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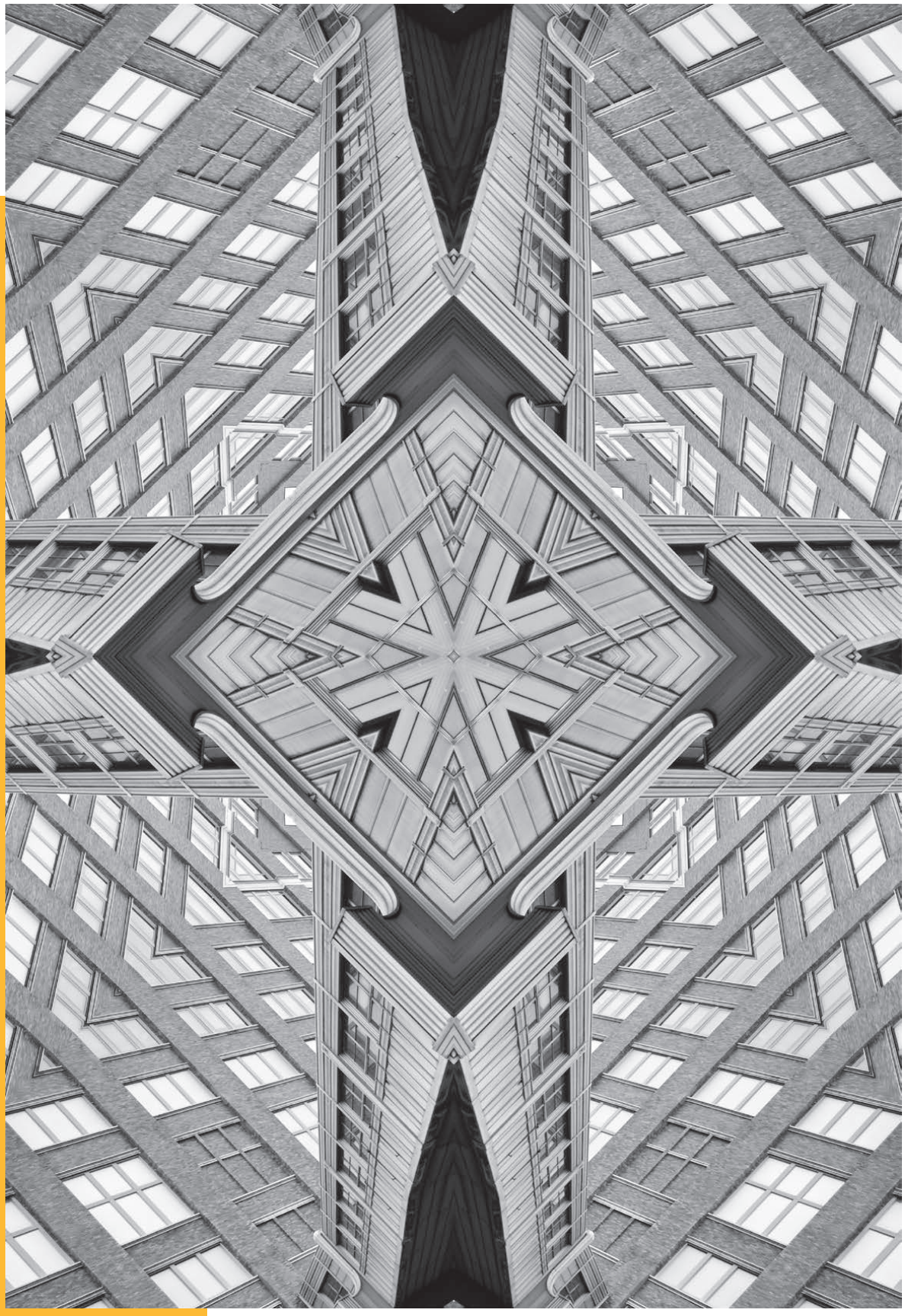

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The Greening Imperative: How Indian States Are Promoting Sustainable Industry

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Abstract

With natural resources being exploited beyond scope of regeneration, excessive pollutants accumulating in the biosphere, and ecosystems and biodiversity undergoing life-threatening degradation, industrial policies that steer investment towards a greener economy have become an imperative. This paper examines the green component of the industrial policies of 14 Indian states which have been found to be responsible for more than 80 percent of manufacturing sector pollution in the country. It identifies the gaps in the green initiatives suggested in these policies, both in design and implementation.

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Introduction

India's industrial development story started soon after Independence with the Industrial Policy Resolution 1948 setting the direction. The Industrial (Development and Regulation) Act of 1958 followed, marking a pathway for implementing industrial policies. So far, industrial policy has focused mainly on sustained growth in productivity, optimal utilisation of human capital, and flexibility in adjusting to markets. Increasingly, it is becoming imperative for such policy to consider sustainability as well.

Unchecked industrial production, inappropriate waste disposal, and overexploitation of natural resources have led to excessive pollution and environmental degradation. The impact on the earth's future is massive and could be irreversible. Industries contribute around one-fourth of India's total greenhouse gas (GHG) emissions. While India's gross domestic product (GDP) increased by 357 percent between 1990 and 2014, its GHG emissions also rose by 180 percent. Relative to GDP, India emits twice as much GHGs as the world average.[1] There is thus a great need for stricter reforms in energy use in India and better disposal of industrial and agricultural waste. India's industries must go green in their production methods and energy consumption.

The Centre and state governments need to come together to ensure energy efficiency and conservation and support the setting up of better infrastructure for non-conventional energy generation and transmission. India's industrial production must be put on the sustainable growth path. While there have been various Centre-led green initiatives and regulations as well as state-wise industrial policies that attempt to address industrial emissions, India has little data and largely no evaluation of the effectiveness of these green policies. It is necessary to list the green policies and categorise them under sectors to analyse how states are addressing the issue. Telangana's industrial policy, for instance, has led to the creation of venture capital and angel funds[a] that promote sustainable growth, and hubs for innovation and common energy use. Maharashtra's industrial policy of 2018, too, discusses the need for a green fund to be set up by the Maharashtra Pollution Control Board, and includes a clause on promoting green fuel.

