10th International Workshop on Sustainable Road Freight

Robust decarbonisation and resilient logistics: Progress in the last decade and a roadmap to 2035

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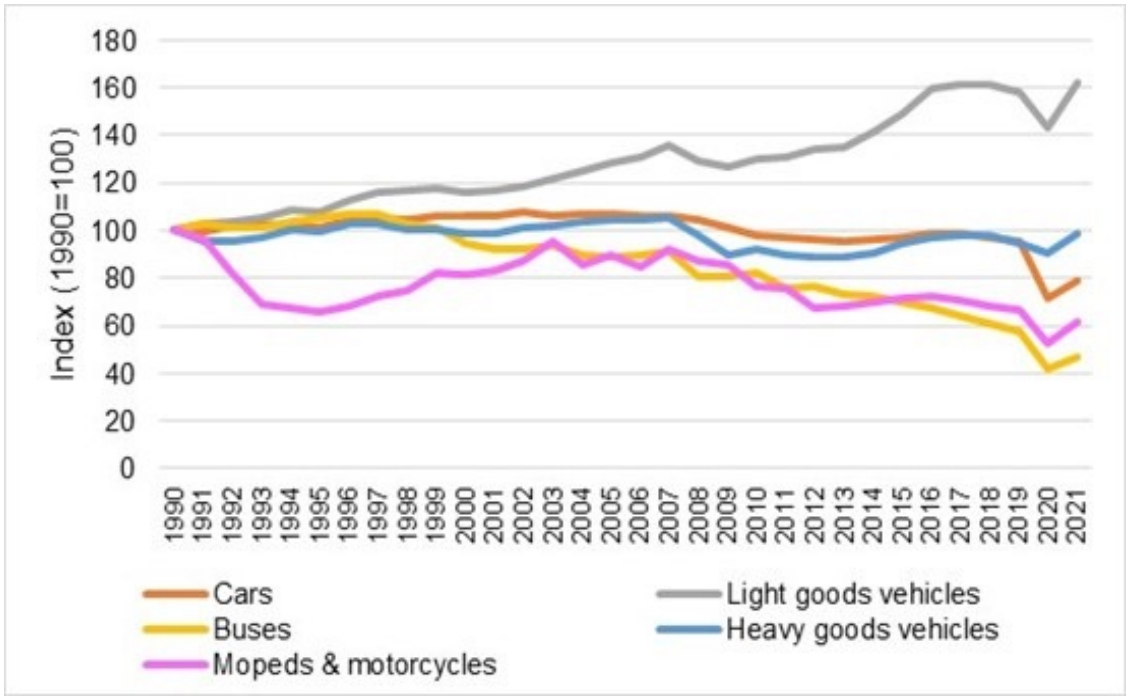
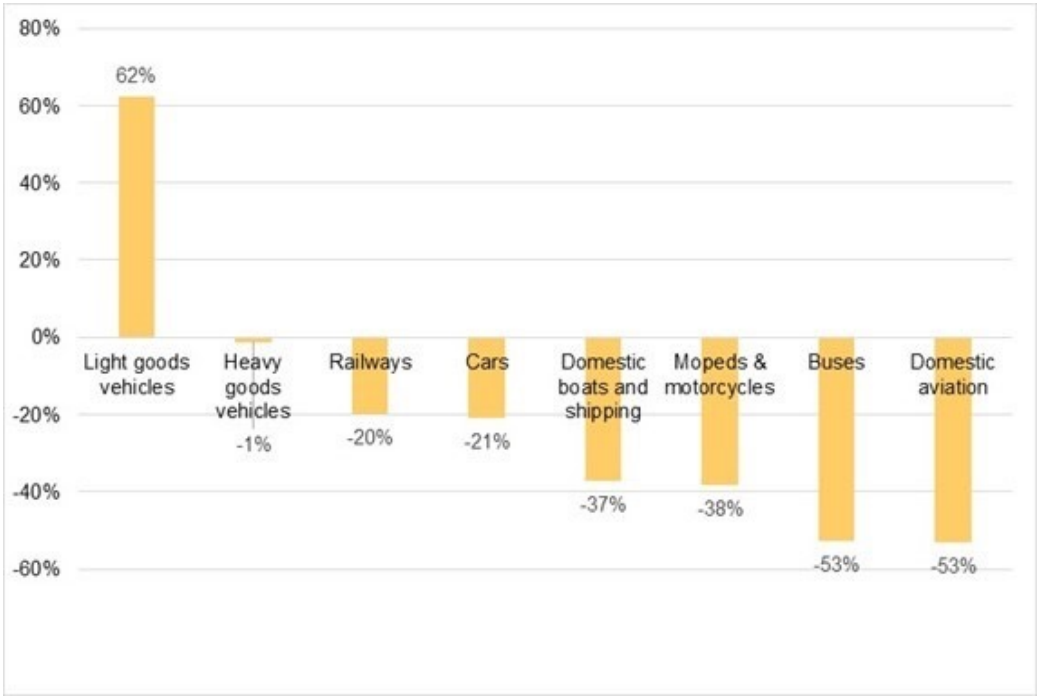
University of Westminster

