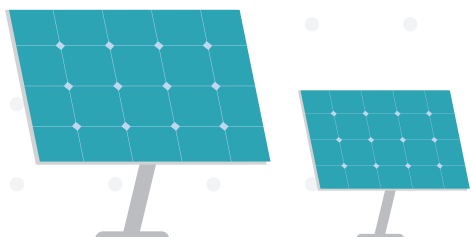




Climate Change and Environment Action Plan of Nagpur District

Executive summary



Prepared By



Supported By



The Climate Change and Environment Action Plans (CCEAP) have been developed for multiple districts of India by Vasudha Foundation with support from Shakti Sustainable Energy Foundation.

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

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Nagpur, Maharashtra

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Cover page images

Top left image:

Korari thermal power station, Nagpur

Bottom right:

Western coal field

Land use map of Nagpur district:

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

■ Built-up land	■ Cropland	■ Fallow land	■ Coal mine	■ Barren land
■ Forest (Deciduous, broadleaf)	■ Mixed forest	■ Plantations	■ Shrubland	■ Wasteland
■ Water bodies				



Climate Change and
Environment Action Plan of

Nagpur District

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Supported By





R. Vimala I.A.S.

Collector & District Magistrate



Foreword

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

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

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

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

With best wishes,

(R. Vimala)

13/11/2022

Shri Radhakrishnan B., IAS
Municipal Commissioner
NMC
Government of Maharashtra

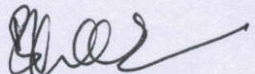
Preface

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

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

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

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


(Radhakrishnan B.)

ACKNOWLEDGEMENTS

We would like to thank Ravindra H Thakare, IAS (Collector & DM, Nagpur) for his inputs and appreciation of the plan, which have been vital in the development of the Climate Change and Environment Action Plan for Nagpur district.

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

We extend our gratitude towards other departments and organizations – Shweta Banerjee (Superintending Engineer, Environment, NMC), Pradeep Dasarwar (Deputy Municipal Commissioner, NMC), M.K. Rao, IFS (PCCF (IT&P), Nagpur), A.P. Dharamadhikari (Joint Director of Industries, Nagpur), Kaushik Chakraborty (GM, Environment, WCL) and officials from Forest Department and MEDA for inputs and suggestions to refine the action plan.

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

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

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

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

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

EXECUTIVE SUMMARY

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

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

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

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



CLIMATE PROFILE AND PROJECTIONS

This section analyses historical data and projects changes in rainfall and temperature for Nagpur district using IMD and NASA's NEX-GDDP datasets, following the multi-modal mean (MMM) approach. Here are some findings for the district:

- **Rainfall expected to increase:** The seasonal rainfall is projected to increase by 4 to 20 percent under RCP4.5 and 15 to 35 percent under RCP8.5 emission scenarios.¹ The number of rainy days is also projected to increase during monsoon, particularly in July and August.
- **Summers are getting hotter:** A significant trend of increase in the maximum temperatures during summer months is seen in the district, which is observed to be accelerated during the last decade. The mean percentage of warm days has increased by about nine percent. The minimum temperature is also projected to increase in the winter season.
- **Warms days to increase:** Maximum temperatures are projected to increase by about 1.2°C to 2.4°C under RCP4.5 and 1.5°C to 4.4°C under RCP8.5 emission scenarios. In future, the percentage of warm days are also projected to increase by over 55 percent of the present climate. The minimum temperatures also show an increasing trend – the percent of cold days may decrease in all epochs under changing climate conditions.

