Logistics : Key to net zero value chains

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Correlation of number 3

1. As per purchasing power of the domestic currency India is the 3rd largest economy
2. India is world's 3rd largest automative market in terms of sale
3. India is the 3rd highest importer of petroleum products
4. India has close to 3 million trucks currently plying on roads plying 100 billion Km per year
5. India is also the 3rd largest carbon emitting country
    1. Trucks in India have a share of 40% of road transport emission and fuel consumption
    2. Road transport is growing at a CAGR of 8%
    3. Unless conversion to cleaner fuel happens carbon emissions will be compounded at 8% year on year

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5 KPIs for Green Mobility in Road Transport

1. Vehicle KM Travelled (VKT)– A reduction in VKT helps in reduction of vehicle emission and improves air quality
2. Mileage – An increase in mileage helps reduction in fuel consumption and emissions from the fuel combustion
3. Share of Type of Fuel – Diesel/CNG/LNG & EV, reduction of share in fossil fuels and increase in CNG/LNG and EV will help reduce the emissions
4. Average Speed: Regulation of speed depending on topography can help control fuel
5. Idle Time: Reduction in idle time can help save fuel and vehicle emissions

All images generated by AI

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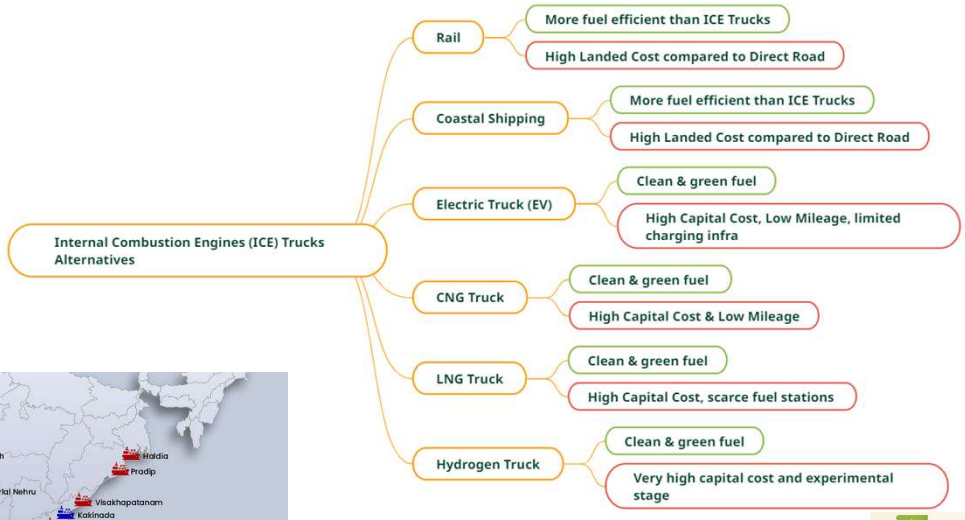
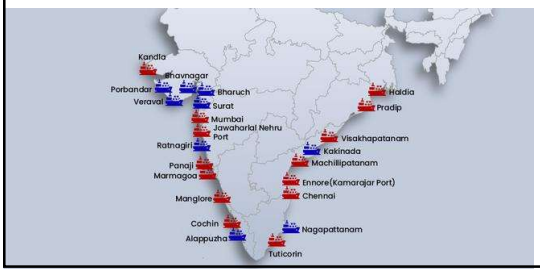
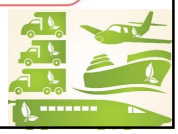
Mindmap of Road Trucks (ICE) Alternatives to cut down emissions







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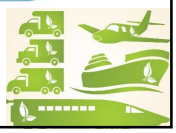
Short, Medium & Long Term Strategies to negate carbon emission