Cambridge 4th-5th December 2023

Change in **total GHG emissions** in the UK by mode and vehicle type, 1990-2021

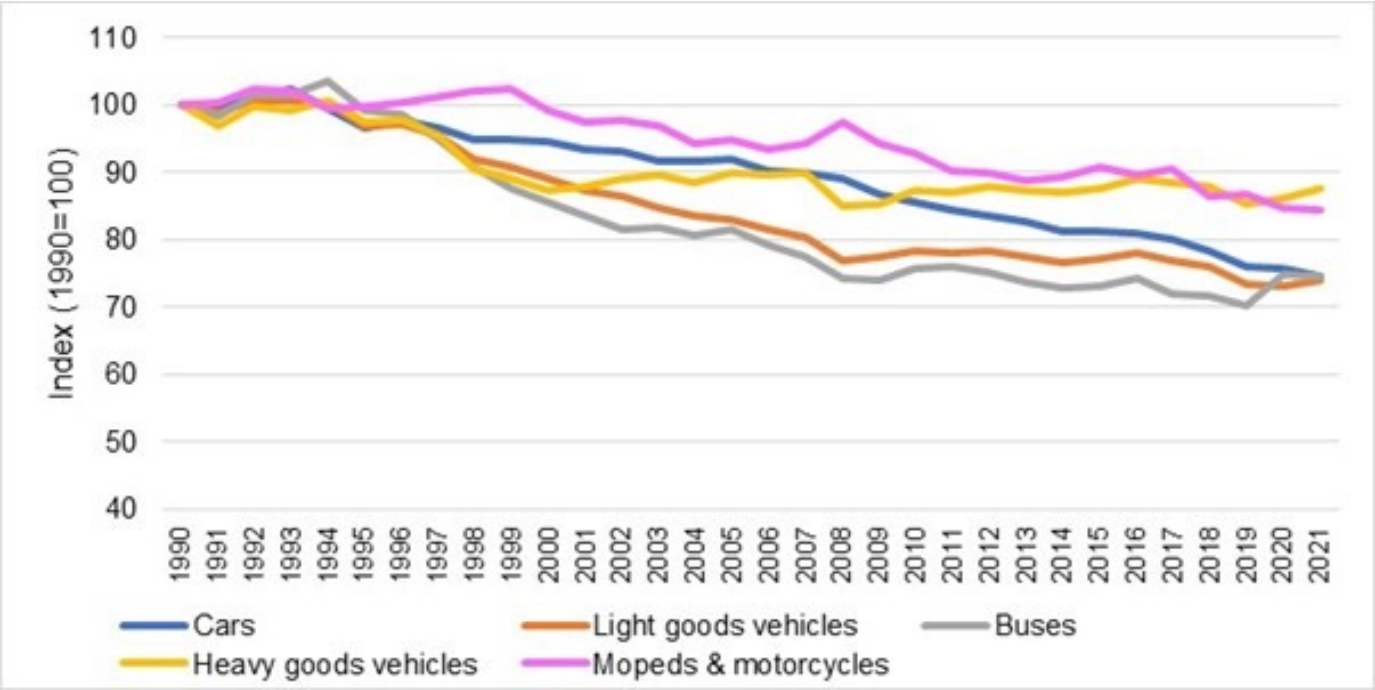




Performance of **total UK domestic transport GHG emissions** by LGVs & HGVs worse than all other transport modes 1990-2021

Source: calculated from data in BEIS, 2023.

