emissions. Under PM KUSUM Yojana and CM Solar Pumps Yojana, the government provides subsidy ranging from 83% to 65% for various pumps and about 50% for cowsheds (gaushalas). If 50% of tube-wells in Indore are converted to solar then 3,10,000 tonnes of CO_2e emissions can be saved. These initiatives will increase farmer income, provide reliable source for irrigation and reduce dependence on diesel in the farm sector.
Enhance the efficiency/ network of cold storage systems and wherever possible, power them with renewable energy.		Medium to long-term	Policy framework exists and can be enhanced (section 6.1.5.1.) Capital investment required Align with solar rooftop policies and ECBC	
AFOLU: Livestock				
Promote grasslands and cultivation of cattle feedstock for good quality forage and to manage fodder scarcity.		Short to medium-term	Policy framework exists (section 6.1.5.1) Research inputs required Collaboration between different communities (farming and pastoral) are needed	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 an estimated reduction of 30% in emissions. 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 Indore at the district level.[4]
Promote cattle breeds with higher productivity. Moreover, productivity of indigenous cattle should also be improved (for instance, through the provision of Nand Ghars) However, it's essential to maintain the balance between resilience and productivity. Currently, in most areas, flock sizes are negatively impacting the climate and ecology.		Medium to long-term	Policy framework exists (section 6.1.5.1) Research collaboration required (to ensure biodiversity of the region is not impacted) Generate awareness Provide monetary support to the pastoral community	These initiatives will help meet growing demand of milk while keeping the livestock headcount low. In Indore, if there is a 10% decrease in the number of indigenous cattle over a period of five years, the loss in milk production will be 13 lakh litres and 81,179 tonnes of CO_2e emission can be avoided. To compensate for this loss in milk production, a total of 81,973 new crossbreed cattle need to be introduced, resulting in 74,036 tonnes CO_2e emissions. The net emissions avoided per year in the district will be 7,168 tonnes CO_2e.

4 http://nianp.res.in/harit-dhara-tamarin-plus

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Promote the use of waste from livestock and poultry as an important source of organic manure for crops. Poultry manure is rich in nitrogen and can be used for various crops like sugarcane, potato etc. for enhancing crop production.		Short to medium-term	Collaboration between different communities (farming and pastoral) is needed; Policy framework is available (section 6.1.5.1)	Poultry manure fertiliser is rich in nitrogen and contains all the 13 essentials nutrients required for crop production. In comparison to cow manure, it is two to three times richer in inorganic fertiliser content.
AFOLU: Forestry and Green Spaces				
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. Funds for continuous tree improvement and tree breeding programmes can be ensured through Compensatory Afforestation Fund Management and Planning Authority (CAMPA).		Short to medium-term	Policy framework and budget provisions exist (section 6.1.5.1) Policy implementation required Stringent monitoring and evaluation	As per India State of Forest Report, 2019, during the period January 2015- February 2019, a total of 12,785 hectares of forest land of MP was diverted for non-forestry purposes under the Forest Conservation Act, 1980. In 2019, Madhya Pradesh received Rs 5,196.69 crore from the CAMPA, which aims to promote afforestation and regeneration activities as a way of compensating for forest land diverted to non-forest uses. As per Parivesh Part-II Report (with state serial proposal number MP-079/2016), 397.235 ha of total forest area in Indore has been diverted since 1980.
Measures to increase trees outside forest (TOF) area and green spaces in Indore a. Set up of urban parks b. Adopt Miyawaki Urban Forestry method c. Transplant trees with the help of tree transplanter machines d. Set up floating gardens, butterfly gardens etc. e. Initiate afforestation activities on wastelands and fallow lands f. Plantation along village roads can be taken up under MGNREGS. g. Develop green belt along the major terrain roads, and surrounding the industrial areas h. Tree census should be conducted periodically.		Medium to long-term	Policy framework is available (section 6.1.5.1) Capital investment, research collaboration and inter-departmental cooperation are required	According to the 2019 FSI assessment report, the extent of TOF for Madhya Pradesh is 21,069 sq km. Dominant tree species in TOF are *Butea frondose, Acacia arabica, Azadirachta indica, Zizyphus jujuba* and many more. Miyawaki urban forestry method has reported 15% faster growth rate per year compared to other reforestation methods. Example: AIIMS Bhopal developed the state's first Miyawaki forest on 24,000 sq ft of land. Similar, pilot projects can be adopted in Indore as well. Green belts help mitigate air pollution, increase urban green cover, thereby leading to carbon sequestration.

Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Enhance forest cover by promoting agro-forestry and social forestry to increase forest biomass and soil moisture. a. Control illegal timber trade. b. Carry out mapping of agroforestry area to monitor the coverage. c. Create provisions of financial instruments/ relaxation in other taxes (over and above the existing schemes) to encourage farming community to adopt agroforestry.		Medium to long-term	Policy framework and budget is available; implementation is required Stringent monitoring and evaluation are necessary	Currently, the forest area in Indore district is only 17.41% of its total geographical area. If 25% of the geographical area of Indore (equivalent to state average forest cover) is converted to green cover, over a period of 10 years, 7.13 Mt of CO_2 emissions can be avoided. According to 2019 FSI Assessment Report, the tree cover of Madhya Pradesh is 8,339 sq. km.
Ensure ULBs carry out regular monitoring of survival of the trees under plantation a. A thorough study needs to be done on suitability of the site and survival ratio of species (majorly native species) before initiating any plantation drive. b. Prepare an audit every year on the number of saplings surviving after plantation drives. c. Ensure geo-tagging of trees (along with site and species) for proper monitoring.		Short to medium-term	Monitoring and evaluation required Collaboration among different stakeholders required	
Promote regeneration of degraded and open forest areas by developing awareness among locals regarding the importance of green spaces.		Long-term	Strengthen the existing policy framework Collaboration among different stakeholders	According to 2019 Forest Survey of India report, there is a decrease in forest cover by 0.27 sq km in Indore from 2017 assessment.

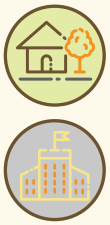
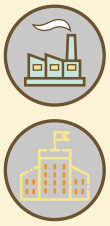
Recommendations	Cross-cutting with	Qualifying priority		District scenario/case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Various aspects of Joint Forest Management need to be promoted: a. Capacity building and skill development of joint forest management committees in tribal and non-tribal areas through workshops and training. b. Initiate participatory forest management programmes at micro scale.		Short to medium-term	Exclusive communication strategy and IEC material to be developed and used Provisions of monetary support	According to 2015 ENVIS Database, total area under JFM in Madhya Pradesh is 66,87,390 ha. There are about 15,228 joint forest management committees.
Prevent invasion of non-indigenous species a. Develop a database and update information on invasive species and their management. b. Raise awareness at regional levels. c. Strengthen and maintain institutions to coordinate invasive species programmes.		Medium to long-term	Research studies of flora specific to the region. Provisions of monetary support Exclusive communication strategy and IEC material to be developed and used Requires funding, monitoring and evaluation, stakeholder collaboration	*Lantana camara, Cassia tora, Ageratina Adenophora, Ageratum conyzoides* and *Senna occidentalis* are some major invasive species in Madhya Pradesh. 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. (Solanki, 2018).
Develop participatory forest fire management strategies such as: a. Collecting baseline forest fire data with respect to perceptions, beliefs, expectations and behaviour of local people with regard to forest fires. b. Training local communities to tackle forest fires. c. Organising awareness programmes in local schools. d. Capacity building to develop an early warning system.		Medium to long-term	Provisions of monetary support Exclusive communication strategy and IEC material to be developed and used Monitoring and evaluation required Needs collaboration among different stakeholders	According to FSI report 2019, about 0.14%, 19.36% and 64.84% of the total forest cover area of Madhya Pradesh is under extreme, moderate and least fire prone area, respectively.
Ensure implementation of Sanjay Gandhi Paryavaran Mission		Medium to long-term	Policy implementation required	According to the targets of this mission, five eco-smart villages/ blocks need to be established in the district, and five crore saplings are to be planted (as a collective effort by all the district departments) by 2025.

6.1.5.1 AFOLU: Policy framework and concerned departments/agencies

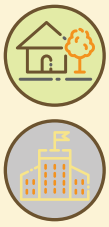
Sectors	Policies and programmes that can push forward the recommendation	Primary departments/ agencies	Supporting departments/agencies
Agriculture	1. Pradhan Mantri Krishi Vikas Yojana 2. National Mission for Sustainable Agriculture 3. Pradhan Mantri Krishi Sinchayee Yojana 4. PM KUSUM Yojana 5. Soil Health Card 6. National Mission on Food Security 7. National Mission on Micro-irrigation 8. CM Solar Pump Scheme 9. Dinkar Yojana 10. Price Support Scheme 11. CM Farmer Promotion Scheme 12. MP Kisan Anudan Yojana 13. Pradhan Mantri Garib Kalyan Yojana	1. Farmers' Welfare and Agricultural Development Department, GoMP	1. Panchayat and Rural Development Department, GoMP 2. Water Resources Department, Madhya Pradesh 3. Energy Department, GoMP 4. Department of Animal Husbandry, GoMP 5. State Knowledge Management Centre on Climate Change (SKMCCC): EPCO – for monitoring 6. Forests Department, GoMP 7. Madhya Pradesh State Agro Industries Development Corporation 8. Madhya Pradesh State Agriculture Marketing Board 9. APMCs 10. MPIDC 11. Proposed District level Committee on Climate Change and Environment
Livestock	1. National Livestock Mission 2. Rastriya Gokul Mission 3. Kisan Credit Cards to Livestock farmers 4. National Programme for Dairy Development 5. Livestock Health and Disease Control 6. National Programme for Dairy Development 7. Intensive Cattle Development Programme 8. Nandi Shala Yojana 9. Upgraded Animal Breeding Scheme 10. Supply of (10 + 1) goat unit on bank loans and grants 11. Acharya Vidyasagar Cow Promotion Scheme 12. VAT observance promotion scheme	1. Department of Animal Husbandry, GoMP	1. Forests Department, GoMP 2. Farmers' Welfare and Agricultural Development Department, GoMP 3. State Knowledge Management Centre on Climate Change (SKMCCC) 4. Proposed District-level Committee on Climate Change and Environment
Forestry and green spaces	1. National Afforestation Programme (NAP) 2. Project Tiger 3. Compensatory Afforestation Fund Management and Planning Authority (CAMPA) 4. Green India Mission (GIM) 5. Integrated Development of Wildlife Habitat (IDWH) 6. Intensification of Forest Management Scheme (IFMS) 7. Pradhan Mantri Ujjwala Yojana	1. Forest Department, GoMP	1. Farmers' Welfare and Agricultural Development Department, GoMP 2. State Knowledge Management Centre on Climate Change (SKMCCC) 3. All ULBs (IMC + other Municipalities) 4. Mineral Resources Department, GoMP 5. Urban Development Department, GoMP 6. Rural Development Department, GoMP 7. Proposed District level Committee on Climate Change and Environment 8. All PRIs