- Strategies to negate carbon emission
  - Short Term
    - Driver training on safe & fuel efficient driving
    - Implementation of Dash Cams with inbuilt level 1 ADAS to give live input to drivers on safety & fuel efficiency
    - Switch to CNG as much as possible
    - Shift min 10% of road transport to rail for long distance
    - Shift to high capacity vehicles for better fuel efficiency
  - Long Term
    - Shift to Hydrogen Trucks as Hydrogen Trucks cost comes down
    - Shift to semi autonomous for HCV and fully autonomous trucks for LCV
    - Implement AI based Logistics Control Tower which decides most fuel efficient mode between road, rail & sea and also the most fuel efficient truck - ICE, EV, CNG or LNG for a particular route based on charging & specific fuel stations
  - Medium Term
    - Shift LCV to EV as EV infra improves
    - Shift HCV to LNG as LNG Points increase
    - Implement Logistics Control Tower to reduce idling time enroute
    - Implement Transport Management system which includes Track n Trace, Plant Logistics Management System & warehouse management system



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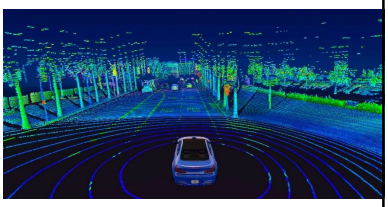
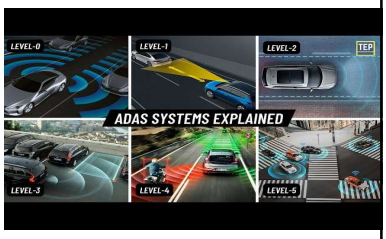
Journey Risk Management with ADAS & 3D Maps

- Journey risk management is a method of collecting data for a route to assess the level of safety which includes assessing accident prone areas and blindspots enroute
- LIDAR (Light Detection & Ranging) based 3D Maps are being created which will map all objects on a road in 3D and store it to create a 3D – Digital MAP of a route
- JRM can be combined with these 3D Maps and ADAS to carry out most optimal JRM
- With ADAS a vehicle is no longer a vehicle but a robot driven by AI
- A machine learning algorithm will continuously analyse the vehicle speed, its fuel injection system (ICE), tyre friction, braking system, torque of the vehicle etc and continuously make changes to make it most fuel efficient
- Currently high end passenger vehicles in India have level 2 ADAS installed more from a safety point of view than fuel efficiency
- Indian startup companies have already invented ADAS Level 5 which has been tested by retrofitting Indian Passenger Cars on Indian High Traffic roads
- By 2030, ADAS Level 5 can be expected in Light Commercial Vehicles in India
- With ADAS Level 5 in EV, the vehicle will be able to self connect itself to a charging point and charge itself





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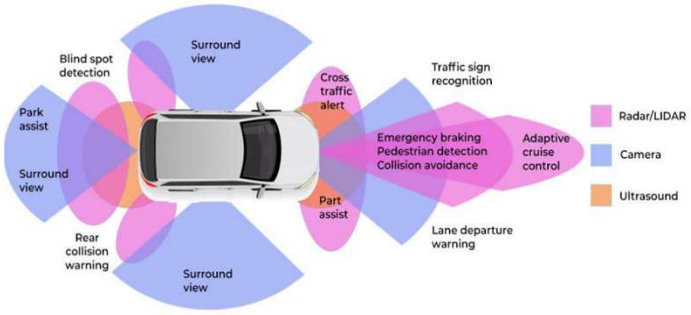
ADAS (Advanced Driver Assistance System) & Future of Autonomous Driving

LEVELS OF ADAS

- Level 0 (No Driving Automation)
- Level 1 (Driver Assistance)
- Level 2 (Partial Driving Automation)
- Level 3 (Conditional Driving Automation)
- Level 4 (High Driving Automation)
- Level 5 (Full Driving Automation)



RADAR

RADAR (Radio Detection and Ranging) sensors are used in ADAS-equipped vehicles for detecting large objects in front of the vehicle

ULTRASONIC SENSOR

Ultrasonic sensing is usually used for short-distance applications at low speeds, such as park assist, self-parking, and blind-spot detection.

