China Clean Transport Strategy

Energy Foundation China

This strategy was presented to EF China board in Dec 2020, and subjects to regular updates.

Outline

1. Strategy development process
2. Context
3. Key policymakers
4. Theory of change
5. Challenges, barriers and drivers
6. Initiatives
7. Internal and external collaboration

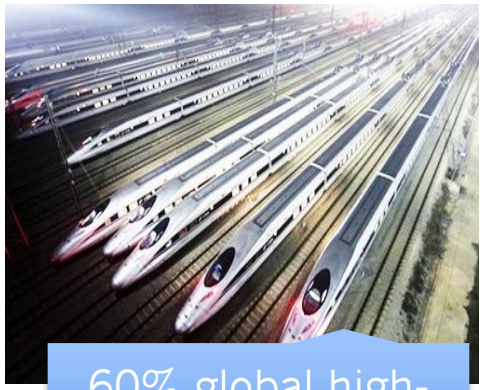
Process: more than 20 meetings internally and externally with more than 20 organizations

Context: China has the world biggest pollution problems but also the cleanest solutions in the transport sector

150,000 km highway

7 of global top 10 container ports

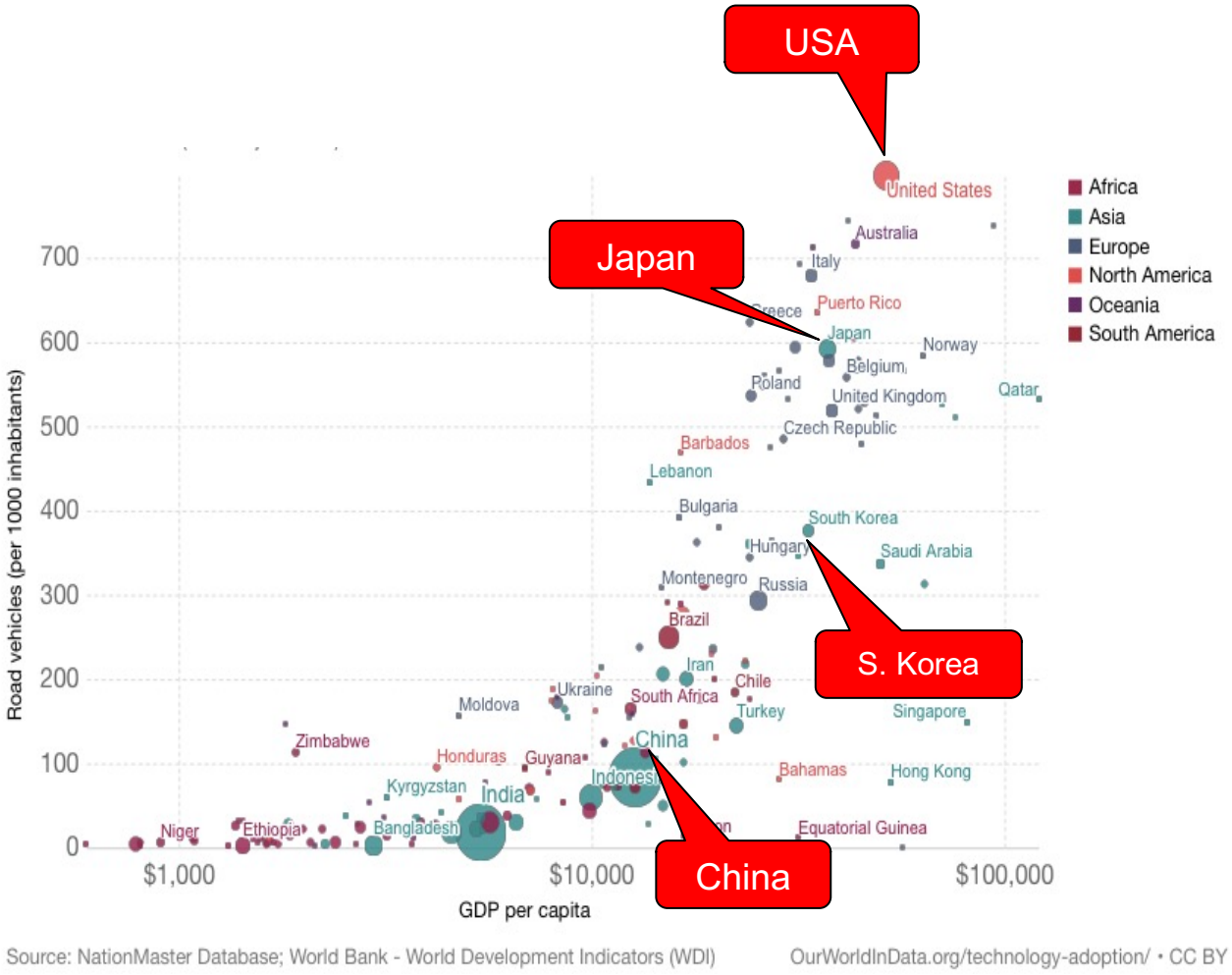
the world's largest vehicle market



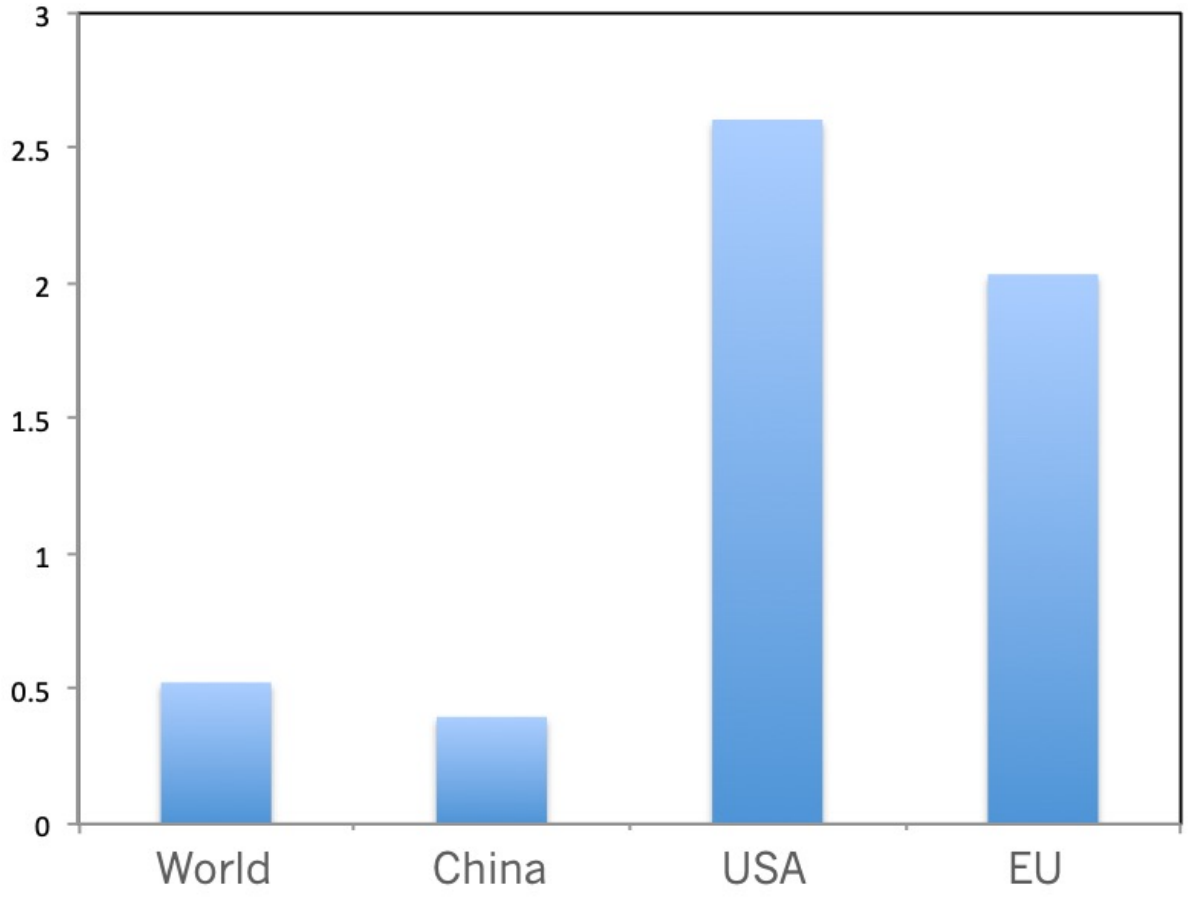
60% global high-speed rail miles

50% of global EV market

Context: the number of vehicles on the road will double or even quadruple in the future without control



Vehicle ownership by countries



Flights per capita by regions

Context: road transport accounted for more than 85% of transport CO_2 emissions and more than half of mobile source CAPs emissions

Focus of this strategy

Transport CO_2 emissions

Road Transport




Non-Road Transport

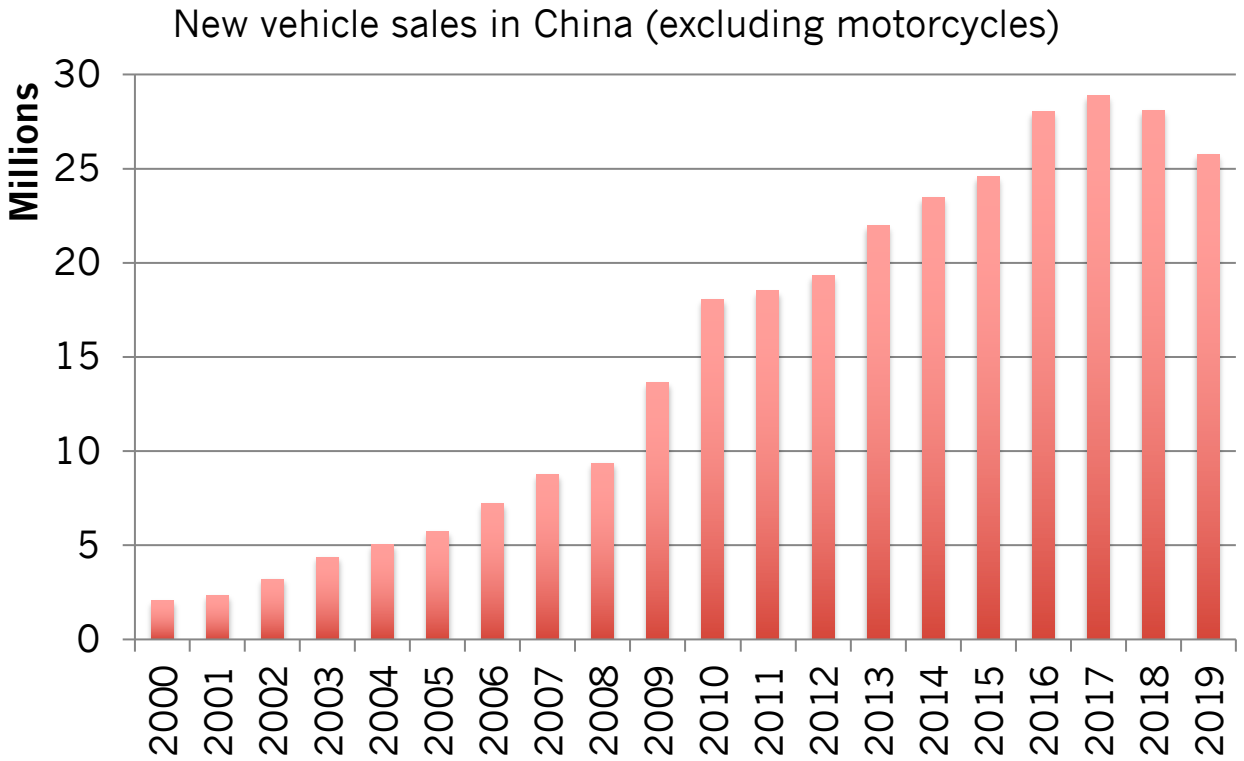


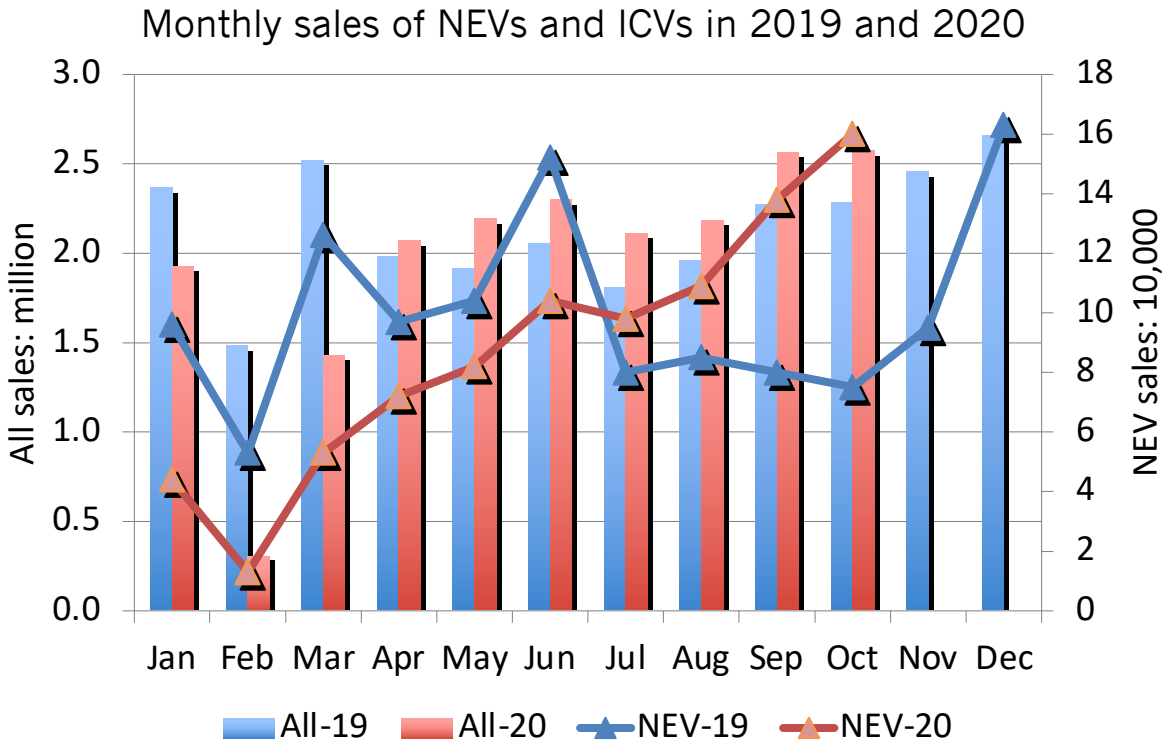
Non-Road Machineries



Mobile source criteria air pollutants (CAPs) emissions

Context: weakened economy and Covid-19 slowed down the Chinese auto market, but it is recovering



