



Mapping the challenges for Indian States

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About Innovating for Transport and Energy Systems (ITES)



ITES is the flagship UK-India initiative driving transport decarbonisation, developing greener, quicker and more affordable ways for people and goods to move around.

Part of the UK-India Net Zero Innovation Virtual Centre, and forged from a landmark Memorandum of Understanding (MoU) between UK and Indian governments, ITES brings together the best innovation and research from both countries to test, fund and fasttrack solutions to market that target transport's toughest Net Zero challenges, such as an electric vehicle-ready infrastructure.

ITES offers a 'soft-landing' for UK innovators interested in the Indian market, as well as opportunities for startups in India. The collaboration will help innovative businesses tackle scalability with go-to-market support and access to potential clients, funders, and investment. Funded by Innovate UK and the UK Department for Science, Innovation and Technology, and backed by a powerful network of industry, innovators, investors, academia and government, ITES is market led, adopting a unique perspective across the whole transport and energy system that considers the multiple and highest priority solutions needed to deliver cleaner roads, railways, seas and cities. By combining international resources, ITES will make it quicker, easier and more cost effective for the UK and India to pioneer the solutions that Net Zero needs.

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METHODOLOGY KEY TASKS



List of Abbreviation

AFV	•	Alternate fuel Vehicles								
CNG	:	Compressed Natural Gas								
GSDP	:	Gross State Domestic Product								
LNG	:	Liquified Natural Gas								
NG	:	Natural Gas								
2W	:	2-wheeler								
3W	:	3-wheeler								
IWT	:	Inland Water Transport								
IPT	:	Intermediate Para Transit								
EV	:	Electric Vehicle								
PT	:	Public Transport								

- GESI : Gender Equality and Social Inclusion
- UTs : Union Territories
- OMC : Oil Marketing Companies
- RO : Retail Outlets (For Petrol and Diesel)

CO ₂	:	Carbon Dioxide
MTPA	•	Million tonne per annum
СРСВ	:	Central Pollution Control Board
RTO	•	Regional Transport Office
PWD	•	Public Works Department
SEB	•	State Electricity Board
ТСРО	:	Town and Country Planning Organization
CAGR	:	Compound annual growth rate

Executive Summary





Summary – SDEG Profile

Geographic Profile

- India's coastline stretches for 7,516 km and the country's geography consists of 30% mountains, 43% plains, and 27% plateaus. This diverse topography provides ample opportunities for various transportation modes, and different multi-modal transport solutions with varying emission levels can be explored.
 - India is the *second most populous country* in the world with a population of over **1.38 billion people**.
- Urban population in India is only at 31%, leaving potential for further growth in urban areas.
- Cities in India are densely populated, with Delhi (11,320 person/sq. km), Kolkata (24,306 person/sq.km), Mumbai (25,357 person/sq. km) and Chennai (26,553 person/sq. km) having significantly higher population densities than global cities like London (~5598 person/sq. km).
- The top five most populous states in India Uttar Pradesh, Maharashtra, Bihar, West Bengal, and Madhya Pradesh have populations equivalent to countries like Brazil, Mexico, the Philippines, France, and Turkey respectively, but with higher population densities.
- India's per capita income in 2021-22 is around €2,248, while the UK's per capita income is €37,378, or 16 times higher.
- 11 states/UTs in India have a *per capita income* above the national average while 20 states/UTs are below the national average. The per capita income of states/UTs varies from €540 in Bihar to nearly €6000 in Sikkim.
- 11 states/UTs in India have vehicle ownership above the national average while 20 states/UTs are below the national average. The vehicle ownership of states/UTs varies from 0.09 per person in Bihar to 0.48 per person in Goa.

Socio-economic and Demographic Profile

Summary – Transport Overview (1/3)

- The study examined four transport sectors: *Railways, Aviation, Maritime, and Road Transport*.
- **<u>Railways</u>**: The Indian Railways have achieved over **80% electrification** of its rail network and is on fast track to achieve its 100% electrification target by 2024.
- **Aviation:** In the aviation sector initiatives, like the National Funding Opportunity on Sustainable Aviation fuels, focus on R&D, lacking concrete policies for adoption of cleaner alternatives.
- <u>Maritime:</u>
 - The Maritime India Vision 2030: Enhance port efficiency, promote recycling, and increase multi-modality
 - Inland Waterway Transport: 111 inland national waterways notified by the National Waterways Act (2016).

Road Transport

- <u>Electric Vehicles</u>: National Electric Mobility Mission Plan (2013), Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles: Phase 1 & 2 (2015 & 2019) and Energy Efficiency Services Limited (EESL) acting as the demand aggregator for the deployment of EVs in govt. ministries and dept.
- Biofuels & LNG: Biofuels Policy (2018), Draft LNG Policy (2021)
- <u>Fuel Efficiency & Emission Standards</u>: Bharat Stage VI Emission Standards (equivalent to Euro VI standards) (2016), Corporate Average Fuel Economy (CAFÉ) norms, Fuel Efficiency Standards for HDVs (2017)
- As hydrogen is at a nascent stage, EVs and natural gas will play a key role in decarbonization of road transport in India
- National initiatives exist across sectors, but only road transportation has concrete policies for adopting clean fuels in vehicles.

State-level Initiative for Decarbonization

- At state level, no comprehensive transport policy present to integrate mobility and EV policy is the only major initiative towards decarbonization.
- Delhi, Maharashtra, Haryana and Uttar Pradesh stand out with the most comprehensive EV policies.

National Initiative for Decarbonization

Summary – Transport Overview (2/3)

	•	Railways: 54,178 km have been electrified out of a total 65,141 km of railways (over 80% electrification).							
Available	•	ntion: A total of 122 airports are present across the states/ UTs with Maharashtra, Gujarat, Uttar Pradesh, Karnataka accounting ¹ 35% of the airports.							
Infrastructure for ecarbonization	•	<i>Inland Waterway Transport: 111 identified national waterways</i> of which majority are accounted by Assam, West Bengal, Maharashtra, Uttar Pradesh and Karnataka.							
	•	Road Transport:							
		 Total length of the <i>road network</i> in India is <i>5,287,754 km</i>. 							
		 79,151 retail outlets for diesel and petrol are present across the country and work is underway to set up charging stations at 22,000 of these retail outlets. 							
		/							
	•	Over 6,000 EV charging stations and 4,500 CNG stations are present across the country.							
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Impact on Emissions

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Accounting for over **50% of the road emissions**, India *needs to decarbonize trucks* but currently *alternatives are scarce*.

Summary – Transport Overview (3/3)

Institutional Structure for Decarbonization

- Only road and aviation have state level implementation agencies whereas other modes are driven by national agencies. State level Aviation departments focus only on creation of infrastructure and do not have any targets for decarbonization.
- *Multiplicity of agencies* involved in the implementation of Transportation policies makes implementation difficult. This challenge is being tackled by a few states by the *creation of EV cell or Steering Committee*.
- States have limited role in CNG and biofuels-based mobility, as it is managed at national level by public and private entities

GESI

- 7 states have clear policy framework for GESI implementation in transport.
- Innovative initiatives have been seen in Kerala, Madhya Pradesh, Delhi, Andhra Pradesh and Puducherry.
- Delhi has implemented well defined GESI measures in transport and it is covered as a case study. (Delhi Case Study)

Existing Decarbonizing Measures in Transport

- Transport decarbonization is still emerging in India with
 - EVs and CNG as the major solutions across segments.
 - EVs have taken up in past 5 years and the top states for EV registrations are Uttar Pradesh, Maharashtra, Delhi, and Karnataka, each with over 150,000 EVs.
 - CNG has also been successful in some states, with Maharashtra, Gujarat, Delhi, Uttar Pradesh, and Haryana being the leading states, each with over 300,000 CNG/ hybrid CNG registrations.

- The readiness index is a tool used to assess the readiness of different states for transport decarbonization.
- Four criteria have been chosen to judge the readiness of states:

- Criteria for Readiness Index
- Institutional Readiness: Evaluating the state's policies, incentives, and implementation targets that are favorable for AFV uptake.
- <u>Economic Readiness</u>: Addressing the *affordability of AFVs*, which is a significant concern in a *cost-competitive market like India*, especially in rural areas with lower per capita income.
- **<u>Infrastructure Readiness</u>**: Assessing the current level of **AFV infrastructure availability** and efficiency in the state.
- <u>Social Readiness</u>: Determining the *level of social acceptance* among citizens, which plays a crucial role in successful AFV adoption.

Result

- Delhi, Maharashtra, Gujarat, Uttar Pradesh and Tamil Nadu have highest level of overall readiness.
 - Delhi, Maharashtra, Odisha, Chandigarh, and Rajasthan scored the highest on institutional readiness
 - Delhi, Goa, Chandigarh, Gujarat and Puducherry have scored the highest on economic readiness
 - Maharashtra, Delhi, Uttar Pradesh, Tamil Nadu and Gujarat have scored the highest on infrastructure readiness
 - Delhi, Maharashtra, Tamil Nadu, Uttar Pradesh, and Gujarat have scored the highest on social readiness

Summary – Grouping of States



• Early Adopters and Fast Followers together cover a major part of the country, and if successful adoption of AFVs can be achieved in these states, India will be way ahead on its decarbonization journey. Based on the readiness index scoring, the states were divided into 4 different archetypes.

Early Adopters

- Leading states with moderate to high AFV adoption, strong policies, and infrastructure
- Economically ready and socially accepting
- <u>States:</u> Delhi, Maharashtra, Gujarat, Uttar Pradesh, Tamil Nadu, Karnataka

Fast Followers

- States catching up quickly with recent policies and growing infrastructure
- Moderate to high institutional and infrastructure readiness, but *lacking economic and social readiness*
- <u>States:</u> Chandigarh, Haryana, Rajasthan, Kerala, Odisha, Andhra Pradesh, West Bengal, Punjab, Madhya Pradesh, Goa

Slow Starters

- Lagging states with low AFV adoption, weak policies, and infrastructure
- Low readiness levels in all aspects, requiring comprehensive ecosystem development
- States: Jharkhand, Bihar, Chattisgarh, Uttarakhand, Puducherry, Assam, Himachal Pradesh

Reluctant Adopters or Yet to Start

- Resistance to AFV adoption with very low adoption rates, no policies, and weak infrastructure
- Very low readiness levels across all aspects, requiring substantial efforts for a viable AFV ecosystem
- States: Jammu and Kashmir, Tripura, Meghalaya, Mizoram, Manipur, Arunachal Pradesh, Sikkim, Nagaland



SDEG Profile

Socio-Demographic-Economic-Geographic Profile

- **1.** Economic Demographic Profile
- **2.** Social Geographic Profile



India has large population base with high density; urbanization yet to reach its potential



									r					
State	Total Population(in millions)	Population Density (person per sq km)		Urban Population	Rural Population	S	∍x Ratio	L	iteracy Rate	E	derly	Diffe Al	rently - bled	
Uttar Pradesh	200	1 829	Ŷ	22%	78%	Ŷ	818		86%		6%		2%	
Maharashtra	112	4 365		45%	55%	₽	932	₽	65%		5%	:	3%	
Bihar	104	1106	₽	11%	89%		996	♠	80%		14%	:	2%	
West Bengal	91	1028	₽	32%	68%	₽	618	♠	87%		5%	:	2%	
1adhya Pradesh	73	4 236	₽	28%	72%	倉	948	₽	66%		8%	:	2%	
Tamil Nadu	72	1 555		48%	52%	₽	889	₽	67%		10%	:	2%	
Rajasthan	69	4 200	Ŷ	25%	75%	₽	895	ſ	76%		13%	:	2%	
Karnataka	61	4 319		39%	61%		958	₽	72%		8%	:	2%	
Gujarat	60	4 308		43%	57%		973	♠	89%		11%	:	2%	
Andhra Pradesh	53	4 330	₽	33%	67%	倉	993	₽	67%		12%	:	3%	
Odisha	42	4 270	₽	17%	83%	₽	919	Î	78%		10%	:	3%	
Telangana	35	4 307		39%	61%	₽	868	Î	86%		9%	:	3%	
Kerala	33	1 860		48%	52%		950	Î	76%		11%	:	2%	
Jharkhand	33	14 414	₽	24%	76%	倉	960	Î	87%		7%	:	2%	
Assam	31	1 398	₽	14%	86%	倉	1037	Î	86%		12%	:	2%	
Punjab	28	1 551		37%	63%	₽	912	₽	68%		8%	:	2%	
Chattisgarh	26	4 189	₽	23%	77%	♠	989	Î	74%		5%	:	2%	
Haryana	25	1 573		35%	65%	倉	973	î	75%		12%	:	2%	
Delhi	17	11320	介	98%	2%		979	₽	73%		12%		1%	
nmu and Kashmir	13	56	₽	27%	73%	倉	963	ſ	79%		11%	:	3%	
Uttarakhand	10	4 189	₽	30%	70%	₽	774	♠	76%		4%	:	2%	
machal Pradesh	7	4 123	₽	10%	90%	倉	972	î	83%		13%	:	2%	
Tripura	4	4 350	₽	26%	74%	₽	834	♠	76%		10%	:	2%	
Meghalaya	3	4 132	₽	20%	80%	₽	931	₽	69%		9%	:	2%	
Manipur	3	4 128		39%	61%	₽	931	♠	80%		5%		1%	
Nagaland	2	4 119	₽	29%	71%	₽	928	₽	66%		9%		1%	
Goa	1	1 394		62%	38%		976	î	91%		6%	:	2%	
unachal Pradesh	1	4 17	₽	23%	77%	1	1084	1	94%		17%		2%	
Puducherry	1	1 2547		68%	32%	₽	918	₽	62%		8%		2%	
Mizoram	1	52		52%	48%	₽	929	1	82%		12%		1%	
Chandigarh	1	1 9258	企	97%	3%	倉	991	₽	70%		9%		1%	
Sikkim	1	4 86	Ŷ	25%	75%	₽	890		81%		5%	:	3%	

 All states have scope of future urbanization as most of the states are below India's average urbanization rate of 34%.

Source: Census of India, 2011 *Green arrows indicate parameter above national average, and red arrows indicate parameter below national average. <u>https://data.worldbank.org/indicator/EN.POP.DNST?locations=BR</u>

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Motorized transport high in states with high GSDP & workforce ratio

- States with *higher GSDP* and higher number of workers* have higher economic activities which requires *efficient transport*
- Tertiary sector is the dominant economic sector across most of the states.
- Per capita income of India in year 2021-22 is €*2,248.15*.
- 12 states have per capita income above national level and 20 states below national level.
- States with *higher per capita income* have *higher vehicle ownership*. This indicates that these states have higher *affordability to invest in alternate fuel vehicles*
- States with high GSDP but low per capita income indicate income inequality, where wealth is not evenly distributed.
- States with *low GSDP but high per* capita income may result from small population and high development, leading to wealth concentration.

*GSDP- Gross State Domestic Product Source: Census of India, 2011 https://data.worldbank.org/indicator/EN.POP.DNST?locations=BR

State	Gross state domestic product (Billion euros) (2020-21)	No. of Workers (2011)(in millions)	Vehicle Registration till date (in millions) (2022)	Share of Tertiary Sector in Economy (2011)	Dominant Economy Sector (2011)	Per Capita Income (euro) (2021-22)	Vehicle Ownership (per person) (2021- 22)	
Maharashtra	23.9	62.9	22.4	60%	Tertiary	2124	🕹 0.20	
Tamil Nadu	15.2	43.3	17.4	54%	Tertiary	2652	1 0.24	
Uttar Pradesh	14.9	100.1	27.7	49%	Tertiary	🦆 757	🗜 0.14	
Gujarat	14.1	34.0	14.9	37%	Secondary	2341	1 0.25	
Karnataka	14.1	34.8	14.9	66%	Tertiary	2 3067	1 0.24	
West Bengal	10.6	50.1	9.5	57%	Tertiary	1462	🖓 0.10	
Rajasthan	8.7	39.8	12.8	45%	Tertiary	1487	🕹 0.19	
Andhra Pradesh	8.4	32.3	9.3	41%	Tertiary	1 2285	🕹 0.18	
Madhya Pradesh	8.2	44.6	11.5	34%	Primary	1372	🕹 0.16	
Kerala	72	17.1	8.7	64%	Tertiary	1 2537	1 0.26	
Delhi	6.9	7.7	6.0	84%	Tertiary	1422	1 0.36	
Haryana	6.7	11.9	72	51%	Tertiary	1021	1 0.28	
Bihar	5.1	43.6	9.4	61%	Tertiary	J- 544	. 0.09	
Punjab	4.7	14.0	7.0	46%	Tertiary	1783	1 0.25	
Odisha	4.7	23.7	6.5	40%	Secondary and Tertiary	🦆 1371	🕹 0.15	
Assam	3.0	16.4	4.0	45%	Tertiary	🖡 1160	🕂 0.13	
Chattisgarh	3.0	16.7	4.8	38%	Tertiary	🦫 1154	🕹 0.19	
Jharkhand	2.7	20.3	4.7	44%	Tertiary	<mark>I</mark> → 865	🕹 0.14	
Uttarakhand	2.1	5.3	22	43%	Secondary	159 2159	1 0.22	
Jammu and Kashmir	1.4	7.4	1.4	63%	Tertiary	1331	🖓 0.11	
Himachal Pradesh	1.4	4.9	1.1	46%	Tertiary	2220	4 0.16	
Goa	0.7	0.7	0.7	44%	Secondary	1 5405	介 0.48	
Tripura	0.5	2.0	0.4	45%	Tertiary	1742	Џ 0.12	
Chandigarh	0.4	0.5	0.4	88%	Tertiary	3223	1 0.42	
Puducherry	0.3	0.6	0.5	45%	Secondary	2364	介 0.44	
Meghalaya	0.3	1.9	0.3	58%	Tertiary	997	JU 0.09	
Sikkim	0.3	0.4	0.1	27%	Secondary	5957	↓ 0.12	
Manipur	0.3	1.2	0.3	62%	Tertiary	966	🐺 0.11	
Arunachal Pradesh	0.3	0.7	0.19	42%	Tertiary	2116	4 0.14	
Nagaland	0.3	1.2	0.241	52%	Tertiary	1357	V 0.12	
Mizoram	0.2	0.6	0.210	45%	Secondary	4 1588	0.19	

*Green arrows indicate parameter above national average, and red arrows indicate parameter below national average.

