Centre for Social and Economic Progress

CSEP

Independence | Integrity | Impact

DISCUSSION PAPER - 35
JANUARY 2026

Fiscal Support for Electric Vehicles in India

Incentives, CO_2 Abatement, and Policy Trade-offs

Shyamasis Das
Tarandeep Kaur

CSEP RESEARCH

Centre for Social and Economic Progress (CSEP)
CSEP Research Foundation
6, Dr Jose P. Rizal Marg, Chanakyapuri,
New Delhi - 110021, India

Recommended citation:
Das, S., and Kaur, T. (2026). *Fiscal Support for Electric Vehicles in India: Incentives, CO_2 Abatement, and Policy Trade-offs* (CSEP Discussion Paper 35). New Delhi: Centre for Social and Economic Progress.

The Centre for Social and Economic Progress (CSEP) conducts in-depth, policy-relevant research and provides evidence-based recommendations to the challenges facing India and the world. It draws on the expertise of its researchers, extensive interactions with policymakers as well as convening power to enhance the impact of research. CSEP is based in New Delhi and registered as a company limited by shares and not for profit, under Section 8 of the Companies Act, 1956.

Designed by Umesh Kumar

Fiscal Support for Electric Vehicles in India

Incentives, CO_2 Abatement, and Policy Trade-offs

Shyamasis Das
Fellow
Centre for Social and Economic Progress
New Delhi, India

Tarandeep Kaur
Former Research Analyst
Centre for Social and Economic Progress
New Delhi, India

Table of Contents

List of Figures

List of Tables

List of Appendices

Abbreviations

BEV	Battery Electric Vehicle
CAFE	Corporate Average Fuel Economy
CAGR	Compound Annual Growth Rate
CBIC	Central Board of Indirect Taxes and Customs
CEA	Central Electricity Authority
CEEW	Council on Energy, Environment and Water
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
CUF	Capacity Utilisation Factor
DRI	Direct Reduced Iron
ECI	Eligible Capital Investment
EEZ	Exclusive Economic Zone
EFCI	Eligible Fixed Capital Investment
EMPS	Electric Mobility Promotion Scheme
EPCA	Environment Pollution Control Authority
EV	Electric Vehicle
FAME	Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles
FY	Financial Year
GBI	Generation Based Incentive
GHG	Greenhouse gas
GNCTD	Government of National Capital Territory of Delhi
GST	Goods and Services Tax
GW	Gigawatts
ICE	Internal Combustion Engine
ICCT	International Council for Clean Transportation
ICED	India Climate and Energy Dash-board
IEA	International Energy Agency
IISD	International Institute for Sustain-able Development
IMF	International Monetary Fund
IRA	Inflation Reduction Act
IRS	Internal Revenue Service
ISTS	Inter-State Transmission System
kWh	Kilowatt-hour
LPG	Liquefied Petroleum Gas
MNRE	Ministry of New and Renewable Energy
MoEFCC	Ministry of Environment, Forest and Climate Change
MV	Motor Vehicle
MW	Megawatts
NAPCC	National Action Plan on Climate Change
NEMMP	National Electric Mobility Mission Plan
NOK	Norwegian Krone
NPV	Net Present Value
OECD	Organisation for Economic Co-op-eration and Development
PEM	Proton Exchange Membrane
PHEV	Plug-in Hybrid Electric Vehicle
PLI	Production Linked Incentive
PM E-DRIVE	PM Electric Drive Revolution in Innovative Vehicle Enhancement
PPP	Purchasing Power Parity
PV	Photovoltaic
R&D	Research and Development
RE	Renewable Energy
RTS	Rooftop Solar
SGST	State Goods and Services Tax
SRISTI	Sustainable Rooftop Implementation for Solar Transfiguration of India
SUPRABHA	Sustainable Partnership for RTS Acceleration in Bharat
T&D	Transmission and Distribution
UNFCCC	United Nations Framework Con-vention on Climate Change
UPERC	Uttar Pradesh Electricity Regulatory Commission
UPNEDA	Uttar Pradesh New and Renewable Energy Development Agency
VAT	Value Added Tax
VGF	Viability Gap Funding
VKM	Vehicle Kilometres
V&V	Vehicle and Vessel

Executive Summary

The government's push towards vehicle electrification in recent years has been driven by the need to reduce emissions from the road transportation sector. Central and state governments have been offering incentives to bridge the cost differential between electric vehicles (EVs) and conventional Internal Combustion Engine (ICE) vehicles. These incentives are in the form of purchase subsidies and concessional tax rates on vehicle sales. Given the climate consideration for offering these incentives and the fiscal cost for the exchequer to support them, it is imperative to assess the efficacy of these incentives in terms of carbon dioxide (CO_2) abatement.

This study aims to address the following research questions:

- What do the current fiscal incentives offered by the government to EVs in India translate to in terms of potential climate benefit?
- How do India's EV incentives compare globally and with other domestic climate interventions in the country?

The analysis considers purchase subsidies offered under the central government's PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE) scheme, and tax incentives in the form of lower applicable rates of Goods and Services Tax (GST)[1] and Motor Vehicle (MV) tax,[2] to electric passenger cars and electric two-wheeled vehicles. For comparison with other domestic climate actions, the study considers offshore wind power generation, green hydrogen production and residential rooftop solar (RTS). These interventions are at an early stage of maturity or have seen limited progress in uptake. They also greatly benefit from government incentives.

To contextualise India's EV incentives in a global context, the study examines incentives to electric passenger car owners and the corresponding CO_2 emission mitigation benefit in some of the advanced EV markets such as Norway, the United States (US), and China. Similar to India, all these countries have implemented targeted fiscal incentives to encourage EV uptake.

Key Findings

1. **Electric two-wheeled vehicles deliver greater climate benefits than electric passenger cars for every rupee spent by the government.** The study finds that for the same level of incentives, an electric two-wheeled vehicle is able to avoid nearly twice as much CO_2 emissions compared to an electric passenger car. This gap arises due to the higher magnitude of the electric car incentive and the limited emission advantage of an electric car over its conventional counterpart on account of the former's below-par energy economy.

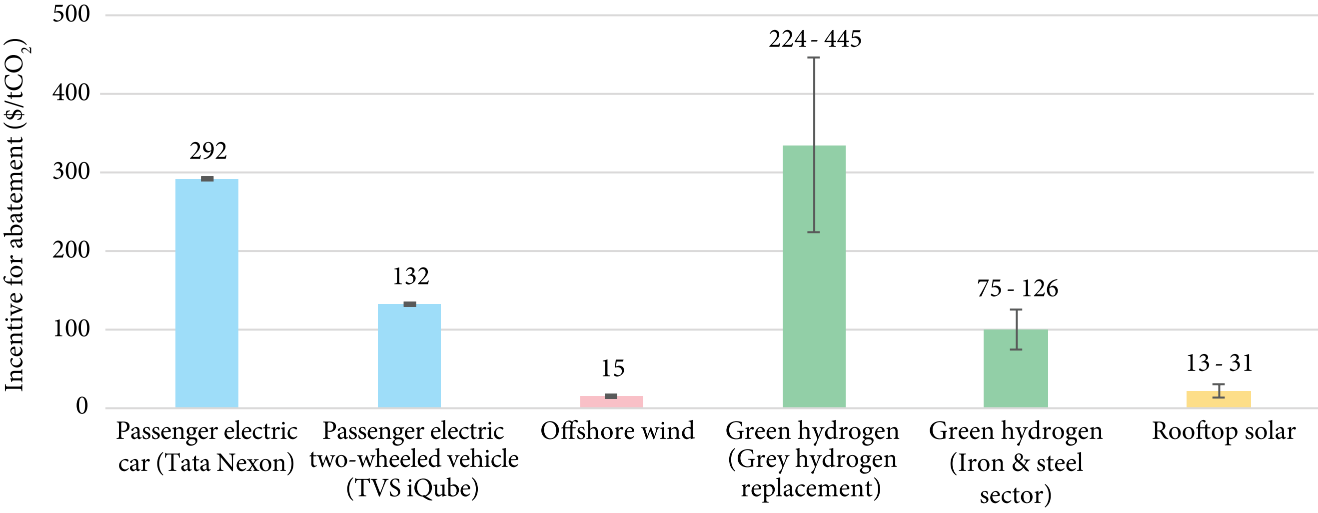
2. **Electric car incentives cost more to the government to reduce emissions compared to other domestic climate actions.** Mitigation of one tonne of CO_2 through electrification of passenger cars costs the government significantly more than through clean electricity generation from residential RTS or offshore wind. However, the support per unit of CO_2 abated offered to green hydrogen as a replacement of grey hydrogen is at par with electric passenger cars (Figure ES-1).

   While the existing incentives offered to residential RTS to realise one tonne of CO_2 abatement are much lower compared to EVs, it is worthwhile to note here that solar Photovoltaic (PV) has been benefitting from sustained government support since the launch of the National Solar Mission in 2010.

   It is important to consider here that the climate benefit from EV incentives is lower due to the high carbon burden of India's grid electricity, where fossil fuels account for almost 75% of the generation. A high emission factor of the electricity grid boosts the CO_2 mitigation potential for renewable energy (RE) like wind and solar but undermines the emissions impact of EVs.

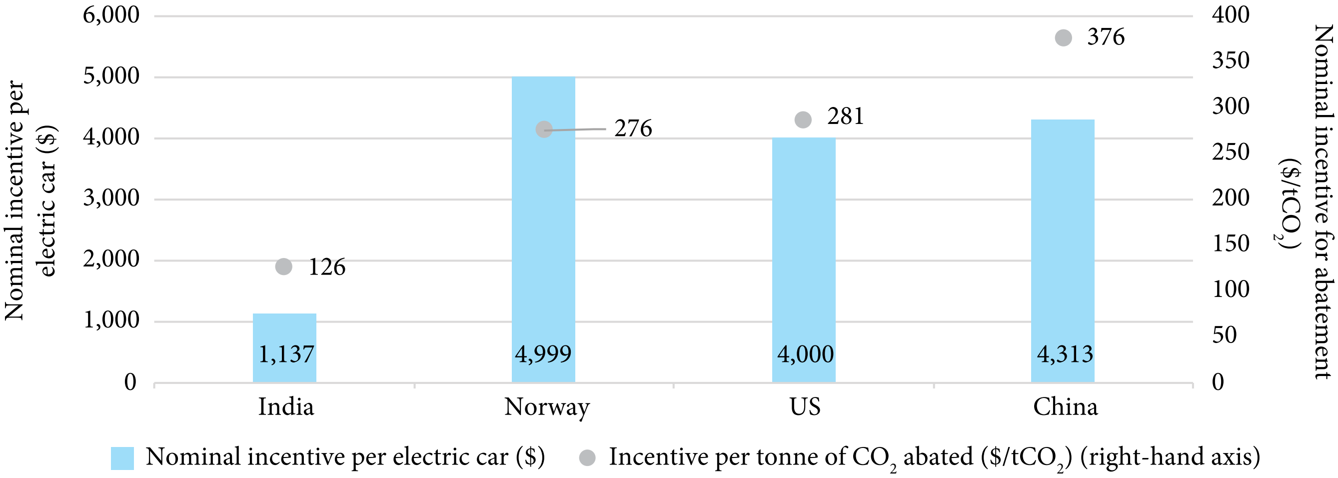
[1] GST is a pan-India tax regime. It is applicable on the ex-factory price of a motor vehicle.
[2] MV tax is levied by States on motor vehicle purchase. It is applicable on the ex-showroom price of a motor vehicle.

Figure ES-1: Incentive to Domestic Climate Solutions for Emissions Abatement



Source: Authors' calculations.

Figure ES-2: Incentive to an Electric Car Owner and CO_2 Abatement in Different Countries



Source: Authors' calculations.

3. **India's nominal incentives for an electric passenger car are lower than some of the advanced EV markets.** India's nominal incentive for an electric car in the form of a GST concession is lower than incentives in countries like Norway, the US and China (Figure ES-2). For the same level of incentives, India is able to realise greater CO_2 abatement compared to these countries. This is despite India's grid being the most carbon-intensive among these countries along with a much slower rate of decarbonisation. After adjusting for Purchasing Power Parity (PPP) to reflect the differences in prices between countries, the electric car incentive for each unit of CO_2 avoided becomes nearly four times higher than its nominal value. This suggests that there is a substantial value of the fiscal incentive to EV buyers in the Indian context. However, India still has a lower incentive for CO_2 abatement compared to Norway and China in PPP terms.

Policy Perspectives

While the National Action Plan on Climate Change (NAPCC) was launched in 2008, India's EV journey began in 2015 with the introduction of the FAME-I (Phase-I of Faster Adoption and Manufacturing of (Hybrid &) EVs) scheme and gained momentum after the implementation of the Phase-II of the scheme in 2019. EV sales in this period have risen from 0.6% of overall sales in Financial Year (FY) 2018–2019 to 7.5% in FY 2024–2025. The window for assessing the climate impact of EV incentives is relatively short.

The higher carbon burden of India's electricity grid being a major underlying cause for EVs to deliver lower climate benefits, it is a strategic imperative for the country to accelerate the share of clean electricity in the supply. This is in no way to suggest wait-listing climate interventions that are dependent on clean electricity availability until there is enough progress in reducing the carbon load of electricity. There will be an opportunity cost for delaying climate levers with conditional benefit at this stage.

This does not mean that the current limitations and red flags regarding the EV transition and its climate impact should be overlooked. Considering that a range of practical means is available to unlock the climate benefit from EVs in the current scenario, government policies, regulations, and programmes should give importance to aligning the use of EVs with climate objectives.

In a price-sensitive market like India, government support plays a critical role in influencing consumer preferences and stimulating early adoption of new clean technologies such as the electric drivetrain in vehicles. Experience from some of the global EV markets has shown that a premature rollback of incentives can potentially stall progress in the transition to a clean technology. Domestic experience in RTS uptake in the residential sector also shows that consumer-facing clean technologies require sustained government support.

Channelling incentives to build shared infrastructure like supporting the rollout of public charging stations is also a meaningful way to enable the EV transition. Spending on supporting charging infrastructure deployment turns out to be a much more cost-effective use of public funds, as it potentially delivers benefits to the entire spectrum of EV users at a fraction of the cost.

Going forward, incentives to EV buyers need to evolve. The government may focus on supporting the hard-to-electrify segments while tapering down incentives for self-sustaining vehicle segments. At the same time, policymakers should adopt a carrot-and-stick strategy as an effective way to accelerate the EV transition and reduce dependence on fiscal incentives. In this regard, consideration should be given to introducing more stringent CO_2 emission targets for automakers, and fleet electrification mandates on commercial vehicles to complement the momentum created through incentives.

Given some of the challenges in the EV sector like supply-chain risks, there is a case for diversifying India's transport decarbonisation strategy to consider other solutions such as biofuels with a flex-fuel engine, and fuel cells. However, these technologies have their own constraints. The absence of a clear direction in decarbonising road transport could lead to inadequate policy support, uncertainty in the industry and market inertia. With limited viable alternatives in the hard-to-abate mobility sector, EVs remain a promising long-term solution in the Indian context. The country has to prioritise investment in technologies that can truly take the economy to the Net Zero milestone. A band-aid approach will end up slowing down the progress in reaching the ultimate goal.

Recommendation: A Mix of Policy Actions

Based on the presented findings in the context of the broader policy and sector landscape, the paper suggests five broad policy interventions with the objective to maximise the climate benefit from every rupee spent on EVs and reduce dependence on subsidies to promote a faster EV transition.

i. **A decarbonisation strategy for road transport to guide policy actions:** Develop a clear roadmap to decarbonise motorised road transport that takes into account associated risks and co-benefits and links incentives with benefits or outcomes. This will help target the government's resources to support climate mitigation in the sector more effectively.

ii. **Renewable-energy-heavy EV charging:** Accelerate RE penetration in the grid supported by faster deployment of utility-scale energy storage and the introduction of solar-aligned time-of-day electricity tariffs for EVs for greater RE offtake during EV charging, thereby increasing the emission abatement impact of EVs.[3] Wherever feasible, integrate charging stations with distributed RE resources like RTS systems.

[3] This should be complemented by faster rollout of public charging infrastructure, especially at workplaces, education campuses, business districts, transit nodes and marketplaces which usually see greater vehicle footfall during daytime. Home or captive charging commonly happens during evening and night.

iii. **A priority-order for directing incentives based on climate impact:** Channel subsidies to only those EV segments or use-cases that are more polluting and harder to electrify (like trucks) and environmentally and socio-economically more beneficial (like buses including privately managed fleets). This apart, provide fiscal support to develop shared infrastructure like upstream electrical systems, which are otherwise costly, to encourage a faster and more economical roll-out of public charging stations that will benefit the entire spectrum of EV users. Adopting this approach would help realise greater climate dividends from the available fiscal resource of the government.

iv. **A predefined logic-based sunset clause for incentive schemes:** Include a clear incentive phase-out plan in the government's support programmes for EVs. The tapering down of incentives should be based on a set rationale, ideally linked with targeted outcomes. For example, MV tax concessions to privately registered EVs can be ended as the total cost of ownership of an EV becomes competitive in the given use-case. Such a rationale-based approach would help free up the financial bandwidth of the government to support harder-to-electrify EV segments.

v. **Research and development (R&D) to reduce the cost of adoption and improve product performance:** Increase spending on R&D significantly to support cost-effective production of EVs and their components, particularly batteries, with improved performance which will ultimately enable EVs to become the preferred choice for a broader range of consumers. This will help reduce the dependence on EV purchase incentives. Enhanced energy economy of EVs because of performance improvement can potentially unlock greater climate benefits.

It is worthwhile to underline here that the assessment has not considered other possible imperatives of the government's policy on EVs, like addressing urban air pollution, reducing crude oil imports, and transitioning to new-age technology with the rest of the world, which have national importance too.

1. Introduction: The Government's Stated Policy Objectives for Electric Vehicle Promotion

India's push towards EV adoption is driven by the imperative to enhance energy security, reduce Greenhouse gas (GHG) emissions, and improve air quality (NITI Aayog, 2025).

The country's reliance on crude oil imports poses a challenge to its economy from an energy security standpoint (Debroy & Misra, 2024). In FY 2022–2023, India spent US$ 144 billion on the net import of oil and gas, with petroleum comprising the largest share of its import bill. Rising international crude oil prices and price fluctuations can expose the economy to external shocks. In this context, EVs play an important role in reducing the dependence on imports and thereby decreasing the country's Current Account Deficit, while also helping to mitigate air pollution (Debroy & Misra, 2024).