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

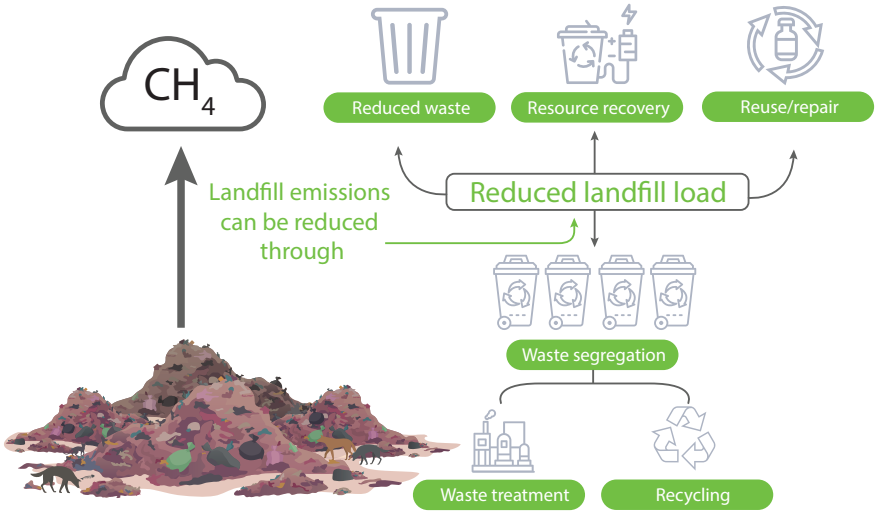
Recommendations	Cross-cutting with	Qualifying priority		District scenario/ case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Solid waste				
Waste prevention: Reducing landfilling				
Minimising landfill waste disposal by: a. promoting reduction of waste at source through product reuse, extending lifetime (maximum use of resources) and right to repair, b. ensuring efficient and 100% segregated waste collection from across the district (both urban and rural) by distributing colour-coded bins, monitoring waste collected from household and penalising households not practicing segregation, c. ensuring and maximising recycling, recovery, optimum resource utilisation throughout product lifecycle and treatment, d. promoting resource efficiency and circular economy practices across sectors.		a. Medium to long-term b. Short to medium-term c. Medium-term d. Long-term	a. Need policy intervention, awareness generation, incentivisation b. Policy framework exists (section 6.1.6.1) c. and d) Need policy intervention and execution (Resource Efficiency Policy has been drafted by NITI Aayog, but has not been implemented)	Landfills are considered to be one of the largest anthropogenic sources of methane emissions contributing to 11% of all global CH_4 emissions. Hence, reducing landfill load and emission is critical in achieving India's NDCs. Following are the initiatives adopted in Indore (mostly the city area) which will eventually reduce emissions from landfill and can be planned for the district as well: For the fifth consecutive year, Indore has been declared as the 'cleanest city' in India by Swachh Survekshan 2021 (cleanliness, hygiene and sanitation survey). Madhya Pradesh has 94% waste collection efficiency and 76% waste treatment rate. Indore has 100% waste segregation and collection efficiency in all the ULBs of the district. IMC has 100% door-to-door waste collection efficiency through partitioned vehicles for collecting wet, dry and domestic hazardous waste separately in all its 85 wards. MP has adopted a 'cluster-based model of ULBs for effective integrated solid waste management (ISWM) based on the concepts of regional landfill and implementation through the public private partnership (PPP) mode. Indore has one of the 26 clusters of the state having eight ULBs – Betma, Depalpur, Hatod, Indore, Manpur, Mhowgaon, Rau, Runji-Gautampura. Indore cluster ISWM facility and landfill site is located at Devguradiya. MP has a target of 80% resource recovery out of the total solid waste generated. Indore cluster reportedly generates 1,010 TPD MSW and has one waste to energy (W2E) plant under implementation. All the wet waste from the bulk generators (50 kg and above) within IMC is processed at their premises. Wet waste from the garbage transfer stations (from households) and semi-bulk collection is transported to a central wet waste processing plant for composting.

Recommendations	Cross-cutting with	Qualifying priority		District scenario/ case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Minimising single use plastic (SUP): Detailed information and recommendations are given in section 6.1.6.2.		Short to medium-term	Policy framework exists (section 6.1.6.2)	Disposable SW take-back has not been implemented in Madhya Pradesh as of now. About 31% of the total waste generated in Indore is inert waste. Paper waste is 8.6%, much of which can be treated/recycled. Within IMC, 500 TPD waste is treated at MRF. Plastic waste is collected at plastic waste collection centres and is sold to a cement plant at Neemuch and to MP Rural Road Development Board for construction of roads. The plastic waste has been used for construction of 10 roads within IMC.
Implement producers (manufacturer/brand owner) take-back mechanism (SWM Rules, 2016) either through financial assistance by the producers or a defined collection system facilitated by the producers for disposables, such as tin, glass, plastics packaging, sanitary napkins and diapers, for efficient management of these waste materials, thereby reducing landfill inert waste load.		Short to medium-term	Mandated by the SWM Rules, 2016 Needs regional policy formulation and interventions	
Ensure 100% recycling of recyclables at landfill through material recycling facilities (MRFs), refuse derived fuel (RDF), waste to energy (W2E), etc. Encourage use of LDPE and HDPE plastic waste in road construction.[5]		Short to medium-term	Capacity enhancement of existing facilities required	
Management of construction and demolition (C&D) waste: a. Ensure segregation, collection, transport and proper management. b. Facilitate processing and recycling. c. Incentivise initiatives for C&D waste reuse in non-structural concrete, paving blocks, lower layers of road pavements, colony and rural roads. d. Mandatory procurement of C&D materials (10% to 20%) in municipal and government contracts (subject to quality control).		Short to medium-term	Mandated by the rules, CPCB guidelines exist (section 6.1.6.1) Needs state-level policy formulation Strict implementation and enforcement Capital investment in infrastrcture required	

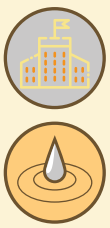
5 Guidelines given by Indian Roads Congress in this regard can be followed. https://pib.gov.in/PressReleasePage.aspx?PRID=1736774

Recommendations	Cross-cutting with	Qualifying priority		District scenario/ case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Increasing consumer awareness and access to recycling facilities and repair options within the district.		Short to medium term	Dedicated awareness campaign required	About 10% to 15% of global GHG emissions can be reduced through improved waste management following a lifecycle assessment approach (Global Waste Management Outlook - UNEP/ISWA, 2015). Prevention and recovery of waste (as secondary material or energy) can significantly save GHG emissions from across the sectors of the economy including energy, forestry, agriculture, mining, transport and manufacturing sectors.
Conduct education and awareness drives to ensure 100% at source segregation of biodegradable waste, non-biodegradable waste, domestic hazardous waste and household biomedical waste.		Short-term	Dedicated awareness campaign required	
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	
Conduct behavioural change communication workshops targeting corporates, educational institutes, PSUs, government offices to influence behaviour at both individual and organisational level to better manage resource and reduce waste generated. For example, conducting weekly workshops at all public schools for waste reduction and recovery. These workshops can also address issues such as energy efficiency 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	

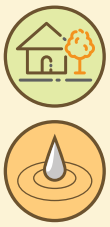
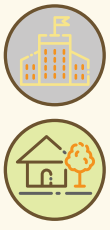
Recommendations	Cross-cutting with	Qualifying priority		District scenario/ case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Ensure segregation, collection and treatment of sanitary waste (sanitary napkins and diapers) to reduce landfill load.		Short to medium term	Mandated by SWM Rules, 2016 Capital investment in infrastructure development (for treatment) is required, which can be obtained from producers	Sanitary waste is being collected separately in IMC as part of domestic hazardous waste, and is segregated before being sent for incineration to the common bio-medical waste treatment facility (CBWTF).
Transitioning the district to a green market approach: a. promoting local circular business models, and b. mainstreaming of alternative sustainable business models for consumers to have a basket of choice.		Medium-term and continuous	Needs alternative business models, collaborations and awareness	
a) Waste transportation emission reduction: Encourage shifting to electric or zero emission vehicles (ZEVs) for all kinds of waste transportation, 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), b) Installation of waste bins with sensors to monitor volume and optimise the routes of collection vehicles to reduce consumption of fuels for waste transport and related emissions.		Medium to long-term	Needs capital investments	The current common cluster-based landfill site for eight ULBs in Indore requires long-distance waste transportation from several ULBs in the cluster. Petrol or diesel-driven trippers/ trucks are used for waste collection and transportation, with significant transport emission potential. These can be avoided by transitioning to ZEVs. Though there are several specifications for CBWTF vehicles to ensure efficient management and monitoring of BMW, they do not consider the mitigation part from transport.