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India's diverse geography requires multi modal transport solutions





India has a coastline of 7,516 km with

43 %





Diverse geography of India makes it suitable for a range of transport modes with varying emission levels.

Plains

Road density





Switzerland Netherlands

10 states have road density above national average of 1,92.6 km/100 km sq. and 18 states below it.



Modes of Public	St
Transport in India	Ass
oneway in Shimla H P	Trip
openay in Simila, m.	Nag
	Ass
	Trip
	Nag
	Megł
	Sik



Water Metro in Kochi, Kerala



DTC buses in Delhi



State	Prominent feature					
A	or Geography					
Assam	Hilly					
Iripura	Hilly/Plain					
Nagaland	Hilly					
Assam	Hilly					
Tripura	Hilly/Plain					
Nagaland	Hilly					
Meghalaya	Hilly					
Sikkim	Hilly					
Manipur	Hilly					
Himachal Pradesh	Hilly					
Uttarakhand	Hilly					
Mizoram	Hilly					
Arunachal Pradesh	Hilly					
Jammu and Kashmir	Hilly					
West Bengal	Coastal/hilly					
Kerala	Coastal					
Goa	Coastal					
Puducherry	Coastal					
Tamil Nadu	Coastal					
Maharashtra	Coastal/Plateau					
Odisha	Coastal					
Karnataka	Coastal					
Gujarat	Coastal					
Andhra Pradesh	Coastal					
Chandigarh	Plain					
Delhi	Plain					
Bihar	Plain					
Punjab	Plain					
Uttar Pradesh	Plain					
Harvana	Plain					
Rajasthan	Plain					
Chattisgarh	Plain					
Telangana	Plateau					
Madhva Pradesh	Plateau					
Jharkhand	Plateau					

Source: https://thewire.in/urban, https://kochimetro.org/water-transport/, https://www.hindustantimes.com/cities/delhi-news/for-the-first-time-entire-bus-fleet-operated-by-dtcdeclared-overage-101627257675531.html, https://kochimetro.org/water-transport/



Transport Characteristics

- **1.** National and State Level Policy
- 2. Transport infrastructure Road, Railways, Airport and Maritime
- 3. Vehicular Characteristics and Emission
- 4. Green Mobility Uptake



National initiatives exist across sectors, but only road transportation has concrete policies for adopting clean fuels.

Road Transport Decarbonizing Initiatives

Electric Vehicles

- National Electric Mobility Mission Plan (2013) 1.
- Faster Adoption and Manufacturing of (Hybrid &) Electric 2. Vehicles: Phase 1 & 2 (2015 & 2019)
- **Energy Efficiency Services Limited** (EESL) acting as the 3. demand aggregator for the deployment of EVs in govt. ministries and dept.

Biofuels & LNG

- **Biofuel Policy (2018):** To reduce the import of petroleum 1. products by promoting blending of biofuels such as ethanol with petrol, and diesel, and utilization of biogas in transport.
- Draft LNG Policy (2021): To decarbonize the trucking 2. industry, by adoption of LNG.

Fuel Efficiency and Emission Standards

- Bharat Stage VI Emission Standards (equivalent to Euro VI standards) (2016)
- Corporate Average Fuel Economy (CAFÉ) norms (Passenger 2. Vehicles - 2015, Light & Commercial Vehicles - 2019)
- **Fuel Efficiency Standards for HDVs** (2017) 3.

Railways

The Indian Railways have achieved over 80% electrification of its rail network and is on fast track to achieve its **100% electrification target by** 2024.

Aviation

In the aviation sector initiatives, like the **National Funding Opportunity on** Sustainable Aviation fuels, focus on R&D, lacking concrete policies for adoption of cleaner alternatives.

Maritime

The Maritime India Vision 2030 aims to enhance port efficiency, promote recycling, and increase multi-modality, yet no clear policy exists for cleaner fuel adoption in ships.

Inland Waterway Transport

- There are **111** inland national waterways officially notified by the National Waterways Act (2016).
- The sector mostly comes under the purview of *national* entity, and minimal intervention from states is expected.

Maritime

Railwav

Link to Backup

Biofuels

Electric Vehicles

Fuel Efficiency

Draft LNG



State Level Matrix – Policy Initiatives Across Transport (1/2)

STATE	Transport Policy	Decarbonization Targets	EV Policy	Aviation Policy	Shipping Policy	Inland waterway Policy	Freight Policy
Andhra Pradesh	\times	×	\checkmark	\checkmark	\times	\times	\times
Arunachal Pradesh	×	×	\checkmark	×	×	×	×
Assam	×	×	\checkmark	×	×	×	×
Bihar	×	×	\checkmark	×	×	×	×
Chandigarh	×	×	\checkmark	×	×	×	×
Chhattisgarh	×	×	\checkmark	×	×	×	×
Delhi	×	×	\checkmark	×	×	×	×
Goa	×	×	×	×	×	×	×
Gujrat	×	×	\checkmark	×	×	×	×
Haryana	\times	×	\checkmark	×	\times	\times	\times
Himachal Pradesh	\checkmark	×	\checkmark	×	\times	\times	\times
Jammu and Kashmir	\times	×	×	×	×	\times	×
Jharkhand	×	×	\checkmark	×	\times	×	×
Karnataka	×	×	\checkmark	\times	×	\times	×
Kerala	\times	×	\checkmark	×	\times	×	×
Madhya Pradesh	\checkmark	*	\checkmark	*	×	×	*

At State Level, no comprehensive transport policy to integrate mobility

EV is the only initiative towards decarbonisation

and

State Level Matrix – Policy Initiatives Across Transport (2/2)

STATE	Transport Policy	Decarbonization Targets	EV Policy	Aviation Policy	Shipping Policy	Inland waterway Policy	Freight Policy
Maharashtra	\checkmark	×	\checkmark	\times	×	×	×
Manipur	\checkmark	\times	\checkmark	\times	×	\times	\times
Meghalaya	×	×	\checkmark	\times	×	×	×
Mizoram	×	×	×	×	×	×	\times
Nagaland	×	\times	×	\times	×	\times	×
Odisha	\times	×	\checkmark	\checkmark	\times	×	×
Puducherry	\checkmark	\times	\times	×	×	×	×
Punjab	×	×	\checkmark	×	×	×	×
Rajasthan	×	×	\checkmark	\checkmark	\times	×	×
Sikkim	×	×	×	\times	\times	×	×
Tamil Nadu	×	×	\checkmark	\times	×	×	×
Telangana	×	\times	\checkmark	\times	×	×	×
Tripura	×	×	\checkmark	\times	×	×	×
Uttar Pradesh	×	×	\checkmark	\checkmark	\times	\times	×
Uttarakhand	×	*	\checkmark	×	×	×	*
West Bengal	×	*	\checkmark	×	×	×	*

For development of successful EV ecosystem, holistic policies including supply, industry and demand side incentives are needed

	Budget	Demand Side Incentives							Supply Side and Industry Incentives				Oth	ers	
Parameters	Specific Budget Allocated for Disbursing Incentives	Subsidy Support for Consumers (2W, 3W,4W)	Subsidy For E-Buses In Addition To Fame II	Subsidy For Other Segments Such As Tractors, E-Cycles, Strong Hybrids	Road Tax + Registration Cost Exemption	Subsidy Offered On Interest Rates	Scrappage Incentive	Retrofitting Inventive	Electricity Tariff Benefits To Consumers	Manufacturi ng Incentives	Focus On Battery Recyclin g	Charging Infrastructu re Incentive	Mandates For Charging Infrastructur e	Promotion And Creation Of Green Zones	State EV Cell Or Steering Committe e
Andhra Pradesh															
Arunachal Pradesh															
Assam															
Bihar															
Chandigarh															
Chhattisgarh															
\star Delhi															
Goa*															
Gujarat															
★ Haryana															
Himachal Pradesh															
Jammu and Kashmir															
Jharkhand															
Karnataka															
Kerala															
Madhya Pradesh															
🗙 Maharashtra															
Manipur															
Meghalaya															
Mizoram															
Nagaland															
Odisha															
Puducherry															
Punjab															
Rajasthan															
Sikkim															
Tamil Nadu															
Telangana															
Tripura															
射 Uttar Pradesh															
Uttarakhand															
West Bengal															
t Ctate	s with the most c	omprehonsivo	final policy	that includes stron	a demand an	d supply side	incentivos	to bolistical	ly develop +	he EV acasy	stom			State	Warniew
Pol	icy discontinued			EV Policy		Draft	Policy			Absent	310111.		Р	resent	Jverview

Overview: Current Infra across Road, Railway, Aviation & Waterways

- Railways is the only sector that has achieved significant progress in its decarbonization goal.
- 15 States/ Union Territories have achieved 90% or above electrification.

State	Length of Roads (km)	Road density (per 1000 sq km)	Total Railways(km)	Electrification of Railways %	Airports	No. of Indentified National Waterways*
Maharashtra	636,887	2,070	5,725	85%	13	15
Uttar Pradesh	442,907	1,821	8,445	99%	10	11
Assam	399,122	5,088	2,518	20%	7	17
Madhya Pradesh	365,045	1,184	4,828	98%	4	3
Karnataka	358,300	1,868	3,817	59%	9	11
Rajasthan	313,469	916	5,596	63%	7	3
Odisha	305,631	1,963	2,703	100%	4	6
Bihar	298,205	3,167	3,678	90%	3	7
West Bengal	283,865	3,198	4,095	83%	4	16
Tamil Nadu	271,137	2,085	3,861	88%	6	10
Kerala	259,932	6,688	1,047	90%	5	5
Gujarat	249,373	1,272	3,868	71%	11	5
Andhra Pradesh	176,351	1,101	3,965	96%	6	3
Punjab	147,862	323	2,253	66%	5	4
Jammu and Kashmir	120,034	2,842	298	100%	2	4
Chattisgarh	105,074	777	1,170	100%	2	0
Jharkhand	81,245	1,019	2,568	98%	2	3
Himachal Pradesh	73,230	1,315	67	100%	3	3
Uttarakhand	68,727	1,285	347	100%	3	0
Arunachal Pradesh	55,262	660	12	-	4	1
Haryana	50,292	1,138	1,701	100%	1	2
Tripura	45,120	4,300	265	-	1	0
Meghalaya	40,258	1,772	9	-	1	5
Nagaland	37,871	2,284	11	-	1	1
Manipur	32,389	1,451	13	-	1	0
Goa	18,697	5,051	189	78%	1	6
Mizoram	16,250	771	2	-	1	1
Delhi	16,170	10,904	183	100%	2	1
Sikkim	12,182	1,717	-		1	0
Puducherry	4,294	219,754	21	100%	1	2
Chandigarh	2,573	22,570	16	100%	1	0

Source:

<u>https://indianrailways.gov.in/railwayboard/uploads/directorate/ele_engg/2022/Railway%20Electrification%20as%20</u>
 <u>on%2001_12_22.pdf</u> * identified national waterways under National Waterways Act,2016

https://shipmin.gov.in/sites/default/files/Approved%20IWT%20Publication.pdf

<u>https://www.aai.aero/sites/default/files/traffic-news/Dec2k22Annex2.pdf</u>

<u>https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=20115</u>

As hydrogen is at a nascent stage, EVs and natural gas will play a key role in decarbonization of road transport in India



Source:

https://vahan.parivahan.gov.in/vahan4dashboard/vahan/dashboardview.xhtml

Existing road ecosystem supports diesel & petrol vehicles, need expansion for EV and natural gas fueling

Many OMCs (Oil Marketing Companies) have started setting up EV charging stations at their ROs and cities like **Chandigarh**, **Delhi and Goa** have **15% ROs with EV charging stations**.

- Most larger states only have 3% to 5% of their ROs with charging facilities.
- Work underway to set up charging stations at 22,000 of the 70,000 petrol pumps across the country.
- Priority-to set up charging stations at every 25 km of highways by Ministry of Power guidelines on EV chargers.



With over 30,000 km of authorized natural gas pipeline infrastructure, NG is expected to play a huge role in India's transport decarbonization strategy.

		Road	Refuelling Infrastructure							
State	Length of Roads	Road density (per 1000	No.of Retail Outlets	ROs with	% of ROs with	EV charging	CNC stations			
State	(km)	sq km)	(RO) (Diesel & Petrol)	Charging	Charging	Stations	CING Stations			
Maharashtra	636.9	2,070	7256	183	3%	660	634			
Uttar Pradesh	442.9	1,821	9713	308	3%	406	698			
Assam	399.1	5,088	1180	61	5%	48	2			
Madhya Pradesh	365.0	1,184	5205	242	5%	174	195			
Karnataka	358.3	1,868	5679	250	4%	705	248			
Rajasthan	313.5	916	5780	281	5%	254	208			
Odisha	305.6	1,963	2159	118	5%	117	46			
Bihar	298.2	3,167	3225	87	3%	83	73			
West Bengal	283.9	3,198	2793	177	6%	189	0			
Tamil Nadu	271.1	2,085	6559	235	4%	441	159			
Kerala	259.9	6,688	2443	102	4%	192	95			
Gujarat	249.4	1,272	5282	219	4%	195	971			
Andhra Pradesh	176.4	1,101	4114	191	5%	222	154			
Punjab	147.9	323	3833	125	3%	126	179			
Telangana	140.6	1,254	3651	224	6%	0	142			
Jammu and		2.842	562	26	5%		0			
Kashmir	120.0					24				
Chattisgarh	105.1	777	1856	115	6%	46	0			
Jharkhand	81.2	1,019	1571	47	3%	60	64			
Himachal Pradesh	73.2	1,315	591	33	6%	27	7			
Uttarakhand	68.7	1,285	721	43	6%	48	0			
Arunachal Pradesh	55.3	660	153	9	6%	9	0			
Haryana	50.3	1,138	3509	199	6%	231	307			
Tripura	45.1	4,300	99	16	16%	18	18			
Meghalaya	40.3	1,772	245	8	3%	19	0			
Nagaland	37.9	2,284	122	6	5%	6	0			
Manipur	32.4	1,451	165	16	10%	16	0			
Goa	18.7	5,051	122	31	25%	44	11			
Mizoram	16.3	771	56	0	0%	-	0			
Delhi	16.2	10,904	400	75	19%	1845	470			
Sikkim	12.2	1,717	60	0	0%	1	0			
Chandigarh	2.6	22,570	47	14	30%	48	0			

Source:

https://economictimes.indiatimes.com/industry/renewables/work-underway-to-set-up-ev-charging-stations-at-22000-of-70000-petrol-pumps-in-country-govt/articleshow/88078743.cms

<u>https://pib.gov.in/PressReleasePage.aspx?PRID=1844982</u>

2W shares 70% Of Indian Automobile Market but car ownership is expected to increase; shared mobility is limited

- Shared mobility is vital for decarbonizing transport. In India, buses have a minimal share of total registrations while cars and 2-wheelers dominate
- 2W shares ~70% of total registrations.
- This can be attributed to:



- Majority of population lives in *rural* areas; *average household income in India is low*.
- Average motorized trip length in India is less which favors 2W vehicles.



- Indian roads have *high traffic density* encouraging public to use 2W.
- The booming e-commerce industry in India has also contributed to the increase due to the use of 2W to make last-mile deliveries.
- With *increased urbanization* and *growing per capita income*, *car ownership* is expected to increase significantly in the coming decades.

.	Total Registrations	Growth	Vehicle Density		Share b				
States	since 2014 (Millions)	Rate	(per sq.km)	2W	3W	Cars	Bus	Trucks	
Uttar Pradesh	27.74	3%	176	81%	3%	10%	0.19%	2%	
Maharashtra	22.42	-1%	109	74%	3%	15%	0.33%	4%	
Tamil Nadu	17.45	-2%	238	82%	1%	11%	0.10%	3%	
Gujarat	14.93	-1%	113	72%	3%	17%	0.24%	3%	
Karnataka	14.90	-3%	153	75%	2%	15%	0.40%	3%	
Rajasthan	12.77	20%	54	76%	2%	12%	0.23%	3%	
Madhya Pradesh	11.52	2%	58	83%	0%	9%	0.60%	0%	
West Bengal	9.50	4%	167	83%	1%	9%	1.17%	3%	
Bihar	9.40	6%	119	81%	5%	6%	0.18%	3%	
Andhra Pradesh	9.34	3%	99	80%	4%	7%	0.28%	4%	
Kerala	8.68	-3%	426	69%	3%	24%	0.29%	2%	
Haryana	7.21	-1%	267	53%	2%	24%	0.37%	5%	
Punjab	7.03	-5%	28	76%	1%	17%	0.36%	3%	
Odisha	6.45	1%	67	82%	2%	8%	0.29%	4%	
Delhi	5.99	-2%	9434	65%	4%	28%	0.17%	3%	
Chattisgarh	4.76	1%	54	81%	1%	8%	0.75%	3%	
Jharkhand	4.73	4%	86	80%	3%	11%	0.15%	3%	
Assam	4.00	8%	66	71%	5%	16%	0.26%	5%	
Uttarakhand	2.21	0%	67	73%	2%	20%	0.32%	3%	
Jammu and Kashmir	1.43	4%	47	55%	2%	34%	0.39%	6%	
Himachal Pradesh	1.08	4%	38	54%	0%	36%	0.67%	7%	
Goa	0.70	-4%	320	71%	0%	26%	0.29%	2%	
Puducherry	0.55	0%	0	85%	0%	14%	0.45%	1%	
Tripura	0.45	5%	67	76%	9%	10%	0.22%	4%	
Chandigarh	0.44	-2%	7224	54%	2%	41%	0.45%	2%	
Manipur	0.31	4%	24	71%	3%	20%	0.27%	4%	
Meghalaya	0.27	1%	22	47%	3%	39%	0.38%	10%	
Nagaland	0.24	0%	24	22%	3%	27%	1.11%	43%	
Mizoram	0.21	4%	16	72%	2%	17%	0.13%	8%	
Arunachal Pradesh	0.19	6%	3	55%	3%	33%	1.25%	6%	
Sikkim	0.07	8%	15	33%	0%	60%	0.57%	6%	

Source:

https://vahan.parivahan.gov.in/vahan4dashboard/vahan/dashboardview.xhtml

NITI Aayog: Status quo analysis of various segments of electric mobility and low carbon passenger road transport in India

Accounting for over 50% of the road emissions, India needs to decarbonize trucks but currently alternatives are scarce



30%

40%

50%

60%

 In India, the transport sector accounts for *less* than a fifth of India's final energy use.