At the same time, India has made international commitments to combat climate change, such as its target to reach Net Zero emissions by 2070. The transport sector in India contributes 12% of its energy-related emissions and 10% of its GHG emissions (Ministry of Environment, Forest and Climate Change [MoEFCC], 2021). Meeting the international commitments would require switching to cleaner alternatives, with EVs being seen as a promising technology to avoid GHG emissions from the transport sector (Debroy & Misra, 2024). In its long-term low-carbon development strategy submission to the United Nations Framework Convention on Climate Change (UNFCCC), India has underscored its intention to promote EVs through targeted policies and programmes (MoEFCC, 2022). The strategy also outlines India's goal of significantly expanding the market share of EVs in the passenger transport segment (MoEFCC, 2022).

In line with the national imperatives to promote EV adoption, state governments have formulated their own EV policies aimed at curbing air pollution and GHG emissions through EV uptake. For instance, Maharashtra's EV policy aims to reduce local air pollution and GHG emissions by focusing on the electrification of buses, goods carriers and transport fleets. The state aims to reduce 325 tonnes of vehicular Particulate Matter 2.5 emissions and 1 million tonnes of GHG emissions by 2030 from the transport sector in the state (Government of Maharashtra, 2025). Uttar Pradesh, in its EV policy, positions EVs as an eco-friendly transportation solution and intends to de-pollute its transport sector through EV uptake (Government of Uttar Pradesh, 2022). Delhi's EV Policy also emphasises the promotion of EVs as a means to bring down emissions from the transportation sector to improve the air quality in the state (Government of National Capital Territory of Delhi [GNCTD], 2020).

2. EVs are a Major Recipient of Government Incentives

The road transport sector accounts for 12% of India's energy-related CO_2 emissions (International Energy Agency [IEA], 2023). Due to their zero tailpipe emissions, EVs have emerged as a promising technology for the decarbonisation of this sector. However, the high upfront costs of EVs compared to conventional ICE vehicles remain a major barrier to widespread EV adoption. In order to bridge the price gap with ICE vehicles, India's central and state governments have been promoting EV uptake through a range of fiscal incentives to buyers. These incentives are in the form of direct budgetary support such as demand incentives, or tax waivers or concessions on vehicle purchase. Incentive schemes with budgetary provisions consist of a fixed monetary allocation (outlay) and a scheme implementation period, while tax waivers and concessions often lack predefined notional outlays and sunset clauses. While the possible impact to the exchequer is known in advance in the case of budgetary incentives, this is not the case with tax concessions and waivers.

2.1 Budgetary Incentives

The PM E-DRIVE scheme is currently the flagship programme of the central government to support EV adoption in the country. Effective since October 1, 2024,[4] it has an outlay of ₹10,900 crore. To put this into perspective, the budgeted amount for the EV scheme is slightly less than the total outlay for the National Green Hydrogen Mission and nearly seven

[4] The implementation period of the scheme has been extended till March 31, 2028 without any change in the outlay. However, the extension is not applicable to electric two-wheeled vehicles and electric three-wheeled vehicles.

times lower than the subsidy allocation under PM Surya Ghar: Muft Bijli Yojana, which is a central scheme to incentivise the installation of RTS across the country. Among the different supports, the PM E-DRIVE scheme offers purchase subsidies to EVs including electric two-wheeled and three-wheeled vehicles but excluding electric passenger cars.[5] An electric two-wheeled vehicle buyer is eligible to benefit from ₹5,000 per kilowatt-hour (kWh) of the vehicle battery (capped at ₹10,000 per vehicle). This incentive amount is set to be halved to ₹2,500 per kWh for the FY 2025–2026 (Ministry of Heavy Industries, 2024; Kohli, 2024).

Before the launch of this scheme, FAME had been the central government's flagship EV support programme which had outlays of ₹895 crore and ₹11,500 crore during its Phase-I (from 2015 to 2019) and Phase-II (from 2019 to 2024), respectively, that offered purchase subsidies to EV buyers in certain segments. Following the expiry of Phase-II in March 2024, the central government notified the Electric Mobility Promotion Scheme (EMPS) with an outlay of ₹778 crore to maintain the continuity of demand incentives to electric two-wheeled and three-wheeled vehicle owners. EMPS was later subsumed under the current PM E-DRIVE scheme.

In addition to the demand incentives currently offered by the Centre, many state governments supplement these efforts with their own purchase subsidies. For instance, Maharashtra in its 2025 EV policy offers a demand incentive at 10% of the ex-factory price[6] for electric cars[7] and two-wheeled vehicles (Government of Maharashtra, 2025). Details of state-provided fiscal incentives to EV owners are presented in Appendix A: Demand Incentives and MV Tax Waivers in Different States.

2.2 Tax Waivers and Concessions

The central government provides tax incentives on EV purchase through a concessional GST rate. While ICE vehicles attract a GST rate of 18%, EVs are currently taxed at a much lower rate of 5% (PIB, 2025) (Table 1). Until September 21, 2025, ICE vehicles attracted an even higher GST rate of 28%, along with an additional Compensation Cess of 1% to 22%, depending on engine capacity and fuel type (Central Board of Indirect Taxes and Customs [CBIC], n.d.). In contrast, EVs during that period continued to be taxed at 5% and remained fully exempt from the Cess.[8]

Table 1: GST Rates for Passenger Cars and Two-Wheeled Vehicles

Vehicle segment	Fuel and vehicle characteristics	GST rate (%)
Two-wheeled vehicles	Electric	5
	Petrol with up to 350 cc engine capacity	18
	Petrol with more than 350 cc engine capacity	40
Cars	Electric	5
	Petrol, liquefied petroleum gas (LPG) or compressed natural gas (CNG) cars with engine capacity < 1200 cc and length < 4000 mm	18
	Diesel cars of engine capacity < 1500 cc and length < 4000 mm	18
	Petrol hybrid (length > 4000 mm and engine > 1200 cc) Diesel hybrid (length > 4000 mm and engine > 1500 cc)	40
	Petrol, LPG or CNG cars with engine capacity > 1200cc and length > 4000 mm	40
	Diesel cars of engine capacity > 1500 cc and length > 4000 mm	40

Source: Authors' compilation based on (PIB, 2025).

5 Electric ambulances, electric trucks and other emerging EVs are also eligible for purchase subsidies under PM E-DRIVE scheme. Electric cars were eligible for an incentive of ₹10,000 per kWh under FAME-II.

6 The ex-factory price of a vehicle is the price at which the manufacturer sells the vehicle to the dealer before adding any taxes such as GST, MV Tax, etc.

7 Electric cars registered as transport vehicles are eligible to receive a demand incentive of 15% of ex-factory price.

8 EVs were taxed at 12% GST from year 2017 to 2019.

Several States have complemented these measures by allowing either a full exemption or concession on MV tax at the time of registration of an EV. For instance, the state governments of Punjab, Uttar Pradesh, and Tamil Nadu have exempted MV tax on EV registrations.[9] States whose original EV policies, that offered the MV tax benefit to EVs for the first time, have expired, are continuing this incentive to promote EV uptake. Karnataka, Maharashtra, Andhra Pradesh and Madhya Pradesh, in their new EV policies, have provided 100% waivers on MV tax on electric passenger cars[10] and electric two-wheeled vehicle registrations (Government of Andhra Pradesh, 2024; Government of Madhya Pradesh, 2025; Government of Karnataka, 2025; Government of Maharashtra, 2025). Gujarat, which previously treated EVs and ICE vehicles at par as far as the applicable MV tax rate of 6% is concerned, has lowered the MV tax rate on EVs to 1% until March 2026 (Akashvani, 2025). Appendix A contains the details of MV tax waivers applicable in different States.

Table 2 illustrates how EV tax incentives play out in the passenger car and two-wheeled vehicle segments using the instance of popular EV models and their petrol counterparts.

Table 2: Differences in Applicable Taxes Between an EV and a Comparable Petrol Vehicle—An Example

	Ex-factory price (₹)	GST + Cess rate	MV tax rate	Realisable GST + Cess (₹)	Realisable MV tax (₹)	Total realisable tax (₹)	Greater realisable tax revenue from sale of petrol version (₹)
Tata Nexon Creative 45—Electric	13.3 lakh	5%	0%	0.67 lakh	0	**0.67 lakh**	
Tata Nexon Creative AMT—Petrol	9.1 lakh	18% (29%)	11.7%	1.63 lakh (2.63 lakh)	1.26 lakh (1.37 lakh)	**2.89 lakh (4 lakh)**	**2.22 lakh (3.34 lakh)**
TVS iQube—Electric	1,04,223	5%	0%	5,211	0	**5,211**	
TVS Jupiter 125—Petrol	62,141	18% (28%)	9%	11,185 (17,399)	6,516 (7,068)	**17,701 (24,467)**	**12,490 (19,256)**

Source: Authors' calculation.

Note:

- *Average MV tax for petrol variants is estimated based on the MV tax rates of 13 States (as of May 2025).*
- *The ex-factory prices of petrol and electric variants are as of March 2025.*
- *The figures in the brackets indicate tax realisation during the previous GST regime which was effective till September 21, 2025.*
- *The values shown in the table are rounded off. However, full values have been used in doing the calculations and the corresponding results have been considered. For this reason, the input values and the results shown in the table might not tally in some cases.*

---

9 Some of the state EV policies which include MV tax benefit are set to expire in FY 2025.

10 Karnataka's MV tax waiver is applicable to electric cars priced under ₹25 lakh. Madhya Pradesh's MV tax waiver is applicable for one year from the date of the policy's notification. While there is no cap on the price of electric two-wheeled vehicle, electric cars priced under ₹20 lakh are eligible for the waiver.

The incentive offered by the government through GST concession and MV tax exemption amounts to about ₹2.2 lakh for an electric passenger car and ₹12,500 for an electric two-wheeled vehicle.[11] The tax incentive amount accounts for about 17% of the ex-factory price of an electric car and 12% of the ex-factory price of an electric two-wheeled vehicle. Clearly, vehicle owners significantly benefit from lower central and state taxes on EV purchase.

3. Rationale, Objective, and Scope

Over the past years, the central and state governments in India have deployed a broad array of budgetary and tax incentives to accelerate EV adoption. These measures have been crucial in reducing the upfront cost differential between EVs and conventional ICE vehicles, thereby encouraging EV uptake in a price-sensitive market. However, such incentives entail a fiscal cost to the exchequer. The tax revenue implications of the EV transition for central and state governments have been examined previously in the paper "*The Fiscal Impact of India's EV Transition: Tax Revenue Losses Go Beyond Fuel*" (Kaur, Das, & Tongia, 2025). Further, the tax revenue forgone from EV incentives was found to be nearly equal to the demand incentives disbursed under FAME-II. Climate change mitigation has been one of the key motivations behind the policy push for EV adoption in India. In its "*Long-Term Low-Carbon Development Strategy*" submission to the UNFCCC, India has emphasised its intention to maximise the uptake of EVs (MoEFCC, 2022). This underscores the importance of understanding not just the EV uptake driven by these incentives but also the potential climate benefit enabled by these fiscal supports.

A decade on from the launch of FAME-I and in light of the current PM E-DRIVE scheme and preferential tax treatment to EVs, it is imperative to assess the effectiveness of these EV incentives in terms of CO_2 abatement.

In this context, it is important to recognise that India is pursuing a range of interventions towards cutting down its CO_2 emissions as highlighted in the country's "*Long-Term Low-Carbon Development Strategy*". Some of these levers like solar and wind power generation at a utility scale have matured over the years, but some others are either still at a developmental phase and have not become a mainstream solution yet or have not made the desired on-ground progress even though the associated technologies have matured. Not to mention, with maturity and scale-up of deployment, solutions usually witness a considerable decline in the cost of uptake.

One may also see that worldwide, the maturity or scale of implementation of a climate intervention widely differs between countries. This means the same technology that is mainstream in one geography can still be at an early stage of market development in another country. The underlying reasons can be varied—national priority with aggressive investment (for example, the EV transition has been a high priority in China and has received very strong fiscal support from the Chinese government (Li, Zhu, Ma, Zhang, & Zhou, 2020)), availability of resources not limited to raw materials (e.g. the United Kingdom harnesses its relatively high offshore wind power generation potential to currently generate about 10 Gigawatts (GW) of power by deploying some of the largest offshore wind farms in the world), early-mover advantage (Norway, which started offering some of the fiscal incentives to EV buyers way back in the late 1990s, is a classic example), etc.

Against this backdrop, this study aims to deal with the following research questions.

- **What do the current fiscal incentives offered by the government to EV buyers in translate to in terms of potential climate benefit?**
- **How do India's EV incentives compare globally and with other domestic climate interventions in the country?**

To evaluate the "*bang for the buck*" as far as the incentives to interventions for avoiding GHG emissions are concerned, the study derives the cost to the government in terms of offering incentives, both budgetary and tax, for realising one tonne of CO_2 abatement. To this end, it estimates the possible CO_2 emission reduction over the lifetime of a mitigation measure.

There is a clear novelty in the approach that this study has applied to examine government supports. The key advantage of deriving fiscal incentive for CO_2 abatement (expressed in terms of fiscal cost per tonne of CO_2 reduction (₹ per tCO_2)) is that it allows for policy efficacy analysis as well as relevant comparative assessment in a very objective manner.

[11] The actual tax benefit amount depends on the ex-factory price of an EV.

Although a similar metric in the form of marginal abatement cost which represents both the cost and emissions abatement potential of mitigation actions has been used in several climate-related assessments globally, bringing the "incentive" dimension into the analysis of cost-effectiveness of GHG mitigation actions is unique; this has no precedent despite its strong merit.

Although there is an existing body of work on the fiscal support for climate solutions, the objectives and the adopted approaches of these studies are found to be different. A report by the International Institute for Sustainable Development (IISD) has estimated the financial support offered by the government in the energy sector (including fossil fuels, RE and EVs) in India over the period from FY 2013–2014 to FY 2022–2023 (Raizada, Sharma, Laan, & Jain, 2023). Jindal et al. (2024) estimated the net present value (NPV) of the total subsidies offered for green hydrogen production. Another report by Council on Energy, Environment and Water (CEEW) assessed the potential support for green hydrogen production offered by state governments in India (Pal, Tripathi, Kothadiya, Aggarwal, & Yadav, 2025). Kohli et al. (2024) examined the impact of purchase subsidies under FAME-II on the cost parity of EVs with ICE vehicles. Another strand of literature focuses on estimating the climate impact of vehicle electrification (Das, 2024; International Transport Forum, The World Bank, 2023). A report by International Council for Clean Transportation (ICCT) compared the lifecycle GHG emissions of passenger cars in China, Europe, India and the USA (Bieker, 2021). While these studies examine fiscal support and emission outcomes, none has employed a fiscal metric like **incentive per tonne of CO_2 abated** to evaluate and compare current incentive policies for different GHG mitigation interventions.

To analyse EV incentives, this study takes into consideration the explicit subsidies on and tax incentives for EV purchase given by central and state governments in India as of September 2025. Similar to the previous CSEP publication (Kaur, Das, & Tongia, 2025), **this assessment considers the case of India's electric passenger car and electric two-wheeled vehicle to capture how the CO_2 emission mitigation benefit unlocked by government incentives varies by vehicle segment**.

To compare with other climate solutions in India, the analysis covers offshore wind power generation, green hydrogen production, and residential RTS PV. All these climate interventions are currently at a nascent to early stage of deployment, have dedicated national programmes and enjoy government incentives, thus being comparable with the EV transition in the country. The study, however, understands that the current government supports to offshore wind energy and green hydrogen are supply-side incentives and do not target consumers, whereas the latter is the beneficiary of the demand-side EV incentives.[12] Consideration of residential RTS PV in the analysis allows this mismatch to be filled as the current government support to this sector is targeted at retail consumers.

For the global comparison, the study analyses the EV incentives in Norway, the US, and China which are some of the prominent EV markets spread across three economically significant continents (i.e., Europe, North America, and Asia, respectively) and have currently seen EV penetration at different levels reflecting their relative positions on the EV adoption curve. In this analysis, only central fiscal incentives available to passenger electric cars in these countries and India have been taken into account.[13]

4. What do EV Incentives Mean in Terms of CO_2 Abatement?

The paper estimates the fiscal incentive for CO_2 abatement separately for an electric passenger car and an electric two-wheeled vehicle to understand how the cost-effectiveness of the current EV incentives plays out between different vehicle segments. This insight potentially helps policymakers prioritise channelling fiscal incentives to specific segments or use-cases given the outlay for an incentive scheme may not be sufficient.

Based on the popular EV models in the passenger car and two-wheeled vehicle segments, the study estimates the government's EV support for CO_2 abatement.[14] The calculations and the results are presented in Table 3.

[12] Support to EV manufacturing has not been considered in the study in absence of explicit vehicle-level government incentives exclusively to EV production. The supply-side incentives presently support manufacturing of advanced chemistry cell-based batteries that have applications in multiple sectors.

[13] Other than India, all the three auto markets are characterised by passenger cars.

[14] In the passenger car category, the models considered are Tata Nexon Creative 45 (electric) and its closest petrol variant, Tata Nexon Creative AMT. The electric two-wheeled vehicle model is TVS iQube and a comparable petrol counterpart is TVS Jupiter 125.

Table 3: Incentives for CO_2 Abatement: Electric Passenger Car and Electric Two-Wheeled Vehicle

	Electric passenger car		**Electric two-wheeled vehicle**	
	Tata Nexon Creative AMT (petrol)	**Tata Nexon Creative 45 (electric)**	**TVS Jupiter 125 (petrol)**	**TVS iQube (electric)**
1. Energy economy of the vehicle	17.2 km/litre	10.87 km/kWh	50 km/litre	34 km/kWh
2. CO_2 emission factor for the energy use	2315.16 gCO_2/litre	702.54 gCO_2/kWh*	2315.16 gCO_2/litre	702.54 gCO_2/kWh*
Calculated: CO_2 emission intensity (gCO_2/km)	134.6	70.7	46.3	22.5
Calculated: Lifetime emissions (tCO_2)	18.9	9.9	3.4	1.7
Emissions avoided over lifetime of an EV (tCO_2)	–	**9.0**	–	**1.8**
3. Budgetary incentives (₹)	–	0	–	7,500
4. Tax incentives (₹)	–	2.2 lakh	–	12,490
Total fiscal incentive for an EV (₹)	–	**2.2 lakh**	–	**19,990**
Fiscal incentive for CO_2 abatement (₹/tCO_2)	–	**24,802**	–	**11,261**
Fiscal incentive for CO_2 abatement (US$/$tCO_2$)$^+$	–	**292**	–	**132**

Source: Authors' calculations.