There are Central policies already in place that encourage and assist state governments to pass environmental safety measures that are mandatory for industrial units. The National Green Tribunal (NGT) has played a pivotal role in ensuring that industrialisation does not overheat the economy or put the

a Business angels are individuals who use their own funds (angel funds) to invest in businesses they like, whereas venture capitalists manage the pooled money (venture capital) of others in a professionally-managed fund.

poor and vulnerable at disproportionate risk. The NGT, on numerous occasions, has directed the Ministry of Environment and Forests (MoEF) to issue stricter norms for effluent and sewage treatment plants, and has assisted the Ministry of New and Renewable Energy (MNRE) in making its proposals more effective.[b]

In its 2015 Paris Climate Agreement commitments, India had pledged to reduce its intensity of GDP emissions by 33-35 percent of 2005 levels by 2030. At the 2009 Copenhagen climate summit, it had promised to lower emissions by 20 to 25 percent by 2020. MoEF minister Prakash Javadekar has said that, as of December 2020, India had reduced its GDP emissions intensity by 21 percent. Further, the national water conservation campaign, Jal Shakti Abhiyan, seeks to deliver clean drinking water to every household, in combination with the Swachh Bharat Abhiyan (Clean India) and the Namami Gange (Clean Ganga) programmes. Finally, a complete policy framework to support electric mobility and metro transportation is being implemented in major cities.

These efforts are expected to reduce both particulate and carbon emissions. However, even better ground results can be achieved if state governments improve both their incentives to promote green industry and punitive measures to check emissions.

This paper evaluates the measures in state industrial policies which are geared towards promoting a circular economy by decoupling growth from consumption of finite resources – such as banning single-use plastics and focusing on recycling and reuse as a green strategy. It underlines the need to closely analyse the impact of these measures. The industrial policies of 14 states— which have the maximum industrial activity in the country and, consequently, GHG emissions— are examined for their green component.

Methodology

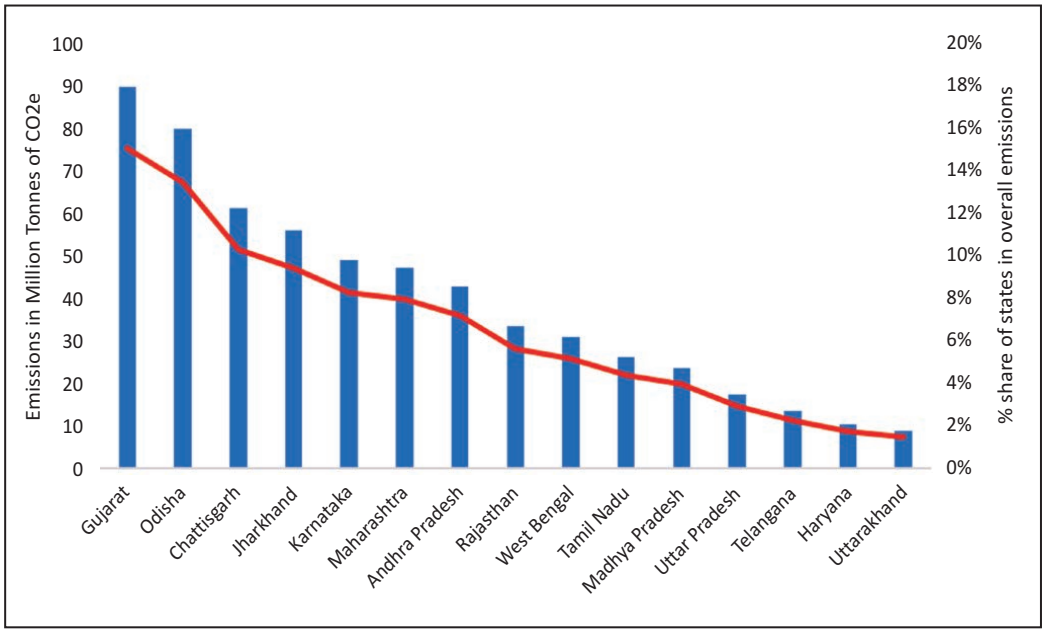
This paper compiles the elements of the industrial strategies of 14 Indian states that seek to address environmental concerns. It compares the best and worst performers amongst these states to analyse their current green policies and point the way to more effective strategies.

b One example is making it mandatory for solar developers to recycle the glass used in their solar photovoltaic (PV) panels.

The evaluation is limited to sectors which are the biggest polluters.[2] In the lead is electricity generation and heat production from thermal sources (coal and its derivatives), which account for approximately 28 percent of the world's GHG emissions.[3] In India, 68.7 percent of GHG emissions come from the energy sector, followed by agriculture, industrial processes, land-use change and forestry, and waste, which contribute 19.6, 6.0, 3.8, and 1.9 percent, respectively.

The 14 states[c] chosen were those whose industrial units emit the highest amounts of GHGs: carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O).[d]

Figure 1
Emissions from Top 14 States (2013)



Source: CEEW analysis, 2017

c The fourteen states are: Gujarat, Orisha, Chhattisgarh, Jharkhand, Karnataka, Maharashtra, Andhra Pradesh, Rajasthan, West Bengal, Tamil Nadu, Madhya Pradesh, Uttar Pradesh, Telangana and Haryana

d Highest GHGs according to CEEW analysis, 2017

Introduction

This paper evaluates five elements of the green-focused policy measures incorporated in state industrial policies: providing assistance in setting up wastewater treatment systems; incentivising water and energy conservation; boosting the renewable energy sector; ensuring pollution control; and arranging common facilities at industrial clusters. The most recent two policy statements of each state have been examined.

> "Industrial policy in India has so far focused on productivity, human capital, and adjusting to markets. It has become an imperative to consider sustainability."

Wastewater Management Systems

Wastewater treatment is carried out using effluent treatment plants (ETPs) or sewage treatment plants (STPs) to eliminate toxins and generate safe and clean water. Many states give financial incentives to industrial units to set up ETP or ZLD (zero liquid discharge) units.

