OICA Global Decarbonization Framework

A technology neutral approach to achieve road transport decarbonization by 2050

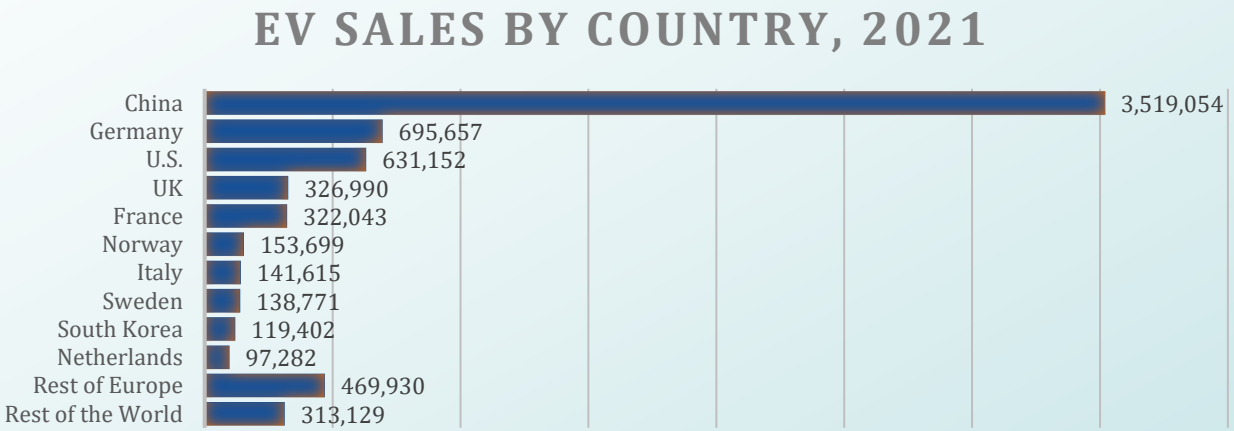
Introduction/Summary

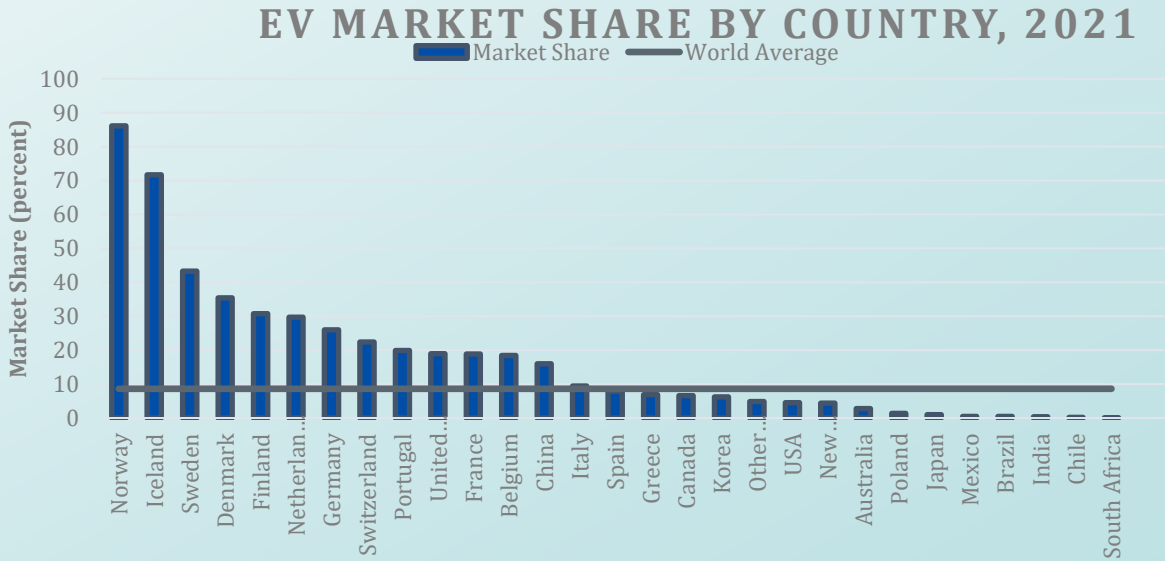
Global Auto Industry commits to contribute

- ➔ But no single government policy or single industry commitment will suffice
- ➔ Need to identify range of approaches necessary to cover ALL countries
- ➔ No approach of "one size fits all"

An Electrified Future

- Auto industry $ 515 billion investment by 2030 for EV (BEV-Battery Electric Vehicles, Plug-In Hybrid, Fuel Cell)
- 6.6 million EV sales in 2021
- 16.5 million EVs on the road in 2021





➔ But large differences between ≠ countries!

