DYNAMICS AMONG PATHWAYS TO DECARBONIZE FREIGHT TRANSPORT SYSTEM

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Agenda

- Emissions and Decarbonization of Freight Transport
- Literature Review: Results and Gaps
- Conceptual Model: Feedbacks and Dynamics
- Conclusions

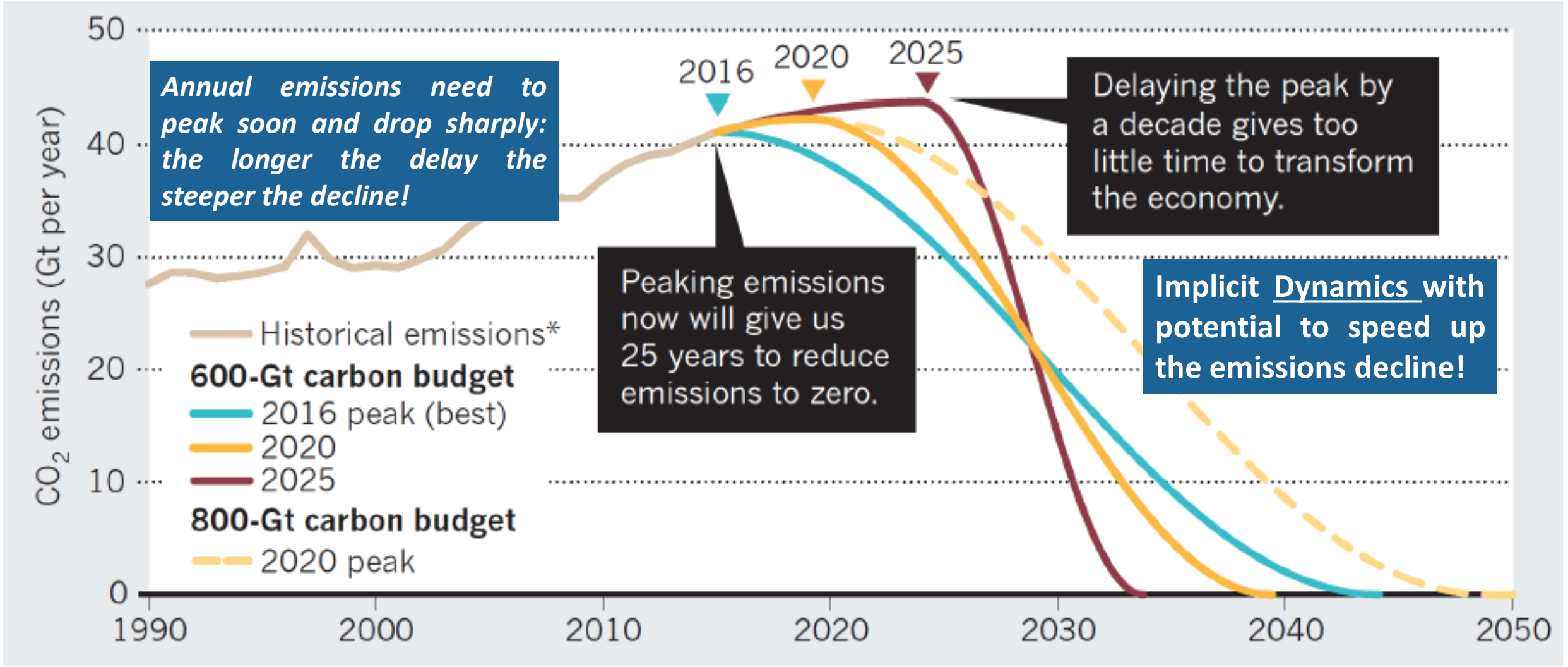


Figure 1 – Global Carbon Project.
Source: Figueres et al. (2017)

Contribution of Freight Transport to Emissions

- 90% of all logistics emissions
- 7-8% of global CO_2 emissions
- Increase in freight tonne-km between 2015 and 2050
- Heavy dependence on fossil fuels

Figura 2 – Logistic Yard.
Source: World Business Council for Sustainable Development, 2020.