According to data released by the government in December 2015, an estimated 62,000 million litres per day of sewage is generated in urban areas, while the treatment capacity across India is only 23,277 MLD, or 37 percent of the sewage.[4] In addition, thermal power plants (TPPs) which are required to use only recycled water, often use fresh or untreated water. Only five states – Delhi, Karnataka, Kerala, Maharashtra, and Tamil Nadu – support the entire water needs of their TPPs with treated sewage.[5]

Moreover, despite numerous efforts by the government, including the allocation of INR 7,000 crore for the cleanup of the river Ganga, clear regulations to prevent additional discharge of effluents into water bodies remain absent. In April 2020, the National Green Tribunal (NGT) directed the Ministry of Environment and Forests (MoEF) to issue stricter norms for effluent discharge from sewage treatment plants.[e] India's effort to increase treatment and management of wastewater has been rapid.[6] Until the 1990s, it had only one central effluent treatment plant (CETP)[f] at Jeedimetla, Hyderabad. By 2016, the number had increased to 193, according to the Central Pollution Control Board (CPCB). However, it is still short of global levels.

e NGT pursued this on the basis of a report filed by a committee comprising nominees from IIT Kanpur, IIT Roorkee, NEERI and Central Pollution Control Board, which noted that 335 rivers out of 351 in India are polluted.

f CETPs are meant to benefit small-scale industries in treating their effluent before disposal whether it is in stream, land, sewerage system or in rivers and seas. These are located in areas with many SMEs that are unable to install treatment systems given their low capital endowments.

Table 1. Policy instruments for setting up wastewater management systems

State	Sector focus	Year of policy launch and operative period	Project	Policy description	Maximum amount allocated
Haryana	MSME	2020 onwards	ETP	Tech up-gradation support + Subsidy* - 50%	INR 25 Lakh per project
	MSME	2020 onwards	ZLD[y]	Subsidy* - 25%	Not specified
	MSME	2020 onwards	ZLD[y]	Subsidy - 50% on each: 1. Technology acquisition 2. Patent 3. Testing equipment	Tech - INR 25 lakh Patent - INR 25 lakh Testing - INR 10 lakh
	MSME	2020 onwards	ZLD[y]	Interest subsidy - 5% (CLSS)[g]	INR 10 lakh per year
Madhya Pradesh	MSME	2014 onwards (amended in Dec2018)	ETPs	Subsidy* - 50%	INR 2.5 lakh per project
	Industrial areas/ parks	2014-2019	ETPs, STPs, ZLD etc	PPP	Not specified
Odisha	MSME	2015	ZLD	Subsidy* - 20%	INR 20 Lakh per project
Gujarat	Industrial area	2020-25	CETPs	Subsidy* - 40%	INR 50 crores + total support limit of 75% of total fixed capital investment
	Industrial area	2015-2020	CETPs	Financial assistance	Not specified
Andhra Pradesh	Industrial area	2015-2020	ETPs, STPs, ZLD etc	Subsidy* - 25%	INR 50 Lakh per project
Maharashtra	Industrial area	2018-2023	ETPs, STPs, ZLD etc	Financial assistance	Total allocation of INR 1,000 crore from Critical Industrial Infrastructure Fund (CIIF)

g Credit linked subsidy scheme (CLSS) – enables MSMEs to adopt modern technology to improve productivity

Karnataka	Industrial area	2020-2025	STPs	Subsidy - 50%	INR 1 crore per project
	Industrial area	2020-2025	CETPs	Subsidy - 50%	INR 5 crore per project
	Large enterprises	2020-2025	ETPs	Subsidy* - 50%	INR 2.5 crore per project
	MSME	2020-2025	ETPs	Subsidy* - 50%	INR 50 Lakh per project
	MSME	2020-2025	ZLD	Subsidy* - 50%	INR 7.5 Lakh per project
Jharkhand	Industrial area	2016	CETPs	Financial assistance	Not specified
Uttar Pradesh	Industrial area	2017-2022		Financial assistance	Not specified
Telangana	Industrial area	2014	CETPs	PPP	Not specified
Rajasthan	Industrial area	2019-2024	CETPs + ETPs and ZLD networks	Financial assistance	Not specified
	Industrial area	2019-2024	Reuse and Recycling of Industrial Waste Plant	Subsidy - 50% (to suppliers of plant)	INR 50 lakh - one time assistance
	Industrial area	2019-2024	ZLD[ɣ]	Subsidy - 50% on investment	INR 5 lakh - one time assistance
		2019-2024	ZLD	Capital subsidy - 20% (suppliers for the plant)	INR 50 lakhs (On an investment of INR 25 crore in Biotechnology Sector)

Note: States that did not announce any wastewater management initiatives in their last two industrial policy announcements were: West Bengal, Tamil Nadu and Chattisgarh.

** Subsidy provided on the total fixed capital investment of green measure projects*

ɣ Zero liquid discharge project under GOIs Zero defect or Zero effect (ZED) scheme

ETPs: Effluent treatment process plant

STPs: Secondary (sewage) treatment plants

ZLDs: Zero liquid waste discharge units

CETPs: Common Effluent treatment plants

PPP: public private partnership

Capital subsidies and other forms of financial support to install ETPs and STPs vary across states. Madhya Pradesh's industrial policy of 2014 has clearly specified financial support in the form of subsidies to SMEs to build ETPs. These policies, accompanied by strict monitoring, have led to outstanding results in ensuring sustainability of industrial units.[7,h]

Haryana has shown improvement in the treatment of sewage/secondary waste. Haryana Shahari Vikas Pradhikaran (HSVP), in collaboration with the Centre on the Zero Discharge or Zero Effect (ZED) project, has provided numerous subsidies at every step to promote ZLD units. However, it has also been found that providing fiscal incentives only at the installation phase does not ensure latter compliance with environmental standards by manufacturing units. In the same year of their launch in 2019, nine of the CETPs set up in the state's industrial areas under this initiative were found to have violated safety standards, forcing the Haryana State Pollution Control Board (HSPCB) to intervene.[8]

