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Decarbonizing logistics, intermodality and efficiency

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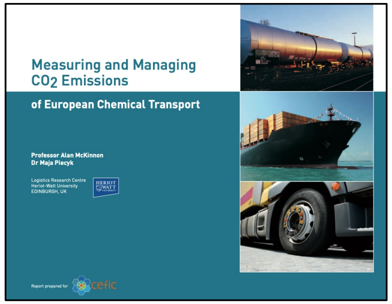
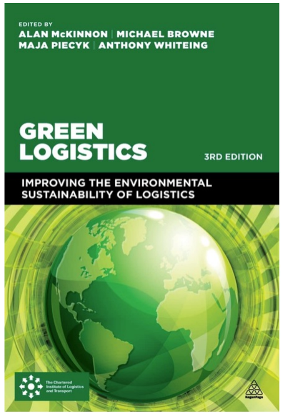
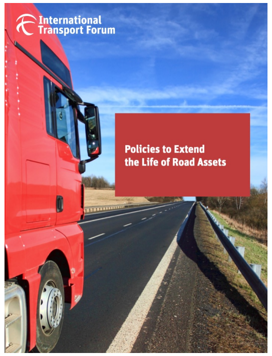
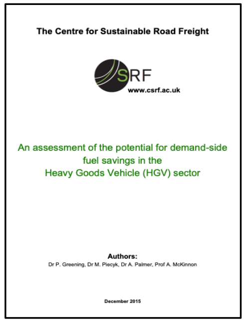
Background & Centre for Sustainable Road Freight









Cambridge University Engineering Department
Internationally leading capability in heavy vehicle engineering

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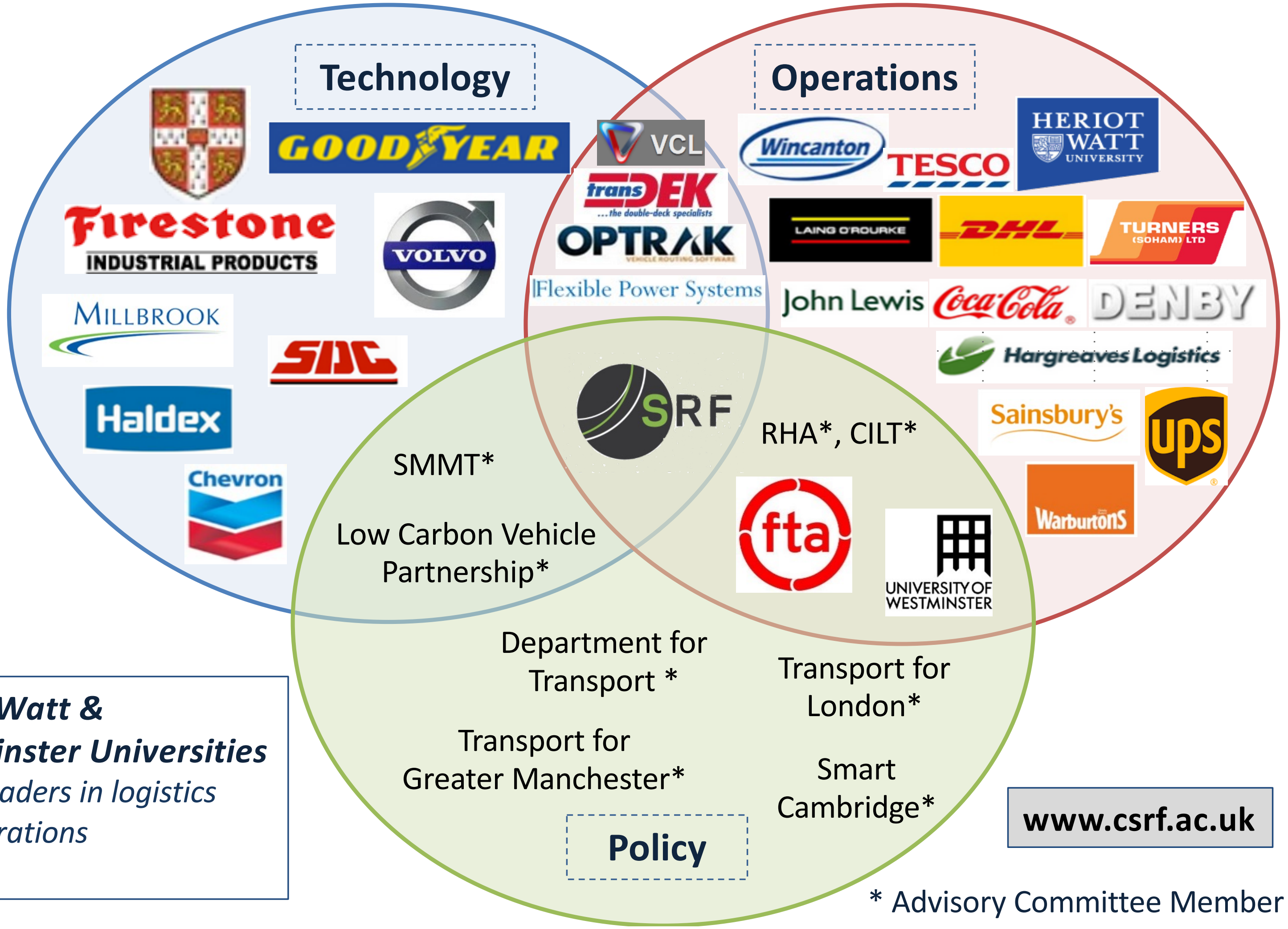
Heriot-Watt & Westminster Universities
World leaders in logistics and operations



