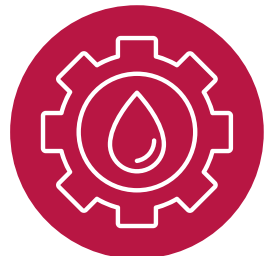




ADVANCING CITY CLIMATE ACTION IN MADHYA PRADESH

Transforming **JABALPUR** into a
low-carbon, climate-resilient city

Executive Summary



Jabalpur City Climate Action Plan

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Department of Environment, Government of Madhya Pradesh, 2023

DISCLAIMER

This document is prepared by WRI India in partnership with Environmental Planning & Coordination Organisation (EPCO), Department of Environment, Government of Madhya Pradesh to support Jabalpur city in developing its Climate Action Plan. The data and information used for preparing this report have been sourced from Jabalpur city, State Government departments, published sources of Government of India, etc. While due care has been taken to ensure authenticity of the data and other information used, any error in their accuracy or interpretation is absolutely unintentional.

About WRI India

WRI India is a research organization that turns big ideas into action at the nexus of environment, economic opportunity, and human well-being.

Design credits: Manasi Nandakumar (*Senior Communications Associate, WRI India*) and Ronak Naik

Image credits: Jabalpur Smart City Ltd.



GULSHAN BAMRA (IAS)
PRINCIPAL SECRETARY



Department of Environment
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Mantralaya, Vallabh Bhawan, Bhopal

Preface

No evidence is required to prove that climate is changing and that too because of increased human activities which have serious repercussions on economic development and natural resource management. Various recent extreme weather events in Madhya Pradesh, urban flooding, and untimely rains have shown that developing localised mitigation and resilience strategies is the need of the hour.

Paris Agreement 2015 and Glasgow Pact 2021 have shown the commitments from the international communities for reducing or mitigating GHG emissions, however to resolve this global issue, there lie the local solutions at sub-national level, district level and city level. Hon'ble Prime Minister of India has also launched the LiFE Movement which emphasizes on change in the lifestyle and behavioural patterns of living. He has stressed on reduce, reuse and recycle concepts as also on the circular economy to be an integral part of our lifestyle and for sustainable development. Concept of inclusivity is also very much integrated with this movement.

We in Madhya Pradesh are also committed to addressing the challenge of climate change in order to pursue the state's development goals in a sustainable manner.

Taking the cue from Ministry of Housing & Urban Affairs (MoHUA) as part of Climate Smart Cities Assessment Framework, the preparation of Climate Action Plans (CAPs) of all the 7 smart cities of MP by State Knowledge Management Centre on Climate Change (SKMCCC), EPCO and WRI India are steps towards making the local authorities equipped with strengths for tackling the challenge of climate change. The city level GHG inventorisation also helps in quantifying the actions to reduce the CO₂ emissions and offsetting the current emissions.

The City level Climate Action Plans (CAPs) for all the 7 smart cities have been drafted after wide consultations and participation with city experts so as to bring all the stakeholders on board and make their say.

I appreciate the efforts of EPCO and WRI India for taking the lead in preparing the City level Climate Action Plans.

These CAPs have flagged important issues which require attention and are expected to be implemented by the local authorities & SPVs.

A handwritten signature in blue ink, appearing to be 'Gulshan Bamra', with a stylized flourish.

(Gulshan Bamra)



Foreword

As extreme weather events unfold across the globe, the climate crisis has reached our doorstep. While India is on track to achieve the Nationally Determined Contributions, the State of Madhya Pradesh (MP) is determined to lead India's fight against this impending crisis by policy-governance reforms and inculcating a climate action culture in the society. With MP's complex urban challenges and increasing climate risks and disasters, sustained actions ensuring cities to prepare for and develop the ability to thrive in the varying climate is crucial. In MP, the rising urban population has created a reason to be concerned about climate change, and therefore the interventions at the city level are deemed important.

In this connection, the Climate Smart Cities Assessment Framework (CSC-AF) issued by Ministry of Housing & Urban Affairs (MoHUA) plays an important role in devising the appropriate actions to keep our cities safe from the adverse impacts of climate change. This brings an opportune time to integrate the concerns of climate change into our on-going program & policies and achieve the goal of low carbon development with inclusive growth.

