Role of electric mobility in net zero transition: Where are we headed?

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September 1, 2023
First the basic facts

What is driving climate action? Desperation of taming global temperature

2015: 196 countries signed Paris Agreement to keep the rise in mean global temperature well below 2 degrees C above pre-industrial levels (1880) and preferably to 1.5 degree C

But global temperature has already increased by 1 degree in 2020

Annual CO2 growth rate a little slower but not enough

At the current trajectory 3 degree warming is possible by 2100 – twice the 1.5 degree C limit

IPCC: The world must become a ‘net zero’ carbon emitter by 2050 – (CO2 emissions must be negated by an equivalent amount of CO2 absorbed or removed) to be ‘net’ zero.
Raising the level of ambition

- 61% countries, 9% states and regions in largest emitting countries, and 13% of larger cities have committed to net zero at the UN Climate Change Conference in Glasgow (COP26) – includes India (net zero by 2070)

- Countries have voluntary targets called Nationally Determined Contributions (NDCs) to limit or reduce emissions -- to progressively have more ambitious NDCs every 5 years

- 116 countries have submitted new NDC targets (as of October 25, 2021)

- Overall, global GHG emissions could be 16% higher in 2030 compared to 2010

- Current commitments add up to a less than 1% reduction by 2030 compared to 2010 levels.

- To keep global warming below 1.5 degrees Celsius, emissions have to be cut by at least 45 per cent by 2030. (UN 2021)
India has raised its ambition

CoP26: India announced “enhanced” targets for India to combat climate change. By 2030:

- India will increase its non-fossil fuel energy capacity to 500 gigawatt (GW).
- India will meet 50% of its energy requirements from renewable sources.
- India will reduce its total projected carbon emissions by 1 billion tonne from now till 2030.
- India will bring down the carbon intensity of its economy to less than 45%
- By 2070, India will achieve its target of net zero.
- A significant carbon reduction will have to come from transport sector
Challenge of public health and climate change risk: need co-benefit agenda for transport sector

-- Local pollution and toxic exposure; enhances public health risk

-- Heat trapping greenhouse gas emissions enhance climate change risk and extreme weather events
Huge costs

Climate change cost India 2.8% of its GDP (World Bank 2018)

By 2030, several such changes to cost between 2.5% to 4.5% of the GDP annually.

To depress the living standards of nearly half the country’s population by 2050.

To worsen due to more local environmental concerns -- Air pollution related mortality is already 1.37% of India’s GDP (Lancet 2021)
Climate change mitigation to define the boundaries of growth and the transportation agenda...
Global trend – CO2 emissions from transport sector obstinate and rising

Transportation emissions grew about 2% annually from 2000 to 2018 (ICCT estimates)

Source: ourworldindata.org
Transport: Business-as-Usual CO\textsubscript{2} Emissions (2050)

Source: Slocat 2016
Pandemic and transport CO2: Nose dives; but recovers
Emissions Gap report 2020
Inflexion point: Scenario for future cut (2000-2030)
What will influence transport sector emissions?

Declaration on 100% transition to zero emissions by 2030-2040: To work towards all sales of new cars and vans being zero emission globally by 2040, and by no later than 2035 in leading markets

Signed on by:
• National governments – 28 countries including India;
• Cities and states – 44
• Automotive companies – 10
• Financial institutions and investors – 15;
• Organisations -- 21

Specific mention from India – “two-wheelers and three-wheelers constitute more than 70% of global sales and more than 80% in India. All governments should also support the transition of these light vehicles to zero emission vehicles”
What will influence transport sector emissions?

ZEV Transition Council set up with representatives from 17 largest vehicle market -- represents 50% of global car market

- California, Canada, Denmark, European Commission, France, Germany, India, Italy, Japan, Mexico, Netherlands, Norway, Spain, South Korea, Sweden, United Kingdom, United States among them

ZEV Alliance launched in 2015 Paris

These developments will shape the future markets
Petro-economy to electro-economy: Is EV transition inevitable?

Transforming markets

- **Governments setting targets for 100% phase out of IC light duty vehicles** --- 20 countries: 100% zero-emission vehicles during 2040–50. More to follow.