Five measures for freight transport decarbonization

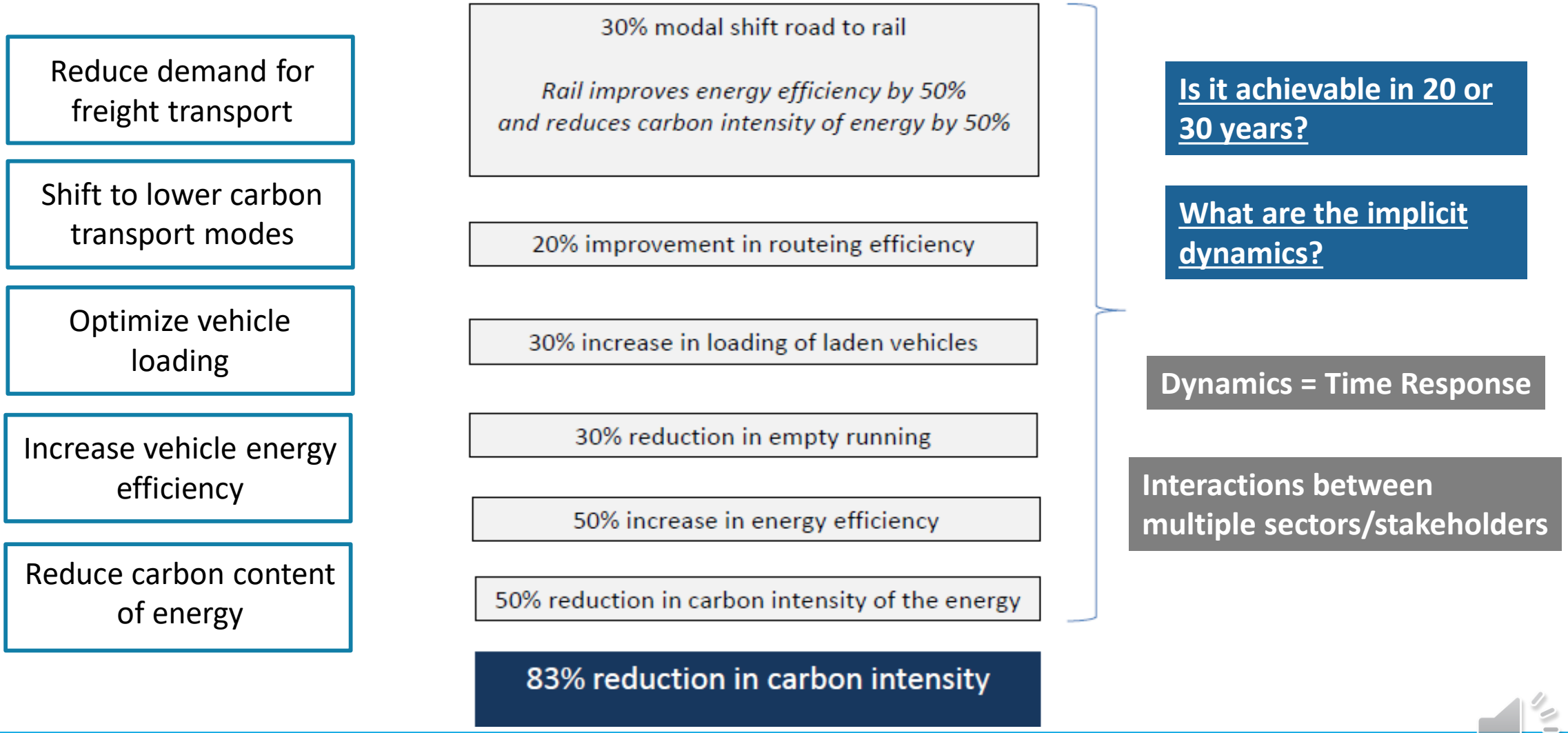
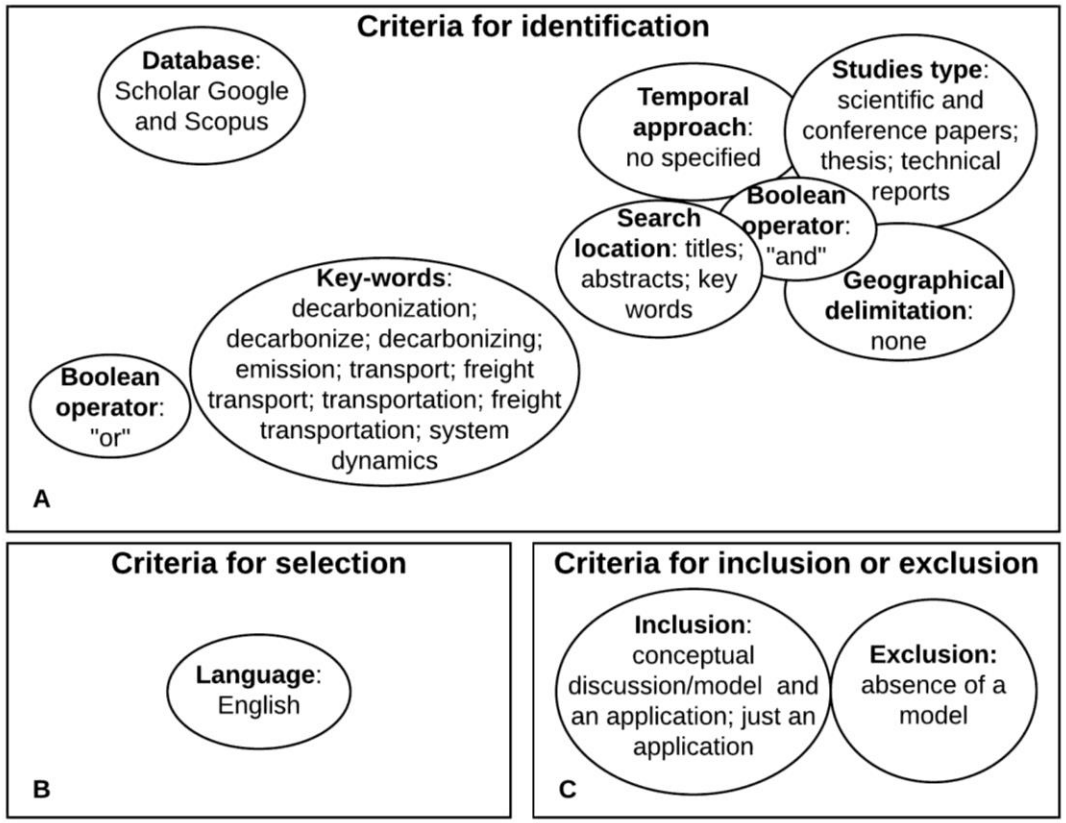