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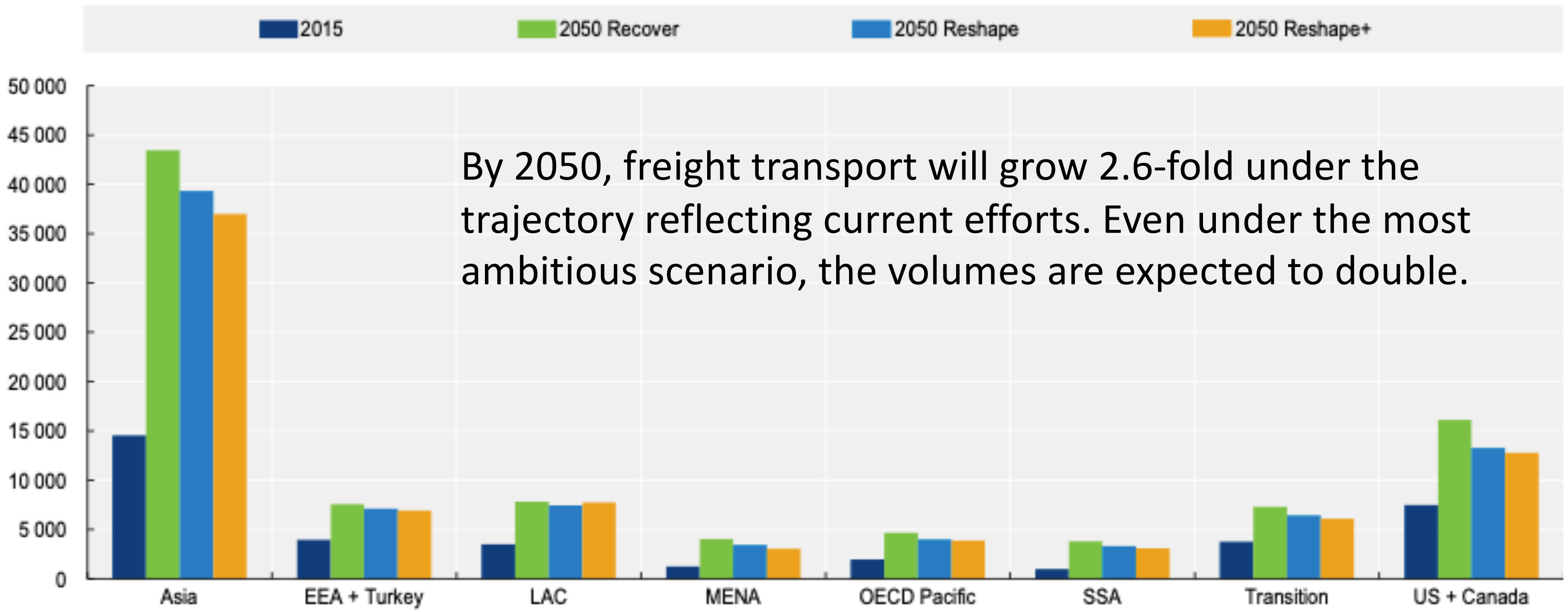
* Advisory Committee Member

Freight transport growth

Figure 5.7. Freight activity by world region to 2050

Under three scenarios, surface and domestic air and sea movements in billion tonne-kilometres