Recommendations	Cross-cutting with	Qualifying priority		District scenario/ case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Waste treatment: Composting				
Encourage 100% conversion of organic waste to biological waste through processing (composting, bio-gas, etc.).		Short to medium-term	Policy framework exists (section 6.1.6.1) Needs awareness and infrastructure development	Organic treatment of compostable waste might initially lead to emissions, but reduces GHG emissions in the long-run, when compared to emissions from landfill. It takes at least three decades of landfill emissions to balance with those from aerobic composting. In Indore, 58% of solid waste is biodegradable and is entirely processed by composting. Composting emission potential is 19,377 tCO_2e/year. Currently, no gas management system is installed at composting units. A state-of-the-art waste management plant is being set up in association with IMC which proposes to convert a traditional 500 TPD (input feedstock) aerobic composting process to an output of 15.3 TPD bio-CNG and 105 TPD composts. The project – South Asia's largest bio-CNG based on urban organic waste – aims to run over 400 vehicles on bio-CNG and market 50% of the bioCNG produced by GAIL. With an annual GHG footprint of over 1,30,000 tCO_2e per year, the project is estimated to have a net carbon sequestration impact equivalent to that of a rainforest spread over 50,000 acres, making it one of the most climate positive projects in the world. No PRI level SWM data or detailed treatment type-wise data is available. Composting with gas management of 100% of the organic waste going to landfill can reduce emission by 17,659 tCO_2e/year in Indore district. Fruit and vegetable waste generated at the Choitram Mandi (the largest mandi in central India) is now collected and processed in a decentralised bio-methanation (bio-CNG) plant of 20 TPD capacity. The plant generates 800 kg of purified and compressed bio-CNG daily, which is used as fuel to operate 15 city buses. The digested slurry is converted into organic compost.
Develop composting facilities at ULB level in addition to cluster-level to avoid: a. loss of carbon content in long-route organic waste transportation; and b. reduce waste transport emissions.		Medium-term	Needs land and infrastructural investment at ULB level	
a. Equip new composting units and upgrade/convert existing ones 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 District-level capital investment and research collaboration required	

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, is important for accurate city or district-level emission estimations from the waste sector.		Short-term	Needs research collaboration	
Ensure better compliance to 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 (section 6.1.6.1)	
Bio-medical waste and hazardous waste				
a. Promote installation of modern incinerators with energy-recovery facilities (such as, 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 facility (CBWTFs) and upgradation of the existing ones. b. Using smart controls, waste treatment plants equipped with energy recovery incineration facilities can be integrated as distributed energy sources into the electricity grid and as heat sources into the district energy network.		Long-term	Needs policy formulation and investment in infrastructure	Though not a recommended treatment due to its emission potential, incineration prevents manual scavenging and further contamination for certain kinds of infectious waste (particularly, the anatomical, contaminated waste, discarded medicines and chemical waste). Incineration is the best available and recommended practice right now in India. Current annual BMW incineration emission in the district is 651 tCO_2e./ year. Energy recovery incineration is not practiced. District-level HW generation/ incineration data is not available.
Strict monitoring of adherence to recommended incineration technologies and practices through regular monitoring by the District Bio-medical Waste Management Monitoring Committee.		Short-term and continuous	Mandated by the BMWM Rules, 2016 (section 6.1.6.1) Needs monitoring by district-level BMWM committee	
Ensure 100% segregation, collection and treatment of bio-medical waste through coverage and registration of all healthcare facilities to CBWTFs.		Short-term and continuous	Mandated by the rules (section 6.1.6.1)	

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 E-waste Management Rules, 2016, a state level e-waste inventory with district-level category wise e-waste generation information needs to be developed. The inventory must include all sources of generation and consider all WEEE categories as per the rules.		Short to medium-term	Mandated by the rules (section 6.1.6.1), Needs research collaboration	About 95% of the e-waste in India is processed informally (including rudimentary operations like open burning, acid wash, open smelting, etc.). City-based studies show that efficient management and recycling of electrical and electronic equipment waste (WEEE) can significantly contribute to emission reduction targets. A 2011 e-waste inventory for Bhopal, Indore, Gwalior and Jabalpur projects 99,031.42 Mt/year WEEE generation in 2020 in Indore. However, only 534.43 Mt/year WEEE was collected (formally reported by MPPCB) during 2018-19 in the entire state, which indicates informal routing of most of the e-waste generated.
Ensure stringent policy implementation -- trace informal routing, restrict informal processing of e-waste (open burning, metal smelting, etc.), ensure proper disposal of mercury containing lamps.		Short-term and continuous	Policy framework exists (section 6.1.6.1)	
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 producers, recyclers and/ or producer responsibility organisation (PROs)	
Ensure proper collection and disposal of electrical waste (lighting infrastructure) and strict monitoring to stop landfilling of the same.		Short to medium-term	Mandated by the rules (section 6.1.6.1) Multi-stakeholder collaboration required Need to create awareness	
Improve consumer awareness of responsible e-waste disposal and provide readily available information on aspects like e-waste collection points, recyclers, producers (manufacturer), producer responsibility organisations or local 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 by collaborating with producers	

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 state and district collaboration	
Wastewater: Domestic and industrial				
Achieve 100% domestic wastewater treatment through the following measures: a. In both urban and rural areas of the district, set up 100% closed and underground sewer collection network. b. Shift 100% domestic wastewater treatment to aerobic setups by having only aerobic STPs for new constructions and transition old anaerobic STPs to aerobic set up. c. Operation and regular maintenance of periodical sludge removal facilities of all STPs. The sludge can be reused for the bio-methanation of compost.		Medium to long-term	Policy intervention and capital investment required	Wastewater, if treated anaerobically, can be a huge source of methane and even nitrous oxide emissions. Being stagnant and subject to heating (anaerobic conditions), open sewers emit CH_4. Closed underground sewers, on the other hand, are considered to be an insignificant source of CH_4. The STPs in Indore (90 MLD capacity) are currently anaerobic. IMC generates 8.03 MLD sewerage at present, and is projected to generate 9.56 MLD by 2035 and 10.13 MLD by 2050. Based on the projections, Asian Development Bank's water supply and sewerage project has proposed a 10 MLD STP with SBR technology (aerobic) having inbuilt nitrification, de-nitrification and biological phosphorous removal mechanism at Shekhar Nagar. This is an ideal technology to reduce GHG emissions from sewerage treatment. No information is available on the rural sewerage coverage and treatment. Fully (100%) closed and underground sewer connection with centralised aerobic STPs can potentially reduce the current 81,954 tCO_2e emission from STPs to negligible in Indore district. MP introduced a state-level policy for wastewater recycle and reuse and feacal sludge management in 2017, which encourages reuse of treated wastewater in industries. Case example: Ahmedabad Municipal Corporation has set up the first sewage sludge hygienisation plant in the country at Pirana (operational since 2019), which can convert 100 tonnes of dry sludge into fertiliser per day. A similar plant can be developed for Indore.
Development of rural wastewater disposal and treatment plan for the district.		Medium to long-term	Requires capital investment and inter-departmental collaboration.	
Create appropriate connecting infrastructure for industries to utilise treated industrial and domestic wastewater. Provide subsidy/tax rebate to industries, healthcare, hospitality sectors for implementation of smart recycled water investments.		Medium to long-term	Policy framework exists Needs capital investment in infrastructure and technology upgradation	
Implement and operationalise the guidelines and regulations of 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	

Recommendations	Cross-cutting with	Qualifying priority		District scenario/ case examples
		Timeframe for the action to be accomplished	Framework for implementation	
Develop a policy mandate for data transparency and availability of waste and wastewater generation, treatment and discharge information for industrial sector, including CETPs.		Short to medium-term	Needs policy intervention Inter-departmental collaboration required	Data transparency on wastewater by industries is key to reducing water pollution, which can be achieved through rating of industries based on their emission and effluent discharge and treatment. 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 encourages public participation.
Encourage data transparency by the industries for wastewater generation, treatment and discharge information including those of CETPs.		Short to medium-term	Needs collaborative efforts	

6.1.6.2 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	1. Solid Waste Management Rules, 2016 & Amendment 2018 2. Plastic Waste Management Rules, 2016 3. Construction & Demolition Waste Management Rules, 2016 4. Integrated Solid Waste Management Project 5. Swachh Bharat Mission - Urban & Rural 6. Indore Master Plan, 2021 7. Indore Smart Cities Mission 8. National Resource Efficiency Policy (draft) 9. Guidelines on Environmental Management of C&D Waste Management in India, CPCB 10. MP State Level Policy for Waste Water Recycle and Reuse and Faecal Sludge Management, 2017 11. MPPCB Annual Reports (for data availability)	1. Urban Development and Housing Department, GoMP 2. All ULBs 3. Panchayats and Rural Development Department, GoMP 4. All gram panchayats 5. Department of Housing and Environment, GoMP	1. Indore district administration and the proposed District-level Climate Change & Environment Committee 2. Madhya Pradesh Urban Development Company Limited (MPUDCL) 3. Indore Development Authority (IDA) 4. Madhya Pradesh Pollution Control Board (MPPCB) 5. Community or Residential Associations 6. State Knowledge Management Centre on Climate Change, EPCO, GoMP
Bio-medical waste and hazardous waste	1. Bio-medical Waste Management Rules, 2016 2. Hazardous and Other Waste (Management & Transboundary Movement) Rules, 2016 3. Batteries (Management & Handling) Rules, 2001 4. Revised Guidelines for Common Bio-medical Waste Treatment and Disposal Facilities, 2016, CPCB	Research funding can be obtained from Department of Environment, GoMP, SKMCC, MPPCB, etc.[6]	1. MPPCB 2. Indore District Administration and the proposed District Level Climate Change & Environment Committee 3. Healthcare facilities 4. CBWTF
Waste-electrical and electronic equipment (WEEE)	1. E-waste Management Rules, 2016 2. Implementation Guidelines for E-Waste (Management) Rules, 2016, CPCB	Only implementation monitoring and research needs resources, which can be obtained from the Department of Environment, GoMP, SKMCC, MPPCB, etc.[7]	1. MPPCB 2. Indore District Administration and the proposed District Level Climate Change & Environment Committee 3. Electronic and Electrical Producer Manufacturers/ Producers/Brand owners, Producer Responsibility Organisations