**Emission calculation related to EVs is based on the Central Electricity Authority (CEA)-published annual average grid electricity emission factor (2023–2024). The emission factor for subsequent operational years is assumed to decline at a 0.6% Compound Annual Growth Rate (CAGR) (which is the annual average change noted over the past 10 years). One should underline that the real-world emissions impact of an EV depends on what time of the day it is charged with grid electricity due to the temporal variation in the share of non-fossil-fuel-based electricity. In this calculation, this aspect has not been taken into account.*

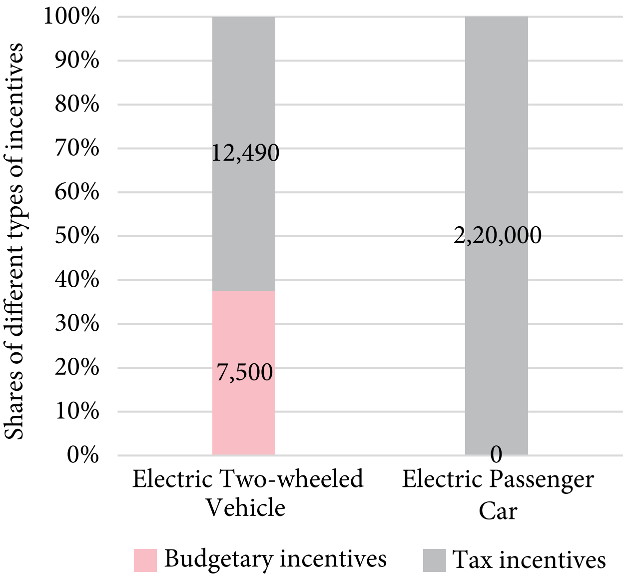
$^+$US$1 = ₹85

Note:

- *The energy economy of an EV is derived based on the existing battery capacity of the concerned model and the corresponding certified driving range.*
- *Average MV tax is estimated based on MV tax rates of 13 States (11.7% for electric passenger cars and 9% for electric two-wheeled vehicles).*
- *The lifespan of a vehicle is assumed to be 12 years, and the average daily Vehicle Kilometres (VKM) travelled is 32 km for a passenger car and 17 km for a two-wheeled vehicle (Kamboj, Malyan, Kaur, Jain, & Chaturvedi, 2022).*
- *Demand incentives: Currently, no demand incentives are available for electric passenger cars at the central or state level. In the case of an electric two-wheeled vehicle, only the central-level demand incentive has been considered in this analysis. While some States provide demand incentives to electric two-wheeled vehicle owners, these are limited to a few States, as the incentives have expired in many others. The demand incentive for an electric two-wheeled vehicle under PM E-DRIVE (central scheme) has been considered as the average of the incentive amounts for FY 2024–2025 and FY 2025–2026.*
- *Since the fiscal incentive and emission abatement potential are specific to an EV model, the value of the fiscal incentive for CO_2 abatement varies from one vehicle model to another. Hence, one should treat the results from an analytical point of view.*

As shown in Table 3, the government support for passenger electric car purchase is ₹2.2 lakh per vehicle compared to around ₹20,000 for an electric two-wheeled vehicle. In the context of CO_2 mitigation, the supports amount to about ₹25,000 (i.e., US$ 292) and ₹11,000 (i.e., US$ 132) to avoid one tonne of CO_2 emissions by an electric passenger car and an electric two-wheeled vehicle, respectively. Therefore, the cost of CO_2 abatement in the case of a two-wheeled vehicle is almost half that of a car. In a way, it points out that incentives to the former deliver greater climate benefits than an electric car. As shown in Figure 1, the incentives for abatement to an electric passenger car are entirely in the form of revenue forgone and not a direct cost to the exchequer i.e., it does not require a budgetary outlay for spending. In contrast, 37% of the support to an electric two-wheeled vehicle incurs budgetary spending.

Figure 1: Comparison of Incentives Between a Two-Wheeled Vehicle and a Passenger Car



Source: Authors' analysis.

The higher ex-factory price of an electric passenger car than an electric two-wheeled vehicle magnifies the absolute value of the tax incentive a car enjoys (the GST rate, set in percentage, is applicable on the vehicle ex-factory price).

Does the above comparison make a case for the government to phase out the existing incentives to electric passenger cars? A logic for continued tax concessions to electric cars can be that these do not require a budgetary outlay i.e., spending by the public exchequer. Otherwise, it may call for tapering down tax incentives to electric passenger cars, especially the privately-owned ones given that economically well-off people are the primary beneficiaries.

At a broader level, the above analysis indicates that the "value for money" for the current set of incentives to EV owners varies considerably between EV segments. This can be a basis for the government to revisit its existing incentive policy if the contribution of the concerned climate action to GHG mitigation is considered as a yardstick.

5. Where do EV Incentives Stand with Respect to Other Climate Actions in India?

India's basket of climate actions is diverse and several of these climate solutions have benefitted from government incentives. Mature technologies such as solar PV and onshore wind have benefited from concessional tax treatment and capital subsidies in the past. More recently, emerging climate interventions such as offshore wind and green hydrogen are being supported by a range of incentives aimed primarily at attracting project investments which typically face early-stage risks with high uncertainty to project developers.

To understand where EV incentives stand within India's broader climate support landscape, this section compares the EV incentive per tonne of CO_2 abated with three other topical climate interventions: offshore wind, green hydrogen, and residential RTS.

While green hydrogen as an energy carrier and feedstock holds decarbonisation potential, especially in hard-to-abate sectors[15] like steel and petroleum refining, it is not yet commercially viable. This makes a case for government support to de-risk investments and accelerate scale-up. Similarly, the deployment of offshore wind is aimed at decarbonising India's electricity grid, but it is still in its early stages of development and requires policy and financial support from the government to become commercially competitive. There are dedicated incentive policies for both green hydrogen production and offshore wind generation projects in India.

On the other hand, RTS is based on a relatively mature solar PV technology and has long been a focus of India's clean energy strategy. However, its uptake has been slow. Against the target of 40 GW for grid-connected RTS capacity by 2022 under the National Solar Mission, approximately 11,628 Megawatt (MW) was achieved by December 2022 (Bridge to India, 2023). As of March 2024, India's RTS capacity stood at 11.87 GW which is far from achieving the targeted capacity (CEA, 2024b). There are ongoing efforts to boost installations. Like in the case of the EV sector, incentives to residential RTS are essentially to encourage greater adoption of the clean technology by consumers. This parallel makes residential solar rooftop incentives relevant for comparison with EVs.

[15] Hard-to-abate sectors are the ones that are particularly challenging to decarbonise due to their heavy reliance on fossil fuels and the nature of their processes and lack of economically attractive cleaner alternatives or mitigation measures.

Taken together, these three climate solutions span both mature and emerging technologies and the incentives they enjoy are supply- or demand-side in nature. Moreover, these interventions are central to achieving India's 2070 Net Zero goal. They have been compared with the EV transition based on the estimated incentive amount per tonne of CO_2 abatement potential. The comparison is captured in Table 4.

In the case of offshore wind, the estimation of incentives takes into account the central government incentives such as Viability Gap Funding (VGF) and GST concessions on turbines. Although offshore wind projects commissioned before 2032 are eligible for a 100% waiver on Inter-State Transmission System (ISTS) charges, this is not included in the calculation because of the incentive structure outlined in Model-A of the offshore wind strategy of the Ministry of New and Renewable Energy (MNRE), under which these projects receive central financial assistance through VGF, and power purchase agreements are secured with the Governments of Gujarat and Tamil Nadu at predetermined tariffs.

Green hydrogen incentives include production incentives under the National Green Hydrogen Mission and ISTS waivers, supplemented by state-level incentives. The case of Uttar Pradesh has been considered to account for state incentives for green hydrogen. Emission abatement for green hydrogen is calculated for two use cases—one, replacing grey hydrogen in petroleum refining, and two, substituting coal in Direct Reduced Ironmaking.

Residential RTS incentives comprise the capital subsidy under the central government's PM Surya Ghar scheme and the state-level subsidy offered by the Delhi government.

Details of the applicable incentive programmes and the different inputs used in estimating the cost of abatement for offshore wind, green hydrogen, and residential RTS are presented in Appendix C, Appendix D, and Appendix E, respectively.

For both offshore wind and RTS, CO_2 abatement is estimated using the CEA-published grid electricity emission factor for FY 2023–2024, on which a downward adjustment of 0.6% CAGR[16] has been made to reflect the possible decline in the CO_2 burden of grid electricity over the useful life of the clean energy asset.

As shown in Table 4, prima facie, the cost for the government to avoid one tonne of CO_2 is the highest for an electric car or green hydrogen and lowest for residential RTS or offshore wind.

Is there a case to treat current EV incentives differently?

A one-size-fits-all approach may not be appropriate to evaluate the incentives to the different climate actions. The first filter for treating these incentives can be the nature of their fiscal impact. For example, purchase or capital subsidies require budgetary allocation whereas tax incentives lead to forgone revenue (that may result in a revenue shortfall in extreme cases). As far as current EV incentives are concerned, tax concessions are the dominant form of support requiring no budgetary spending. A previous study by CSEP examined the impact of EV tax incentives on the governments' revenue collection (Kaur, Das, & Tongia, 2025). The analysis has estimated that the revenue losses from the EV tax incentives are about 0.14% of the government's total tax revenue in FY 2023–2024, increasing from just 0.004% in FY 2018–2019. While the results show that the current level of tax incentives does not jeopardise the government's revenue arithmetic, the trend signals the possible high opportunity cost of sustaining the tax concessions as EV adoption grows.

The second filter for the incentive assessment can be the current technology maturity which is essentially linked with the incentive policy rationale. Taking forward the EV versus solar PV comparison, there is no denying the fact that the electric drivetrain is a relatively new technology in the Indian market. Solar PV has taken its time to mature and has seen improvement in module efficiency over the years. Its unit economics has turned highly attractive with the steep decline in module costs between 2010 and 2022 (Koundal, 2023). Further, the growth in RTS installations has been supported by various initiatives over the years such as the SUPRABHA (Sustainable Partnership for RTS Acceleration in Bharat) and SRISTI (Sustainable Rooftop Implementation for Solar Transfiguration of India) schemes (Roy, 2024). The SRISTI scheme, announced in 2019, provided capital subsidies of up to 40% for RTS systems with a capacity between 1 kW and 3 kW, 20% for RTS between 3 kW and 10 kW, and 20% for installations in large apartment complexes and group housing societies. Apart

[16] This is based on the trend in grid electricity emission factor over past 10 years.

Table 4: Government Support for CO_2 Abatement for Different Climate Actions

Climate action		Budgetary incentive per tonne of CO_2 abatement (₹/tCO_2)	Tax concessions per tonne of CO_2 abatement (₹/tCO_2)	Total govt. incentive per tonne of CO_2 abatement (₹/tCO_2)
Vehicle electrification	Electric passenger car (Tata Nexon)	0	24,802 (US$ 292)	24,802 (US$ 292)*
	Electric two-wheeled vehicle (TVS iQube)	4,225 (US$ 50)	7,036 (US$ 83)	11,261 (US$ 132)*
Offshore wind		1,081 (US$ 13)	221 (US$ 3)	1,302 (US$ 15)
Green hydrogen	Replacement of grey hydrogen	3,503–4,753 (US$ 41–US$ 56)	15,552–33,047 (US$ 183–US$ 389)	19,054–37,801 (US$ 224–US$ 445)
	Substituting coking coal in iron and steel sector	1,172–1,348 (US$ 14–US$ 16)	5,204–9,375 (US$ 61–US$ 110)	6,376–10,724 (US$ 75–US$ 126)
Residential RTS		1,111–2,675 (US$ 13–US$ 31)	0	1,111–2,675 (US$ 13–US$ 31)

Source: Authors' calculations.

**Tax incentives for EVs will be a range depending on the ex-factory prices of the vehicle models. However, in this assessment, a particular passenger EV model has been considered, and therefore, the cost of abatement is a single value in this assessment.*

Note:

- *The US$ values may differ due to rounding off. US$ 1 = ₹85.*
- *The incentive calculation for RTS is done for plant capacities ranging from 1kW to 10 kW. Since the incentive amount is dependent on the plant capacity (as shown in Table 6 and Table 7) for both central and state incentives, the cost of CO_2 abatement appears as a range.*
- *The cost of abatement for green hydrogen is estimated for both Alkaline and Proton Exchange Membrane (PEM) electrolysers, which differ in characteristics such as capex cost, energy consumption, stack degradation, and stack durability. Additionally, parameters like ISTS charges and emission abatement sourced from the literature were available as a range. As a result, the abatement cost is presented as a range, reflecting these variations (Appendix D).*

from direct incentives, consumers have also benefited in most States at some point in time from net metering and gross metering arrangements for accounting for prosumer-generated electricity.[17] Government supports to utility-scale solar parks have also enabled the mainstreaming of the technology with the fall in solar PV module price and widespread technology uptake. Under the Generation Based Incentive (GBI) scheme for solar,[18] introduced in 2011, the government provided a significant incentive of ₹12.41 per kWh to the state distribution utilities for purchasing solar power from project developers directly (PIB, 2011).

On the other extreme of the maturity scale are offshore wind and green hydrogen. Both are at a nascent stage of development in the country. Although the country notified its Offshore Wind Policy in 2015, actual deployment has not taken off till now. The low support for abatement and the slow pace of implementation in the case of offshore wind possibly suggest that the existing incentives might not be sufficient in stimulating investments. The recent decision of the Solar Energy Corporation of India, on August 12, 2025, to cancel a tender for a 500-MW offshore wind energy project in Gujarat due to a lack of interest from prospective developers (The Economic Times, 2025) in a way reflects the poor financial viability of the sector.

[17] A prosumer is an electricity consumer who also produces electricity.
[18] Solar power projects with capacities between 100 kW and 2 MW, connected to high-tension (HT) grid below 33 kV were eligible under this scheme.

Green hydrogen is also an upcoming sector and has garnered the interest of investors with several projects announced in Gujarat, Maharashtra, Andhra Pradesh and other States. However, one should exercise caution in "*counting chickens before they are hatched*". The support for abatement in the case of green hydrogen for the replacement of grey hydrogen hovers between US$ 224 and US$ 445 per tCO_2. The incentive range is apparently closer to the electric car incentive (although it is largely in the form of a tax concession in the case of the latter). The cost to the government for CO_2 abatement through green hydrogen use in the iron and steel sector is lower (US$ 75 to US$ 126 per tCO_2) and comparable to electric two-wheeled vehicles (US$ 132). This may signal the possible need for greater incentives to this sector. The fact that no project has been formally announced for green steel production in India till now might echo the above sentiment.

The third filter that merits consideration is unique for EVs—the conditionality of its climate benefit. The emissions impact of the country's electric mobility largely hinges on the greenness of the consumed electricity. The current EV incentives appear high from the point of view of mitigating each tonne of CO_2 due to the significant carbon burden of the country's grid electricity as expressed in terms of its annual average CO_2 emission factor. Currently, about 75% of the electricity is generated from fossil-fuel-based thermal power plants (India Climate & Energy Dashboard, 2025). Therefore, when three-fourths of electricity consumption is catered for by carbon-intensive sources, any form of grid electricity consumption, including EV charging, leaves a substantial carbon footprint (Das, 2024). Despite the addition of around 127 GW of non-fossil-fuel-based power generation capacity, primarily in the form of solar PV, over the recent 10 years since FY 2013–2014, the annual average emission factor of grid electricity has declined at an annualised rate of only 0.6% (Das & Kaur, 2025). The high CO_2 content of electricity in India disadvantages the climate impact of vehicle electrification. For example, where on average an electric scooter is estimated to be more than seven times more energy-efficient than its petrol counterpart, the former's operational CO_2 emissions are only 2.5 times less (Das, 2024).

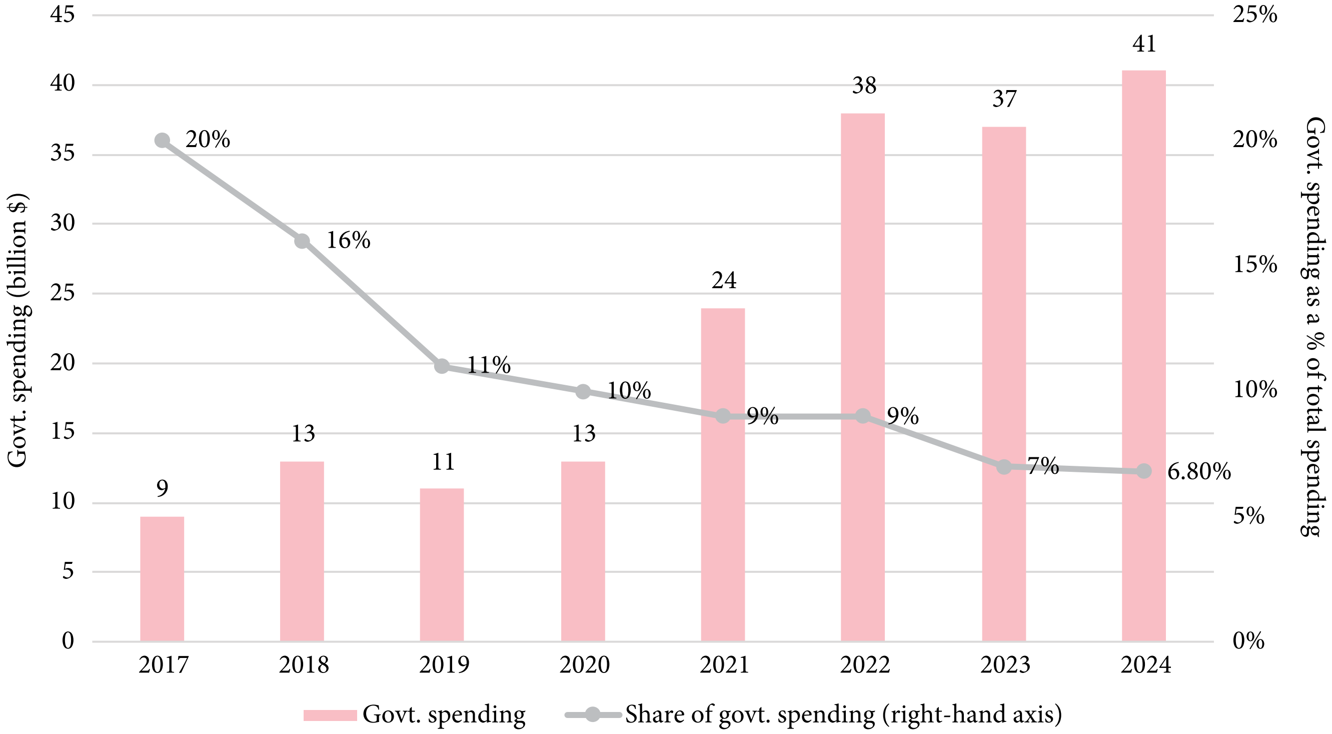
On the flip side, the current high GHG emission intensity of electricity augurs well for offshore wind and solar rooftop or any intervention that adds zero-emission power to the grid; their emission reduction potential gets magnified due to the current high magnitude of the grid electricity emission factor. This aspect weighs in when climate dividends from EV incentives are contrasted with that of offshore wind or residential RTS. If the carbon load of supplied electricity in the country decreases with the rising share of non-fossil-fuel-based power, the current amount of incentive to a clean energy source for each tonne of CO_2 avoided will appear disproportionate and it will be the reverse for EVs.