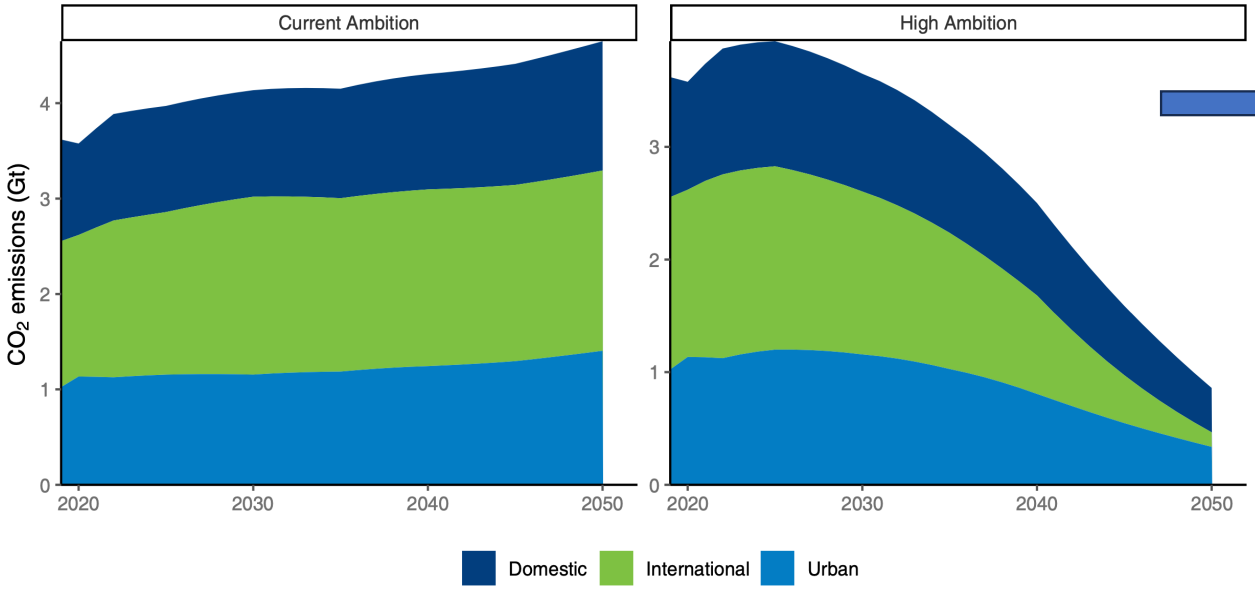
GHG emissions per vehicle kilometre travelled in the UK by road vehicle type, 1990-2021 (index 1990=100)



- Performance of HGVs poor over last 10 years in terms of **GHG emissions per vehicle km**
- Possible causes:
  - Continued shift to larger, heavier vehicles
  - Poor operational performance

Source: calculated from data in BEIS, 2023; Department for Transport, 2022.