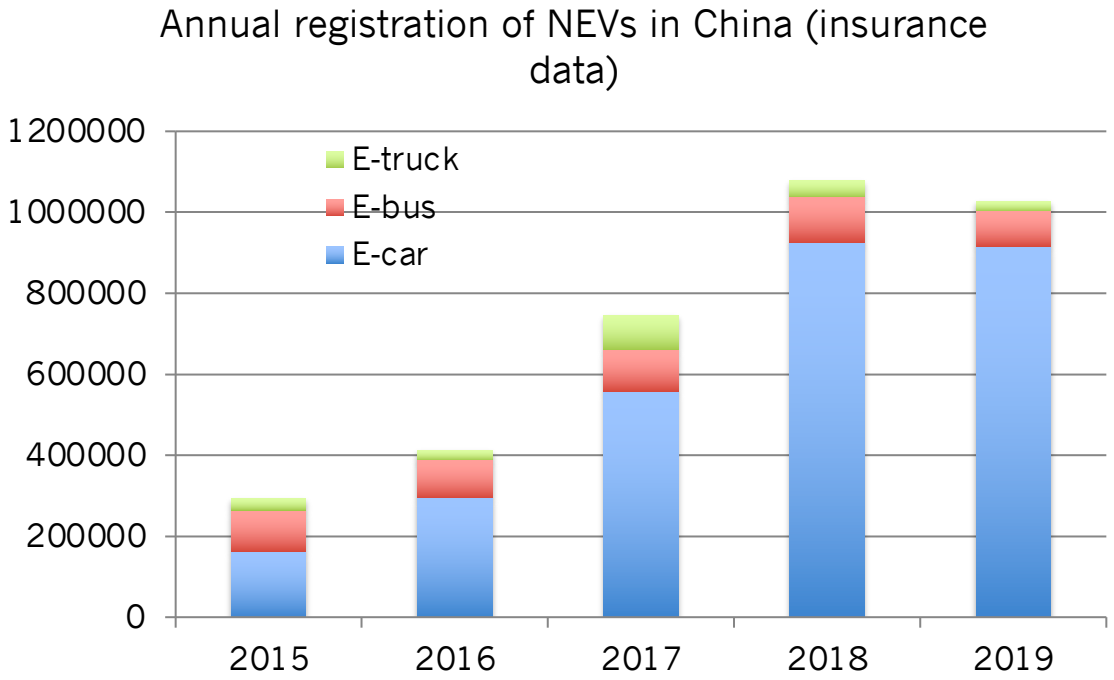


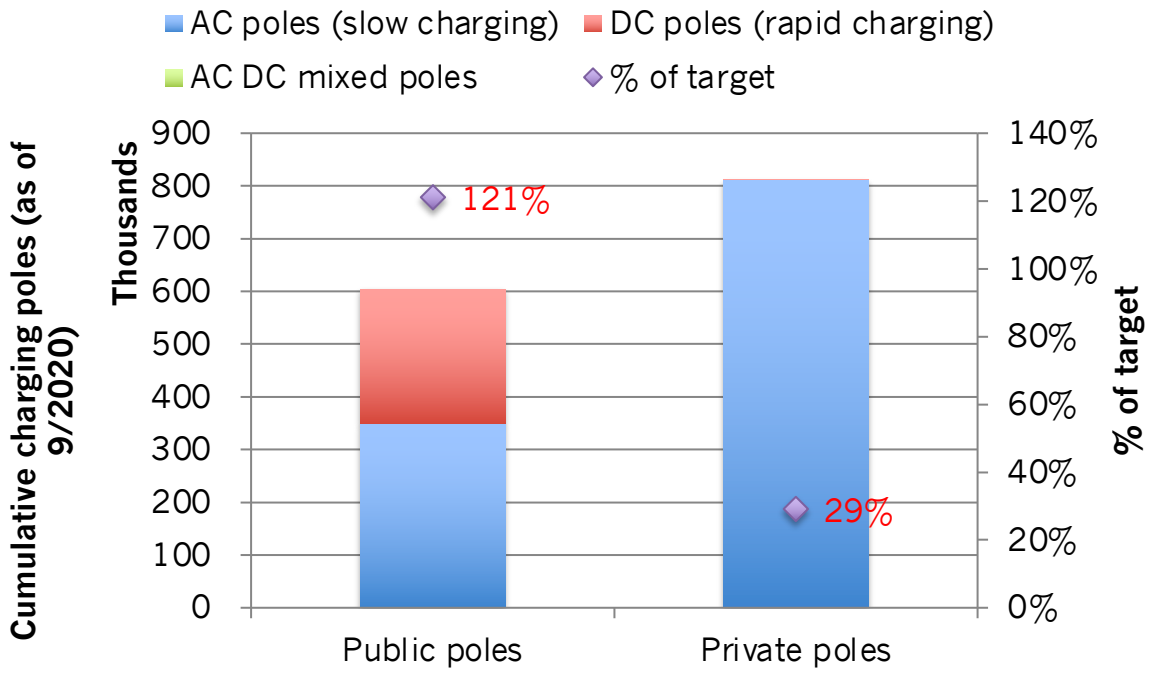
NEV sales in September and October reached historic highs in 2020

Impacts on transport of China's responses to Covid-19:

- New investment plan for next-generation infrastructure
- Local cities raised license plate limits and provided vehicle purchase subsidies
- Fiscal incentive policies, including subsidies and purchase tax exemption, extended for another two years till 2022
- Growing people realize the importance of private mobility

Context: 2020 NEV goals might be partially missed, but ambition continues to be high





Progress compared to 2020 targets (by September 2020):

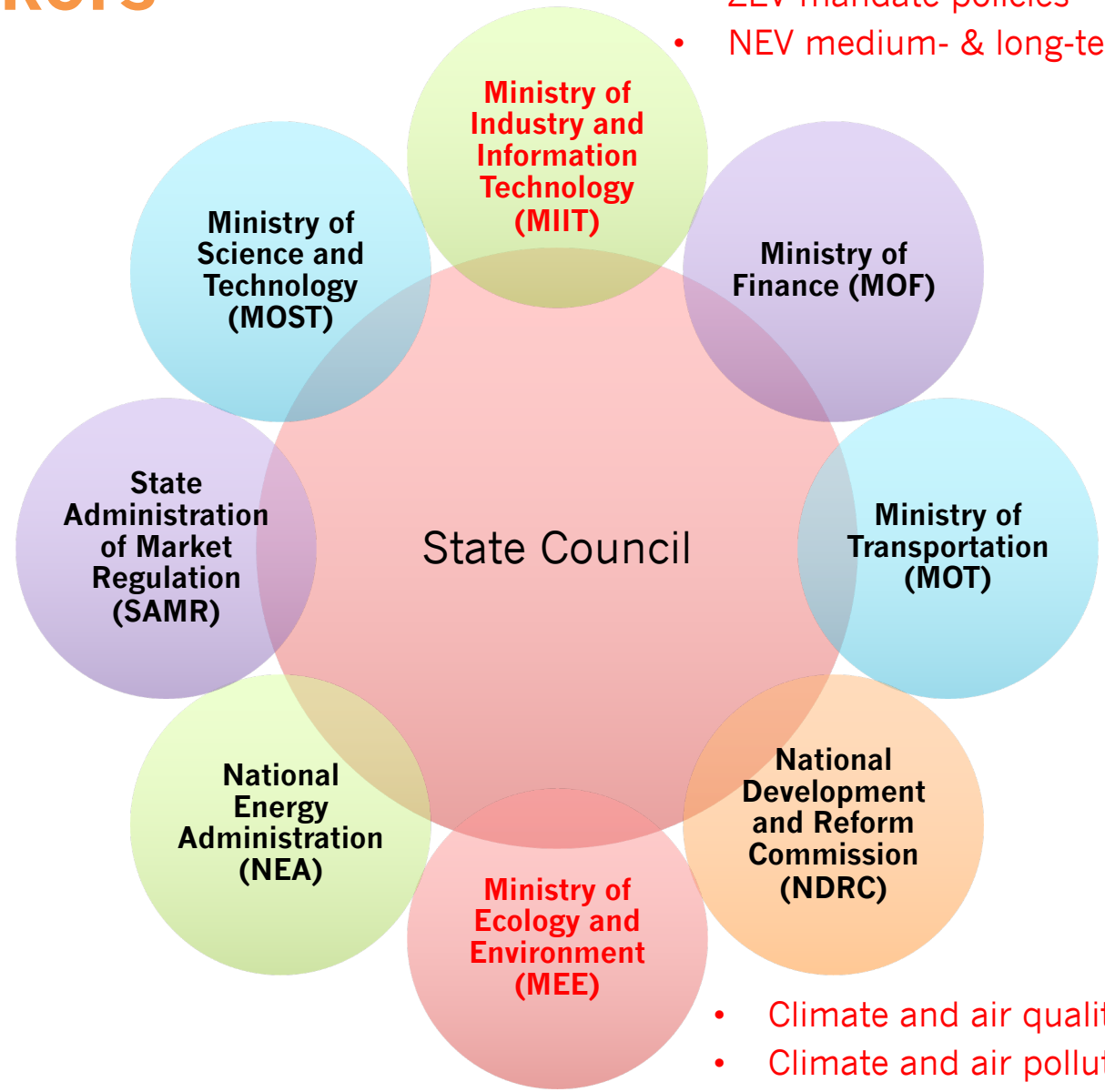
- 734,000 NEV sales vs. 2m goal;
- 4.8m cumulative sales vs. 5m goal;
- 812,000 private charging poles vs. 2.8m goal;
- 605,000 pubic charging poles vs. 500,000 goal

2035 NEV Plan:

- more than 80% of new sales of buses, taxis, and logistics trucks in "eco-civilization" pilot and air pollution control areas must be electric since 2021
- about 20% of new sales of all vehicles need to be electric by 2025
- all public service vehicles nationwide must be electric by 2035
- BEVs become mainstream products by 2035

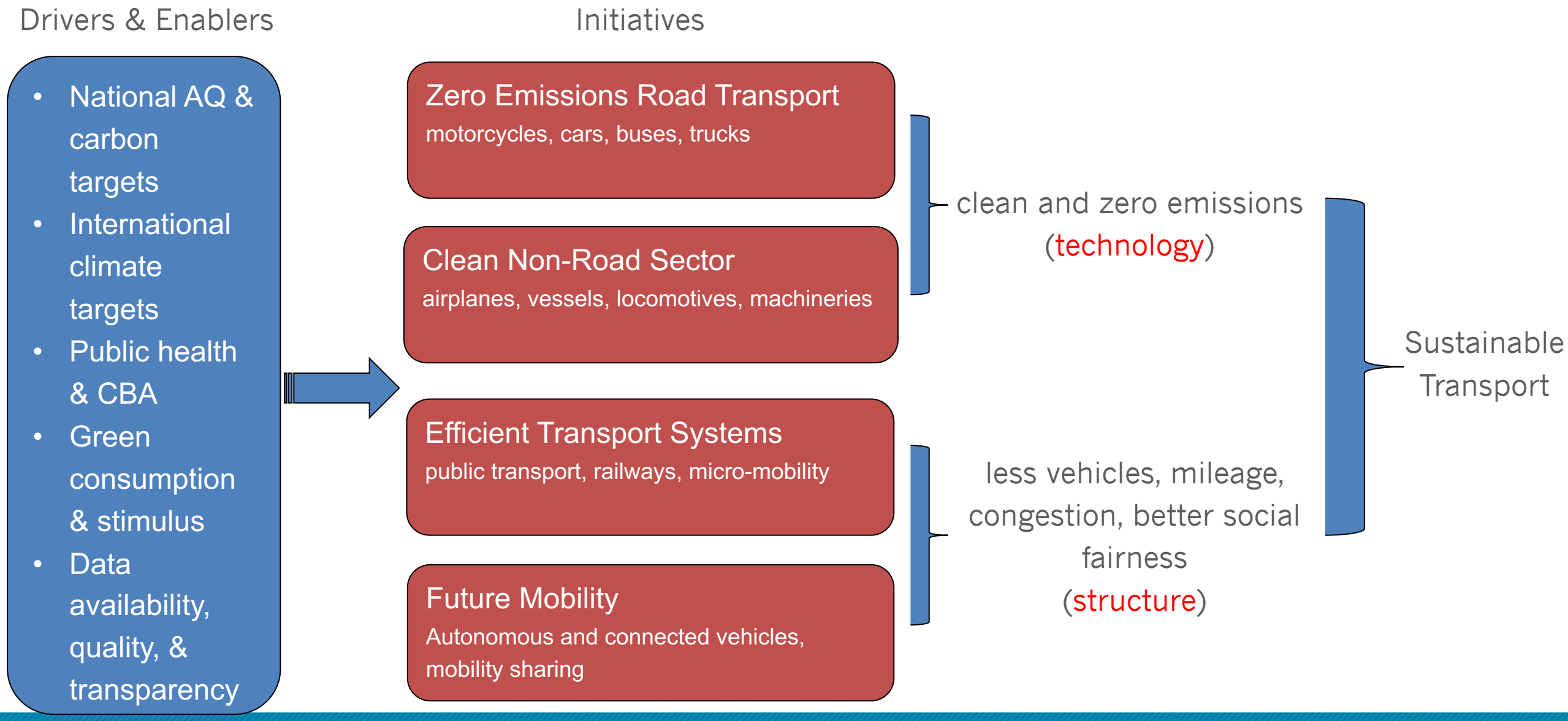
Key policymakers

- Fuel economy standards
- ZEV mandate policies
- NEV medium- & long-term development plan



- Climate and air quality targets
- Climate and air pollution control action plan
- Tailpipe emissions standards

Theory of Change



Challenges and barriers for zero emissions vehicles

1. Supply chain readiness: mineral exploitation and production capacity, production capacities for raw chemical materials, battery and electric, EVs etc.
2. Supply chain reliability and national security: production and international trade on nickel, lithium, and cobalt; diversified energy vs electricity only
3. Oil and ICV companies transition: social cost, resistance for change
4. Talent capacity and social fairness: human resources needs and job losers
5. Safety concerns: growing fire accidents
6. Public acceptance and alignment
7. Impacts from decentralized truck manufacturing industry and operators, cheap dirty trucks for carrying coal, steel, cement etc.
8. Charging infrastructure: land use and supply, urban planning, parking, building codes
9. Grid readiness: capacity, smart, clean
10. Technology choice: fuel cell vs battery electric