6. How do India's EV Incentives Compare Globally?

Advanced EV markets globally are not unfamiliar with government incentives to EV owners. Government spending on electric cars, which includes direct central government spending on purchase subsidies and revenue forgone from waivers and concessions on purchase taxes and registration taxes, has risen from US$ 9 billion in 2017 to US$ 41 billion in 2024 (IEA, 2025) (Figure 2). However, the share of government spending in overall spending[19] on electric cars has come down from 20% to less than 7% in the same period. In 2024, the latest year for which data are available, government spending on electric car promotion was reportedly highest in China (US$ 30 billion), followed by the United States (about US$ 6.5 billion) and Europe (about US$ 3.5 billion) (IEA, 2025). Spending by the Chinese government in the form of waivers and purchase subsidies on electric cars has been increasing steadily since the COVID-19 pandemic years. In the US, too, government spending on electric car incentives increased consistently between 2020 and 2023, with a slight decline in 2024. In contrast, Europe's EV subsidies peaked in 2022 and have declined thereafter, reflecting the gradual phase-out of incentives across several member countries.

[19] Overall spending includes both consumer spending and government spending, wherein consumer spending is defined as the total expenditure on an EV minus government incentives.

Figure 2: Government Spending on Electric Cars Globally



Source: (IEA, 2025).

To put the Indian context into perspective, this study draws a contrast with EV incentives in Norway, the US, and China which are some of the major EV markets that have progressed differently and are at different stages of transition to electric mobility.

6.1 Norway

Norway has been a frontrunner on EV uptake, with electric cars accounting for 89% of all car sales in 2024. Since the 1990s, the Norwegian government has been promoting EV adoption through a range of incentives such as exemptions on vehicle registration tax, annual road tax, toll charges and municipal parking charges. In the next decade, a bouquet of other types of incentives in the form of an exemption on VAT (Value Added Tax), ferry charges and company car taxes were offered to EV owners. As of March 2025, exemption from the 25% VAT is the most prominent incentive available for electric cars. VAT exemption accounted for the highest tax expenditure among all the incentives for EVs in Norway in 2021. Table 5 captures the array of incentives that EVs in the country have enjoyed currently or in the past.

Table 5: Incentives for EVs in Norway (as of March 2025)

Type of tax	Timeframe	Incentive level	Estimated tax expenditure (2021)
25% VAT on vehicle purchase and leasing	2001–2022	Full exemption	NOK 11.3 billion
	2022 onwards	VAT is applicable to high-end electric car models that cost over US$ 52,000	
Vehicle registration tax	1990–2023	Full exemption	NOK 5.8 billion
	2023 onwards	Registration tax based on the weight of the car (12.5 NOK (US$ 1.2) per kg over 500 kg)	
Annual road tax	1996–2020	Full exemption	NOK 950 million
	2021	30% exemption	
	2022 onwards	No exemption (NOK 3,270 (US$ 316) annually)	
Company car tax	2000–2008	25% exemption	NOK 340 million
	2009–2017	50% exemption	
	2018–2021	40% exemption	
	2022 onwards	20% exemption	
Re-registration tax	2018–2023	Full exemption	NOK 300 million
Charges on toll roads	1997–2017	No charges	N.A.
	2018–2022	50% exemption	
	2023 onwards	30% exemption	
Charges on ferries	2009–2017	No charges	N.A.
	2018 onwards	50% exemption	
Municipal parking	1997–2017	No charges	N.A.
	2018 onwards	50% discount	

Source: Authors' compilation based on (Norsk elbilforening, n.d.; Organisation for Economic Co-operation and Development [OECD], 2022; European Alternative Fuels Observatory, n.d.).

Note: Ongoing incentives in Norway have been highlighted in grey.

Notwithstanding the scaling back of exemptions on registration tax and annual road tax post 2020, EV uptake in the country continues to increase, rising from 80% of new car sales in 2022 to 82% in 2023 and 89% in 2024 (Gridserve, 2025).

6.2 The US

In the US, the Clean Vehicle Credit, under the Inflation Reduction Act (IRA), is a prominent incentive aimed at bolstering EV sales. From January 1, 2023, an EV buyer can claim up to US$ 7,500 in tax credits provided that the vehicle satisfies eligibility requirements related to critical mineral sourcing and battery component manufacturing (Table 6). This incentive is expected to cost US$ 72 billion in revenue and will remain in effect till 2032 (Committee for a Responsible Federal Budget, 2023).

6.3 China

EV owners in China benefit from a range of tax incentives, such as exemption from purchase tax, vehicle and vessel (V&V) tax,[20] bridge and road tolls, and public charging fees. EVs have been exempted from paying the 10% sales tax up to US$ 4,170 since 2014, with the exemption expected to be halved in 2025 and completely phased out by 2027 (Reuters, 2023).

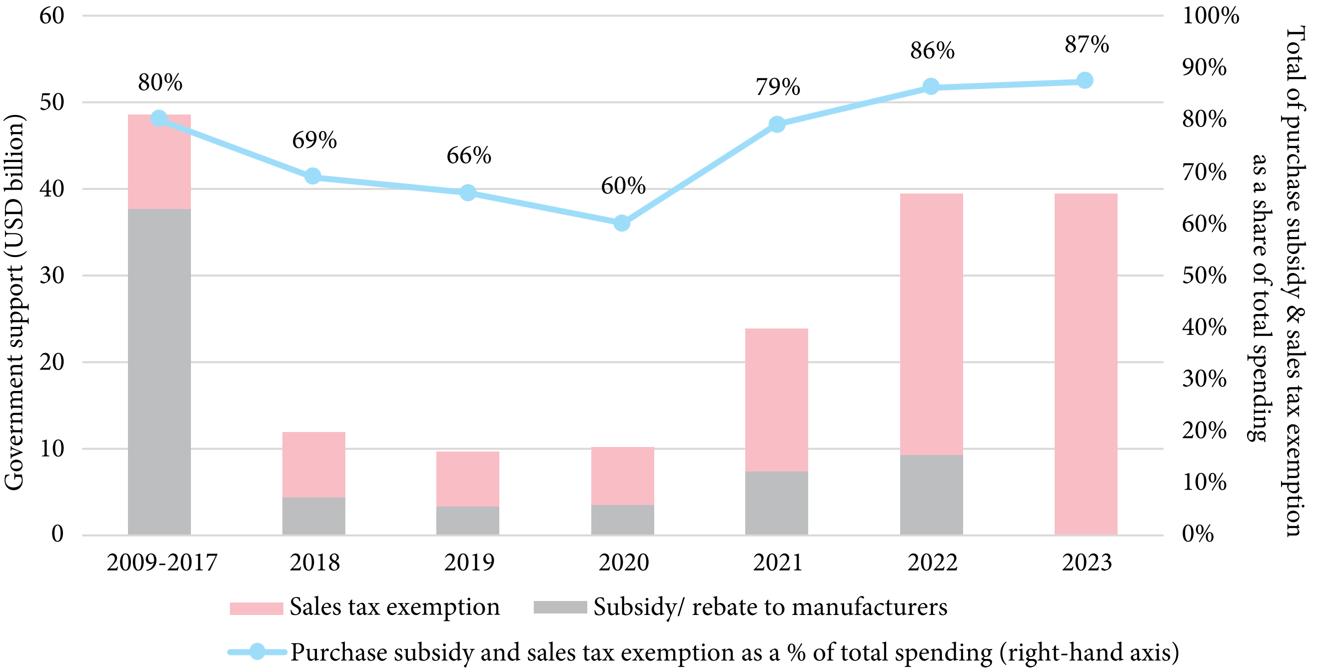
[20] V&V tax is an annual tax based on a vehicle's engine capacity and ranges from 60 to 320 yuan (US$8 to US$44) per passenger vehicle.

Table 6: Tax Credits Under the Inflation Reduction Act

	New EV	Used EV
Tax credit	• US$ 3,750 if the vehicle meets the critical minerals requirement only • US$ 3,750 if the vehicle meets the battery components requirement only • US$ 7,500 if the vehicle meets both	Lesser of US$ 4,000 or 30% of the sale price
Vehicle price limit	• US$ 80,000 for vans, sport utility vehicles and pickup trucks • US$ 55,000 for other vehicles	US$ 25,000 or less
Eligibility	Gross incomes to be under- • US$ 300,000 (couples) • US$ 225,000 (heads of household) • US$ 150,000 (all others)	Gross incomes to be under- • US$ 150,000 (couples) • US$ 112,500 (heads of household) • US$ 75,000 (all others)

Source: (Internal Revenue Service [IRS], n.d.).

Figure 3: Chinese Government Spending on the EV Sector

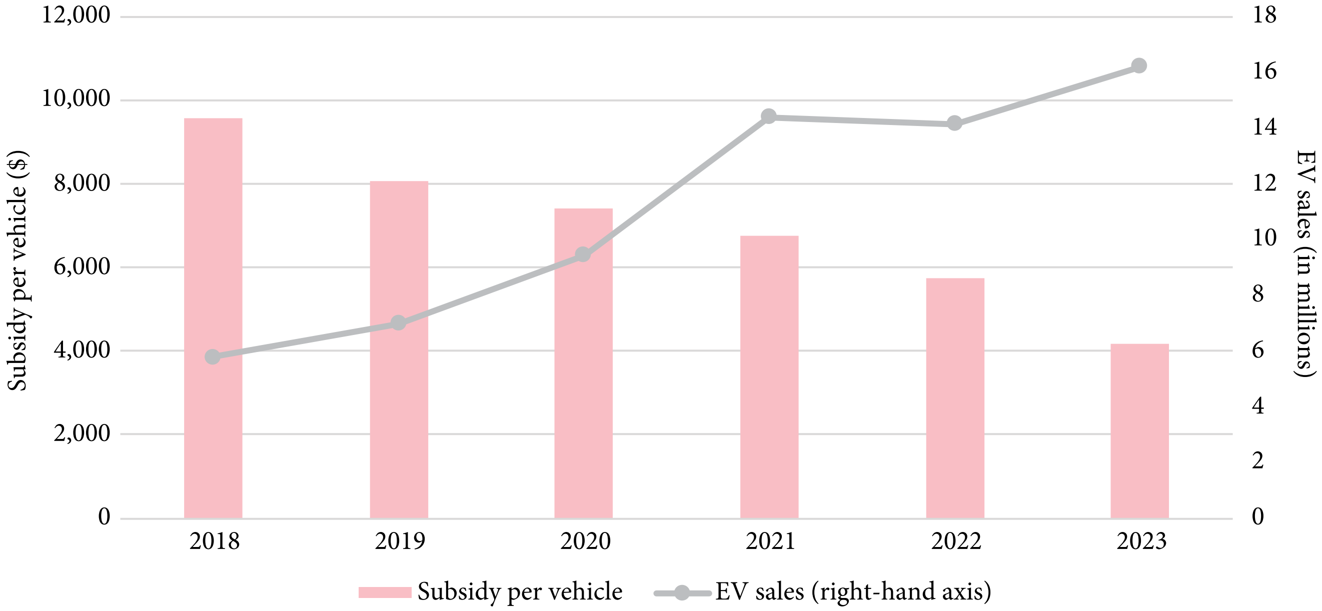


Source: Authors' analysis based on (Center for Strategic and International Studies, 2024).
Note: Other areas of spending include R&D, infrastructure subsidies and government procurement.

In the past, the Chinese government had also offered purchase subsidies depending on the driving range of an EV. These subsidies were announced in 2016 and were gradually reduced by 20% in 2017 and 40% in 2019 from 2016 levels and were planned to be completely phased out by 2020. However, due to the decline of EV sales in 2019, coupled with the COVID-19 pandemic effects on the auto industry, the subsidy was reinstated and gradually phased down between 2020 and 2022 and completely phased out by 2023 (Zhang, Burke, & Wang, 2024).

From 2009 to 2023, the Chinese government's spending on the EV sector was reportedly around US$ 230 billion, with purchase subsidy and sales tax exemption accounting for 75% of the total spending on the EV sector (Figure 3) (Center for Strategic and International Studies, 2024).

Figure 4: Trends of EV Subsidy per Vehicle and EV Sales in China



Source: Authors' analysis based on (Center for Strategic and International Studies, 2024) and (IEA, 2025).

Note:

- *Subsidy per vehicle has been adjusted to only include purchase subsidies and sales tax exemption.*
- *EV sales include both battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs), covering different vehicle formfactors like cars, two-wheeled vehicles, three-wheeled vehicles, buses, trucks, and vans.*

In 2025, China renewed its trade-in scheme wherein consumers receive a subsidy up to US$ 2,730 on scrapping an older ICE vehicle or EV and purchasing a new EV (Rho motion, 2025). While the overall volume of support offered by the Chinese government has consistently increased from 2019 onwards, the average subsidy per vehicle has fallen in China from about US$ 9,500 in 2018 to about US$ 4,000 in 2023 (Figure 4).

Although per-vehicle subsidies declined, overall EV uptake continued to grow, except for a slight decline in 2022 due to less electric two- and three-wheeled vehicle sales.

6.4 How India's EV Incentives Fare from an International Perspective

This section compares India's EV incentives with those offered by central governments in the three major EV markets—Norway, the US, and China. Electric passenger cars make up the majority of EV sales in these geographies. In 2024, electric cars accounted for 59% of EV sales in China, 93% in Norway, and 98% in the USA (IEA, 2025). Hence, the analysis focuses on incentives offered to electric cars.[21]

To carry out a like-to-like comparison of the incentive amount available for an electric car across the given countries, the study considers the Tata Nexon Creative 45 model (electric) as the case in point, that is, the eligible incentive amount for this electric passenger car model in each of these countries has been taken into account. Similar to the assessment of the climate benefit of EV incentives vis-à-vis other climate solutions in the Indian context, the incentive amount per tonne of CO_2 abatement (US$/t$CO_2$) from an electric car (Tata Nexon Creative 45) is treated as a yardstick for the country-level comparison. In addition, PPP adjustments of the incentives have been made to reflect the differences in prices between countries, for a more appropriate country-to-country comparison.

The calculation of the possible lifetime CO_2 emissions of an electric car duly considers the country-specific grid electricity emission factor (adjusted for transmission and distribution (T&D) losses) over the 12-year lifespan of the vehicle.

[21] While the majority of EV sales in India is in form of electric two-wheeled vehicles and three-wheeled vehicles, these vehicle segments are not prominent in all the advanced EV markets.

Table 7: Climate Benefit from Electric Car Incentives in Different Countries

Country	Type of central support	Nominal incentive per electric car (US$)	Incentive per electric car (US$$_{PPP}$)	Incentive per tonne of CO_2 abatement (US$/t$CO_2$)	Incentive per tonne of CO_2 abatement (US$$_{PPP}$/t$CO_2$)
India	GST concession	1,137	4,677	126	520
Norway	• 25% VAT exemption • Registration tax exemption	4,999	17,384	276	961
US	Clean Vehicle Credit under IRA	4,000	4,000	281	281
China	• Exemption from the 10% Sales Tax • Trade-in subsidy	4,313	12,280	376	1,069

Note:

- *Only central government fiscal supports have been considered in the country-level comparison.*
- *The grid electricity emission factors used in this analysis are 727 gCO_2/kWh for India, 31 gCO_2/kWh for Norway, 369 gCO_2/kWh for the US, and 582 gCO_2/kWh for China (Our World in Data, n.d.). The emission factors have been adjusted over the 12-year vehicle lifetime based on CAGR over the past 10 years (refer to Appendix B for details). According to the latest available estimates, T&D losses are 9% for India, 4% for China, 5.6% for Norway and 5% for the US (EIA, n.d.; Enerdata, n.d.). The emission mitigation potential of an EV is estimated by considering the petrol variant of the Tata Nexon.*
- *While EVs are eligible for a tax credit up to US$ 7,500 in the US, the average tax credit was around US$ 4,000 per vehicle in 2024. This is because not all electric cars are eligible for the benefit, and some cars are receiving only US$ 3,750 (IEA, 2025).*
- *In Norway, the registration tax exemption was withdrawn in 2023 as EV penetration reached a very high level. However, for a meaningful comparison with India, it is appropriate to consider incentives available prior to 2023 to reflect the full extent of government support.*
- *US$$_{PPP}$ denotes PPP adjusted US dollar. The PPP conversion rate (local currency per USD) is based on 2025 data (International Monetary Fund [IMF], n.d.).*
- *The values shown in the table are rounded off. However, full values have been used in doing the calculations and the corresponding results have been considered. For this reason, the input values and the results shown in the table might not tally in some cases.*

Among the countries analysed (Table 7), the nominal incentive offered per electric car is the highest in Norway (US$ 4,999) and lowest in India (US$ 1,137). India's GST concession aimed at lowering the upfront purchase cost of electric passenger cars is similar to China's sales tax exemption and the VAT exemption in Norway. As of 2025, electric passenger cars in India are no longer eligible for purchase subsidies under the PM E-DRIVE scheme. Earlier, they were eligible for demand incentives under the FAME-II scheme which provided an incentive of ₹10,000 per kWh (about US$ 117 per kWh), capped at US$ 1,764 per car (which is still lower than the trade-in subsidy of US$ 2,745 in China). The Chinese government continues to offer subsidies despite electric cars accounting for 50% of all cars sold in 2024 and plans to continue the sales tax incentives till 2027. Similarly, in Norway, where electric cars account for 90% of new car sales, the incentive per vehicle remains the highest among all countries assessed.

When comparing the government incentives per tonne of CO_2 abatement potential, India's support, at US$ 126 per tonne is the lowest among the countries. By forgoing US$ 1,137 in GST revenue per electric car, India can realise greater CO_2 abatement per dollar of incentive spending compared to the other countries. This is despite India's electricity grid being the most carbon-heavy among all countries and with the slowest rate of decline in the emission intensity based on past trends.