6 Bio-medical and Hazardous waste management is profitable and not funded by Govt except for providing the land, which generally are the Industrial Development Corporation lands

7 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	1. Atal Mission for Rejuvenation and Urban Transformation (AMRUT) 2. Jawaharlal Nehru National Urban Renewal Mission on Urban Infrastructure and Governance (JNNURM) 3. National River Conservation Plan 4. Integrated Urban Sanitation Programme 5. Swachh Bharat Mission (Urban) – MP 6. Swachh Bharat Mission (Rural) – MP 7. Indore Smart City Mission 8. Indore Master Plan, 2021	1. Urban Development and Housing Department, GoMP 2. All ULBs 3. Panchayats and Rural Development Department, GoMP 4. MP Jal Nigam	1. Indore Development Authority 2. MPUDCL 3. Indore Smart City Development Corporation 4. All Gram Panchayats 5. Indore District Administration and the proposed District Level Climate Change & Environment Committee
Wastewater: Industrial	1. Common Effluent Treatment Plant System 2. Online Continuous Emission Monitoring System 3. MPPCB Annual Report	1. Department of Housing & Environment, GoMP	1. Madhya Pradesh Pollution Control Board (MPPCB) 2. Indore District Administration and the proposed District Level Climate Change & Environment Committee

6.1.6.3 Single use plastics (SUPs) – critical to replace

Definition

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

Concerns

- Since SUPs are made for single use, they increase waste load and are resource-intensive.
- SUPs often get out of the collection and treatment network and (a) are one of the biggest ocean polluters and ingested by aquatic animals, (b) stay in the environment for forever, leading to microplastic pollution, and (c) block waterways and intensify natural 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 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	**Cloth (cotton)** • Pros: Natural fibre, durable, reusable, biodegradable, profitable and non-food crop • Cons: High consumption of chemical fertilisers and pesticides in cotton farming; high cost, water intensive crop; not moisture resistant; needs to be reused many times to offset high degradation/recycling carbon footprint **Jute** • Pros: Natural fibre, durable, reusable and biodegradable, high carbon assimilation rate • Cons: Expensive, water-intensive crop, highly dependent on rainfall, product not moisture resistant **Bio-plastics** • Pros: Bio-degradable, moisture resistant, inexpensive, light weight • Cons: Most contain significant number of plastic polymers leading to microplastic pollution; needs commercial composting facility to degrade; can inadvertently be mixed with plastic recyclables in municipal solid waste; needs quality check and control **Paper** • Pros: Bio-degradable, low manufacturing cost, can be made from recycled paper • Cons: Water-intensive, high carbon footprint, not durable, not moisture resistant **Glass** • Pros: Inert, infinitely recyclable, no toxic chemical additives, low manufacturing carbon footprint • Cons: Fragile, higher cost, injury and health risk, weight **Metal** • Pros: Renewable resource, durable, can be recovered and infinitely recycled • Cons: Expensive, higher transportation carbon footprint, tin- coated steel can leach into food & contaminate, heat conductor
Plastic packaging a. Food packaging b. Insulated food packaging, fragile item protective packaging c. Multi-layered packaging (chips, biscuits, noodle, etc) d. Packaging for online delivery	a. LDPE b. Expanded polystyrene (EPS) c. Paper + foil + LDPE/ PE + foil + paper/ polyethylene terephthalate (PET) + foil + LDPE, etc. d. LDPE	FMCG (food & beverages), hospitality, e-commerce	Bio-plastics, recycled paper	
Plastic bottles, tubes for household, personal care & 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 and beverages, PCCP), hospitality	Cellophane/ another bio- degradable alternative	
Styrofoam products (plates, tray, cups)	Expanded polystyrene (EPS)	--	Bio-plastic, recycled paper, leaf, bamboo	
Biscuit tray, plastic box, air seal for food, etc.	Polypropylene (PP)	FMCG (food and beverages), hospitality	Bio-plastic	
Plastic water and other drink bottle	Polyethylene Terephthalate (PET)	Hospitality, FMCG (food and beverages)	Glass, metal, ceramics, bulk vending	
Plastic cutlery, plates, cups and stirrers	Polystyrene (PS)	Hospitality	Bio-plastic, 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 and beverages), hospitality	Tetra pack, 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. European Commission defines them as consisting of man-made, conventional plastics including bio-degradable plastics, bio-based analogue plastics and bio-based alternative plastics with a particle size below 5 mm and include nanometer sized plastics as well (nanoparticles).
- Major sources: a) vehicle tyres, b) fishing gear, rope, painting and maintenance of ships and boats, c) loss from plastic manufacturing industry, d) painting, construction and road marking, e) fibres from synthetic textile, f) microbeads in personal care and cosmetic products, g) breakdown of plastic products
- Out of all the sources, intentionally-added microbeads in cosmetics and personal care products are 'designed to drain' SUPs. Replacement of microbeads in PCCPs comes 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 – such as earbuds with plastic sticks, plastic sticks for balloons, plastic flags, candy sticks, ice-cream sticks and polystyrene (thermocol) for decoration – shall be prohibited from January 1, 2022, b) The manufacture, import, stocking, distribution, sale and use of the SUP (including polystyrene and expanded polystyrene) items – such as plates, cups, glasses, cutlery such as forks, spoons, knives, straw, trays, wrapping/packing films around sweet boxes; invitation cards; and cigarette packets, plastic/PVC banners less than 100 micron and 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 single use plastic ban or restrictions (of different kind) exist in at least 23 states and five union territories of India. Madhya Pradesh does not have any policy directive at state level as of now.

Recommendations[8]

- 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, such as on a) commodities: Ear buds with plastic sticks, plastic sticks for balloons, plastic flags, candy sticks, ice-cream sticks, polystyrene (thermocol) for decoration by January 1, 2022; and b) on items -- such as plates, cups, glasses, cutlery such as forks, spoons, knives, straw, trays, wrapping/packing films around sweet boxes; invitation cards; and cigarette packets, plastic/PVC banners – less than 100 micron by July, 1 2022.
- Formulate policies with provisions to: a) Mandate producers to put labels on products and create awareness on disposal, clean-up, collection and treatment of SUP products/packaging, b) Mandate collection target (can be a differential target for different products) for SUP producers as part of extended producer responsibility (EPR), c) Penalise consumers for accepting banned SUP carrier bags or products, d) Strict and random monitoring for implementation of bans in supermarkets, street vendors, shopping malls, large organised markets, etc., e) Gradual phasing out (giving the transition time) of other selected categories of SUP products; can be achieved by sensitising for voluntary action/targeting for elimination of identified groups of key industries/sectors.

8 Note: A sustainable solution to SUP products needs both state and district-level collaborations at all levels including policy formulations and implementations
UNEP. 2018. Single use plastics: A roadmap for sustainability. Available at http://www.indiaenvironmentportal.org.in/files/file/singleUsePlastic_sustainability.pdf
Toxics Link. 2020. Single use plastic, the last straw: A watershed moment in the anthropogenic era.
MoEF&CC. 2016. Solid Waste Management Rules, 2016.
MoEF&CC. 2018. Plastic Waste Management (Amendment) Rules, 2018

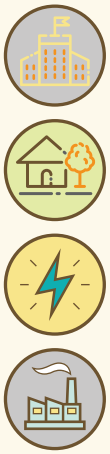
- Promote eco-friendly alternatives to SUPs through: a) Identifying alternative sustainable products, b) Identifying micro-enterprise and cottage industries for the products, c) Integrating them into the mainstream business models through connecting/cross-cutting policies, d) Providing financial incentives for alternative industries and for integrating sustainable products into mainstream business models, such as in the hospitality industry, e) Strict quality control and certification requirement for plastic-free alternatives, such as mandating that no resin or plastic powder is mixed product in the name of alternative.
- Promote extended lifespan and reuse of products, even for the sustainable alternatives, through continued and lasting campaign for 'no single use' to ensure public participation. Replacing the concept of 'single use' is critical as biodegradability or recyclability have 'time' and 'conditions' (energy and water footprint, transport requirement, etc.) attached to them.
- Introduce economic incentives/support: a) Invest in R&D of alternatives to different SUP products, b) Support technology incubation and stimulate creation of micro-enterprises to drive job creation, c) Introduce livelihood support schemes or have special provisions in the existing schemes to accommodate the job loss from plastic industry, d) Grant tax rebate to alternative models, public-private partnerships, etc., e) Incentivise plastic industries to shift 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	Needs policy formulation Collaboration among various stakeholders required Create specific financial instruments	In 2018, Indore Municipal Corporation raised ₹ 140 crore through municipal bonds. The funds raised were to be used for infrastructure development in the district.
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	Need feasibility studies, research and inter-departmental and multi-stakeholder collaboration Institutional structure needs to be established for the same	In 2020, Smart City Indore collected carbon credit of around ₹ 50 lakh through its two bio-methanisation plants. Since 2019, the smart city has avoided emissions of 1,70,000 tCO_2e to generate credits. The gas generated from these plants is used in the city buses – City Bus and iBus.