Drivers

Public health protection

Climate change mitigation obligations

Increase auto industry global competitiveness

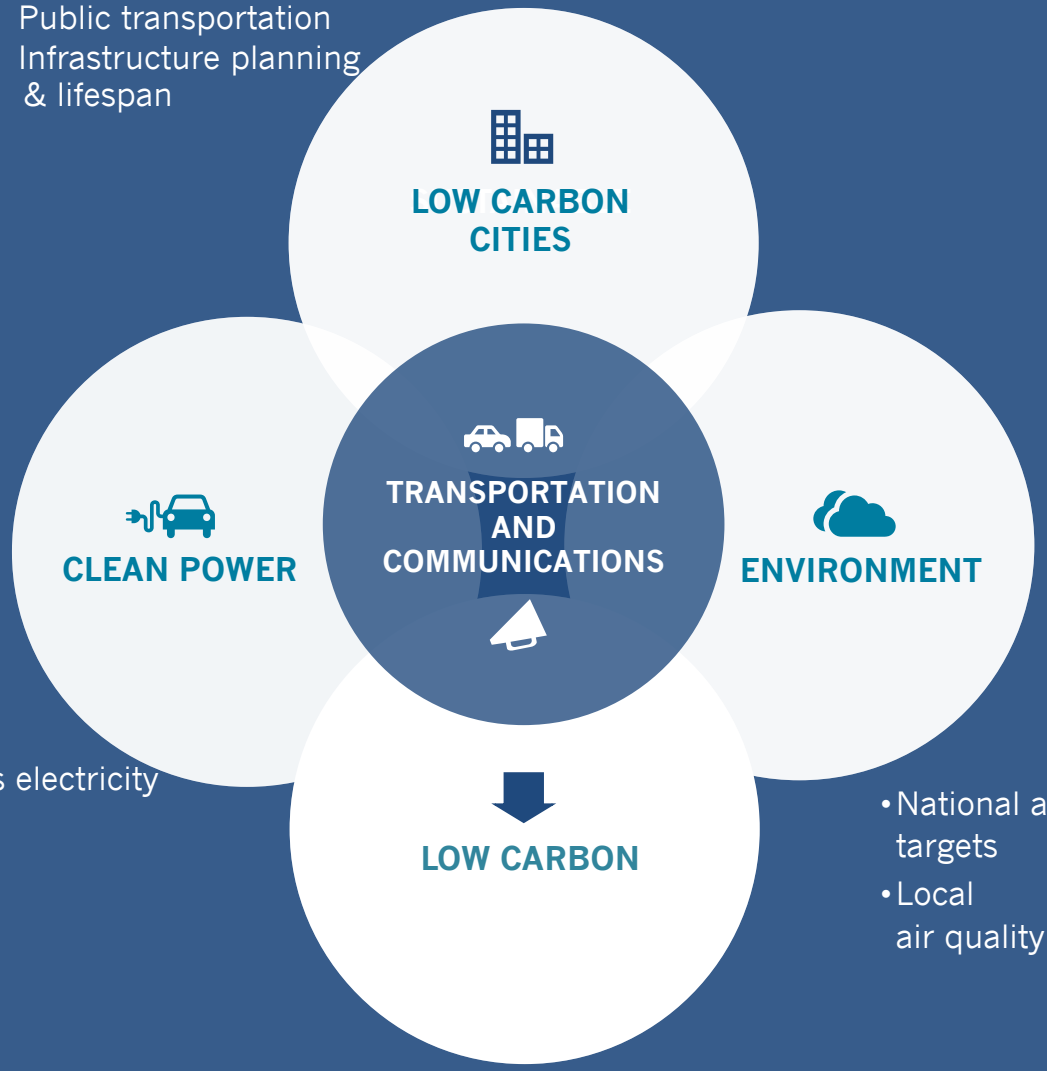
Energy security

Green consumption and stimulus plan

Multiple approaches with synergies are necessary

Internal Cross-Program Coordination & Collaboration

- Targets
- Roadmaps
- Policies



- Land use & urban planning
- Public transportation
- Infrastructure planning & lifespan

- Zero emissions electricity
- Grid capacity
- Smart grids

- National air quality targets
- Local air quality targets

- International & national carbon targets
- Carbon targets for transportation

INDUSTRY & COAL: Less demand for transportation

Field collaboration and synergies: CCTP

- **NGOs**
  - ICCT, iCET, NRDC, WRI, RMI, ITDP, SFC
- **Independent think tanks / Universities**
  - China EV100, SAE-China, Tsinghua, BIT, Tongji, PKU
- **Industrial think tanks**
  - CATARC, CAERI, CAAM, ACEA, JAMA, EVCIPA
- **Government-affiliated think tanks**
  - VECC, EIDC, NCSC, CAEP, ERI, CATS, TPRI, CAE, CAS

中国清洁交通伙伴关系
CHINA CLEAN TRANSPORTATION PARTNERSHIP

Transforming transport in China has impacts beyond just China transport sector

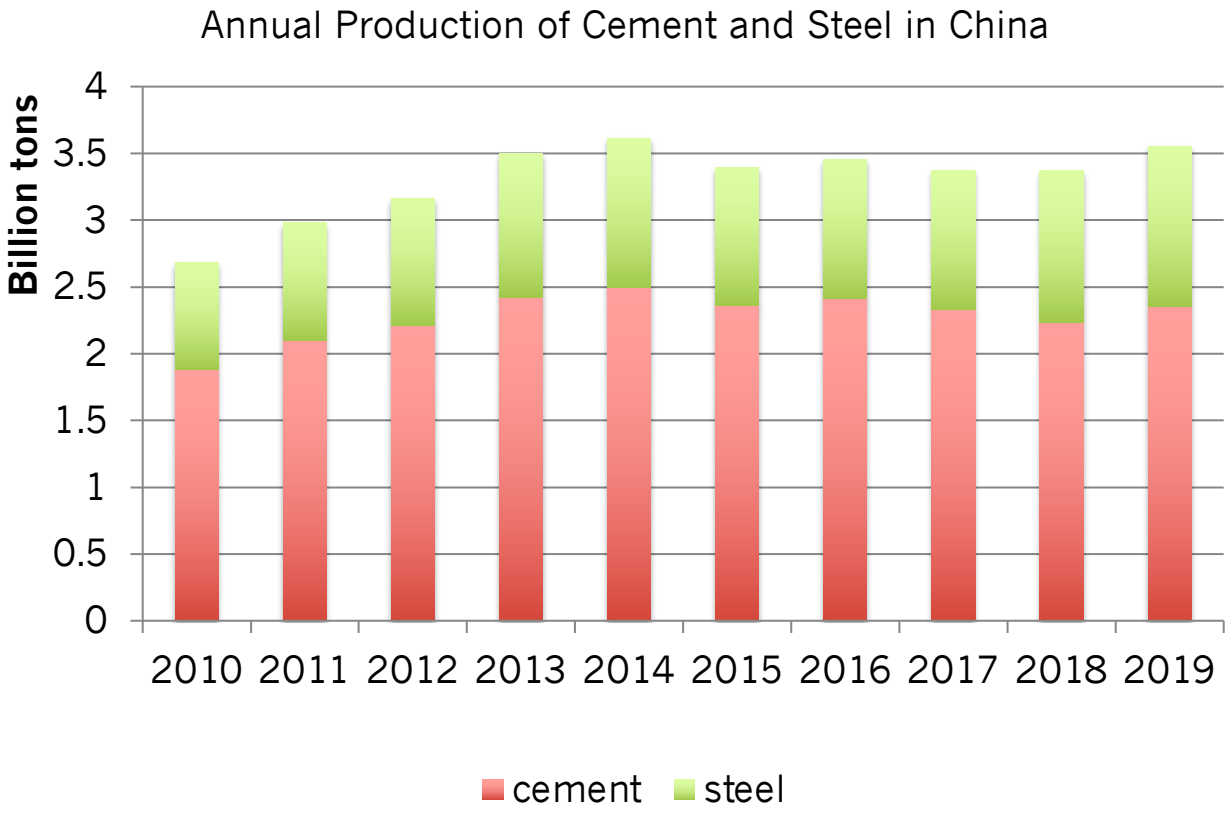
- Significantly decrease battery and EV costs globally
- Accelerate global transport zero emissions transformation, including BRI countries
- Reduce global oil exploitation and supply

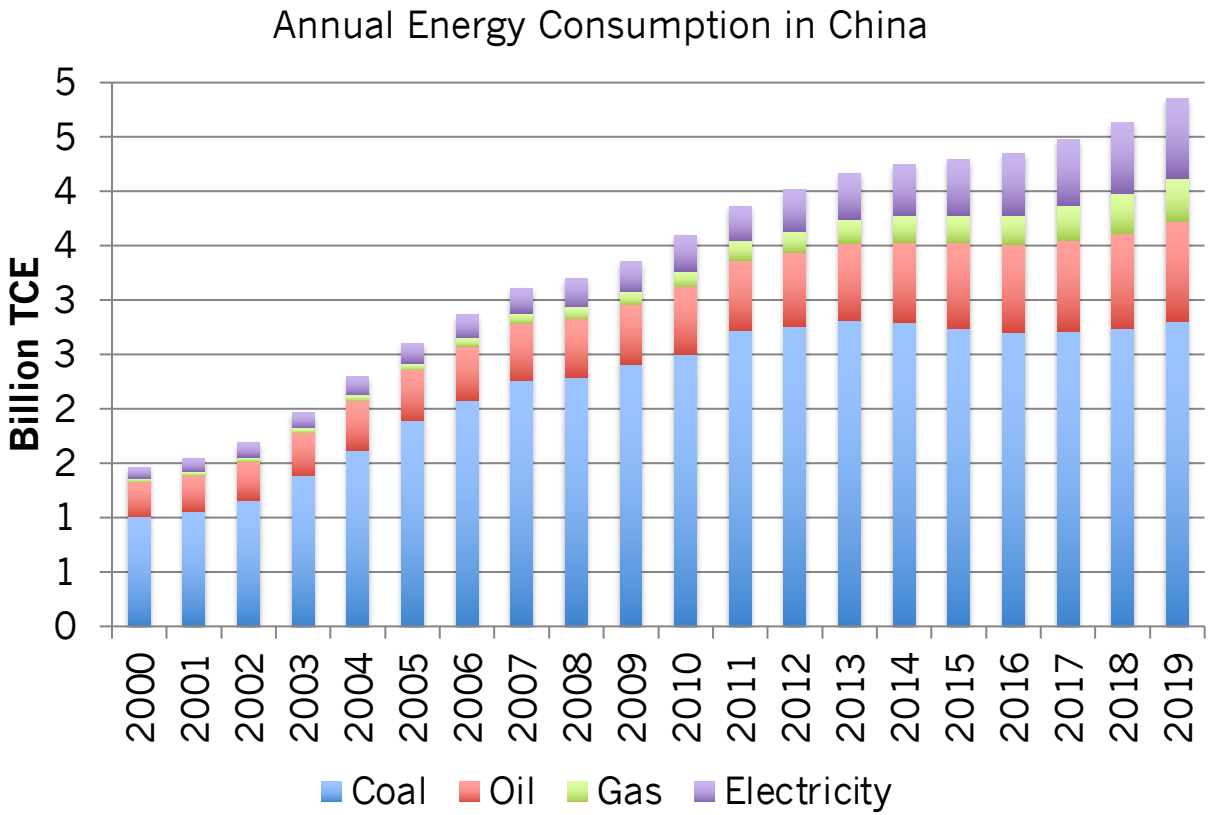
- Build a new growth story to support China's economic development
- Support accelerating clean energy transition in China
- Help avoid building more power plants through V2G and increasing energy storage

THANK YOU

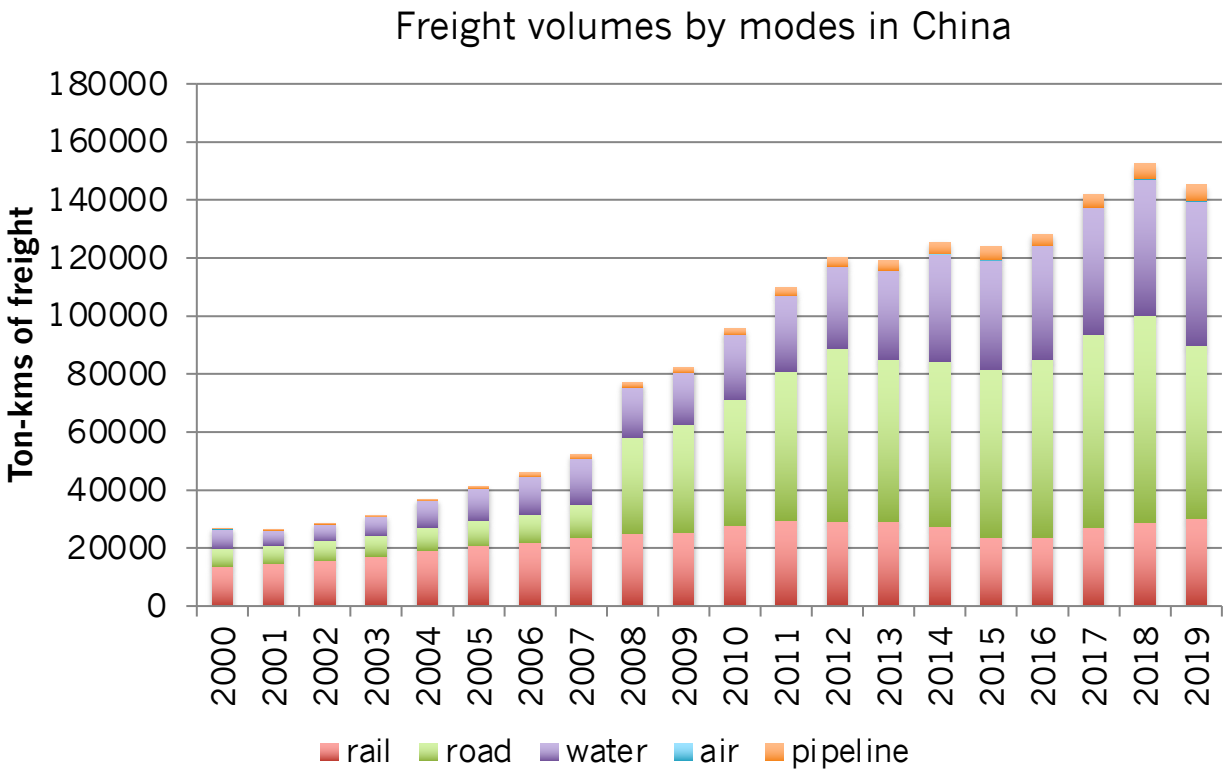
Annex

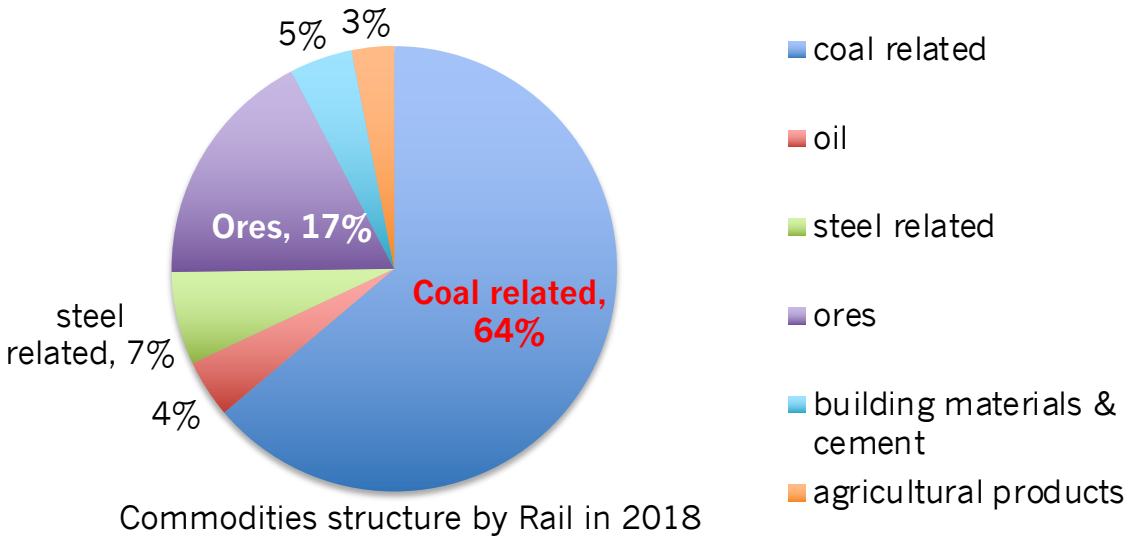
Economy and energy structure determine the freight transport demand in China



