WRI INDIA

CONFERENCE PROCEEDINGS

Long-term low-carbon development strategy of Madhya Pradesh

MULTI-STAKEHOLDER DIALOGUE

October 18, 2024 | Bhopal, Madhya Pradesh | Compiled by: Kshitij Singh, Prateek Barapatre, and Saransh Bajpai

Introduction

Although long-term climate strategies communicated to the United Nations Framework Convention on Climate Change (UNFCCC) are designed at the national level, their implementation needs to be operationalized at both the national and subnational levels. India's Long-Term Low Emission Development Strategy (LT-LEDS) recognizes the important role of state governments in climate action and will need to be operationalized at multiple levels, including at the state level.

In Madhya Pradesh, WRI India is engaging with the state government to develop a long-term low-carbon development strategy through research, capacity-building, and engagement with the relevant stakeholders. In this context, WRI India, in collaboration with the Environmental Planning & Coordination Organisation (EPCO), Department of Environment, Government of Madhya Pradesh, organized a workshop titled "Multi-Stakeholder Dialogue on Long-Term Low-Carbon Development Strategy of Madhya Pradesh" on October 18, 2024, in Bhopal.

The dialogue brought together more than 70 diverse stakeholders, including representatives from the state government, technical experts, civil society organizations (CSOs), and academic institutes to deliberate on the following areas:

- Focus areas and sectors for developing a long-term low-carbon development strategy of Madhya Pradesh.
- Decarbonization challenges and opportunities in Madhya Pradesh.
- Madhya Pradesh's role in contributing to and achieving India's Nationally Determined Contribution (NDC) targets by 2030 and net zero emissions by 2070.

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This conference proceedings reflects the presentations and discussions of the participants and does not necessarily represent the views of WRI India or other participating institutions.

The above topics were discussed in three sessions. The inaugural session involved presentations that set the context, followed by two panel discussions, one titled "Opportunities & Challenges for Decarbonization in Madhya Pradesh" and the other titled "Role of the States in Achieving India's NDCs and LT-LEDS." The dialogue highlighted the challenges Madhya Pradesh would face across various sectors when envisioning long-term low-carbon development and identifying opportunities to decarbonize the sectors. The dialogue also discussed the factors such as finance, data availability, policy ramifications and appropriations, interdepartmental coordination, and citizen awareness, that are critical for low-carbon development.

Madhya Pradesh and climate change

Madhya Pradesh, India's second-largest state in terms of area and the sixth largest in terms of population, is also considered one of the states that are most vulnerable to climate change (DST 2021). Madhya Pradesh is rich in biodiversity, has more than a quarter of its land under forests, and possesses plenty of mineral wealth (GoMP 2023). Any change in climatic conditions may adversely impact natural-resource-based livelihoods and make communities more vulnerable to climate change. Seventy-two percent of the state's population resides in rural areas (Department of Farmer Welfare and Agriculture Development n.d.). Their livelihoods depend primarily on natural resources as from forestry, agriculture, and allied sectors.

Notably, Madhya Pradesh has been ranked sixth nationally in greenhouse gas emissions (GHG Platform India n.d.). Madhya Pradesh's per capita emissions, 2.65 tonnes of carbon dioxide equivalent (tCO2e), exceed the national average of 2.22 tCO2e (GHG Platform India 2022). Population growth, urbanization, and industrialization were the major drivers for the increase in GHG emissions during 2005–2018. The energy sector was the largest contributor to GHG emissions in the state. Within the energy sector, public electricity generation was the biggest contributor of GHG emissions, with a share of 67 percent in 2018. This was followed by emissions from industries (~13 percent) and transport (~7 percent). Emissions from the industrial processes and product use (IPPU) sector are largely driven by chemical, metal, and mineral industries and non-energy products from fuels and solvent use. Mineral industry emissions were the major contributor to IPPU emissions in Madhya Pradesh, with an almost 92 percent share in 2018.