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
		Time frame to attain the recommendation	Framework for implementation	
Water scarcity and water pollution				
Conduct zone-wise assessment and mapping of water challenges in the district.		Short-term	Multi-stakeholder collaboration required Research collaboration required	Madhya Pradesh has provided aquifer vulnerability index (AVI) information to Central Ground Water Board and identified areas for mapping, giving the list of assessment units under critical and overexploited category and their respective change in the water table level.
Prepare a comprehensive district action plan for integrated water resource management (IWRM), for a bottom-up approach in addressing water stress. Establish sustainable and inclusive water governance in the district to develop, implement, evaluate as well as share information on programmes for water resource management and efficient water use in a transparent and inclusive manner with mandatory stakeholder engagement and public participation.		Medium-term	Policy intervention required Stakeholder and research collaboration required	According to the Composite Water Resource Management Index (2019) prepared by the NITI Aayog, MP is one of the top performing states in water resource management. This can be complemented by a district level IWRM.
Promote net zero water (NZW) construction and infrastructure upgradation in urban areas in alignment with ECBC norms.		Medium-term	Policy-level interventions required	

Recommendations	Cross-cutting with	Qualifying priority		District scenario / case examples
		Time frame to attain the recommendation	Framework for implementation	
Promote rainwater harvesting (RWH): a. Renovation of existing rainwater harvesting structures, b. Implementation of artificial recharge developed by Central Ground Water Board for Indore district in the Gambhir and Kshipra river basins, c. Ensure rainwater harvesting structures in new construction of residential buildings, institutions, commercial centres and industries in the district as per building the bye-laws, d. Efficiently plan storm water drainage. Storm water can also be used for recharging activities.		Short to medium-term	Policy framework exists Align with existing regulations	Indore Municipal Corporation (IMC) has mandated RWH in all new buildings with an area of 250 sqm or more. Added to this, a rebate of 6% on property tax is provided as an incentive to install RWH system. Indore has 126.10 km of underground storm water drainage network against the total existing road length of 1912.2 km (i.e., 6.59% coverage). There is a gap of 93.41% in coverage of storm water drainage network. There is no underground storm water drainage in ABD area. And eventually, storm water ends up in roadside open drains, nallahs and rivers.
Ensuring minimum non-revenue water (NRW), i.e., technical loss due to leakage, seepage or unauthorised use.		Medium-term	Research collaboration required	According to a water balance study (UN-HABITAT) of four cities of Madhya Pradesh, NRW is between 33% and 60% in Bhopal, Gwalior, Jabalpur and Indore – indicating that more than one-third of water is lost in distribution. Reducing NRW through repairs (of leakages) can help the district meet the national average of 20% NRW.
Improve the condition of local surface water sources (Yashwant Sagar Dam) to reduce dependence on Narmada (thereby leading to less energy consumption due to less pumping, less water loss due to leakages, and lower cost of water – the cost of water from local source is ₹ 4 to 5/kl as compared to ₹ 50-70/ kl for water from Narmada). Base water billing on water metering rather than fixed charges. Penalisation for over-consumption should be encouraged.		Medium to long-term	Need to create awareness and collaboration	Indore receives 75% of its water supply from Narmada, which flows at a distance of about 70 km from the city, making it one of the most energy-intensive and costliest water supply in the country (@₹ 30/1,000 litres) To check wastage of drinking water, IMC has linked the water distribution to Supervisory Control and Data Acquisition (SCADA) system. IMC has installed water meters in nearly 1,000 households to record the units of water utilised per house. Installation of meters in remaining households is underway.
Promote dual-flush systems to reduce water consumption, energy consumption and wastewater generation.		Short to medium-term	Align with the existing policies Can be aligned with green buildings	

Recommendations	Cross-cutting with	Qualifying priority		District scenario / case examples
		Time frame to attain the recommendation	Framework for implementation	
Revive local lakes/ponds and rejuvenate polluted river stretches through desilting, aquifer recharging, and river rejuvenation projects.		Medium-term and continuous	Requires long-term planning and financial investment Multi-stakeholder collaboration required Inter-departmental cooperation required	MPPCB has proposed river rejuvenation action plans for the rivers Kanh, Chambal and Kshipra. The entire stretch of river Kanh is reportedly polluted due to the city sewage of Indore. The Kanh river meets river Kshipra at Triveni Sangam, Ujjain, thus polluting the same. Example: Revival of Kaveri (a tributary of Narmada River) in the Khandwa district of MP, has made it a perennial river from a 'monsoon river' and has increased irrigation area by around 1,000 ha, thereby helping overcome water shortage. Similar initiatives can be undertaken for the other rivers (Chambal, Kshipra, Kahn, Gambhir) in Indore.
Identify and map all wastewater sources to the rivers and waterbodies. Ensure proper functioning of STPs and ETPs to prevent direct release of untreated wastewater from industries, commercial and residential sectors to surface water sources.		Medium-term	Policy framework exists Strict monitoring and reporting required	Sewage disposal at some places within the city is connected with storm network or disposed of in natural drains or in open street drains. Mapping of these sources can help in implementation of measures to extend sewerage network coverage and ensure treatment of wastewater. MP has introduced a state level policy – Waste Water Recycle and Reuse and Feacal Sludge Management in 2017 – which encourages reuse of treated wastewater in industries. Indore city has been declared the first "water plus" city of India under the Swachh Survekshan 2021. IMC has tapped 1,746 public and 5,624 domestic sewer outfalls in 25 small and big drains freeing the city's Kanh and Saraswati rivers from sewer lines. About 110 MLD water is being treated through 7 STPs constructed from these sewers. Example: In Gujarat, 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. Similar policy initiatives in MP can help overcome the water challenges in Indore.

Recommendations	Cross-cutting with	Qualifying priority		District scenario / case examples
		Time frame to attain the recommendation	Framework for implementation	
Managing air pollution				
Facilitate source apportionment studies to identify the sources and develop specific containment measures.		Short to medium-term	Research collaboration required	Indore is categorised as one of the 124 non-attainment cities in India under the National Clean Air Programme (NCAP) for managing particulate matter concentration (PM_{10} and PM_{25}) in alignment with the existing CPCB norms. Indore has one CAQMS at Pologround Industrial Area and three manual stations operated as per CPCB guidelines under National Ambient Air Quality Monitoring Programme (NAMP), installed at Vijay Nagar, Kothari Market and Sanwer Road. Major sources for air pollution in Indore include vehicular emission, road dust, construction activities, biomass and garbage burning, industrial emission, etc. MPPCB already has an action plan to control air pollution in Indore. No recent source apportionment study is available for Indore. IMC has multi-level parking facilities at five locations currently, and 12 more are proposed. Indore had a target of opening 300 vehicular pollution check centres (Action Plan), of which 61 opened to issue PUCs. India's first greenfield SEZ in Pithampur (Madhya Pradesh), located 35 km from Indore, covers a total area of 1,114 hectare.
Increase the number of Continuous Air Quality Monitoring Stations (CAQMS) to statistically, spatially, and temporally, represent the mix of sources and the range of pollution in the city. Also increase the number of air quality display facilities in public places.		Short to medium-term	Policy framework and budgetary provisions exist	
Increase the modal share of public and non-motorised transportation (detailed recommendation under transport sector). Further, promote e-vehicles.	 	Medium to long-term	Policy framework available Need to create awareness Capital investment required Inter-departmental coordination required	
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 required	
Increase/create green cover or green buffers along the major traffic corridors, circles and industrial areas (Pithampur SEZ).	  	Medium to long-term	Inter-departmental coordination Efficient maintenance and monitoring of plantation sites	
Enforce environmental standards set by CPCB for emissions from industries.		Short-term and continuous	Robust M&E required	

Recommendations	Cross-cutting with	Qualifying priority		District scenario / case examples
		Time frame to attain the recommendation	Framework for implementation	
Sprinkling of water (preferably, recycled grey water) for road dust suspension during peak pollution episodes.		Short-term and continuous	Inter-departmental cooperation required	
Open waste burning (of solid waste, biomass, plastic, horticulture waste, etc.) should be regulated by the municipal corporation/nagar panchayats.		Short to medium-term	Implementation of existing rules/ regulations required	
Implementation of action plan for construction and demolition waste (as per CPCB guidelines).		Short to medium-term	Implementation of existing rules/ regulations required	
Ensure installation and operation of air pollution control devices in industries and adherence to emission standards.		Medium to long-term	Implementation of existing rules/ regulations required Robust M&E required	

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	1. Model Bill for the Conservation, Protection, Regulation, Management of Ground Water, 2016 2. Water Prevention and Control of Pollution Act, 1974 3. National Water Mission 4. MP State Level Policy for Waste Water Recycle and Reuse and Feacal Sludge Management, 2017 5. Comprehensive State Water Policy, 2015	1. MP Water Resources Department, GoMP 2. MP Pubic Health Engineering Department, GoMP 3. MPPCB	1. Proposed District Level Climate Change & Environment Committee 2. All ULBs 3. Indore Development Authority (IDA) 4. Urban Development and Housing Department, GoMP 5. Panchayat and Rural Development Department, GoMP 6. Dept of Industry Policy and Investment Promotion, GoMP 7. MPIDC 8. CGWB
Managing air pollution	9. Air (Prevention and Control of Pollution) Act- 1981; 10. Environment (Protection) Act, 1986; 11. National Clean Air Programme 12. Solid Waste Management Rules, 2016 & Amendment 2018 13. Construction & Demolition Waste Management Rules, 2016	1. Department of Housing and Environment, GoMP 2. MPPCB	1. District Administration and the proposed District Level Climate Change & Environment Committee 2. Department of Housing and Environment, GoMP 3. Department of Forest, GoMP 4. Department of Transport, GoMP 5. RTO 6. All ULBs

Carbon neutrality for Indore

The Smart Cities Mission was launched by the Government of India in June 2015 with the objective of promoting cities that provide core infrastructure, clean and sustainable environment through the application of 'smart solutions' (Ministry of Housing and Urban Affairs, 2021). Indore was one of the first 20 cities selected under the mission in 2016. The same year, Indore Smart City Development Limited (ISCDL), a special purpose vehicle, was established for this purpose.

Indore is the only smart city in India to trade carbon offset in the international market. ISCDL has generated revenue of ₹ 50 lakh by selling credits against 1.7 lakh tonnes CO_2 under the Verified Carbon Services Programme. This was achieved through three projects undertaken by the Indore Municipal Corporation (IMC):

- 600 tonne/day composting plant;
- 35 tonne/day bio-methanation plant;
- 1.5MW solar plant.