It has been a very good opportunity for EPCO to join the LiFE movement launched by Hon'ble Prime Minister of India during Glasgow CoP. All the concepts of LiFE have been tried and addressed in the cities while developing the plans.

It is also important for us to develop well researched strategies specific to the cities to respond effectively to the possible impacts of climate change. To address these challenges, City level Climate Action Plans (CAPs) have been developed by State Knowledge Management Centre on Climate Change, EPCO in association with WRI India. The CAPs have highlighted key concerns and strategies for actions as per the indicators outlined in the CSCAF.

I would like to acknowledge the efforts of EPCO professionals and WRI India team for their commendable work. I would also like to extend my gratitude towards UADD, all the SPVs and other stakeholders for extending their support to formulate these plans and providing necessary data and information to make these plans more robust.

(Mujeebur Rehman Khan)



Acknowledgements

Environmental Planning and Coordination Organization (EPCO) is grateful to Mr Gulshan Bamra, Principal Secretary, Government of Madhya Pradesh, Environment Department; Mr Mujeebur Rehman Khan, Executive Director EPCO; and other team members from EPCO for their continuous support and guidance at various stages of developing the inclusive-climate action plan for Jabalpur city.

We extend gratitude to Commissioner, Urban Administration and Development Department (UADD) for facilitating the plan development process and providing necessary guidance. We also are grateful to Commissioner, Jabalpur Municipal Corporation and Chief Executive Officer of Jabalpur Smart City Limited for constant support in providing valuable city level inputs and facilitating data collection across all departments and parastatal agencies. We would also like to thank all officers and city experts from concerning line departments and external agencies who contributed to the development and refinement of this plan through timely provision of data and valuable insights during stakeholder consultations.

EPCO would like to thank World Resources Institute (WRI) India, especially Mr Madhav Pai, CEO, Dr OP Agarwal, Senior Advisor and Former CEO, Ms Ulka Kelkar, Director, Climate Program for providing technical support to EPCO and Jabalpur city, which played a key role for developing this plan.

We would also take this opportunity to appreciate the efforts made by the study team Mr Saransh Bajpai, Mr Prateek Barapatre, Ms Ramya MA, Ms Faiza Solanki and Ms Avni Agrawal for providing their expertise to assist in the research and development of the climate action plan.

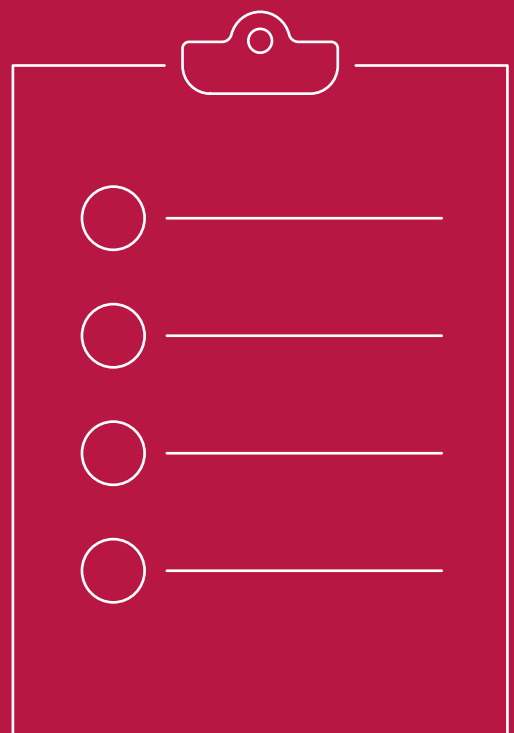
Lastly, we would like to thank the internal reviewers from WRI India including Ms Marie Duraisami, Ms Sumedha Malaviya, Mr Dhilon Subramanian, Ms Azra Khan, Ms Chaitanya Kanuri and Ms Sahana Goswami for providing valuable feedback to strengthen the sectoral strategies in the plan

(Lokendra Thakkar)