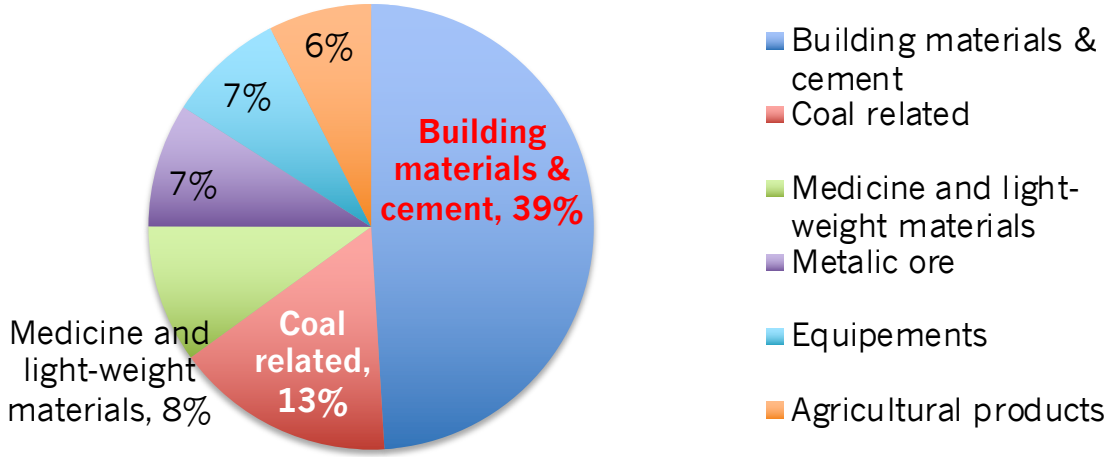


Freight volume continues to grow; coal and raw materials dominate transport demand in China