20%

10%

0%

- In India, *trucks* are responsible for *over 50% of emissions* and <u>natural gas is the primary solution</u> <u>being promoted for their decarbonization</u>.
- Despite the *draft LNG policy*, the government needs to push for greater adoption of LNG as *significant uptake has not been achieved*.

	Total Devictuations	CO2 Emissions (MTPA)									
States	since 2014 (Millions)	2W	3W	Cars & Taxi	Bus	Trucks	Total				
Uttar Pradesh	27.74	6.9	1.1	5.6	0.8	14.4	29				
Maharashtra	22.42	5.1	1.8	6.9	1.1	20.0	35				
Tamil Nadu	17.45	4.4	0.7	4.0	0.3	11.5	21				
Gujarat	14.93	3.3	1.5	5.0	0.6	10.1	21				
Karnataka	14.90	3.4	1.0	4.4	0.9	11.1	21				
Rajasthan	12.77	3.0	0.4	3.1	0.5	9.1	16				
Madhya Pradesh	11.52	2.9	0.0	2.1	1.1	0.0	6				
West Bengal	9.50	2.4	0.2	1.7	1.7	7.4	13				
Bihar	9.40	2.4	1.1	1.1	0.3	5.2	10				
Andhra Pradesh	9.34	2.3	1.2	1.4	0.4	7.1	12				
Kerala	8.68	1.8	0.9	4.1	0.4	5.0	12				
Haryana	7.21	1.4	0.4	3.5	0.4	7.8	13				
Punjab	7.03	1.6	0.1	2.4	0.4	4.4	9				
Odisha	6.45	1.6	0.5	1.0	0.3	5.0	8				
Delhi	5.99	1.2	0.3	3.3	0.1	3.1	8				
Chattisgarh	4.76	1.2	0.1	0.7	0.6	3.6	6				
Jharkhand	4.73	1.2	0.5	1.0	0.1	3.3	6				
Assam	4.00	0.9	0.3	1.3	0.2	4.4	7				
Uttarakhand	2.21	0.5	0.0	0.9	0.1	1.3	3				
Jammu and Kashmir	1.43	0.2	0.1	1.0	0.1	1.8	3				
Himachal Pradesh	1.08	0.2	0.0	0.8	0.1	1.7	3				
Goa	0.70	0.2	0.0	0.3	0.0	0.4	1				
Puducherry	0.55	0.1	0.0	0.2	0.0	0.1	0				
Tripura	0.45	0.1	0.1	0.1	0.0	0.4	1				
Chandigarh	0.44	0.1	0.0	0.4	0.0	0.2	1				
Manipur	0.31	0.1	0.0	0.1	0.0	0.3	1				
Meghalaya	0.27	0.0	0.0	0.2	0.0	0.6	1				
Nagaland	0.24	0.0	0.0	0.1	0.0	2.4	3				
Mizoram	0.21	0.0	0.0	0.1	0.0	0.4	1				
Arunachal Pradesh	0.19	0.0	0.0	0.1	0.0	0.2	0				
Sikkim	0.07	0.0	0.0	0.1	0.0	0.1	0				
All India	206.99	48.62	12.65	56.69	10.74	142.55	271.27				

While 3W have significant penetration of clean alternatives but most vehicle classes still need to be decarbonized

- 99% of 2W run on petrol, while ~1% are electric.
- 3W has relatively high penetration of cleaner alternatives. Although 44% run on diesel and 12% on petrol, but 20% are electric, 17% are hybrid, and 7% run on CNG.
- For *cars & taxi*, over 93% run on petrol and diesel. Only ~7% *are hybrid*, and very minor share of electric vehicles.
- ~95 % buses run on diesel and petrol, with
 ~4% running on CNG and less than 1% are electric.
- Responsible for the most emissions, ~94% of trucks run on diesel (92%) and petrol (2%).
 ~5% run on CNG, and LNG adoption is at a nascent stage.
- While NG uptake is expected to significantly increase in the next three decades, uptake of electric trucks will require a considerable improvement in battery densities.
- Other fuel options such as *hydrogen and* synthetic fuels are at a very early stage of innovation and need more time for full-scale deployment.

Maps

	Total	Share of Major fuels for different vehicle classes (%)																					
	Registratio		2W			3W				Ca	ars and	Тахі				Bus					Trucks	5	
States	ns since 2014 (Millions)	Petrol	Electric	Diesel	Petrol	Electri c	Hybri d	CN G	Diesel	Petrol	Electri c	Hybrid	CNG	Diesel	Petrol	Electric	Hybri d	CNG	Diese I	Petro I	Elect ric	Hybri d	CNG
Uttar Pradesh	27.74	100%	0.2%	24%	4%	52%	9%	10%	39%	50%	0.0%	10%	0.0%	85%	0%	1%	0%	13%	92%	1%	0%	0%	6%
Maharashtr a	22.42	99%	1.1%	12%	19%	2%	56%	10%	36%	47%	0.5%	14%	0.0%	89%	2%	2%	2%	4%	92%	2%	0%	1%	4%
Tamil Nadu	17.45	99%	0.7%	45%	44%	3%	1%	5%	40%	57%	0.2%	0%	0.0%	100%	0%	0%	0%	0%	97%	2%	0%	0%	1%
Gujarat	14.93	99%	0.8%	38%	1%	1%	48%	13%	35%	48%	0.2%	16%	0.0%	95%	0%	1%	0%	4%	90%	2%	0%	1%	6%
Karnataka	14.90	99%	1.4%	39%	45%	5%	1%	5%	40%	56%	0.5%	1%	0.0%	84%	15%	1%	0%	0%	95%	3%	0%	0%	1%
Rajasthan	12.77	99%	0.8%	46%	15%	28%	3%	6%	38%	58%	0.2%	2%	0.0%	99%	0%	0%	0%	1%	96%	2%	0%	0%	2%
Madhya Pradesh	11.52	100%	0.4%	34%	0%	39%	1%	25%	36%	59%	0.1%	3%	0.0%	66%	33%	0%	1%	0%	84%	11%	0%	0%	4%
West Bengal	9.50	100%	0.1%	31%	19%	31%	2%	0%	25%	72%	0.2%	0%	0.0%	60%	39%	0%	0%	0%	97%	1%	0%	0%	0%
Bihar	9.40	100%	0.2%	67%	1%	24%	2%	6%	40%	56%	0.1%	1%	0.0%	98%	0%	0%	0%	2%	71%	1%	0%	0%	0%
Andhra Pradesh	9.34	99%	0.6%	94%	0%	1%	4%	1%	47%	47%	0.2%	1%	0.0%	94%	6%	0%	0%	0%	81%	3%	0%	0%	0%
Kerala	8.68	99%	0.8%	84%	7%	2%	3%	5%	25%	72%	0.3%	0%	0.0%	99%	1%	0%	0%	0%	95%	4%	0%	0%	1%
Haryana	7.21	98%	0.4%	36%	0%	19%	27%	18%	38%	45%	0.1%	14%	0.0%	82%	0%	0%	0%	17%	82%	3%	0%	1%	13%
Punjab	7.03	100%	0.2%	47%	5%	17%	18%	7%	56%	41%	0.0%	2%	0.1%	97%	1%	0%	0%	0%	95%	2%	0%	0%	2%
Odisha	6.45	99%	0.7%	92%	0%	3%	3%	1%	32%	63%	0.1%	1%	0.0%	97%	2%	0%	0%	0%	74%	1%	0%	0%	0%
Delhi	5.99	99%	1.3%	0%	0%	56%	33%	11%	23%	57%	0.6%	18%	0.1%	9%	0%	4%	0%	87%	13%	0%	0%	6%	81%
Chattisgarh	4.76	99%	0.6%	63%	9%	27%	0%	0%	28%	68%	0.1%	0%	0.0%	84%	16%	0%	0%	0%	96%	2%	1%	0%	0%
Jharkhand	4.73	100%	0.3%	82%	1%	11%	2%	4%	33%	64%	0.1%	0%	0.0%	99%	1%	0%	0%	0%	89%	2%	0%	0%	0%
Assam	4.00	100%	0.1%	34%	19%	47%	0%	0%	18%	80%	0.0%	0%	0.0%	99%	0%	0%	0%	1%	88%	7%	0%	0%	0%
Uttarakhano	2.21	99%	0.5%	20%	6%	68%	1%	5%	32%	65%	0.1%	1%	0.0%	98%	1%	0%	0%	0%	87%	2%	0%	0%	2%
Jammu and Kashmir	1.43	100%	0.5%	72%	19%	9%	0%	0%	17%	83%	0.0%	0%	0.0%	99%	0%	1%	0%	0%	93%	7%	0%	0%	0%
Pradesh	1.08	100%	0.2%	51%	42%	7%	0%	0%	18%	80%	0.0%	0%	0.0%	97%	1%	1%	0%	0%	97%	2%	0%	0%	0%
Goa	0.70	98%	1.4%	6%	81%	8%	2%	2%	15%	81%	0.5%	0%	0.0%	97%	0%	3%	0%	0%	88%	8%	0%	1%	2%
Puducherry	0.55	99%	0.5%	51%	37%	5%	0%	2%	47%	50%	0.1%	0%	0.0%	100%	0%	0%	0%	0%	96%	3%	0%	0%	0%
Tripura	0.45	98%	0.1%	8%	27%	30%	13%	21%	9%	54%	0.0%	24%	9.7%	92%	0%	0%	0%	8%	92%	3%	0%	0%	2%
Chandigarh	0.44	99%	0.6%	23%	13%	38%	4%	2%	43%	53%	0.3%	2%	0.0%	96%	0%	4%	0%	0%	94%	2%	0%	0%	4%
Manipur	0.31	100%	0.1%	62%	30%	8%	0%	0%	18%	80%	0.0%	0%	0.0%	100%	0%	0%	0%	0%	94%	6%	0%	0%	0%
Neghalaya	0.27	100%	0.0%	51%	48%	0%	0%	0%	17%	82%	0.0%	0%	0.0%	100%	0%	0%	0%	0%	95%	4%	0%	0%	0%
Nagaland	0.24	100%	0.1%	9%	91%	0%	0%	0%	29%	70%	0.0%	0%	0.0%	100%	0%	0%	0%	0%	100%	0%	0%	0%	0%
Iviizoram	0.21	100%	0.0%	0%	100%	0%	0%	0%	25%	74%	0.0%	0%	0.0%	100%	0%	0%	0%	0%	97%	3%	0%	0%	0%
Pradesh	0.19	93%	0.0%	17%	16%	0%	0%	0%	33%	59%	0.0%	0%	0.0%	92%	0%	0%	0%	0%	85%	1%	0%	0%	0%
Sikkim	0.07	100%	0.0%	0%	0%	0%	0%	0%	34%	65%	0.0%	0%	0.0%	100%	0%	0%	0%	0%	100%	0%	0%	0%	0%

Share of Conventional vs AFV

Share of different AFVs



Mapping of Key Institutes for Transport Decarbonization



Only road and aviation have state level implementation agencies whereas other modes are driven by national agencies

Key institutions involved in different modes of transport in India											
MODES		INFRASTRUCTURE		OPERATIONS							
	Centre	State	Local	Centre	State	Local					
Roads	Ministry of Road Transport and Highways	Public Works Department	Panchayats and ULBs (maintenance)	Ministry of Road Transport and Highways	Road Transport Corporations	Local Bus Transport Corporations					
	National Highways Authority of India	Transport Corporation Authorities (ex- Metro)		Ministry of Environment and Forests	Transport Corporation Authorities (ex- Metro)						
	Ministry of Urban Development	Land Development Authority		СРСВ	RTOs						
	Ministry of Rural Development	Rural Department/Roads Departments									
Civil Aviation	Ministry of Civil Aviation			Airports Authority of India,	State Departments of Civil Aviation						
	Airports Authority of India			Directorate General of CivilAviation							
Ports	Ministry of Shipping, National Shipping Board			Directorate General of Shipping,							
Rail	Ministry of Railways	Metro Rail Corporations*		Ministry of Railways,							
	Zonal Railways			Zonal Railways							
Inland Waterways	Inland Waterways Authority of India			Inland Waterways Authority of India							

State level Aviation departments focus only on creation of infrastructure and do not have any targets for decarbonization.

The challenge of multiple independent agencies is being tackled by few states by creation of EV cell or Steering Committee

	Inct	itutional Fram	State EV Cell/ Steering Committee				
	11190					CREST (Chandigarh Renewable Energy and Science &	
						Chandigarh	Technology)
			C 1 1				The nodal agency will be leading and responsible for
			Chhattisgarh	setting up the committee and monitor the growth			
		Go	Delhi	State EV cell			
						Gujarat	Transport department
Public Morks			The second Constant	Municipal		Jharkhand	Industrial department steering committee
Public Works	Transport	State Electricity	Town and Country	Wunicipal Corporation of	Smart city Limited		BESCOM (Bangalore Electricity Supply Company
Department	Department	Board (SEB)		corporation of		Karnataka	Limited) Karnataka electric vehicle cell
(PWD)			(ICFO)	City			Madhya Pradesh Urban Development & Housing
		A				Madhya Pradesh	Department (UDHD)
		<i>₽</i>		田南		Maharashtra	EV Cell
,	•••	\bowtie		nn		Meghalaya	Transport department
Development of	Implementation	Provision of	Identification and	Executio	on at	Odisha	Transport department
Infrastructure	Authority	Electricity	Planning of Charging	city le	vel	Punjab	Transport department
	,	,	locations	,		Rajasthan	Under the transport department, State EV cell
			locations			Tamil Nadu	Invest Tamil Nādu
						Talangana	TSREDCO (Telangana State Renewable Energy
						Telangana	Development Corporation)
 The institu 	itional framewor	k varies from	ework	Uttar Pradesh	Invest UP		
in aludaa ti					0.1.011	Wast Rongal	Transport department with other departments-EV
includes ti	ne above mentic	nea institutio	SUS			west bengai	accelerator cell
						Andhra Pradesh	-
		والارتباع المرور بالمراجع	Arunachal Pradesh	_			

Assam

Bihar

Haryana

Himachal Pradesh

Kerala

Manipur

Uttarakhand

- Multiplicity of agencies involved in the implementation of Transportation policies makes implementation difficult.
- 16 out of 26 states have EV cell or Steering Committee whereas others don't specify nodal agency.

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States have limited role in CNG and biofuels-based mobility, as it is managed at national level by public and private entities



Natural Gas

- For distribution of natural gas, the country has been divided into geographical areas (GAs) by the PNGRB (Petroleum and Natural Gas Regulatory Board).
- The PNGRB, regularly allots these GAs, to public, private and joint venture entities, who then have marketing exclusivity for sale of natural gas to consumers with requirement less than 50,000 SCMD.
- Development of CNG stations within a GA, is taken by the authorized entity, which can be a *public*, *private or join venture entity*.





 Highly polluted cities like Delhi, have imposed mandates for conversion of buses, 3W and taxis to CNG in the past to curb air pollution. Some of the key entities that have been provided authorization and marketing exclusivity for various GAs

- 1. Adani Total Gas Limited (Private Sector)
- 2. AG&P (Private Sector)
- 3. BPCL (Public Sector)
- 4. GAIL (Public Sector)
- 5. IndianOil-Adani Gas (*Joint venture* between public and private company)
- 6. Mahanagar Gas Limited (*Public Sector*)
- 7. ThinkGas (Private Sector)

Biofuel

- Though the National Biofuels Policy (2018) has defined the roles of key ministries, but synchronization of different ministries is difficult.
- **No state level institute** has been designated with this task currently.

Key Ministries for Biofuel Programme

Ministry of Petroleum and Natural Gas

Ministry of Rural Development

Ministry of Agriculture and Farmers Welfare

Ministry of Environment, forest and Climate Change

Ministry of Science and Technology

Ministry of Road Transport and Highways

Ministry of Housing & Urban Poverty Alleviation

Ministry of New & Renewable Energy



GESI in Transport

- **1.** Stata level GESI policies and initiatives in Transport sector
- 2. Case-study for GESI in Transport



7 states have clear policy framework for GESI implementation in transport

State	Policy/ document for GESI support	GESI provision in Public Transport (seat reservation, Fare concession and Pink buses)	Encouraging GESI groups in workforce and getting Drivers' Licenses	Innovative Initiatives	Total scoring	 Nirbhaya and Raksha App Facility management center (for women
Kerala	\checkmark	\checkmark	\checkmark	\checkmark	4	workforce participation
Madhya Pradesh	\checkmark	\checkmark	\checkmark	\checkmark	4	in transport sector)
Delhi	Х	\checkmark	\checkmark	\checkmark	3	
Maharashtra	\checkmark	\checkmark	\checkmark	Х	3	
Uttar Pradesh	\checkmark	\checkmark	\checkmark	Х	3	
Gujarat	Х	\checkmark	\checkmark	Х	2	
Himachal Pradesh	\checkmark	\checkmark	Х	Х	2	
Odisha	Х	\checkmark	\checkmark	Х	2	
Punjab	Х	\checkmark	\checkmark	Х	2	Baby feeding pods at all
Andhra Pradesh	Х	\checkmark	Х	\checkmark	2	transit terminals
Goa	Х	\checkmark	Х	Х	2	Free driving license for
Tamil Nadu	\checkmark	\checkmark	Х	Х	2	female
Puducherry	\checkmark	Х	Х	\checkmark	2	
Haryana	Х	\checkmark	Х	Х	1	
Jammu and Kashmir	Х	\checkmark	Х	Х	1	
Jharkhand	Х	\checkmark	Х	Х	1	She Auto Stands
Karnataka	Х	\checkmark	Х	Х	1	
Mizoram	Х	\checkmark	Х	Х	1	
Nagaland	Х	\checkmark	Х	Х	1	Transport Allowance (
Tripura	Х	Х	Х	Х	0	100 rs. Der menth for
West Bengal	Х	Х	Х	Х	0	
Arunachal Pradesh	Х	Х	Х	Х	0	disabled persons)
Assam	Х	Х	Х	Х	0	
Bihar	Х	Х	Х	Х	0	
Chandigarh	Х	Х	Х	Х	0	
Chhattisgarh	Х	Х	Х	Х	0	
Manipur	Х	Х	Х	Х	0	
Meghalaya	Х	Х	Х	Х	0	
Rajasthan	Х	Х	Х	Х	0	
Sikkim	Х	Х	Х	Х	0	
Uttarakhand	X	X	Х	Х	0	

Source: https://investodisha.gov.in/download/Civil-Aviation-Policy-2022.pdf https://gad.rajasthan.gov.in/details/Rajasthan Civil Aviation Policy 2018.pdf https://niveshmitra.up.nic.in/CivilAviationPolicy.aspx

Policy for GESI in transport

• Pink police patrol

Case Study- Delhi- GESI initiatives

Government measures to improve women's representation in employment in transport sector

- Relaxed norms to recruit female drivers for its buses including reducing the minimum height needed from 159 cm
- cutting the 'experience criteria' for women to a month.
- Reserved 33% of the new permits for new electric autos for women
- Route Rationalization of Public Transport incorporating women's travel

Priority Seating for Women and Differently-abled in DTC (Delhi Transport Corporation) buses and metro Free tickets for women in DTC buses



2=:

Bus Marshals Program



Panic Buttons in buses



Undertaking research for women's safety in public transport



- Commercial bus driving training for women and Gender Sensitization Training for the overall staff of buses
- Standard Operating Procedures
- ที่ได้ Universal accessibility elements in Delhi metro



Space to park wheelchairs inside Delhi Metro Trains



Elevator provision for persons with disabilities



State Level Summary



Transport decarbonization is still emerging in India with

- EVs and CNG as the major solutions across segments.
 - EVs have taken up in past 5 years and the top states for EV registrations are Uttar Pradesh, Maharashtra, Delhi, and Karnataka, each with over 150,000 EVs.
 - CNG has also been successful in some states, with Maharashtra, Gujarat, Delhi, Uttar Pradesh, and Haryana being the leading states, each with over 300,000 CNG/ hybrid CNG registrations.