➔ Compare with 1.4 billion vehicles already on the road!

Maximise EV acceptance

A variety of factors:

➔Charging/Refuelling infrastructure

➔Affordability/Consumer acceptance

➔Mineral Resources/End of Life policies

➔Decarbonisation of electric grid

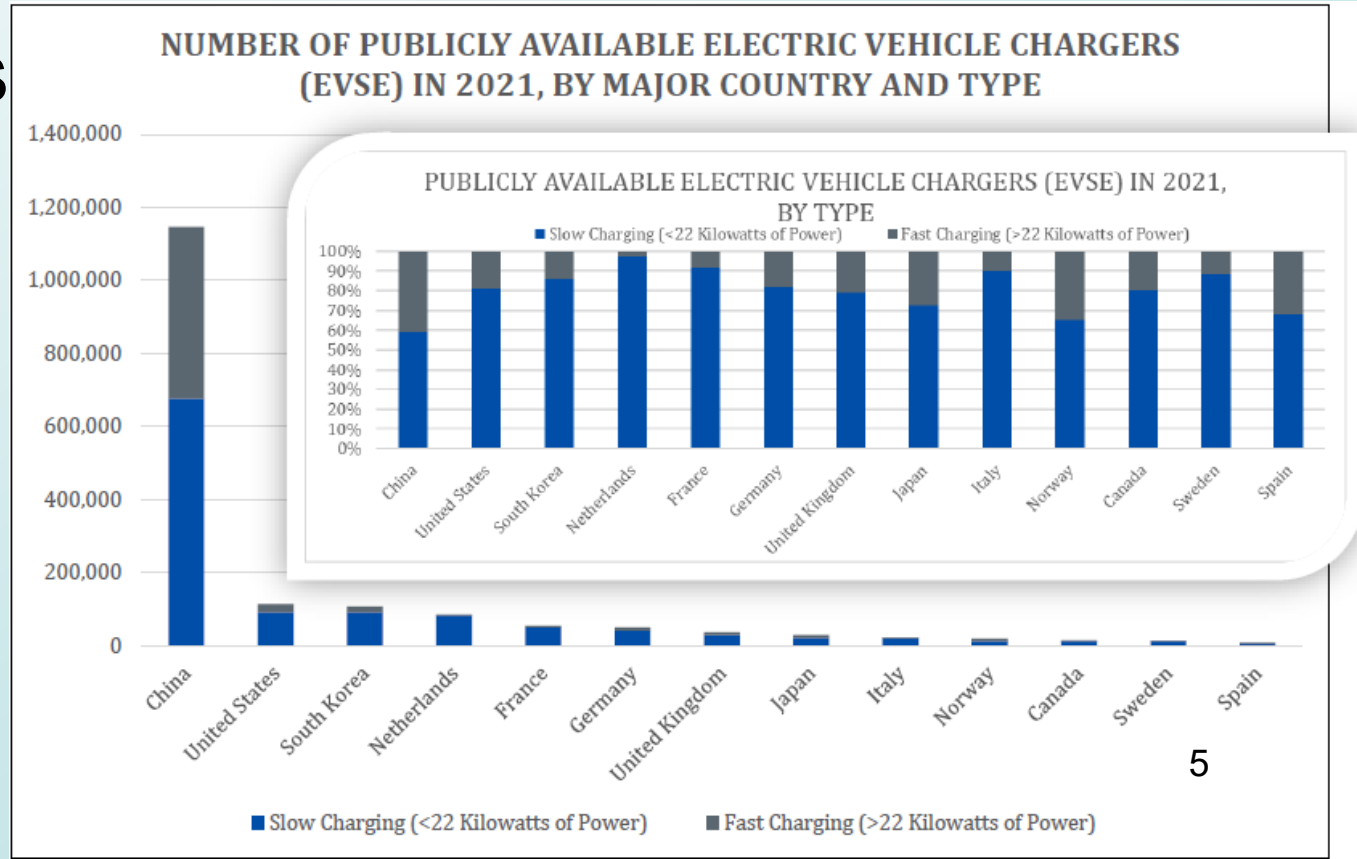
➔Supply chains

➔Etc

Charging/Refuelling Infrastructure

- $ 300 billion investment needed by 2030
- Charging needs differ among markets
  - ➔ Geographics/Distances
  - ➔ Demographics
  - ➔ Etc


Frederic J. Brown / AFP - Getty Images



Affordability/Consumer Acceptance

- Additional cost EV ←→fleet renewal
- R&D needed for Parity of Cost/Utility/Convenience:
  - → Cost of EV compared to equivalent ICE
  - → Additional cost for EV utility/convenience (larger batteries for equivalent range, charging speed, ...)
- Need to provide EV owners similar cost/benefit