Figure 3 – Leveraging the decarbonization parameters to achieve deep emissions reduction.
Source: McKinnon (2018)

Systematic Literature Review of SD Models for Freight Transport Decarbonization



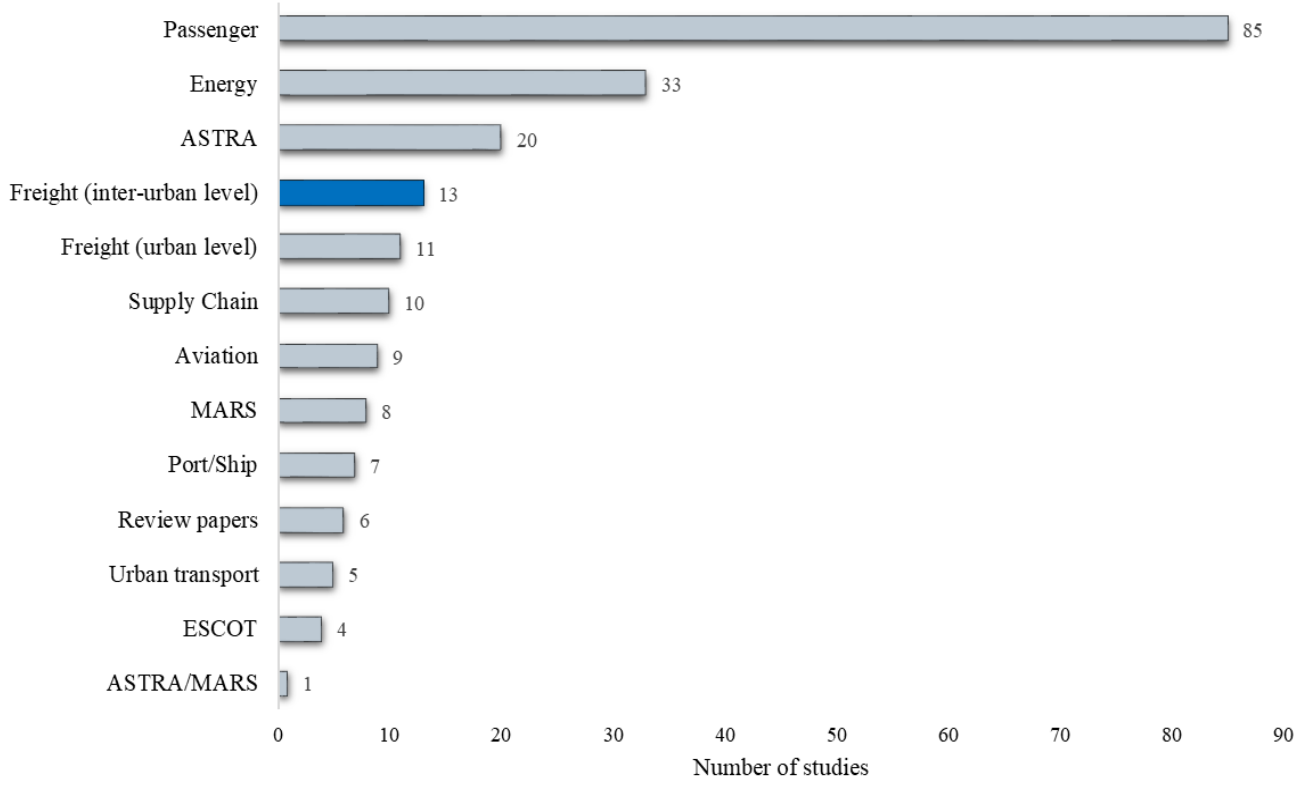


Figure 4 –Studies identification, selection and classification.

Results and Gaps

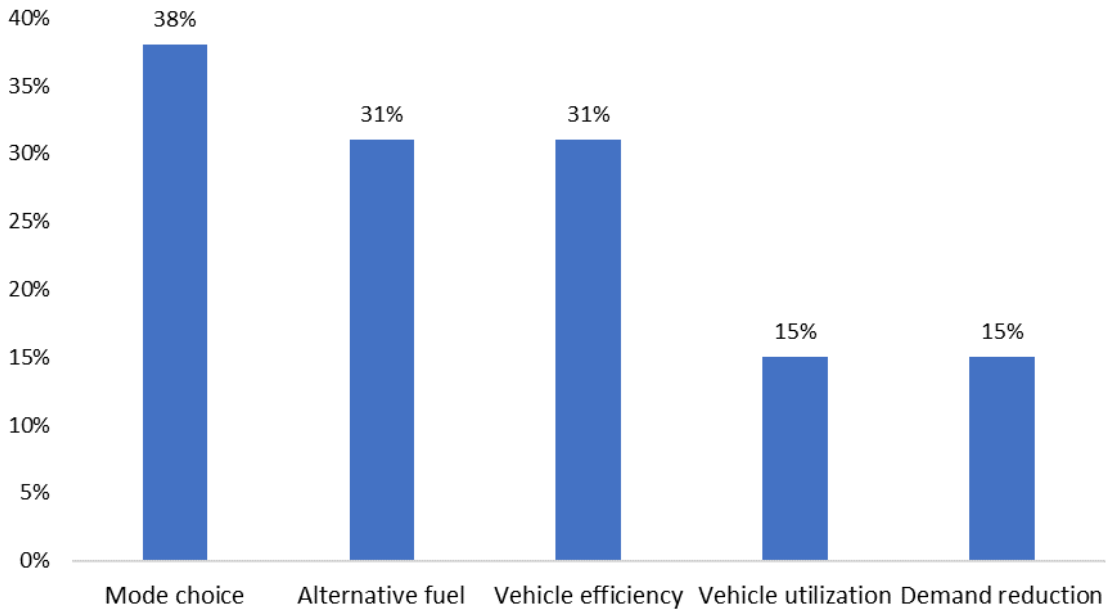


Figure 5 – Percentage of each decarbonization in the reviewed studies.

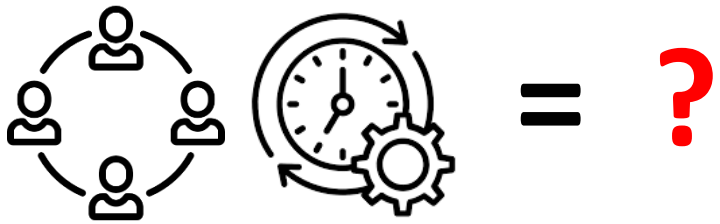


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Table 1 – Classification according to Green logistics and TIMBER frameworks.

