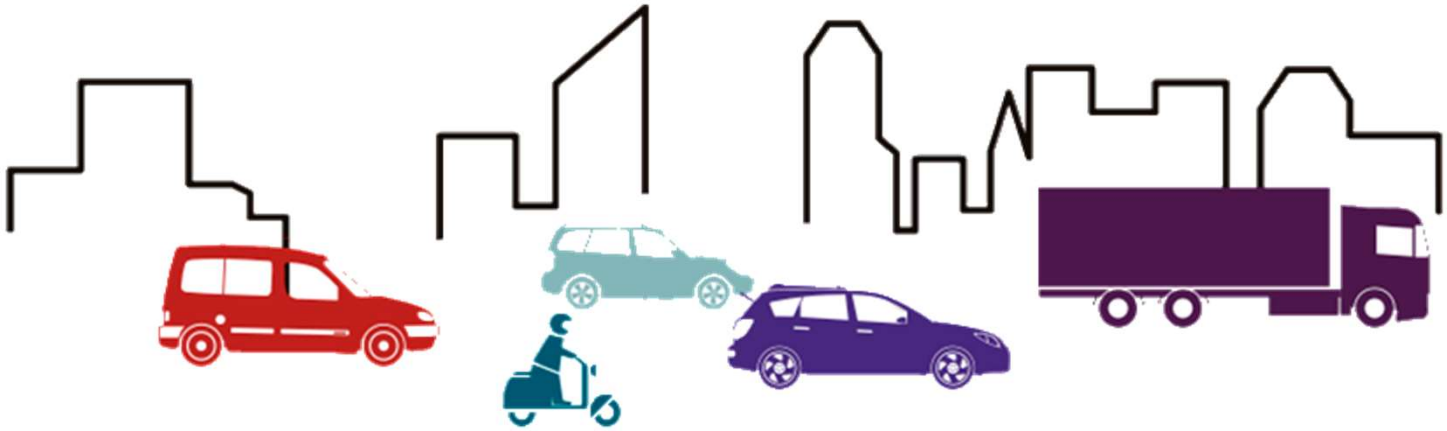
South Africa 2050: Transport Futures
A Systems Perspective



Climate Transparency Report 2020: South Africa Country Profile

25 November 2020

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Climate Transparency

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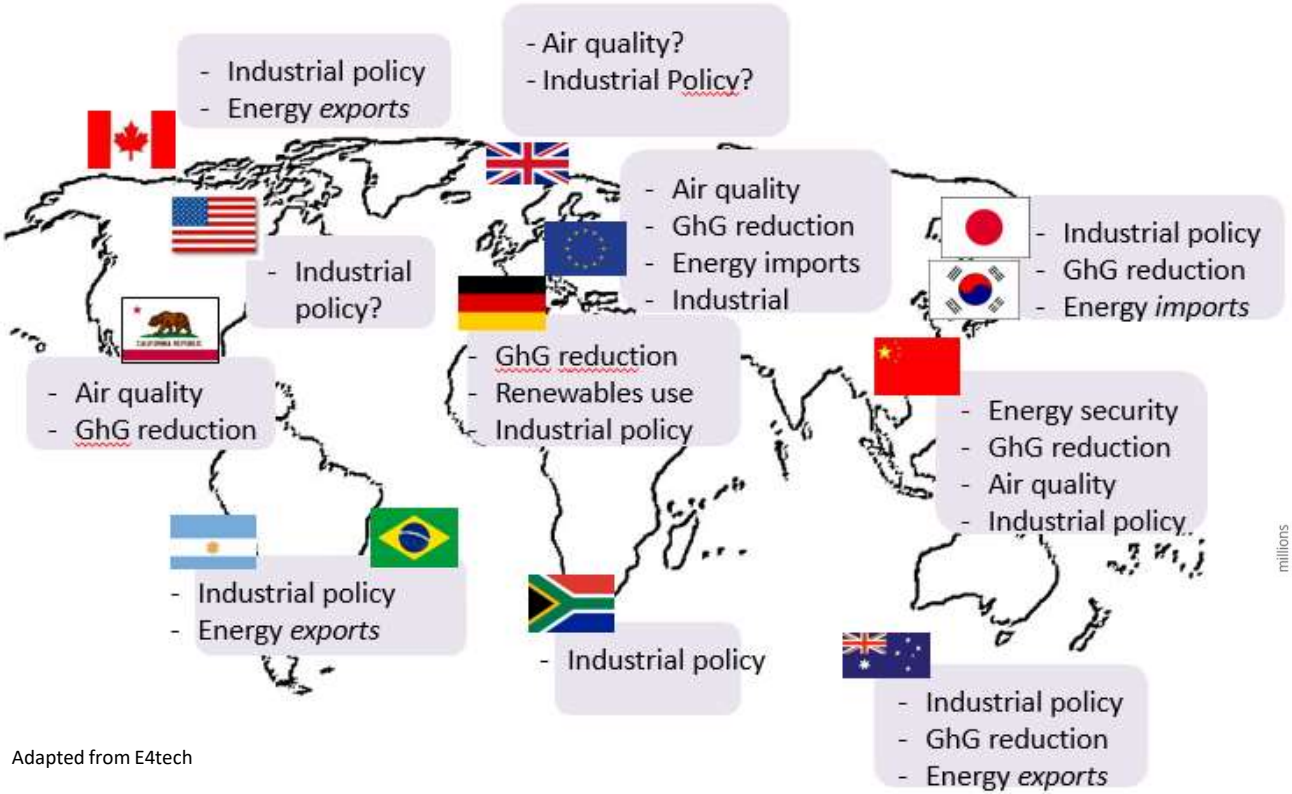
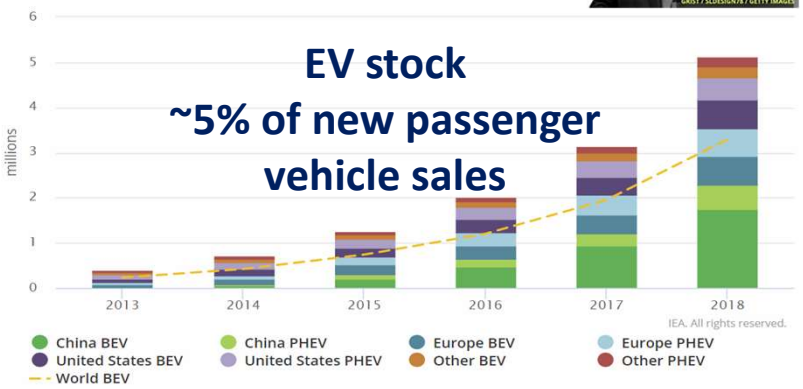
Low Emission Vehicles: National and Regional Policy Stimulating Demand