Andhra Pradesh (AP)

- AP is the 10th most populous state. Total population: 53 million (4% of India), which is comparable to Italy.
- The state has 3 identified waterways.
- The state's EV policy focus on infrastructure development and manufacturing incentives, which are essential demand drivers.
- EV penetration at 0.51% (47,000 EVs) & yearly EV sales grew at CAGR 268% (over 5 yr).
- CNG penetration at 0.26% (24,661 vehicles including hybrid CNG) & yearly sales grew at CAGR 28% (over 5 yr).
- Currently, *low penetration of AFVs* across vehicle classes; over *90% vehicles* in all classes rely on *diesel and petrol*.
- With the right policy initiatives and availability of AFVs, the state presents a huge potential market for clean vehicle deployment.

Arunachal Pradesh

- Total population is ~1 million (0.1% of India), similar to any large metro city of India. Urban population is only 23%.
- The state has 1 identified waterway.
- No defined target for EV sales, manufacturing or charging infrastructure.
- EV penetration at 0.01% (11 EVs)
- CNG penetration at 0.13% (256 vehicles including hybrid CNG) & yearly sales grew at CAGR 22% (over 5 yr).
- The state presents *low vehicle ownership* (0.14 per person) and lower per capita income (2116 euro).
- The state's lower per capita income makes it less probable for AFV to penetrate faster but shared mobility services can be transitioned to ecofriendly vehicles.

Assam

- Total population of 31 million (3% of India), which is equivalent to Poland.
- Only 14% of the population is urban.
- Very low per capita income at 1160 euro, and low vehicle ownership at 0.13 per person.
- The state has 17 identified waterways.
- The state EV policy has a *target* for all govt vehicles to be electrified by 2030, and 200,000 EVs on road by 2025.
- EV penetration at 2.33% (93,378 EVs) & yearly EV sales grew at CAGR 53% (over 5 yr).
- CNG penetration at 0.01% (464 vehicles including hybrid CNG) & yearly sales grew at CAGR 64% (over 5 yr).
- It has a high share of 3W at 5%, to other states and ~50% of its 3W are electric.
- With low per capita income, other vehicle segments might not achieve significant AFV penetration.

Bihar

- Bihar is the second most populous state with a population of 105 million (9% of India), equivalent to that of Philippines. Only 11% of the population is urban.
- Lowest per capita income (544 euros) and the lowest vehicle ownership (0.09 per person) in the country.
- The state has 7 identified waterways.
- Bihar is one of the first State to launch EV policy in 2019. Only state that has achieved its target of 100,000 EVs on-road 2 years ahead of the 2024 deadline.
- EV penetration at 1.34% (125,891 EVs) & yearly EV sales grew at CAGR 66% (over 5 yr).
- CNG penetration at 0.49% (45,717 vehicles including hybrid CNG) & yearly sales grew at CAGR 176% (over 5 yr).
- **3W** the only segment that have AFV penetration (33%), **other classes lag behind.**
- New yearly registrations in the state grow at a 6% CAGR, showing a potential market for AFVs. But, due to low per capita income, AFV penetration appears challenging.

Chandigarh

- Chandigarh is a union territory and a city in India with 1 million (0.1% of India) population.
- The *per capita income and vehicle ownership of the UT is quite high* at 3223 euro and 0.42 per person respectively.
- Though released, only last year, Chandigarh EV policy, is one of few that has mandated the creation of charging infra in residential buildings, offices etc.
- As the UT has *high per capita income*, its *share of cars is at 41%.*
- 38% of its 3W are EVs, and even in bus and truck segment 3-4% of vehicles run on AFV such as EV or CNG.
- EV penetration at 1.2% (5316 EVs) & yearly EV sales grew at CAGR 110% (over 5 yr).
- CNG penetration at 0.86% (3820 vehicles including hybrid CNG) & yearly sales grew at CAGR 18% (over 5 yr).
- Due to its significant population, and urbanization, it is a key potential market for AFV penetration.

Chhattisgarh

- Chhattisgarh has a population around 26 million (2% of India)
- 20% of the population is urban.
- It has low per capita income and low vehicle ownership of 1154 euro and 0.19 per person.
- Though released in April last year, the Chhattisgarh EV policy covers demand side incentives, and promotes installation of charging infrastructure.
- The *current AFV infrastructure* in the state is *lacking*.
- The state has seen AFV penetration in 3W segment only
- EV penetration at 0.79% (37,645 EVs) & yearly EV sales grew at CAGR 86% (over 5 yr).
- CNG penetration at 0.001% (43 vehicles including hybrid CNG).

Delhi

- Delhi, being the capital of India, with a population of 17 million (1.4% of India).
- The state has *high per capita income and vehicle ownership* at 4422 euro and 0.36 per person respectively.
- Delhi EV policy, is one of the most comprehensive policies covering a range of parameters for building the EV ecosystem in the city.
- Delhi is one of the *leading cities for AFV deployment*, with significant EV charging stations, along with CNG refueling stations.
- EV penetration at 3.27% (195,930 EVs) & yearly EV sales grew at CAGR 27% (over 5 yr).
- CNG penetration at 9.17% (549,240 vehicles including hybrid CNG) & yearly sales grew at CAGR 0.11% (over 5 yr).
- It has also achieved 99% AFV penetration in 3W segment. In cars & taxi, 18% are hybrid, in buses, 87% are CNG and 81% trucks are CNG.
- Delhi has been a leader in clean fuel adoption, and AFV market in the city is expected to grow further.

Goa

- Goa has a population of roughly 1.4 million (0.1% of India).
- 62% of the *population is urban*.
- High sex ratio, and high literacy rate.
- The state has 6 identified waterways.
- The state has one of the highest per capita income, and the highest vehicle ownership at 5405 euro, and 0.48 per person respectively.
- The EV policy was discontinued*.
- EV penetration at 1.18% (8,259 EVs) & yearly EV sales grew at CAGR 177% (over 5 yr).
- CNG penetration at 0.19% (1,331 vehicles including hybrid CNG) & yearly sales grew at CAGR 220% (over 5 yr).
- The state is *lacking in AFV infrastructure* and has not done well in AFV penetration across vehicles segments due to lack of policy initiatives.
- Though the state has high vehicle ownership, and is a good potential market for AFVs, but due to lack of policy initiatives, AFV penetration has been lacking.

Gujarat

- Gujarat has a population of 60 million (5% of India), roughly equivalent to that of France.
- The state is highly urbanized, and has 94% urban population. The state has the 4th highest GSDP at 14.15 billion euros.
- The state has 5 identified waterways.
- The state has decent per capita income and vehicle ownership at *2341 euros* and *0.25* per person respectively.
- The state's EV policy has weak demand-side incentives. (2 out of 8 parameters)
- EV penetration at 0.63% (93,324 EVs) & yearly EV sales grew at CAGR 217% (over 5 yr).
- CNG penetration at 5.03% (750,503 vehicles including hybrid CNG) & yearly sales grew at CAGR 6% (over 5 yr).
- The state has a high number of airports and ports.
- The state has excellent AFV infrastructure availability especially for CNG, and good amount of EV chargers are also available.
- Major AFV deployment in the state comes from CNG and CNG hybrids.

• The government of Goa has not officially stated the reason for the discontinuation of EV policy.

<u>https://timesofindia.indiatimes.com/auto/policy-and-industry/goa-to-stop-offering-ev-subsidy-from-july-31-details-explained/articleshow/93154612.cms</u>

Haryana

- Total population of **25 million (2.1% of India)**. and is mainly a rural state.
- The *per capita income is* at 3021 euros and vehicle ownership at 0.28 per person.
- The state has 2 identified waterways.
- Though released last year in July, Haryana is one of the states with the most comprehensive EV polices covering strong demand and supply side incentives.
- EV penetration at 0.77% (55,195 EVs) & yearly EV sales grew at CAGR 56% (over 5 yr).
- CNG penetration at 5.22% (376,961 vehicles including hybrid CNG) & yearly sales grew at CAGR 16% (over 5 yr).
- Situated close to Delhi, the state shares a lot of traffic with Delhi, and hence decent AFV infrastructure for CNG and EVs, is present in the state.
- The state has over 50% EV penetration in 3W segment, but in cars & taxi, buses and trucks, CNG and CNG hybrid is the only AFV alternative with moderate penetration.

Himachal Pradesh

- Total population of 7 million (0.6% of India).
- *Lowest share of urban population at 10%.* It is a hilly state.
- The *per capita income* of the state is close to the national average at 2220 euros, and it *has low vehicle ownership at 0.16* per person.
- The state has 3 identified waterways.
- It one of the few states with a transport policy, and it promotes *multi-modal integration*.
- The state has released an EV policy, but it has weak demand side incentives (covers only 2 out of 8 parameters)
- EV penetration at 0.17% (1,816 EVs) & yearly EV sales grew at CAGR 75% (over 5 yr).
- CNG penetration at 0.06% (611 vehicles including hybrid CNG) & yearly sales grew at CAGR 167% (over 5 yr).
- The state is *lacking in AFV infrastructure*.
- The state has significant share of cars at 36%.
- The state has negligible AFV penetration across segments.

Jammu & Kashmir

- Total population of 13 million (1% of India).
- It's a hilly State with extreme altitude.
- The state has very low per capita income and low vehicle ownership at 1331 euros and 0.11 per person respectively.
- The state has 4 identified waterways.
- The state has no EV policy or any AFV policy currently.
- EV penetration at 0.48% (6837 EVs) & yearly EV sales grew at CAGR 377% (over 5 yr).
- CNG penetration at 0.005% (70 vehicles including hybrid CNG) & yearly sales grew at CAGR 32% (over 5 yr).
- The state has *negligible AFV infrastructure* and *AFV penetrations* across segments.
- Currently, the state does not present a good potential market for AFV, due to lack of any initiatives from the state government.

Jharkhand

- Total population of 33 million (2.7% of India), which is equivalent to Poland.
- Second lowest per capita income, with only 859 euros, and a very low vehicle ownership rate of 0.14 per person.
- The state has 3 identified waterways.
- The state also has an EV policy which covers some of both demand and supply side incentives.
- The state has *moderate AFV infrastructure* and more CNG stations as compared to EV charging stations.
- EV penetration at 0.58% (27,524 EVs) & yearly EV sales grew at CAGR 57% (over 5 yr).
- CNG penetration at 0.28% (13,380 vehicles including hybrid CNG) & yearly sales grew at CAGR 281% (over 5 yr).
- The state has *moderate AFV penetration* in the 3W segment alone, while *other segments are lacking*.
- Overall, the state can be positioned to have moderate potential for AFV deployment, as no significant initiative stands out.

Karnataka

- Total population of 61 million (5% of India) equivalent to France. 40% of the population is urban. 5th highest GSDP: 14.1 billion euros.
- It has a high per capita income of 3067 euros, and high vehicle ownership of 0.24 per person.
- The state has 11 identified waterways.
- First state to roll out an EV policy in 2017. Though the policy, came out long ago, it is missing significant demand side incentives.
- The state has missed its *investment and* electrification of fleet targets for 2022.
- EV penetration at 1.22% (181,831 EVs) & yearly EV sales grew at CAGR 93% (over 5 yr).
- CNG penetration at 0.35% (52,445 vehicles including hybrid CNG) & yearly sales grew at CAGR 225% (over 5 yr).
- The state has AFV infrastructure, yet the *penetration of AFV is not high*.
- With 14.9 million vehicle registrations, the state presents a huge potential AFV market, but policy initiatives need to be better implemented.

Kerala

- Total population of **33 million (2.8% of India)**, which is equivalent to that of Poland.
- The population is evenly split between urban and rural.
- The state has high per capita income of 2537 euros, and high vehicle ownership of 0.26 per person.
- The state has 5 identified waterways.
- Though the state released its policy in 2019, the policy has lack of demand side incentives
- State missed its 2022 EV penetration targets.
- EV penetration at 0.7% (60,479 EVs) & yearly EV sales grew at CAGR 248% (over 5 yr).
- CNG penetration at 0.34% (29,742 vehicles including hybrid CNG) & yearly sales grew at CAGR 131% (over 5 yr).
- The state has 2nd highest number of EV chargers in the country, and decent availability of CNG infrastructure.
- The state currently has a low adoption rate of AFVs.

Madhya Pradesh	Maharashtra	Manipur
 Madhya Pradesh known as the heart of India is 5th most populous state of India with a 	 Maharashtra is the 2nd most populous state with a population of 112 million (9.3% of India) which is comparable to Mexico. 	 Manipur has a population of 3 million (0.2% of India).
population of 73 million (6% of India) which is comparable to Turkey.	 The state has a moderate <i>per capita income</i> and <i>vehicle ownership</i> of <i>2124 euros</i> and <i>0.2 vehicle per person</i> respectively. 	 The state has 4th lowest per capita income of 966 euros
 The state has a per capita income and vehicle ownership of 1372 euros and 0.16 vehicle per 	 It has the <i>highest vehicle registration in country</i> with a total of 22 <i>million</i> vehicles registered from 2014 till date 	and vehicle ownership of 0.11 vehicle/person
 Madhya Pradesh aims for 25% of all new 	 The state has <i>15 identified national waterways</i> out of which 4 are operational 	 Electrification of railways has not yet begun in the state.
registered vehicles to be electric by 2026, but its current EV penetration stands at 2.2% of total vehicle sales which can be due to weak demand side incentives (covering 2 out of 8 parameters)	 State's EV policy covers a wide range of both demand and supply side parameters making it one of the most comprehensive policies 	 Being a hilly state, it has no ports and IWT. Manipur has an EV policy but it.
 It has 0.3% EV penetration (35,997 EVs) in cumulative vehicle registration which grew at a yearly CAGP of 200% (5 year) 	 The state has <i>highest number of EV chargers</i> (317), which can be attributed to good supply side incentives of the state. 	<i>lacks incentives</i> on comparing with other state's EV policies (covering 2 out of 15
 CNG vehicle penetration is 0.3% (34,245) 	 It has 1% EV penetration (215,346 EVs) in cumulative vehicle registration which grew at a yearly CAGR of 148% (5 year). 	parameters). • It has 0.3% EV penetration
vehicles including hybrid CNG) with a CAGR of 44%.	 CNG vehicle penetration is 4.3% (962,152 vehicles including hvbrid CNG) with a growth rate of 1%. 	(1,029 EVs) in cumulative vehicle registration which
 Inland Waterways are not yet developed in the state, though <i>3 national waterways</i> have been 	 The state has <i>highest CO2 emission</i> levels with 35 MTPA. 	grew at a yearly CAGR of 128% (5 year).
 identified in and around state <i>Development</i> of <i>waterways</i> can play a role in decarbonization. 	 Highest emission is by trucks, but It has the <i>highest emitting 3-wheeler segment in the entire country with 1.8 MTPA</i>. This is because it has 2nd biggest fleet of 3-wheeler which is primarily of hybrid followed by petrol and diesel with low penetration of electric. 	 CNG vehicle penetration is 0.01% (18 vehicles) with a negative growth rate of - 100%.
	 High vehicle ownership and a moderate per capita income combined with a comprehensive EV policy makes Maharashtra a potential market for AFVs. 	 The state's lower per capita income makes it less probable for AFV to penetrate faster

Meghalaya

- Total population of 3 million (0.2% of India).
- The state has 5th highest share of rural population at 80%.
- It has 5th lowest per capita income with 977 euros and lowest vehicle ownership with 0.09 vehicles per person.
- EV policy of state has *decent demand side incentives*. The state has also *allocated budget for incentives*.
- It has 0.03% EV penetration (78 EVs) in cumulative vehicle registration which grew at a yearly CAGR of 82% (4 year).
- CNG vehicle penetration is 0.01% (18 vehicles) with a growth rate of %.
- Meghalaya has 2nd highest share of truck registration in the entire country with 10% of registered vehicle of state due to low road tax
- The state's low per capita income makes it less probable for AFV to penetrate faster.

Mizoram

- Mizoram is one of the least populous states of India having a population of 1.1 million (0.1% of India) and 3rd lowest population density at 52 person/sqkm.
- Mizoram has a higher share of urban population at 52%
- The state has a *per capita income* and *vehicle ownership* of *1588 euros* and *0.19* vehicle per person respectively.
- It has 1 declared national waterways.
- It has 0.03% EV penetration (59 EVs) in cumulative vehicle registration which grew at a yearly CAGR of 278% (3 year).
- CNG vehicle penetration is 0.02% (43 vehicles) with a growth rate of -100%.
- Mizoram does not have an EV policy.