Madhya Pradesh contributes 3.86 percent to India's GDP, but it accounts for approximately 7.28 percent of the country's net GHG emissions (GHG Platform India 2022). This is primarily due to coal-based power generation within the state; industries such as cement, steel, and mining; large-scale deforestation for land-use change; and traditional farming practices, including stubble burning, and livestock. Moreover, increasing vehicle use and urban expansion contribute significantly to GHG emissions. A detailed analysis of emissions across all sectors of the state is required to mitigate them.

For combating climate change, the state has undertaken several measures, such as updating its State Action Plan on Climate Change (SAPCC) and creating GHG inventories and district- and city-level climate action plans (EPCO 2023) aligned with India's NDCs and the broader agenda for Viksit Madhya Pradesh@2047 (GoMP 2024). India's LT-LEDS also explicitly highlights interventions such as SAPCCs as primary subnational measures; however, SAPCCs and other research products and plans are short term and do not address long-term planning needs.

As Madhya Pradesh embarks on a long-term low-carbon development strategy, it should meaningfully contribute towards India's NDCs and net zero targets while ensuring inclusive social and economic development. The entire process and components involved in developing Madhya Pradesh's long-term low-carbon development strategy were discussed during the dialogue. The process includes preparing detailed GHG emission profiles, estimating future emission scenarios, and assessing the mitigation potential of key policies using the World Resources Institute's Policy and Action Standard framework to create low-carbon development roadmaps.

Challenges and opportunities in addressing climate change in the long term

Because India's LT-LEDS hinges on coordinated climate action across levels of governance, Madhya Pradesh also needs to think beyond the 10-year horizon in the SAPCC and plan climate action in the long term. The discussions revolved around the challenges and opportunities in Madhya Pradesh and the state government's role in contributing to India's climate goals.

Challenges across sectors associated with low-carbon development in Madhya Pradesh

Gaps in renewable energy adoption

The Government of India plans to augment renewable energy generation capacity to 500 GW in 2030 (PIB 2024). Madhya Pradesh aims to contribute to India's goal and is among the leading states having Variable Renewable Energy (VRE) potential. Post-COVID, per capita electricity consumption in MP has increased by 11.65 percent, reaching 1332 kilowatt-hours (kWh) in 2024 (Department of Public Relations, Government of Madhya Pradesh 2024). Also, the peak demand in MP increases during the winter months, i.e., November to February (Central Electricity Authority n.d.).

MP is yet to adapt to the fluctuating renewable energy sources and the inter-regional grid transfer of renewable energy during seasonal variability. It also faces challenges of grid infrastructure and integration. Firstly, integrating a large generation into the grid poses significant challenges, including maintaining grid stability and balancing demand and supply. Secondly, limited storage technology options like Pumped Hydro Storage (PHS), Battery Energy Storage (BES), etc., create a vacuum as such a quantum of electricity could not be utilized during high RE generation and low demand periods. Lastly, the intermittent nature of RE leads to fluctuations in frequency and voltage, requiring grid operators to take measures to maintain stability. Moreover, during non-solar hours, inverters generate harmonics, which may cause issues at grid sites.

Feasible project design and inter-department coordination could enable the optimum utilization of available spaces at government-owned buildings such as Community Health Centers (CHC), Schools, Anganwadis, hostels, etc. The execution of the power purchase agreement (PPA) between departments could ease project timelines. Timely payment to vendors could boost the efficient operation of solar water heating and photovoltaic applications.

Decentralized problems need decentralized solutions, which could be achieved with better penetration of decentralized renewable energy (DRE) across various departments. Hence, the policy and regulatory framework plays a crucial role in ensuring that the DRE solutions don't create uncertainty and hinder the long-term investments in RE projects. Further, the absence of clear standards for Operation and Maintenance (O&M) procedures and certification systems of RE equipment can also pose a challenge in the effective implementation of DRE schemes across the state. This leads to a delay in the timely implementation of PM-KUSUM (Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan) scheme.