Not all state governments' industrial policies have a calibrated green focus. But there are states where industries have nonetheless taken steps towards sustainability. Despite the lack of a significant green direction in Jharkhand's industrial policy, for example, Jamshedpur became the country's first ZLD city, thanks to the Bara treatment plant set up by Tata Steel. Despite low financial incentives from the government, Telangana has been witnessing a surge in the setting up of liquid waste treatment plants. Telangana's example suggests that regulations, backed by strict monitoring with penalties, works better than financial incentives.[9]

Some states have also set up extensive solid waste disposal systems to reduce pollution. The urban local body of Alappuzha, Kerala, in coordination with the district's Suchitwa Mission (Cleanliness Mission), has implemented a project that focuses on decentralised solid waste management through segregation and treatment of wet waste at the source.

h One such successful initiative, in collaboration with Asian Development Bank (ADB) resulted in the construction of 12 water treatment plants and two sewage treatment plants.

Water and Energy Conservation

Of the 178.7 million rural households in the country, only 32.7 million or 18 percent get clean piped water. According to the latest Economic Survey, by 2050, India will be among the global hotspots of 'water insecurity.'[10] In 2012 the National Water Policy was formulated, and the National Water Supply and Drainage Board is required to take strict steps towards developing water conservation policies. There have been talks of privatising water rights and setting up a National Bureau of Water Use Efficiency.

Energy conservation has played a pivotal role in India's industrial policy framework. Energy efficiency improvements since 2000 led to a 6-percent reduction in additional energy use in 2017. There have also been some energy savings due to movement of economic activity from energy-intensive sectors to less-intensive ones, but this has been almost entirely offset by increased energy use, driven by factors such as changes in transport modes and occupancy levels, as well as increased appliance ownership and relaxation of norms around building floor area.

India's mandatory energy efficiency policies cover 23 percent of its energy use. The most effective enabler of energy efficiency in industry has been the Perform, Achieve, and Trade (PAT) scheme. PAT[i] is a regulatory instrument to reduce specific energy consumption in energy-intensive industries, with an associated market-based mechanism to enhance cost effectiveness of energy saving through certification of excess savings, which can be traded. The mandated decrease in specific energy consumption under the PAT programme has led to a decline of 4-5 percent in energy consumption in 2015 as compared to 2012.[11]

The Energy Conservation (EC) Act 2001 makes energy audits mandatory for industries notified as designated consumers of energy.[j] This has helped identify various energy-saving opportunities in energy-intensive industries and other establishments. Many state governments provide financial support on the cost of audit for both water and energy conservation projects. In addition, a policy initiative to rate MSMEs on quality control and certification for energy efficiency, called the ZED (Zero Effect Zero Defect) Maturity Assessment Model has enhanced resource efficiency.

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i Flagship programme of Bureau of Energy Efficiency under the National Mission for Enhanced Energy Efficiency

j Aluminium, Cement, Chlor-Alkali, Fertilizer, Iron & Steel, Paper & Pulp, Railways, Thermal Power and Textile

Table 2

Policy instruments supporting water/ energy conservation

State	Sector focus	Year of policy launch and operative period	Project	Policy Description	Maximum amount allocated
Gujarat	Industrial units	2014-2019	Energy/water conservation	Financial assistance on cost of audit	Not specified
Rajasthan	Industrial area	2019-2024	Water conservation	Reimbursement of 50% of cost of water audit	INR 2 lakh
	Industrial area	2019-2024	Water conservation	subsidy - 50% (to supplier of the plant)	INR 50 lakh - one time assistance
	Industrial area	2019-2024	Rain water harvesting	Capital Subsidy - 50%	INR 50 crores - on total fixed capital investment
Odisha	MSME	2015	Energy conservation	Financial assistance on cost of audit	INR 1 lakh in Micro INR 2 lakh for small enterprises INR 3 lakh for medium
Karnataka	MSME	2014-2019	Rain water harvesting	Capital Subsidy - 50%	INR 1 lakh
	MSME	2014-2019	Energy conservation	Subsidy - 10% of capital costs	INR 5 lakh - If energy use reduced by 10% or more
	MSME	2020-2025	Rain water harvesting	Capital Subsidy - 50%	INR 2 lakh
	MSME	2020-2025	Water conservation	Reimbursement of 75% of cost of water audit	INR 10 lakh per audit

Maharashtra	Large enterprises/ MSME	2013-2018	Water conservation	Capital Subsidy - 50%	INR 5 lakh each unit
	Large enterprises	2013-2018	Energy/water conservation	Reimbursement of 75% of cost on audit	INR 1 lakh on water audit INR 2 lakh on energy audit
	MSME	2013-2018	Energy/water conservation	Reimbursement of 50% of cost on audit	INR 1 lakh on water audit INR 2 lakh on energy audit

Note: Nine of the 14 states considered are yet to formulate policies for water and energy conservation: West Bengal, Madhya Pradesh, Telangana, Andhra Pradesh, Jharkhand, Chattisgarh, Haryana, Tamil Nadu, and Uttar Pradesh.

Kerala ranks lowest in access to safe drinking water, which is provided to only 33.5 percent of households in the state, while the national average stands at 85.5 percent. Delhi is ranked worst on water use efficiency while Gujarat is top performer.[12,k]

Karnataka is the second-most drought prone state after Rajasthan. According to a 2018 study, 23 of its 30 districts are drought prone. Apart from green features in its industrial policy, the state government of Karnataka has also launched the Jalamrutha and Jalandhare schemes to revive traditional water bodies, being implemented by the state's rural development and panchayat raj departments, respectively.[13] Haryana has been working towards recharging groundwater supplies by making rainwater harvesting mandatory and promoting crop diversification to move towards less water-intensive crops.[14]

k Jal Shakti ranking 2019: The survey was based on various parameters on efficiency targets and the study included the review of central as well as the state government water departments by the Union Ministry of Jal Shakti

Water and Energy Conservation

Rajasthan, the country's most drought-prone state, with large tracts of desert, has taken great leaps in water conservation; it now ranks third among all Indian states in water efficiency. It has set up a computerised system for gathering and analysing real-time data called Supervisory Control and Data Acquisition (SCADA), which has improved its water efficiency. The government launched the Mukhyamantri Jal Swavalamban Abhiyan (MJSA) in January 2016 to make its villages self-sufficient in water. Using a variety of methods, MJSA has resulted in an average rise of 4.66 feet in the water table in 21 non-desert districts of the state. The Rajiv Gandhi Jal Sanchay Yojana (RGJSY), launched in all 33 districts in 2019, had identified 180,000 projects to be executed in its first phase of creating a robust water harvesting infrastructure in over 3,900 villages.[15] Rajasthan has been recognised by the National Water Mission for its water conservation and efficient water practices.[16]

> "If current trends are not reversed, by 2050, India will be among the world's hotspots of water insecurity."