Authors	Decarbonization Strategies (Green Logistics Framework)				
	Demand Reduction	Mode Choice	Vehicle Utilization	Vehicle Efficiency	Alternative Fuels
Agha et al (2019)	X				
Aschauer (2013)			X		
Azlan et al (2019)	X				
Barisa and Rosa (2018a)					X
Barisa and Rosa (2018b)					X
Brito Junior et al (2011)		X			
Han and Hayashi		X			
Piattelli et al (2002)		X			
Purwanto et al (2011)		X		X	X
Seitz (2014)				X	
Seitz and Terzidis (2014)				X	
Sim (2017)		X	X		X
Yang et al (2018)				X	

Ph.D. Goals Mapping

Literature Review

- Models of freight transport decarbonization
- Found gaps and research opportunities

Paper under Review

Conceptual Model

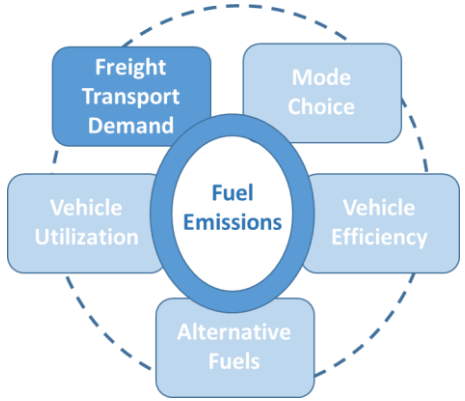
- Integrate five decarbonization measures
- Identify feedback loops and dynamic links

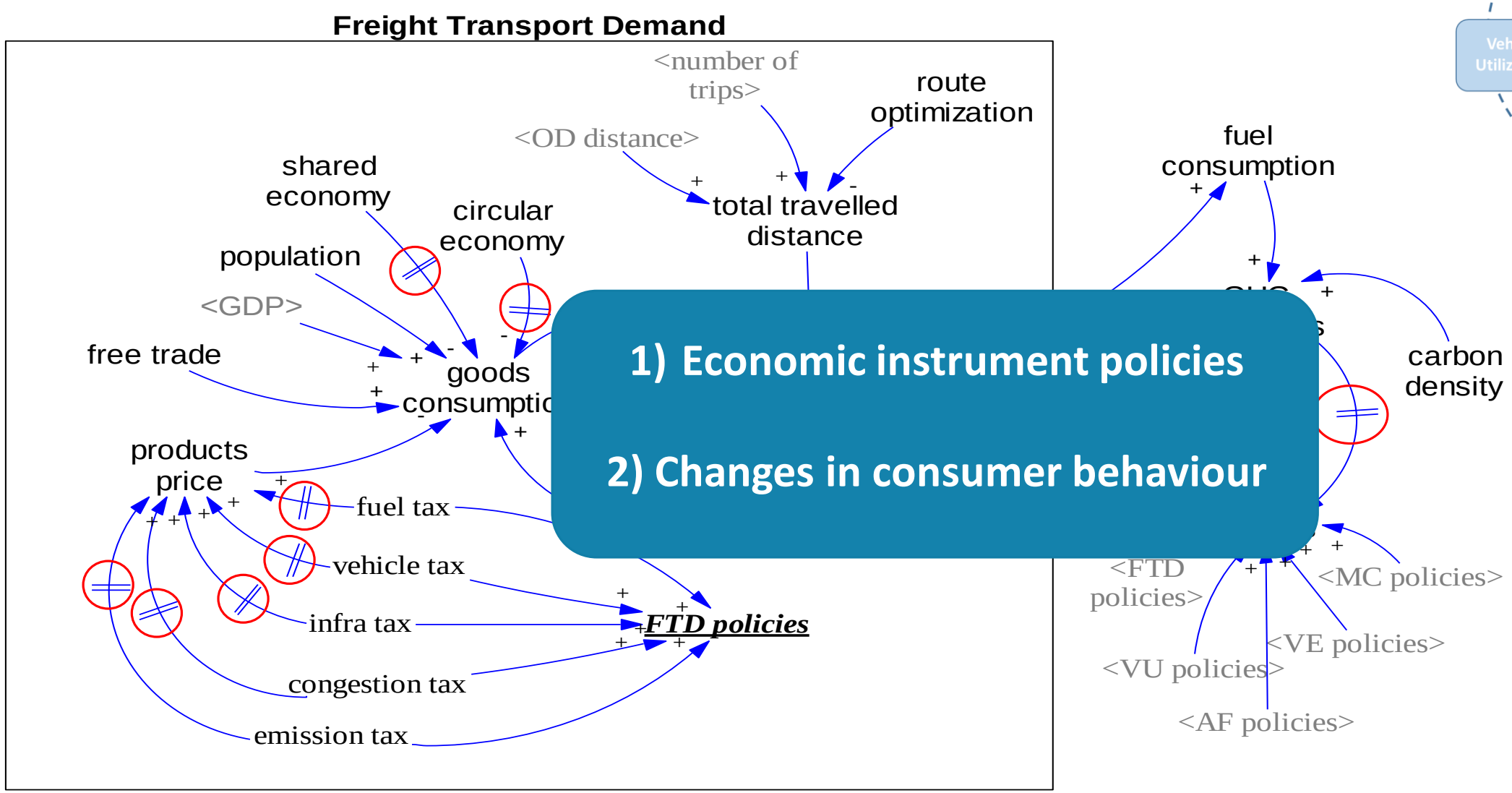
Paper to be submitted to RTBM

SD Model

- Data survey, interviews with stakeholders
- Model tests and scenarios simulations