Financial and economic factors are other major challenges in upscaling renewable energy. Moreover, the mega-scale projects often require significant upfront investment, but the weak financial health of distribution companies (DISCOMs) affects the ability of allied government trading companies to purchase power from upcoming RE projects, impacting the deployment and viability of renewables (Michael 2025).

It is essential to bring public participation and awareness in various sections of society. This includes awareness around the usage of energy-efficient equipment, adopting energy conservation measures, shifting agricultural usage load during solar hours, timely disbursement of solar rooftop domestic subsidies, better O&M procedures, etc. Bringing awareness around these subjects could help narrow down gaps in the penetration of RE in Madhya Pradesh.

Narrow transport planning and limited electric vehicle (EV) uptake

Madhya Pradesh's transport sector accounted for approximately 7 percent of the state's fuel combustion emissions and 5.7 percent of its total greenhouse gas emissions in 2018 (GHG Platform India 2022). Road transport alone accounted for 93 percent of the overall transport sector emissions in the state (GHG Platform India 2022). To decarbonize road transport, Madhya Pradesh revised its Electric Vehicle (EV) Policy in 2025 to promote the purchase of EVs (GoMP 2025). Vehicle electrification across modes and adoption of EVs are recognized as key elements within the low-carbon transport system pathway in India's LT-LEDS. The other key elements are increased availability of and access to public transport, phased adoption of cleaner fuels, and improved fuel efficiency. In this context, low-carbon transport is associated with the following challenges:

- Lack of comprehensive mobility planning: A holistic view of motorized and non-motorized transport for long-term planning is missing at the city level. Solutions to transport sector emissions and road connectivity do not sufficiently leverage data on travel behaviors and vehicle use. The lack of these nuanced data points at the city level hinders long-term planning for transport.
- Skewed preference for EVs: The uptake of EVs in Madhya Pradesh has increased, but two-wheelers and three-wheelers dominate the sales, comprising around 97 percent of the total EV sales (MoRTH 2025). EVs for public transport, such as e-buses, see very low uptake within the state. A comprehensive market assessment to promote vehicles in other categories is missing.
- Lack of consumer awareness: Incidents such as mishandling or vandalism of charging infrastructure and usage of unauthorized connections for charging need to be addressed.

Inadequate adoption of green technologies in industries

The dialogue explicitly highlighted that many large and small industries are actively installing new technologies to enhance their operations; however, micro and small-scale industries face significant challenges in this regard, primarily due to lack of financing. These micro-industrial units are particularly vulnerable, because they often lack the resources needed to invest in modern technologies.

To address this issue, initiatives such as the Raising and Accelerating MSME Performance scheme and the introduction of Zero Defect Zero Effect (ZED) certification could provide much-needed support in overcoming these barriers and accessing the incentives that accompany the certification (MoMSME 2022). These programs not only provide incentives but also enhance operational efficiency, build credibility, and ensure compliance. Both schemes may help micro, small, and medium enterprises (MSMEs) qualify for incentives, subsidies, and lower interest rates from banks while also ensuring sustainability and quality assurance, making MSMEs more appealing to private investors.

Nevertheless, the overarching challenges of limited awareness and inadequate financing continue to hinder the adoption of low-carbon technologies across these smaller enterprises. Tackling these issues is essential for fostering innovation and sustainability within the industrial sector.

Unsustainable farming practices and excessive usage of fertilizers

Agriculture, forestry, and other land-use sectors accounted for 10 percent of Madhya Pradesh's total GHG emissions in 2018 (GHG Platform India 2022). Madhya Pradesh is a major contributor to India's agricultural output, and agriculture utilizes approximately half the state's area (GoMP 2023). According to the state's revised SAPCC, challenges from climate change impact crop productivity and farmers' income despite success in increasing production. In this context, the key challenges highlighted during the discussion are as follows:

- Burning of crop residues: Seasonal burning of crop residue ensures its quick removal. This common practice is preferred to expensive labor-intensive and time-consuming clearing methods. However, burning can increase pollutants in the air and destroy soil microbes (GoMP 2023).
- Excessive use of fertilizers: Between 2009 and 2015, fertilizer use in Madhya Pradesh increased from 78 kg/hectare to 133 kg/hectare (GoMP 2023). Excessive usage of fertilizers can reduce soil fertility over long periods and pollute groundwater.