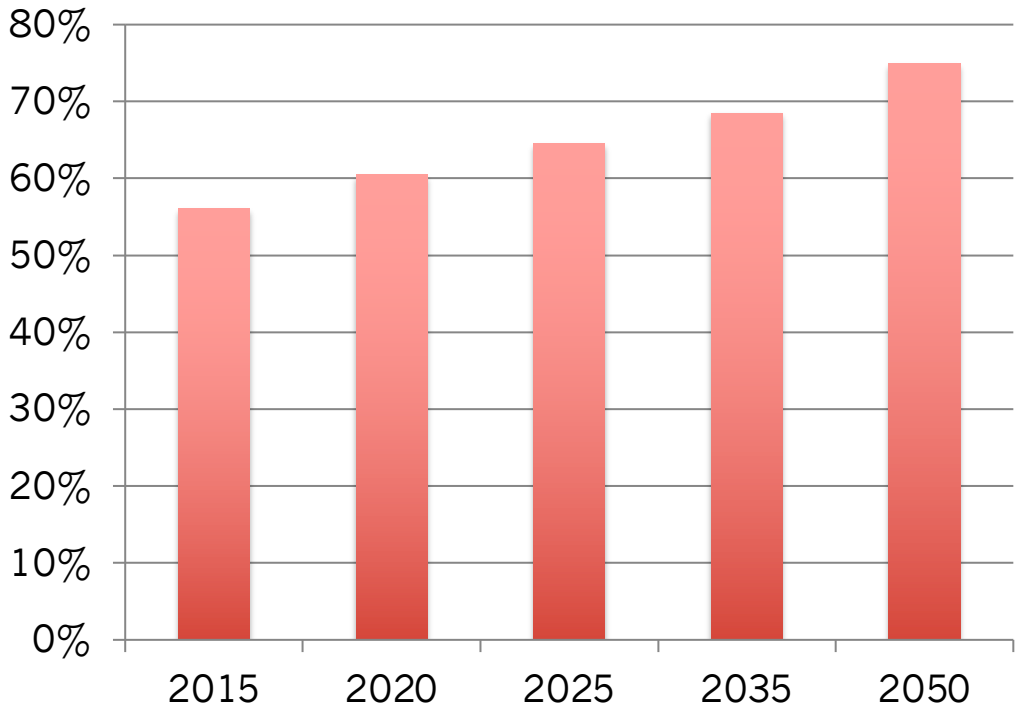


Commodities structure by Rail in 2018

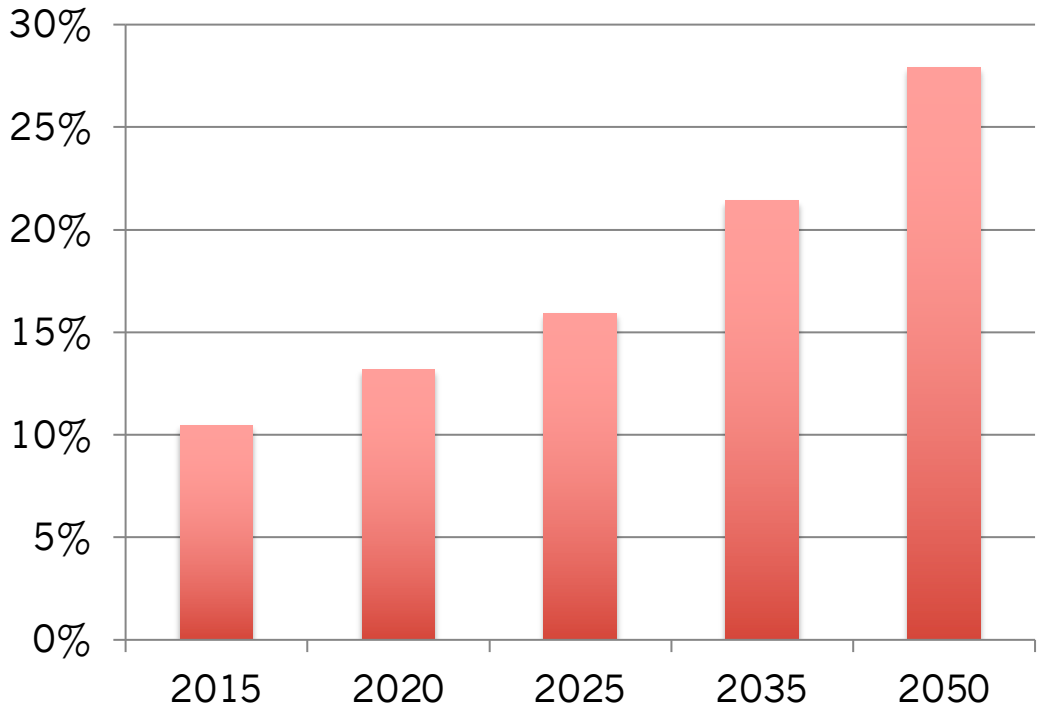


Commodities structure by Trucks in 2019

China's population is urbanizing and aging

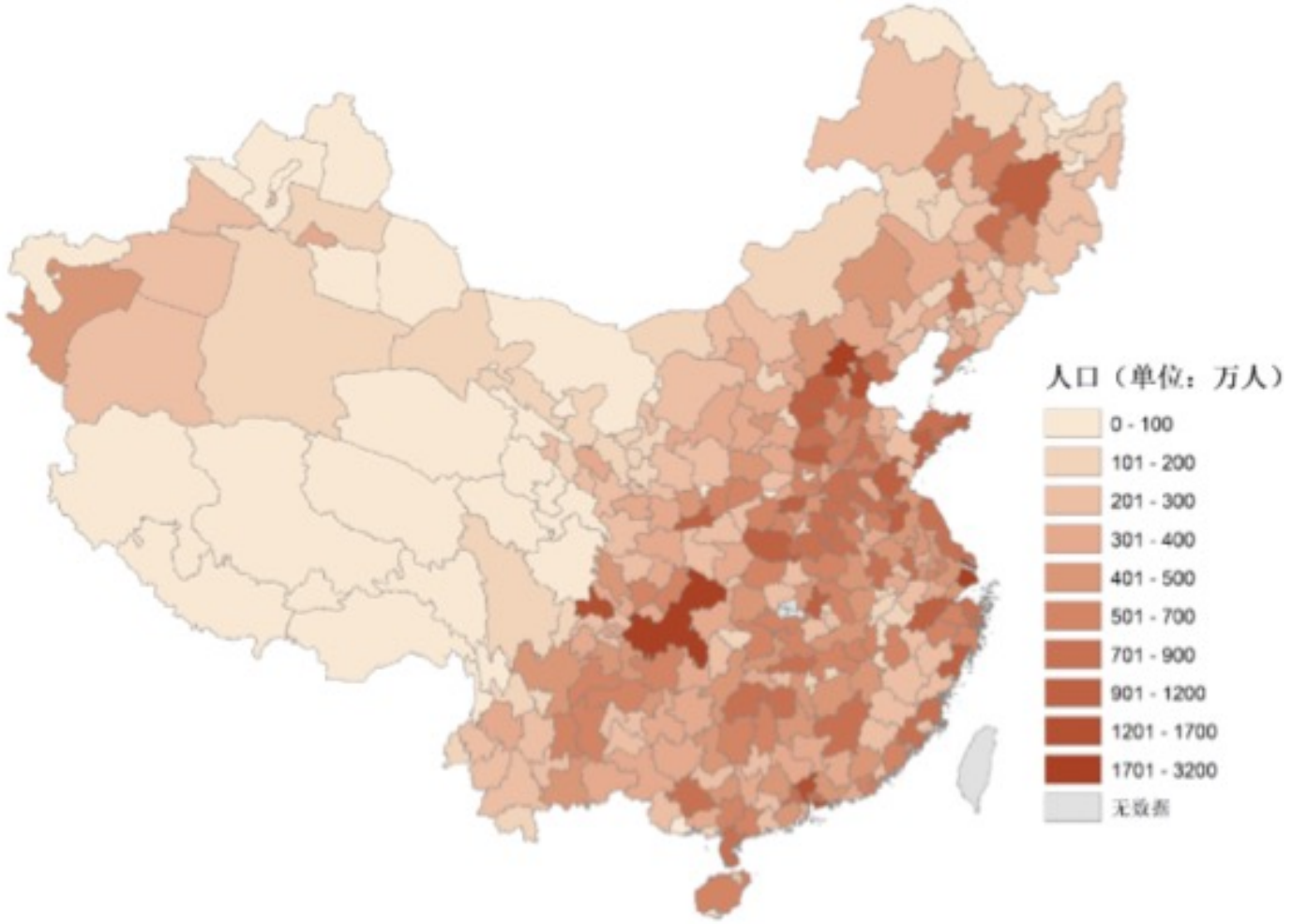


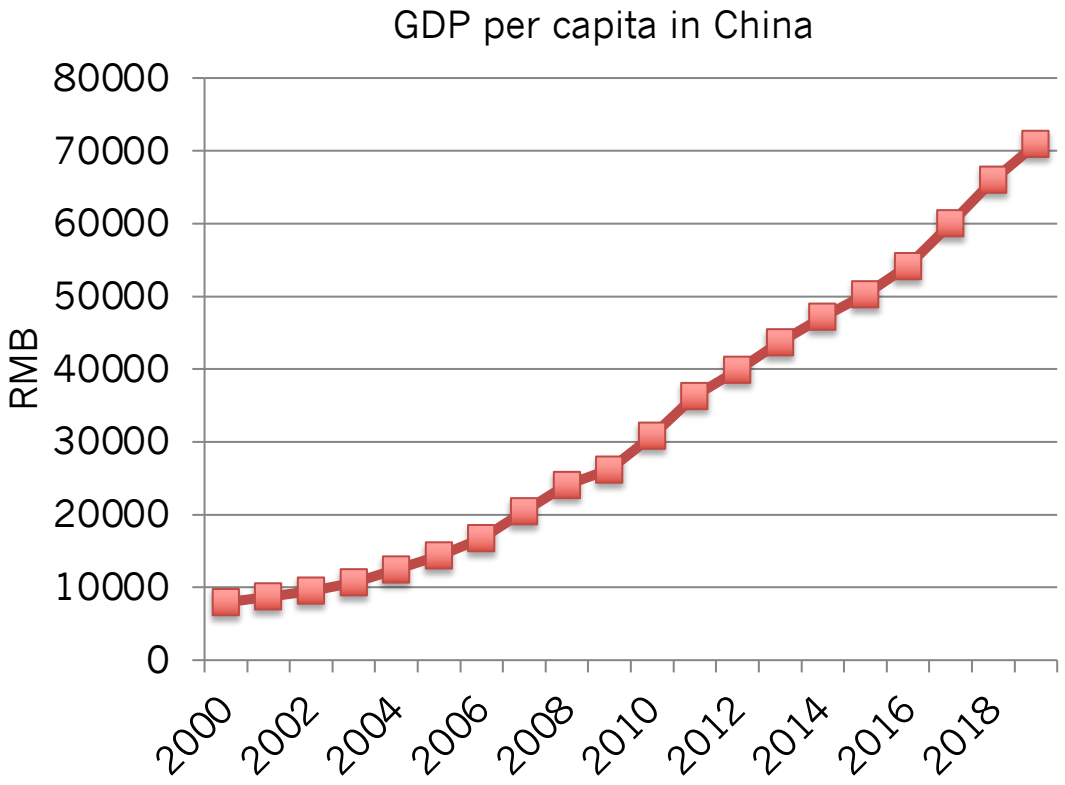
Urbanization rate



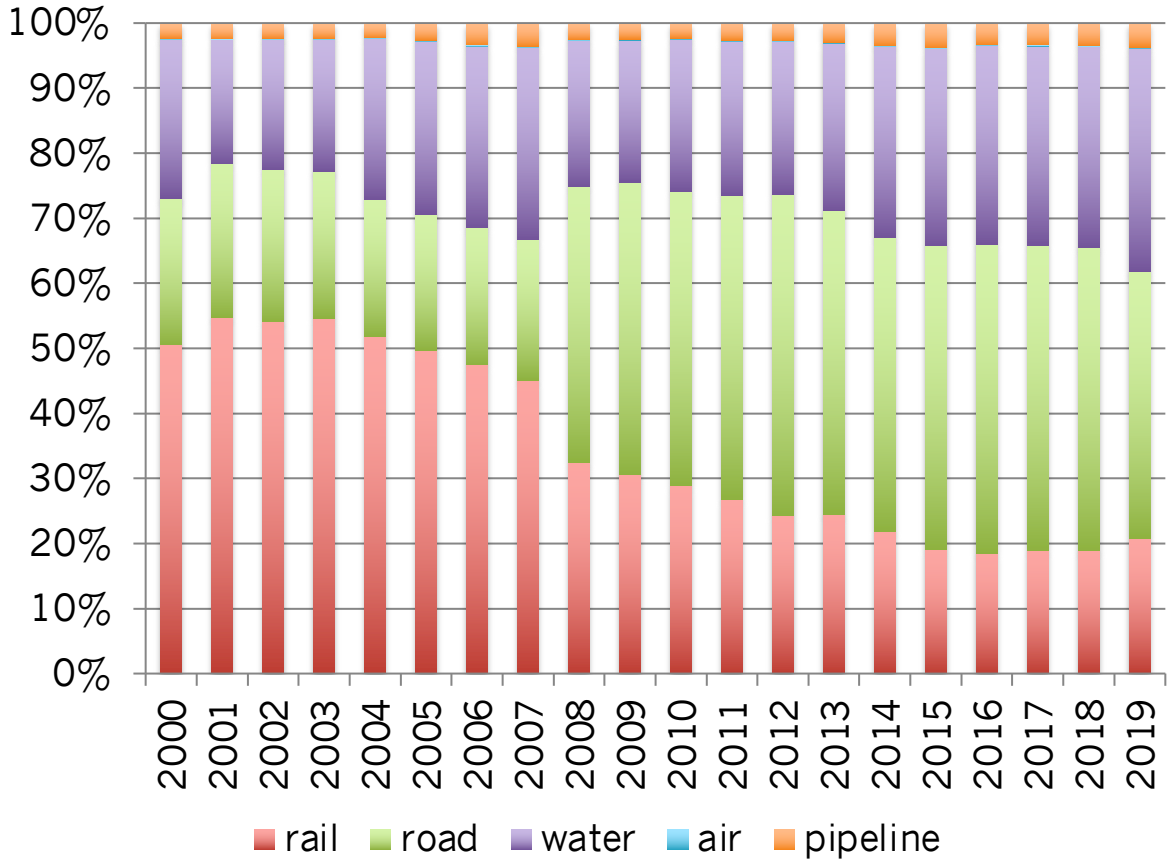
% of people above 65 years

Population location and GDP per capita affects passenger transport demand

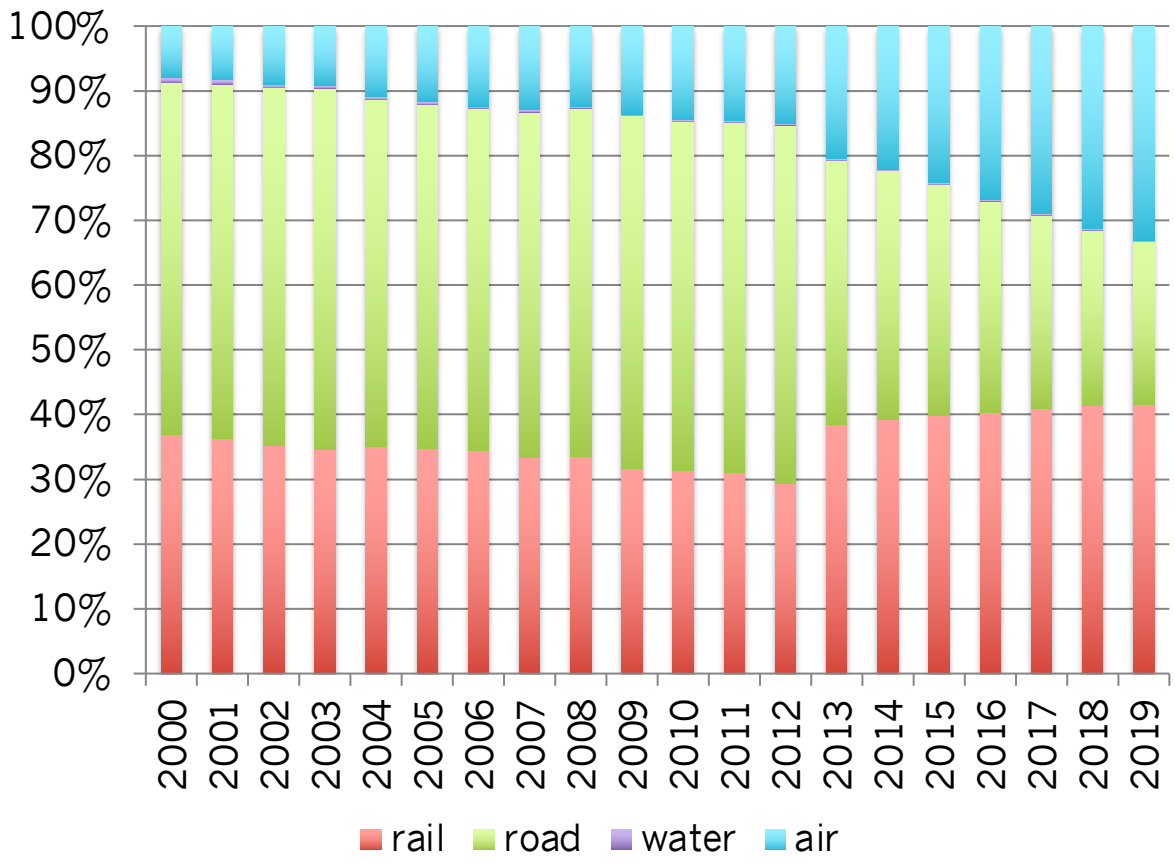




Railways are losing freight market while airways are increasing passenger market



Freight transport market by ton-km



Passenger transport market by person-km

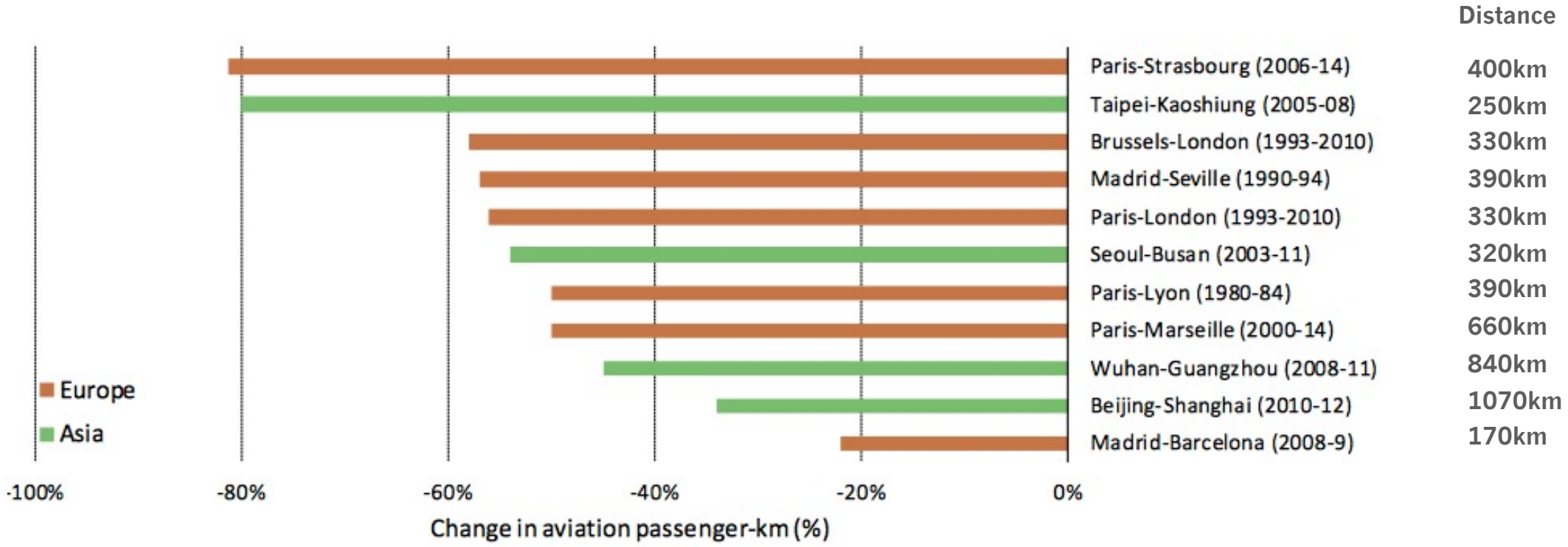
High-speed rail has strong competition capacity with private driving and aviation

Unit: %

Distance	Less than 100 km	Around 100-300 km	Around 300-500 km	Around 500-800 km	Around 800-1200 km	More than 1200 km
Driving	64	40	15	6	4	3
High-Speed Trains	17	43	68	73	57	42
Inner-City Buses	13	14	11	6	4	3
Taxies	6	2	1	1	1	1
Airplanes	-	1	4	15	34	51

HSR significantly reduces the demand for aviation

Average change in passenger activity on selected air routes after high-speed rail implementation

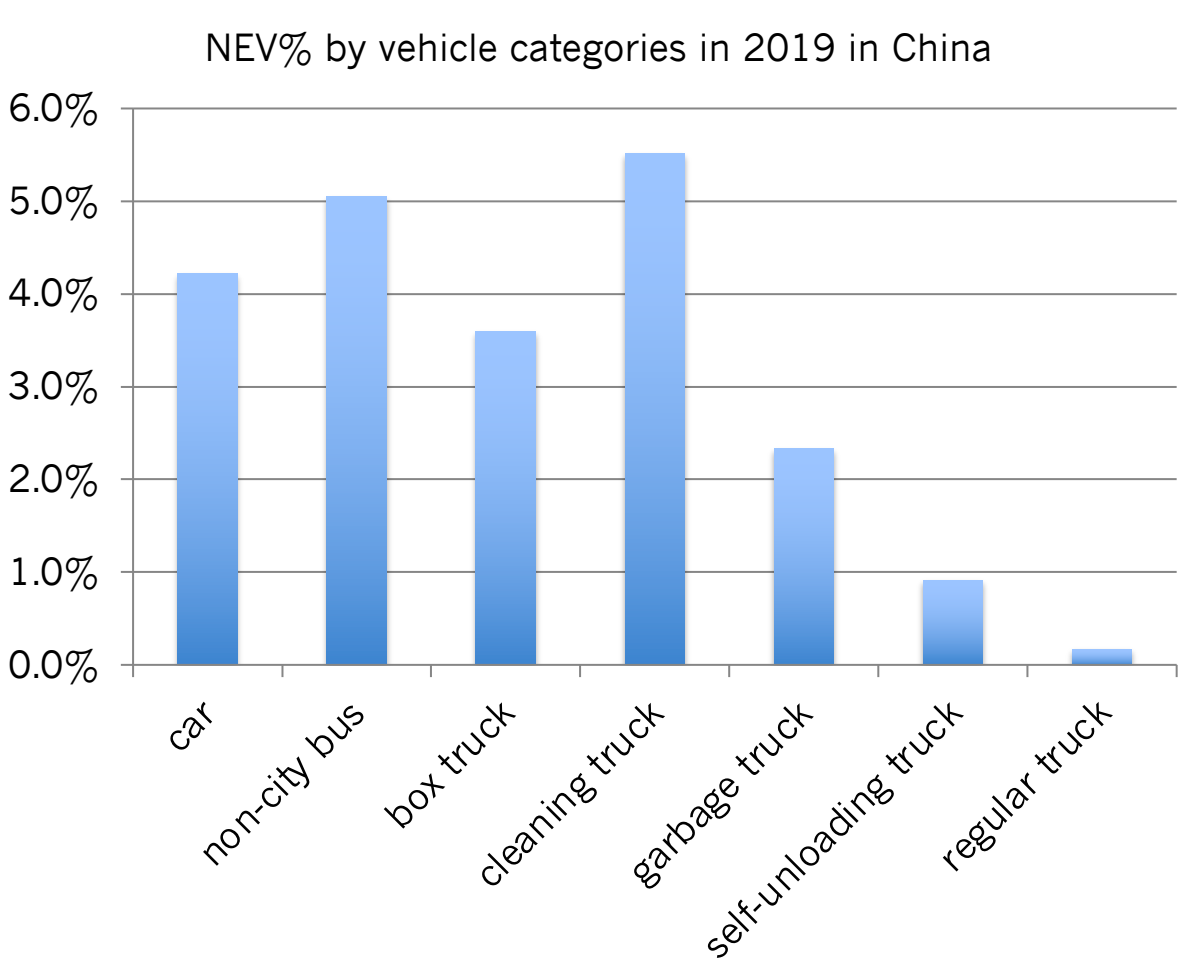


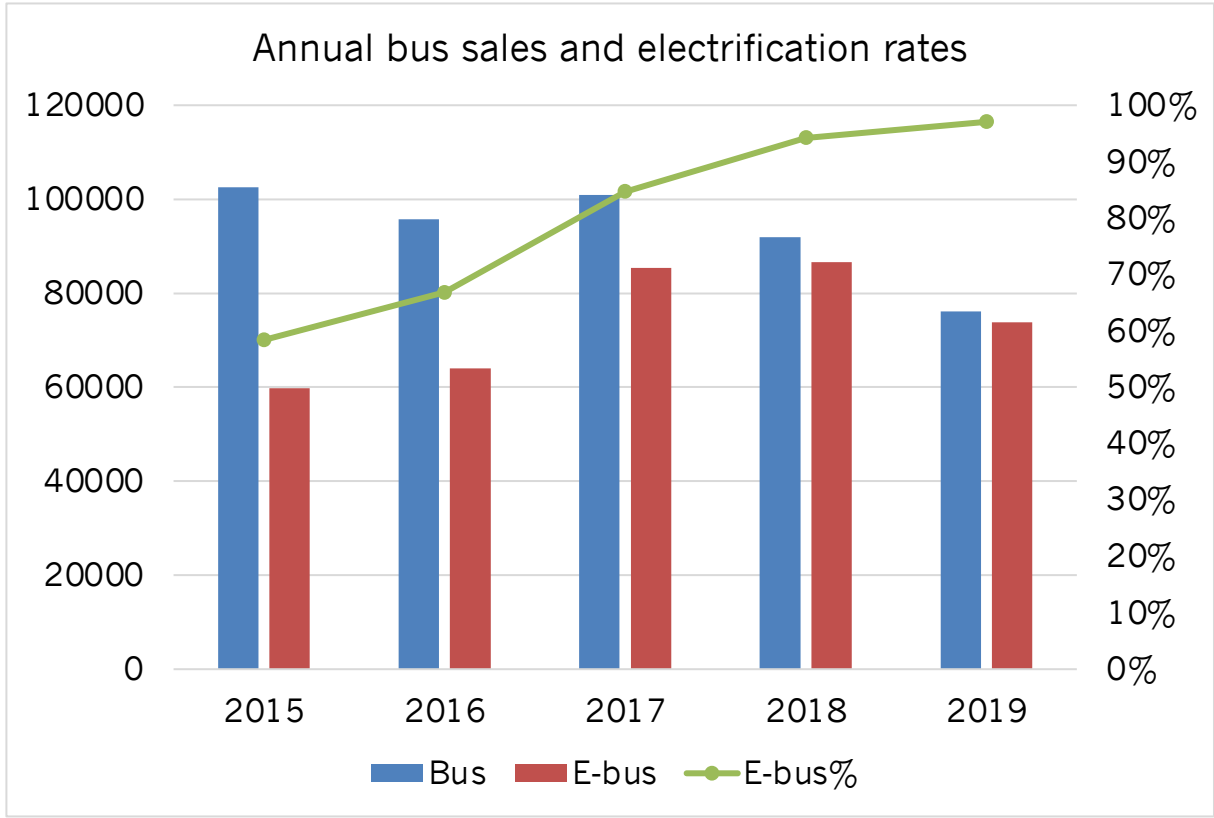
Sources: Xia (2016); Börjesson (2014); Givoni (2013); Chen (2017); Commissariat Général au Développement Durable (2016).

Note: The periods of time vary from line to line in this figure, which needs to be taken into account when comparing these elements.