- **Governments setting targets for 100% phase out of IC Trucks**

- Global automotive companies announcing commitments to produce 100% electric vehicles by 2040.

- IEA: Electric vehicles stock to jump from around 5% of global car sales in 2020 to more than 60% by 2030. Annual battery production for EVs to leap from 160 gigawatt-hours (GWh) today to 6,600 GWh in 2030, -- adding almost 20 gigafactories each year for the next ten years.

- IC engines to become more complex and expensive as real world emissions regulations tighten…

- Electro economy is also part of the industrial policy in countries
Lifecycle emissions much lower from EVs

Figure ES.1. Life-cycle GHG emissions of average medium-size gasoline internal combustion engine (ICEVs) and battery electric vehicles (BEVs) registered in Europe, the United States, China, and India in 2021 and projected to be registered in 2030. The error bars indicate the difference between the development of the electricity mix according to stated policies (the higher values) and what is required to align with the Paris Agreement.

Source: ICCT, A global comparison of the life cycle greenhouse gas emissions of combustion engine and electric passenger cars
India’s carbon and energy challenge from road transportation
Taming energy guzzling

- Energy demand for road transport to **more than double** over the next two decades.
- **300 million more vehicles to be added** between now and 2040.
- **Oil demand to increase** by almost four million barrels per day in 2040—to be the largest increase for any country.
- **Road freight activity will triple by 2040**. Over half of the growth to be fuelled by freight transport.
- Between 2005–06 and 2019–20, **petrol and diesel consumption to increase by three times and two times**.
- Close to 85% of crude oil is imported.
- Oil splurge in the vehicle sector cannot remain untamed.

Source: IEA 2021, Air Quality and Climate Policy Integration in India
Road transport to upset energy budget in India

- IEA: India - Final energy use of transport by subsector and road transport by fuel in the Stated Policies Scenario, 2010-2040

Source: IEA 2021, Air Quality and Climate Policy Integration in India
Motorisation and mobility demand: Explosive in India

- Passenger km to increase more than 3 times by 2050
- Trip length and rate to increase with city size and income
- Private transport to overtake public transport by 2040.
- Peak traffic to crawl

Trend of Registered Motor Vehicles in India (1951 – 2017): Added approx. 1.5 billion vehicles in past 10 years

Source: UNEP, 2015
What carbon neutrality means for the automotive sector?

Not just tailpipe emissions

But lifecycle emissions –
Sourcing of raw material, material used, production process, energy used for production, product choices – clean fuels and zero emissions vehicles etc
Balancing emissions from tailpipe and material sourcing: GHG emissions from the entire value chain

The automotive industry has largely focused on the reduction of tailpipe emissions; reducing material production emissions should also be a priority.

% of total current life-cycle emissions of internal combustion engine vehicles

- Total lifecycle emissions: 3–5
- Logistics: 4–6
- Production and assembly: 4–6
- Fuel supply and tailpipe: 65–80
- Material production: 60–70
- End-of-life materials recovery: 3–5

Under more direct OEM control and currently addressed
Mainly addressed by electrification of vehicles and processes paired with increased supply of green electricity

Not addressed; requires transparency and complex supplier management

Source: Mckinsey

For C-segment vehicle.
Source: Natural and bio Gas Vehicle Association; expert interviews; McKinsey analysis
What is needed?

World Economic Forum Guide for corporate strategy:

• **Build a comprehensive emissions baseline**, gradually filled with actual supplier data;

• **Set ambitious and holistic reduction targets** for emissions

• Revisiting product design choices

• Reconsidering (geographic) sourcing strategy;

• Set ambitious procurement standards

• Work jointly with suppliers to co-fund abatement levers;

• **Work with peers to align sector targets** to maximize impact and level playing field;

• Use scale to drive demand to lower the cost of green solutions;

• Develop internal governance mechanisms to steer mechanism and align the incentives of decision-makers with emission targets.
Impact on material and supply chain

Car companies developing well to wheel policies to reduce life cycle emissions

Light weighting: Car makers adopting lighter aluminum, carbon composites, and plastic to reduce weight