- Need to secure supply chains
- Need to provide similar answers for hydrogen (affordability, availability, ...)

Mineral Resources/End of Life

- Mineral resources demand ↗
- Lithium as example:

  Production 2020: 82,000 tons

  Demand 2030: 3 million tons
- 300 new mines for graphite, lithium, nickel and cobalt needed
- Surging prices (x7 in May 2022 for lithium compared to 2021)

https://miningdigital.com/top10/5-largest-lithium-mining-companies-world

Decarbonization of Electric Grid

Electric grid / power to

- ➔ Charge electric vehicles
- ➔ Produce hydrogen

should be

- ➔ Clean
- ➔ Reliable
- ➔ Resilient
- ➔ Affordable
- ➔ Compatible with various charging needs.

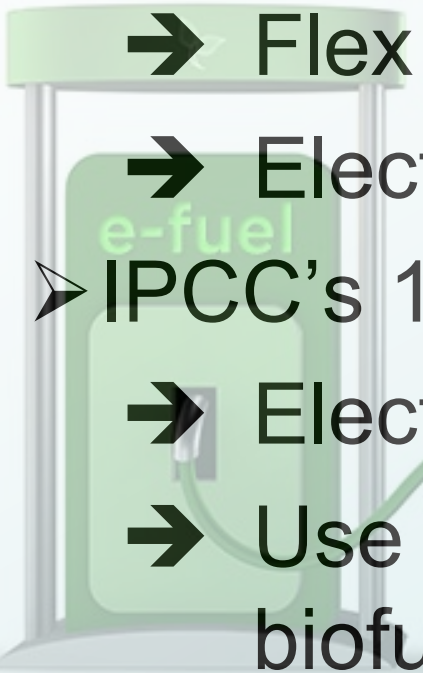
One size fits all?

All the above factors are important!

➔ Is full-scale electrification the most realistic or practical solution for all nations around the world ?