SECTORAL GREENHOUSE GAS EMISSIONS PROFILE: CLIMATE CHANGE DRIVERS

- **Greenhouse gases have increased ten-folds since 2005:** Between 2005 and 2019, the total greenhouse gas (GHG) emissions of Nagpur district increased by 1,046 percent (from 4.73 million tonnes CO₂e in 2005 to 54.20 million tonnes CO₂e in 2019) with a CAGR of 19.03 percent. These estimates represent GHG emissions from 14 categories covering three major sectors – energy; agriculture, forestry and other land use (AFOLU); and waste.
- **Energy sector is the highest contributor of emissions:** Energy sector (direct fuel combustion for public electricity generation, transport, industries, agriculture, residential categories etc. and fugitive emissions from mining) is the highest contributor of GHG emissions. The energy emissions increased 12-folds between 2005 and 2019 at a CAGR of 20.7 percent (mostly due to increase in public electricity generation). Under the BAU scenario, energy sector emissions are projected to increase by 357 percent by 2030.
- **AFOLU sector is now witnessing high GHG emissions:** Although the forest area of Nagpur district improved between 2004 and 2008, the overall stock of carbon reduced due to reduction in the carbon stock density. As a result, the 'forest removals' could not become a sink. The emissions from forest removals slightly dipped post 2011 (because the rate of loss in forest area was very low), but increased again from 2016 (due to significant reduction in forest area). The emissions under AFOLU sector increased by 49 percent between 2005 and 2019 at a CAGR of 3 percent. Under the BAU scenario, AFOLU sector emissions are projected to increase 144 percent by 2030.
- **Waste sector emissions have dropped:** Overall, waste sector emissions have increased by 38 percent between 2005 and 2019 (at a CAGR of 2.34 percent), but its contribution reduced from 4 percent to 1 percent in economy-wide emissions. Domestic liquid waste management practices have improved more than solid waste management practices. As a result, after 2011, the emissions from wastewater have increased at a marginal rate of 1.23 percent CAGR, whereas solid waste emissions increased by 2.58 percent CAGR (between 2011 and 2019). Under the BAU scenario, waste sector emissions are projected to increase 26 percent by 2030.

¹ Representative concentration pathways (RCPs) are concentration pathways used by the IPCC. They are prescribed pathways for greenhouse gas and aerosol concentrations, together with land use change that are consistent with a set of broad climate outcomes used by the climate modelling community. The pathways are characterised by the radiative forcing produced by the end of the 21st century. Radiative forcing is the extra heat that will be retained by the lower atmosphere as a result of additional greenhouse gases, measured in watts per square metre (W/m²). There are four RCPs – RCP2.5 (low pathway where radiative forcing peaks at approximately 3 W/m² before 2100), RCP4.5 and RCP6.0 (two intermediate stabilisation pathways in which radiative forcing is stabilised at approximately 4.5 W/m² and 6.0 W/m² after 2100) and RCP8.5 (high pathway for which radiative forcing reaches greater than 8.5 W/m² by 2100).

ASSESSMENT OF POLICIES THROUGH THE LENS OF CLIMATE CHANGE

A total of 39 major national/state-level policies and programmes of energy, AFOLU and waste sector were evaluated for their climate mitigation potential.

- **Power and energy:** Eleven policies/programmes were evaluated. UDAY and PAT schemes were found to be the biggest contributors to GHG mitigation.
 - ◀ Policies related to clean energy generation mitigated 9,46,137 tCO₂e. emissions.
 - ◀ Policies pertaining to energy-efficient buildings and processes helped avoid 48,47,063 tCO₂e. emissions.
- **AFOLU and cross-cutting:** Thirteen policies were assessed.
 - ◀ Forestry policies alone led to a mitigation of 70,77,360 tCO₂e. emissions.
 - ◀ Policies pertaining to livestock proved to be beneficial for climate action, avoiding 3,007 tCO₂e.
 - ◀ For the agricultural sub-sector, GHG impact of the policies could not be computed due to lack of availability of data.
 - ◀ Policies pertaining to cross-cutting sector helped mitigate 5,03,778.5 tCO₂e. emissions.
- **Waste:** Fifteen policies were assessed.
 - ◀ Policies pertaining to sanitation added 2,25,092 tCO₂e. emissions.
 - ◀ Composting as a part of solid waste management practices mitigated 36,096 tCO₂e. emissions.
 - ◀ Domestic wastewater treatment interventions have led to 30,204 tCO₂e. emissions.

BUDGETARY ANALYSIS TO ESTIMATE EXPENDITURE ON CLIMATE ACTION

This section analyses the district expenditure to estimate spending on climate action. District budgets from the Planning Department, Government of Maharashtra for the years 2016-17 to 2018-19 were analysed to understand expenditure on climate action in Nagpur district. The expenditure on climate relevant actions is estimated to be 9.34 percent, 19.79 percent, and 18.85 percent, respectively, of the total district budget for three years. The distribution of expenditure on climate action in the district between 2016-17 to 2018-19 is summarised in Figure 1a below. The distribution of schemes reveals that most climate relevant schemes over 2016-17 to 2018-19 fall under the marginal category, indicating the scope for increasing commitment to climate action at the district level (see Figure 1b). Further, Figure 1c gives the budgetary allocation attributed to climate action by level of climate relevance (direct, indirect, marginal, potential) of the schemes listed in the district budget .