Nagaland

- Nagaland has a population of 2 million (0.2% of India) The state has a per capita income and vehicle ownership of 1357 euros and 0.12 vehicle per person respectively.
- It has 1 declared national waterways.
- Nagaland has *highest share of truck registration* in the entire country with 43% of registered vehicle of state. This can be attributed to *lower taxation in the state compared to other states* which attracts vehicle owners from other states to get their trucks registered in Nagaland.
- It has 4th highest bus registration signifying high public transport dependence of state with 1.1% of registered vehicles as buses.
- It has 0.02% EV penetration (48 EVs) in cumulative vehicle registration which grew at a yearly CAGR of -42% (4 year).
- CNG vehicle penetration is 0.02% (40 vehicles) with a growth rate of %.
- Nagaland does not have an EV policy.

Odisha

- Odisha has a population of 42 million (3.5% of India).
- The state has a *per capita income* and *vehicle ownership* of *1371 euros* and *0.15* vehicle per person respectively.
- It has 5th lowest CO2 emission levels with
 0.44 MTPA
- EV policy of Odisha has strong demand side incentives. It offers *interest subvention on loans* through financial institutes.
- It has 0.66% EV penetration (42,884 EVs) in cumulative vehicle registration which grew at a yearly CAGR of 125% (5 year).
- CNG vehicle penetration is 0.16% (10,572 vehicles including hybrid CNG) with a growth rate of 49%.
- The state has 6 declared national waterways which can be utilized as a step for decarbonization.

Puducherry

- Puducherry is 4th least populous state with *1.2 million population (0.1%* of India).
- The state has *2 declared national waterways*.
- It has 10th highest per capita income with 2364 euros and highest vehicle ownership with 0.44 vehicles per person.
- Puducherry has 5th lowest CO2 emission levels with 0.44 MTPA.
- It has 0.46% EV penetration (2,524 EVs) in cumulative vehicle registration which grew at a yearly CAGR of 189%(5 year).
- CNG vehicle penetration is 0.05% (252 vehicles including hybrid CNG) with a CAGR of 144%.
- Puducherry does not have an EV policy.
- With highest vehicle ownership in country and high per capita income, can be a potential state for the development of AFV infrastructure and market.

Punjab

- Punjab has a population of 28 million (2.3% of India).
- The state has a *per capita income* and *vehicle ownership* of *1783 euros* and *0.25* vehicle per person respectively.
- Punjab has 4 declared national waterways.
- It has the *lowest growth rate of -5% in vehicle registration* which can be attributed to *high motor vehicle tax* in state due to which people get their vehicles registered in neighboring states like Uttar Pradesh, Haryana.
- Punjab EV policy covers <u>3 out of 4 supply side</u> <u>parameters</u> and has key initiatives to boost manufacturing in the state.
- It has 0.33% EV penetration (23,460 EVs) in cumulative vehicle registration which grew at a yearly CAGR of 153% (5 year).
- CNG vehicle penetration is 0.56% (39,660 vehicles including hybrid CNG) with a CAGR of 39%.
- The state has 4 declared national waterways which can be utilized as a step for decarbonization.

Rajasthan

- Rajasthan has a population of **69 million (5.6%** of India).
- The state has a *per capita income* and *vehicle ownership* of *1487 euros and 0.19* vehicle per person respectively.
- The state has **3 national waterways**.
- It has *highest share of diesel vehicles in its 3-wheeler* registration with 94% of overall 3 wheelers. 3-wheeler mostly being used for last mile connectivity and goods movement can be decarbonized to reduce the emissions from intermediate para transit.
- The state's EV policy covers <u>5 out of the 8</u> <u>demand side incentives parameters</u>, and hence has good demand side incentives.
- It has 1.1% EV penetration (138,868 EVs) in cumulative vehicle registration which grew at a yearly CAGR of 76% (5 year).
- CNG vehicle penetration is 0.44% (55,620 vehicles including hybrid CNG) with a CAGR of 68%.

Sikkim

- Sikkim is the *least populous state with a* population of 0.6 million (0.1% of India).
- Sikkim has the *highest per capita income* with 5957 euros with vehicle ownership of 0.12 vehicle per person.
- Sikkim has *highest share of car registration with 60%* of its vehicle registration.
- Being a hilly state, it does not have any 3wheeler registered.
- It has 0.01% EV penetration (6 EVs) in cumulative vehicle registration which grew at a yearly CAGR of % (5 year).
- CNG vehicle penetration is 0.05% (34 vehicles) with a CAGR of %.
- The state does not have an EV policy

Tamil Nadu

- Tamil Nadu has a *population of 72 million (6%* of India).
- The state has a *per capita income and vehicle ownership* of *2652 euros and 0.24* vehicle per person respectively.
- The state has **10 declared national waterways.**
- Tamil Nadu has **3rd highest vehicle registration in the country with 17 million** vehicles registered from 2014 till date.
- The state has 3rd highest CO2 emission levels with 21 MTPA.
- It has clearly defined EV targets, but the policy doesn't cover significant parameters for demand side incentives (2 out of 8 demand side parameters), though the policy has decent supply side incentives.
- It has 0.7% EV penetration (119,313 EVs) in cumulative vehicle registration which grew at a yearly CAGR of 232% (5 year).
- CNG vehicle penetration is 0.16% (28,049 vehicles including hybrid CNG) with a CAGR of 538%.
- The state has 10 declared national waterways which can be utilized as a step for decarbonization.

Tripura

- Tripura has a population of 4 million (0.3% of India's population).
- The state has a *per capita income of 1742 euros* and *5th lowest vehicle ownership with* 0.12 vehicle registered per person.
- It has 2.7% EV penetration (12,109 EVs) in cumulative vehicle registration which grew at a yearly CAGR of 355% (5 year).
- CNG vehicle penetration is 6.6% (29,505 vehicles including hybrid CNG) with a CAGR of 11%.
- The state does not have an EV policy.

Uttar Pradesh

- Uttar Pradesh is the most populous state of the country with 200 million (16.5% of India's population) which is comparable to Brazil.
- The state has 2nd lowest per capita income in the country with 757 euros with vehicle ownership of 0.14 vehicle per person.
- Uttar Pradesh has declared 11 national waterways. Out of these, 1 is operational.
- The state has one of the most comprehensive EV policy with allocated budget to disperse incentives and focus on both demand and supply incentives to create an EV ecosystem <u>covering 10 out of 15</u> <u>parameters.</u>
- It has 5th highest EV penetration with 1.6% of registered vehicles.
- It has EV penetration with 1.6% (455,843 EVs) in cumulative vehicle registration which grew at a yearly CAGR of 30% (5 year).
- CNG vehicle penetration is 1.65% (458,699 vehicles including hybrid CNG) with a CAGR of 25%.
- With high population, high GSDP, one of the highest emissions along with a comprehensive EV policy, the state has both need and potential to decarbonize its transport market.

Uttarakhand

- Uttarakhand has a *population of 10 million* (0.8% of India's population).
- The state has a *per capita income of 2159 euros* and *vehicle ownership of 0.22* vehicle registered per person.
- Uttarakhand has achieved 100% railway electrification.
- EV policy of state is one of the least comprehensive policies with <u>3 out 8 demand</u> incentives and 1 out of 4 supply side incentives.
- It has 1.9% EV penetration (41,499 EVs) in cumulative vehicle registration which grew at a yearly CAGR of 28% (5 year).
- CNG vehicle penetration is 0.4% (9,137 vehicles including hybrid CNG) with a CAGR of 245%.

West Bengal

- West Bengal is the 4th lost populous state with a *population of* 91 million (7.5% of India's population).
- The state has *per capita income of 1462 euros* and *3rd lowest vehicle ownership with 0.10* vehicles per person.
- The state has **16 declared national waterways in or passing through the state. 2 of them are operational**.
- It has 3rd lowest level of CO2 emissions with 0.2 MTPA
- EV policy of the state has mandated the creation of charging infrastructure in new residential buildings, offices, parking lots, malls, etc.
- It has 0.6% EV penetration (55,934 EVs) in cumulative vehicle registration which grew at a yearly CAGR of 15% (5 year).
- CNG vehicle penetration is 0.07% (6,346 vehicles including hybrid CNG) with a CAGR of 96%.
- It has 5th lowest car registration with 9% of total registered vehicles.
- It has 2nd highest bus registration with 1.17% share of overall registered vehicles which can be translated to a higher public transport ridership in state.
- High bus registration leads the state to release *highest percent of CO2 emissions from buses with 1.7 MTPA* Thus, it becomes important to *decarbonize existing diesel bus fleet on a priority basis.*



Readiness Index



Four readiness indices were selected to examine the states' overall preparedness

Institutional Readiness

Institutional criterion assesses the state's readiness in regard to policies, incentives and implementation targets favorable for AFV uptake in the state.

Economic Readiness

- India being a cost competitive market, higher cost of AFVs comes as a significant deterrent, especially in rural areas where the average per capita income is a fraction of the urban income.
- For the successful adoption of AFVs, *affordability* is a key concern which is covered under economic readiness.

Infrastructure Readiness

- Infrastructure availability and efficiency have a significant impact on the AFV adoption in states
- Under *infrastructure readiness*, the current level of state's AFV infrastructure is covered.

Social Readiness

 Social readiness score reflects the level of acceptance among citizens regarding the adoption of AFVs and it is paramount for successful AFV adoption.

Delhi, Maharashtra, Gujarat, Uttar Pradesh and Tamil Nadu have highest level of readiness

State	Institutional Readiness	Economic Readiness	Social Readiness	Infrastructure Readiness	Total Readiness Score
Delhi	1.0	1.0	1.0	0.7	3.73
Maharashtra	1.0	0.4	1.0	1.0	3.35
Gujarat	0.6	0.5	0.8	0.7	2.64
Uttar Pradesh	0.8	0.2	0.9	0.7	2.49
Tamil Nadu	0.6	0.3	0.9	0.7	2.45
Karnataka	0.6	0.3	0.6	0.6	2.05
Chandigarh	0.8	0.6	0.2	0.3	1.98
Haryana	0.6	0.4	0.4	0.6	1.96
Rajasthan	0.8	0.2	0.4	0.4	1.81
Kerala	0.5	0.3	0.5	0.5	1.76
Odisha	0.9	0.1	0.3	0.4	1.65
Andhra Pradesh	0.5	0.2	0.4	0.5	1.62
West Bengal	0.7	0.1	0.2	0.7	1.60
Punjab	0.7	0.2	0.3	0.4	1.58
Madhya Pradesh	0.6	0.1	0.4	0.5	1.55
Goa	0.1	0.6	0.4	0.4	1.50
Jharkhand	0.7	0.1	0.4	0.4	1.48
Bihar	0.6	0.1	0.4	0.3	1.37
Chattisgarh	0.7	0.1	0.2	0.2	1.27
Uttarakhand	0.4	0.3	0.3	0.3	1.23
Puducherry	0.1	0.4	0.4	0.3	1.16
Assam	0.6	0.2	0.2	0.2	1.14
Himachal Pradesh	0.4	0.1	0.2	0.4	1.11
Jammu and Kashmir	0.1	0.1	0.5	0.4	1.04
Tripura	0.1	0.4	0.5	0.0	1.00
Meghalaya	0.7	0.0	0.1	0.2	0.98
Mizoram	0.0	0.2	0.3	0.0	0.50
Manipur	0.2	0.1	0.1	0.1	0.45
Arunachal Pradesh	0.2	0.1	0.0	0.1	0.42
Sikkim	0.0	0.2	0.0	0.1	0.33
Nagaland	0.0	0.1	0.0	0.1	0.18

Delhi social readiness adjusted to 1.0 as being a leader in AFV adoption, it has shown significant social acceptance.

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Delhi, Maharashtra, Odisha, Chandigarh, and Rajasthan scored the highest on institutional readiness

- Local, state, and central governments play a pivotal role in EV transition in states with the help of policies, regulations/mandates, and other fiscal and non-fiscal incentives.
- Institutional criterion assesses the state's readiness in regard to policies, incentives and implementation targets favorable for AFV uptake in the state.
- <u>Top states-</u> Delhi, Maharashtra, Odisha, Chandigarh and Rajasthan

Key Takeaways

- Being one of the major state level decarbonizing initiative, EV policy forms an important parameter for institutional readiness.
- It is observed that the EV policy of top 5 states, covers significant demand, supply and industry side incentives and also mentions the establishment of an EV cell.
- Amongst the top 5 states, only Odisha has no mention of emission guidelines across any of its policies.
- Delhi and Odisha have done well in achieving decent progress against the targets set in EV policy.

States	Institutional Readiness Score
Delhi	1.00
Maharashtra	0.98
Odisha	0.87
Chandigarh	0.84
Rajasthan	0.84
Uttar Pradesh	0.76
Chattisgarh	0.73
Punjab	0.71
West Bengal	0.71
Meghalaya	0.71
Jharkhand	0.68
Bihar	0.63
Gujarat	0.62
Haryana	0.59
Madhya Pradesh	0.59
Tamil Nadu	0.57
Karnataka	0.56
Assam	0.56
Andhra Pradesh	0.52
Kerala	0.46
Himachal Pradesh	0.40
Uttarakhand	0.37
Manipur	0.21
Arunachal Pradesh	0.19
Goa	0.06
Puducherry	0.06
Tripura	0.06
Jammu and Kashmir	0.06
Mizoram	0.00
Sikkim	0.00
Nagaland	0.00

Institutional Readiness Parameters

	Identified Nodal			Incentive Coverage in EV Policy			1	Implementati	
State	Agency for Transport Decarbonization	EV policy Present	State EV Cell or Steering	Budget	Demand Side Incentive	Supply Side and Industry Incentive	Promotion and Creation of Green Zones	Emission Guidelines	on Targets Scoring
Delhi									
Maharashtra									
Odisha									
Chandigarh									
Rajasthan									
Uttar Pradesh									
Chattisgarh									
Meghalaya									
Punjab									
West Bengal									
Jharkhand									
Bihar									
Gujarat									
Haryana									
Madhya Pradesh									
Tamil Nadu									
Assam									
Karnataka									
Andhra Pradesh									
Kerala									
Himachal Pradesh									
Uttarakhand									
Manipur									
Arunachal Pradesh									
Goa									
Jammu and									
Kashmir									
Puducherry									
Tripura									
Mizoram									
Nagaland									
Sikkim									

Delhi, Goa, Chandigarh, Gujarat and Puducherry have scored the highest on economic readiness

- For the successful adoption of AFVs, *affordability is a key concern* which is covered under economic readiness.
- AFVs are *still in a developing stage* they tend to have *relatively higher costs than conventional fuel vehicles.*
- India being a cost competitive market, higher cost of AFVs comes as a significant deterrent, especially in rural areas where the average per capita income is a fraction of the urban income.
- To assess the <u>economic readiness</u> the following parameters were chosen:



population



Urban share of states' Per Capita Income



Vehicle Ownership



Market Penetration of AFVs

• <u>Top states-</u> Delhi, Goa, Chandigarh, Gujarat and Puducherry.

States	Economic Readiness Score
Delhi	1.00
Goa	0.64
Chandigarh	0.62
Gujarat	0.53
Puducherry	0.44
Haryana	0.44
Tripura	0.44
Maharashtra	0.36
Karnataka	0.33
Kerala	0.30
Uttarakhand	0.30
Tamil Nadu	0.29
Sikkim	0.25
Punjab	0.22
Andhra Pradesh	0.19
Uttar Pradesh	0.19
Assam	0.18
Rajasthan	0.18
Mizoram	0.18
Chattisgarh	0.13
Madhya Pradesh	0.11
Ódisha	0.10
Arunachal Pradesh	0.09
Jharkhand	0.08
Manipur	0.08
Jammu and Kashmir	0.08
Himachal Pradesh	0.08
Bihar	0.06
West Bengal	0.06
Nagaland	0.06
Meghalaya	0.00

States with high scores in urban share, per capita income, and vehicle ownership have demonstrated *significant AFV** *adoption*

- The top 5 states show *high urban* share and high vehicle ownership score, resulting in decent EV and CNG penetration in the states.
- Although having the highest per capita income score, *Sikkim scores low* on *vehicle ownership* and *AFV penetration*.
- However, Assam has a high EV penetration score, even with low scores across all other parameters due to the *aggressive adoption of electric 3W* in the state.
- Despite the typical requirement of multiple supporting factors for significant AFV adoption, some markets have emerged without these conditions.

States	Urban % Share	Per capita income	Vehicle Ownership	EV Penetration	CNG Penetration
Delhi	1.00	0.72	0.68	1.00	1.00
Goa	0.60	0.90	1.00	0.36	0.02
Chandigarh	1.00	0.49	0.85	0.37	0.09
Gujarat	0.96	0.33	0.40	0.19	0.55
Puducherry	0.67	0.34	0.90	0.14	0.00
Haryana	0.28	0.46	0.50	0.23	0.57
Tripura	0.18	0.22	0.08	0.83	0.72
Maharashtra	0.40	0.29	0.28	0.29	0.47
Karnataka	0.33	0.47	0.39	0.37	0.04
Kerala	0.43	0.37	0.44	0.21	0.04
Uttarakhand	0.23	0.30	0.33	0.57	0.04
Tamil Nadu	0.44	0.39	0.39	0.21	0.02
Sikkim	0.17	1.00	0.07	0.00	0.00
Punjab	0.31	0.23	0.42	0.10	0.06
Andhra Pradesh	0.27	0.32	0.22	0.16	0.03
Uttar Pradesh	0.14	0.04	0.12	0.50	0.18
Assam	0.05	0.11	0.10	0.71	0.00
Rajasthan	0.17	0.17	0.25	0.33	0.05
Mizoram	0.48	0.19	0.26	0.01	0.00
Chattisgarh	0.15	0.11	0.25	0.24	0.00
Madhya Pradesh	0.20	0.15	0.18	0.10	0.03
Ödisha	0.08	0.15	0.16	0.20	0.02
Arunachal Pradesh	0.15	0.29	0.12	0.00	0.01
Jharkhand	0.16	0.06	0.14	0.18	0.03
Manipur	0.33	0.08	0.05	0.10	0.00
Jammu and Kashmir	0.20	0.15	0.06	0.15	0.00
Himachal Pradesh	0.00	0.31	0.17	0.05	0.01
Bihar	0.01	0.00	0.00	0.41	0.05
West Bengal	0.25	0.17	0.04	0.00	0.01
Nagaland	0.22	0.15	0.08	0.01	0.00
Meghalaya	0.11	0.08	0.00	0.01	0.00

Maharashtra, Delhi, Uttar Pradesh, Tamil Nadu and Gujarat have scored the highest on infrastructure readiness

- Infrastructure availability and efficiency have a significant impact on the AFV adoption in states
- Infrastructure readiness indicators assess the existing *AFV infrastructure* in terms of the number of cities with charging stations, number of AFV refueling stations, level of railway electrification, number of identified national waterways, and number of EVs per charger.
- <u>Top states-</u> Maharashtra, Uttar Pradesh, Gujarat, Delhi and Tamil Nadu.