Adapted from E4tech

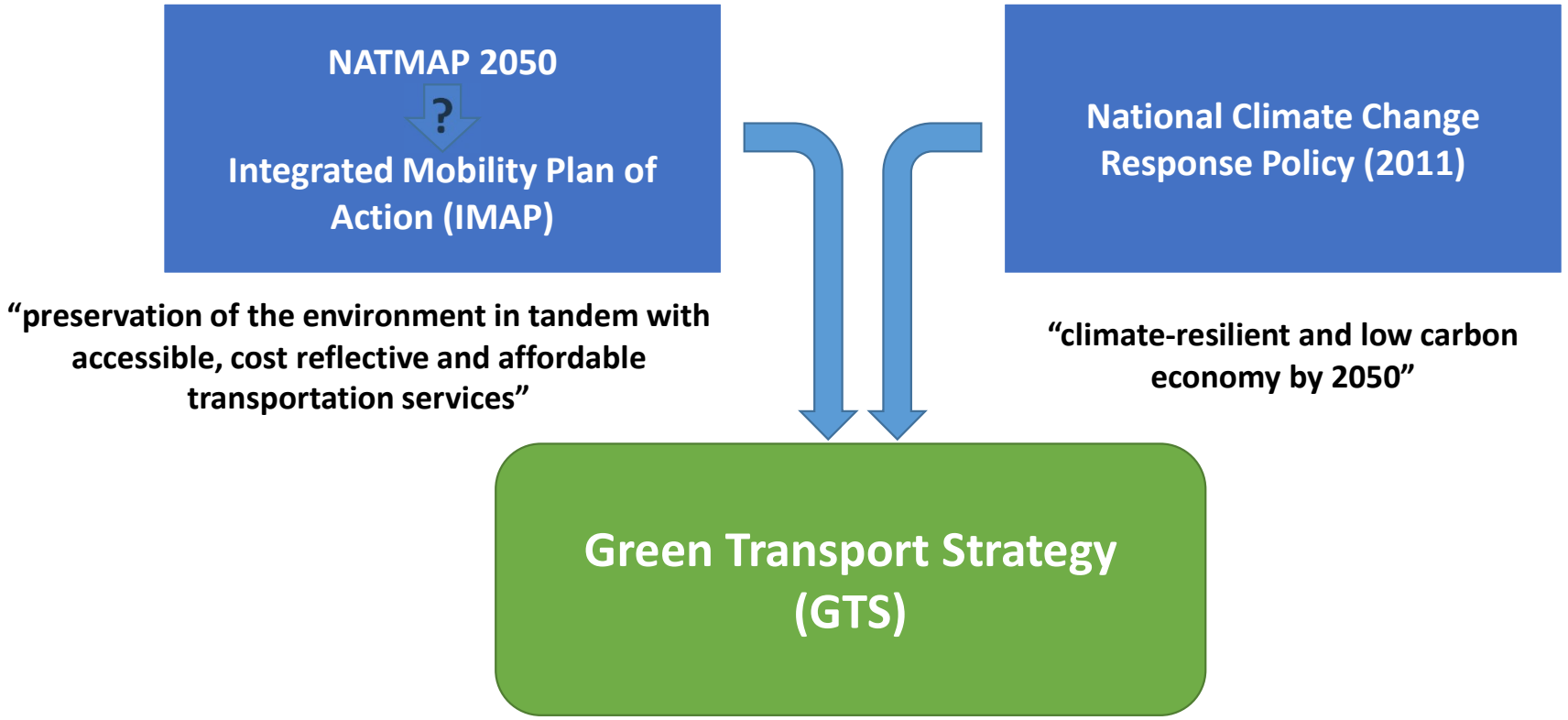
"Net-Zero" is the new paradigm



~70,000,000 new passenger vehicle sales (OICA, 2018)

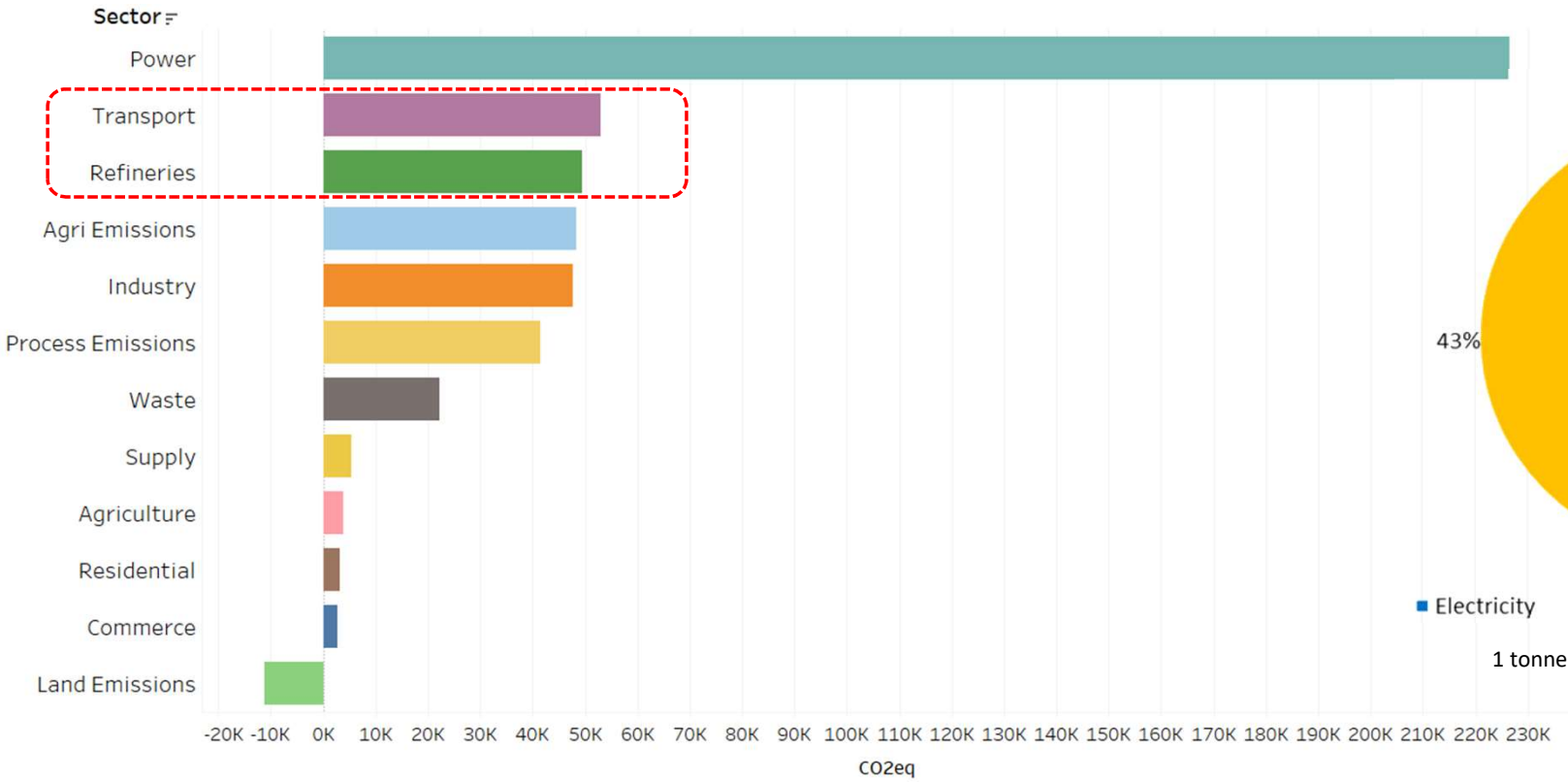
Environmental and Industrial Policy Driving the Transition