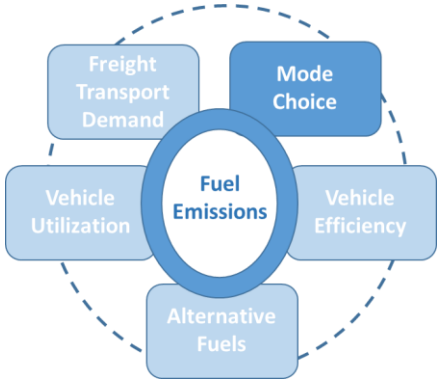
Forward Ph.D. study





1) Economic instrument policies

2) Changes in consumer behaviour

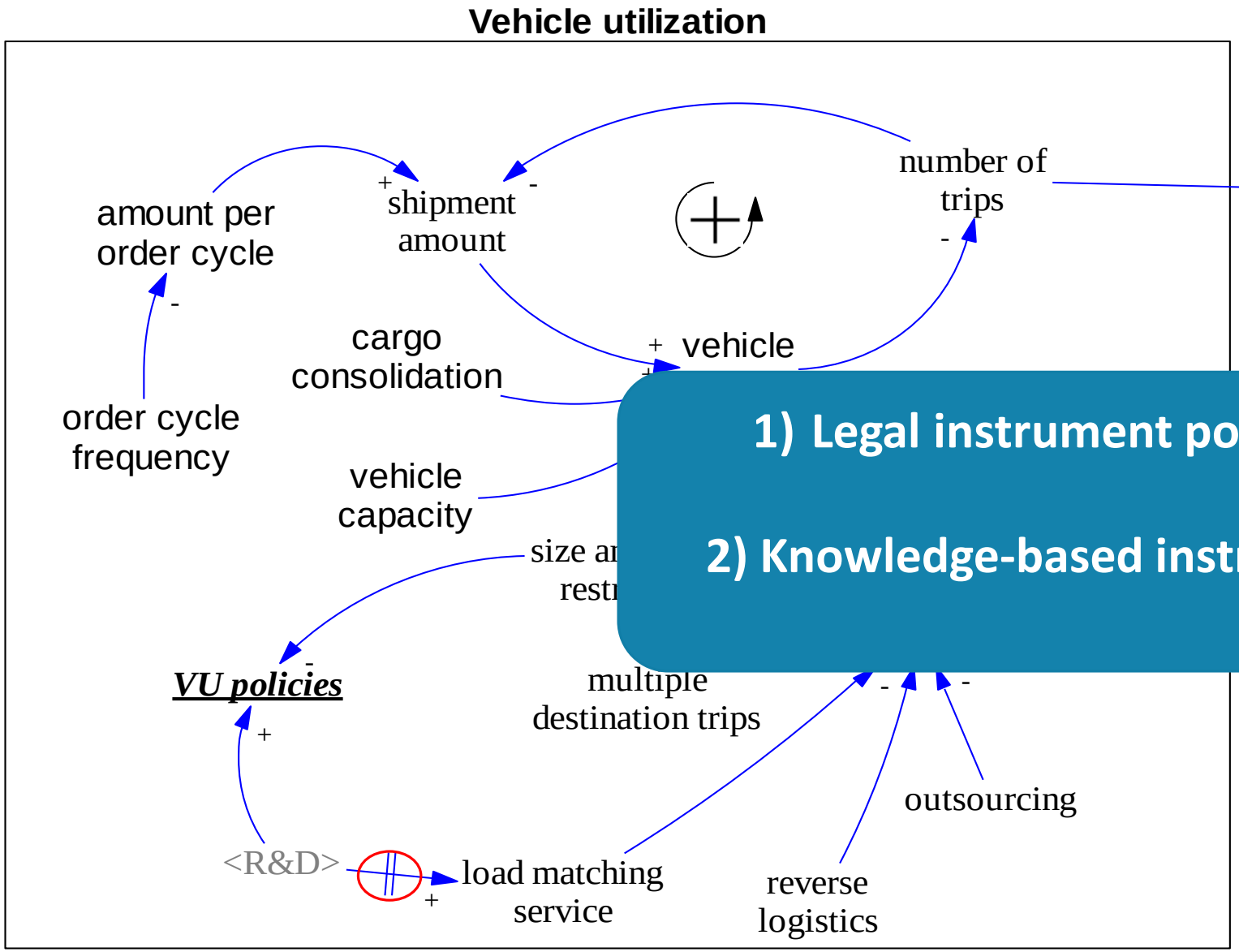


Mode choice

GDP
public sector investment
private sector investment
profitability expectation
geographic/climate restrictions
infra investment
fuel consumption
GHG emissions
carbon density
policies
<FTD policies>
<MC policies>
<VE policies>
<VU policies>
<AF policies>
<wear and tear>
MC policies
mode subsidy
service frequency
attractiveness
generalised costs
<emission tax>
<fleet efficiency improvement>
<infra tax>
mode utilization
OD distance
<vehicle tax>
transit time
<route optimization>
<congestion tax>