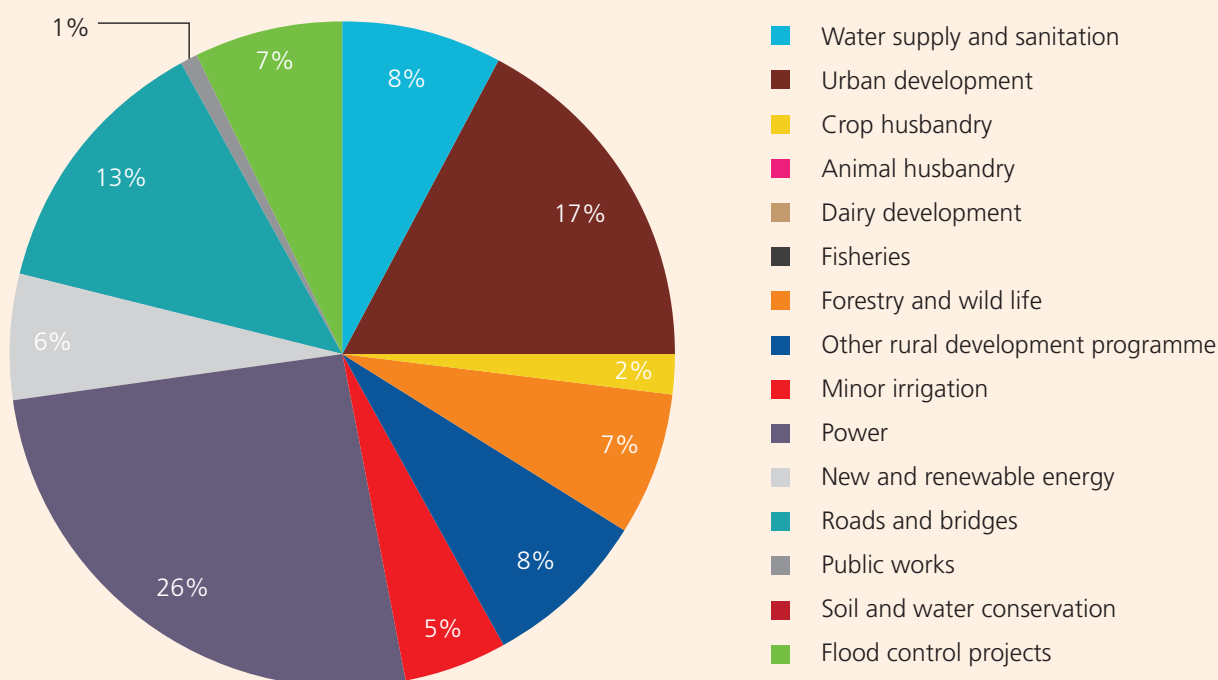


Figure 1a: Nagpur District: distribution of expenditure on climate action

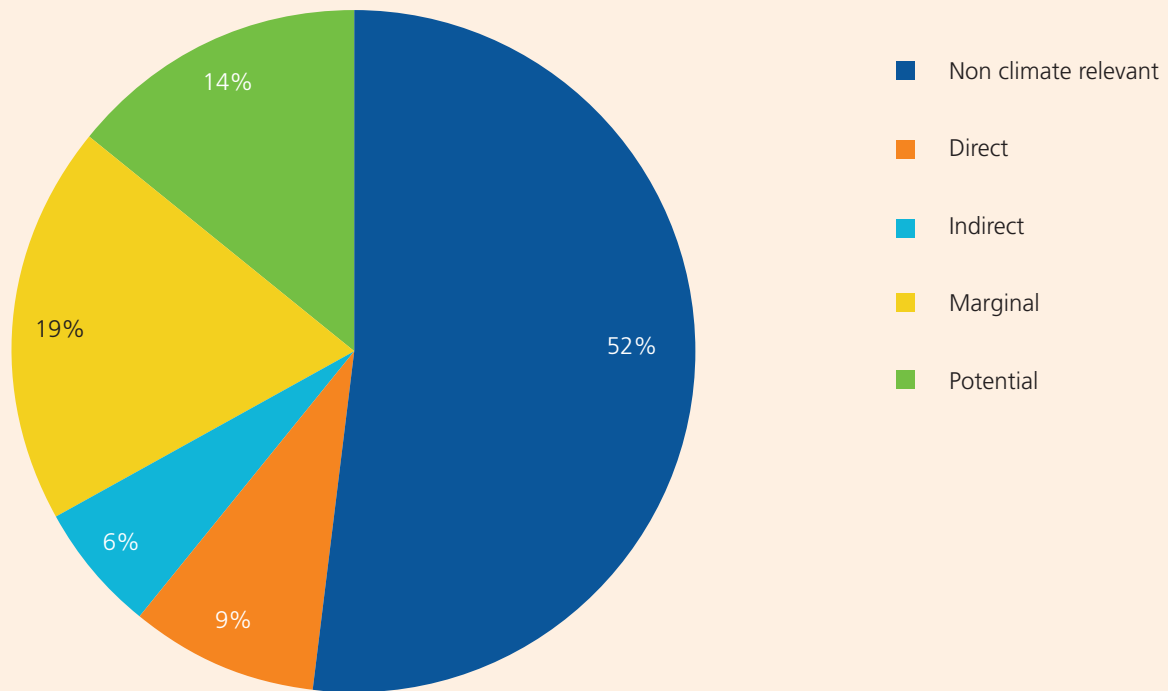


Figure 1b: Distribution of schemes by relevance to climate action