Coordinator,
State Knowledge Management
Centre on Climate Change, EPCO



EXECUTIVE SUMMARY



Jabalpur and its Vulnerability to Climate Change

Jabalpur is the third largest urban agglomeration in the state of Madhya Pradesh, central India and ranked 43rd among the 100 cleanest urban local bodies (ULBs) in India in 2020 with more than 1 lakh population. In 2020, Jabalpur Smart City Limited also received the 'Smart City Empowering India Award' in the smart mobility category for non-motorized transport. Located in the eastern part of the state and on the banks of River Narmada, Jabalpur is also known as the 'marble city' because of the white marble rocks at Bhedaghat. The city has the famous Dhuandhar Falls, well-known educational institutions and defense-related manufacturing industries. The city is also home to 2600 acres of forested land – the Dumna Nature Reserve (DNR), within the Jabalpur municipal corporation area. Jabalpur is also surrounded by 800 acres of Khandari lake. Lying within this unique physiography, the city falls under the humid-tropical climatic zone, which contributes to its micro-climatic variabilities to a great extent.

The city has 37 lakes and ponds including hanuman tal, ranital, khandari lake, etc. However, the city's lakes have been drying up and also face the issue of contamination⁴. As per the vulnerability assessment conducted by Environmental Planning & Co-ordination Organization (EPCO), Jabalpur has a very low composite vulnerability, driven largely by the socioeconomic indicators. In terms of water resources, Jabalpur falls under low vulnerability owing to River Narmada flowing through the city. Jabalpur fares well in the forest sector owing to the large green cover. However, the projected higher temperatures and rainfall extremes are likely to result in increased climate risks.

Given the challenges that Jabalpur city faces, and against the backdrop of the Smart Cities Mission, the Ministry of Housing and Urban Affairs has initiated the "Climate Smart Cities Assessment Framework (CSCAF)" for smart cities. The framework aims to provide a roadmap for cities to combat climate change through mitigation and adaptation measures, while planning their city-level development actions and policies. It is made up of 28 indicators across five sectors namely, energy & green buildings, urban planning, green cover & biodiversity, mobility & air quality, water management and waste management. By taking appropriate measures, cities can make a significant contribution to mitigating climate change and becoming resilient to its impacts.

In this context, WRI India is supporting EPCO, Department of Environment, and Department of Urban Development and Housing, Government of Madhya Pradesh as a technical partner, in planning adaptation and mitigation strategies and building a city climate action plan (CAP). The climate action plan is based on the GHG emissions profile and vulnerability assessment of cities. It identifies existing gaps through a review of data submitted by cities under the CSCAF 2.0 to identify key entry points in terms of recommendations to achieve the sectoral priorities of cities through a low-carbon and climate-resilient pathway. The CAP identifies actions to address future climate risks across the five thematic areas. It also proposes an institutional framework which is necessary to implement the recommendations outlined.

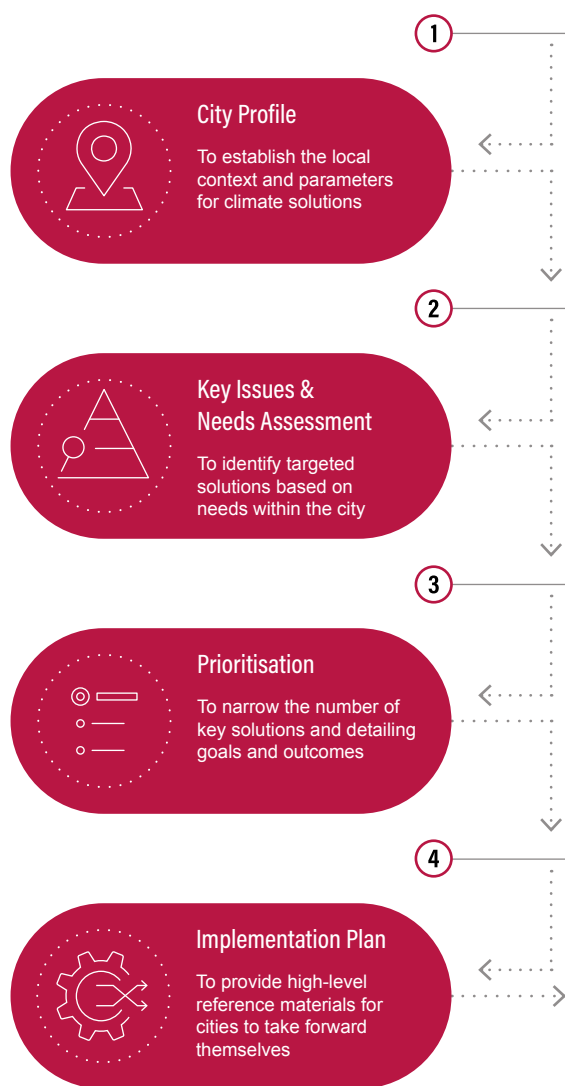
Climate Action Planning Process

WRI India adopted a 4-pronged approach in the entire process of preparing the Climate Action Plan (CAP) as illustrated in ES figure 1:

- A planning-cum-launch workshop was organized in Bhopal on 20 February 2020, with participation from state and city officials, academicians, and civil society organizations to apprise them about the importance and relevance of developing these city-level plans and identify development challenges and climate risks in MP's urban areas.
- This was followed by an extensive desk review of submissions made by Jabalpur as a part of CSCAF 2.0, sectoral plans, government reports and other documents to identify key gaps in achieving the sectoral priorities, develop a climate profile and greenhouse gas (GHG) emissions inventory. This review and analysis have led to developing a bucket list of sectoral goals and actions which have been enumerated in the climate action plan.
- As the next step, in order to narrow down the number of sectoral actions and detailing goals and outcomes, a stakeholder consultation workshop was organized in Jabalpur in September 2021, with participation from city officials, sectoral experts and civil society representatives.
- The final CAP provides prioritized sectoral actions along with an implementation plan and CAP governance mechanism for effective coordination and monitoring of the CAP's implementation.

ES Figure 1: CAP development process (Source: WRI India)

INTENDED OUTCOME OF THE STEP



ENGAGEMENT OVERVIEW

- 1** | City climate context workshop
 - Stakeholder consultations to identify:**
 - Priorities and brainstorm main challenge areas for emissions reduction across sectors
 - Climate risks for resilience priorities
 - On-going initiatives
- 2** | Desk review and CSCAF performance analysis
 - Review of secondary literature to:**
 - Understand current performance levels
 - Understand status of on-going initiatives
 - Develop bucket list of solutions
 - Draft report on city climate action for stakeholder consultation
- 3** | Stakeholder engagement
 - Stakeholder consultations to:**
 - Assess societal, equity and spatial inclusion in the proposed solutions
 - Align with current and future priorities
 - Identify synergies with state and national level solutions
- 4** | Dissemination workshop
 - Finalized city climate action plan:**
 - Climate vision and strategy for cities
 - Inclusive solutions
 - Prioritized actions across the sectors
 - Implementation plan

Baseline Assessment

Climate Smart Cities Assessment

Jabalpur has been a moderate performer in the first two rounds under CSCAF. The city has been doing well under the waste management sector. However, the city must focus on improving its score and performance for indicators under the other sectors. Some of the current initiatives and possible areas of improvement have been highlighted in the ES table 1.

Greenhouse Gas Emissions Inventory

In 2019, Jabalpur’s GHG emissions were 1.5 mtCO₂e which was 1.3 tCO₂e per person. The emissions inventory was compiled as per the Global Protocol for Communities (GPC) BASIC standards using C40’s City Inventory

Reporting and Information System (CIRIS) tool. Majority of the emissions comes from energy and electricity use in residential buildings followed by the industrial sector. The contribution of the three sectors to total emissions in the city is given in the ES Figure 2. Stationary energy contributes 56% to the city’s total emissions, followed by 32% from transportation. Waste sector contributes 12% to the city’s total emission.

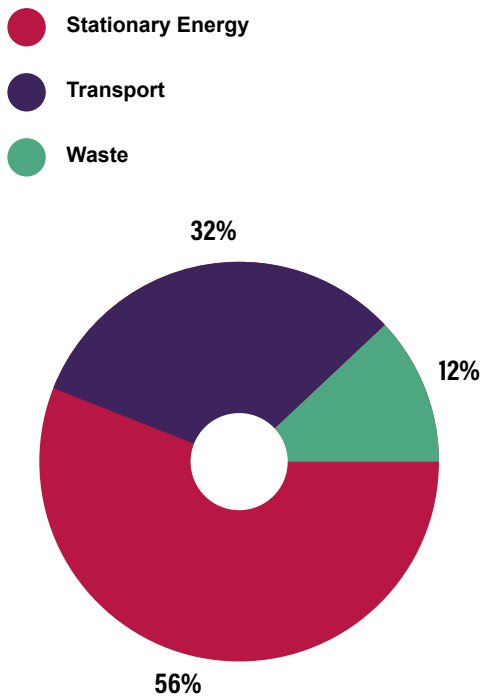
The business-as-usual projected emissions for Jabalpur is presented in ES Figure 3. The emissions are projected to increase by 18% by 2025 and 35% by the end of the decade till 2030 compared to the baseline emissions of 2019. This creates an urgent need for the city to implement measures presented in the report for achieving its vision of low carbon and climate resilient development.