Renewable Energy

Renewable energy is energy derived from natural sources that replenish at a higher rate than they are consumed. Solar, wind, geothermal, hydro[l] and biomass are common sources of renewable energy.[17] By the end of 2017, India had the world's fourth largest wind-installed capacity and the sixth largest solar-installed capacity. In its Nationally Determined Contributions (NDCs) under the Paris Agreement, India committed itself to a target of 40 percent renewable energy installed capacity by 2030.[18]

The target is modest, considering the advances in non-conventional energy generation, both in India and globally. There is plenty of room for India to improve and expand its green energy generation capacity. A report by the Central Electricity Agency indicated that the non-fossil fuel component of India's installed power capacity could rise to as much as 64 percent by March 2030. The prime minister has also announced that India's installed capacity could reach 450 GW by 2030.[19]

Renewable energy production in India has grown massively, with installed capacity more than doubling since 2012. Central subsidies to the renewable energy sector grew almost six-fold between 2014 and 2017 (from $431 million to $2.2 billion). During the same period, subsidies for energy powered by oil and gas reduced by 76 percent from $26.1 billion to $5.5 billion. While the latter subsidies are still massive as compared to those for renewable energy, the trend offers hope for a clean energy transition in India. (Subsidies for coal-based power too have fallen, but only marginally.)

> "The non-fossil fuel component of India's installed power capacity could rise to as much as 64 percent by March 2030."

l Only small hydro projects are considered among renewable energy sources. Large dams are a separate category.

Table 3

Central government's subsidy support to energy sector (in USD million)

Energy Type	FY 14	FY 15	FY 16	FY 17
Transmission & Distribution	6,618.1	8,119.3	9,547.6	12,876.1
Coal	2,586.8	2,587.7	2,267.6	2,383.7
Oil and Gas	26,064.2	14,307.0	7,700.7	5,513.6
Renewable Energy	431.1	1,011.0	1,416.7	2,241.8
Electric Vehicles	0.3	0.6	12.9	22.1
Total	**35,700.4**	**26,025.6**	**20,945.4**	**23,037.2**

Source: https://www.iisd.org/system/files/publications/india-energy-transition.pdf

Overall, subsidies to produce renewable energy have had a positive outcome. But it is also essential to analyse the performance of individual states in the transition to green energy. As of March 2017, the following 10 states had a total renewable energy (RE) installed capacity of 51,088 MW which was about 89 percent of the total 57,260 MW of RE capacity in India.

> "Central government subsidies to the renewable energy sector grew almost six-fold between 2014 and 2017."

Table 4
RE Installed Capacity in MW (as of Feb 2021)

State	Installed Capacity
Karnataka	15428.48
Tamil Nadu	14977.12
Gujarat	12530.96
Maharashtra	10266.87
Rajasthan	9944.50
Andhra Pradesh	8762.09
Madhya Pradesh	5205.57
Telangana	4361.23
Uttar Pradesh	3833.86
Haryana	693.19
Chhattisgarh	573.38
West Bengal	568.26
Odisha	549.57
Jharkhand	56.98

Source: Ministry of New and Renewable Energy Dashboard

Table 5
Policy instruments supporting renewable energy capacity growth

State	Sector focus	Year of policy launch and operative period	Project	Policy description	Maximum amount/nature of subsidy/other conditions
Andhra Pradesh	Large enterprises	2015-2020	Solar, wind and bio-energy	Subsidy - 25%	INR 50 crore
	Industrial units	2015-2020	Solar, wind and bio-energy	Zero rated category schedule of the VAT Act	Recycling waste into environment friendly products/energy
Gujarat	Vehicles	2014-2019	Bio-mass based power	Preferential tariff	Preferential tariff of INR 5.04-5.27/ kWh on projects
	MSME	2014-2019	Solar Energy	Subsidy	Increase in the price for purchase of surplus solar power from INR 1.75/ unit to INR 2.25/unit.
	Industrial units	2014-2019	Solar Energy	Interest subsidy	7% of term loan - maximum amount of Rs. 35 lakhs pa for 7 years for Category I Talukas 6% of term loan - maximum amount of Rs. 30 lakhs pa for 6 years for Category II Talukas 5% of term loan - maximum amount of Rs. 25 lakhs pa for 5 years for Category III Talukas
	Industrial units	2014-2019	Solar Energy	Creating gandhinagar a Solar city	Capacity to harness 3500 MW of wind power, 900 MW of Bio-mass power and 10,000 MW of Solar Power
Maharashtra	Industrial units	2013-2019	Green Energy and Bio-fuel Production	Thrust sector	Not specified
	Industrial units	2013-2019	Unconventional energy Captive Power Plants	Green Industrialization Assistance	Not specified
	Industrial units	2013-2019	Green Energy and Bio-fuel Production	Financial incentives - 20%	2 year additional eligibility period shall be applicable
	MSME	2013-2019	Green Energy and Bio-fuel Production	Encourage investment	Not specified