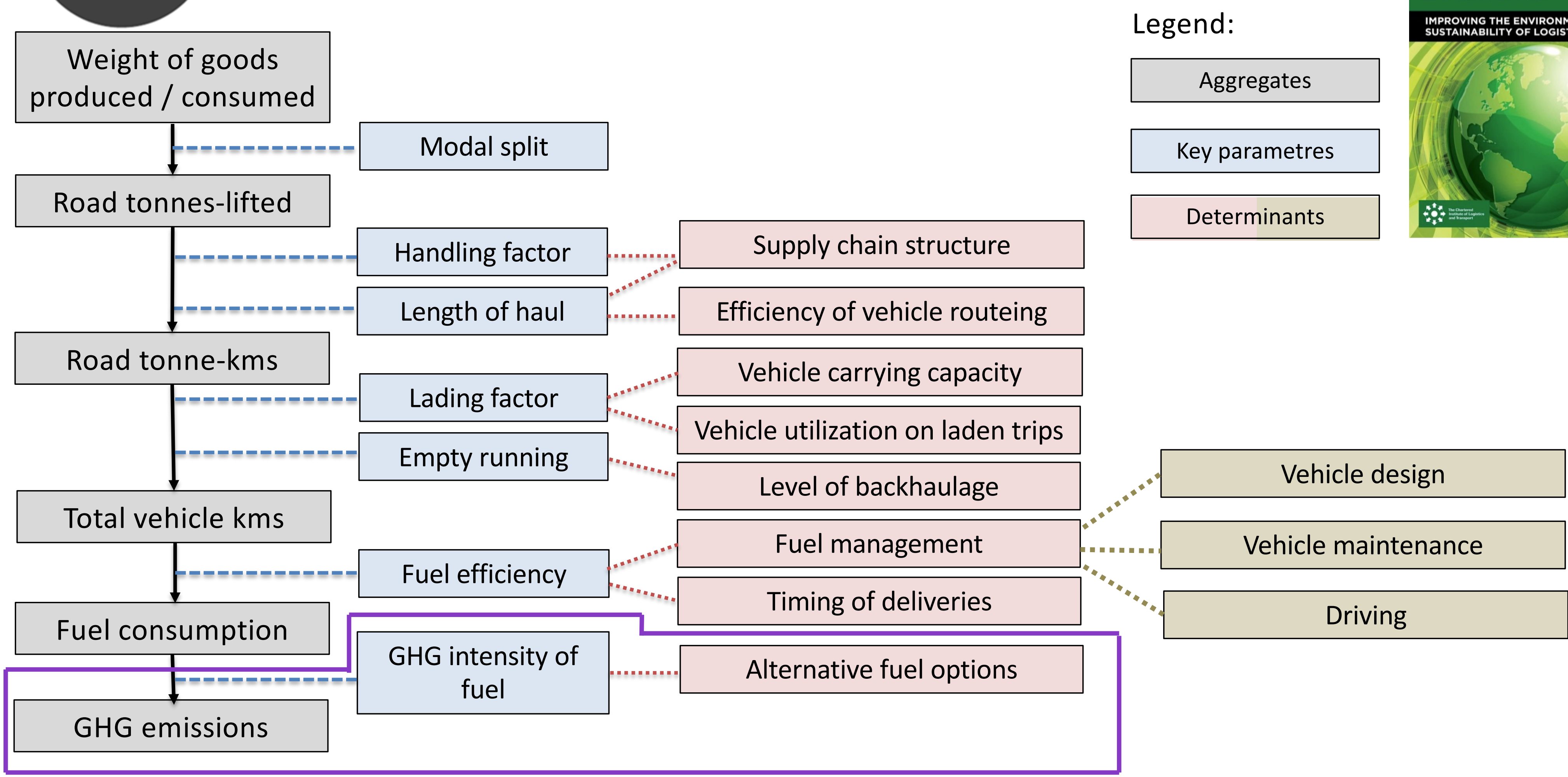


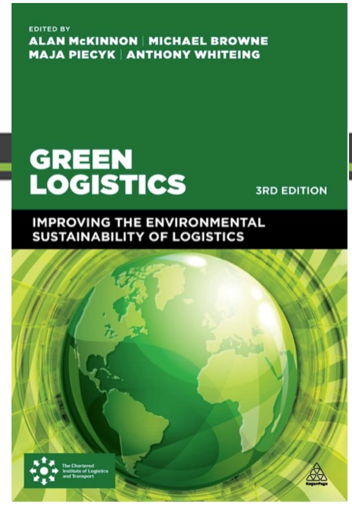
By 2050, freight transport will grow 2.6-fold under the trajectory reflecting current efforts. Even under the most ambitious scenario, the volumes are expected to double.

Note: Figure depicts ITF modelled estimates. *Recover*, *Reshape* and *Reshape+* refer to the three scenarios modelled, which represent increasingly ambitious post-pandemic policies to decarbonise transport. EEA: European Economic Area. LAC: Latin America and the Caribbean. MENA: Middle East and North Africa. OECD Pacific: Australia, Japan, New Zealand, South Korea. SSA: Sub-Saharan Africa. Transition economies: Former Soviet Union and non-EU South-Eastern Europe.