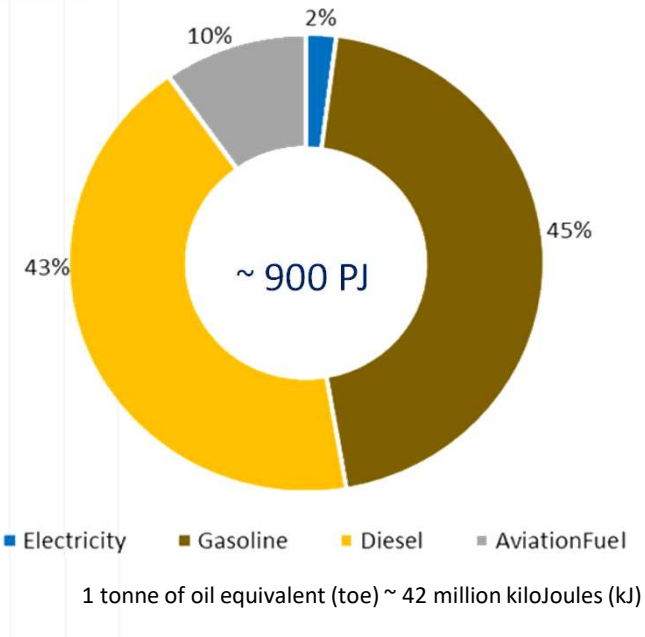
Charting the Future



"to substantially reduce GHG emissions and other environmental impacts from the transport sector by 5%"

Transport GHG Emissions and Energy

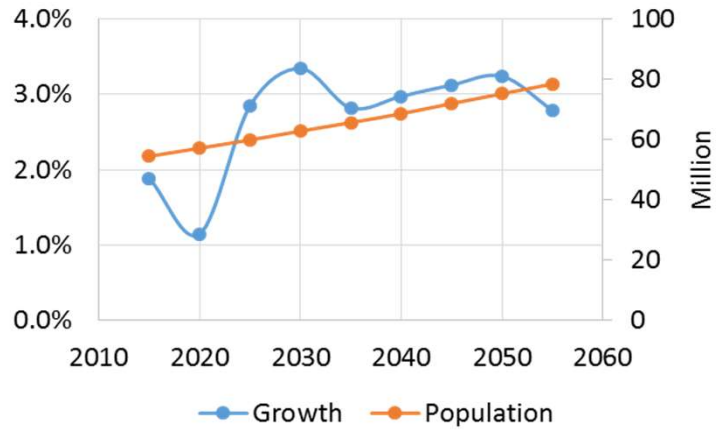


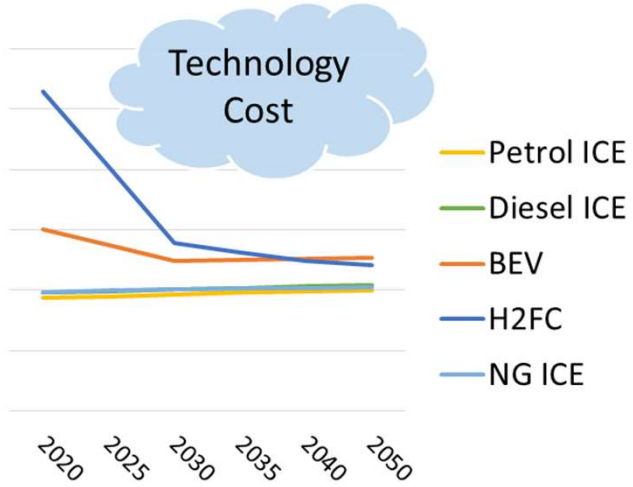


1 tonne of oil equivalent (toe) ~ 42 million kiloJoules (kJ)

Comparable to industrial sector if emissions attributed to fuel production are included.

Key Drivers of Transport Emissions Growth





Infrastructure

- Freight Road to Rail
- Public Transport
- Transit Oriented Design (TOD)

Power Sector:

- Committed Coal + REIPPP4;
- Least Cost Build with Unconstrained RE investment post 2030;
- MES for Coal Plants