Rajasthan	Industrial units	2019-2024	Solar & wind energy	Investment subsidy - 25%	State tax due and deposited for 7 years: on investment of INR 10 cr or more
	Industrial units	2019-2024	Solar & wind energy	Employment Generation Subsidy - 25%	Employment Generation Subsidy, subject to upper limit of 75% for 7 years
	Industrial units	2019-2024	Solar & wind energy	Interest Subsidy - 5%	5% Interest Subsidy on term loan taken for a period of 5 years Cap of INR 25 Lakh p.a.
	Industrial units	2019-2024	Solar & wind energy	Exempted from charges	Exemption from Electricity Duty for additional 3 years
	Industrial units	2019-2024	Solar & wind energy	Capital subsidy - 20%	Cap of INR 50 Lakh
	Industrial units	2019-2024	Solar energy	Exempted from charges	Rebate in transmission charges: manufacturing of Photovoltaic cells and battery modules
Tamil Nadu	Industrial units	2014-2019	Solar and Wind energy	Encourage investment	Set a target of 3000 MW of Solar power by 2015
Orissa	Industrial units	2015-2020	Unconventional energy Captive Power Plants	Exempted from charges	Exempted from electricity duty 100% for the period of 5 years from the day of commissioning
Haryana	Industrial units	2015-2020	Unconventional energy Captive Power Plants	Exempted from charges	100% reimbursement for Transmission and Wheeling charges 100% exemption from banking charges
Karnataka	Large enterprises	2014-2019	Unconventional energy Captive Power Plants	Reimbursement of equipment cost	50% of the amount paid for the renewable energy plants
	Large enterprises	2014-2019	Solar, wind and bio-energy	Subsidy - Rs. 0.50 per unit	Subsidy to general category entrepreneur
West Bengal	Industrial units	2013-2018	Solar, wind and bio-energy	Encourage investment	Set a target of setting up 2706 MW capacity
Uttar Pradesh	Industrial units	2017-2022	Unconventional energy Captive Power Plants	Encourage investment	Promote: 1. Micro-hydro electric power generation 2. Grid based power projects 3. solar power plants 4. power generation sectors like biogas, biomass and garbage
Telangana	Industrial units	2014-2019	Solar, wind and bio-energy	Encourage investment	Demand and supply of non-conventional energy, especially solar power.
Jharkhand	MSME	2016	Comprehensive Project Investment Subsidy	Subsidy - 20%	Eco-friendly power generation equipment

The states which did not announce any policies to promote renewable energy generation in their last two industrial policy announcements were Chhattisgarh and Madhya Pradesh. However, Madhya Pradesh has numerous renewable energy policies (not included in industrial policy list) that has enabled the state to grow its renewable energy capacity by tenfold since 2012. The state has 5205 MW of renewable energy capacity as of February 2021.[20]

As of February 2021, Karnataka was the largest producer of solar power with 7,346 MW installed capacity followed by Telangana, Rajasthan, Andhra Pradesh and Gujarat. Rajasthan has been fast increasing assistance to green energy developers. In addition, the government decided in 2018 to set up biogas plants linked with cow shelters across the state.

Gujarat has the largest and one of the oldest biogas power plants in the country, which has been running since 25 April 1987, operating with no external assistance. Maharashtra tops in biogas production with 35.78 crore cubic meters annually; Andhra Pradesh comes next with 21.65 crore cubic meters.[21] Maharashtra and Andhra Pradesh have done much to encourage biomass-based energy.

Apart from its green industrial policies, Gujarat has launched a solar power scheme for farmers, where it provides 60 percent of the initial investment – the Suryashakti Kisan Yojana (SKY), enabling them to generate electricity for captive consumption and to sell surplus power to the grid.[22]

Pollution Control Policies

The Water Act 1974 and Air Act 1981 make it mandatory for industrial units to obtain a 'Consent to Establish' certificate from the concerned state pollution control board before starting construction. Similarly, it is mandatory to obtain a 'Consent to Operate' certificate from the state pollution control board before starting production. Some states also have provisions for green energy certificates, while the Bureau of Energy Efficiency gives certificates to relevant industrial units which reduce the compliance and regulatory requirements for the unit to operate.

The Continuous Emission Monitoring System (CEMS) mandates highly polluting industries to install 24x7 real-time monitoring of emission and effluent discharge points. Continuous monitoring helps pollution control boards as well as the industry keep pollution levels in check on a real-time basis.[23] In February 2014, the Central Pollution Control Board (CPCB) asked 17 categories of highly polluting industries, such as distilleries, tanneries, oil refineries, sugar mills and cement plants, to install CEMS. As of 2019, 4,251 industries across the country had complied.

Haryana, Madhya Pradesh, and Rajasthan are the only state governments whose industrial policies discuss Electric Vehicles (EVs) as an alternative form of transportation within industrial estates, and how to provide the required infrastructure for it. The National Electric Mobility Mission Plan (NEMMP 2020) is working towards incentivising demand-side acquisition of electric or hybrid vehicles, as well as promoting research in electric vehicles. Some other states and union territories – Delhi, Andhra Pradesh, Tamil Nadu, Uttar Pradesh and Telangana – also have EV policies that subsidise, or give tax benefits, to firms producing EVs, using electric buses, or providing charging infrastructure. The Department of Heavy Industry formulated a Scheme viz. Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India (FAME India) Scheme in 2015 to promote manufacturing of electric and hybrid vehicle technology and to ensure its sustainable growth.[24]