Complementary alternatives

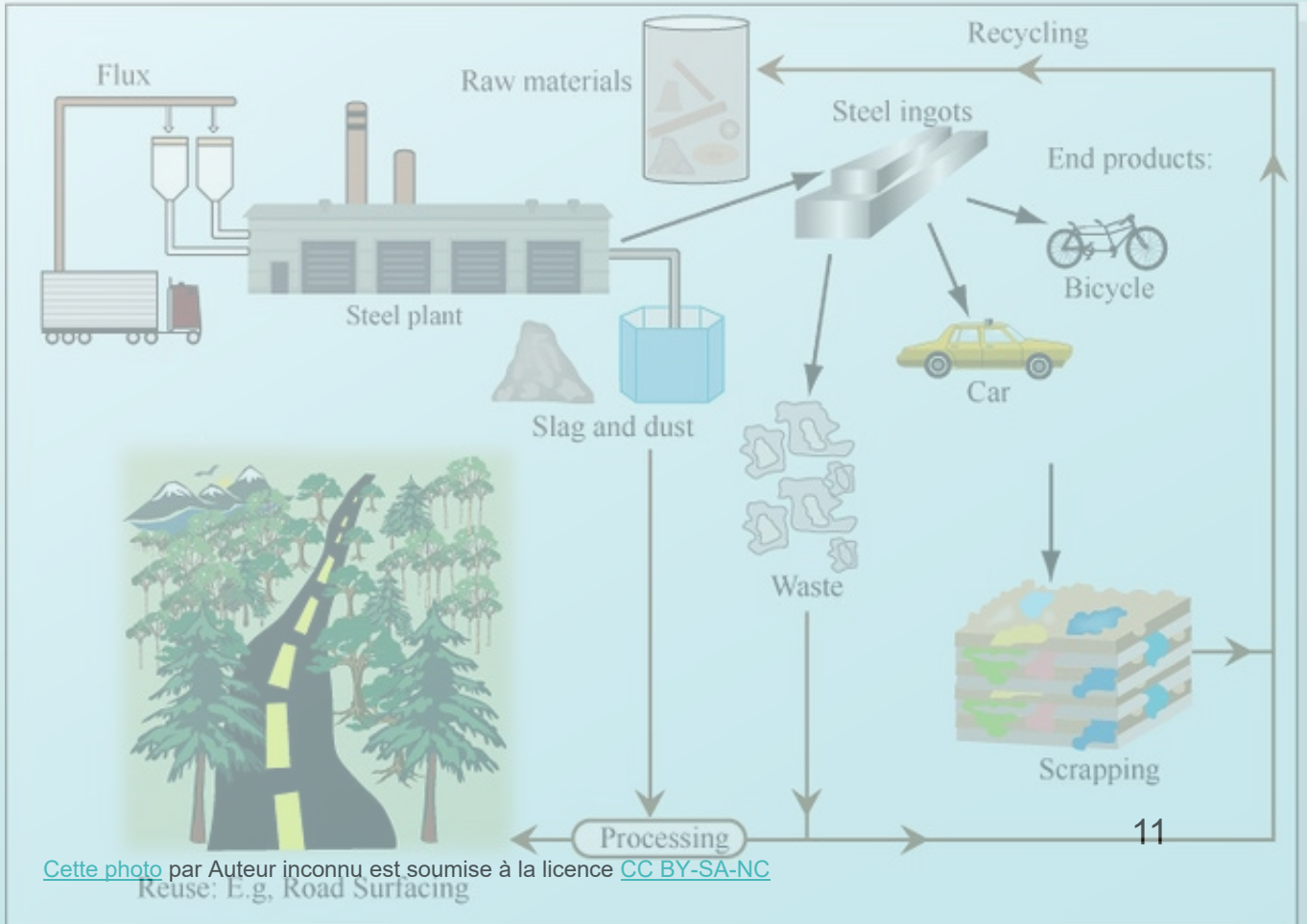
- Brazil example:
  - ➔ Lower greenhouse gases with Biofuels
  - ➔ Flex Fuel Engines: 84% in 2021
  - ➔ Electrification not fully suitable for Brazilian situation
- IPCC's 1.5° C scenarios possible with combination of:
  - ➔ Electrification of powertrains
  - ➔ Use of carbon-neutral auto fuels (synthetic and biofuels) at 30% of 2020 consumption
- Hydrogen in ICE



Life Cycle Analysis

Need to address complete energy chain:

- Well to Wheel
- Cradle to Grave



Conclusion

- Collaboration to identify the most suitable approach(es) for all individual nations, considering:
  - ➔ Economic realities
  - ➔ Geographic realities
  - ➔ Cultural realities

- Electrification will play a leading role in this transition; but it is probably not the most appropriate **single** technology for **all** nations.

Conclusion (Cont'd)

- Technology neutral approach to enable all nations to implement practical, sustainable, alternative or complementary measures
- Competitiveness of the automobile industry
- Decarbonize electric grids
- Ensure reliable infrastructure

Thank you for your attention