Indore is the only Indian smart city to trade carbon offset in international market generating ₹ 50 lakh revenue against 1.7 lakh tonnes of CO_2

Carbon neutrality denotes achieving a balance between emitting and absorbing carbon emissions from the atmosphere. Numerous cities across the globe have committed to attaining carbon neutrality within a certain timeframe. These include New York (by 2050), London (by 2050), Helsinki (by 2035), Copenhagen (by 2025), and Bangalore (by 2050). Various consortiums of cities have been organised across the globe to achieve this target. One such consortium is the C40 Cities, which defines the criteria for a carbon neutral city as follows:

1. Net zero GHG emissions from fuel use in buildings, transport and industry
2. Net zero GHG emissions from grid supplied energy
3. Net zero GHG emissions from treatment of waste generated within the city boundary
4. Net zero GHG emissions from additional sectoral emissions in the city's GHG accounting boundary

Smart City Indore can further enhance its ambition of sustainability and become a carbon neutral city by adopting the following measures:

1. Enhancing urban energy infrastructure
    a. Transitioning the current fossil fuel-based energy regime to renewable and waste-based energy regime
        i. Government schools in Indore district, if equipped with solar rooftops, can generate 56.83 MUs electricity, thereby avoiding 40,000 tCO_2e annually.
        ii. If 50 percent of the commercial buildings in Indore city (having a potential of 870 MW and) install solar rooftops, 9,10,000 tCO_2e can be avoided annually.
    b. Modernising grids and moving to a demand-based energy supply structure.
    c. Transitioning towards climate neutral buildings by (a) retrofitting old buildings to become energy and water efficient in compliance with the ECBC norms; and (b) ensuring new buildings are compliant with 'net zero' or 'plus energy' standards. These measures would lead to considerable drop in emissions (given below):
        i. By 2025, if 23 percent of the existing residential areas in Indore become ECBC compliant, 10,80,000 tCO_2e can be avoided.
        ii. During the same period, if 30 percent of the commercial area in the district becomes ECBC compliant, around 3,00,000 tCO_2e can be avoided.
    d. Design energy tariffs, incentive packages and taxes in a manner that encourage investment in energy-efficient infrastructure and eliminate energy imbalances in the residential, commercial, and industrial sectors.
2. Urban planning and spatial strategies
    a. Limit horizontal urban sprawl by achieving appropriate building density.
    b. Limit car dependency by enhancing public transport facilities.
    c. Promote sustainable and low carbon transport modes.
    d. Encourage eco-towns and sustainable settlements.
3. Low carbon mobility
    a. Developing a comprehensive network of bicycle routes and bicycle hire facilities across the city.
    b. Ensuring safe and convenient cycling and walking infrastructure, particularly for the elderly, children and those with reduced mobility.
    c. Making public transport attractive, convenient, and affordable.
    d. Developing no-vehicle pedestrian friendly zones.
    e. Encouraging a transition to electric fuel-based public and intermediate transport and installing RE-based charging infrastructure for the same.
4. Enhancing lung spaces
    a. Green spaces should represent a considerable portion of land use while being integrated into the city design in a manner to protect the city infrastructure from natural disasters, mitigate urban heat island effect and to provide ample recreation space.
    b. Enhance trees outside forest and urban forestry initiatives.
        i. Table 16 gives the CO_2 sequestration potential by a single tree of common tree species.
    c. Installing green roofs and converting brownfield sites into green areas.
    d. Green spaces also reduce the risks of floods, droughts and heat waves.
5. Waste and wastewater management:
    a. Promoting recycle and reuse to minimise waste generation.
    b. Ensuring 100 percent waste segregation from residential, commercial and industrial sectors.
    c. Treating waste as valuable feedstock for energy generation and developing infrastructure for material recycling, 100 percent organic waste treatment (by composting with a methane capturing facility), waste-to-energy generation, heat recovery of incinerators.
    d. Achieving 100 percent underground sewerage network coverage with aerobic sewerage treatment.
    e. Promote reuse of treated wastewater in industrial sector and for landscaping and gardening.

6. Building urban resilience
    a. Undertaking a climate risk assessment exercise to investigate exposure and impacts of climate, energy and environmental risks.
    b. Identifying vulnerable groups and locations through social impact assessment.
7. Awareness
    a. Well-designed awareness campaigns with widespread reach through social media, radio, newspapers and other local media, ***nukkad nataks***, wall paintings and school programmes. This will help ensure people's participation for advancing towards carbon neutrality that is based on the principles of social inclusion.

Table 16: Indicative CO_2 sequestration potential of different plant species[9]

Species	Girth class (cm)/age class (year)	Carbon sequestered by one tree (kg/tree)	CO_2 sequestered by one tree (kg/tree)
Mangifera indica (Aam/Mango)	10 to 30 cm	11.3	41.4
	31- 60 cm	40.5	148.5
	61 – 90 cm	83.3	305.43
	91 – 200 cm	727.4	2,665.67
	> 200 cm	810.7	2,972.57
Ficus benghalensis (Banyan)	10 to 30 cm	21.4	78.47
	31- 60 cm	54.2	198.74
	61 – 90 cm	197.9	725.64
	91 – 200 cm	283.6	1,039.87
	> 200 cm	706.9	2,591.97
Delonix regia (Gulmohar)	10 to 30 cm	8.38	30.72
	31- 60 cm	44.48	163.09
	61 – 90 cm	89.32	327.5
	91 – 200 cm	330.39	1,211.43
	> 200 cm	602.34	2,208.58
Emblica officinalis (Amla)	10 to 30 cm	4.82	17.67
	31- 60 cm	28.4	104.13
	61 – 90 cm	112.9	413.97
	91 – 200 cm	176.9	648.64
	> 200 cm	340.89	1,249.93
Tectona grandis (Teak)	10 to 30 cm	73.44	269.28
	31- 60 cm	134.34	492.58
	61 – 90 cm	352.48	1292.42
	91 – 200 cm	775.17	2842.29
	> 200 cm	2413.68	8850.16
Tamarindus indica (Khati Imli)	10 to 30 cm	21.33	78.21
	31- 60 cm	42.38	155.4
	61 – 90 cm	310.9	1139.97
	91 – 200 cm	705.3	2586.1
	> 200 cm	1111.8	4076.6

9 CO_2 sequestration potential is calculated using species wise information provided in "Carbon Stock Assessment of Selected Tree Species in Urban and Sub Urban Areas of Gujarat (Report-II)" published in 2013 by the Forest Department, Gujarat State in collaboration with GEER Foundation. MP specific CO_2 sequestration potential can be calculated if species wise carbon stock assessment/carbon stock density of MP is available.

Species	Girth class (cm)/age class (year)	Carbon sequestered by one tree (kg/tree)	CO_2 sequestered by one tree (kg/tree)
Polyalthia longifolia (Ashopalav)	10 to 30 cm	7.4	27.1
	31- 60 cm	100.2	367.4
	61 – 90 cm	130.9	479.97
	91 – 200 cm	497.4	1823.8
	> 200 cm	1590	5830
Ficus religiosa (Peepul)	10 to 30 cm	7.1	26.03
	31- 60 cm	49.5	181.5
	61 – 90 cm	71.5	262.17
	91 – 200 cm	189.5	694.83
	> 200 cm	679.2	2,490.4
Azadirachta indica (Neem)	10 to 30 cm	11.7	42.9
	31- 60 cm	56.2	206.06
	61 – 90 cm	248.5	911.17
Dendrocalamus strictus (Bamboo)	1 year	2.67	9.8
	2 year	3.23	11.84
	3 year	3.30	12.1
	4 year	3.49	12.8
	5 year	3.50	12.84

6.4. Actions district authorities can recommend to state departments

Recommendations that can be pursued by the district collector/committee at the state level	Cross-cutting with	Qualifying priority		District scenario/case examples
		Time frame for the action to be accomplished	Framework for implementation	
POWER SECTOR: Upgrade DISCOM infrastructure and their supply network to reduce AT&C losses, billing inefficiencies etc. Furthermore, introduction of smart billing system would help curtail power thefts, and increase billing efficiency, helping the DISCOM generate more revenue.		Short to medium-term.	Policy framework and targets exist (section 6.4.1)	• The current AT&C losses of MPPKVVCL are 25.8%, which is higher than the international standard range of 6 to 8%. • MPPKVVCL needs to upgrade its infrastructure, expand smart metering, smart billing, etc. to increase its efficiency. • For example, EESL has signed an MoU with Uttar Haryana Bijli Vitran Nigam and Dakshin Haryana Bijli Vitran Nigam for 10 lakh smart meters. The deployment of smart meters in the country has led to a 20% increase in monthly revenue per customer for DISCOMs, a 5% (average) reduction in AT&C losses and has enabled remote disconnection of defaulters. Smart meters have also completely eliminated the need for manual reading of meters, thereby reducing the cost of operations (as per EESL).