Reducing embedded energy: Energy intensity of production, decarbonisation of fuels

Increased uptake of recycled material

Implications for supply chain
Emerging evidence
Energy consumption in vehicle production

By material
- Steel 35%
- Aluminum 23%
- Plastic 19%
- Rubber 4%
- Glass 1%
- Copper 1%
- Assembly 13%

62 GJ

By energy
- Natural gas 45%
- Coal 23%
- Electricity 22%
- Oil 10%

62 GJ

By productive phase
- Part production 19%
- Mining and material production 68%
- Assembly 13%

62 GJ

By material and energy resource

Source: Fernando Enzo Kenta Sato 1,2 and Toshihiko Nakata, 2020, Energy Consumption Analysis for Vehicle Production through a Material Flow Approach, MDPI
End of life and material recovery

• To maximize the use of resources by being restorative and regenerative. Re-use of materials instead of “take-make-use-dispose.
• Recycling of waste and easy returns for end-of-life disposal --consumer being given options to return vehicles and parts for responsible disposal.
• Sustainable manufacturing for production processes to reduce waste and improve recyclability and reuse of materials.
Metal recovery

Huge potential for recycling steel, aluminium and plastics

- **FICCI estimates** – Possible to recover 8 million tonnes of steel; In 2015-16 auto industry used 10% of steel consumption in the country

- Steel content can be as high as 65-70% in vehicles reaching obsolescence

- **Steel**: World Steel Association -- Auto industry accounts for around 12% of global steel consumption. European car makers and steelmakers tying up for lower-carbon steel

- Recycled steel avoids carbon-intensive process of melting iron ore into steel

- **Green steel**: Using hydrogen instead of coal to fuel the heat-intensive process of making steel can reduce carbon intensity of steep production. But use green hydrogen
End of life regulations in India -- Manufacturer’s role

AIS 129 framed by Automotive Industry Standard Committee in 2015 on reusability, recyclability and recoverability

Minimum 80-85% of material used in vehicles must be recyclable/recoverable or reusable from end of life vehicles

Restricts use of heavy metals – lead, mercury, cadmium, hexavalent chromium, etc

Coding of plastic component to inform dismantlers

Voluntary action – legally binding?

Industry discussing – recycling infrastructure, end of life vehicle system, vehicle inspection programme
Bringing back the material

Use of other recycled materials and giving a second life to an auto battery

**FCA:** established a closed system for steel and aluminium recycling in Europe. Up to 25% of aluminium used in some vehicles manufactured in Italy is recycled. Requires suppliers and subcontractors to increase recycled plastic.

**Ford:** To contain use of plastics to recycled or produced from organic raw materials.

**Toyota:** Developing plastic recycling technology that enables quality and performance requirements to be met.

**PSA** to have at least 15 kg of recycled plastic in all of the group’s vehicles by 2025, -- about half of the total amount of plastic in a vehicle.

**Renault** aims to increase the proportion of recycled plastic by 50% between 2013 and 2022.

**Audi** has initiated a pilot team working with the aluminum industry to increase the proportion of recycled aluminum by creating a closed system.
The ICE vehicles will have to be a lot more fuel efficient...
Future challenge – trend towards heavier vehicles
Share of SUVs increasing

(a) Share of SUVs in total car sales in key markets, 2010–19
(b) Share of different category of passenger vehicles in calendar year 2020

Source: Market sources
Where is India in the fuel efficiency race?

Source: ICCT
Improved fuel efficiency reduce carbon footprint and out-of-pocket expenses

- **Example:** Reducing CO\(_2\) emissions by promoting downsizing, weight reduction, improvement in combustion efficiency, and reduction in resistance for all products.

**Swift Dezire petrol**

*2009 model:*
- 15.9 kmpl
- 149.1 g CO2/km
- 1,035 kg curb weight

*2020 model:*
- 24.1 kmpl
- 98.3 g CO2/km
- 890 kg curb weight
- 34% improvement in fuel economy

**Swift Dezire petrol**

*2009 (Petrol price Rs 44.72/ L):*
- Annual travel 10,000 km (assumption 27 km/day travel)
- **Annual petrol cost:** Rs 28,126
- Annual CO2 emission 1,491 kg

*2020 (Petrol price Rs 101.84/ L):*
- Annual travel 10,000 km
- **Annual petrol cost:** Rs 42,324
- Annual CO2 emission 983 kg
- Without fuel economy improvement; annual fuel cost: Rs 64,151 and same CO2 emissions
Need tighter benchmarks

- **Assessment of Stage 1 standards**: Car companies have not only met but also exceeded the 2017–18 requirement of fuel efficiency.