in Nagpur district between 2016-17 and 2018-19

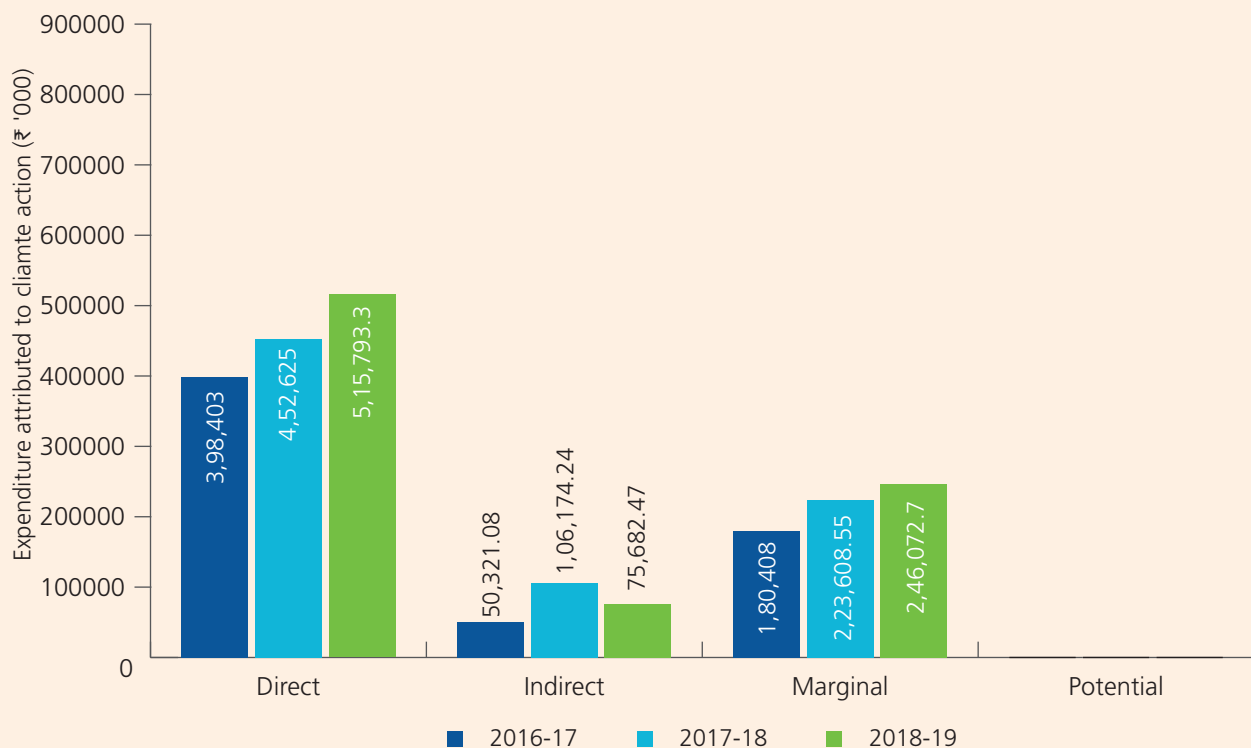


Figure 1c: Expenditure attributed to climate action by category of climate relevance in Nagpur district between 2016-17 and 2018-19