State	Infrastructural Readiness Score			
Maharashtra	1.00			
Delhi	0.74			
Uttar Pradesh	0.68			
Tamil Nadu	0.67			
Gujarat	0.66			
West Bengal	0.66			
Karnataka	0.60			
Haryana	0.57			
Madhya Pradesh	0.50			
Kerala	0.47			
Andhra Pradesh	0.46			
Rajasthan	0.43			
Odisha	0.42			
Himachal Pradesh	0.39			
Goa	0.37			
Jammu and Kashmir	0.36			
Punjab	0.36			
Jharkhand	0.35			
Chandigarh	0.35			
Puducherry	0.29			
Uttarakhand	0.26			
Bihar	0.26			
Chattisgarh	0.25			
Assam	0.16			
Meghalaya	0.16			
Arunachal Pradesh	0.10			
Nagaland	0.10			
Sikkim	0.08			
Manipur	0.08			
Mizoram	0.04			
Tripura	0.00			

States with high infrastructural readiness have installed infrastructure for both CNG and EVs



- Delhi has high scores for EV charging stations, railway electrification, EV per charger and CNG stations but falls behind in number of waterways.
- Maharashtra, Tamil Nadu, Uttar Pradesh, and Gujarat are top 4 states with highest GSDP in India, and have done well in infrastructure readiness.
- Maharashtra having the highest score, has nearly double the number of cities with EV charging stations when compared with Tamil Nadu which has the second highest score in this parameter.

	Infrastructural Readiness					
States	Number of EV Charging Stations	Number of cities with EV Charging Stations	Railway Electrification	No. of Waterways	EV per charger	CNG Station
Maharashtra	0.36	1.00	0.85	0.88	0.83	0.65
Delhi	1.00	0.09	1.00	0.06	0.95	0.48
Uttar Pradesh	0.22	0.32	0.99	0.65	0.42	0.72
Tamil Nadu	0.24	0.55	0.88	0.59	0.86	0.16
Gujarat	0.11	0.41	0.71	0.29	0.75	1.00
West Bengal	0.10	0.32	0.83	0.94	1.00	0.05
Karnataka	0.38	0.27	0.59	0.65	0.87	0.26
Haryana	0.13	0.45	1.00	0.12	0.88	0.32
Madhya Pradesh	0.09	0.27	0.98	0.18	0.89	0.20
Kerala	0.10	0.27	0.90	0.29	0.84	0.10
Andhra Pradesh	0.12	0.18	0.96	0.18	0.89	0.16
Rajasthan	0.14	0.50	0.63	0.18	0.72	0.21
Odisha	0.06	0.05	1.00	0.35	0.81	0.05
Himachal Pradesh	0.01	0.05	1.00	0.18	0.97	0.01
Goa	0.02	0.05	0.78	0.35	0.90	0.01
Jammu and Kashmir	0.01	0.00	1.00	0.24	0.85	0.00
Punjab	0.07	0.05	0.66	0.24	0.90	0.18
Jharkhand	0.03	0.05	0.98	0.18	0.76	0.07
Chandigarh	0.03	0.05	1.00	0.00	0.94	0.03
Puducherry	0.00	0.00	1.00	0.12	0.68	0.01
Uttarakhand	0.03	0.09	1.00	0.00	0.56	0.03
Bihar	0.04	0.05	0.90	0.41	0.22	0.08
Chattisgarh	0.02	0.05	1.00	0.00	0.58	0.00
Assam	0.03	0.09	0.20	1.00	0.00	0.00
Meghalaya	0.01	0.00	0.00	0.29	1.00	0.00
Arunachal Pradesh	0.00	0.00	0.00	0.06	1.00	0.00
Nagaland	0.00	0.00	0.00	0.06	1.00	0.00
Sikkim	0.00	0.00	0.00	0.00	1.00	0.00
Manipur	0.01	0.00	0.00	0.00	0.97	0.00
Mizoram	0.00	0.00	0.00	0.06	0.79	0.00
Tripura	0.01	0.00	0.00	0.00	0.65	0.02

Delhi, Maharashtra, Tamil Nadu, Uttar Pradesh, and Gujarat have scored the highest on social readiness

• **Social readiness score** reflects the **level of acceptance** among citizens regarding the adoption of AFVs and it is paramount for successful AFV adoption.



- Social acceptance of citizens for adopting AFVs can be seen by their growth in the state over past years.
- Growth rate alone might not paint the complete picture, as larger markets grow at a slower pace, hence the AFV market size is also considered.
- Top states- Maharashtra, Tamil Nadu, Uttar Pradesh, Gujarat and Delhi

States	Social Readiness Score
Delhi	1.00
Maharashtra	1.00
Tamil Nadu	0.92
Uttar Pradesh	0.87
Gujarat	0.83
Karnataka	0.56
Jammu and Kashmir	0.53
Kerala	0.53
Tripura	0.50
Andhra Pradesh	0.45
Goa	0.43
Bihar	0.41
Puducherry	0.37
Haryana	0.37
Madhya Pradesh	0.36
Jharkhand	0.36
Rajasthan	0.36
Uttarakhand	0.30
Punjab	0.28
Mizoram	0.28
Odisha	0.26
Himachal Pradesh	0.24
Assam	0.24
West Bengal	0.17
Chandigarh	0.17
Chattisgarh	0.17
Meghalaya	0.11
Manipur	0.08
Arunachal Pradesh	0.04
Nagaland	0.03
Sikkim	0.00

Delhi social readiness adjusted to 1.0 as being a leader in AFV adoption, it has shown significant social acceptance. AFV means EV and CNG.

States with high CNG uptake present good EV uptake showing higher social readiness



- Uttar Pradesh and Delhi have low scores in EV registration growth rate as both have large EV markets (150,000 EV registrations since 2014).
- Maharashtra, Uttar Pradesh, Gujarat and Delhi have had presence of CNG vehicles prior to 2014, therefore their markets are relatively developed.
- CNG growth rate score is low across 4 of the top 5 states barring Tamil Nadu which has the highest score.

	Social Readiness				
States	Growth % EV	Registered EVs	Growth % CNG	Registered CNG including hybrids	
Maharashtra	0.45	0.47	0.16	1.00	
Tamil Nadu	0.65	0.26	1.00	0.03	
Uttar Pradesh	0.17	1.00	0.20	0.48	
Gujarat	0.62	0.20	0.17	0.78	
Delhi(*)	0.16	0.43	0.16	0.57	
Karnataka	0.32	0.40	0.51	0.05	
Jammu and Kashmir	1.00	0.01	0.21	0.00	
Kerala	0.69	0.13	0.36	0.03	
Tripura	0.95	0.03	0.17	0.03	
Andhra Pradesh	0.74	0.10	0.20	0.03	
Goa	0.52	0.02	0.50	0.00	
Bihar	0.26	0.28	0.43	0.05	
Puducherry	0.55	0.01	0.38	0.00	
Haryana	0.23	0.12	0.18	0.39	
Madhya Pradesh	0.58	0.08	0.23	0.04	
Jharkhand	0.24	0.06	0.60	0.01	
Rajasthan	0.28	0.30	0.26	0.06	
Uttarakhand	0.17	0.09	0.54	0.01	
Punjab	0.47	0.05	0.22	0.04	
Mizoram	0.76	0.00	0.00	0.00	
Odisha	0.40	0.09	0.23	0.01	
Himachal Pradesh	0.28	0.00	0.42	0.00	
Assam	0.23	0.20	0.26	0.00	
West Bengal	0.14	0.12	0.31	0.01	
Chandigarh	0.36	0.01	0.18	0.00	
Chattisgarh	0.31	0.08	0.17	0.00	
Meghalaya	0.30	0.00	0.16	0.00	
Manipur	0.41	0.00	0.00	0.00	
Arunachal Pradesh	0.15	0.00	0.19	0.00	
Nagaland	0.00	0.00	0.31	0.00	
Sikkim	0.10	0.00	0.16	0.00	

Delhi social readiness adjusted to 1.0 as being a leader in AFV adoption, it has shown significant social acceptance. The scores shown here for Delhi are prior to adjustment.

Note-Numbers in table represent normalized and adjusted values under all the factors of social readiness

States can be grouped in 4 archetypes covering their current level of readiness for adopting AFVs



All early adopters show high readiness scoring, but Delhi and Maharashtra stand out in the group



Readiness Scoring

State	Institutional Readiness	Economic Readiness	Social Readiness	Infrastructure Readiness	Total Readiness Score
Delhi	1.0	1.0	1 (*)	0.7	3.73
Maharashtra	1.0	0.4	1.0	1.0	3.35
Gujarat	0.6	0.5	0.8	0.7	2.64
Uttar					2.40
Pradesh	0.8	0.2	0.9	0.7	2.49
Tamil Nadu	0.6	0.3	0.9	0.7	2.45
Karnataka	0.6	0.3	0.6	0.6	2.05

Key takeaways

- All these states have strong scores in social and infrastructure readiness.
- Institutionally, Maharashtra and Delhi stand out on the top.
- Only Delhi is evincing an economic readiness.

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• Delhi social readiness adjusted as being a leader in AFV adoption, it has shown significant social acceptance.

Challenges & Opportunities for Early Adopters

State	Challenges	Opportunity
Delhi	 Low growth rate of AFVs as the market for AFVs is significantly developed already. 	 Well defined institutional mechanism and incentives One of the states with highest per capita income and high vehicle ownership, and hence presents a key market for AFV solutions. Sole state that has a greater proportion of AFV buses (87% CNG, 4% electric) than diesel buses, whereas in other states, buses predominantly operate on diesel. Good implementation with the established institutional framework have led to achieving highest no. of charging stations Innovative mechanisms and R&D initiatives: ✓ Delhi-Jaipur electric highway pilot project. First phase of this tech-trial run conducted in 2021 between Delhi and Agra. In the second test run, NHEV (National Highways for EV) aims to answer the concerns of the users and create awareness about CO2 emission saved by one EV over one year. ✓ Uber has begun piloting electric cabs in select areas. ✓ In 2020, Delhi became the first city in the country to roll out hydrogen-enriched compressed natural gas (HCNG) buses for public transport. Presence of Private Players-Yulu, Zypp, SmartE, BluSmart, LetsTransport, Lithium, Fortum, Volttic, Magenta, Kazam EV, Altigreen, Baaz Bikes, Battery Smart Charneup. Pure EV Vecmocon.
Maharashtra	 Per capita income high only in urban pockets. Though the state has performed well in infrastructure readiness in comparison to others, the total EV charging stations are limited considering the market size of the state (20 million registrations since 2014), 	 Well defined institutional mechanism and incentives State with highest number of cities with EV charging stations It has a transport policy with outlined measures for transport decarbonization. Innovative mechanisms and R&D initiatives: Implementation of pilot pedestrianization projects in high footfall areas Integration of EV chargers with urban infrastructure like streetlights Pilot project to shift non bulk freight to railways and water (Between central railways and Amazon) Pilot on the conversion of CNG buses to Bio-CNG buses from mandi waste. Conduct a study on existing battery recycling infrastructure. Midia's first bio-gas powered EV charging station. Set up by AeroCare Clean Energy in Mumbai. Uses food waste to create methane which produces electricity. Pollution Control Board (MPCB) has taken a step towards transparency by sharing continuous emission monitoring system (CEMS) data on their official website. Both real-time data and historical data are now visible on the MPCB website. Presence of Private Players- Yulu, Zypp, LetsTransport, Lithium, Hoppr, Charzer, Fortum, Magenta, Kazam EV, Altigreen, Bgauss

Challenges & Opportunities for Early Adopters

State	Challenges	Opportunity
Gujarat	• The state's EV policy lacks significant coverage of supply and industry side incentives leading to a low score for EV infrastructure.	 High industrialization, along with highest number of CNG stations in the country, has led to high adoption of CNG vehicles. Presence of identified national waterways have potential to reduce state's transport emissions as IWT is more energy efficient. Presence of Private Players- TDSG, Nexcharge, Yulu, Fortum
Uttar Pradesh	 2nd lowest per capita income, low urban population share and vehicle ownership, make a challenging environment for AFV adoption and lead to low AFV growth rate. Lack of emission guidelines and poor performance in implementing its set targets 	 High railway electrification present an opportunity to decarbonize state's emissions. Highest number of registered EVs, due to aggressive adoption of electric 3W. Presence of Private Players- Corrit Electric, Lohum
Tamil Nadu	• Absence of specific budget for disbursing incentives and abysmal progress in achieving its set targets, has led to low scores in AFV refueling stations and AFV penetration in state.	 State with 2nd highest "number of cities with EV charging stations" High railway electrification and presence of identified national waterways provide an avenue for decarbonizing the state's emissions. Presence of Private Players- Grinntech, Altigreen, Lithium, Kazam EV
Karnataka	Absence of specific budget for disbursing incentives in its EV policy.	 State with 2nd highest number of EV charging stations. With 14.9 million vehicle registrations, the state presents a huge potential AFV market. Presence of identified national waterways have potential to reduce state's transport emissions as IWT is more energy efficient. Innovative mechanisms and R&D initiatives: Ola is planning a pilot EV cab service in Bengaluru with 1000 cars Hygge energy implemented an EV charging project at the retail outlet of IOCL in Bengaluru In a first in the country, Bangalore Metropolitan Transport Corporation (BMTC) will be running 20 buses on 15% Methanol blended with Diesel (MD15). Flagged off in March 2023, the pilot will run for three months. India's first Hydrogen Internal Combustion Engine (H2-ICE) powered heavy-duty truck, flagged off at the India Energy Week (Feb –2023) in Bengaluru. A joint effort by Reliance Industries Limited and Ashok Leyland, the truck was under testing since last year. Presence of Private Players- Bounce, Yulu, Zypp, LetsTransport, Lithium, Fortum, Magenta, Kazam EV, 3EV, Altigreen, Cell Propulsion, ElectriPe, Sun Mobility, Motovolt Mobility, KwH Bikes

Fast followers show lower scores in economic and social readiness with the exception of Goa



Readiness Scoring					
State	Institutional Readiness	Economic Readiness	Social Readiness	Infrastructure Readiness	Total Readiness Score
Chandigarh	0.8	0.6	0.2	0.3	1.98
Haryana	0.6	0.4	0.4	0.6	1.96
Rajasthan	0.8	0.2	0.4	0.4	1.81
Kerala	0.5	0.3	0.5	0.5	1.76
Odisha	0.9	0.1	0.3	0.4	1.65
Andhra Pradesh	0.5	0.2	0.4	0.5	1.62
West Bengal	0.7	0.1	0.2	0.7	1.60
Punjab	0.7	0.2	0.3	0.4	1.58
Madhya Pradesh	0.6	0.1	0.4	0.5	1.55
Goa	0.1	0.6	0.4	0.4	1.50
Key takeaways					

- Most of these states have moderate to high scores in institutional readiness.
- Moderate scores in infrastructure readiness and lower scores in economic and social readiness.
- Goa is an exception, which has a decent economic readiness, but lacks significantly in institutional readiness.

Challenges & Opportunities for Fast Followers

State	Challenges	Opportunity
Chandigarh	 Low AFV penetration due to lack of AFV refueling infrastructure Unwillingness of citizens to use public transport due to short distance trips and high affordability of owning private vehicles. 	 High urban share, possibility of high future emissions can become a trigger for faster AFV adoption. High per capita income and high vehicle ownership make state a key market for AFV solutions. High railway electrification present an opportunity to decarbonize state's emissions. Innovative mechanisms and R&D initiatives: Chandigarh administration and UK are jointly conducting a study for decarbonizing transport in the Chandigarh city. Project is funded by the UK government. India's first electric tractor venture AutoNxt Automation showcases its self-driving Electric Tractor at Chandigarh EV Expo organized by PHDCCI. (PHD Chamber of Commerce and Industry)
Haryana	 Challenging eco-system for AFVs in state due to low urban share Lacking a state EV cell, clear budget for incentives, emission guidelines, and ranking lower as compared to other states in institutional readiness, has led to a lack of AFV refueling infrastructure in the state. Low EV penetration due to lack of AFV refueling infrastructure. 	 High railway electrification present an opportunity to decarbonize state's emissions. Presence of identified national waterways have potential to reduce state's transport emissions as IWT is more energy efficient.
Rajasthan	 Challenging eco-system for AFVs in state due to low urban share and low per capita income leading to lower AFV penetration. Due to recent launch of policy, there is lack of AFV refueling infrastructure 	Presence of identified national waterways have potential to reduce state's transport emissions as IWT is more energy efficient.
Kerala	 Lacking an EV cell and a specific budget for disbursement of incentives have led to low AFV refueling infrastructure and AFV penetration. 	 High railway electrification present an opportunity to decarbonize state's emissions. Presence of identified national waterways have potential to reduce state's transport emissions as IWT is more energy efficient. Innovative mechanisms and R&D initiatives: Thiruvananthapuram – Kasaragod Semi High-Speed Rail (SilverLine) Project: Government claims that the line will contribute to a decrease in greenhouse gas emissions. The project also plans for trains and stations to be 100% reliant on renewable energy sources ✓ Kochi will soon have the distinction of being the first Indian city to roll out a water metro, the new innovative transport system combining water-based transport with road and rail. The metro boats are built as Hybrid-EVs and 100% of its energy usage shall be from land-based renewables.