ITF / OECD, Transport Outlook 2021

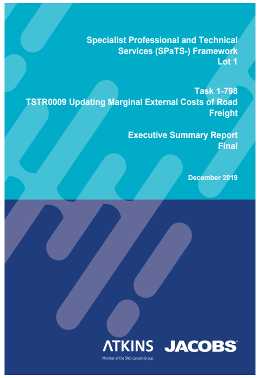
Green logistics framework

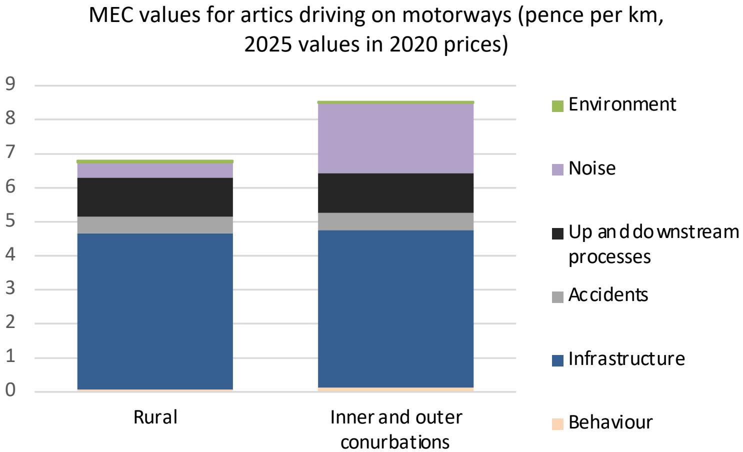


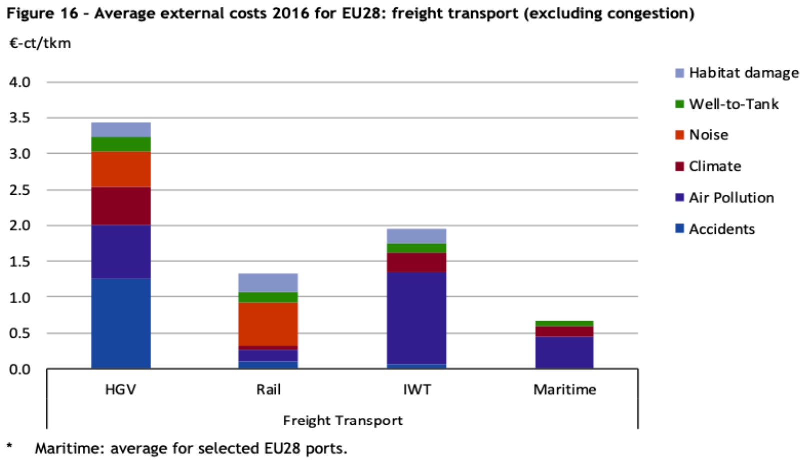


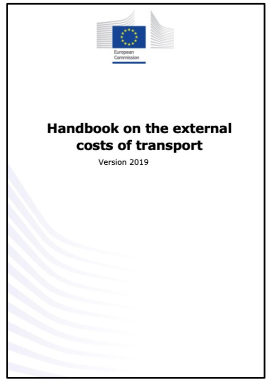
Logistics is important

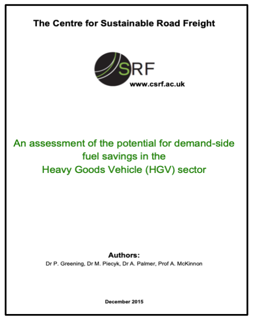
- We need to minimize energy use no matter the source
- GHGs are priority, but other externalities also need to be addressed