- **IEA evaluation**: Average fuel consumption of new light-duty vehicles sold in 2018 was roughly 9% ahead of the target for that year. Industry has comfortably achieved its target.

- **ICCT evaluation**: The fleet is only 7% away from meeting the next target in 2023. Only a small improvement is needed to meet the Stage 2 standard in 2022–23, especially after the weigh adjustment.

- **Targets are not very ambitious in the first place**: ICCT:-- Only 1–2% electrification of major carmakers can meet Stage 2 targets easily without any significant changes in the ICE technology. Tighter targets would have required higher levels of electrification.
Fuel efficiency standards have strong fuel and carbon saving potential – leverage this

- **BEE estimates:** CAFC standards can reduce 22.97 million tonnes of fuel consumption by 2025.

- CAFC has led to a higher energy and CO2 savings than the FAME-I incentive scheme for electric vehicles in 2018–19.
  - CAFC has reduced 0.848 million tonnes of oil equivalent (MTOE) as compared to the FAME-1 scheme reduction of 0.038 MTOE.
  - Corresponds to emissions reduction from CAFC - by 2.650 million tonne carbon dioxide (MtCO2), as opposed to 0.070 MtCO2 by FAME-1.8

- If CAFC norms can be further tightened, they have the potential to induce faster fleet-wide changes.
**Build strong consumer information**

- **Introduce fuel-efficiency labelling programme for vehicles:** Keep it dynamic.

- **Regulators must ensure credibility of labels, monitor compliance**

- **Transparent consumer information:**
  - Prepare fuel economy guide with detailed information about emissions, fuel and monetary savings, comparison with peer brands and front runners, etc. Make common portals. Fuel consumption and emissions data in all promotional and advertising material of a vehicle model.

- **Build consumer trust:** Consumers need to understand the information that a label provides.

- **SIAM’s voluntary disclosure** -- Voluntary Fuel Economy Information Brochure -- Consumers largely depend on advertised fuel economy values, market reports etc.
Need ambitious electric mobility programme

Big changes underway: Cannot remain insular
Uncertain targets in India

- **Policy intent**: Ministerial announcements -- 30@30

- **NITI Aayog 2019**: 70% electrification of all commercial cars, 30% of private cars, 40% of buses, and 80% 2/3-wheelers by 2030.

- **Not backed by any regulatory mandate and long-term policy roadmap**

- **Automotive industry's voluntary targets (SIAM 2019)**: All new vehicle sales for intra-city public transport fleets to be electric by 2030; 40% of new vehicle sales to be electric by 2030. All new vehicle sales to be electric by 2047.

- **State level target**: Eg Delhi – 25% electrification by 2024; Others too
How EV registration has grown in India

Projection of EV registrations and annual market share to reach 30@30

- Around 2.9 million electric vehicles (EVs) today.
- 2022-23: EV penetration rate around 5.3% of the total, -- almost 6 times from 2020-21 level.

CSE Analysis based on Vahan Data
How EV registration needs to grow for a market share of 30-@30

Projection of EV registrations and annual market share to reach 30@30
Top ten states with highest EV share and segment wise share -- 2022

Source: CSE based on VAHAN data base
A lot is happening. But what is the effectiveness of accelerators?

- FAME II incentives (Corpus of Rs 10,000 crore - to support only 15.6 lakh vehicles)
- Zero emissions mandate?
- Production linked incentives
- Fuel economy regulations
- Charging and battery ecosystem
- Financing strategies
- State level policy for bottom up pressure
Electric bus: A big growth story in India

By 2030, India could emerge as the second-largest e-bus market, if 4 out of 10 sold buses are electric. (Department of Heavy Industry Jul 2020)

As of August 2023, India has around 5200 electric buses on ground.