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How to train drivers to improve fuel efficiency

- Defensive driver training can help reduce harsh braking, acceleration and manouvering
- Whenever there is a harsh movement there is an uptake in power which leads to more fuel getting burnt
- Hence by training drivers on defensive driver training fuel can be conserved
- Trucks can be fitted with Dash Cams which come with ADAS built in which can alert the driver in case of lane change and provide inputs on braking distance with reference to the vehicle in front
- Today dashcams come with 360 degree view which can track driver eyes and facial expresssions to detect fatigue and alert the driver to take a break

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Saving Paper through Electronic Paper

- There are 3 million commercial vehicles on Indian Roads
- Assuming each does minimum 5 trips per month
- That's 15 million trips, in each trip a driver carries atleast 2-3 copies of paper based invoice
- By making E-Invoicing mandatory 45 million bundles of paper can be saved which in turn can help save so many trees
- Other ways of saving paper is by making Electronic Proof of Delivery Mandatory

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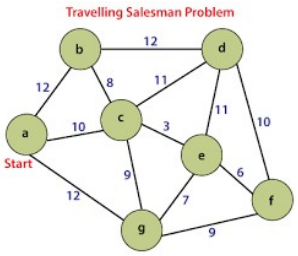
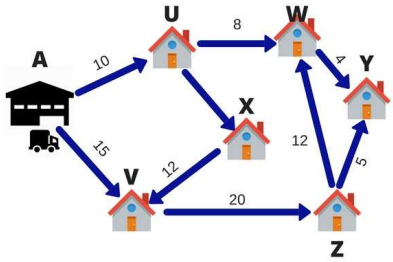
Leveraging mathematics to save fuel

- Implementing operation research (OR) initiatives is an important part of supply chain excellence
- Optimisation algorithms, Linear Programming Algorithms which provide the lowest cost of serve are part of the OR
- Lowest cost to serve means lower freight and lower freight means lower diesel consumption as diesel cost contributes to 30-40% of typical freight rate on average
- E-Commerce can use the Travelling Salesman Problem (TSP) algorithm to improve route optimisation which finds the best route to cover all the points for parcel delivery
- Linear programming algorithms are best suited for bulk industry which give the best source for a given set of destinations based on certain constraints





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Cost of Idling enroute and how it affects implementation of clean fuel technology

- At an approximate level, the cost per hour of idling for a truck cost 25 Lakhs is Rs 100
- Idling of trucks happen due to the following reasons
  - Chokage at toll plazas
  - High traffic zones
  - At customer site waiting for unloading
  - No Entry restrictions into cities for commercial vehicles
  - Driver rest time in case of single driver

- Idling with ignition on leads to higher fuel consumption
- Higher idling leads to lower trips per month which can act as barrier of entry for new technology trucks like EV, LNG & Hydrogen trucks
- New technology trucks due to economies of scale currently have capex cost which can only be offset by higher number of trips per month and idling can effectively kill this initiative
- Idling can be reduced by as much as 70% by implementing Logistics Control Towers

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Are we ready for Hydrogen Trucks
At present there is no data but the capital cost is expected to be higher than EV

Daimler Truck #HydrogenRecordRun: Mercedes-Benz GenH2 Truck cracks 1,000 kilometer mark with one fill of liquid hydrogen

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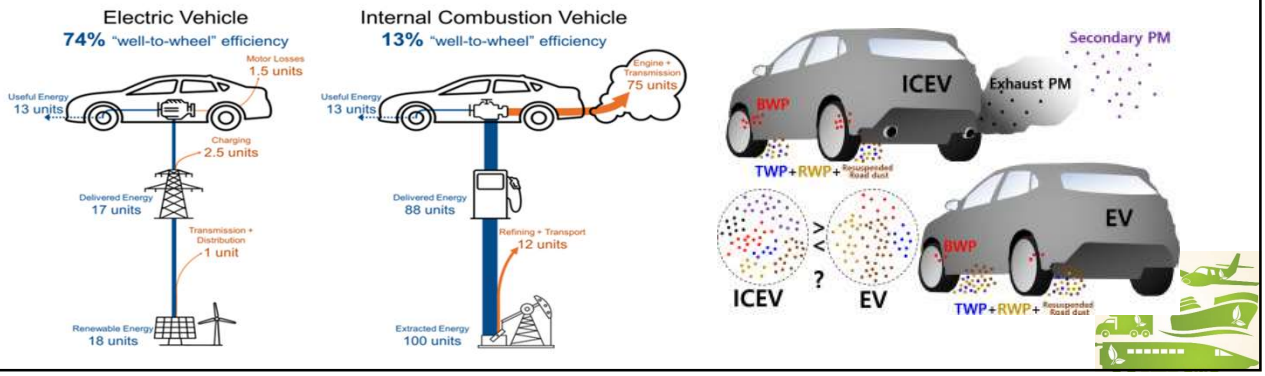
Advantage of EV in Commercial Vehicles