ES Table 1: CSCAF 2.0 analysis (Source: CSCAF 2.0 submission of city)

Overall Score as per CSCAF 2.0	Energy and Green Buildings	Urban Planning, Green Cover and Biodiversity	Mobility and Air Quality	Water Management	Waste Management
★ ★ ★	★ ★	★	★	★	★ ★ ★ ★ ★
CSCAF 2.0 Score	213.5	74	89	25	579
Current measures being undertaken in the city	<ul style="list-style-type: none"> 790 kW rooftop solar power plant established with net metering on water treatment plants. 	<ul style="list-style-type: none"> Ankur program – where citizens are awarded for planting trees – has been launched in the state, and PMAY has been linked to it. Prepared GIS maps of water bodies and open spaces. City has collated disaster related loss and damage data. Working on Dumna nature reserve development phases 1 and 2. 	<ul style="list-style-type: none"> 7% of city's shared mobility run on clean fuels, including 1107 e-rickshaws. City has introduced intelligent traffic management system. Working on redesigning Omti Nalla with footpaths and street furniture. 450 kW solar electric chargers for e-rickshaws installed at nine locations with capacity to charge 15 rickshaws in each location. Feasibility study completed for electric public bike sharing system and 6km cycle track constructed. Prepared a clean air action plan. The city has 2 manual and one continuous ambient air quality monitoring station. Introduced a multi-purpose smart card for use in city transport and other purposes. 	<ul style="list-style-type: none"> Completed development of Gulauaa talab as a tourist attraction. Revitalization of Ranital lake is ongoing. Installing rainwater harvesting at various locations. 	<ul style="list-style-type: none"> 100% door to door collection of segregated waste Operational waste-to-energy plant of 600-tonnes capacity generating 11.5 MW energy. Radio Frequency Identification (RFID) tags on household dustbins and solid waste vehicle tracking system in place. Work order issued for biomining of waste at Rani Taal dumping site.
Areas of improvement	<ul style="list-style-type: none"> Increasing energy efficient streetlighting (currently 28.53%). Need for promotional or penalty schemes for code compliance, pre-certification and certification of green buildings. 	<ul style="list-style-type: none"> Increasing urban green cover (currently 11.74% of total area). Should set up a disaster management cell and should conduct Ward level Hazard Risk, Vulnerability and Capacity Assessment and prepare a disaster management plan. 	<ul style="list-style-type: none"> Increasing the number of buses (currently 0.1 buses/1,000 population). Increasing the % of roads with footpaths and cycle tracks (currently 3%) City needs to install more continuous air quality monitoring stations to capture PM₁₀, PM_{2.5}, NO_x and SO_x. 	<ul style="list-style-type: none"> Reducing Non-Revenue Water (NRW) which is currently more than 40%. Jabalpur needs to assess current water resources and future demand and prepare a water resources management plan with short-, medium- and long-term actions. 	<ul style="list-style-type: none"> Waste deposition center for domestic hazardous waste is needed. City needs to involve more NGOs in waste management. Need for plastic waste collection centers.

Overall Score as per CSCAF 2.0	Energy and Green Buildings	Urban Planning, Green Cover and Biodiversity	Mobility and Air Quality	Water Management	Waste Management
	<ul style="list-style-type: none"> Need to create a green building cell Increasing the energy coming from renewables. Currently, 1957 MWh out of 1021126 MWh comes from renewables, amounting to 0.09%. 	<ul style="list-style-type: none"> City is not taking measures to conserve biodiversity. Setting up a city-level biodiversity management committee can be the first step 		<ul style="list-style-type: none"> Should measure the amount of wastewater recycled. Need to prepare a flood risk management plan. Need to conduct energy audits of water supply and wastewater management systems. 	<ul style="list-style-type: none"> Methane capture from landfill and sewage treatment plants is needed.