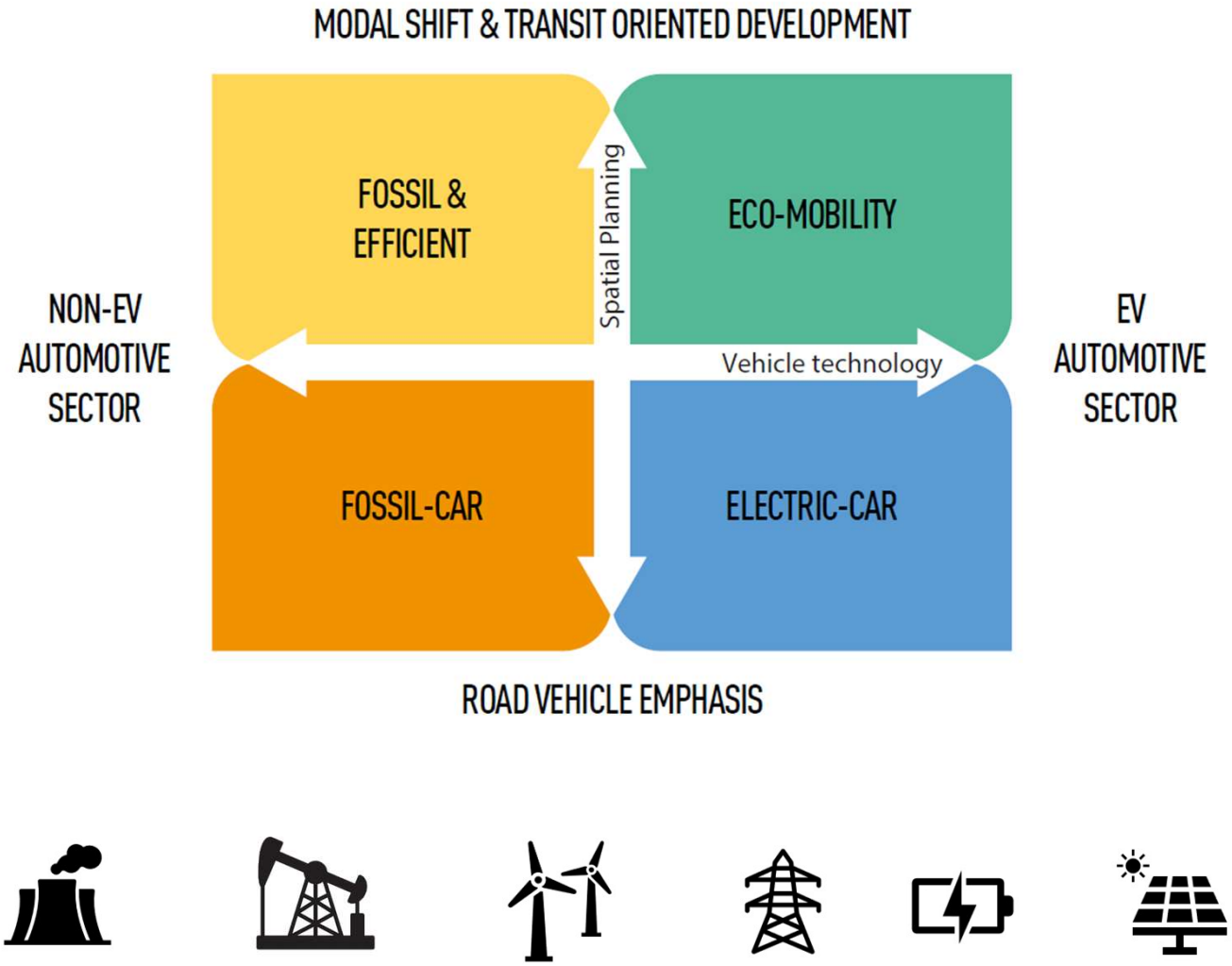
Liquid Fuels:

- Clean Fuels Phase 2: invest in upgrading existing crude-oil refineries by 2030;
- New refinery; or retire domestic production and switch to imports.

Hydrogen:

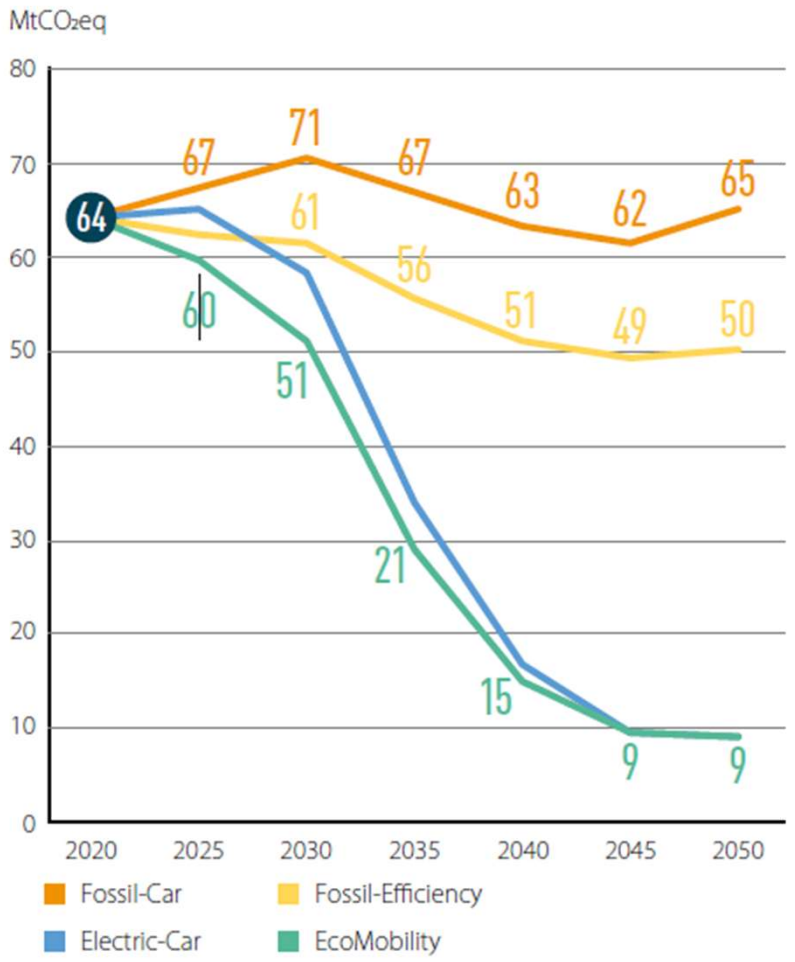
- Natural gas SMR;
- Electrolysis

Transport Pathways to 2050?



Transport Emissions

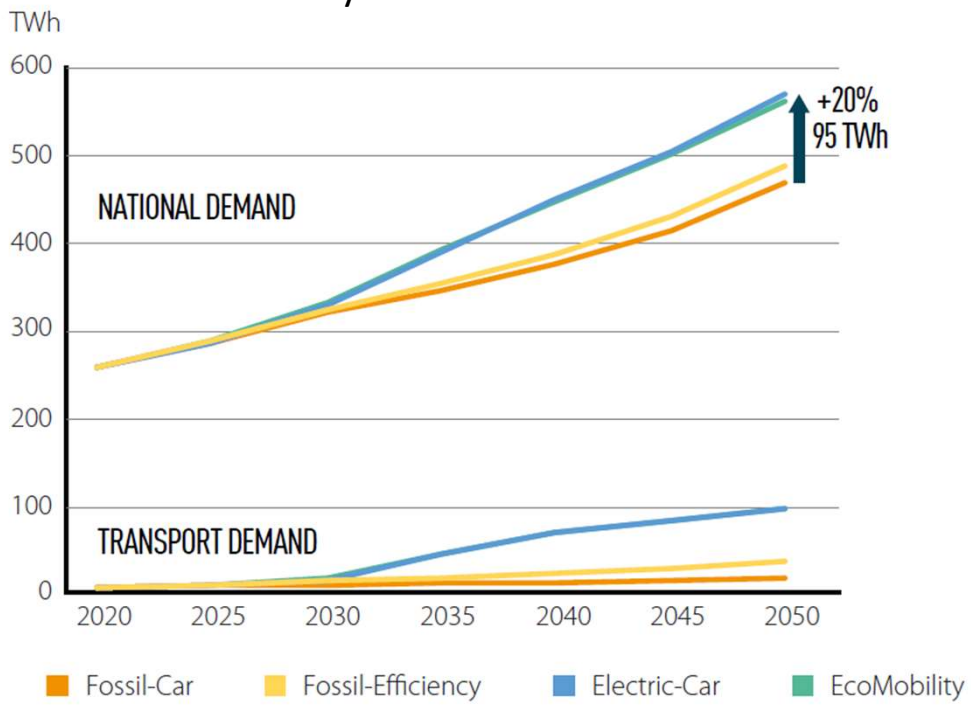
E-mobility pathways are decarbonized with zero direct emissions from road vehicles