Purchase order for another 11,000 buses — (Grand challenge and NEBP phase-1 buses).

Another 25,000 electric buses to be procured (NEBP phase-2, state and PM e-bus Sewa scheme etc.)
E-2 wheeler market: evolving rapidly

- **FAME I** allowed cheaper, low-speed and low range scooters with lead acid batteries

- **FAME II**: **Performance criteria** -- minimum range of 80 km per charge and minimum top speed of 40 kmph; defined energy efficiency, minimum acceleration, and higher number of charging cycles. Disallowed lead acid battery-powered scooters.

- **Innovation in business models** -- manufacturers provide charging solutions around their products and have platforms for their users to provide longer term solutions.

- E-2W sales have picked up after petrol price hike

  How soon can we seen a bigger turn around?
On-road price of 2Ws with and without incentives in Delhi – more cost effective

FAME II lowered average price by 35%;
FAME + Delhi government incentives can reduce on an average by 57% from the on-road price (13 vehicle models in Delhi)
FAME and electric cars

FAME II not for personal cars

State policies -- Delhi electric vehicle policy -- initial subsidy support for a targeted c-car fleet; Tax waivers, non-fiscal preferential incentives, reliable charging network…

- **Limited models** -- Less than 10 vehicle car models available with range varying between 140 km to up to 300+ km. Most variants have a top speed of 80 kmph.

- **Cars need to be part of the 30@30 or stronger targets**: Total cumulative battery capacity needed in 2030 to support this target, the share of cars have to be at least 31%. (ICCT)

- **Key to scale** -- OEM price, fiscal and non-fiscal support, model availability, and charging infrastructure.

- **Consumer expectations of range**: Tata Nexon model and consumer expectation. Improve test procedures to reduce gap between certified range and on-road performance.
Incentive for E-passenger cars

On-road price of private E4Ws with and without incentives in Delhi
Upfront price reduce by an average of 19% -- several models still remain more expensive than petrol counterparts.
Incentive for cars for commercial use

On-road price of commercial E4Ws with and without incentives in Delhi: Upfront price reduce by an average of 32% -- several models remain slightly more expensive than their petrol counterparts.

![Graph showing on-road price comparison between commercial E4Ws with and without incentives]
FAME and fleet aggregators: Scalable

- High utilization segments -- ride-hailing, urban freight/deliveries, and employee transport.

- **Ride hailing**: Voluntary and government target for electrification. 40% by 2026?

- **Quicker recovery of cost and viable:**
  - ICCT's assessment- at current cost and incentive, some models are cheaper than ICE in terms of 5-year TCO and cost per kilometre. Some marginally higher; Additional incentives can help

- **More strategies:**
  - Differential fares between e-ride services vs ICE vehicle based services.
  - Reserved parking spaces for e-fleet operators, preferential parking permits, preferential parking rates etc

- **Special needs of overnight charging, home based and neighbourhood scale roadside charging with discount,**

- **Preferential electricity rates.**

- **Delhi, -- a new scheme:** Ride hailing and delivery aggregators to convert 25% of fleet within one year of notification of the scheme and 50% in the subsequent year.
FAME and delivery fleet: Scalable

Phenomenal increase in last-mile deliveries across urban e-commerce,
(e-Kart, Delhivery, GATI and others to transition to Evs; Amazon and Ikea have set global targets to move to electric vehicle deliveries.)

- Delhi government partnered with Flipkart, Amazon, Zomato, Blue Dart Express, and 26 other companies to start using electric vehicles for deliveries

- Electrification of feeder services of metro. Delhi metro-- facility is now available at 29 stations, with an operational fleet of over 1,000 e-rickshaws.

- Need management of last-mile urban freight and deliveries: Regulation of daytime entry of heavier electric delivery vehicles; Link incentives with e-kilometers based on odometer reading.

- Limited EV options for heavier delivery vehicles,

- Permit concerns related to cross-sector usage of the same vehicle, and licensing system of two-wheelers.