Challenges & Opportunities for Fast Followers

State		Challenges		Opportunity
Odisha	Ch	hallenging eco-system for AFVs in state due to low urban share,	•	High railway electrification present an opportunity to decarbonize state's emissions.
	penetration	•	Presence of identified national waterways have potential to reduce state's transport emissions as IWT is more energy efficient.	
	• La	ack of AFV refueling infrastructure.		
Andhra Pradesh	• Cł	hallenging eco-system for AFVs in state due to low urban share	•	High railway electrification present an opportunity to decarbonize state's emissions.
	• De re	espite the policy being launched in 2018, it still has a lack of AFV efueling infrastructure.	•	Presence of identified national waterways have potential to reduce state's transport emissions as IWT is more energy efficient.
			•	Presence of Private Players-Bounce, Yulu, Zypp, LetsTransport, Lithium, Fortum, Magenta, Kazam EV, 3EV, Altigreen, Cell Propulsion, ElectriPe, Sun Mobility, Motovolt Mobility, KwH Bikes
West Bengal	Ch	hallenging eco-system for AFVs in state due to low urban share,	•	High dependance on public transport.
leading to lower AFV penetration	•	High railway electrification present an opportunity to decarbonize state's emissions.		
	Du no	ue to the recent launch of EV policy launch in 2022, the state has ot been able to realize its policy targets and there is a lack of AFV	•	Presence of identified national waterways have potential to reduce state's transport emissions as IWT is more energy efficient.
	•	Innovative mechanisms and R&D initiatives:		
				 Hindustan Motors Ltd is expecting to complete due diligence for its proposed electric two-wheeler project with a foreign partner. Combined investment for the electric vehicle (EV) project will be around Rs 600 crore. The pilot project will come up at the Uttarpara plant in West Bengal, where 'Ambassador' cars were earlier manufactured.
			•	Presence of Private Players-Motovolt Mobility

Challenges & Opportunities for Fast Followers

State	Challenges	Opportunity
Punjab	Challenging eco-system for AFVs in state due to low urban share, lack of AFV refueling infrastructure leading to low AFV penetration.	Presence of identified national waterways have potential to reduce state's transport emissions as IWT is more energy efficient.
Madhya Pradesh	 Challenging eco-system for AFVs in state due to low urban share, low per capita income and one Lack of EV charging station due to lack of charging infrastructure incentives Lacks a state EV cell and clear budget for incentives disbursement leading to lower adoption of EVs. 	 It has a transport policy with outlined measures for transport decarbonization. High railway electrification present an opportunity to decarbonize state's emissions. Presence of identified national waterways have potential to reduce state's transport emissions as IWT is more energy efficient.
Goa	 Lack of policy initiatives lead to lack of AFV refueling infrastructure and low AFV penetration. 	 2nd highest per capita income and high vehicle ownership make state a key market for AFV adoption. High urban share, possibility of high future emissions can become a trigger for faster AFV adoption High railway electrification present an opportunity to decarbonize state's emissions. Presence of identified national waterways have potential to reduce state's transport emissions as IWT is more energy efficient.

Slow starter states struggle in economic and infrastructure readiness



Readiness Scoring

State	Institutiona I Readiness	Economic Readiness	Social Readiness	Infrastructure Readiness	Total Readiness Score
Jharkhand	0.7	0.1	0.4	0.4	1.48
Bihar	0.6	0.1	0.4	0.3	1.37
Chattisgarh	0.7	0.1	0.2	0.2	1.27
Uttarakhand	0.4	0.3	0.3	0.3	1.23
Puducherry	0.1	0.4	0.4	0.3	1.16
Assam	0.6	0.2	0.2	0.2	1.14
Himachal					1 1 1
Pradesh	0.4	0.1	0.2	0.4	1.11

Key takeaways

- Lower scores across all readiness indexes, especially in economic and infrastructure readiness.
- Most of these states have moderate institutional readiness barring Puducherry, which has extremely low institutional readiness.
- Barring Puducherry, most states score very low in economic readiness, which could pose a challenge for AFV adoption.

Challenges & Opportunities for Slow Starters

State	Challenges	Opportunity
Jharkhand	 Lacks emission guidelines and clear budget for EV incentives Low urban population share, low per capita income, low vehicle ownership coupled with a lack of AFV refueling infrastructure have led to lower AFV penetration in the state. 	High railway electrification and presence of identified national waterways provide an avenue for decarbonizing the state's emissions.
Bihar	 Lacking a state EV cell, specific budget for incentives, and emission guidelines, the state has moderate institutional readiness, and has fallen behind in AFV refueling infrastructure. 2nd lowest urban population share along with lowest per capita income and vehicle ownership lead to a challenging ecosystem for AFV adoption. 	 High railway electrification and presence of identified national waterways provide an avenue for decarbonizing the state's emissions. New yearly registrations in the state grow at a 6% CAGR and with over 9 million registrations since 2014, the state proves to be a potential market for AFVs.
Chattisgarh	 Absence of emission guidelines and specific budget for incentives coupled with the fact that the state EV policy came in 2022, it has yet to install significant AFV infrastructure. Low urban population share, and per capita income have led to low AFV penetration. 	High railway electrification provide an avenue for decarbonizing the state's emissions.
Uttarakhand	 Lacking a state EV cell, clear budget for incentives, emission guidelines, and ranking lower as compared to other states in institutional readiness, has led to lack of AFV refueling infrastructure in the state. The state also has low urban share. 	High railway electrification provide an avenue for decarbonizing the state's emissions.

Challenges & Opportunities for Slow Starters

State	Challenges	Opportunity
Puducherry	Absence of an EV policy, and any state-level institutional framework has led to a significant lack of AFV refueling infrastructure and low AFV penetration.	 It has a transport policy with outlined measures for transport decarbonization. High urban % share and highest vehicle ownership, provide an opportunity for a welcoming AFV market. High railway electrification and presence of identified national waterways provide an avenue for decarbonizing the state's emissions.
Assam	 Lacking an EV cell, specific budget for incentives, emission guidelines and with a moderate institutional readiness, the state has a lack of AFV refueling infrastructure. Low urban share, per capita income, vehicle ownership present a challenging market for AFV adoption. 	 Presence of identified national waterways have potential to reduce state's transport emissions as IWT is more energy efficient. Innovative mechanisms and R&D initiatives: ✓ Roll out of M15 petrol (15% methanol with petrol) in Tinsukia's district
Himachal Pradesh	 Lowest urban share and recent launch of EV policy in 2022 have led to a lack of AFV refueling infrastructure and low AFV penetration in the state. Low scope of road widening to provide "complete streets"* due to lack of land availability. Current EV policy lacks specificity while covering various parameters. 	 It has a transport policy with outlined measures for transport decarbonization. High railway electrification provide an avenue for decarbonizing the state's emissions. Transport department has converted its fleet to EV and now the state government aims to convert entire government fleet to EV. The state is planning to come up with a revised EV policy with even more aggressive targets. State is developing footpaths and ropeways to decongest and decarbonize its transport.

Due to extremely low readiness scores across indexes these states would need significant push to develop AFV ecosystem



Challenges & opportunity for Reluctant Adopter States

State	Challenges	Opportunity
Jammu & Kashmir	 No state level initiatives for AFV adoption, and a lack of AFV refuelling stations have led to lesser registered AFVs. One of the lowest vehicle ownership. 	
Tripura, Meghalaya, Mizoram, Manipur, Arunachal Pradesh, Sikkim, Nagaland	 Low scope of road widening to provide "complete streets"* due to lack of land availability. No state level initiatives for AFV adoption (except Arunachal Pradesh, Meghalaya and Manipur), leading to low level of infrastructure readiness across all parameters. Low economic readiness has led to lower AFV penetration. No emission guidelines (except Tripura) 	Challenges created due to low institutional and economic readiness of these states can be dealt with local employment generation models which can help in creating an ecosystem for AFV adoption.
Exceptions		 Manipur has a transport policy with outlined measures for transport decarbonization. High AFV penetration and emission guidelines in Tripura High institutional readiness of Meghalaya due to presence of EV policy. Arunachal Pradesh has an EV policy, though it is less comprehensive than other states.



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Annexure



National EV Policy landscape

National Electric Mobility Mission Plan (NEMMP), 2013-2020



To deploy about 6-7 million electric vehicle / hybrid electric vehicles on Indian roads by 2020, primarily focusing on two wheelers and four wheelers with the aim to achieve national fuel security

Faster Adoption & Manufacturing of (Hybrid and) **Electric Vehicles (FAME) –** Phase I (Completed), 2015



The funds under FAME-I were used to provide direct subsidy to the EV buyers. In addition, grants for specific projects (as pilot) were sanctioned. R&D/technology development, and public charging infrastructure components were also sanctioned under the scheme.

nmem

FAME India Scheme Phase II (National Mission on Electric Mobility)

Faster Adoption &

Manufacturing of (Hybrid and)

Electric Vehicles (FAME) –

Phase II (Ongoing Policy),2019

3

This phase aims to generate demand by way of supporting 7000 e-Buses, 5 lakh e-3 Wheelers, 55000 e-**4 Wheeler Passenger Cars** (including Strong Hybrid) and 10 lakh e-2 Wheelers

Draft Battery Swapping Policy,2022



The vision of policy is to catalyze large scale adoption of EVs. Policy will support adoption of Battery Swapping implemented via **Battery as a Service (BaaS)** business model.

Overview of Biofuel Policy



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Draft LNG Policy – To meet India's decarbonization commitments, a need for integrated LNG policy was felt by the government

India is the **3rd largest energy consumer** in the world and the among top 13 globally in gas consumption. Every **1 MMSCMD** of natural gas usage as a substitute for polluting liquid fuels can reduce around **270,000 tons of CO2** emission per annum.

Why the need for LNG?

To meet India's COP 21 commitments in UNFCC, the government has planned to increase the share of natural gas in primary energy basket to **15% by 2030** from the current **6.3%, and create a gas-based economy.**

LNG can aid in meeting this goal, and hence, a need has arisen for an integrated policy for the procurement, storage , transportation and use including sale and marketing of LNG.

Upstream

- * LNG Terminals and Regasification facility
- Create LNG terminals with a capacity more than 100 MMTPA to achieve 15% share of natural gas in the primary energy mix by 2030.
- Create a regasification capacity of 70 MMTPA by 2030 and 100 MMTPA by 2040.
- * Virtual pipelines and enabling infrastructure

Midstream

- ***** Dedicated highways with extensive LNG infrastructure
- ***** High volume closed loop truck circuits (such as mining etc.)
- ***** Conversion of transport vehicles to LNG based transmission
- * Mobile dispensing
- Create enabling regulatory environment in respect of safety and technical requirements
- ***** Partnering automotive industry for enhancing manufacturing facility
- * Gas exchange

Downstream

- LNG stations (1000 LNG stations)
- * Marketing and sale of LNG
- * Enhancing use of LNG as transport fuel in long haul heavy duty trucks through incentives
- ***** Explore adoption of LNG in green field areas

R&D

- Explore and promote new technologies for establishing a value chain for LNG
- * Creation of start-up environment

Transport policy of States

State	Transport Policy	Measures taken	Link to PDF
Himachal Pradesh	Transport Policy 2014	 Encourage scrapping the obsolete fleet causing pollution Review working of pollution check centers with an effective monitoring regime. Encourage alternate modes of transport like cable cars, trams and non-mechanised modes to achieve sustainable transport development Modal shift from private to the public transport 	https://rajpatrahimachal.nic.in/open File.aspx?id=19222&etype=Notice
Madhya Pradesh	Madhya Pradesh Urban Transport Policy 2021/22 (Draft)	 Improving public transport Promotion of non-motorized transport Like pedestrian & bicycle network infrastructure Promotion of green hydrogen, ethanol, methanol, LPG and CNG will be promoted for use in public transport and private passenger vehicles. Encouraging fuel stations providing alternative fuels E-vehicles will be promoted by Regional Transportation Authority (RTO) in activities such as para transit, first &last mile logistics etc. Solar energy-based charging stations will be explored and integrated in all plans of smart cities. In order to promote e-rickshaws, Government of Madhya Pradesh (GoMP) will develop battery swapping facilities and charging infrastructure 	https://aiggpa.mp.gov.in/projectdet ails/view/M0FEaDA4ZVpKT0FPTTIM WWV4S1JZdz09
Maharashtra	Maharashtra State Urban Transport Policy, 2017 (Draft)	 Periodic vehicle emissions checks and monetary penalties for non-compliance. Promote walking, cycling and public transport to maintain their modal share at least 80% of all person trips 	https://www.maharashtra.gov.in/sit e/Upload/Acts%20Rules/Marathi/N otification%20for%20Transport%20 Policy.pdf
Manipur	State Transport Policy, Manipur, 2013 (Draft)	 Levy of green tax Promotion of non- motorized mode of transport and public transport 	http://manipur.gov.in/wp- content/uploads/2013/11/draft- revised-state-transport-policy.pdf
Puducherry	Transport Policy for the Union Territory of Puducherry, 2017	 Encourage introduction of new generation cleaner energy buses. Share of public transport buses will be increased from the present 20% to 50% by 2036. Preferential treatment to public transport in the tax structure as compared to personalized transport. Reduce dependency on personal transport and increase the share of railways in inter-state and intercity transport and that of buses in intra-state and intra-city transport. Integrated network for pedestrians and non-motorized traffic will be established 	https://transport.py.gov.in/sites/def ault/files/transport-policy-2017.pdf

Fuel Efficiency and Emissions Standards

Policy	Launched	Description
Bharat Stage VI Emission Standards	Draft Notification issued in Feb 2016. Effective April 1, 2020	The standards apply to light- and heavy duty vehicles, as well as two- and three-wheeled vehicles. The adoption of the BS VI emission standards was to essentially bring Indian motor vehicle regulations into alignment with European Union regulations
Corporate Average Fuel	2017	The fuel consumption standards would be effective from 2017-18 onwards, and a second set of standards would come into force from 2022-23. <i>The standards relate the Corporate Average Fuel Consumption to the Corporate Average Curb Weight of all the cars sold by a manufacturer in a fiscal year.</i>
Economy (CAFÉ) norms	2017	<i>It may be noted that the standards apply to the Corporate Average Fuel Consumption</i> i.e. the average of the standard fuel consumption of all vehicles sold by the manufacturers in the fiscal year, and not to the fuel consumption of an individual model.
	2017	Bureau of Energy Efficiency (BEE) published fuel-efficiency standards for HVDs with a GVW over 12t in 2017 and amended the regulation in 2019 to include standards for vehicles of 3.5t to 12t .
		The standards adopted in 2017 were designed as a two-phase approach:
Fuel-efficiency standards for HVDs		 Phase I entered into force in April 2018 and Phase II, originally planned for April 2021, was eventually not implemented.
		• MoRTH re-notified Phase-I standards in November 2022 which shall come into force in April 2023.
		Manufacturers must demonstrate compliance with the rule by evaluating vehicles over the constant speed fuel consumption (CSFC) test procedure.

Aviation Policies in Indian States



Andhra Pradesh Civil Aviation Policy, 2015

To *increase* number of airports from 1 international airport to at least 3 modern *international airports* in the state by the year 2022 Uttar Pradesh Civil Aviation Policy, 2017



to connect the underserved as well as unserved airports/airstrips/locations through incentives from central and state governments.

Rajasthan Civil Aviation Policy, 2018

To *up-grade and modernize* the infrastructure at existing airports/airstrips

To provide seamless air transportation to all parts of the state for *sustainable development of trade and tourism*.



To aid the potential of tourism by linking major tourist spots of the state with various domestic and international locations by adding at least 3 potential airstrips to "Functional Airports"

Only National level policies present in Inland Waterways Transport

Coastal and inland waterways contribute



~6% of the country's freight

modal mix

while adjacent developing economies, such as Bangladesh (16%) and Thailand (12%)





Inland Waterway Policy, 2001

Encourage large-scale participation of the private sector both for the creation of infrastructure and for fleet operations.

Increase cargo movement to 1 billion tonne kilometers, thus reducing fuel cost by about Rs. 25 crores and the cost of transportation by about Rs. 45 crores.

Sections declared as National Waterways

1620 km on Ganga	890	km on Brahmaputra	205 km in Kerala
	- ·		
588 km in West Bengal &	Orissa	1,027 km across Andhra Pradesh, Tamil Nadu &	
		Pudu	Icherry

National Waterways Act 2016

111 waterways(including 5 existing and 106 new) have been declared as National Waterways (NWs). Development activities have been initiated in the first 13 NWs out of the 25 viable NWs

Center receives the *authority to control and establish inland waterways*, which Parliament has proclaimed to be *national waterways* by statute, as provided in the Inland Water Authorities Act, 1985

India Maritime Vision, 2030

Propelling India to the *forefront of the Global Maritime Sector*

Source: https://pib.gov.in/PressReleasePage.aspx?PRID=1795504 https://pib.gov.in/PressReleasePage.aspx?PRID=1803364 http://sagarmala.gov.in/sites/default/files/MIV%202030%20Report.pdf, Indian Express, https://www.hindustantimes.com/opinion/inland-waterways-will-reshape-transportation-101668350178132.html

India Maritime Vision, 2030 focuses on decarbonization targets for ports but mentions no targets for clean fuel adoption in ships

India Maritime Vision, 2030

- Propelling India to the forefront of the Global Maritime Sector
- One of the 10 Key themes of MIV 2030 -*Enhance Cargo and Passenger Movement through Inland Waterways*
- Increase share of Renewable energy consumption at ports (self generated + procurement from grid) to 60% from Current share of-<10%
- Target of 30% reduction in CO2 emission / ton of cargo
- Indian ports shall increase adoption of LNG with bunkering facilities in next 5-10 years.
- Indian Ports shall look to achieve 50% vehicle switch towards cleaner fuels (for vehicles used at port) C N G, LNG and Electricity by 2030.
- Indian Ports shall drive a pan-India electrification program aimed to achieve more than 50% electrified material handling equipment by 2030



Indian Railways Electrification Targets and Current Status

Annual Electrification of Railways



Electrification Targets

- **By FY 2024**: Complete electrification of Indian Railways
- Status as on March 2022: 50,394 RKMs out of 65,093 RKMs (77.41% of total Broad Gauge network)
- Targets also include Konkan Railways

Infrastructure Augmentation

- 2 dedicated freight corridors
 - Mumbai Delhi (1520 KMs)
 - Ludhiana Dankuni (1856 KMs)