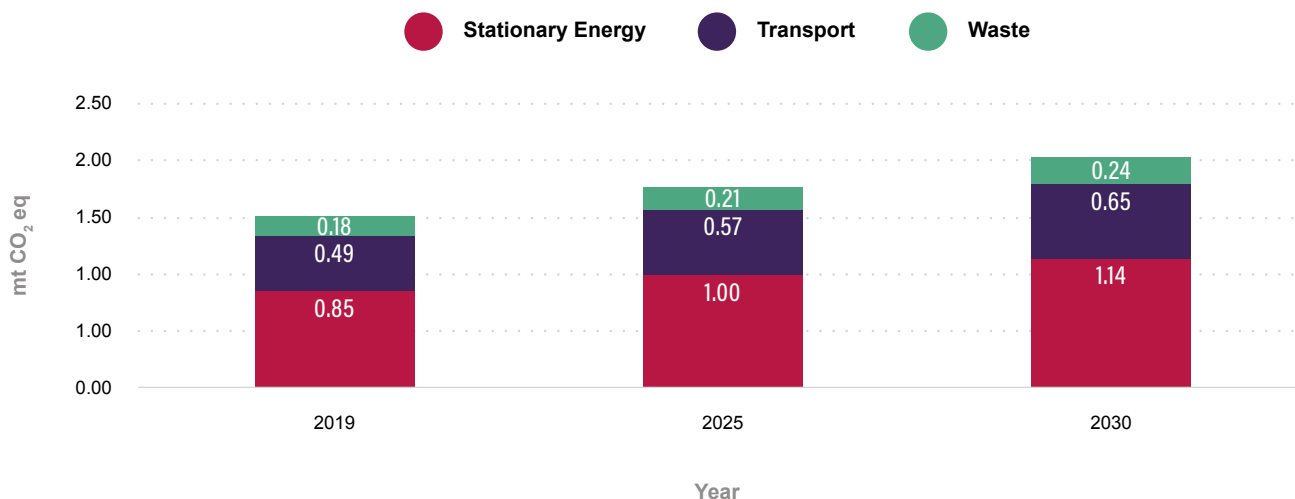
ES Figure 2: Percentage distribution of emissions by sector for 2019 (Source: WRI analysis using primary city data)



Vulnerability Analysis

As per the vulnerability assessment for Jabalpur, the climate of Jabalpur is subject to large year-to-year variability, particularly for rainfall. Observed records for the Jabalpur region indicate a clear trend towards higher temperatures and more frequent high temperature extremes.

ES Figure 3: Projected business as usual emissions for Jabalpur (Source: WRI India analysis using primary data)



ES Table 2: Projected climate change and risks (Source: CEEW)

Projected Climate Changes	Potential Impacts and Risks ⁸
Warmer conditions, including more intense and frequent high-temperature extremes and heat wave days.	• Number of warm days can increase by an average of 23 days by 2050 with a 4.4°C rise in mean temperature. This can lead to increased human heat stress, potential increase in mortality and decreasing labor productivity particularly for outdoor workers.
Higher annual rainfall totals and change in frequencies	• As per the assessment, the number of days per year with rainfall greater than 20 mm, is projected to increase by about 10 days on an average from 1981-2010 to 2071-2100. This can increase the risk of flooding and can impact water balance.

Strategic Goals and Sectoral Actions

The ES Table 3 summarizes the goals and actions which the city may adopt to become climate resilient while

also addressing concerns of inequality and inclusivity in development.