Table 6
Policy instruments promoting pollution control

State	Sector focus	Year of policy launch and operative period	Project	Policy Description	Maximum amount allocated/non-financial benefit
Chhattisgarh	MSME	2016-2021	Certification	Reimbursement of 50% of cost of certification	INR 5 lakh
	MSME	2016-2021	Carbon credits	subsidy - 50%	INR 25 lakh Environment Management Project Subsidy
	MSME	2016-2021	Environment friendly development	Consent to Operate (CTO)	Increased to 15 years for green category
Gujarat	MSME	2014-2019	Environment friendly development	Non- polluting units incentives	Not specified
Madhya Pradesh	MSME	2014-2019	Certification	Non- polluting units incentives	Exempted from certification by state PCB
	MSME	2014-2019	Certification	Polluting units penalty	Re-issue every 3 years
	Industrial units	2014-2019	Green technology	Reimbursement of 15% of total capital expenditure	INR 15 crores
	Electric vehicles	2014-2019	Green technology	Thrust sector	EV & Related Infrastructure Policy 2018
Rajasthan	Large enterprises	2019-2024	Green building Measures	Green Building Measures for minimum floor space of 2000 sq meters	Subsidy of 50% to supplier of STPs
	Industrial units	2019-2024	Green technology	Assistance	Not specified
	Electric vehicles	2019-2024	Green technology	Financial assistance	Not specified
	Electric vehicles	2019-2024	Green technology	Interest Subsidy - 5%	Term loan for the EV manufacturing unit (Investment INR 50 crore or more)
	Electric vehicles	2019-2024	Green technology	Capital Subsidy - 25%	INR 50 lakh.
	Industrial units	2019-2024	Certification	Reimburse 15% of expenditure	INR 5 lakhs

Andhra Pradesh	Large enterprises	2015-2020	Green building Measures	Subsidy - 25%	INR 50 crore for structures rated green by certifying agencies like IGBC/LEED/ GRIHA
	Large enterprises	2015-2020	Green building Measures	Subsidy - 25%	INR 50 crores on projects approved by Empowered Committee of Secretaries
	Large enterprises	2015-2020	Clean production Methods	Capital Subsidy - 35%	INR 35 lakh After certification from Andhra Pradesh Pollution Control Board)
Jharkhand	MSME	2016	Comprehensive Project Investment Subsidy	Subsidy - 20%	On pollution control
	Industrial units	2016	Envi. friendly development	No CTO and CTE approval	Green industries with investment less than INR 50 lakh
	Industrial units	2016	Certification	Reimburse 50% of expenditure	INR 5 lakh for units with: • Green Energy Certificate • Bureau of Energy Efficiency (BEE) Certificate • ISO-14000 Environmental Management System • LEED Certification • Internationally accredited eco-labels OKE-TEX 100, etc.
Haryana	Industrial units	2015-2020	Envi. friendly development	Exempted from consent management	Not specified
	Electrical vehicles	2015-2020	Envi. friendly development	Green transport media	Connectivity of all the Industrial Estates to nearby urban centres through public transport
	Electrical vehicles	2020-2025	Envi. friendly Development	EV charging infrastructure	Not specified
Maharashtra	Industrial units		Envi. friendly development	Walk to work concept	Satellite offices shall be developed, accommodation facilities for employees within 5 km radius of the work area.
	Industrial units		Envi. friendly development		Non-polluting industry will be allowed such as service sector in residential area
	Industrial units		Certification		Procedural simplification in environmental clearance

Note: States which did not announce any pollution control policies in their last two policy cycles were: Karnataka, Telangana, Tamil Nadu, and Uttar Pradesh.

CTO: Consent to operate

CTE: Consent to establish

Certification: ISO categories, BIS certification, Bureau of Energy Efficiency (BEE) certification, LEBP certification in the field of new and renewable energy, AGMARK, Euro Standard or other equal national/international certification

Sustainable Industrial Parks/Clusters

An eco-industrial park is one which promotes waste reduction, efficient use of resources, and business cooperation to manage pollution. Many state industrial policies have provisions for CETPs at industrial parks which ensure better waste management. Some more state policies trying to ensure an environmentally sustainable industrial development are analysed in the following paragraphs.

In Telangana, the green industrial park at Jadcherla and the Association of Lady Entrepreneurs of Andhra Pradesh's (ALEAP) Green Industrial Park (A-GRIP) are showcase examples of how site master planning (SMP) supported by application of GIZ standards[m] on cooperation and processes – mainly stressing stakeholder involvement – and a strategic approach can be used to obtain customised, yet high-quality, results. Telangana's green industrial zoning policies have been minimal but highly effective due to quality parameters put in place under the SMP. Adherence to these quality parameters enabled the Jadcherla park to obtain a silver rating, and A-GRIP a gold rating, on the German Sustainable Building Council rating system.[25]

In Gujarat, the various steps taken at the Naroda, Sachin and Vapi industrial clusters were not entirely aimed at environmental benefits at first – better economic performance was the primary motive. Over the years, however, they have resulted in multifaceted benefits.

The Naroda industrial estate in Ahmedabad was established by the Gujarat Industrial Development Corporation in the 1980s. The eco-industrial initiative there came much later, a joint project of the Naroda Industrial Association (NIA) and the University of Kaiserslautern (Germany), to find solutions for better treatment of the estate's toxic industrial waste. Similar resource efficiency and cleaner production initiatives were taken at the Sachin industrial estate, Surat, which included management of waste and other pollution control techniques. The Vapi industrial estate was once named as a "critically polluted" industrial area.[26] As a result, the Gujarat Pollution Control Board (GPCB) has been monitoring the quality and quantity of effluents from each unit in the estate and the functioning of its CETP. The GPCB imposes heavy penalties and has even closed down units in Vapi for exceeding permissible limits.

Gujarat is a role model for other states to follow in development, but the full-scale planning and enforcement still falls short. Therefore, more ambitious national policies on sustainable industrial development should be formulated and robust enforcement must be assured with a better implementation framework.