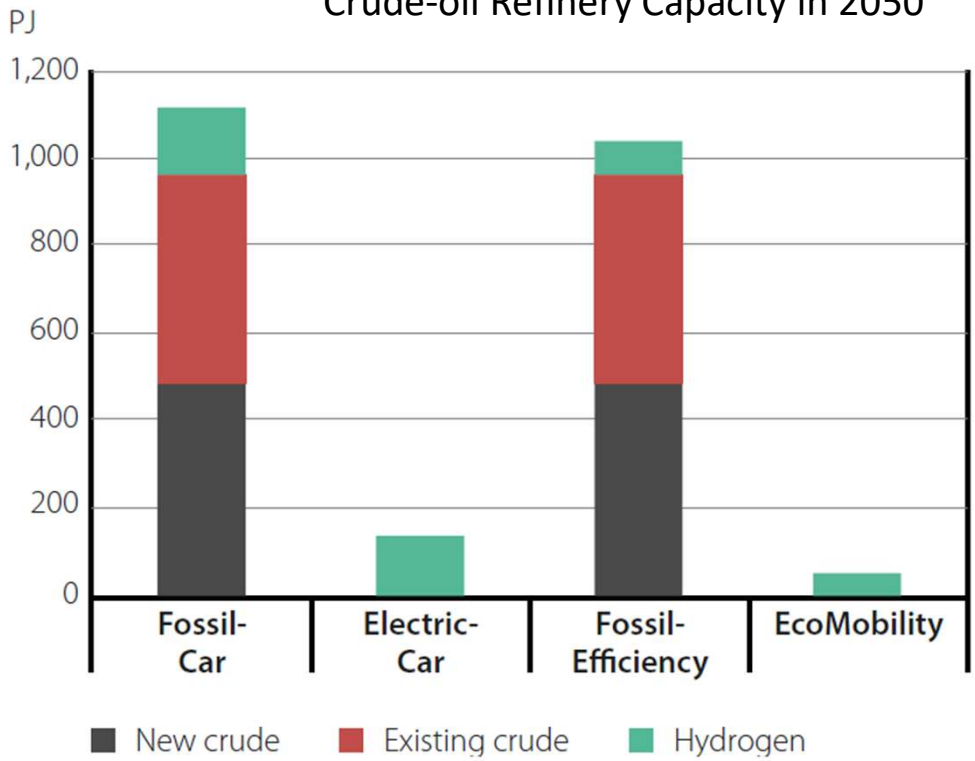
https://www.climate-transparency.org/wp-content/uploads/2020/08/CT-Low-Carbon-Transport-SA-DIGITAL.pdf

Transport Fuel Supply

Electricity



Crude-oil Refinery Capacity in 2050



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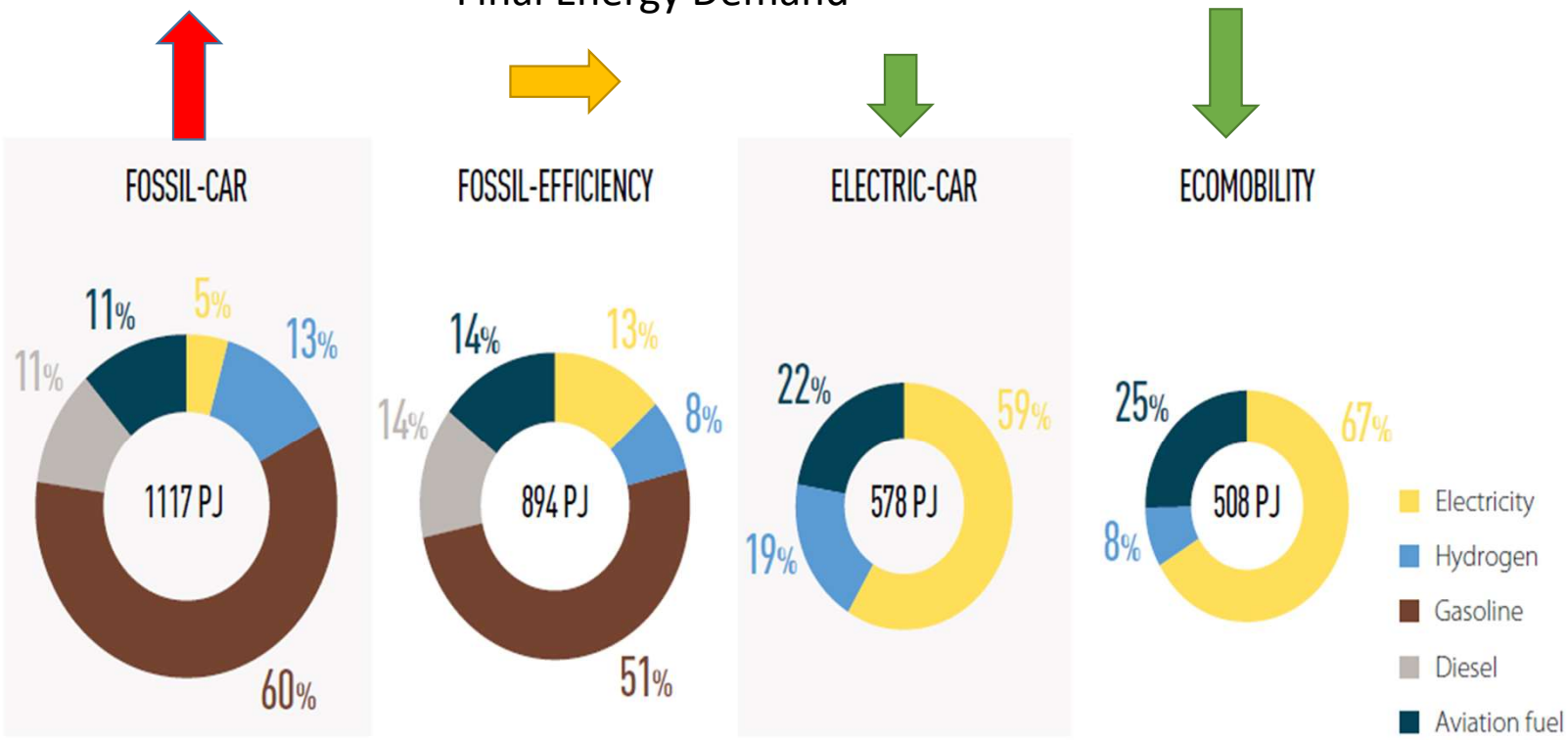
Transport Futures in 2050?