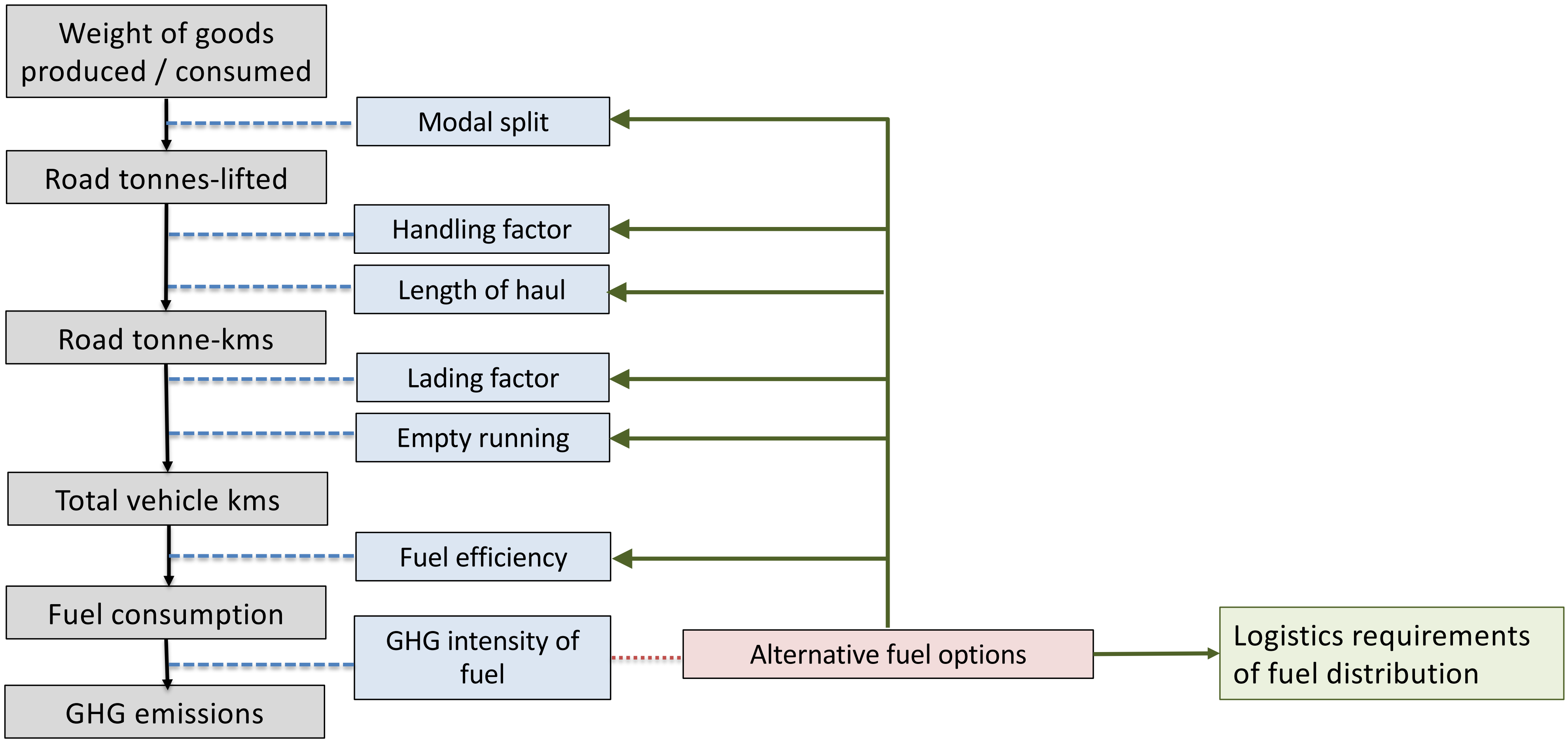


- Logistics measures can significantly reduce GHGs from diesel trucks – faster & in a more cost-efficient manner → vital in short & medium term

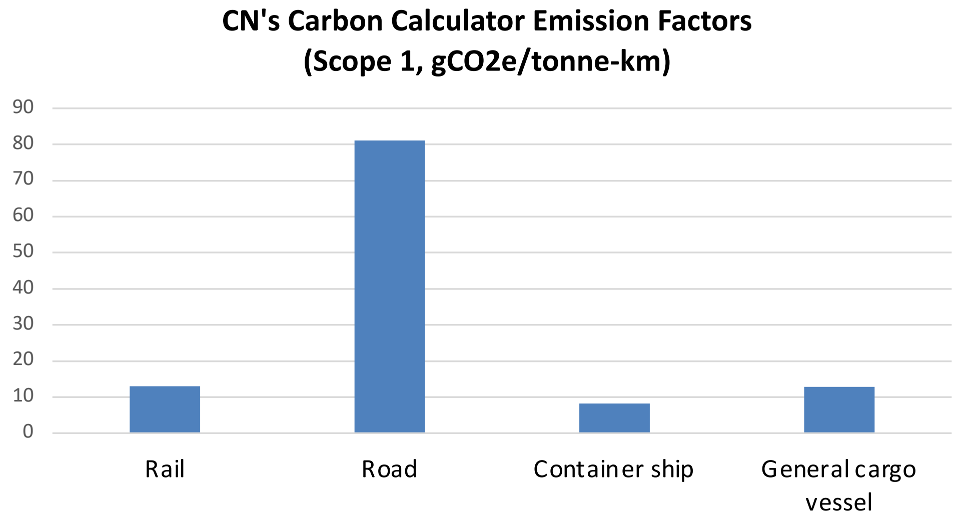
34% reduction in GHGs from existing diesel fleet possible by 2035 (from 2015 baseline)