m Standards developed by the Germany-headquartered global development agency GIZ

Table 7

Policy instruments supporting Zoning and Common Facilities in Industrial Parks

State	Year of launch and operative period	Project	Nature of policy	Description
Andhra Pradesh	2020-2023	Industrial Zoning	Environmental Impact Assessment (EIA)	Industrial land environmentally zoned as per the environment management plan (EMP). Andhra Pradesh Industrial Infrastructure Corporation (APIIC) will conduct the EIA before allotment
	2020-2023	Industrial Zoning	Envi. sustainable industrial development	Common facilities set up in APIIC industrial parks
	2020-2023	Industrial Zoning	Green Category MSME approval	Conditional on formalising all approvals within three years
	2020-2023	MSME Parks	PPP model	In the form of two types of models in addition to the PPP framework: (i) APIIC Model: APIIC as Executing Agency; (ii) Private Developer Model: A Private Developer including an SPV formed by MSMEs as Executing Agency, with land procured by Private Developer.
Gujarat	2014-2019	Industrial Zoning	Envi. sustainable industrial development	Zoning on the basis of environmental aspects, existing and proposed infrastructure including environment
	2014-2019	Industrial Zoning	Monitoring for Compliance	Support to Gujarat Pollution Control Board for third party audit
	2014-2019	Green Industrial Estate	Financial Assistance	Common infrastructure and waste management projects to shift polluting industries to industrial zones
	2014-2019	Industrial Parks	Financial Assistance	1. Financial assistance to private promoters subject to preparation of Comprehensive Development Plan for 5 years by cluster group 2. Financial assistance for nodal groups and hiring of experts 3. Clusters eligible for financial assistance as under the Scheme of Critical Infrastructure
	2014-2019	Industrial Parks	Financial Assistance	Financial assistance for: 1. Common infrastructure 2. Strengthening Environmental Compliance 3. Development of Green Industrial Estate 4. Shifting of chemical based units from residential to industrial zones

Haryana	2015-2020	Global City project	Greenfield Smart City	Acquire 1,000 acres at Gurgaon through a joint venture of Haryana State Industrial Infrastructure Development Corporation and Delhi Mumbai Industrial Corridor Development Corporation.
	2015-2020	Industrial Parks	Monitoring for Compliance	Shifting red and orange category units to industrial parks, or closing them down.
Chhattisgarh	2014-2019	Industrial Parks	Envi. sustainable industrial development	Setting up common facilities in each development block.
	2019-2024	Industrial Parks	PPP model with financial incentives	Financial incentives to the private sector for common facility centres through the public-private partnership (PPP) model
Jharkhand	2016	Green Industrial Estate (Promoting green technology)	Financial assistance	Need based financial assistance
Karnataka	2020-2025	Product specific industrial park	Envi. sustainable industrial development	Kalaburagi district to be a hub for solar panels, inverters etc.
	2020-2025	Industrial Parks	Envi. sustainable industrial development	Karnataka Industrial Area Development Board to ensure common facilities
Madhya Pradesh		Industrial Parks	Envi. sustainable industrial development	1. Shifting polluting units to industrial parks 2. Encouraging common facilities in all industrial parks
Tamil Nadu	2014-2019	Industrial Parks	Envi. sustainable industrial development	1. Promoting new industrial parks through State Industries Promotion Corporation of Tamil Nadu, Tamil Nadu Industrial Development Corporation, Small Industries Development Corporation or through the private sector 2. Providing incentives for setting up of common facilities
Telangana	2014-2019	Industrial Parks	Envi. sustainable industrial development	Creating common infrastructure by raising market loans with government guarantee
	2014-2019	Industrial Parks	Envi. sustainable industrial development	Earmarking land in private industrial parks to set up of common utility centres
Uttar Pradesh	2017-2022	Industrial Parks	Envi. sustainable industrial development	National Industrial Manufacturing Zones to be set up in Jhansi and Auraiya, which will be provided the facilities mentioned in the National Manufacturing Policy
	2017-2022	Industrial zoning	Envi. sustainable industrial development	Developing the Lucknow-Kanpur, Kanpur-Allahabad and Varanasi-Allahabad zones

Note: States which failed to announce any steps to promote sustainability of industrial clusters in their last two policy cycles were West Bengal, Odisha, Rajasthan and Maharashtra.

Conclusion

State governments are taking small steps towards encouraging green industries and more efficient treatment of toxic waste. This analysis of 14 of India's states has found that governments are encouraging greener development through financial incentives, as well as providing better infrastructure in certain industrial clusters for better management of waste. However, with the low levels of state and central expenditure on research and development (the last budget allocation was just 0.7 percent of GDP) there has been little or no indigenous innovation or technological growth in these six green focus sectors. While state governments are doing their part to curb emissions by industries, incentives and punitive measures can only do so much to help India transition to a green economy.

Moreover, barring a few states, no specific budget has been earmarked for emission reduction in each industrial subsector at the state level. This gap could make it difficult to reach targets. There is_lack of transparency on how state policies influence the decisions taken by industries to promote sustainability. Also absent are monitoring and evaluation systems at the state level; this could prove costly, given that most state strategies encourage sustainability through financial incentives.

One state which performs poorly on all the five elements of green industrial policy focus considered is West Bengal, while one of the best performers is Gujarat. A comparison of the best and worst performers shows how similar policies achieve contrasting results in different states. As noted earlier, data on impact is scant and unreliable, and therefore this paper can validate the policies undertaken by the (comparatively) successful states only to a limited extent.

There is dire need for policy impact analysis and evaluative literature (on green policies and their impact) to ensure the policies are working in the right direction and meeting minimum goals. There is little year-on-year data available on the changes in the level of pollution. Only 15 states have PM 2.5 (Particulate Matter 2.5) monitoring systems for any year, and only West Bengal has above-average level readings available at 110 each on its five monitors. The lack of state-wise data on annual pollution levels, which alone could assess the impact of green policies that states incorporate in their industrial policy drafts, shows the lack of seriousness among states in containing emissions. Even those states which have incorporated green policies are not making serious efforts to check the effectiveness of these policies. Curiously, a state like West Bengal, with extremely few green policy initiatives, has a monitoring system in place.

Conclusion

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It remains to be seen if environment-friendly government policies lead to widespread adoption of cleaner technology and waste disposal methods. Whether financial incentives are economically viable – and for how long – or punitive measures are more effective is still an open-ended question. Nonetheless, states that are taking the help of international organisations or research institutes and formulating green policies are to be commended for making their industrial units more environmentally sensitive.

Finally, despite states like Gujarat and Haryana clearly specifying green targets, there is little or no time series data available on changes in pollution levels. It could well be that the incentives have contributed little. Proof of concept should be considered vital before laying down sustainable policy measures. Ultimately, green policies should be evaluated as rigorously as any other important state-level policy measure.

> "While states are encouraging green development through financial incentives and infrastructure, expenditure on R&D remain low."

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