- Based on current data it can be assumed that EV could reduce the carbon dioxide emission by 30-40%
- In Cement Industry we will see EV penetration initially in small commercial vehicles & Light Commercial vehicles upto 12 MT Capacity
- Today only manufacturers will find it viable to invest in Electric Vehicles as compared to transporters due to high cost, charging infra and onroad service issues
- As per an economic times article, EV- LCV is expected to grow by 25-30%
- Today it is also possible to retrofit existing commercial vehicles with EV and convert it into a hybrid vehicle but it is also an expensive affair
- As per recent research a 25 MT Electric Truck with 569 KW battery pack and range of 400 Km can reduce operating cost by 28%



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Challenges to EV penetration in Indian Road Transport

- High upfront cost with high battery cost
- Limited model availability
- Lack of consumer awareness & education
- Range anxiety – Lack of charging points enroute can create a lot of pressure in the mind of transporter
- Availability of charging infra – Every transporter looks for return load, charging points may be available in forward movement but choice of return movement get restricted due to unavailability of charging points
- Charging Time – EV Trucks can take 8-10 hours to charge, without availability of swappable batteries this can effectively kill the Trips per truck per month
- Standardisation of Charging Points
- High Chasis weight – a high chasis weight can effectively reduce the mileage and carrying capacity of a truck

Image 1 - Chassis platform for an Internal Combustion Engine (ICE) vehicle

Image 2 - Chassis platform for an Electric Vehicle (EV)

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Commercial element comparison of Diesel vs CNG vs EV truck

Element	Units of Measurement	Diesel	CNG	EV
Capacity	MT	25	25	25
Mileage	KMPL	3.5	3.5	2 (KW/h/Km)
Fuel Cost	Rs/Litre	98	93	8 (Per Unit)
Capital Cost	Rs	25 Lakhs	27 Lakhs	80 Lakhs
Operating Cost (Fixed + Variable)	Rs/Km	70	80	100
PTPK for 250 Km round trip	Rs/MT/KM	2.7	3.2	4.0

- Although the fuel cost of CNG is cheaper than Diesel and EV is even more cheaper than CNG, their Capital cost is very high in comparison to Diesel trucks, secondly their mileage is also lower compared to Diesel truck
- Values are approximate in nature and not to be taken at face value

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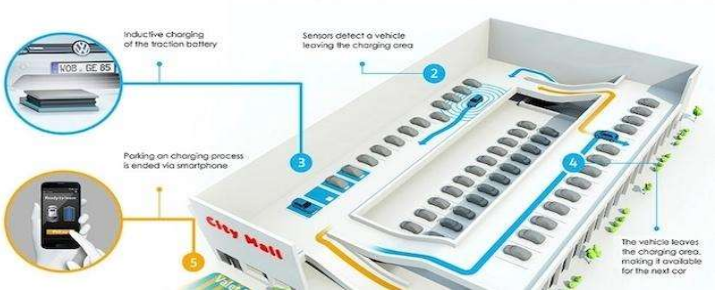
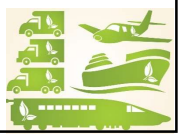
Suggestions to make EV Trucks commercially viable as compared to ICE

- Heavy discounting for next 8 years on Transport Finance on EV in the range of 3% per annum as compared to 10-12% per annum
- Exemption on road tax and goods permit
- Exemption on toll taxes nationwide
- Free solar charging points for free charging of Trucks on highways
- Secured parking complexes with charging points for long charging and driver rest rooms, regular trucks are often subject to theft and EV Trucks with their high Capex cost will become attractive targets for enroute piracy