ES Table 3: Summary of goals and actions for Jabalpur (Source: WRI India)

Goals	Actions	Outcomes
Goal 1 Power Jabalpur through renewables & climate-resilient infrastructure	<ul style="list-style-type: none"> • Developing a long-term renewable energy procurement plan • Promoting energy efficiency improvements and renewable energy use in MSMEs • Expanding the use of bio-CNG from dairy waste for residential and commercial consumption • Incentivizing installation of rooftop solar panels and solar water heaters in all existing and new residential buildings • Implementing low carbon components in municipal buildings and projects • Solar powered bus stops and parking lots • Implementing institutional measures to increase adoption of green buildings in the city 	<ul style="list-style-type: none"> • Reduced emissions from MSMEs • Reduction in overall long-term electricity consumption and costs • Benefits for MSMEs due to reduced power bills • Increased job opportunities • Reduction in emissions from the consumption of grid supplied electricity • Improved access to energy

Goals	Actions	Outcomes
	<ul style="list-style-type: none"> Promotion of green and cool roofs in residential projects/ colonies/apartments to reduce cooling demand Energy efficient retrofits and common solar PV projects for low-income housing under PMAY scheme 	
Goal 2 Towards low-carbon mobility in Jabalpur	<ul style="list-style-type: none"> Augmenting Jabalpur's bus fleet and conducting feasibility studies for bus rapid transit system Ensuring multistakeholder-driven action through Jabalpur's recently formed NMT cell Jabalpur non-motorized transport policy NMT-focused urban street design guidelines for Jabalpur Promoting electric two wheelers for freight and passenger fleets Incentivizing municipal employees to travel by low-carbon modes and making government offices EV ready 	<ul style="list-style-type: none"> Increase in NMT infrastructure Decreased air pollution due to transport Increased availability and accessibility of public transport Increase in low-carbon and non-motorized transport modal share Reduced GHG emissions due to transport
Goal 3 Make Jabalpur a climate-smart tourist destination	<ul style="list-style-type: none"> NMT friendly tourist areas with electric hop-on-hop-off bus services Installing reverse vending machines and collection centers for plastic waste and wet waste compost units at major tourist areas Providing a platform for sustainable tribal products, artifacts, and culture 	<ul style="list-style-type: none"> Economic growth and job creation Reduction in emissions from tourism sector – waste, buildings, transport
Goal 4 Sustainable & circular waste management in Jabalpur	<ul style="list-style-type: none"> Innovative model for managing electronic waste in Jabalpur Efficient disposal of religious waste and idol immersion to prevent contamination of Jabalpur's lakes Conversion of municipal solid waste management fleet into electric vehicles 	<ul style="list-style-type: none"> Formalization of informal e-waste sector Skill development and capacity building among the marginalized Creation of jobs for self-help groups Reduced emissions from waste transport Reduced pollution in lakes
Goal 5 Revitalize green & blue spaces in Jabalpur	<ul style="list-style-type: none"> Engaging citizens and private sector in urban green cover conservation Mapping green and blue spaces in the city Action plan for increasing Jabalpur's green cover Participatory model with involvement of resident welfare associations Bioremediation and riparian zones for conservation of water bodies in Jabalpur Institutionalizing a tree cell to prevent illegal logging and protect heritage trees Developing a local biodiversity strategies and action plan (LBSAP) for the city Disaster management cell and plan for Jabalpur 	<ul style="list-style-type: none"> Improved water security Reduced flood risk Improved air quality and climate resilience due to the city's green cover Increased access to affordable drinking water through groundwater recharge Equitable access to green and open spaces
Goal 6 Water-wise Jabalpur	<ul style="list-style-type: none"> Conduct a water resources assessment and implement a demand management plan Reusing water for gardens and defense and textile related manufacturing industries Inter-linking of water bodies, wherever feasible, within city limits Developing and implementing an integrated flood and storm water management plan Implementing energy-efficient water supply and wastewater management systems 	<ul style="list-style-type: none"> Increased access to potable water Increased flood resistance Better sewage management Reduced water costs and improved equitable access Reduced emissions from energy consumption for water treatment Better demand management Increased water table

The city authorities can select actions and sectoral strategies provided in this plan to develop a detailed implementation plan for pilot projects that can be rolled out in the short, medium, and long term. The GHG emission profile of the city included in the plan may be used as a guiding analysis to prioritize implementation of actions in different sectors. The plan also provides guidance on mainstreaming actions with existing policies, schemes, and programs to establish convergence of implementation.

Lastly, this plan must be treated as a dynamic document and must be updated regularly with the latest emissions profile of the city. Instituting a climate change cell at the city level with representation from ULB departments concerned, smart city, citizens' forums, academic institutions, and civil society becomes necessary to lead and coordinate this process. Organizing periodic stakeholder consultations would help in strengthening the plan as per the evolving requirements of the city.





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