Loss of green cover in urban areas

Forest cover or the recorded forest area accounted for 30.72 percent of the state's total geographical area (FSI 2023). Beyond forest products and livelihoods, they offer ecosystem services such as regulating water cycles, preserving soil quality, and serving as carbon dioxide sinks. The National Forest Policy and the Madhya Pradesh State Forest Policy, 2005, emphasize sustainable management practices. However, forest management faces several challenges due to increased demand for fuelwood, urban expansion, soil deterioration, invasive species, and human-wildlife conflicts (GoMP 2023). In the context of urbanization-related challenges, the discussions revolved around land management and afforestation projects.

Increasing demand for land due to urbanization and migration from rural to urban areas for better economic opportunities continue, and cities will inevitably expand. Cities such as Bhopal that are surrounded by forests require careful planning for green cover management and conservation efforts. Afforestation projects that focus on beautification often tend to rely on non-native species of plants, which can degrade soil quality and harm local fauna. Instead, such projects should use plants that complement local biodiversity.

Despite these challenges ranging across sectors, there are entry points for action in each sector, as highlighted in the last section of this document. The next section discusses a few cross-sectoral factors that were identified during the discussions on how Madhya Pradesh could contribute to national climate goals and formulate its low-carbon development strategy.

Critical factors determining a long-term low-carbon development strategy for Madhya Pradesh

Planning and implementing a long-term low-carbon development strategy requires considering the state's current local resources and capacities, and how they must evolve to meet the state's development aspirations and build resilience against climate impacts. The discussion highlighted that sector-specific timelines and outcomes can ensure that each sector contributes effectively to mitigating carbon emissions. India's LT-LEDS can serve as a starting point. However, Madhya Pradesh needs to contextualize the strategic pathways outlined within India's LT-LEDS based on its emissions and geographical and socio-economic context. The panelists in the dialogue highlighted key factors for planning the state's long-term low-carbon development strategy.

Financing and investment

Domestic sources account for the majority of green finance in India, their share being 83 percent in the financial year 2022 (Khanna et al. 2022). Private sector involvement needs to increase in the future, especially in sectors such as EVs that have not yet established a mature market.

When identifying sectors that require financing, it is essential to carefully evaluate the associated risks and returns. The Rewa solar project is an example of innovative financing in the RE sector. Its success stems from a public-private partnership model characterized by sustained engagement throughout the project life cycle, from project conceptualization to financing. Early stage de-risking and improved bankability, achieved through proactive planning, helped create a market (IFC 2019). This highlights the need for technical support in developing bankable projects.

To create sustainable projects, it is essential to build the capacity of project developers through technical support, collaboration, and training. If developers' skills and knowledge are enhanced, they will be better equipped to navigate the complexities of project financing and implementation.

Financial and technical partnerships are required in the long term to best utilize funds and leverage knowledge and technology. Goa's subnational blended finance facility is an example of financing projects within critical but hard-to-fund sectors (PIB 2024). Such institutional measures need to be explored.

Data availability

Availability of data on the state's key economic activities and their associated impacts, such as emissions, emerged as a critical component of long-term low-carbon development pathways. Limited data hinder comprehensive climate actions in various sectors. For example, the lack of travel and vehicle usage data in cities prevents envisioning long-term solutions to mobility issues in major cities of the state.