It is important to recognise that Norway's current incentive structure builds on decades of consistent policy support. Norwegian EVs have historically benefited from a range of incentives, including exemptions from registration and re-registration taxes, annual road taxes, and charges for toll roads and ferries since the 1990s. Further, India and Norway are at very different stages of their EV transitions: while only 10% of cars sold currently in Norway are non-electric, the electric share stands at just 2.6% in

India. While China's per-car total incentive is comparable to that in the US, its incentive per tonne of CO_2 abatement (US$ 376/tCO_2) is the highest among all countries assessed. This is primarily on account of the relatively high emission factor of China's grid compared to the US and a slower projected rate of decline in emission intensity in the former (2% versus 3% in the US).

While the nominal incentive in India (US$ 1,137) is the lowest, when adjusted for purchasing power to reflect the true value of the incentive, it rises to $US\$_{PPP}$ 4,677 making it nearly four times higher than the nominal value. Following PPP adjustment, India no longer offers the lowest incentive for abatement ($US\$_{PPP}$ 520/tCO_2); instead, at US$ 4,000 per electric car, the incentive in the US is found to be lower than all the other countries.

Similar to India, China's incentive in US$-PPP terms per tonne of CO_2 becomes higher than Norway or the US. Although Norway has the highest PPP adjusted incentive per electric car, at $US\$_{PPP}$ 17,384, its cost of CO_2 abatement through vehicle electrification is still lower than India and China owing to its less carbon-intensive grid electricity.

7. Food for Thought: Why or Why Not EV Incentives Are Important

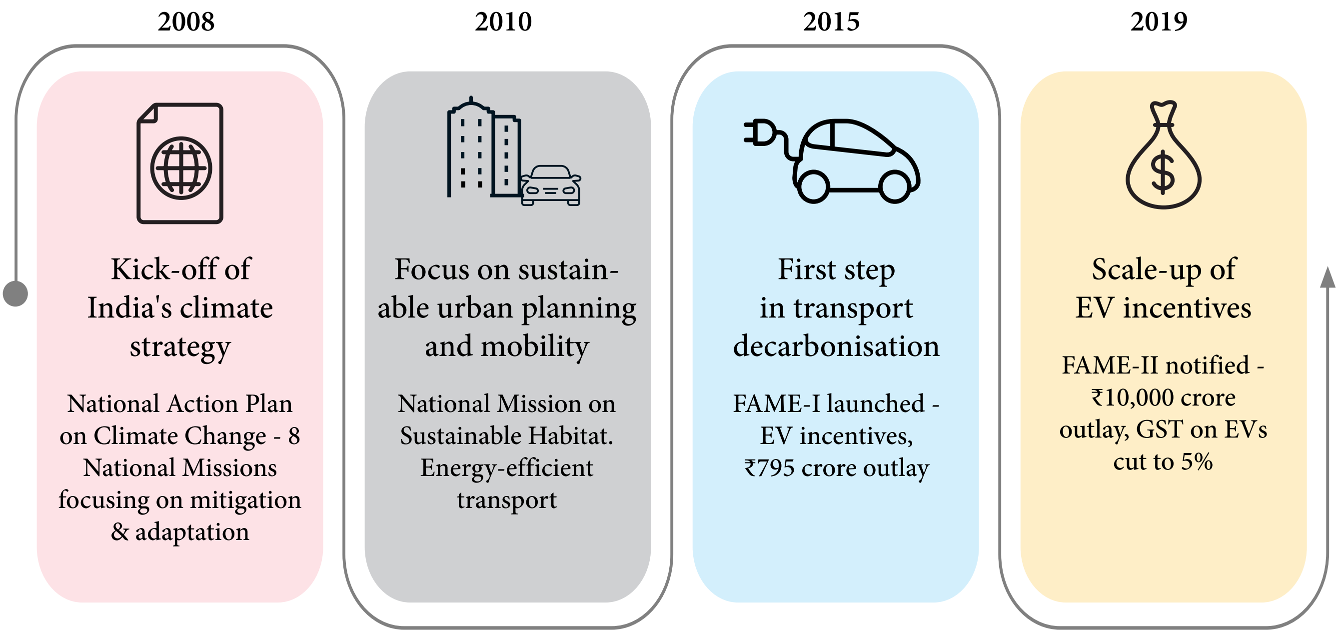
India's journey towards a low-carbon future officially kickstarted on June 30, 2008 with the release of the NAPCC that outlined the country's strategy to meet the challenge of climate change (PIB, 2021). Eight National Missions form the core of the National Action Plan representing a multi-pronged approach covering both mitigation and adaptation aspects.[22] On the mitigation front, the focus was on the solarisation of the country's power sector as a means to reduce the carbon burden of the electricity supply-side, and improving energy efficiency across different energy end-uses, particularly in the industrial sector. The National Mission on Sustainable Habitat, approved in June 2010 and housed in the Ministry of Housing & Urban Affairs, points towards among other things the need for comprehensive mobility plans that enable cities to undertake long-term, energy-efficient and cost-effective transport planning (PIB, 2021). The technology aspect of the means to achieve this mission objective has not been directly dealt with. It is only when the FAME scheme as part of the National Electric Mobility Mission Plan (NEMMP) 2020 was launched a decade ago, in 2015, initially for a period of two years with an outlay of ₹795 crore, that the country got a sense of the possible technology pathway to decarbonise its motorised road transport.[23] The first major fillip towards the technology transition, however, came in the form of Phase-II of the FAME scheme which was notified in 2019 with a bigger outlay of ₹10,000 crore for a period of 3 years.[24] The preferential GST rate on an EV, initially at 12% which was subsequently reduced to 5% since the end of 2019, has been another major fiscal support to EV adoption (Kaur, Das, & Tongia, 2025).

[22] These Missions are National Solar Mission, National Mission on Enhanced Energy Efficiency, National Mission on Sustainable Habitat, National Water Mission, National Mission for Sustaining the Himalayan Eco-system, National Mission for a Green India, National Mission for Sustainable Agriculture, and National Mission on Strategic Knowledge for Climate Change.

[23] The National Policy on Biofuels was adopted in May 2018 that aims to augment the generation of biofuels and to build a sustainable biofuel ecosystem.

[24] The design of the scheme also underwent major improvements.

Figure 5: Chronology of Policy Developments Towards Sustainable Mobility



Source: Authors' representation of the policy evolution.

From all these details about India's pursuit for clean mobility, it is apparent that not long ago, the country took the first concrete effort to electrify road transport to reduce emissions although it geared up with a larger national climate plan much before. India's EV journey is a relatively recent development.

While the timeframe to evaluate the climate benefit of India's policy towards EVs is short, as shown in the paper the cost for the government to abate each tonne of CO_2 through vehicle electrification, especially in the case of passenger cars, is possibly among the highest among the climate interventions that currently enjoy a generous amount of direct government incentive, namely offshore wind, green hydrogen, and residential RTS. A large part of the cost to the government for promoting electric passenger cars and electric two-wheeled vehicles is in the form of revenue forgone and not budgetary expenditure.

The international benchmarking shows that India is not necessarily as generous as some of the advanced markets to support electric passenger cars.[25] However, there is a substantial value of the fiscal incentive to EV buyers in the Indian context.[26]

The current high carbon burden of grid electricity in India puts vehicle electrification at a disadvantage by limiting the CO_2 mitigation potential. This underlying factor greatly influences the relative efficacy of India's EV incentive to reduce GHG emissions in the present scenario in comparison with other domestic climate interventions and advanced EV markets.[27]

This signifies the criticality of decarbonising India's electricity grid to not only reduce the carbon footprint of electricity consumption but also support climate actions in other sectors like transport. Accelerating the share of clean electricity in the supply should, therefore, be a strategic imperative for the country. However, this is in no way to suggest wait-listing climate interventions that are dependent on clean electricity availability until there is enough progress in reducing the carbon load of electricity. There will be an opportunity cost for delaying climate levers with conditional benefit at this stage.

This does not mean that the current limitations or red flags regarding the climate impact of the EV transition should be overlooked.[28] However, are the challenges insurmountable that potentially pose as

[25] India's incentive to an electric car buyer is not only the lowest in contrast to Norway, the US, and China, it translates to higher CO_2 abatement for each dollar of incentive given in nominal terms than all these countries.

[26] Post PPP adjustment which is to reflect the differences in prices between countries, the relative position of India changes. Its incentive per electric car is not the lowest but is still lower than China and Norway.

[27] Among the four EV markets, India presently has the highest annual average emission factor of electricity and records the slowest decline over past 10 years. On the flip side, it makes non-fossil-fuel-based electricity generation, like based on offshore wind and solar rooftop, very attractive due to the high CO_2 emission reduction opportunity.

[28] For example, reliance on nighttime charging of EVs does not serve the climate cause at present.

showstoppers? In fact, there is a range of practical means to unlock the emission reduction potential of EVs even in the present scenario as suggested in a recent CSEP study (Das, 2024), which includes incentivising EV charging during midday when the share of RE in the grid is high, encouraging battery swapping in vehicle segments where feasible and charging the swappable batteries with clean electricity, integrating plug-in charging infrastructure with distributed solar PV systems supported by energy storage systems (wherever financially viable), and more. Government policies, regulations, and programmes should give due importance to aligning the use of EVs with climate objectives.

Similarly, there is room for improvement in the energy economy of the present set of EVs, particularly in the medium- and heavy-duty vehicle segments. After accounting for the CO_2 emission factor of grid electricity, the gap in GHG emissions between an electric passenger car and its ICE counterpart narrows down, which further reduces to almost an equal level when contrasted with a strong hybrid passenger car. In the case of current two-wheeled vehicle models, electric technology shows superior energy performance with respect to a petrol type which helps the former maintain a considerable gap in emissions.

It is also noted that higher usage (annual VKM) of an EV increases its lifetime emission reduction potential and thus translates to a better abatement benefit of the EV incentives. This makes a case for channelling incentives to segments or use-cases that are characterised by high usage like freight vehicles.

Considering the less than desired climate dividends from the current level of EV incentives, a legitimate question might be whether to continue the incentives and instead let the auto sector take its course. In a cost-sensitive market like India, swaying consumer behaviour away from an age-old bankable technology, in this case conventional vehicles, and towards the adoption of a more complex and evolving alternative with a higher price tag, is a time-taking proposition. Early intervention of the government becomes critical not just to generate interest among consumers and create initial demand for the new technology; continued reliance on government patronage till the foreseeable future may be envisaged to avoid the possibility of a reversal in the current momentum towards the EV transition. However, this does not mean that the level or form of incentives or target vehicle-segments should remain constant indefinitely. Based on considerations like self-sustaining momentum in the EV transition in a segment, the social equity aspect, the opportunity for greater emission mitigation, etc., the government can take a calibrated approach in extending support like prioritising public vehicles like public electric buses, or hard-to-electrify but highly polluting segments like trucks.

However, any rollback of government support from a segment should be done in a phased manner because such actions are likely to plant indecision in the minds of the next set of potential EV buyers (“followers” to early adopters). Countries such as Germany and the Netherlands experienced a decline in EV sales when subsidies were tapered down (Dutch News, 2025). For instance, when Germany decided to reduce its subsidy sharply from €6,000 to between €3,000 and €4,500 with only a week’s notice, EV sales dropped by 83% (Clean Energy Wire, 2023). Countries such as Sweden, China and Norway were better able to handle the phasing out of subsidy due to higher EV penetration and the gradual removal of subsidy (MIT Technology Review, 2024).

The example of residential RTS in India reinforces how consumer-facing clean technologies demand long-term government support. The continuation of financial incentives to residential RTS, where retail consumers are at the centre of adoption or transition, even after a decade since the launch of the National Solar Mission, shows that major transformation at the consumer end is a painstakingly slow process. A similar case may be made for the switch to EVs. Incentives aimed at EV uptake may remain the mainstay for EV growth till the electric drivetrain becomes the go-to option for consumers. Will continuing the EV incentives dent a major hole in the government’s fiscal kitty? As per the CSEP study, the government incurred a tax revenue loss of about ₹4,328 crore in FY 2022–2023 due to the EV transition i.e., accounting for both fuel tax loss[29] and tax incentives, in the two-wheeled vehicle and passenger car segments (Kaur, Das, & Tongia, 2025). The shares of this loss in India’s total tax revenue and GDP are estimated to be 0.09% and 0.02%, respectively. The country in that year registered around 7.3 lakh electric two-wheeled vehicles and close to 50 thousand electric passenger cars.

[29] Fuel switch from oil to electrons reduces revenue from taxes on fuel sales. VAT and excise duty on petrol or diesel are greater than electricity duty.

Are there alternative policy approaches to make the EV-shift without depending on consumer incentives? Mandates, which are often considered to be effective in realising a rapid course change, can be seen in the case of the judiciary-imposed mandate on the changeover of public buses in Delhi from diesel to CNG, the only clean fuel available then, by April 1, 2001.[30] Gradually, the ban on diesel vehicles expanded to cover other types of passenger commercial vehicles registered in Delhi. The blanket ban has never been applicable to the personal vehicle segment. It is true that such mandates often help hasten a required change. However, such actions do not yield the desired outcome in isolation. In the case of switching over to CNG, the low fuel price of the latter is a major pull factor for the commercial fleets. Hence, once CNG became easily available to vehicle users, market forces started driving the large-scale transition. Moreover, the underlying vehicular technology and operation remain the same requiring no change in vehicle-user behaviour. Also, mandates can be effective within a limited geography and to specific use-cases. A country-wide change through a mandate in a diverse sector like road transport where States govern the grant of permits to vehicles under the framework of registration or permit is not feasible.[31] In the case of EVs, the role of a "carrot-and-stick" approach is often deliberated. The Centre can explore introducing more stringent CO_2 emission targets for automakers in the upcoming Corporate Average Fuel Economy (CAFE)-III and CAFE-IV cycles (Das, 2024).[32] This is expected to nudge the auto manufacturers to sell a greater number of cars with cleaner technologies including electric to meet the emission targets.

At the state level, governments may mandate commercial vehicle fleets to achieve a certain share of EVs. For example, in November 2023, the Delhi government notified the "Motor Vehicle Aggregator and Delivery Service Provider Scheme, 2023" which mandates a transition to an all-electric fleet for cab companies, food delivery firms and e-commerce entities by April 1, 2030 (Transport Department, GNCTD, 2023). It is worthwhile to add here that Delhi's state EV policy, issued in August 2020, offered purchase incentives for a range of EVs including commercial fleets over and above the eligible FAME-II incentives (Transport Department, GNCTD, 2020). NITI Aayog has also emphasised the need to "move from incentives to mandates" for EV adoption with "target timelines" and "progressively more stringent" emission norms (NITI Aayog, 2025). Does offering only a "stick" and no "carrot" work? The jury is still out.

Should the government taper down consumer incentives? Considering the incentives are meant to reduce the cost of EV adoption, this may be a possible option as the costs of batteries and consequently EVs come down organically. Policymakers, by engaging with market analysts, the industry, civil society and academia, can track the evolution of the total cost of EV ownership in different vehicle segments and use-cases and develop a time-bound plan for phasing down and out the EV incentives to take the electric transition on a fiscally sustainable glide path. Internationally, it has been observed in recent times that as electric car sales increase, government spending per vehicle, in the form of purchase subsidies and tax incentives, has shown a downward trajectory. In 2024, government spending accounted for less than 7% of total spending on electric cars globally, compared to about 20% in 2017 (IEA, 2025).

In this debate around the climate impact of EV incentives, the World Bank's policy research working paper throws an interesting perspective. Based on its global analysis of the uptake of passenger EVs, the study observes that spending on charging infrastructure turns out to be a much more cost-effective use of public funds (government incentives), as it potentially delivers additional EV adoption at a fraction of the cost: US$ 1,500 to US$ 4,000 per EV sale induced in contrast to the higher fiscal cost of US$ 10,000 to US$ 13,000 for every sale promoted through consumer subsidies (Li, Wang, Yang, & Zhang, 2021). The assessment inferred that "*investment in charging infrastructure would have been much more cost-effective than consumer purchase subsidies in promoting electrical vehicle adoption*". This shows that channelling government support to shared infrastructure like charging stations allows a wider reach of the benefit and a better outcome for every money spent. The main downside of this strategy is that it is difficult to ensure the benefit of government support is effectively passed on to EV users in terms of a reduced cost of charging. The cost buildup for the charging

[30] In response to a public interest litigation regarding worsening air quality in Delhi, Supreme Court issued an order in 1998 for the entire fleet of public transport buses to switch over to single fuel mode of CNG by April 1, 2001.

[31] Motor vehicles and other mechanically propelled vehicles fall under Entry 35 of List–III of the Indian Constitution. This means both Centre and States have power to legislate on matters relating to MVs.

[32] Imposed on a carmaker's entire production fleet, and not on an individual model, CAFE is a limit set on the total emissions of CO_2 produced. These norms force manufacturers to make more efficient cars, which impacts many other things.

fee that an EV user pays to a charge point operator depends on multiple factors not limited to capital expenditure on the equipment.

Should all eggs be put in one basket? Considering some of the apprehensions regarding the possible vulnerability of the EV industry, for instance, supply chain risks due to over-reliance on imports of lithium-ion battery cells or the required critical minerals, it makes a strong case for the country to base its transport decarbonisation strategy not on one technology but multiple potential solutions like biofuels enabled by a flex-fuel engine, fuel-cells, etc. Technology diversification does help hedge some of the risks. However, on the downside, a lack of visibility on a clear path forward may lead to half-hearted policy actions with divided fiscal support,[33] industry indecision[34] and market inertia and limited concerted effort to drive a technology. Progress in decarbonisation may ultimately suffer.[35] Moreover, one needs to reflect on whether the country has a better technology alternative to EVs that fits the bill. Is there a clear "winner" in sight? Biofuels have their limitations and risks[36] and so do fuel cells.[37] Strong hybrid cars are hardly a progression towards decarbonisation despite their greater fuel economy; road transport remains stuck with petroleum consumption and associated emission problems. The country has to prioritise investment in technologies that can truly take the economy to the Net Zero milestone. A band-aid approach will delay reaching this ultimate goal.