Recommendations that can be pursued by the district collector/committee at the state level	Cross-cutting with	Qualifying priority		District scenario/case examples
		Time frame for the action to be accomplished	Framework for implementation	
HABITAT: Provide subsidies/ tax rebates to builders/ building owners to encourage adoption of ECBC or IGBC (e.g., property tax/water cess/IT rebate).		Medium to long-term	Policy framework exists (section 6.4.1), but targets need to be set Needs inter-departmental collaboration	ECBC buildings deliver 20-25% of energy savings, in different climates, when compared with the conventional buildings (BEE, 2017). By 2025, If 30% of the commercial area in the district becomes ECBC-compliant, around 0.3 $MtCO_2e$ emissions can be avoided.
TRANSPORT: Energy efficiency of infrastructure in railways can be enhanced through the following measures: a. Installation of solar panels along electrified tracks and on railway station rooftops b. Installation of optimal light control systems and appliances, smart sensors and building management systems at station buildings c. Ensuring regeneration of energy (through rolling stock) parallel 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 Indore district can also be developed along those lines.
TRANSPORT: Use fiscal instruments to discourage the use of personal vehicles. Here are some examples: a. Increase charges on registration of internal combustion engines (ICE) vehicles b. Levy congestion charges and other green tax c. Phase out older, more polluting vehicles.		Short-term and continuous	Proper policy backing based on research and inter-departmental cooperation is needed	In January 2021, the Ministry of Road Transport and Highways announced 'green taxes' in the form of additional taxes on old vehicles that are unfit for roads.
TRANSPORT: Identify and plan shifting of key commercial / business centres from all the ULBs to outside city limits to reduce traffic load.		Long-term	Proper policy backing based on research and inter-departmental cooperation is needed	There is need to develop areas outside of IMC limits to accommodate the shifting of industries, business centres, IT parks etc.
TRANSPORT: 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 can be pursued by the district collector/committee at the state level	Cross-cutting with	Qualifying priority		District scenario/case examples
		Time frame for the action to be accomplished	Framework for implementation	
INDUSTRY: a) Ensure regular PAT compliance of DISCOMs and other designated consumers (DCs) in the district b) Increase the number of DCs for PAT scheme 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	Until PAT Cycle VI (2020-21), only four[10] DCs had volunteered under the scheme in Indore district. Over the years, these DCs from Indore district have helped avoid around 7.11 $MtCO_2e$[11] by improving their systemic energy efficiency, under the PAT scheme. Under the BEE-SME Programme, Indore was among the four pilot MSME clusters across the nation to adopt energy efficiency measures to reduce energy consumption in forging, textile, food and brick industries. Seven industries out of the Indore food cluster participated in the programme. Under the project, several interventions such as optimisation of the combustion efficiency, compressed air system energy efficiency etc. were carried out in the cluster. Up to March 2017, implementations carried out in these industries led to energy savings of 220 tCO_2e.
INDUSTRY/ENERGY: Ensure compliance to renewable purchase obligations (RPO) and increase the RPO targets gradually.		Medium to long-term	Policy framework exists (section 6.4.1)	For FY 2021-22, the RPO target for industries is 17%.
AGRICULTURE: 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 the following targets of SDG#2: 2.1, 2.3, 2.4	In Indore, jowar production has continuously decreased (230 MT in 2017-18 to 12 MT in 2018-19).

10 Names of Designated Consumers- MPPKVVCL, STI India Limited, Pratibha Syntex Limited, Raddisson Blu.

11 It may be noted that the DISCOM Is not situated within Indore district, and the emissions savings depicted here are calculated on the basis of population share of the district in DISCOM's supply network.

Recommendations that can be pursued by the district collector/committee at the state level	Cross-cutting with	Qualifying priority		District scenario/case examples
		Time frame for the action to be accomplished	Framework for implementation	
AGRICULTURE: To compensate for predicted decrease in crop productivity, initiate research on high yield, drought and temperature resilient genotypes of various food and cash crops, in association with agricultural institutes/universities.		Medium to long-term	Needs research collaboration and capital investment This would also help meet the following targets of SDG#2: Targets 2.1, 2.3, 2.4, 2.a.	Rainfed area (for agriculture) of Indore decreased from 2.81 lakh ha (in 2010-11) to 2.52 lakh ha (2015-16). However, the irrigated area increased from 1.79 lakh ha (2010-11) to 2.16 lakh ha (2015-16). Area under wheat cultivation in the district increased from 1.10 lakh ha to 1.26 lakh ha (between 2017-18 and 2018-19) and production improved from 4.65 lakh MT to 5.21 lakh MT (between 2017-18 and 2018-19). However, the yield reduced by 2.01 %. In order to meet the future food demand, climate-smart agriculture will be the key to reducing crop failures.
AGRICULTURE: For overall reduction in electricity consumption and water savings in the agriculture sector, subsidies can be reduced by some percentage points in a phased manner.		Medium to long-term	Policy intervention needed Requires awareness generation and collaboration with the farming communities	Tariffs are levied based on the consumption slabs as well as the capacity of the pump being used. As per Madhya Pradesh Electricity Regulatory Commission's Aggregate Revenue Requirement and Retail Supply Tariff Order for FY 2020-21, the electricity cost is 645 paise/unit and 469 paisa/unit for domestic sector and agriculture & allied activities sector, respectively, upon utilisation of 300 units. - both state and central Electricity tariff policies, in conjunction with large subsidies for agricultural power, have caused rapid groundwater depletion in many regions and led to massive financial losses for power utilities and (state and central) governments.
FORESTRY/GREEN SPACES: Promote regeneration of degraded and open forest areas through CSR (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	Green belt on the boundaries of industries helps in maintaining the green cover of the area. Moreover, it absorbs the pollution emitted from the industries (i.e., helps in carbon sequestration).
E-WASTE: Adopting 'green marketing' approach by: a. Promoting green products, b. Displaying product lifespan as a label on e-products to influence purchase decisions, thereby, using the labels as behavioural intervention.		Medium to long-term	Needs policy intervention, collaborations and awareness	

6.4.1 Actions district authorities can recommend to state departments: Policy framework and departments

Sub-sectors	Policies and programmes that can push forward the recommendation	Primary departments/ agencies	Associated departments/agencies
Power sector	1. National Smart Grid Mission 2. Smart Metering National Programme 3. Integrated Power Development Scheme (IPDS); 4. Restructured Accelerated Power Development and Reforms Programme (R-APDRP) 5. UDAY Scheme, 2015 6. National Mission on energy Efficiency, specifically PAT (Perform, Achieve and Trade) Scheme 7. MP Solar Power Policy, 2012 8. Policy for Decentralised Renewable Projects, 2016 9. Standards and Labelling Programme	1. MPPMCL-MPPKVVCL, GoMP 2. MPUVNL, GoMP 3. BEE (EESL)	1. State Knowledge Management Centre on Climate Change (SKMCCC)- EPCO 2. West Central Railways – Indore Division 3. Proposed District Level Climate Change and Environment Committee
Habitat	1. ECBC	1. Urban Development and Housing Department, GoMP 2. All ULBs 3. Indore Smart City Development Corporation Limited (ISDCL).	1. Proposed District Level Climate Change and Environment Committee 2. MPUVNL
Transport	1. ECBC 2. JNNURM 3. Smart Cities Mission 4. AMRUT	1. Ports and Transport Department 2. All RTOs 3. ALL ULBs	1. MPSRTC 2. MPUVNL 3. Indore Smart City Development Corporation Limited 4. West Central Railways - Indore Division
Industry	1. PAT Scheme 2. Industrial Promotion Policy, 2014 3. BEE-SME Program	1. Department of Industry Policy and Investment Promotion, GoMP	1. Industries Commissionerate 2. District Industries Centre 3. Proposed District Level Climate Change and Environment Committee
AFOLU	1. National Mission on Food Security 2. Pradhan Mantri Krishi Vikas Yojana 3. National Mission for Sustainable Agriculture 4. Price Support Scheme 5. National Afforestation Programme (NAP) 6. Green India Mission 7. CSR Act, 2013	1. Farmers' Welfare and Agricultural Development Department, Government of Madhya Pradesh 2. Forest Department, Government of Madhya Pradesh	1. APMCs 2. MPIDC 3. Energy Department, GoMP 4. Madhya Pradesh State Agro Industries Development Corporation 5. Mineral Resources Department, GoMP 6. Madhya Pradesh State Agriculture Marketing Board 7. Proposed District level Committee on Climate Change and Environment
Waste	1. E-waste Management Rules, 2016	1. Science and Technology Department, GoMP	1. Proposed District Level Climate Change and Environment Committee

6.5. Sustainable Development Goals being addressed

SDGs	Targets	Sector (sub-sectors) addressing the recommendation
SDG 1: No Poverty 	Target 1.4: Ensure that all men and women, in particular the poor and the vulnerable, have access to basic services.	Waste; water
SDG 2: Zero Hunger 	Target 2.1: End hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants to safe, nutritious and sufficient food all year round.	AFOLU (agricultural)
	Target 2.3: Double Agricultural Productivity.	AFOLU (agricultural)
	Target 2.4: Implement resilient agricultural practices that increase productivity and production.	AFOLU (agricultural)
	Target 2.a: Increase investment, including through enhanced international cooperation, in rural infrastructure and agricultural research.	AFOLU (agricultural)
	Target 2.a; Article 10.3.e: Development of sustainable irrigation programmes for both crops and livestock.	AFOLU (agricultural and livestock)
SDG 3: Good Health and Well-being 	Target 3.3: End the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases.	Water pollution; co-benefits from waste (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 pollution; air pollution
SDG 6: Clean Water & Sanitation 	Target 6.1: Achieve universal and equitable access to drinking water.	Water scarcity and water pollution
	Target 6.3: Improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.	Waste; energy (industry); water pollution
	Targe 6.4: Substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals.	Energy (habitat – demand-side management, by-laws for new construction & industry); AFOLU (agricultural and green spaces); water scarcity
	Target 6.5: Implement integrated water resources management at all levels.	AFOLU (agricultural and green spaces/ forestry); water scarcity and pollution
	Target 6.8: Support and strengthen the participation of local communities.	Waste; AFOLU; transport
	Target 6.a: Expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including wastewater treatment, recycling and reuse technologies.	Waste; AFOLU; transport

SDGs	Targets	Sector (sub-sectors) addressing the recommendation
SDG 7: Affordable & Clean Energy 	Target 7.1: Ensure universal access to affordable, reliable and modern energy services.	Energy (power & habitat); AFOLU (agricultural)
	Target 7.2: Increase share of renewable energy in energy mix.	Energy (power, transport, habitat – energy efficiency in building and bye-laws for new construction & industry)
	Target 7.3: Double the global rate of improvement in energy efficiency.	Energy (power, habitat & industry)
	Target 7.a: Enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.	Energy (power)
	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
SDG 8: Decent Work and Economic Growth 	Target 8.2: Achieve higher levels of economic production through diversification, upgradation, and innovation.	Energy; AFOLU (agricultural & livestock)
	Target 8.4: Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production.	Waste
SDG 9: Industry, Innovation and Infrastructure 	Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure.	Energy (habitat – energy efficiency in building); waste; transport
	Target 9.2: Promote inclusive and sustainable industrialization.	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 (agricultural); waste, energy (industry); water scarcity
	Target 9.5: Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending.	Energy (power); waste
	Target 9.b: Research and innovation in developing countries, including by ensuring a conducive policy environment.	Waste; energy (power & industry); air pollution