Units: Route, in kilometers Source: Indian Railways Yearbook 2021-22

GESI in Transport policies of states

State	Policy/ document for GESI support	Takeaway	Link
Kerala	Gender Equality and Women's Empowerment Policy for Kerala, 2014- 2020	Metropolitan transport authorities as the nodal agency for gender mainstreaming in the transport sector	http://swd.kerala.gov.in/DOCUMENT S/Policy/State%20Policy/genderpolc y 1458713694.pdf
Himachal Pradesh	• Transport Policy 2014	 Due care will be taken to provide toilets, waiting rooms and childcare facilities in all major bus stands. Fifty percent seats will be reserved for ladies in all local buses and priority will be given to ladies in all buses. Bus stands will be fitted with cameras to ensure 24 x 7 surveillance. Further, to ensure women participation in transport planning and regulation one member each will be appointed from amongst women in the State Transport Authority (STA) and Himachal Pradesh Road Transport Corporation (HRTC). Provide service to the under-served or un-served areas, habitations having majority of Scheduled Castes (SC), Scheduled Tribes (ST) and Other Backward Castes (OBC) population. Appropriate tax incentives will be given to make operations viable in such areas 	https://rajpatrahimachal.nic.in/open File.aspx?id=19222&etype=Notice
Maharashtra	Maharashtra State Policy and Action Plan for Gender Equality and Women's Empowerment 2022	 Gender and disabled friendly and inclusive design of vehicles and transport infrastructure Ensuring safety and security of women and transgender persons Providing special/concessional fares proportionate reservation of seats Prioritizing auto, taxi, heavy vehicle permits for aspiring women and transgender persons Prioritizing employment and entrepreneurial opportunities Periodic gender equality and social inclusion (GESI) sensitization of all transport personnel 	http://www.bamu.ac.in/Portals/0/GE WE-Policy.pdf
Madhya Pradesh	Empowering Women through Safe and Simplified Transport Services to Improve their Mobility, 2014	 Removal of films glass from windows for better visibility from outside reserving Seat no 11 to 16 exclusively for woman passengers Installation of the CCTV and GPS in the public transportation and checking the records of all the driver before giving them charge Reservation of first row of seats behind the driver with facility of curtains from three sides was made mandatory in stage carrier buses. This step was taken for the newborn infants travelling and the lactating mothers Recruitment of a female driver or travelling of a female staff/ teacher was made mandatory when the school buses are carrying girls. Exhibition of women help, and police help line number Free driving license for female Special learning license drive for female 	https://publicadministration.un.org/ unpsa/Portals/0/UNPSA_Submitted Docs/2018/CD264AF2-5239-4451- <u>84D1-</u> 7692B4B992BC/Empowering%20Wo men%20through%20Safe%20and%2 OSimplified%20Transport%20Service s%20to%20Improve%20their%20Mo bility%20Final.pdf?ver=1439-05-26- <u>111952-253</u>
Puducherry	Transport Policy for the Union Territory of Puducherry, 2017	Improvement in terms of coverage, performance and capacity in this administration	https://transport.py.gov.in/sites/def ault/files/transport-policy-2017.pdf
Tamil Nadu	Tamil Nadu State New Policy for Women 2021 (Draft)	 All forms of Transport systems should be facilitated to be women friendly. In Buses the first half of the seats shall be earmarked for women and front exit/ entrance shall be used only by women. Instant on / off boarding of public transport at remote locations / remote areas in cities without bothering about public bus stops. To facilitate women street vendors who normally rely on public transport, to transport their freight, exclusive Buses (multi modal transport systems included) with carriage space to keep big bags, baskets, big vessels etc may be deployed. 	https://cms.tn.gov.in/sites/default/fil es/documents/TN Policy Women 2 021_draft.pdf
Uttar Pradesh	Handbook on Gender Issues in Roads and Transport Sector,2020	Network improvement- road upgraded infrastructure incorporate elderly people, women, children and people with disabilities friendly (EWCD) design and safety measures institutional strengthening of PWD- civil works contracts hire females for at least 30% of the routine maintenance works Comprehensive road safety- disseminate women help line number on all public transport vehicles	http://www.uppwd.gov.in/site/writer eaddata/siteContent/WB/20201125 1221575951Handbook%20on%20G ender%20Issues%20in%20Roads%2 0and%20Transport%20Sectors March%202020.pdf



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Detailed EV Policy Analysis



States	Budget for Incentives	Subsidy For E-Buses In Addition To Fame II	Subsidy For Other Segments	Road Tax + Registration Cost Exemption	Interest and Retrofitting	Electricity Tariff Benefits To Consumers	Scrappage Incentive
Andaman and Nicobar	-	Purchase incentive of 10% of the cost of e-bus, upto a maximum of ₹8 lakh e-bus	For 4W strong hybrid/fuel cell: Purchase incentive ₹10,000 kWh, up to a maximum of ₹1,00,000	100% exemption		Rs 6.9/unit	2W: ₹5,000 3W: ₹10,000 4W: ₹25,000 L5N & N1: ₹20,000 Bus: ₹50,000
Chandigarh	-	-	Upfront: 25% of Cost of Bicycle or max ₹3,000	100% exemption	3W: A subsidy of 15% on total kit cost or max ₹10,000	3.60 kWh as per JERC	2W: ₹5,000 3W: ₹15,000 4W: ₹7,000
Chhattisgarh	-	100% SGST will be reimbursed along with registration fee exemption	-	100% exemption		-	Additional monetary support will be provided via separate transport fund
Delhi	Rs 100 crore	E-buses to get subsidies of about Rs 45 lakh on a bus costing Rs 1.5-Rs 2 crore — 5 per cent of capital cost	Upfront subsidy of around ₹5,500	100% exemption	The interest subvention of 5% applicable, only if loan is from DFC	Rs 4 or 4.5 per kW depending on the station	2W: ₹5,000 3W: ₹7,500
Gujarat	Rs 870 crore	-	-	50% exemption		-	-
Jharkhand	-	Incentive of 10% of the ex- showroom price of vehicle up to Rs 20 lakh	-	100% exemption for first 10,000 buyers then decreases		Rs 6-6.25/unit	-
Karnataka	-	-	-	100% exemption		100% duty exemption	-
Madhya Pradesh	-	-	-	100% exemption on registration fee, road tax at 1%		Rs 6/unit	-
Maharashtra	Rs 930 crore	Incentive of 10% of the ex- showroom price of vehicle up to ₹20 lakh	-	100& exemption		Rs 4-6.6/ unit	2W: ₹7,000 3W: ₹15,000 4W: ₹25,000
Meghalaya	Rs 25.42 crore	Purchase subsidy ₹4000/- per KWh with maximum ex-factory price to be at ₹2 crore for EV buses	Strong hybrid 4W: Subsidy ₹4000 per kWh for maximum ex-factory price to avail incentive is ₹15 lakh	100% exemption		Provide attractive electricity tariff including fixed demand charges for the EVCS.	_

States	Charging Infrastructure Incentive Mandates For Charging Infrastructure		State EV Cell Or Steering Committee
Andaman and Nicobar	Slow: Capital Subsidy of 60% of the value of the charging station equipment/machinery or a maximum subsidy of ₹10,000 per station Fast: Capital Subsidy of 50% or ₹5,00,000 max per station	-	A high power Committee in the form of UT Electric Vehicle Board will be constituted at the UT level to monitor the implementation of this policy
Chandigarh	Private Charging: Infrastructure incentive of ₹6,000 max for 30,000 Pvt chargers Public Charging Station (high capacity): GST reimbursement or max ₹50,000	20% of all vehicle holding capacity/parking to be charging infra ready	CREST will be leading the committee along with other departments.
Chhattisgarh	Capital subsidy of 25% on cost of the equipment & als government will also provide 100% SGST reimbursement	The State Government shall promote charging infrastructure of different capacities (Levels 1, 2and 3) and promote variety of business models	The nodal agency will be leading and responsible for setting up the committee and monitor the growth.
Delhi	100% grant for the purchase of charging equipment up to ₹6000 per charging point	20 % of all vehicle holding capacity/parking required to be Electric Vehicle ready	State EV cell under transport department in place which monitors the growth of EVs in the states.
Gujarat	Capital Subsidy of 25% of the value of the charging station equipment /machinery upto a maximum subsidy of ₹10,00,000	-	Transport department will be the nodal agency (committee to to monitor the growth)
Jharkhand	Slow: 60% or ₹10,000 max of the total cost Moderate/Fast: 50% or ₹5 Lakh max of the total cost Solar based: 70% or ₹7 lakh max of the total cost	-	Under the Industrial department steering committee
Karnataka	-	_	Under the BESCOM Karnataka electric vehicle cell will be responsible for monitoring the EV growth
⁄ladhya Pradesh	-	-	Madhya Pradesh Urban Development & Housing Department (UDHD), Government of Madhya Pradesh ('GoMP'), will be the nodal department for the implementation of Madhya Pradesh Electric Vehicle (EV) Policy
Maharashtra	Slow: 60% of the cost or ₹10,000 max Moderate/fast: 50% of the cost or ₹5,00,000 max	New residential buildings will be mandated to have at least 20% of the total parking spaces as EV ready of which 30% should be in common parking spaces or parking spaces unallotted to any individual residence owner	Respective cities under state have formed their EV Cell under the GoM
Meghalaya	-	Provide Government land, wherever available, free of cost, for the first 5 years in order to make the EVCS economically viable.	Transport dept will lead the committee and support the growth of EVs in the state

States	Budget for Incentives	Subsidy For E-Buses In Addition To Fame	Subsidy For Other Segments	Road Tax + Registration Cost Exemption	Interest, Retrofitting, Scrappage	Electricity Tariff Benefits To Consumers
Odisha	-	Incentive of 10% of the ex- showroom price of vehicle up to ₹20 lakh	-	100% exemption	 100% interest free loans to State Govt employees. Interest subvention of 5% on loans for purchase of E- Bus, electric goods carriers. 	Rs 5.70/unit
Punjab	-	-	Ecycle: 25% of max sales price or ₹5,000 per cycle (whichever is lower) Ecycle cargo: 25% of max sales price or ₹15,000 per cycle (whichever is lower)	100% exemption		Rs 6/unit
Rajasthan	40 crore	As per battery capacity incentive will be decided by state between ₹1 lakh to 5 lakh	_	100% exemption	15% of the retrofit kit cost (including taxes) up to ₹10,000 per vehicle	Rs 6/unit
Tamil Nadu	-	-		100% exemption	-	Rs 8-10/unit as per time slots
Telangana	-	-	-	100% exemption	3W: A subsidy of ₹10,000 allocated for retrofitting	Rs 6/unit
Uttar Pradesh	410 crore	15% of ex-factory cost upto ₹20 lakh per vehicle	-	100% exemption	-	Rs 5.90-6.20/unit
West Bengal	-	Purchase subsidy ₹20,000/- per KWh with maximum upto ₹50 lakh, ex-factory price to be at ₹2 crore for EV buses	-	100% exemption	-	Rs 6/unit
Andhra Pradesh		-	-	100% exemption	-	-
Arunachal Pradesh	-	-	-		-	-
Assam		-	-	100% exemption	15% or up to max ₹15,000	100% duty exemption
Bihar	-	₹10,000 per kWh of battery capacity subject to a maximum of ₹25 lakh per vehicle	4W Hybrid: Purchase subsidy ₹10,000 per kWh with max incentive around ₹13,000	100% exemption	Interest subvention of 10% to buyer of light electric freight vehicle or e-bus	Rs 7.15/unit
Haryana	-	Incentive of 10% of the ex- showroom price of vehicle up to ₹10 lakh	-	100% exemption, 75% exemption for 4Ws	-	Phase wise/ City wise, promotional discounted tariff
Himachal Pradesh	_	-	-	100% exemption	-	Rs 5/unit
Kerala	-	-		50% exemption	_	Rs 10-12-15/ unit depending on hour
Manipur	-	-		100% on reg fee	-	-
Uttarakhand	-	-	_	100% exemption	-	100% duty exemption

States	Charging Infrastructure Incentive	Mandates For Charging Infrastructure	State EV Cell Or Steering Committee
Odisha	Subsidy of ₹5000 per charger	Setting up of Charging Infrastructure shall be mandated in the Housing Policy by H&UD Department	Transport department will be the leading steering committee along with the other departments for implementation of EV policy
Punjab	3000 per Charge Point for level 1 charger and ₹10000 per Charge Point for Level 2 charger	-	The transport department will be the nodal committee under which the state EV is set up to support and monitor the growth.
Rajasthan	SGST Reimbursement for defined station units	-	Under the transport department, a state EV cell has been setup which will monitor the growth of the EVs in the state
Tamil Nadu	TANGEDCO will invest in setting up both slow and fast charging Networks	-	Invest tamil nadu will be the steering committee
Telangana	-	-	TSREDCO will be the nodal agency along with other departments
Uttar Pradesh	A capital subsidy of 20% of total cost or subject to maximum ₹10 lakh per unit station	-	Invest UP will lead the committee along with other depts to support the growth of EVs in the state
West Bengal	_	Mandates in setting-up of EV charging stations including home charging, workplace charging and EV-ready parking	The transport department will be the nodal agency and with the others departments EV accelerator cell will be in place.
ndhra Pradesh	Capital Subsidy of 25% of the value of the charging station equipment/ machinery or a maximum subsidy of ₹10,00,000 for 100 V & above for 100 stations Capital Subsidy of 25% of the value of the charging station equipment/machinery or a maximum subsidy of ₹30,000 for 100V & below	All new permits for commercial complexes, housing societies and residential townships with a built-up area 5,000 sq.mt and above will mandate charging stations	-
Arunachal Pradesh	Capital subsidy of 15% of total cost of machinery/station for Oil marketing companies & 25% total cost of station for CPO-Charge Point Operator to be incentivized	-	-
Assam	Capital Subsidy of 25% of the value of the charging station equipment/machinery upto a maximum subsidy of ₹10,00,000	-	-
Bihar	Capital Subsidy of 25% of the value of the charging station equipment/machinery upto a maximum subsidy of ₹5,00,000	-	-
Haryana	Capital Subsidy of 25% of the value of the charging station equipment / machinery or a maximum subsidy of ₹10,00,000 for stations above 100V and Capital Subsidy of 25% or ₹30000 max for station for below 100V	-	-
Himachal Pradesh	_	-	-
Kerala	Capital Subsidy of 25% of the value of the charging station equipment/ machinery or a maximum subsidy of ₹10,00,000 for stations above 100V and Capital Subsidy of 25% or ₹30000 max for station for below 100V	-	-
Manipur		-	-
Uttarakhand	_	-	-

Battery Recycling

- States actively promoting & attracting investments for battery recycling include Andhra Pradesh, Assam, Chhattisgarh, Haryana, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh and Andaman & Nicobar.
- Chandigarh and Manipur promote the reuse of EV batteries along with recycling.
- Delhi aims to set up battery collection centres and collaborate with manufacturers for recycling.

Promotion and Creation of Green Zones

 Andhra Pradesh, Madhya Pradesh, Maharashtra, Punjab, Uttar Pradesh, West Bengal and Himachal Pradesh are the states that are focussing on promoting and creating Green Zones.

Successful strategies and key drivers from New Delhi

Figure 107 Other key measures taken by Delhi for uptake of electric mobility



Capital Hits EV Milestone With 1,000 Charging Points





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Electric cabs find niche in Delhi's green mobility push

Delhi News

e-Mobility push: Delhi proposes

quate charging in

new EV policy As per EV policy document the biggest h

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Updated on Sep 26, 2022 12:06 PM IST

In the past few years, several electric cab services-such as BluSmart, Plug Mobility, Evera, and eeeTaxi-have been launched in Delhi/NCR.



Blu Smart Cabs' charging hub in Nehru Place, New Delhi. (Sanchit Khanna/HT Photo)

Progression milestones						
Oct 2020 Demand incentives and other exemptions under the policy operationalised	Nov 2021 Launch of a single-window process to install charging points at private/semi-public locations		Apr 2022 Approval to procure 1,500 e-buses under the Grand Challenge			
• •		•	•			
Feb Launch of th campaign awareness	2021 e Switch Delhi to increase s about EVs	Feb 2 Hundred sites for publ stations awarded t (EV charging at INR 2.	2022 lic charging/swapping to concessionaires 50/unit of electricity)			

Focus on implementation

EV Policy Domains	Score
Disbursement of incentives and fee waivers	89%
Charging infrastructure	89%
Battery recycling ecosystem development	63%
State EV fund	50%
${\it Creatingjobs-vocationaltrainingandR\&D}$	70%
Policy implementation	88%
Delhi EV Policy Score	83%

Private players in AFV market of India

LOGO	CATEGORY	FEATURES
Э	Fleet Operator	Electric scooter manufacturer, Expects to sell 3k units/month
Yulu	Fleet Operator	Started as a network of battery and swapping station, now manufacturers 3 bikes
© ZYPP	Fleet Operator	Offers B2B delivery and shared mobility services to consumers. Target to double its fleet by Dec 2025
SMART MOBILITY	Fleet Operator	Operates 100% electric cabs with a fleet size of 400 in Delhi-NCR region
ТАТА	Charging Infra	EV Charging solutions deployed in 300+ cities
ATHER	Charging Infra	Already installed 1,000 EV charging stations in 80 cities across the country; install 2500+ by 2023
	Charging Infra	Has more than 3,000 charging points across over 1,500 EV charging stations across 37 cities
Charzer	Charging Infra	Their first product is Kirana Charzer, a low-cost, compact and affordable charging station
The smart move	OEM	Launched Optima and NYX scooters, has cumulatively sold over 600,000 units of electric scooters
OKINAWA	OEM	Has sold 2,50,000 electric scooters over the last 6 years. Currently has 8 scooters on sale
AMPERE	OEM	Two-wheeler brand and an electric mobility subsidy of Greaves' Cotton
JBM®Ò	OEM	Over 1000 electric buses

Private players in AFV market of India

LOGO	CATEGORY	FEATURES
TDSG; cell	Battery Manufacturing	India's first Lithium-ion Battery manufacturing plant in Gujarat
nexcharge	Battery Manufacturing	Joint venture between Exide and Leclanche; Exide to have 80%
LOHÜM	Battery Manufacturing	60-70 percent share of the total domestic Li-ion battery recycling market.
GRINNTECH	Battery Manufacturing	Their manufacturing facility in Ambattur, Chennai, commenced operations in the previous quarter and can cater to a demand of up to 400 MWh.
3en	EV Manufacturing	It manufactures vehicles across cargo and passenger segments, along with kits to convert conventional vehicles to electric
	EV Manufacturing	Offers last-mile transportation through two-wheeler, three-wheeler and four- wheeler EVs for commercial use
BAAZ	EVs for gig workers	Helps gig workers earn money by using its electric scooters for deliveries for companies
Z Battery Smart	Battery swapping stations	Operates more than 100 Swap Stations across Delhi-NCR