"An effective combination of these measures could easily reduce total emissions by at least **50% within 10 years** at a cost much less than the exotic future technologies that could be available in the distant future" (logistics measures + natural gas)

Feedback loop



Intermodality



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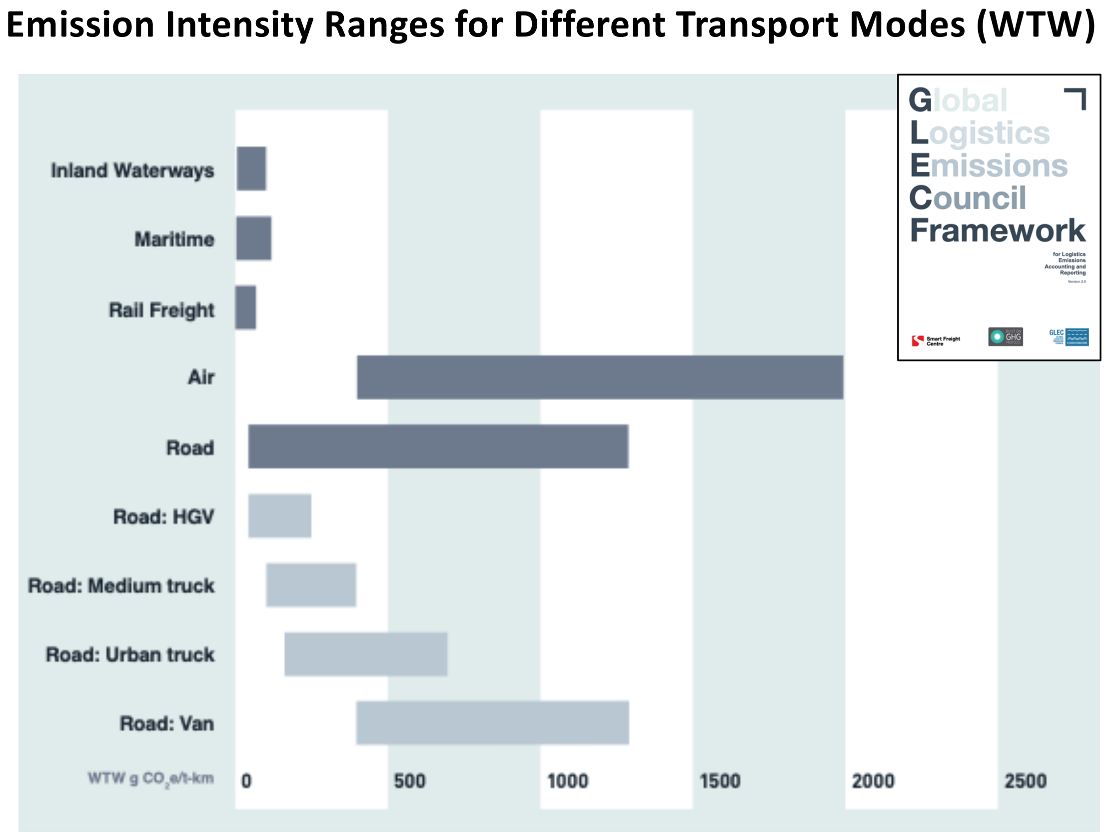
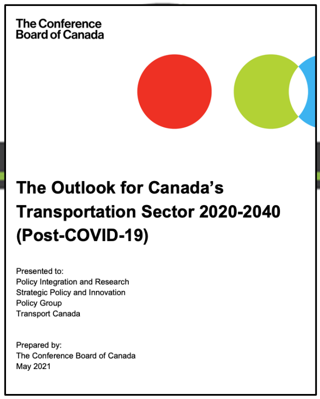
- Decarbonisation of non-road modes?
- Road transport demand is more price sensitive on longer distances, rail and water are more sensitive over shorter distances (ITF, 2022)→ how will the change in future road transport costs impact on modal split?