7.1 Recommendation: A Mix of Policy Actions

Based on the presented arguments, the paper suggests five broad policy interventions with the objective to maximise the climate benefit from every rupee spent on EVs and reduce dependence on subsidies to promote a faster EV transition.

i. **A decarbonisation strategy for road transport to guide policy actions:** Develop a clear roadmap to decarbonise motorised road transport that takes into account associated risks and co-benefits and links incentives with benefits or outcomes. This will help target the government's resources to support climate mitigation in the sector more effectively.

ii. **Renewable-energy-heavy EV charging:** Accelerate RE penetration in the grid supported by faster deployment of utility-scale energy storage[38] and the introduction of solar-aligned time-of-day electricity tariffs for EVs for greater RE offtake during EV charging, thereby increasing the emission abatement impact of EVs.[39] Wherever feasible, integrate charging stations with distributed RE resources like RTS systems.

iii. **A priority-order for directing incentives based on climate impact:** Channel subsidies to only those EV segments or use-cases that are more polluting and harder to electrify (like trucks) and environmentally and socio-economically more beneficial (like buses[40] including privately managed fleets). This apart, provide fiscal support to develop shared infrastructure like upstream electrical systems (electrical substations and allied network), which are otherwise costly, to encourage a faster and more economical rollout of public charging stations that will benefit the entire spectrum of EV users (in contrast to EV purchase subsidies which are exclusionary in nature). Adopting this approach would help realise greater climate dividends from the available fiscal resource of the government.

iv. **A predefined logic-based sunset clause for incentive schemes:** Include a clear incentive phase-out plan in the government's support

---

33 Available budget being a constraint in majority of cases.

34 It is hard to expect an auto company to invest in multiple technologies.

35 Sunita Narain, who is the Director General of Centre for Science and Environment and a member of the Supreme Court-appointed Environment Pollution Control Authority (EPCA), highlighted in her address at ET Energy Leadership Summit 2025 that the country's road transport needs a clear decarbonisation plan that can be pursued at scale and speed. This is not possible if multiple solutions are tried at the same time with the hope that one will click one day.

36 As highlighted in a previous CSEP study, the source of ethanol used in blending in the country is primarily molasses made from sugarcane, and not agricultural residues or any waste. *Roadmap for Ethanol Blending in India 2020–2025* prepared by NITI Aayog and the Ministry of Petroleum and Natural Gas flags the possibility of negative ecological impacts due to the current sourcing of ethanol. Sugarcane and paddy combined are using 70% of the country's irrigation water, thus depleting water availability for other crops.

37 Futuristic and expensive and likely viable in case of long-haul heavy-duty vehicles.

38 Renewable capacity growth has not been fast enough to create surplus power for storage.

39 This should be complemented by faster rollout of public charging infrastructure, especially at workplaces, education campuses, business districts, transit nodes and marketplaces which usually see greater vehicle footfall during daytime. Home or captive charging commonly happens during evening and night.

40 An electric sedan or SUV emits 1.5 to 2 times higher CO_2 than an electric bus for every passenger-km.

programmes for EVs. The tapering down of incentives should be based on a set rationale, ideally linked with targeted outcomes. For example, MV tax concessions to privately registered EVs can be ended as the total cost of ownership of an EV becomes competitive in the given use-case. GST on EVs of a certain vehicle form factor can be raised to 18% (at par with conventional vehicles) when EV sales become dominant in the given segment. Such a rationale-based approach would help free up the financial bandwidth of the government to support harder-to-electrify EV segments.

v. **R&D to reduce the cost of adoption and improve product performance:** Increase spending on R&D significantly to support cost-effective production of EVs and its components, particularly batteries, having improved performance which will ultimately enable EVs to become the preferred choice for a broader range of consumers. This will help reduce the dependence on EV purchase incentives. The enhanced energy economy of EVs because of performance improvement can potentially unlock greater climate benefits.

The above strategy will help drive India's road transport on a clean, green and fiscally sustainable pathway.

As a caveat, this study does not take into account the broader co-benefits of EV adoption in India, like addressing urban air pollution, while evaluating EV incentives and comparing them with other domestic climate solutions. Just because it is difficult to quantify the associated health and economic benefits, the latter should not be discounted.

Coming back to India's climate journey, achieving Net Zero emissions by 2070 would likely benefit from early targeted climate interventions considering the mid and last miles of this expedition are expected to be more challenging and costly. The majority of the available "low-hanging fruits" in terms of climate actions may be exhausted as the country makes progress towards Net Zero, leaving mostly the more difficult and expensive problems to tackle. Developing and improving new technologies and their rapid deployment at scale would be critical and would require government patronage more than ever. Decarbonisation efforts in the mobility sector can be a good case in point.

References

Akashvani. (2025, April 19). *Gujarat slashes EV motor vehicle tax to 1% to boost green mobility*. Newsonair. https://www.newsonair.gov.in/gujarat-slashes-ev-motor-vehicle-tax-to-1-to-boost-green-mobility/

Bieker, G. (2021). *Global comparison of the life-cycle greenhouse gas emissions of passenger cars.* International Council on Clean Transportation.

Bridge to India. (2023, March 22). *India solar rooftop map, December 2022*. https://bridgetoindia.com/report/india-solar-rooftop-map-december-2022/

CBIC. (n.d.). *GST rates for goods and services as on 01.04.2023*. https://cbic-gst.gov.in/gst-goods-services-rates.html

Center for Strategic and International Studies. (2024, June 20). *The Chinese EV dilemma: Subsidized yet striking*. https://www.csis.org/blogs/trustee-china-hand/chinese-ev-dilemma-subsidized-yet-striking

CEA. (2024a). *Electricity tariff & duty and average rates of electricity supply in India*. https://cea.nic.in/wp-content/uploads/fs___a/2025/01/Tariff_Book_2024_Scanned.pdf

CEA. (2024b). *Monthly Renewable Energy Generation Report*.

CEA. (2025, May 9). *CDM – CO2 baseline database*. https://cea.nic.in/cdm-co2-baseline-database/?lang=en

Clean Energy Wire. (2023, February 6). *E-car sales plummet in Germany following subsidy cut*. https://www.cleanenergywire.org/news/e-car-sales-plummet-germany-following-subsidy-cut#

Committee for a Responsible Federal Budget. (2023, July 6). *IRA energy provisions could cost two-thirds more than originally estimated*. https://www.crfb.org/blogs/ira-energy-provisions-could-cost-two-thirds-more-originally-estimated#fn1

Das, S. (2024). *Demystifying the climate benefit of EV transition in India: Opportunity to decarbonise through vehicle electrification is complex (CSEP Working Paper 84)*. Centre for Social and Economic Progress. https://csep.org/wp-content/uploads/2024/11/Demystifying-The-Climate-Benefit-Of-Ev-Transition-In-India-1.pdf

Das, S., & Kaur, T. (2025). *Moving to a cleaner future: Is India's electricity grid on track? A data-driven analysis to understand why or why not*. New Delhi: CSEP.

Debroy, B., & Misra, D. P. (2024). *Igniting the bright spark: Through the looking glass on electric mobility in India*. Economic Advisory Council to the Prime Minister. https://eacpm.gov.in/wp-content/uploads/2024/03/Adoption-of-EVs-Project-EAC-PM-Publication-Version-1.pdf

Dutch News. (2025, March 18). *Car owners say "no" to electric vehicles as subsidies stop*. https://www.dutchnews.nl/2025/03/car-owners-say-no-to-electric-vehicles-as-subsidies-stop/

EIA. (n.d.). *How much electricity is lost in electricity transmission and distribution in the United States?* U.S. Energy Information Administration. https://www.eia.gov/tools/faqs/faq.php?id=105&t=3#:~:text=The%20U.S.%20Energy%20Information%20Administration%20%28EIA%29%20estimates%20that,in%20the%20United%20States%20in%202018%20through%202022.

Enerdata. (n.d.). *Global energy statistical yearbook*. https://www.enerdata.net/

ET Energy World. (2024, June 27). *Significant tariff differences across India's energy segments amid new offshore wind funding: CRISIL*. https://energy.economictimes.indiatimes.com/news/renewable/significant-tariff-differences-across-indias-energy-segments-amid-new-offshore-wind-funding-crisil/111309881#:~:text=NEW%20DELHI%3A%20Tariffs%20for%20various,Rs%206%2D6.5%2FkWh.

European Alternative Fuels Observatory. (n.d.). *Incentives and legislation*. https://alternative-fuels-observatory.ec.europa.eu/transport-mode/road/norway/incentives-legislations

European Hydrogen Observatory. (2025, May 26). *Levelised cost of hydrogen calculator*. https://observatory.clean-hydrogen.europa.eu/tools-reports/levelised-cost-hydrogen-calculator

GIZ. (2018). *Repowering of old wind turbines in India*. https://www.giz.de/en/downloads/11_Repowering_Study_Idam.pdf

Government of Andhra Pradesh. (2018, June 8). *Electric mobility policy 2018–23*. https://www.acma.in/uploads/doc/AP%20Policy_final.pdf

Government of Andhra Pradesh. (2023). *Andhra Pradesh green hydrogen & green ammonia policy*. https://nredcap.in/PDFs/2023/GO_Ms_No_14_Dt_20_06_2023.pdf

Government of Andhra Pradesh. (2024). *Andhra pradesh sustainable electric mobility policy (4.0) 2024–29*. https://apiic.in/wp-content/themes/custom-theme/assets/Pdfs/AP%20Sustainable%20Electric%20Mobility%20Policy%20GO%20MS%20No%2088.pdf

Government of Assam. (2024, March 14). *Assam renewable energy policy*. https://www.apdcl.org/website/docs/documents/pmsurya/Notification-Operational%20Guidelines.pdf

Government of Delhi. (2023). *Delhi solar energy policy.* https://solar.delhi.gov.in/public/assets/solar/delhi_solar_policy_2023_0.pdf

Government of Gujarat. (2022). *Aatmanirbhar Gujarat scheme for assistance to large industries and thrust sector.* https://ic.gujarat.gov.in/documents/commondoc/2022/Atmanirbhar%20Gujarat%20Scheme%20for%20assistance%20to%20Large%20Industries%20and%20Thrust%20Sector.pdf

Government of Gujarat. (2024). *Development of offshore wind farms at Gujarat.* https://indextb.com/files/2024/6/5a4afc38-f884-4fd9-9de9-94482ae66124_18.%20Development%20of%20Off-shore%20Wind%20Farm%20at%20Gujarat.pdf

Government of Jharkhand. (2022). *Jharkhand state solar policy.* https://api.jreda.com/all-uploaded-img/img/6360e972de5e0.pdf

Government of Karnataka. (2025). *Karnataka clean mobility policy 2025-30.* https://industries.karnataka.gov.in/storage/pdf-files/8211.pdf

Government of Madhya Pradesh. (2025). *Madhya Pradesh electric vehicle policy.* https://invest.mp.gov.in/wp-content/uploads/2025/02/MP-EV-Policy-2025_FINAL-1.pdf

Government of Maharashtra. (2023). *Maharashtra green hydrogen policy.* https://jmkresearch.com/wp-content/uploads/2023/11/Maharashtra-Green-Hydrogen-Policy-2023.pdf

Government of Maharashtra. (2025). *Maharashtra electric vehicle policy.* https://gr.maharashtra.gov.in/Site/Upload/Government%20Resolutions/Marathi/202505231834008229....pdf

GNCTD. (2020). *Delhi electric vehicles policy.* https://www.nsws.gov.in/s3fs/2022-12/Delhi%20Electric%20Vehicles%20Policy%202020.pdf

Government of Rajasthan. (2023). *Rajasthan green hydrogen policy.* https://rising.rajasthan.gov.in/storage/app/public/files/pdf/rajasthan-green-hydrogen-policy-2023.pdf

Government of Rajasthan. (2024). *Rajasthan investment promotion scheme.* https://rising.rajasthan.gov.in/storage/app/public/files/pdf/rips-2024.pdf

Government of Tamil Nadu. (2021). *Tamil Nadu Industrial Policy.*

Government of Uttar Pradesh. (2022). *Uttar Pradesh electric vehicle manufacturing and mobility policy.* https://invest.up.gov.in/wp-content/uploads/2023/02/Uttar-Pradesh-Electric-Vehicle-Manufacturing-Policy-2022.pdf

Government of Uttar Pradesh. (2024). *Uttar Pradesh green hydrogen policy.* https://invest.up.gov.in/wp-content/uploads/2024/06/UPNEDA-GH2-Policy-English_120624.pdf

Government of Uttarakhand. (2023). *Uttarakhand state solar policy.* https://ureda.uk.gov.in/department2/library_file/file-08-05-2023-13-00-55.pdf

Gridserve. (2025, February 25). *Why Norway leads the world in EV adoption*. https://www.gridserve.com/why-norway-leads-the-world-in-ev-adoption/

Hall, W., Millner, R., Rothberger, J., Singh, A., & Shah, C. K. (2021). *Green steel through hydrogen direct reduction: A study on the role of hydrogen in the Indian iron and steel sector.* TERI. https://www.teriin.org/sites/default/files/2021-08/policybrief-green-steel.pdf

ICED. (2025). *Source-wise electricity installed capacity trends*. India Climate & Energy Dashboard. https://iced.niti.gov.in/energy/electricity/generation/capacity

IEA. (2023). *Transitioning India's road transport sector.* https://www.iea.org/reports/transitioning-indias-road-transport-sector

IEA. (2025). *Global EV Outlook.*

IMF. (n.d.). *Implied PPP conversion rate*. International Monetary Fund. https://www.imf.org/external/datamapper/PPPEX@WEO/OEMDC/

India Climate & Energy Dashboard. (2025). *Source-wise electricity generation trends*. https://iced.niti.gov.in/energy/electricity/generation/power-generation

International Transport Forum & The World Bank. (2023). *Life-cycle assessment of passenger transport – An Indian case study.*

IRS. (n.d.). *Credits for new clean vehicles purchased in 2023 or after*. Internal Revenue Service. https://www.irs.gov/credits-deductions/credits-for-new-clean-vehicles-purchased-in-2023-or-after

Jindal, A., Shrimali, G., & Tiwary, N. (2024). At scale adoption of green hydrogen in Indian industry: Costs, subsidies and policies. *Energy for Sustainable Development, 83*. https://doi.org/10.1016/j.esd.2024.101549

JMK. (2025). *Trends in ISTS green open access market.*

Kamboj, P., Malyan, A., Kaur, H., Jain, H., & Chaturvedi, V. (2022). *India transport energy outlook.* CEEW. https://www.ceew.in/sites/default/files/ceew-research-transport-energy-use-carbon-emissions-decarbonisation.pdf

Kaur, T., Das, S., & Tongia, R. (2025). *The fiscal impact of India's EV transition: Tax revenue losses go beyond fuel (CSEP Discussion Paper 23).* Centre for Social and Economic Progress.

Kohli, S. (2024). *Electric vehicle demand incentives in India.* International Council on Clean Transportation. https://theicct.org/wp-content/uploads/2024/06/ID-169-FAME-opps_report_final.pdf

Koundal, A. (2023, September 4). *What explains the steepest dip in solar installation costs in India?* ET Energy World. https://energy.economictimes.indiatimes.com/news/renewable/what-explains-the-steepest-dip-in-solar-installation-costs-in-india/103329903

Kshirsagar, S., Bhattacharjee, A., & Malladi, K. (2022, February 14). *Conventional pathways for hydrogen production*. WRI. https://india.wri.org/blogs/conventional-pathways-hydrogen-production#:~:text=The%20challenges%20associated%20with%20SMR,gas%20that%20can%20be%20captured.

Li, S., Wang, B., Yang, M., & Zhang, F. (2021). *The global diffusion of electric vehicles: Lessons from the first decade.* The World Bank.

Li, S., Zhu, X., Ma, Y., Zhang, F., & Zhou, H. (2020). *The role of government in the market for electric vehicles: Evidence from China.* World Bank Group.

Ministry of Coal. (2022). *Roadmap from coal to hydrogen production.* https://coal.gov.in/sites/default/files/ncgm/rch09-05-2022.pdf

Ministry of Heavy Industries. (2024, September 29). *PM electric drive revolution in innovative vehicle enhancement (PM E-DRIVE).* https://pmedrive.heavyindustries.gov.in/docs/policy_document/257594.pdf

Ministry of Power. (2023, June 9). *Waiver of inter-state transmission charges on transmission of the electricity generated from solar and wind sources of energy under Para 6.4 (6) of the Tariff Policy, 2016- Addendum.* https://powermin.gov.in/sites/default/files/Waiver_of_Inter_State_Transmission_Charges_on_transmission_of_the_electricity_generated_from_solar_and_Orders.pdf

MIT Technology Review. (2024, September 23). *Some countries are ending support for EVs. Is it too soon?* https://www.technologyreview.com/2024/09/23/1104247/ending-ev-subsidies/

MNRE. (2015, October 6). *National offshore wind policy.* https://cdnbbsr.s3waas.gov.in/s3716e1b8c6cd17b771da77391355749f3/uploads/2024/12/202412201344723115.pdf

MNRE. (2023, June 28). *Scheme guidelines for implementation of "Strategic Interventions for Green Hydrogen Transition (SIGHT) Programme- Component I: Incentive Scheme for Electrolyser Manufacturing" of the National Green Hydrogen Mission.* https://www.nsws.gov.in/s3fs/2023-10/Scheme%20Guidelines%20-%20Electrolyser%20Manufacturing%20-%20SIGHT%20%281%29.pdf

MNRE. (2023). *Strategy paper for establishment of offshore wind energy projects.* https://mnre.gov.in/en/document/strategy-paper-for-establishment-of-offshore-wind-energy-projects/

MNRE. (2024). *Guidelines for PM-Surya Ghar: Muft Bijli Yojana.* https://pmsuryaghar.gov.in/assets/files/1.%20CFA%20to%20Residential%20Consumers.pdf

MNRE. (2024, July 3). *Scheme guidelines for implementation of "Strategic Interventions for Green Hydrogen Transition (SIGHT) Programme- Component II: Incentive Scheme for Green Hydrogen Production (under Mode-1) -Tranche -II" of the National Green Hydrogen Mission.* https://cdnbbsr.s3waas.gov.in/s3716e1b8c6cd17b771da77391355749f3/uploads/2024/07/202407041145009350.pdf

MNRE. (2024). *Scheme guidelines for implementation of "Viability Gap Funding (VGF) Scheme for offshore wind energy projects.* https://cdnbbsr.s3waas.gov.in/s3716e1b8c6cd17b771da77391355749f3/uploads/2024/09/202409121089987626.pdf

MoEFCC. (2021). *India: Third biennial update report to the United Nations Framework Convention on Climate Change.* Government of India. https://unfccc.int/sites/default/files/resource/INDIA_%20BUR-3_20.02.2021_High.pdf

MoEFCC. (2022). *India's long-term low-carbon development strategy.*

NITI Aayog. (2025). *Unlocking a $200 billion opportunity: Electric vehicles in India.* https://www.niti.gov.in/sites/default/files/2025-08/Electric-Vehicles-WEB-LOW-Report.pdf

Nitturu, K., Sripathy, P., Patidar, R., Elango, S., Yadav, D., & Mallya, H. (2024). Decarbonising coal-based direct reduced iron production. CEEW. https://www.ceew.in/sites/default/files/decarbonising-coal-based-dri-production.pdf

Norsk elbilforening. (n.d.). *Norwegian EV policy*. https://elbil.no/english/norwegian-ev-policy/

OECD. (2022). *OECD environmental performance reviews: Norway 2022.* OECD Publishing. doi:https://doi.org/10.1787/59e71c13-en

Our World in Data. (n.d.). *Carbon intensity of electricity generation*. https://ourworldindata.org/grapher/carbon-intensity-electricity?tab=table

Pal, R., Tripathi, V., Kothadiya, K., Aggarwal, P., & Yadav, D. (2025). *Augmenting the national green hydrogen mission assessing the potential financial support through policies in India.* CEEW.