The lack of standardized emissions and activity data is a barrier to obtaining a holistic picture of the state's latest activities and emissions. The limited capacities of the state departments also hinder data availability. The lack of data collection and storage protocols can lead to the omission of critical information from the departments' policies and programs. Data collected also need to be made accessible to other departments and citizens. Another challenge is leveraging data on emissions and activities to create long-term solutions.

Interdepartmental coordination

The discussions highlighted that long-term climate action planning is cross-sectoral and requires the involvement of, and coordination between, multiple sectoral departments and non-governmental actors. For instance, when analyzing the GHG emissions from a particular sector, data would be sourced from various departments, each comprising multiple units. Limited coordination within and between departments may hinder the integration of diverse perspectives and expertise, which leads to missed opportunities and inefficiencies.

The State Steering Committee that has already been established for climate change in Madhya Pradesh is chaired by the Chief Secretary, Government of Madhya Pradesh. The committee may also become the apex decision-making body for the long-term low-carbon development strategy for Madhya Pradesh. The committee members are senior-level policymakers from key line departments, associated organizations, and technical partners who ensure a whole-of-government approach and facilitate inter- and intra-departmental coordination. The apex body may regularly provide strategic direction, address governance challenges, and ensure that the strategy is aligned with Madhya Pradesh's developmental priorities.

Drawing from the successful experiences of other states such as Bihar, mission-oriented approaches and cross-departmental coordination have proved effective in driving multisectoral synergies towards achieving environmental priorities. This underscores the importance of mainstreaming climate action across various sectors and institutional frameworks, ensuring a holistic and sustainable approach to development.

Citizen awareness

Citizen awareness and participation are critical in service delivery and policy implementation. A lack of citizen awareness regarding minor technical details, pre-installation processes, and so on, hinders RE initiatives such as solar rooftops. Similarly, lack of understanding also leads to crop residue burning when alternatives might be available to farmers. Although the state departments are actively helping bridge the information gap, they are limited in their capacity. Specific climate and environmental actions require the active participation of citizens, such as leveraging the Industrial Promotion Policy 2025 to install green technologies in industries or maintain green cover in urban neighborhoods as part of the Green Industrialisation Assistance component of the state's industrial promotion policy (MP Industrial Promotion Policy 2025). Hence, awareness can play an essential role in the long term by instilling a sense of ownership and nudging citizens toward climate-friendly behaviors.

The way forward

A long-term low-carbon development strategy needs to balance development in the context of climate change by minimizing the key environmental and developmental concerns and capitalizing on opportunities, while suggesting a road map to overcome implementation barriers. The major highlights from the discussions along with the key entry points for the state's upcoming long-term low-carbon development strategy are as follows:

- The strategy must be socially and politically acceptable, environmentally feasible, and financially viable, while establishing a robust institutional mechanism. This will help obtain sectoral buy-in from, and instill a sense of ownership among, key departmental stakeholders.

- Effective monitoring, evaluation, and learning systems would be needed to support the implementation of the strategy. In parallel with these efforts, building climate leadership and capacities within the state and its context would be critical to this strategy.
- Strong research support is essential for developing policies that could enhance the state's policy documents, such as vision documents and state- and city-level plans and strategic frameworks for addressing climate change effectively.