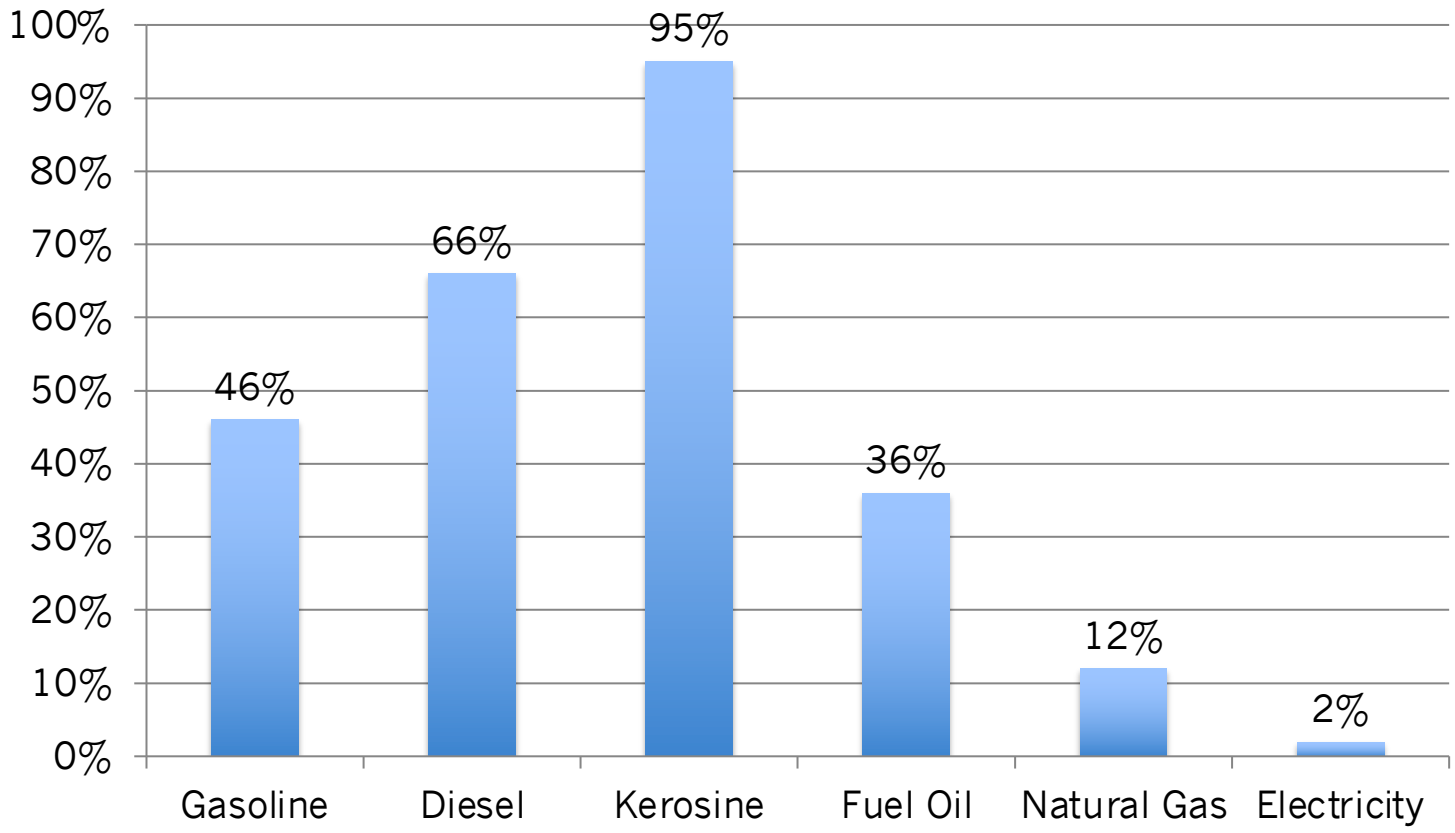
Source: IEA, The Future of Rail

Most vehicle categories have low electrification rates, but city buses have achieved almost full electrification



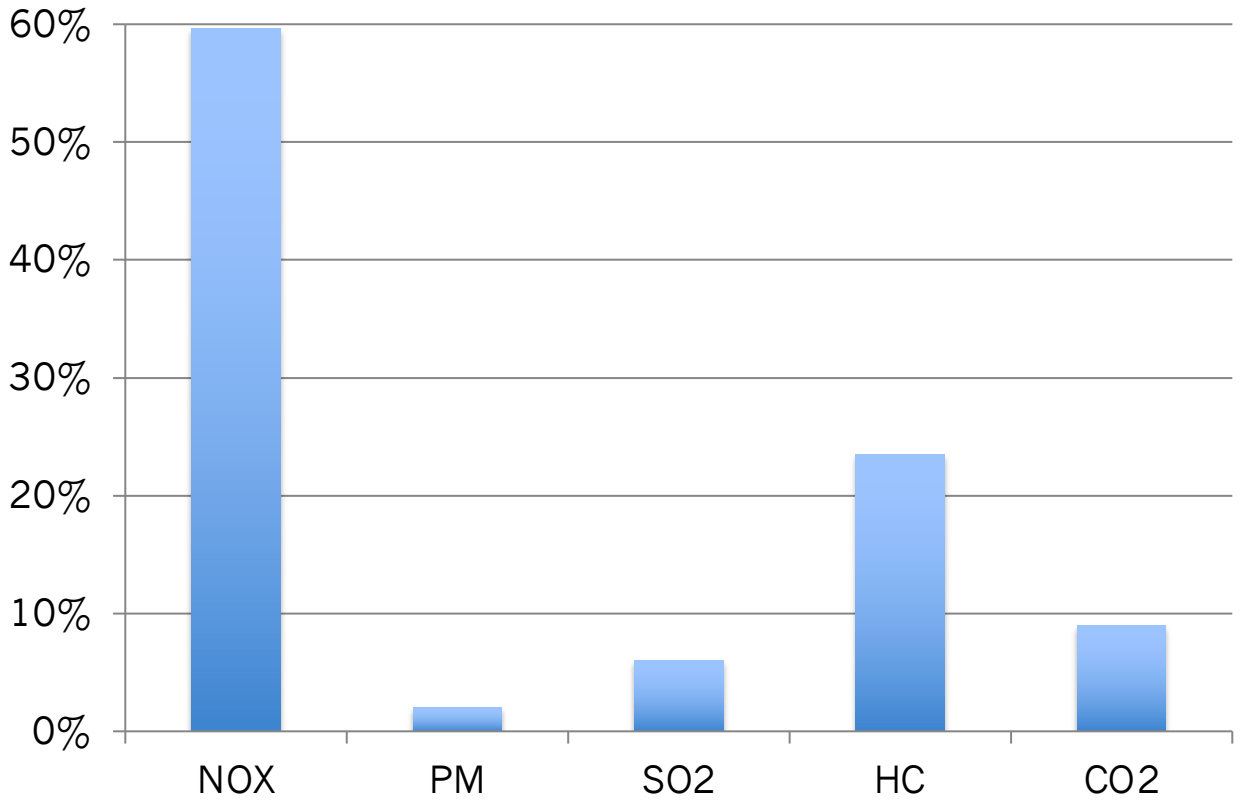


Transport energy consumption is underestimated, especially for gasoline



Transport consumption share of energy category in 2017

CAPs from transport account for higher percent of total emissions, while CO_2 is underestimated

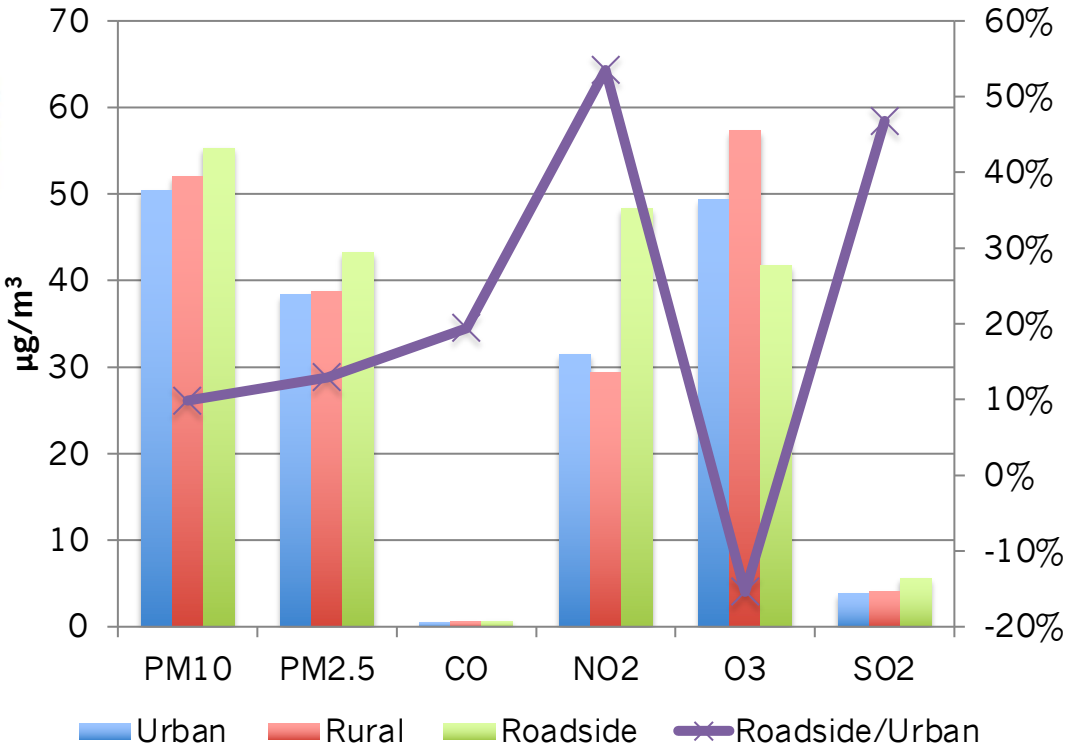


Transport emissions in 2017, as percentage of total national emissions from all sources

Mobile sources are increasingly creating significant health impacts

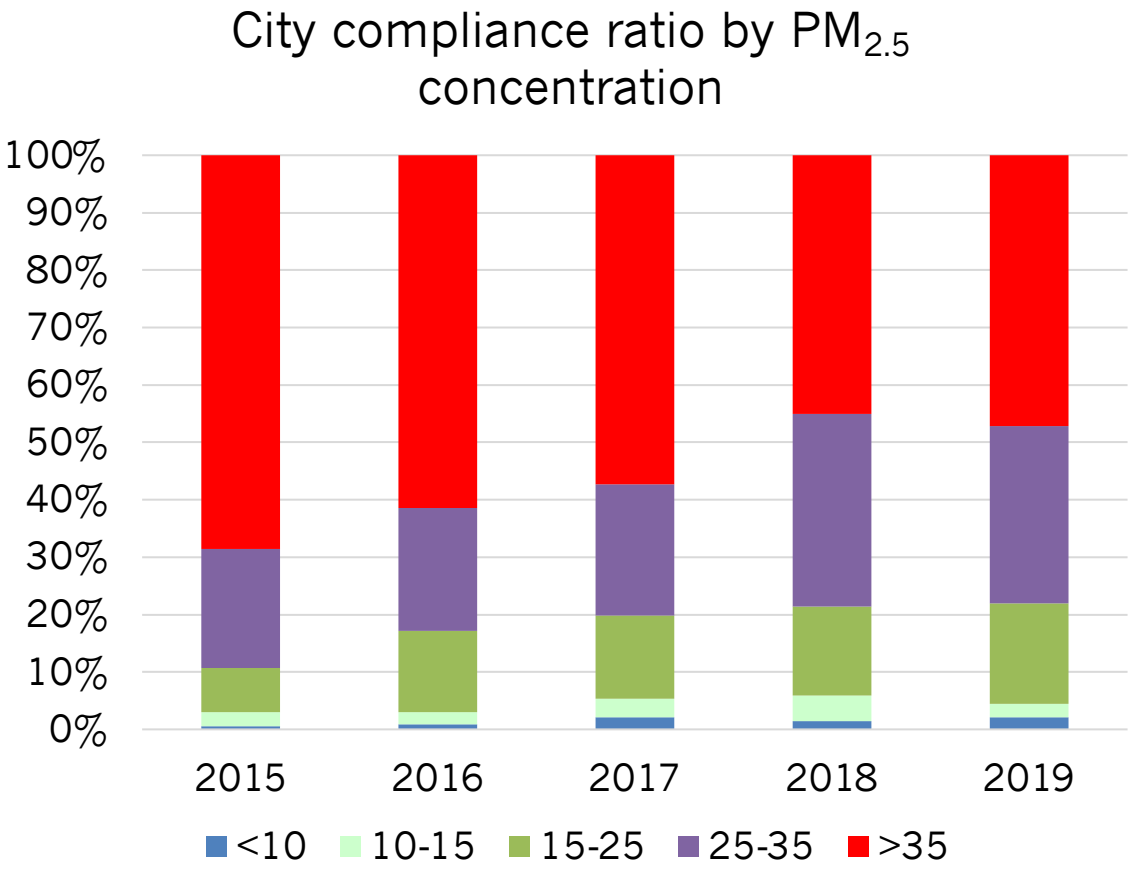
$PM_{2.5}$ contribution from mobile sources in Chinese cities