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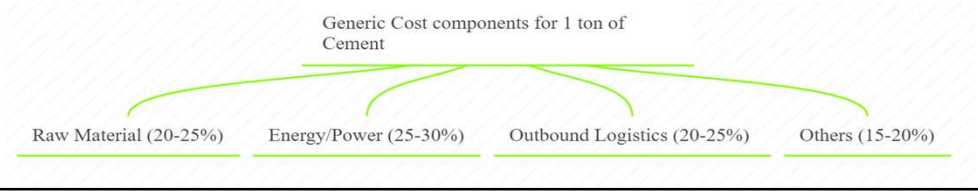
First Mile Road vs Rail vs Water ways & Total Landed Cost of all 3 modes

- Any domestic freight tmovement whether it is via Coastal Shipping, Rail or Road comprises of the following cost components
  1. Loading cost at Source
  2. First Mile Freight Cost
  3. Warehousing/Storage Space Cost – unloading cost, storage rental cost & loading cost
  4. Last Mile Cost from warehouse/storage space to customer
- Except Road transport which can be delivered directly from Source to destination within firstmile, both waterways and rail incur second mile and warehouse/storage cost
- Just comparing first mile waterways is 50% the cost of rail and road is 150% the cost of rail and hence they look cheaper
- But second mile for waterways and rail again road is used, in addition to the additional road cost in second mile there are multiple handlings involved via warehouse/storage spaces. This negates the initial lower cost advantage of first mile
- As a result at a landed cost level road is always cheaper as compared to Rail and Water ways
- Rail and Waterways are only attractive when very high volume needs to be transported in one go
- Waterways is only attractive when a firm has captive jetty at both loading and unloading points



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Logistics Control Tower to track & monitor sustainability KPIS

All images generated by AI

- A Logistics Control Tower is a physical setup which tracks and monitors vehicle movement 24x7 via the GPS device fitted on trucks
- Control Tower use cutting edge technology algorithms to automate data analytics and give crisp insights into mileage and distance KPIs
- As technology advances generative AI models like ChatGPT can be leveraged to crunch more data quickly and take realtime decisions
- The team at the control tower are in constant touch with drivers advising them on fuel efficiency and safety KPIs related to driver behaviour like Harsh driving

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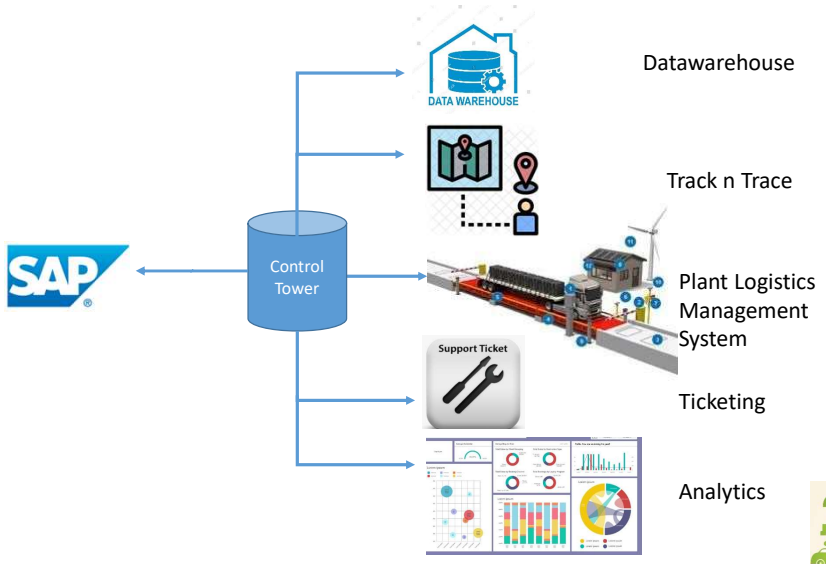
Transport Management System
Control Tower Software Architecture



Presentation Title

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