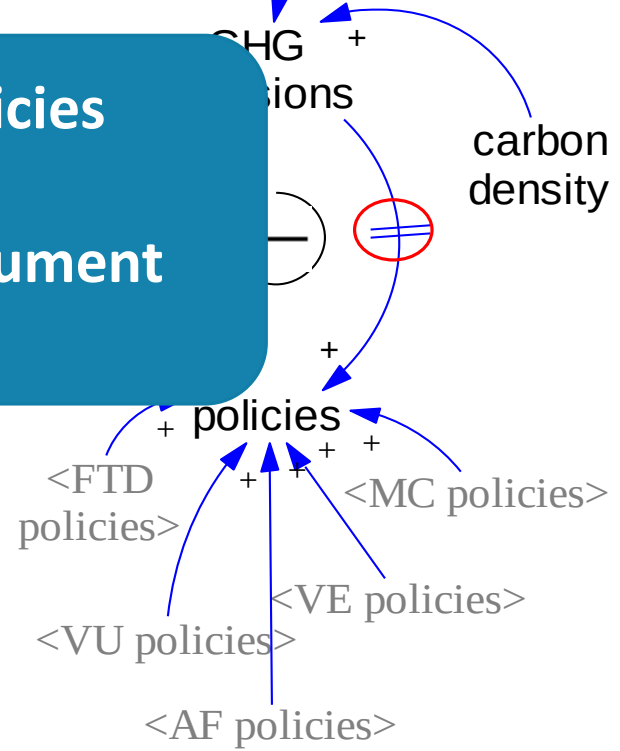
1) Economic instrument policies

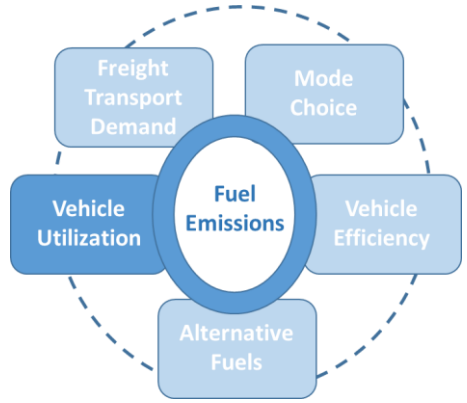
2) Infrastructure investments

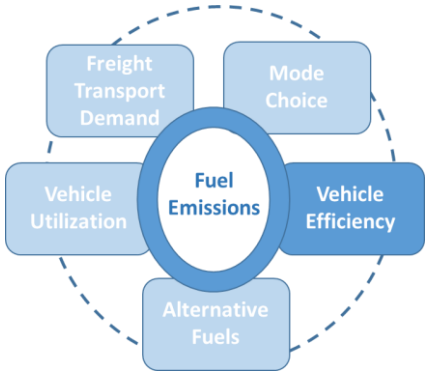


1) Legal instrument policies

2) Knowledge-based instrument

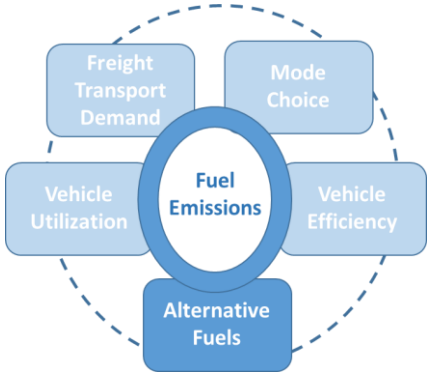


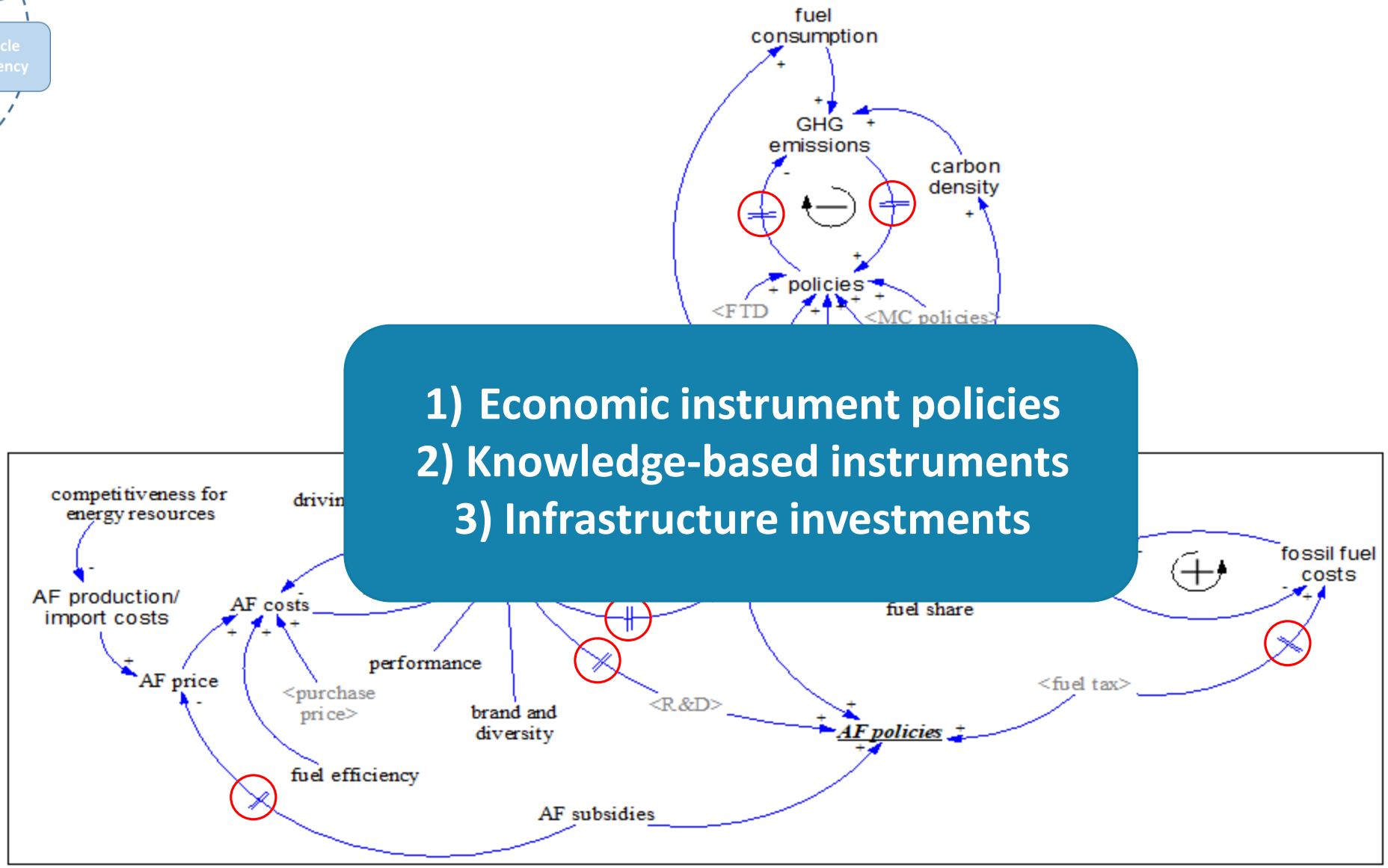




Vehicle efficiency improvement

1) Economic instrument policies
2) Knowledge-based instruments
3) Fleet renewal process



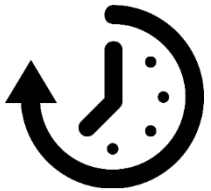


1) Economic instrument policies
2) Knowledge-based instruments
3) Infrastructure investments

Conclusions

The main dynamic processes identified in the conceptual model:

- Economic, Legal and Knowledge-based instruments
  - Taxes, subsidies, vehicles restrictions, R&D and maturation of new technologies
- Changes in goods consumption according to consumer behavior
- Infrastructure investments
- Fleet renewal process



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