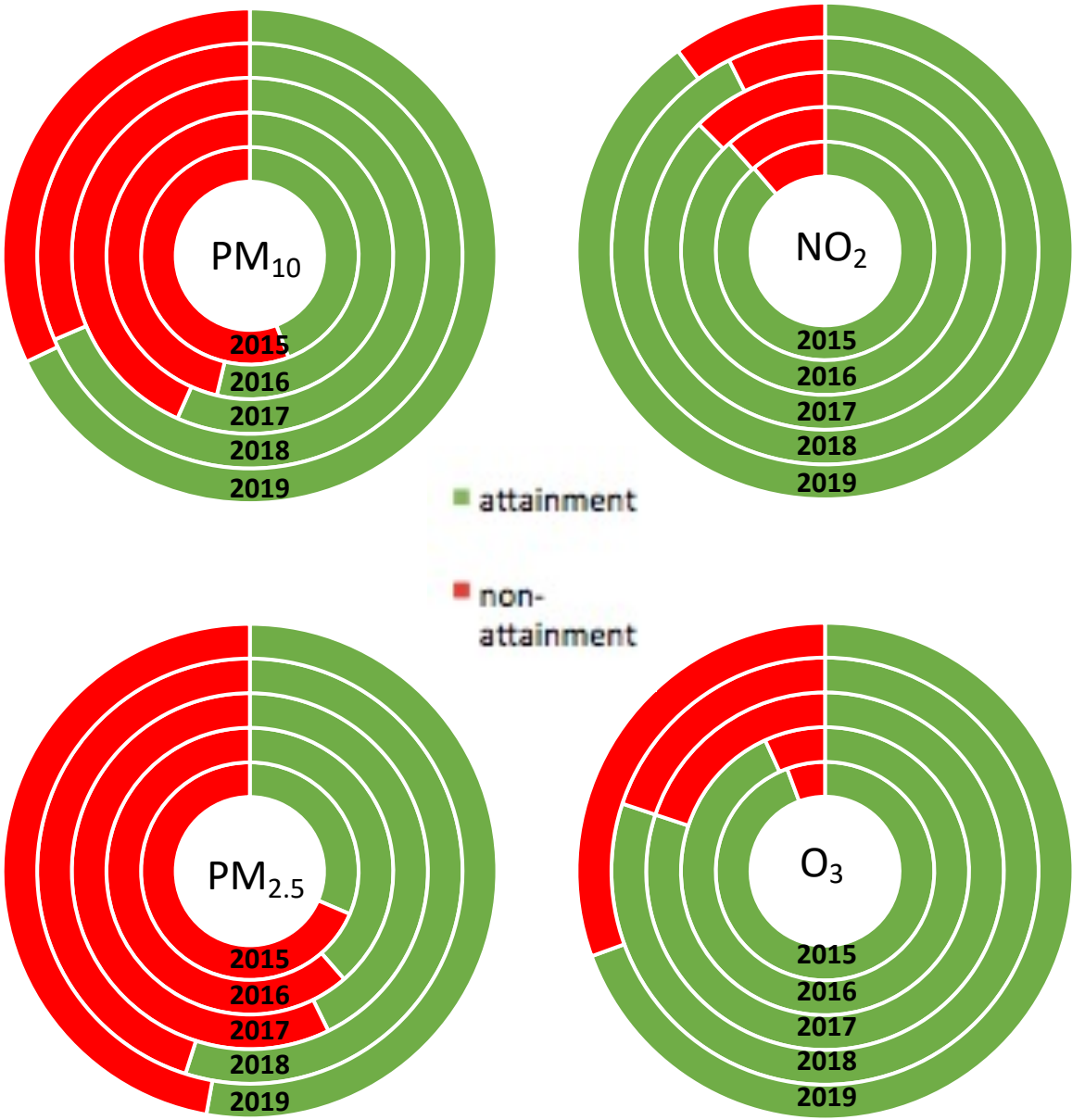
CAPs concentrations in 2019 in Beijing



Roadside CAPs concentrations are 10-50% higher than urban averages

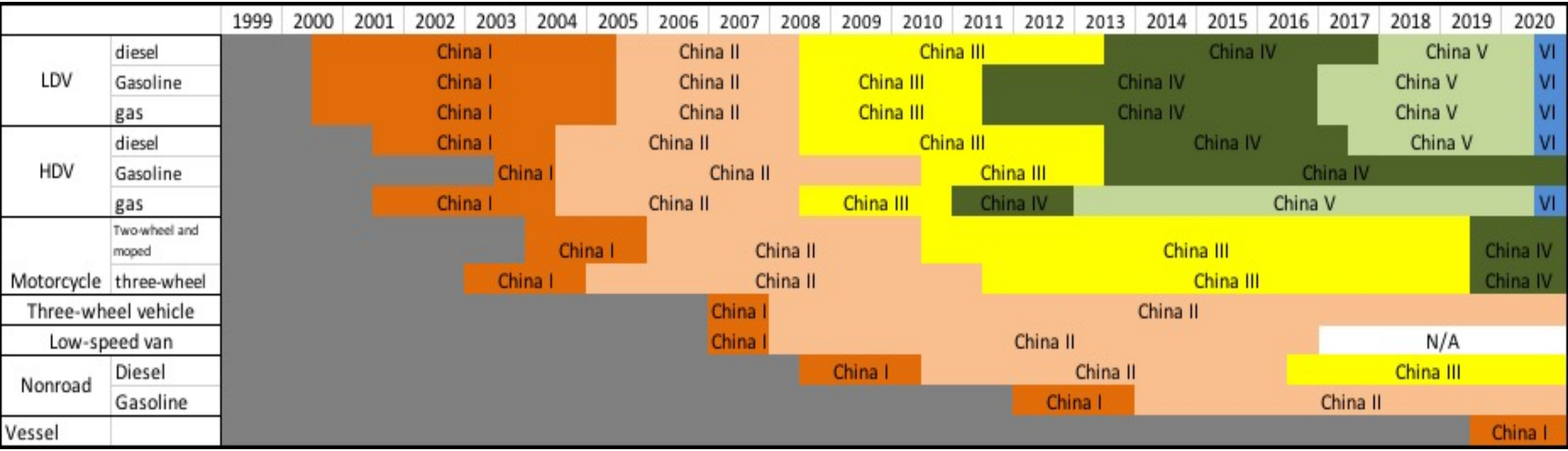
~50% of cities have achieved China's NAAQS for $PM_{2.5}$, but O_3 getting worse





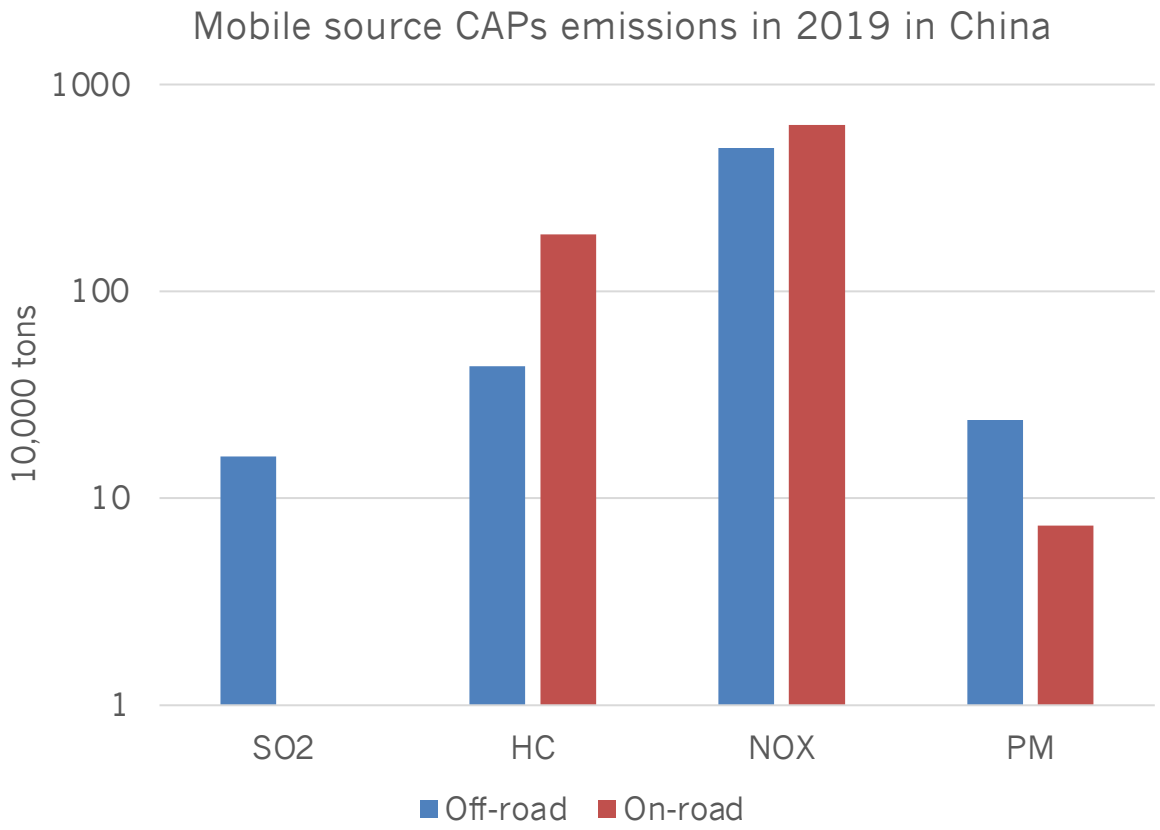
City compliance ratio by pollutants in 2019

Off-road vehicles are lagging far behind on emissions

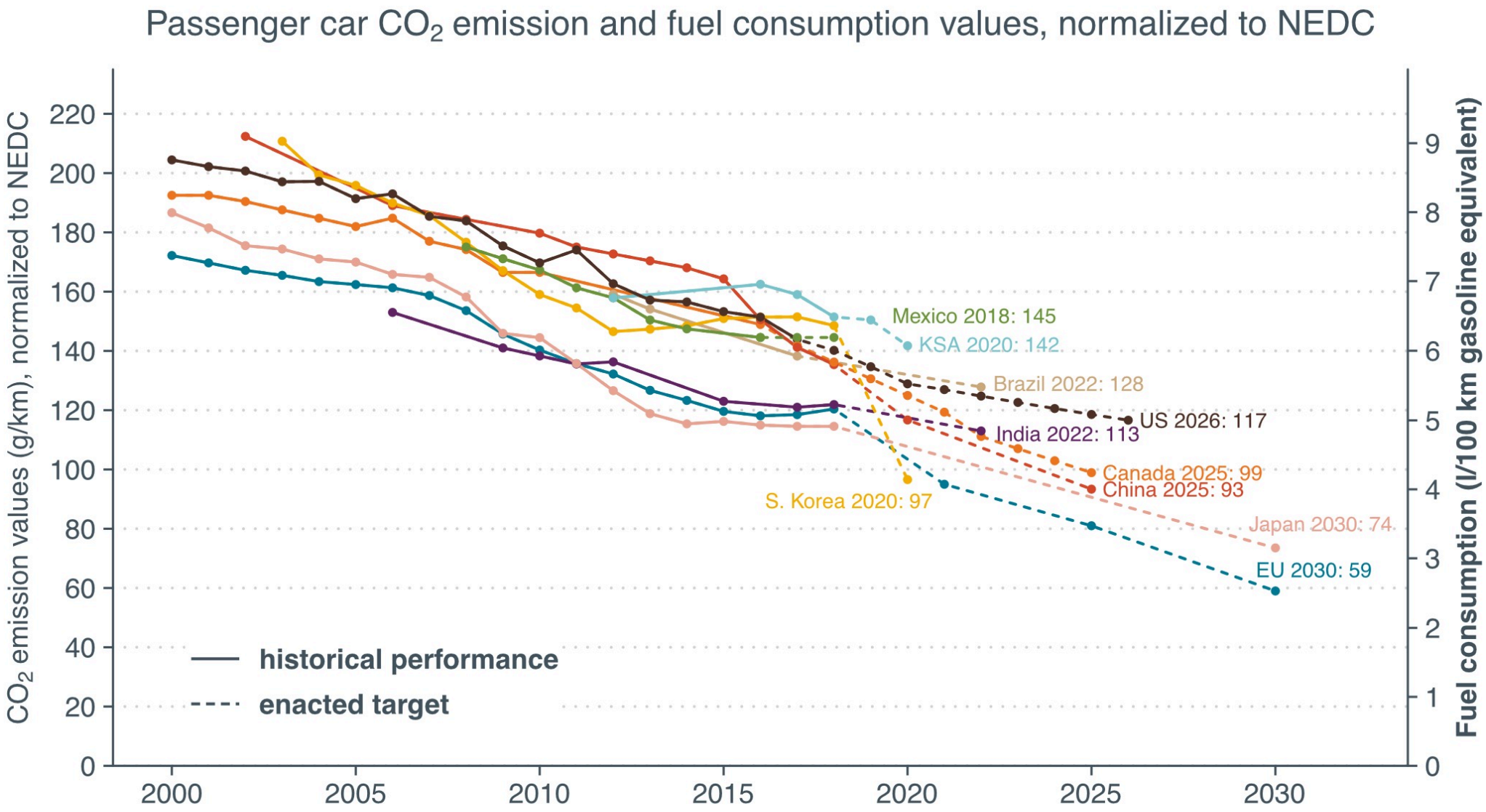


Emissions standards implemented by dates for different mobile sources

Off-road mobile sources accounted for 44% and 76% of total NOx and PM emissions from mobile sources respectively in 2019

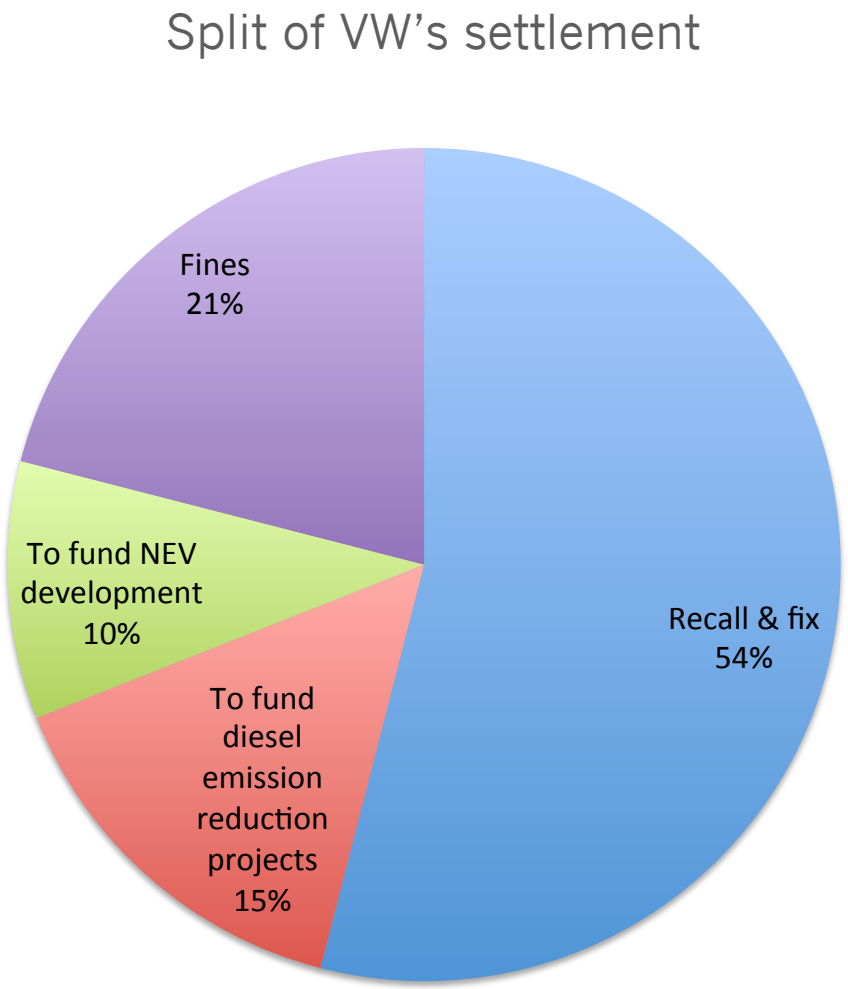


Passenger car fuel efficiency keeps improving



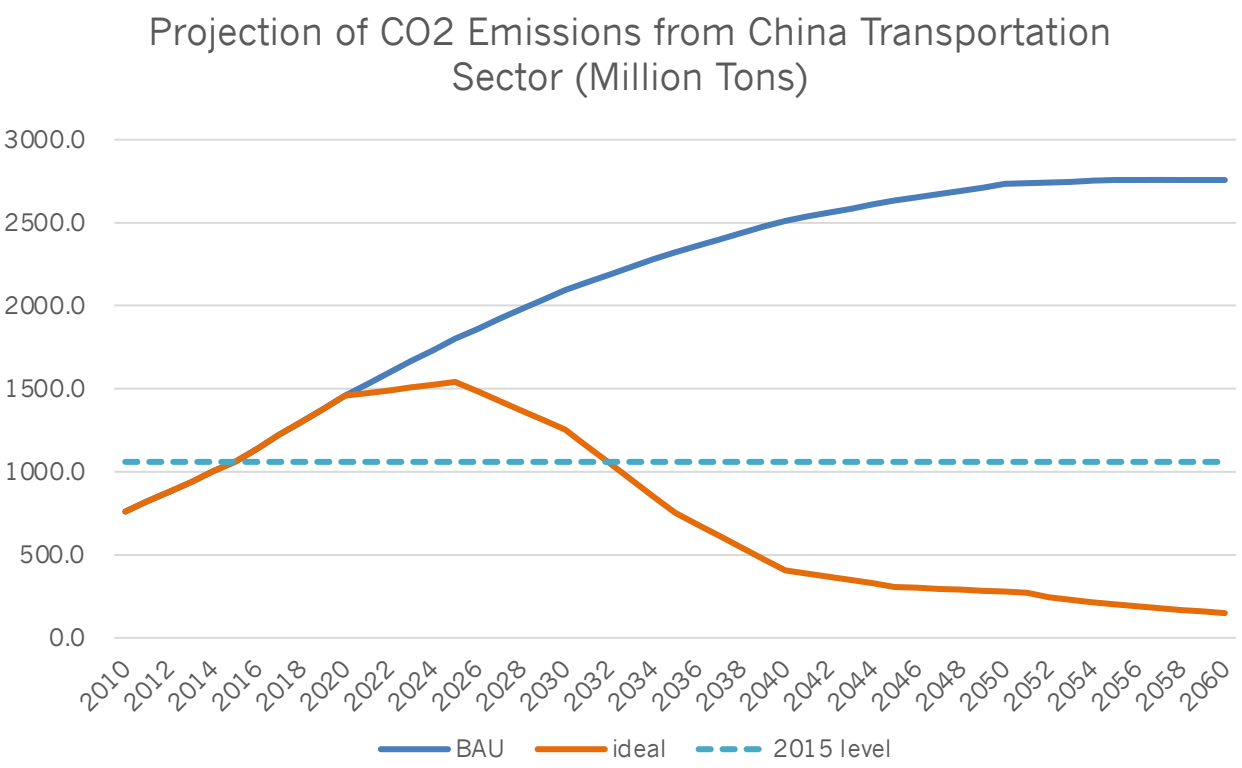
Updated May 2020
Details at www.theicct.org/chart-library-passenger-vehicle-fuel-economy