SDGs	Targets	Sector (sub-sectors) addressing the recommendation
SDG 11: Sustainable Cities and Communities	Target 11.1: Ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums.	Waste; habitat; water
	Target 11.2: Safe, affordable, accessible and sustainable transport systems for all.	Energy (transport); habitat; air pollution
	Target 11.3: Enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management.	Waste; energy (power; habitat – energy-efficient building), all district-specific inputs
	Target 11.4: Strengthen efforts to protect and safeguard the world's cultural and natural heritage.	AFOLU (forestry); water scarcity
	Target 11.6: Reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.	Waste, energy (power, transport, habitat industry) and 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 and industry)
	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
SDG 12: Responsible Consumption and Production	Target 12.1: Implement the 10-year framework of programmes on sustainable consumption and production, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries.	Energy; waste
	Target 12.2: Achieve the sustainable management and efficient use of natural resources.	Energy; AFOLU; waste; air pollution and water pollution
	Target 12.3: Halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses.	AFOLU; waste
	Target 12.4: Achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil.	AFOLU; waste; air pollution and water pollution
	Target 12.5: Substantially reduce waste generation through prevention, reduction, recycling and reuse.	Waste; energy (habitat and industry)
	Target 12.6: Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle.	Waste; industry
	Target 12.8: Ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature.	Individual action and behavioural change communication (BCC)
	Target 12.a: Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production.	Waste; AFOLU (agriculture and livestock)
SDG 13: Climate Action	All targets	All sectors
SDG 14: Life under Water	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
SDG 15: Life on Land	Target 15.1: Ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements.	AFOLU; waste; water pollution
	Target 15.2: Promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation.	AFOLU (forestry/ green spaces)
	Target 15.3: Combat desertification, restore degraded land and soil.	AFOLU (forestry/ green spaces)
	Target 15.9: Integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies.	AFOLU and water scarcity
	Target 15.a and 15.b: Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity, ecosystems and sustainable forest management.	AFOLU and water scarcity
SDG 17: Partnerships for the Goals	Target 17.7: Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries.	Energy; AFOLU; waste; BCC; individual action
	Target 17.16: Enhance the global partnership for sustainable development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the sustainable development goals in all countries, in particular developing countries.	Energy; AFOLU; waste

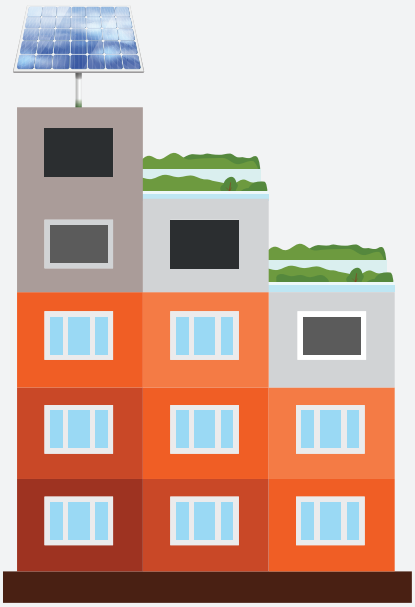
6.6. Promoting voluntary individual climate action

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. Electronic brand website gives information on e-waste collection points, ensure formal recycling of your electronic products by going through the collection points.
4. Responsibly dispose your e-waste: send them to a recycler, producer (manufacturer), producer responsibility organisation or dispose during local e-waste collection drives.
5. Say no to personal care products using microplastics/microbeads, read the labels before buying.
6. Say no to easily avoidable single use plastic products, like, plastic cutlery, straws, plastic carry bags, pouch products, food wraps, multi-layered packaging products.
7. Choose products with: a) less packaging waste, b) sustainable packaging, c) displayed higher product lifespan, d) displayed recycling/resource recovery efforts and information.

Housing

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



Lighting

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

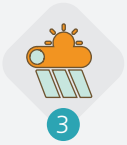
Kitchen

1. While 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

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)



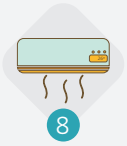
3. Replace electric water heater with a solar water heater, if feasible

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

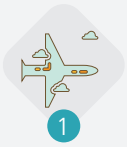
6. Proper maintenance of air conditioners helps to increase efficiency

7. Do not overload the refrigerator



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

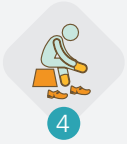
Transport



1. Choose direct flights to reduce carbon footprint

2. Travel light to reduce carbon emissions

3. Strictly abide by pollution norms



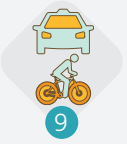
4. Put on your shoes for short trips

5. Ensure regular maintenance of vehicles

6. Choose inter-modal transport (private + public)

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

8. Shift to clean, non-petroleum fuels such as electricity (through RE) to power vehicles



9. Car pool to work, Use bicycles park and ride

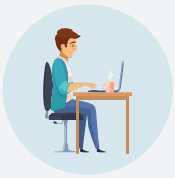
10. Swicth off the ignition at traffic signals

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 bottled water, adopt minimalist lifestyle to reduce overconsumption of resource, purchase only when necessary.

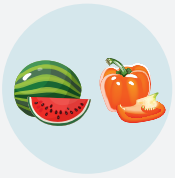
Go for climate conscious producers/ manufacturers. Develop a knowledge and preference for locally available and sustainably produced and designed products.



If possible, opt for work from home option for a few days in a week.

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

Choose standard shipping while ordering online.



Buy locally available produces, especially food, items vegetables and other perishable products.

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

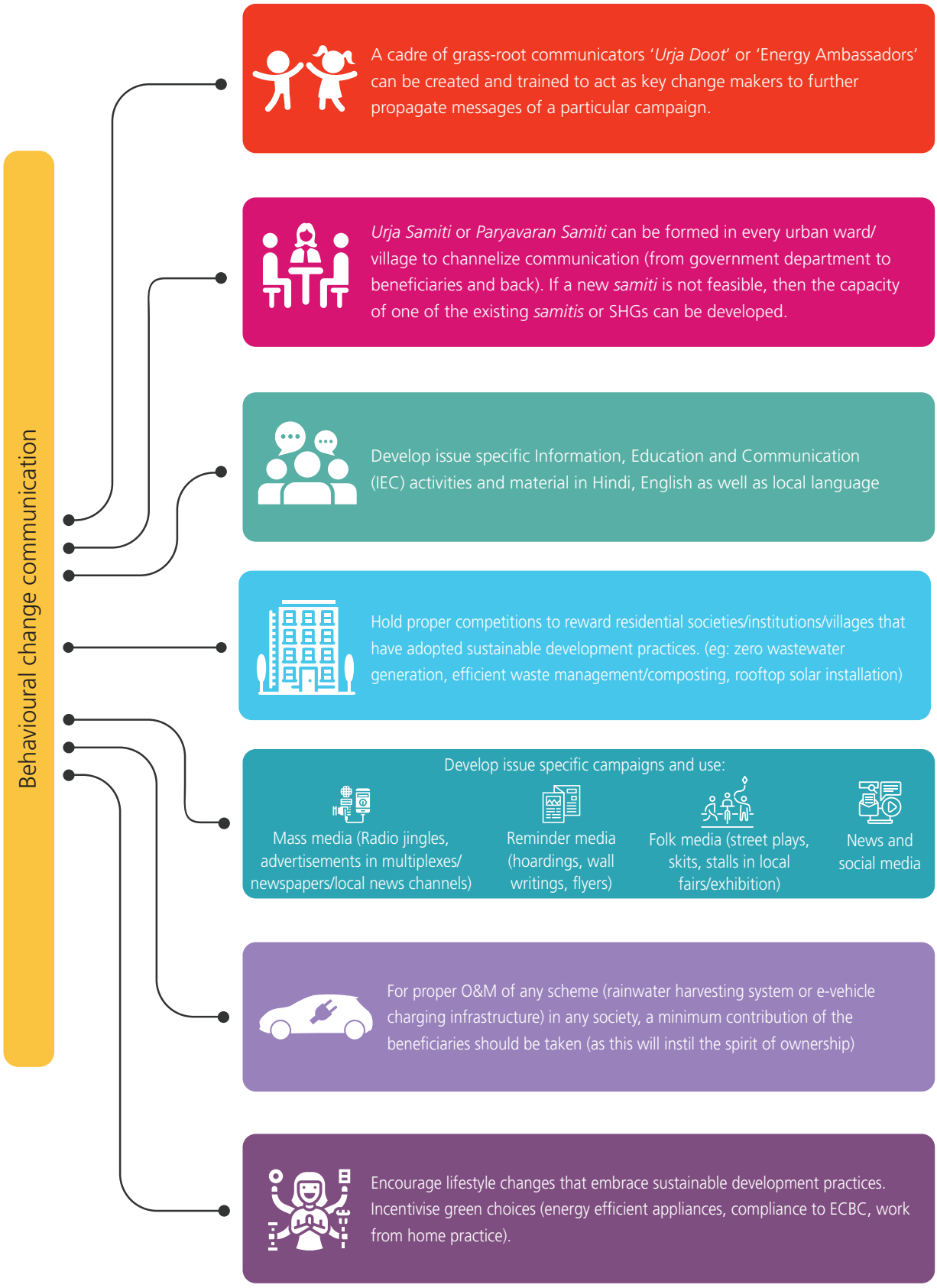
Develop a habit of repair and reusing appliances and products at home instead of buying new ones. Follow reduce, reuse and recycle principles in the household to reduce footprint.

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 fertilisers.

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

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'.

SKMCCC, EPCO, Department of Environment
Government of Madhya Pradesh

The Environmental Planning & Coordination Organisation (EPCO), state's premier organisation in the field of environmental matters, was established by the Housing and Environment Department of the Government of Madhya Pradesh in 1981 and is presently under the Urban Development and Environment Department of the Government of Madhya Pradesh. It works closely with the State Government, despite having established its own identity as an autonomous organisation.

Vasudha Foundation

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