Final Energy Demand



Hybrid-ICE

- New regional refinery capacity? 300,000 bbl/day
- Fuel standards harmonisation

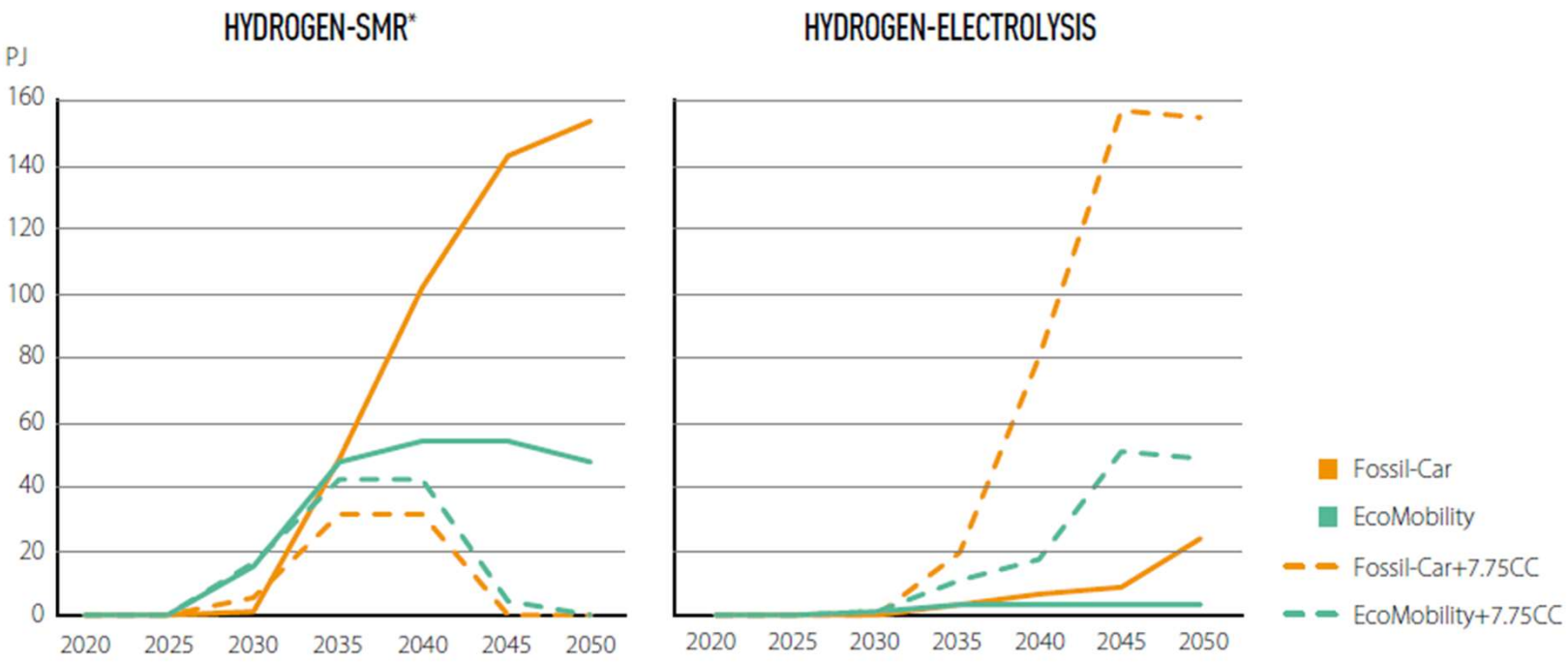
⇆

Electric Drivetrain

- Stimulate electricity sector demand > 100 TWh
- 40 - 45 GW Diversified RE portfolio

https://www.climate-transparency.org/wp-content/uploads/2020/08/CT-Low-Carbon-Transport-SA-DIGITAL.pdf