TABLE 1 | Key entry points for action to address sectoral challenges

SECTOR	CHALLENGES	ENTRY POINTS FOR ACTION
RE	Grid integration protocol	▪ Transition to renewable energy by modernizing the grid and integrating resource planning effectively for thermal and RE projects. A mechanism to fund modernization is crucial because modernization requires significant capital investment, which is difficult to obtain due to the challenging financial condition of the state distribution company (discom). Storage is another option, but most storage technologies (BESS, PSH, etc.) are in the developmental stage.
	Lack of standards for RESCOs and CAPEX hinder investment	▪ The implementing agency, that is, the state nodal agency (SNA), should meticulously draft the O&M agreement, payment security mechanism, and other details for effective coordination between RESCO/CAPEX developers, the beneficiary institutions, and other stakeholders. ▪ To reduce the high tariffs for RE installations (grid-connected/off-grid), the state could implement CAPEX incentives, generation-based incentives, and a reverse bidding process.
	Lack of awareness among stakeholders and the general public	▪ Incentives could be given to domestic consumers to encourage households to adopt solar solutions instead of giving them subsidies.
Transport	Lack of comprehensive mobility planning	▪ Collect data on travel movement and vehicle usage in cities to inform mobility planning.
	Skewed preference for EV two-wheelers and three-wheelers	▪ Conduct a market assessment to understand the low uptake of other categories. ▪ Emphasize public transport in mobility planning to improve the uptake of e-buses. ▪ Provide technical support to government departments for the replacement of end-of-life vehicles with sustainable vehicles such as EVs.
	Lack of consumer awareness	▪ Improve charging infrastructure availability in residential areas to address unauthorized charging connections. ▪ Conduct awareness programs for manufacturers to reduce incidents of vandalism of charging infrastructure.
Industries	Lack of a monitoring mechanism to track and incentivize industrial sustainability practices	▪ Establish a comprehensive state-level framework that industries can use to report their carbon emissions and track progress, followed by a policy effectiveness assessment. ▪ Introduce state awards to recognize emissions intensity improvement by industries to incentivize and reward GHG reduction efforts.
	MSMEs lack technical and financial support to adopt low-carbon technology	▪ The SNA could regularly organize cluster-wise capacity-building workshops in collaboration with industry representatives such as CII and FICCI. ▪ Conduct capacity-building programs for MSMEs and provide technical support services. ▪ Help MSMEs obtain ZED certification and thereby access financial support.
Agriculture	Crop residue burning	▪ Introduce farmer-led projects on using crop stubble as compost or in biochar production.
	Excessive fertilizer use	▪ Conduct pilot projects for sustainable soil management using natural manure to partially replace fertilizers without affecting productivity.
Forestry	Declining urban forests	▪ Implement afforestation initiatives using native plant species. ▪ Conduct capacity-building programs for stakeholders in afforestation to enhance their understanding of biodiversity's role in afforestation. ▪ Utilize Kawaki and Miyawaki plantation techniques. ▪ Ensure scale-up and robust monitoring and evaluation of the Ankur Program scheme.

Note: BESS = Battery Energy Storage System. CAPEX = capital expenditure. CII = Confederation of Indian Industry. FICCI = Federation of Indian Chambers of Commerce and Industry. GHG = greenhouse gas. MSME = micro, small, and medium enterprise. O&M = operations and maintenance. PSH = pumped storage hydropower. RESCO = renewable energy service company. ZED = Zero Defect Zero Effect.

Source: WRI India authors.

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Inaugural session

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Panel discussion I: Opportunities & challenges for decarbonization in Madhya Pradesh

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Panel discussion II: Role of the states in achieving India's NDCs and LTS

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List of abbreviations

BESS	battery energy storage system
CSO	civil society organization
DST	Department of Science and Technology
EPCO	Environmental Planning & Coordination Organisation, Government of Madhya Pradesh
GHG	greenhouse gas
GoMP	Government of Madhya Pradesh
IPPU	industrial processes and product use
LT-LEDS	long-term low-emissions development strategy
LTS	long-term strategy
NDC	Nationally Determined Contributions
O&M	operations and maintenance
PIP	Press Information Bureau
PSH	pumped storage hydropower
RAMP	Raising & Accelerating MSME Performance
RE	renewable energy
RESCO	renewable energy service company
SAPCC	State Action Plan for Climate Change
SNA	state nodal agency
UNFCCC	United Nations Framework Convention on Climate Change
ZED	Zero Defect Zero Effect

References

Department of Farmer Welfare and Agriculture Development. n.d. "About Us." *Department of Farmers Welfare and Agricultural Development, Madhya Pradesh*. https://mpkrishi.mp.gov.in/Englishsite_New/Aboutus_English.aspx. Accessed March 15, 2025.