GLEC Framework 2.0, 2019


The Conference Board of Canada

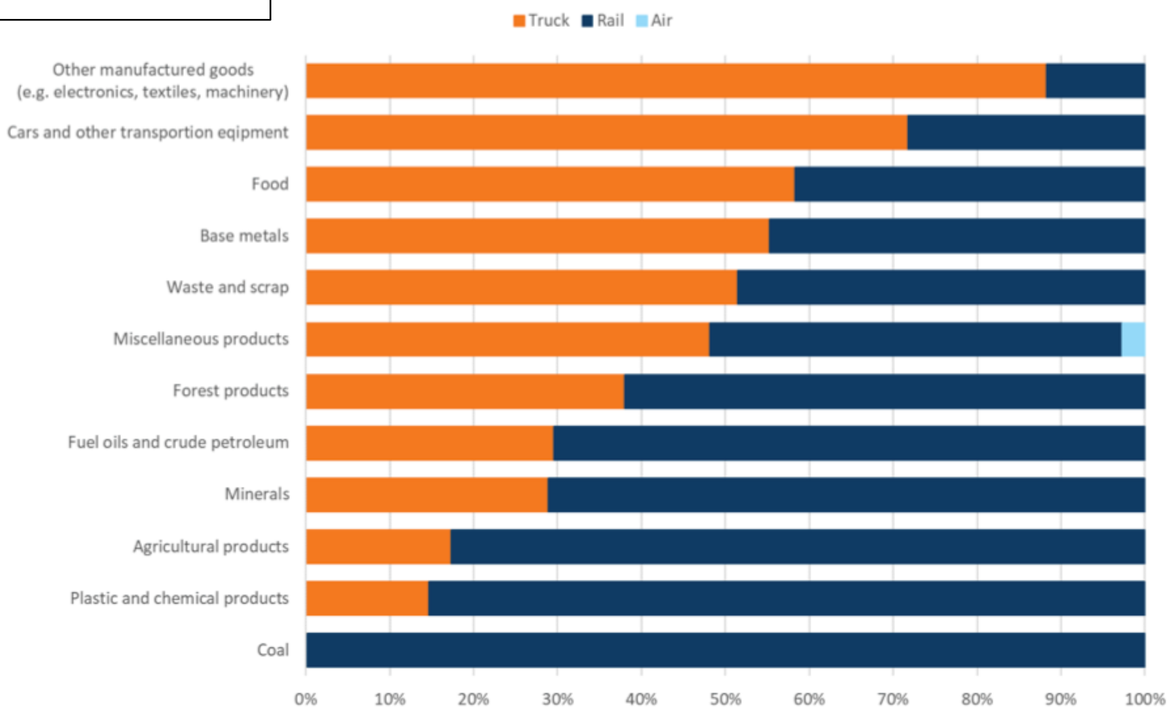
The Outlook for Canada's Transportation Sector 2020-2040 (Post-COVID-19)

Presented to:
Policy Integration and Research
Strategic Policy and Innovation
Policy Group
Transport Canada

Prepared by:
The Conference Board of Canada
May 2021

Intermodality

Percentage of freight transported by mode (2017)



Sources: The Conference Board of Canada; Statistics Canada. Canadian Freight Analysis Framework.

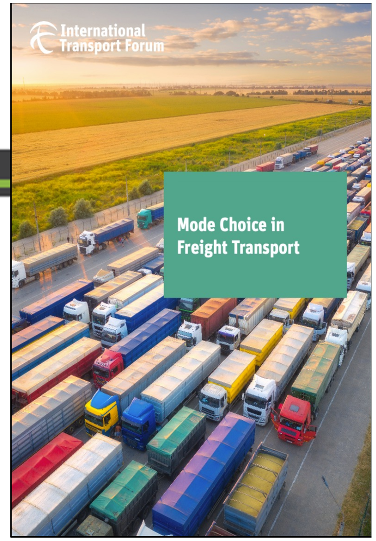
Photo: The Guardian, 6th Oct 2021

- UK FMCG sector: ADSA since 2001, Tesco since 2008
- Each Tesco's refrigerated train removes around 40 HGVs from UK's roads and saves 9,000 tonnes of CO_2

EU inland waterways:

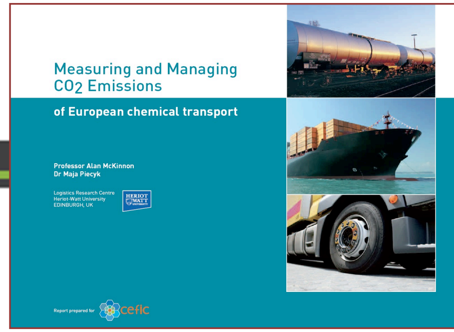
- canals and rivers carry just 6% of EU freight
- the goal of increasing transport by inland waterways and short sea shipping by 25% by 2030, and by 50% by 2050