Refineries – Hydrogen Feedstock

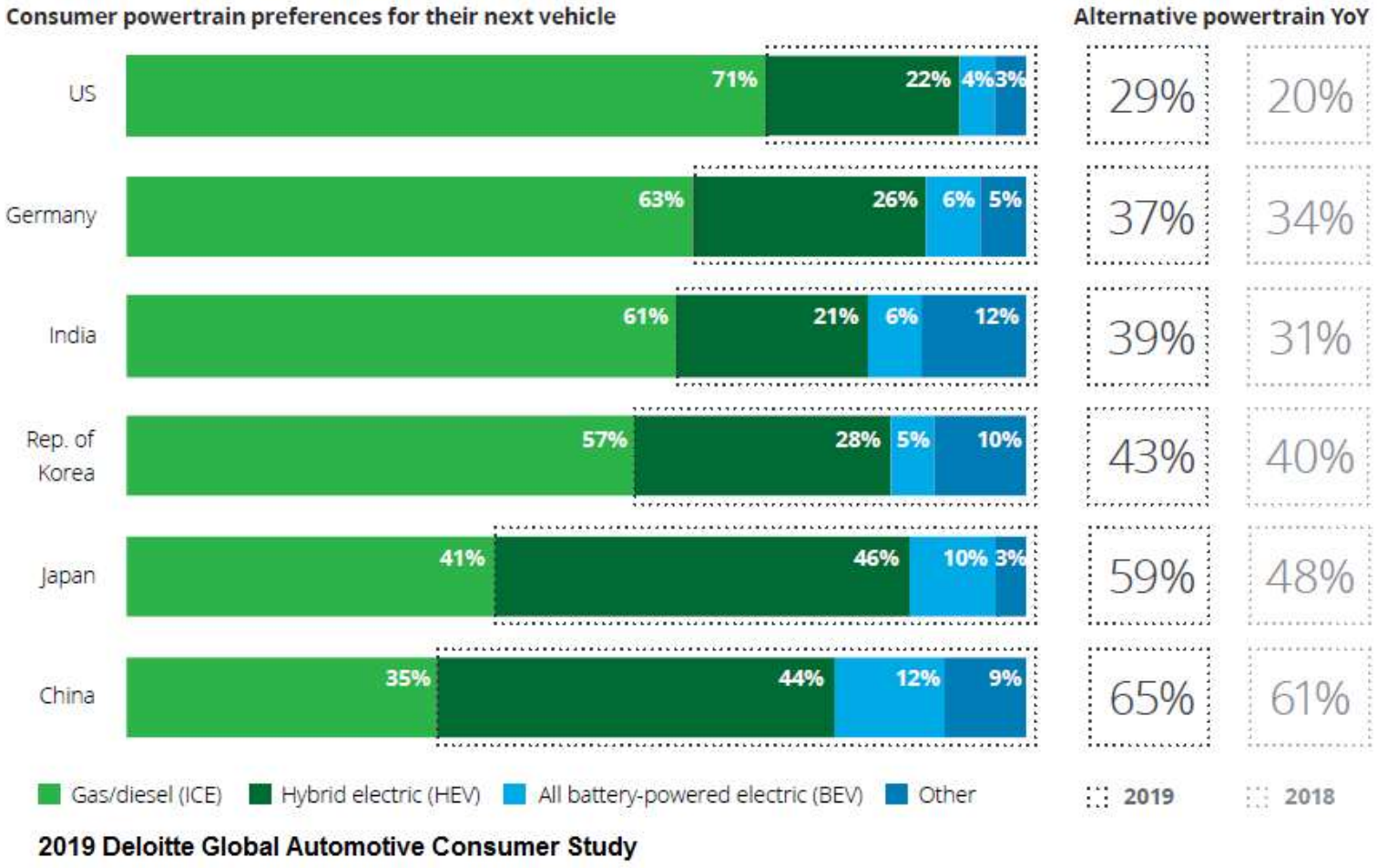


* Steam Methane Reforming (SMR)

Electrolysis

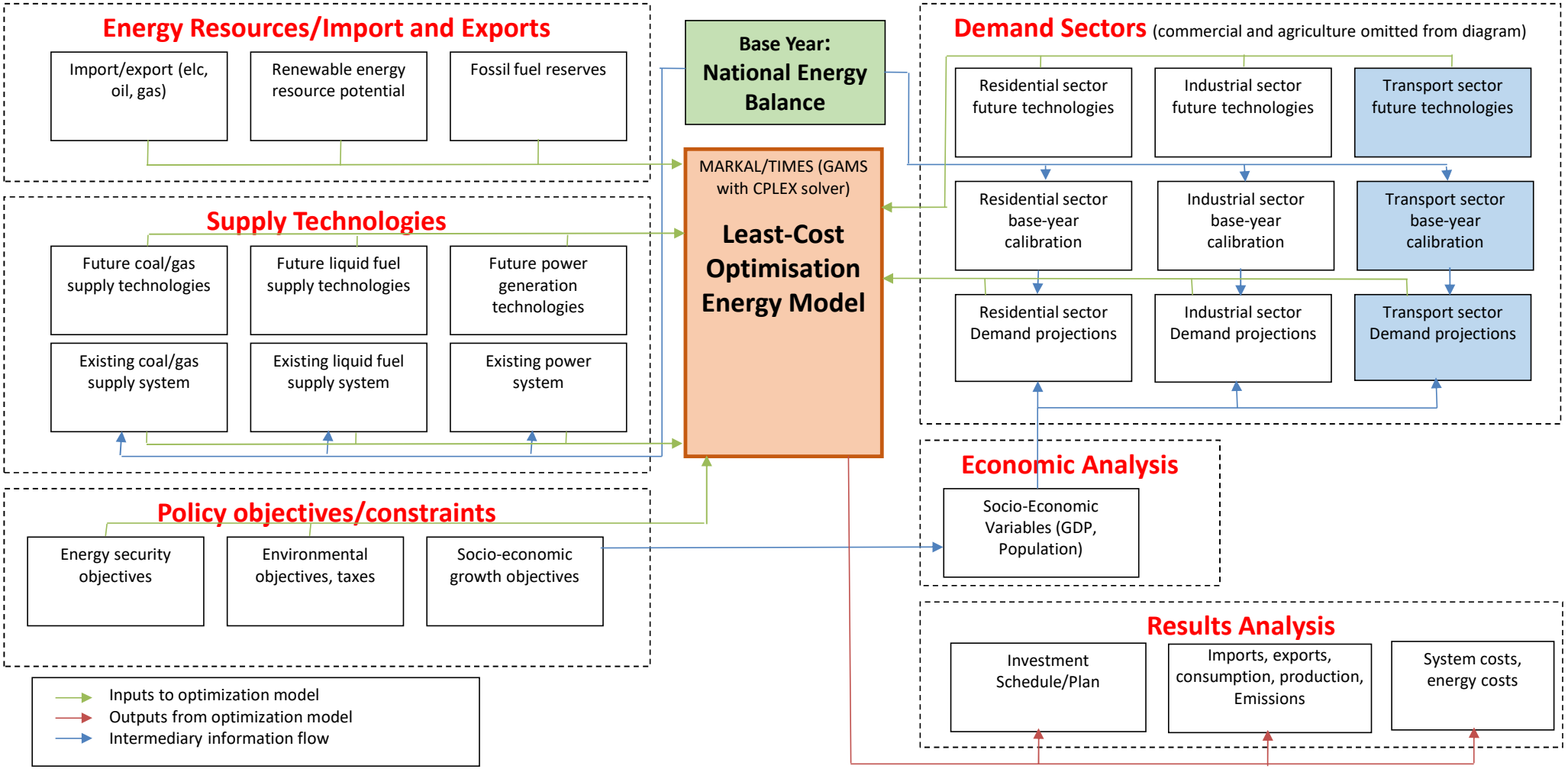
Production for H2 production switches from natural gas to electrolysis when an emissions constraint is applied to the economy. (8 Gt Carbon Budget)