DST (Department of Science & Technology). 2021. *Climate Vulnerability Assessment for Adaptation Planning in India Using a Common Framework.* New Delhi: DST, Government of India. https://dst.gov.in/sites/default/files/Full%20Report%20%281%29.pdf.

EPCO (The Environmental Planning & Coordination Organisation). 2023. "Strategic Knowledge Creation, Collation and Dissemination." *EPCO, Government of Madhya Pradesh.* https://epco.mp.gov.in/strategic-knowledge-creation-collation-and-dissemination.

FSI (Forest Survey of India). 2023. *India State of Forest Report 2023 (Volume 1).* Dehradun, India: FSI, Ministry of Environment, Forest & Climate Change. https://fsi.nic.in/uploads/isfr2023/isfr_book_eng-vol-1_2023.pdf.

GHG Platform India. n.d.. "Economy Wide Emissions Estimates in 2018." *GHG Platform India.* https://www.ghgplatform-india.org/economy-wide/.

GHG Platform India. 2022. "Trend Analysis of GHG Emissions of Madhya Pradesh."https://www.ghgplatform-india.org/wp-content/uploads/2022/09/GHGPI_Trend-Analysis_2005-to-2018_Madhya-Pradesh_Sep22.pdf.

GoMP (Government of Madhya Pradesh). 2023. *Madhya Pradesh State Action Plan on Climate Change.* Bhopal, Madhya Pradesh: GoMP. https://www.nitiforstates.gov.in/public-assets/Policy/policy_files/GSSNAD000290.pdf.

GoMP. 2024. "Vision Document @ 2047 Will Be the Basis of Vikasit Madhya Pradesh - Chief Minister Dr. Yadav," November 12. *Department of Public Relations, Government of Madhya Pradesh.* https://www.mpinfo.org/Home/../Home/TodaysNews?newsid=20241112N141&fontname=FontEnglish&LocID=32&pubdate=11/12/2024.

GoMP. 2025. *Madhya Pradesh Industrial Promotion Policy 2025.* Bhopal, Madhya Pradesh: GoMP. https://invest.mp.gov.in/wp-content/uploads/2025/02/IPP_2025_Policy.pdf.

IFC (International Finance Corporation). 2019. "Scaling Infrastructure: Rewa Solar (India)." Washington, DC: IFC. https://www.ifc.org/en/insights-reports/2010/scaling-infra-rewa-solar-india.

India Climate & Energy Dashboard. 2025. "Madhya Pradesh State Profile: A Comprehensive Overview." *India Climate & Energy Dashboard*. https://iced.niti.gov.in/state-report/madhya-pradesh.

Khanna, N., D. Purkayastha, and S. Jain. 2022. *Landscape of Green Finance in India 2021.* New Delhi: CPI (Climate Policy Initiative). https://www.climatepolicyinitiative.org/wp-content/uploads/2022/08/Landscape-of-Green-Finance-in-India-2022-Full-Report.pdf.

MoMSME (Ministry of Micro, Small and Medium Enterprises). 2022. "Brief History." https://zed.msme.gov.in/brief-history.

MoRTH (Ministry of Road Transport & Highways). 2025. " Vahan Dashboard. https://vahan.parivahan.gov.in/vahan4dashboard/.

PIB (Press Information Bureau). 2024. "Government of Goa and Power Finance Corporation come together to pioneer subnational Blended Finance Facility for Climate Action," February 20. Press Release. https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2007483.

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About WRI India

WRI India, an independent charity legally registered as the India Resources Trust, provides objective information and practical proposals to foster environmentally sound and socially equitable development. Our work focuses on building sustainable and livable cities and working towards a low carbon economy. Through research, analysis, and recommendations, WRI India puts ideas into action to build transformative solutions to protect the earth, promote livelihoods, and enhance human well-being. We are inspired by and associated with World Resources Institute (WRI), a global research organization. Know more: www.wri-india.org

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