Considerations related to modal split



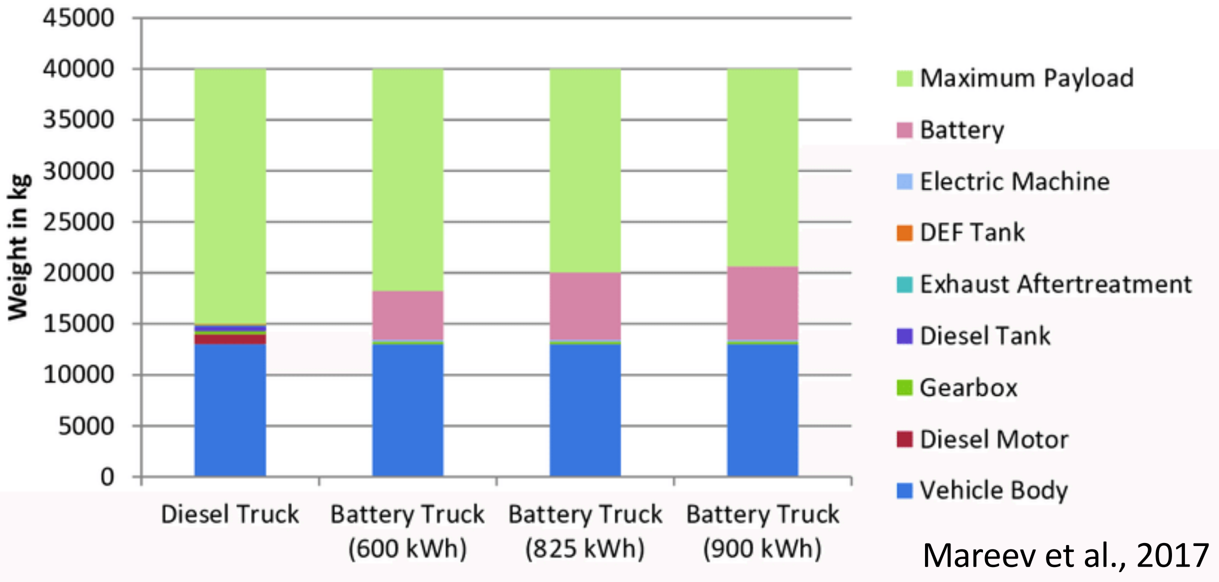
- Non-road freight transport is needed to address congestion and other externalities
- The cost coverage for the infrastructure of freight transport is generally very low.
    - EU countries: 25% for diesel freight trains, 17% for electric freight trains, 13% for heavy-duty vehicles, 12% for inland waterway, and 4% for seaports (CE Delft, 2019).
    - 20%-40% additional road wear associated with BEVs, 6% for hydrogen - overwhelmingly caused by large vehicles – HGVs and buses (Low et al., 2023)
- Accessibility of infrastructure is important →UK: only 6% of large warehouses are rail-connected (Hearn et al., 2022)
- Ability to substitute one mode's infrastructure for another if needed (e.g. road for rail) is vital (ITF, 2022) → risk assessment

Vehicle utilisation is key



CO_2 emission factor for HGV (44t) (UK, gCO_2 per tonne-km)

load tonnes	% of truck-kms run empty 0%	5%	10%	15%	20%	25%	30%	35%	40%
10	81.0	85.2	89.9	95.1	101.0	107.6	115.2	124.0	134.2
11	74.8	78.7	83.0	87.8	93.2	99.4	106.4	114.5	123.9
12	69.7	73.3	77.3						
13	65.4	68.8	72.5						
14	61.7	64.9	68.5						
15	58.6	61.6	65.0						
16	55.9	58.8	62.0						
17	53.5	56.3	59.3						
18	51.4	54.1	57.0						
19	49.6	52.2	55.0						
20	48.0	50.5	53.2						
21	46.6	49.0	51.6						
22	45.3	47.6	50.2						
23	44.2	46.5	49.0						
24	43.2	45.4	47.9						
25	42.3	44.5	46.9						
26	41.5	43.7	46.0						
27	40.8	42.9	45.3						
28	40.2	42.3	44.6	47.2	50.1	53.4	57.1	61.4	66.5
29	39.7	41.7	44.0	46.6	49.4	52.6	56.3	60.6	65.6



Mareev et al., 2017

McKinnon & Piecyk, 2011

Based on fuel efficiency figures from Coyle (2007) '*Effects of Payload on the Fuel Consumption of Trucks*' DfT

Impact on logistics is highly uncertain

- Impact on routing and scheduling, e.g. charging breaks, limits on distance travelled, price difference for charging points
- Impact on vehicle utilization and ability to service backloads
- Interaction with other logistics technologies, e.g. need to recharge at depot vs. automation of loading / unloading
- Rollout of charging / refueling infrastructure
- Policy interventions to incentivize technology uptake
- Impact on SMEs

Concluding remarks

- Zero/low carbon solutions are vital, but we also need to address the growth of traffic and other externalities
- Even with zero/low carbon options we still need to minimize energy use
- Significant GHG reduction opportunities in current fleets exist and should be exploited in short and medium term
- Wider impacts of zero / low carbon options should be included in the assessment
  - Understanding of logistics requirements and implications is important → need for better logistics data and whole system analysis

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