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

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

Scheme selected	Climate relevant activities	Year	Total allocation to district under scheme (₹ lakh)	Allocation to climate action (₹ lakh)	% of total scheme budget for climate action at district level*
MGNREGS	Eleven out of 17 activities were identified as climate relevant: Drought proofing, fisheries, flood control and protection, land development, micro-irrigation, renovation of traditional water bodies, rural connectivity, drinking water, sanitation, water conservation and water harvesting	2018-19	5,492	1,757	32
		2019-20	4,599	1,058	23
PMKSY	Micro-irrigation activities	2016-17	595	410	69
		2019-20	483	333	
AMRUT	Water supply, sewage and septage management, urban transport, drainage, green spaces	2015-16	27,297	713	2.6
		2016-17	150	31.5	21
DDUGJY + Saubhagya	New and upgradation of substations, LT lines, feeder segregation, consumer metering, DTR metering, etc	Up to April 2020	16,321	8,160	50

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

RECOMMENDATIONS

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

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

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

Overall, the mitigation actions suggested in the recommendations can help mitigate 8.6 Mt CO₂e per annum. The sectoral breakdown of the same is as following:

GHG mitigation potential of CCEAP recommendations (tCO₂e)

 **Energy**
68,66,857

 **AFOLU**
17,54,734

 **Waste**
44,914.26



Figure 2 Recommendations for CCEAP Nagpur

DISTRICT ENVIRONMENTAL ISSUES



Water scarcity & water pollution



Air pollution



Brick kilns



Heat waves



Upcoming TPPs in pipeline



Mining

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)

Here are some in-brief, sector-wise recommendations

Power and energy

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

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



Transport

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



AFOLU

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



Waste

With the waste sector being one of the biggest contributors of methane emissions globally, major recommendations revolve around reducing landfill disposal of waste and managing wastewater to reduce GHG emissions from them through measures such as:

(a) reducing waste at source, (b) proper segregation, collection and channelisation of different categories of waste (including bio-medical waste and e-waste) for recycling and treatment, (c) 100 percent conversion of organic waste to compost and gas management of composting units, (d) recycling, recovery and reuse of 100 percent inert waste (plastic, construction waste, etc), and (e) setting up of centralised aerobic wastewater treatment plants with closed sewer networks and sludge removal facility.



Given the unique environmental issues of the district, the action plan also recommends:

1. Adopting a holistic approach for water conservation and wastewater management, including conservation techniques such as rainwater harvesting, net zero water infrastructure, minimising losses in water supply, installing water-efficient fittings, water metering and adoption of inclusive and sustainable water governance.
2. Developing extensive infrastructure to monitor air pollution and suggestions on interventions for preventive measures.

3. Making brick kilns sustainable.
4. Minimising emissions and climate change impacts of the existing and upcoming Thermal Power Plant (TPPs).
5. Ensuring sustainable mining practices in the district.

COVID-19 IMPACT

This section presents an assessment of how the COVID-19 pandemic has impacted various sectors and the developmental measures. During the national lockdown in 2020, the total energy demand in India went down considerably

The Maharashtra-Madhya Pradesh border in Nagpur district was a key crossing point for many migrants in both the states. Nagpur faced an outflux of migrant workers during the lockdown period. In the agriculture sector, harvesting activities were interrupted due to the lockdown. Supply chain problems were also witnessed. However, the reverse migration proved beneficial for kharif season.

Overall, the pandemic resulted in significant reduction in air pollution. Air quality improved owing to reduced transport and industrial activities during the lockdown and unlock period. The most impacted sector, perhaps, was waste management with single use plastic waste and bio-medical waste from both households and healthcare sector increasing manifold, leading to increased incineration, landfilling and single-use product consumption.





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



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

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



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