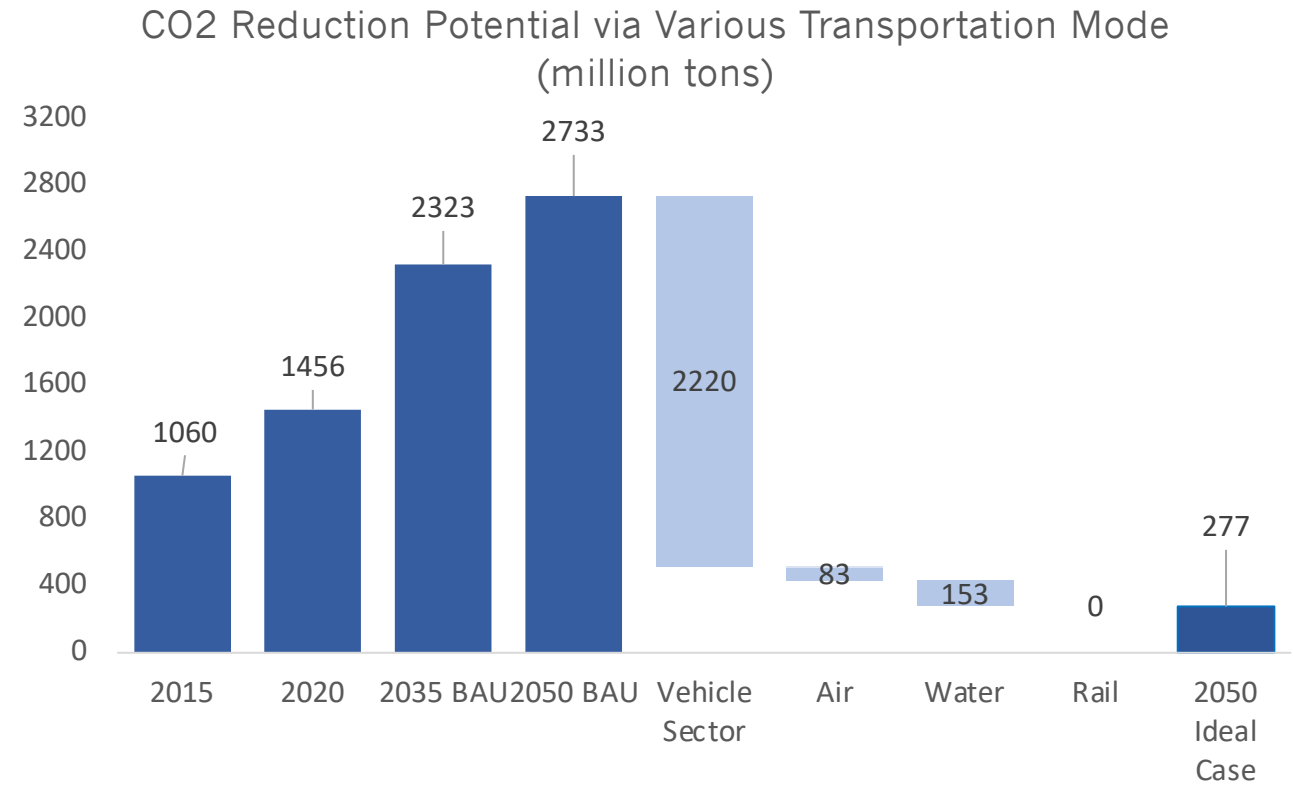
Enforcement is key



	VW	Kama	T•King
Number of vehicle affected	590,000	326	109
Economic cost	20.2 billion $ (127.4 billion RMB)	31.7 million RMB	7.03 million RMB
Fines per vehicle	45345 RMB	97239 RMB	64500 RMB

All transport: vehicle sector dominates emission reduction potential

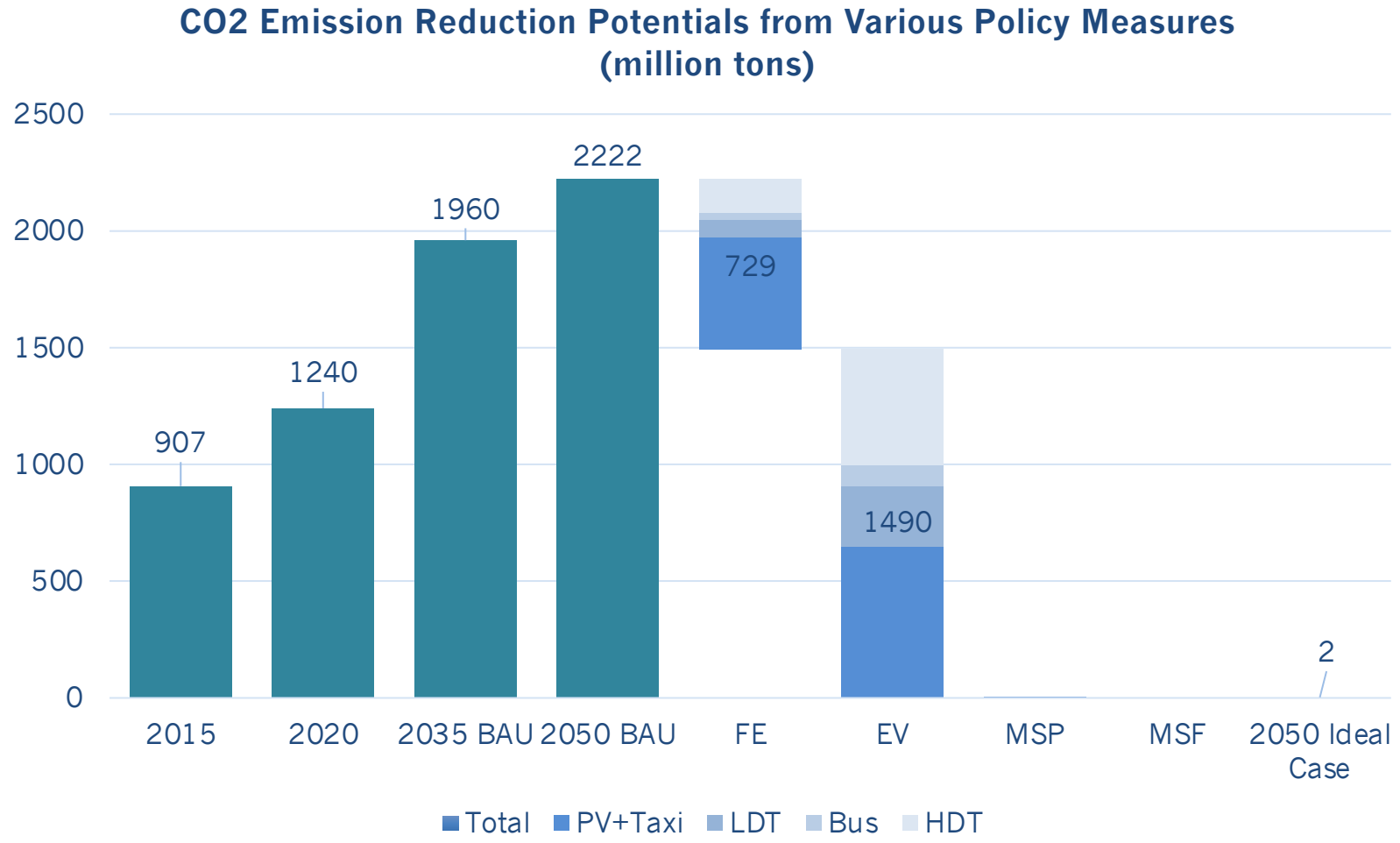




Compared to 2015, 75% CO_2 reduction and 90% CAPs reduction are possible by 2050

Source: EFC internal modeling and analysis

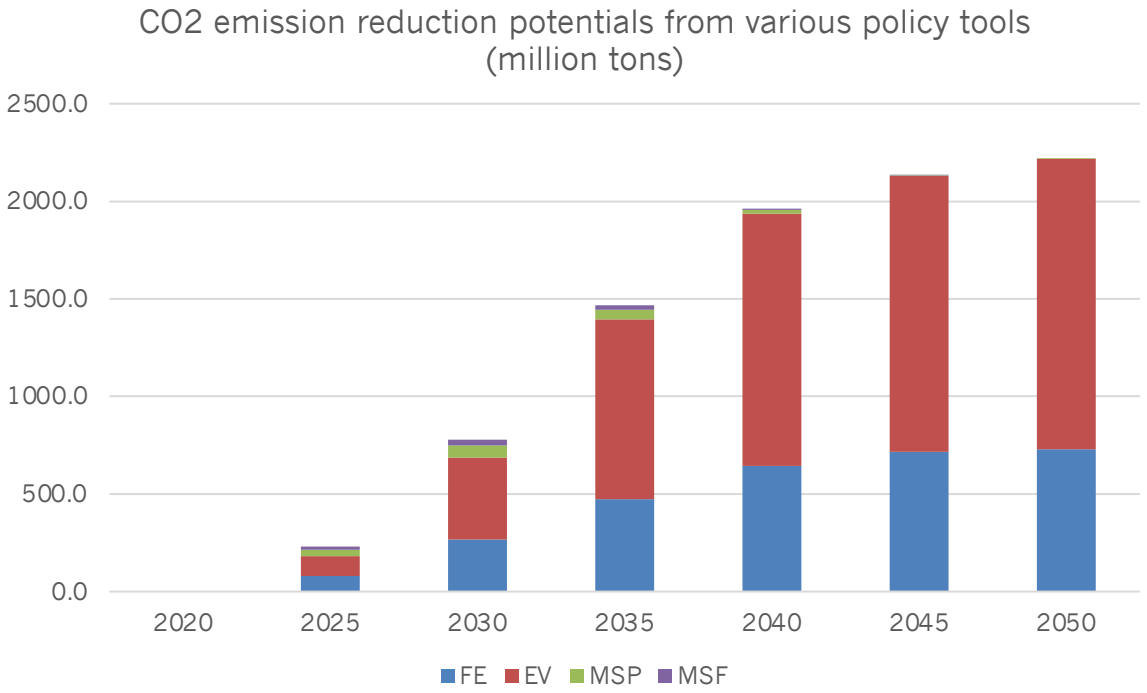
Road transport: electrification and fuel efficiency dominate carbon reduction potential

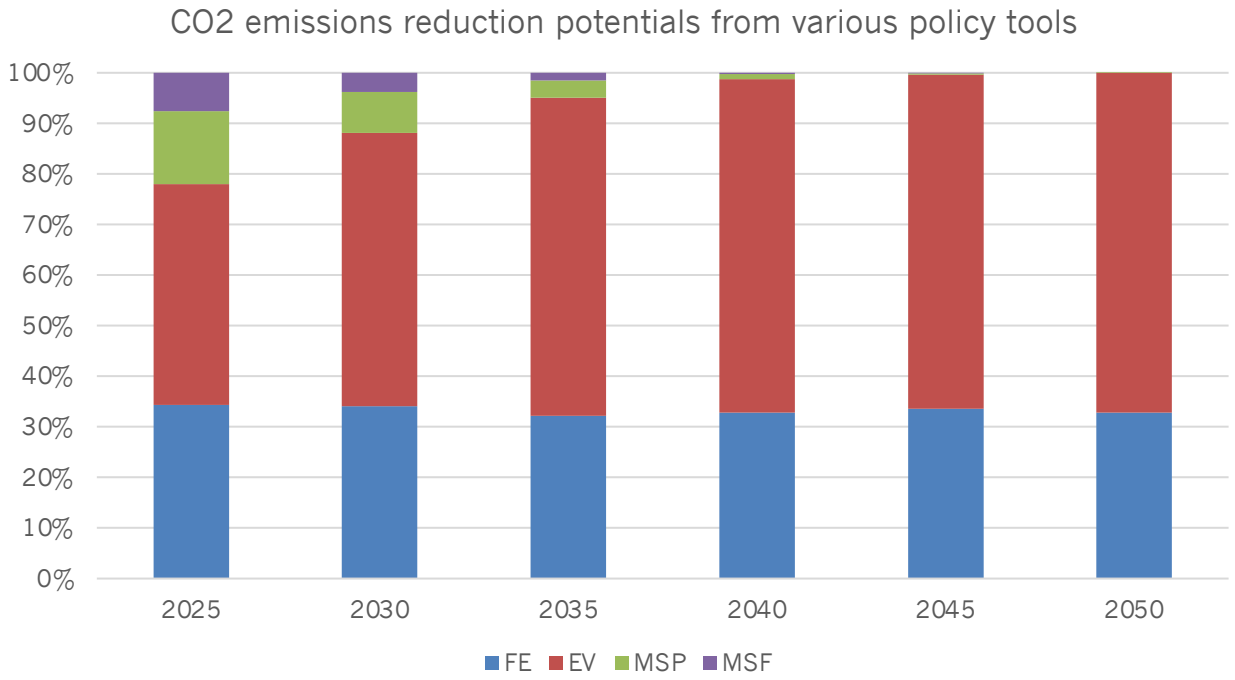


Source: EFC internal modeling and analysis

MSP: modal shift for passenger transportation
MSF: modal shift for freight transportation

Emissions reduction contribution from modal shift gets smaller as electrification increases, but is still important in the near-term and considering social cost, equity, and congestion





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