Pandey, S., Kumar, S., Mhatre, R., & Singh, T. (2023, July 21). *Analysis of performance degradation of PV modules.* https://www.powermag.com/analysis-of-performance-degradation-of-pv-modules/

PIB. (2011, December 16). *Generation based incentive scheme*. https://pib.gov.in/newsite/PrintRelease.aspx?relid=78829#:~:text=Grid%20solar%20power%20projects%20in,of%20the%20solar%20power%20plant.

PIB. (2018, June 19). *Offshore wind power to add a new element to the already existing basket of renewable energy for the country*. https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1535909

PIB. (2021, December 01). *National Action Plan on Climate Change (NAPCC)*. https://static.pib.gov.in/WriteReadData/specificdocs/documents/2021/dec/doc202112101.pdf

PIB. (2023, May 29). *The ISTS waiver of Green Hydrogen and Green Ammonia projects extended from 30 June 2025 to 31 Dec 2030.* https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1928128

PIB. (2024, June 19). *Cabinet approves Viability Gap Funding (VGF) scheme for implementation of offshore wind energy projects*. https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2026700

PIB. (2025, September 3). *Recommendations of the 56th Meeting of the GST Council held at New Delhi, today*. https://www.pib.gov.in/PressReleasePage.aspx?PRID=2163555

Raizada, S., Sharma, D., Laan, T., & Jain, S. (2023). *Mapping India's Energy Policy 2023.* International Institute for Sustainable Development. https://www.iisd.org/story/mapping-india-energy-policy-2023/

Reuters. (2023, June 21). *China unveils $72 billion tax break for EVs, other green cars to spur demand*. https://www.reuters.com/business/autos-transportation/china-announces-extension-purchase-tax-break-nevs-until-2027-2023-06-21/

Rho Motion. (2025, January 13). *China extends its vehicle trade-in policy scheme in a boost to 2025 EV sales*. https://rhomotion.com/news/china-extends-its-vehicle-trade-in-policy-scheme-in-a-boost-to-2025-ev-sales-industry-update/#:~:text=China%20has%20renewed%20its%20car,EV%20subsidy%20ended%20in%202022.

Roy, S. (2024, June 27). *How well is India tapping its rooftop solar potential? | Explained*. https://www.thehindu.com/sci-tech/energy-and-environment/history-future-value-india-rooftop-solar-programme-explained/article68335798.ece

Sud, T., Sharma, R., Sharma, R., & Kitson, L. (2015). *India's accelerated depreciation policy for wind energy.* IISD. https://www.iisd.org/system/files/publications/india-accelerated-depreciation-policy-wind-energy-case-study.pdf

The Economic Times. (2025, August 13). *SECI cancels two offshore wind energy tenders*. https://economictimes.indiatimes.com/industry/renewables/seci-cancels-two-offshore-wind-energy-tenders/articleshow/123265468.cms

Transport Department, GNCTD. (2023). *Gazetted notification of Delhi Motor Vehicle Aggregator and Delivery Service Provider Scheme, 2023.* GNCTD.

Tyagi, B., Zachariah, S., Kuldeep, N., Chouhan, D. S., Chouhan, S. S., Mahajan, A., & Jain, A. K. (2023). *kWh from kW: Achieving optimum energy generation from rooftop solar systems -Insights from field visits in Delhi.* CEEW.

UPERC. (2023). *Approval of ARR and tariff for state disComs for FY 2023-24, APR of FY 2022-23 and True-up of FY 2021-22.*

UPNEDA. (n.d.). *Grid connected solar rooftop systems.* https://upneda.org.in/MediaGallery/Documents/GridConnected_RSS.pdf

Zhang, T., Burke, P. J., & Wang, Q. (2024). Effectiveness of electric vehicle subsidies in China: A three-dimensional panel study. *Resource and Energy Economics, 76*. https://doi.org/10.1016/j.reseneeco.2023.101424

Appendices

Appendix A: Demand Incentives and MV Tax Waivers in Different States

Maharashtra in its 2025 EV policy offers a demand incentive at 10% of the ex-factory price[41] for electric cars[42] and two-wheeled vehicles (Government of Maharashtra, 2025). While Andhra Pradesh in its 2018 EV policy did not offer any purchase subsidies, the state in its recent 2024 EV policy offers a purchase incentive of 5% of an EV's ex-showroom price[43] to electric two-wheeled vehicles,[44] but no incentive has been extended to electric cars (Government of Andhra Pradesh, 2024; Government of Andhra Pradesh, 2018).

Many States, such as Uttar Pradesh, Haryana and Tamil Nadu, have offered demand incentives in the past in addition to those offered by the Centre. These incentives were subject to expiry depending on the registration of a certain number of EVs or were valid for a specific period from the date of policy notification. For instance, Uttar Pradesh in its 2022 EV policy provided demand incentives for electric two-wheeled vehicles and electric cars at 15% of the ex-factory cost for one year from the date of policy notification (Government of Uttar Pradesh, 2022). Haryana, in its 2022 EV policy, announced purchase incentives for EVs not covered under the FAME-II scheme for 2,000 electric cars registered in the state. Tamil Nadu, in its 2023 EV policy, granted a demand incentive of ₹10,000 per kWh for electric cars[45] and two-wheeled vehicles subject to a maximum registration of 6,000 electric two-wheeled vehicles and 3,000 electric cars.

Table A-1: A Summary of State-level Subsidies for EVs

States	EV policy launch date	Valid until	MV Tax waiver	Demand incentive
Maharashtra	April 01, 2025	March 31, 2030	100% waiver for the entire period	• **Electric two-wheeled vehicles:** 10% of ex-factory cost up to ₹10,000 per vehicle subject to maximum of 1 lakh EVs • **Electric four-wheeled vehicles (non-transport):** 10% of ex-factory cost up to ₹1.5 lakh per vehicle subject to maximum of 10,000 EVs • **Electric four-wheeled vehicles (Transport):** 15% of ex-factory cost up to ₹2 lakh per vehicle subject to maximum of 25,000 EVs
Andhra Pradesh	2024	2029	100% waiver for the entire period	• **Electric two-wheeled vehicles:** 5% of ex-showroom price for EVs with ex-showroom price < ₹1 lakh (incentive available till March 2027)
	2018	2023	N.A.	N.A.
Madhya Pradesh	2025 (Draft)	2030	100% waiver for the entire period	• **Electric two-wheeled vehicles:** ₹ 5,000/kWh up to ₹10,000 per vehicle for a maximum of 1,00,000 EVs, with an ex-factory price < ₹1.5 Lakh • **Electric four-wheeled vehicles:** ₹ 2,500/kWh up to ₹50,000 per vehicle for a maximum of 10,000 EVs, with an ex-factory price < ₹25 Lakh
	2019	2024	Concessional MV tax of 1%	N.A.

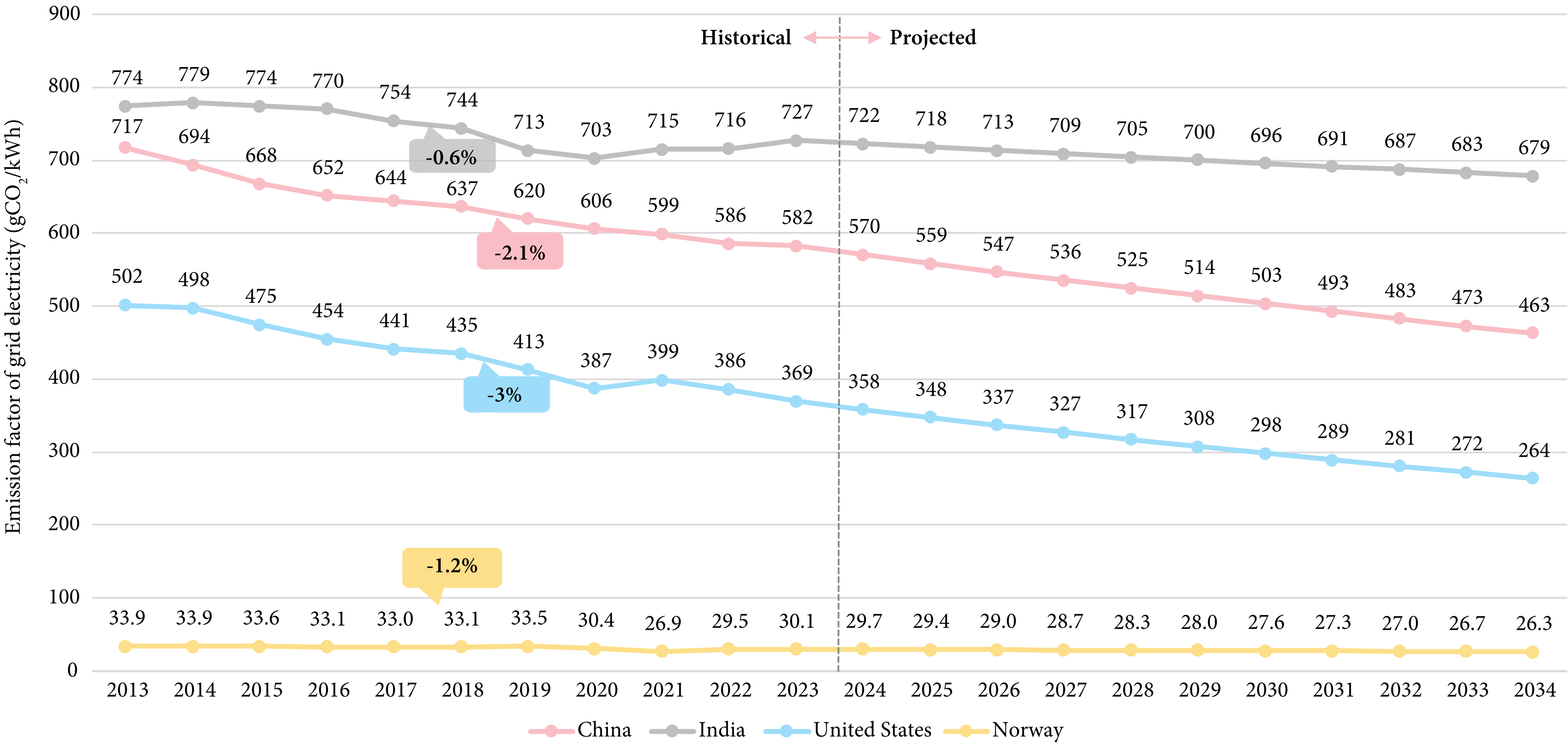
41 The ex-factory price of a vehicle is the price at which the manufacturer sells the vehicle to the dealer before adding any taxes such as GST, MV Tax, etc.
42 Electric cars registered as transport vehicles are eligible to receive a demand incentive of 15% of ex-factory cost
43 The ex-showroom price of a vehicle is the price at which a dealer sells the vehicle to a customer before adding registration charges, insurance, and MV tax.
44 The purchase incentives to electric two-wheeled vehicle owners is limited to models with an ex-showroom price below ₹1 lakh and remains in effect until March 2027.
45 Electric cars registered as transport vehicles are eligible for the demand incentive.

States	EV policy launch date	Valid until	MV Tax waiver	Demand incentive
Karnataka	February, 11 2025	February 11, 2030	100% waiver on all vehicles except electric cars priced > ₹25 lakh	N.A.
	2017	–	100% waiver	N.A.
Tamil Nadu	2023	2028	100% waiver till 31.12.2025	● **Electric two-wheeled vehicles:** ₹10,000/kWh up to ₹30,000 per vehicle subject to maximum of 6000 EVs ● **Electric four-wheeled vehicles (Transport):** ₹10,000/kWh up to ₹1.5 lakh per vehicle subject to maximum of 3,000 EVs
Gujarat	01 July 2021	01 July 2025	1% MV tax until 31 March, 2026	● **Electric two-wheeled vehicles:** ₹10,000/kWh, ex-factory price < ₹1.5 lakh ● **Electric four-wheeled vehicles:** ₹10,000/kWh, ex-factory price < ₹15 lakh
Uttar Pradesh	2022	2027	● 100% on any EV purchased & registered in UP over a period of 3years from policy notification (till 2025) ● 100% on any EV manufactured, purchased & registered in UP till 2027	● One time subsidy valid till 1 year from date of notification (2023) ● **Electric two-wheeled vehicle:** @15% of ex-factory cost up to ₹5,000 per vehicle subject to maximum budget outlay of ₹100 Cr. to maximum of 2 lakh EVs ● **Electric four-wheeled vehicle:** @15% of ex-factory cost up to ₹1 lakh per vehicle subject to maximum budget outlay of ₹250 Cr. to maximum of 25,000 EVs
Haryana	10 July 2022	10 July 2027	● **Electric two-wheeled vehicles:** 100% exemption for first 30,000 vehicles ● **Electric cars**: 75% exemption for first 10,000 vehicles	● **Electric cars (priced from ₹15 lakh to ₹40 lakh):** 15% of the ex- showroom price for first 1,000 vehicles, maximum up to ₹6 lakh per vehicle ● **Electric cars (priced from ₹40 lakh to ₹70 lakh):** 15% of the ex- showroom price for first 1,000 vehicles, maximum up to ₹10 lakh per vehicle
Chandigarh	2022	2027	100% waiver	● **Electric two-wheeled vehicles:** ₹5,000/kWh up to ₹30,000 per vehicle subject to maximum of 10,000 EVs ● **Electric four-wheeled vehicles (non-transport):** ₹5,000/kWh up to ₹1.5 lakh per vehicle subject to maximum of 2,000 EVs ● **Electric four-wheeled vehicles (Transport):** ₹ 10,000/kWh up to ₹2 lakh per vehicle subject to maximum of 1,000 EVs
Odisha	February 2021	February 2026	N.A.	● **Electric two-wheeled vehicles:** 15% subsidy, max ₹5,000 per vehicle ● **Electric four-wheeled vehicles:** 15% subsidy, max ₹1 lakh per vehicle
Punjab	February 21, 2023	February 21, 2026	100% waiver	● **Electric two-wheeled vehicles:** ₹5,000/kWh up to ₹30,000 per vehicle subject to maximum of 10,000 EVs
Delhi	2020	2023, extended	100% waiver for the entire period	● **Electric two-wheeled vehicles:** ₹5000/kWh and max of ₹30,000 per vehicle ● **Electric cars:** ₹10,000/kWh max of ₹1,50,000 per vehicle for the first 1000 electric cars
Kerala	2019	2023	100% waiver for 3 years (till 2022)	N.A.

Source: EV policies of respective States

Appendix B: Grid Electricity Emission Factor in Different Countries

Figure A - 1: Trend in Grid Electricity Emission Factor in Different Countries



Source: Authors' analysis based on (Our World in Data, n.d.) and (CEA, 2025).

Note:

- *The boxes in each line graph represent the 10-year CAGR (2013–2023) for the four countries.*
- *For India, the emission factor published by the CEA for 2013–2014 has been used as a proxy for 2013, and similarly for subsequent years. This approach has been followed due to the availability of CEA-reported emission factors only on a FY basis.*
- *The projections from 2024 to 2034 are calculated using the historical 10-year CAGR for each country.*

Appendix C: Policy Landscape and Details on Offshore Wind

Despite offshore windfarms' potential to deliver electricity nearly round-the-clock at greater capacity utilisation and India's long coastline, the opportunity has not been tapped till now. Offshore wind deployment faces a range of challenges, right from wind farm installation and subsea cabling, electrical connection to the mainland transmission system, and vulnerability to tropical storms to regular asset maintenance. Compared to onshore wind projects, offshore wind entails a much greater capital cost, which results in a higher cost of electricity generation. The offshore wind tariff even after accounting for government support during its construction is estimated to range between ₹6 per kWh to ₹6.5 per kWh, significantly higher than onshore wind, which is about ₹3 per kWh (ET Energy World, 2024).

In October 2015, the government notified the National Offshore Wind Policy, which aimed to explore and promote the deployment of offshore windfarms in the Exclusive Economic Zones (EEZ) of the country (MNRE, 2015). In 2018, the MNRE declared installation targets: a medium-term target of 5 GW capacity by 2022 and a long-term target of 30 GW by 2030 (PIB, 2018). However, on account of a lack of progress in implementation, a strategy paper for auctioning 37 GW of offshore wind capacity along the coasts of Tamil Nadu and Gujarat was released in 2023 (MNRE, 2023).

In June 2024, the government announced a VGF Scheme for the installation of 1 GW of offshore wind capacity with a total outlay of ₹7,453 Crore (MNRE, 2024). The scheme allocates ₹6,583 Crore for installing two 500 MW wind farms off the coasts of Gujarat and Tamil Nadu and ₹600 Crore for the upgradation of two ports to meet the logistics requirements of these wind farms.

Previously, in May 2023, all offshore wind projects commissioned before December 31, 2032 were granted a complete waiver of ISTS charges for 25 years. The waiver would be reduced gradually for projects commissioned between 2033 and 2035 and completely phased out by 2036 (PIB, 2023).

As applicable to a wind power project, offshore wind also benefits from tax incentives offered by the government. Wind turbines attract a lower GST rate compared to other equipment in the same category, resulting in tax revenue forgone. Investors can also claim accelerated depreciation at 40% compared to the standard 15% for plant and machinery, thereby lowering near-term tax liabilities (Sud, Sharma, Sharma, & Kitson, 2015).

Inputs used in the estimation of the cost of abatement for offshore wind are shown in Table A- 2.