- Charging plan is critical
Towards zero emissions mandate for vehicle industry

- Incentive-based strategies already in place

- A ZEV mandate can ensure robust supply and larger model availability; address skewed costs etc

- A mandate-based strategy provides certainty; encourage investors; provide flexibility to the industry to develop plans to achieve targets.

- Reduce cost pressure

- A mandate is revenue neutral strategy for the government - leverage market competition to promote ZEVs. Free up government capital for EV promotion, charging infrastructure

- A credit trading mechanism: provide an incentive to manufacturers to build EVs, win ZEV and emission credits, get a fresh revenue stream from banking and trading over-compliance credits.
Charging: can make or break

- Deloitte global automotive consumer survey 2018: 36% Indians hold lack of charging infrastructure and charging anxiety as bigger deterrent than cost or range.

- Ministry of Power (MoP) notification -- electricity consumed for charging vehicles not to be considered as transmission or distribution or trading of electricity; **no license required.** Recognized battery swapping.

- **Building-ready:** MoHUA - Model Building Byelaws, 2019; provide for ‘electric vehicle only parking areas’ within premises. Building premises can have additional power load.

- **FAME II support for charging infrastructure increased** to 10% of 10,000 crores total outlay. (Rs 300-400 Cr/yr). Reduced GST on charging stations from 18% to 5%. But not extended to battery swapping.

- **Access to capital a challenge esp for small players** -- cost of charging equipment, land and grid connectivity requires initial capital.

- **Develop robust EV charging standards.** (Bharat DC 001 and AC 001) to be further reformed to enable charging of all types of vehicles. BIS and DST working on indigenous charging standards for India. Low-cost AC charger (LAC); **interoperability of chargers.**
Charging: address barrier

- **2021 WBCSD report** -- Unclear rules on grid upgradation strategies; **land availability** for private investments; **absence of subsidy support to battery swapping**; **double taxation** levied on charging services; and **operational difficulties** related to the open-access regulation threshold.

- **Swapping:** Batteries sold separately for vehicles will reduce the upfront cost of vehicles and the need for a dense recharging network.
  - Swapping requires a standardized system of battery cavities, batteries and chargers, in order to enable interoperability, and a system that will work well for the commercial segment.
  - Permit battery swapping to avail FAME subsidy, and reduce GST on charging and battery swapping services.

- City’s mobility plan needs to integrate a charging network plan.

- **Integrate captive charging stations with larger public charging network** to improve utilization and access.

- **Varying usage patterns and charging requirements according to vehicle types** makes the decision even more complex.
ICCT study 2021: Life-cycle GHG emissions analysis shows the advantage of EV pathway 2021

--- Even at 95% EVs by 2040 additional electricity demand from vehicle electrification is just 0.9% increase in generation in 2030; 1% increase in generation in 2040 from base case of 1% EVs.

--- If no new policy on coal and gas power plants SO2 to see modest increase: But net emission reductions in NOx, CO2, and PM2.5.

--- If power plant emission controls improve, coal power plant retired, RE increase etc - PM2.5 to reduce by upto 27%; SO2 by 85%, Nox - 77% , and CO2 - 25%
Localisation of manufacturing ....

• Production linked incentive (PLI) of Rs 18,000 crore for production batteries – 50GWH target

• Linked to the National Mission on Transformative Mobility and Battery Storage, 2019,-- local manufacturing; raw materials, electrochemistry, and end-of-life treatment of cells, modules, and battery packs.

• Needs matching demand from the EV sector - PLI incentives to be disbursed on the basis of incremental sales from domestic units.

• Five years too short to get adequate commitment from manufacturers; high uncertainty about volumes, evolving battery chemistries. Too large a risk if the support structures and roadmap not clear.

• The 30@30 target will require much larger battery capacity. India may need annual addition of 246.9 GWh and cumulative addition of 824.7 GWh in 2030. (ICCT)
Need battery eco-system

- **Battery ecosystem**—battery production and raw material sourcing, battery assembly and management, R&D, innovation in battery chemistry among others.