Low emission vehicles: consumer preference increasing

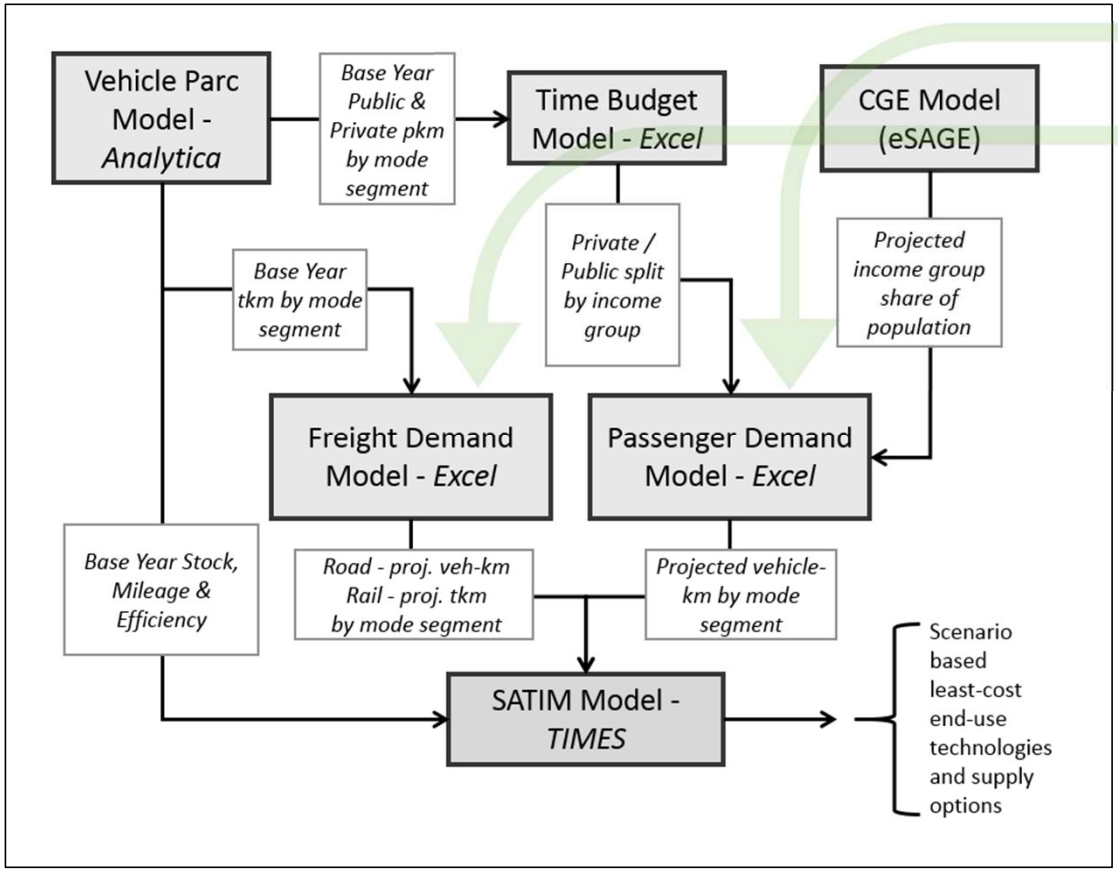


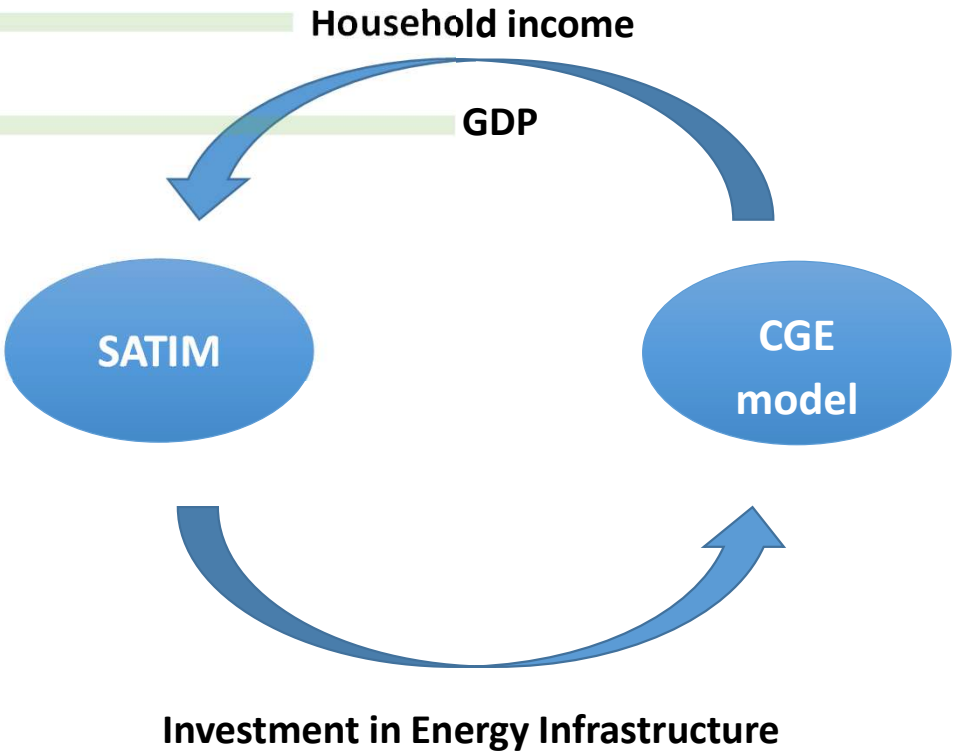
Key export hubs are shifting to low carbon alternatives

Overview of the Energy Systems Model (SATIM)



Transport Demand Model





Transport Technologies in SATIM

Fuel/ Technology	Freight Road					Freight Rail			Passenger Private Road			Passenger Public Road			Passenger Rail		Other		
	LCV	HCV1	HCV2–3	HCV4–5	HCV6–9	Corridor	Export (Bulk Mining)	Other	Car	SUV	Motor-cycle	Minibus	Bus	BRT(1)	Metro(2)	High-Speed Metro	Aviation	Pipeline	Other
Gasoline/ ICE*	•	•							•	•	•	•							
Diesel/ICE	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•			
Gasoline/ Hybrid-ICE	•								•	•									
Diesel/ Hybrid-ICE	•								•	•		•							
Natural Gas/ICE	•	•	•	•	•				•	•		•	•	•					
Blended Bioethanol-Gasoline (E85)/ICE									•	•		•	•	•					
Electricity#	•	•	•			•	•	•	•	•	•	•	•	•	•	•		•	
Hydrogen/ Fuel-Cell			•	•	•				•	•		•	•	•					
HFO(3)																			•
Jet Fuel																	•		
Aviation Gasoline																	•		

*(1): BRT: Bus Rapid Transport; (2): Metro: Metropolitan i.e. intra-city; (3): Used for Coastal & Inland Navigation; * Internal Combustion Engine; #: Battery Electric for Road Vehicles; HCV1: Medium commercial vehicle of 3 000–7 500kg GVM; HCV 2: Heavy commercial vehicle of 7 501–12 000 kg GVM; HCV 6: Heavy commercial vehicle of 24 001–32 000 kg GVM. SUV: Sport Utility Vehicle (usually 4X4 and >1ton in mass)*