Table A-2: Inputs Used in Estimation of Cost of Abatement for Offshore Wind

Parameter	Value	Source
Capacity Utilisation Factor (CUF)	42%	(PIB, 2024)
Operational life	25 years	(PIB, 2024)
Degradation factor	0.25% annually	(GIZ, 2018)
Capital cost of offshore wind turbine	₹10.35 crore/ MW (adjusted for inflation)	(Government of Gujarat, 2024)
GST rates	12% for wind turbine and 18% for steam turbine	(CBIC, n.d.)

Source: Listed in the Table.

Appendix D: Policy Landscape and Details on Green Hydrogen

In 2021, the demand for hydrogen in India was reportedly about 6.7 million tonnes, majorly from two industries—petroleum refinery (with a demand of 3.6 million tonnes, 54% of total demand) and urea production (3 million tonnes, 45% of total demand) (Ministry of Coal, 2022). Almost all of this demand is fulfilled by grey hydrogen, which is produced from fossil fuels like natural gas, causing 9 to12 kg of CO_2 emissions per kg of grey hydrogen (Kshirsagar, Bhattacharjee, & Malladi, 2022).

Green hydrogen, produced through electrolysis using RE, can substitute grey hydrogen in these industries. It can also serve as the reducing agent replacing coking coal in iron production through the direct reduced iron (DRI) method, thus enabling a zero-carbon pathway for the iron and steel sector (Hall, Millner, Rothberger, Singh, & Shah, 2021). Based on coal and iron ore consumption, emissions from DRI production are estimated to range between 1.54 to 2.08 tonnes of CO_2 per tonne of DRI produced (Nitturu, et al., 2024).

Under the National Green Hydrogen Mission, which is implemented from FY 2025–2026 to FY 2029–2030, the government has allocated ₹13,050 crore to incentivise the production of green hydrogen, which includes a direct incentive to producers for each kilogram (kg) of green hydrogen produced for a period of three years (MNRE, 2024). The incentive amount is capped at ₹50 per kg in the first year of production, ₹40 per kg in the second year, and ₹30 per kg in the third year. The government has also allocated ₹4,400 crore to provide incentives for the manufacturing of electrolysers (MNRE, 2023). The incentive will be provided for five years and will start at ₹4,400 per kW in the first year and be gradually reduced to ₹1,480 per kW in the fifth year. The incentive amount is also dependent upon the domestic value addition by the manufacturer and the performance characteristics of the electrolyser.

In addition, green hydrogen or green ammonia projects commissioned before December 31, 2030 have been granted exemption from the payment of ISTS Charges for a period of 25 years (Ministry of Power, 2023). This waiver is expected to be phased out gradually with 25% of ISTS charges applicable in 2031, 50% in 2032 and 75% in 2033 and completely phased out by 2034.

Several state governments are also offering incentives related to investment promotion and power supply to give impetus to green hydrogen projects. Four States in India— Gujarat, Tamil Nadu, Rajasthan and Uttar Pradesh, are expected to account for 76% of the potential hydrogen production in India by 2030 (Pal, Tripathi, Kothadiya, Aggarwal, & Yadav, 2025). The incentives for green hydrogen production in these States are detailed in Table A-3. For instance, Uttar Pradesh offers capital subsidies ranging from 10% to 30% based on plant location and investment. The state also offers additional incentives on top of the central PLI (Production Linked Incentive) scheme (Government of Uttar Pradesh, 2024).

States like Maharashtra, Uttar Pradesh, Rajasthan and Andhra Pradesh offer exemptions and concessions on electricity duty, cross-subsidy surcharges, and intra-state wheeling and transmission charges (Government of Maharashtra, 2023; Government of Andhra Pradesh, 2023; Government of Rajasthan, 2023).

Table A-3: Incentives for Green Hydrogen Production in States

	Gujarat	Rajasthan	Tamil Nadu	Uttar Pradesh
Investment promotion subsidy	**1. State Goods and Services Tax (SGST) reimbursement:** 80%–100%, depending on the location of the project, for 10 years **2. Interest subsidy**: 7% on term loan for 8–10 years up to 1–1.2% of EFCI (Eligible Fixed Capital Investment) p.a.	**Choose any one of the following:** **1. Capital subsidy:** 16%–35% of the eligible capital investment (ECI) based on quantum and location of investment for 10 years (25% additional booster available on top of 13% to 28% of subsidy for the first 3 mega/ultra mega projects) **2. SGST reimbursement:** 75% reimbursement for 7 years **3. Turnover-linked incentive:** 1.5%–2.5% depending on net sales turnover based on quantum and area of investment for 10 years (25% additional booster on top of 1.2%–2% of subsidy for first three mega/ultra mega projects)	**1. Interest Subvention:** 5% to ultra mega projects on term loans, up to ₹4 Cr p.a. for 6 years **Choose any one of the following:** **1. Fixed capital subsidy:** 10%–25% of ECI based on quantum and location of investment **2. SGST reimbursement:** 100% on final products for 15 years **3. Flexible capital subsidy:** 35%–40% based on location, employment, exports, ecosystem creation **4. Turnover-based subsidy:** 1.5% to 2%, up to a cap of 4% of cumulative investment in Eligible Fixed Assets p.a. for 10 years	**Choose any one of the following:** **1. Capital subsidy:** 10%–30% of the ECI based on quantum and location of investment **2. SGST reimbursement:** 100% **3. PLI top-up:** 30 % of the sanctioned PLI by the Government of India
Power supply related				
Exemption on wheeling charges	–	For the first 500 kTPA capacity, a 50% waiver for 10 years	–	100% for 10 years or the life of the project
Exemption on Intra-State Transmission Charges	–	For the first 500 kTPA capacity, 50% waiver for 10 years	–	100% for 10 years or life of the project
Exemption of Cross Subsidy and Additional Surcharge	100% waiver for captive RE	100% waiver	100% waiver for captive RE	100% waiver
Exemption on Electricity Duty	–	For the first 500 kTPA capacity, 50% waiver for 10 years	–	100% for 10 years or the life of the project

Source: Authors' compilation based on Government of Rajasthan (2023); Government of Uttar Pradesh (2024); Government of Gujarat (2022); Government of Tamil Nadu (2021); Government of Rajasthan (2024); Pal, Tripathi, Kothadiya, Aggarwal, & Yadav (2025).

Table A-4, Table A-5 and Table A-6 share the calculation inputs used regarding central government incentives, state government incentives (specifically Uttar Pradesh), and the electrolyser stack, respectively.

Table A-4: Inputs Related to Central Government Incentives

Parameter	Value	Source	Remarks
Incentive for electrolyser manufacturing under Green Hydrogen Mission	₹2,960/kW	(MNRE, 2023)	Average incentive amount for 5 years
Incentive for hydrogen production under Green Hydrogen Mission	₹40/kg	(MNRE, 2024)	Average incentive amount for 3 years
ISTS charges	₹1/kWh to ₹2/kWh	(JMK, 2025)	Open access ISTS charges considered for green hydrogen projects

Source: Listed in the Table.

Table A-5: Inputs Related to State Government Incentives in Uttar Pradesh

Parameter	Value	Source	Remarks
Wheeling charges	₹0.88/kWh	(CEA, 2024a)	As of FY 2023–2024
Cross subsidy surcharge	₹0.49/kWh	(CEA, 2024a)	As of FY 2023–2024
Electricity duty	₹0.62/kWh to ₹0.69/kWh	(CEA, 2024a)	As of FY 2023–2024
Intra State Transmission Charges	₹0.29/kWh	(Uttar Pradesh Electricity Regulatory Commission [UPERC], 2023)	As of FY 2022–2023

Table A-6: Parameters Related to Electrolyser Stack (as of March 2025)

Parameter	Alkaline	PEM	Source
Capex for electrolysis unit (€/kW)	2,310	2,503	(European Hydrogen Observatory, 2025)
Energy Consumption (kWh/kg)	52.4	53.3	(European Hydrogen Observatory, 2025)
Stack durability (hours)	80,000	60,000	(European Hydrogen Observatory, 2025)
Stack degradation (% per 1000 hours)	0.12%	0.19%	(European Hydrogen Observatory, 2025)

Source: Listed in the Table.

Appendix E: Policy Landscape and Details on Residential Rooftop Solar

The government has put a lot of focus on RTS as a means to increase RE capacity across the country and provide quality power to households. As of FY 2024–2025, 17 GW of RTS capacity has been installed, accounting for 16% of overall solar capacity and 7.5% of overall non-fossil-fuel-based power generation capacity (India Climate and Energy Dashboard [ICED], 2025).

The most prominent incentive for RTS available currently is under PM Surya Ghar: Muft Bijli Yojana, notified in March 2024, with an outlay of ₹75,021 crore. The scheme aims to increase solar rooftop capacity by providing capital subsidies to residential consumers (MNRE, 2024). The incentive amount depends on the installed capacity of RTS and can range from ₹30,000 to ₹78,000 for an installation. Table A-7 shows the incentive available to consumers under the scheme.

Table A-7: Incentive Structure under the PM Surya Ghar Scheme

RTS capacity (kW)	Incentive amount (₹)
1	30,000
2	60,000
> =3	78,000

Source: (MNRE, 2024).

Several States such as Delhi, Uttar Pradesh, Assam, Jharkhand and Uttarakhand offer capital subsidies over and above the Central Financial Assistance of the Government of India (Table A-8). In addition to providing a capital subsidy, Delhi also provides a GBI for five years to domestic consumers (Government of Delhi, 2023).

Table A-8: State-level Incentives to Residential Rooftop Solar

State	Incentives available
Assam	• Capital subsidy of ₹15,000 per kW limited to ₹45,000 per consumer for 1 lakh consumers in the state.
National Capital Territory of Delhi	• Capital subsidy of ₹2,000 per kW limited to ₹10,000 per consumer. • GBI of ₹3/kWh for residential consumers having up to 3kW capacity and GBI of ₹2/kWh for residential consumers having > 3 kW up to 10kW for 5 years
Uttar Pradesh	• Capital subsidy of ₹15,000/kW to a maximum limit of ₹30,000 per consumer
Uttarakhand	• Capital subsidy of ₹23,000/kW for plants with capacity < 1 kW and ₹17,000/kW for 1-3 kW plants
Jharkhand	• Capital subsidy of 60% of benchmark cost (up to 3kW if annual income is less than ₹3 lakh) • Capital subsidy of 80% of benchmark cost (3 kW to 10 kW if annual income is less than ₹3 lakh)

Source: Authors' compilation based on Government of Delhi (2023); Uttar Pradesh New and Renewable Energy Development Agency (UPNEDA) (n.d.); Government of Uttarakhand (2023); Government of Jharkhand (2022); Government of Assam (2024).

Note: The subsidies are as of April 2025.

Table A-9 presents the inputs used in the estimation of the cost of abatement.

Table A-9: Inputs Used in Estimation of Cost of Abatement in Case of Rooftop Solar

Parameter	Value	Source
CUF	14%	(Tyagi et al., 2023)
Operational life	25 years	(Tyagi et al., 2023)
Degradation factor	2.5% in the first year and 0.7% annually thereafter	(Pandey, Kumar, Mhatre, & Singh, 2023)

Source: Listed in the Table.

CRediT Authorship Contribution Statement

Shyamasis Das (corresponding author)**:** Conceptualised the research; framed the methodology; derived policy inferences based on the results; formulated the recommendations; contributed to finalising the research paper.

Tarandeep Kaur: Undertook all data-driven analyses; produced the key results; prepared the initial draft of the research paper.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

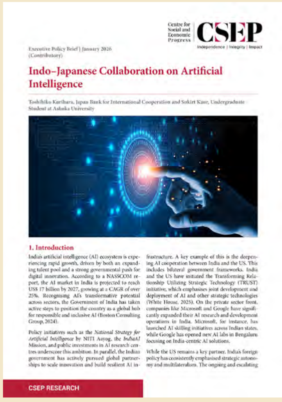
The authors have not used any AI or AI-assisted technology or service to synthesise the paper. The only instance in this work where an AI tool has been responsibly applied is to draw inspiration while making the infographic presented in Figure 5 which involves no data analysis. The authors take full responsibility for the content of the publication.

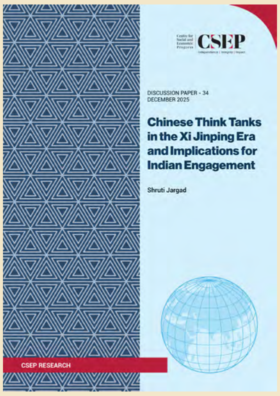
About the authors

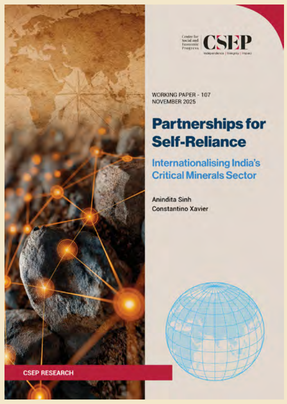
Shyamasis Das, Fellow, CSEP, has over 16 years' experience in dealing with core and cross-cutting energy and climate change issues such as energy transition, electricity distribution, mobility, demand response, emissions mitigation stocktaking, energy subsidies, etc. He has devoted past several years in understanding and decoding different aspects of electric mobility. He has led several data-analytics based studies to shed light on EV transition and its inter-linkages with other sectors or issues like emissions and sustainability, electricity, government finance, etc. He has been instrumental in developing road-maps and implementation guidance documents for India and other developing countries like Vietnam. He has been invited by the Ministry of Finance - Government of India to become a Member of the Technical Committee constituted to formulate the framework for India's first Climate Finance Taxonomy. He has also worked extensively on the subject of energy transition, particularly in the context of India's power sector.

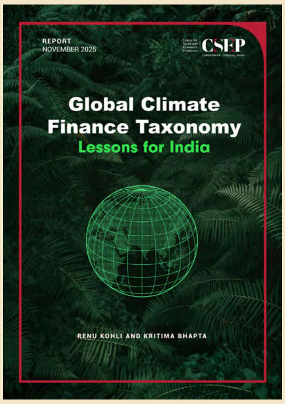
Tarandeep Kaur is a Former Research Analyst in the Energy Vertical at CSEP. She has completed her Masters in Development Studies from Tata Institute of Social Sciences (TISS), Mumbai. Prior to joining CSEP, she worked as a Young Professional at NITI Aayog in areas such as Blue Economy, Circular Economy and Industry Promotion. Her areas of interests include climate change, sustainability and electric mobility.

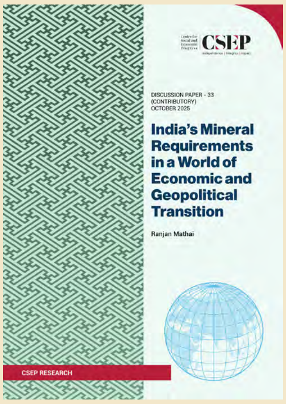
Other publications

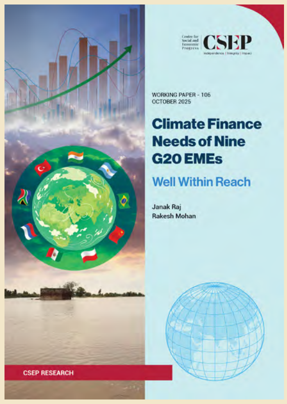


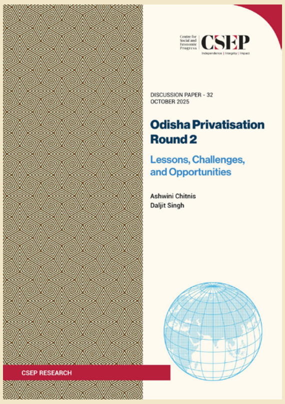


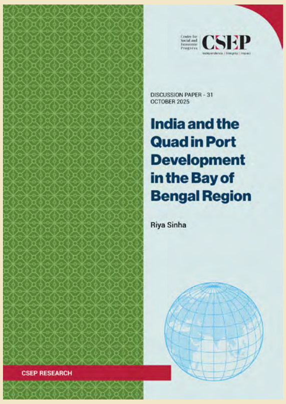


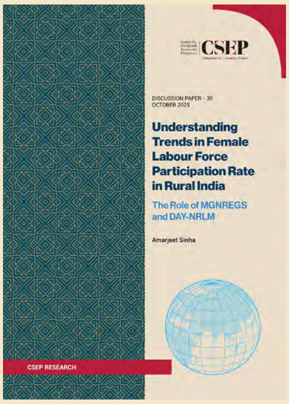


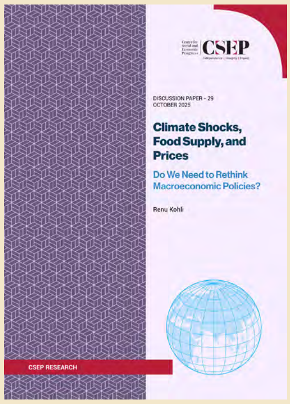


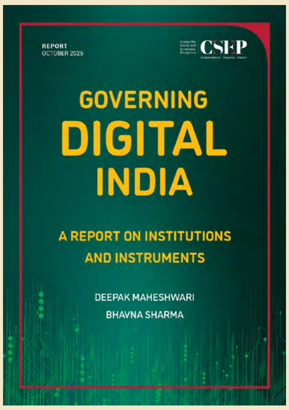


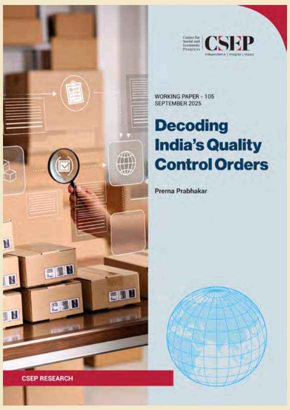


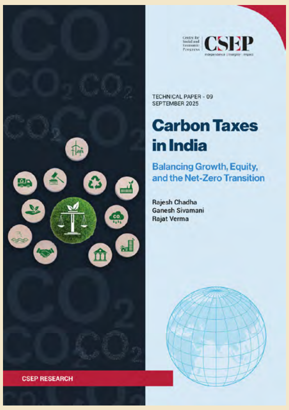


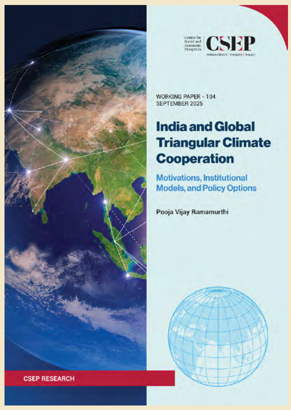












All CSEP publications are available at www.csep.org

Independence | Integrity | Impact

Centre for Social and Economic Progress

6, Dr Jose P. Rizal Marg, Chanakyapuri, New Delhi- 110021, India

Centre for Social and Economic Progress

@CSEP_Org

www.csep.org