- **Battery raw material security and access to mined materials** -- challenge to localization of battery cells

- **Vulnerability to geopolitical complexities**; global supply of material and minerals and battery technology. Securing supply chain for cobalt, lithium, nickel, graphite

- **Battery costs**: Between 2010 and 2020, battery price reduced by over 85% -- to drop further below $100 per kWh. Promote diverse battery chemistry

- **Recycling to recover** lithium, cobalt, or nickel: Scalable recycling technologies and regulations on recovery rates for strategic resource. Improve rate of recovery. Need regulatory mandate for collection of spent batteries and recycling.

- **Standardize battery products** with information on the chemicals used and streamlined networks for battery collection
Race towards critical minerals and restructuring of global auto industry

- **To reduce supply risks and price volatility** The US and EU Investing in mines of critical minerals to secure direct access to raw material or getting into offtake agreements.

- **Improving stockpiling of minerals**, (e.g., cobalt) facing severe supply constraints.

- **Exploring substitution of materials** -- increasing battery-cell efficiency and changing battery chemistry. Recycling of end-of-life of batteries to recover rare earths and other such critical minerals.

- **Automakers investing in mining projects to secure and control raw material sources.** Europe’s lithium mine is looking for auto industry investors -- automakers to own stakes in mining projects in Finland etc.

- **Focus - How to retain the value chain within the industry.**
State level policy: Need bottom up pressure

- 26 states have either notified or drafted EV policies

- Delhi Electric Vehicle Policy -- EV sales share increased from 1.23% to 12%. E2W market grown more than twice, electric car registrations –

Varying scope of state policy:

- Demand side incentives 16 parameters -- Odisha (13), Delhi (11) and Punjab (10). -- Delhi and Odisha define technical eligibility for availing incentives

- Supply side incentives – manufacturing -12 parameters -- Tamil Nadu (11), Uttarakhand (10) and Uttar Pradesh (9). Delhi (None)

- Non-fiscal enablers - Odisha (6) Andhra Pradesh (8) Delhi (7)

- Industrial policy (interest free loans and reimbursement of GST for companies setting up up factories, business infrastructure with subsidies on capital (land, water, electricity, waste disposal and testing facilities).
Financing Evs...

- **2021, NITI Aayog - Rocky Mountain Institute study**: for 70% electrification in 2030 cumulative capital cost expected to be Rs 19.7 lakh crore by 2030.

- **State support**: interest rate subvention; low cost loans etc.

**Barriers:**

- **High financing cost** (high interest and insurance rates);
- **Low loan-to-value ratio, and limited financing options** for retail customers.
- **Banks and non-banking financial institutions** – 50% to four-wheeler passenger vehicles, 40% to commercial vehicles, and only 10% to two-wheelers.
- **Concerns around performance and resale value of Evs**: Two-wheelers and buses have different parameters for financing.
- **Unsecured borrowing from the unorganized sector** at higher rates.
- **Two/three-wheeler fleet operators** need high daily vehicle usage to justify their business model viability to financial institutions.
- **This needs a robust charging infrastructure network to support operations and financing plan.**
Financing: Find answers

• Increase access to low-cost financing; Need priority sector lending mandates

• **State policy important** -- interest rate subvention; product guarantees and vehicle performance and increase resale values.

• **SBI started Green Car Loan for electric cars**, in April 2019. Provides discount.

• **Fleet operators can offer risk sharing mechanisms** with the financial institutions by providing guarantees for their driver partners including partial credit guarantees, share default risk with Fis etc.

• **Offer utilization guarantees to driver partners** to help achieve TCO parity while improving the fleet economics, innovate the business model and set target for fleet electrification.

• **Start-ups financing.** Venture capital funding is catalysing this sector -- bigger role in two- and three-wheeler markets where financing penetration is low
Need scale and urgency to align with net zero goal

-- Need ambitious regulatory target: Set the bar high

-- Need target setting for longer term policy visibility to bring more certainty in investments: vehicle segment-wise, for charging, and production facilities

-- Need zero emissions mandate to upscale: Consider production based ZEV credit regulations

-- Central and state level: define milestones for each strategy for timebound implementation that is measurable and verifiable

-- Devil in design of each strategy

-- With tighter CO2/FE targets and post BSVI emissions standards, EV technologies to be more cost effective

This transition is inevitable