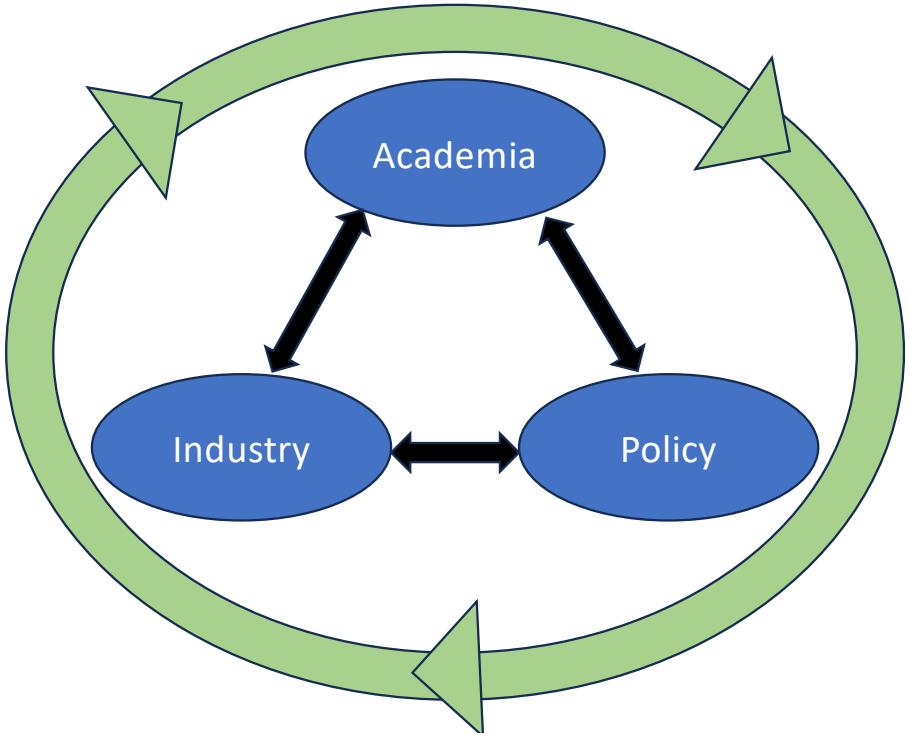
ITF emissions projections from freight transport, 2019-50



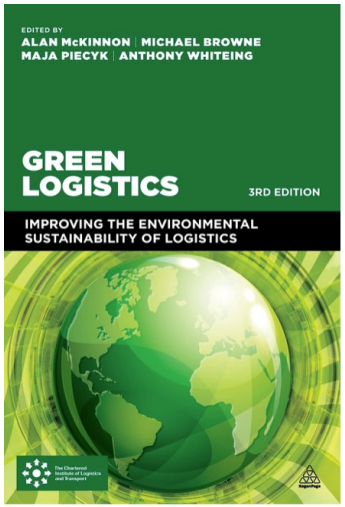
Note: Figure depicts ITF modelled estimates. Current Ambition (CA) and High Ambition (HA) refer to the two main policy scenarios modelled, which represent two levels of ambition for decarbonising transport. International: between national borders; Domestic: non-urban, within national borders.

Source: ITF Transport Outlook 2023

All stakeholders need to intensify efforts to decarbonise freight transport sector.



Green logistics framework



Legend:

- Aggregates
- Key parametres
- Determinants

Weight of goods produced / consumed

↓

Road tonnes-lifted

↓

Road tonne-kms

↓

Total vehicle kms

↓

Fuel consumption

↓

GHG emissions

- Modal split
- Handling factor
- Length of haul
- Lading factor
- Empty running
- Fuel efficiency
- GHG intensity of fuel

- Supply chain structure
- Efficiency of vehicle routeing
- Vehicle carrying capacity
- Vehicle utilization on laden trips
- Level of backhaulage
- Fuel management
- Timing of deliveries
- Alternative fuel options

- Use load-matching services
- Promote collaborative initiatives
- Explore backloading opportunities in purchasing negotiations
- Increase ratio of trailers to tractors
- Include backloading in CVRS
- Use telematics to increase vehicle visibility
- Consolidate return of handling equipment & packaging
- Relax delivery schedules to permit backloading

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Forecasting the carbon footprint of road freight transport in 2020

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Carbon footprint of road freight transport in Great Britain now and in 2020.

	Current situation	2020 BAU
Total tonne-kms (billion)	255	325
Share of road (%)	64	60
Road tonne-kms (billion)	161	195
Lading factor (%)	57	64
Empty running (%)	27	22
Average length of haul (km)	87	86
Tonnes lifted (billion tonnes)	1.9	2.3
Average load (tonnes)	9.8	11.1
Laden vehicle kilometres (billion)	16.3	17.5
Total vehicle kms (billion)	22.4	22.4
Projected change in fuel efficiency (%)		+5
Fuel efficiency (mpg)	8.7	9.1
Fuel efficiency (l/km)	0.32	0.31
Projected change in carbon intensity of fuel		−5%
Conversion ratio (kg CO_2/l of fuel)	2.63	2.50
Total fuel consumption (billion litres)	7.3	7.0
Total CO_2 emissions (million tonnes)	19.3	17.4
Percent change from current level (%)		−10

2006

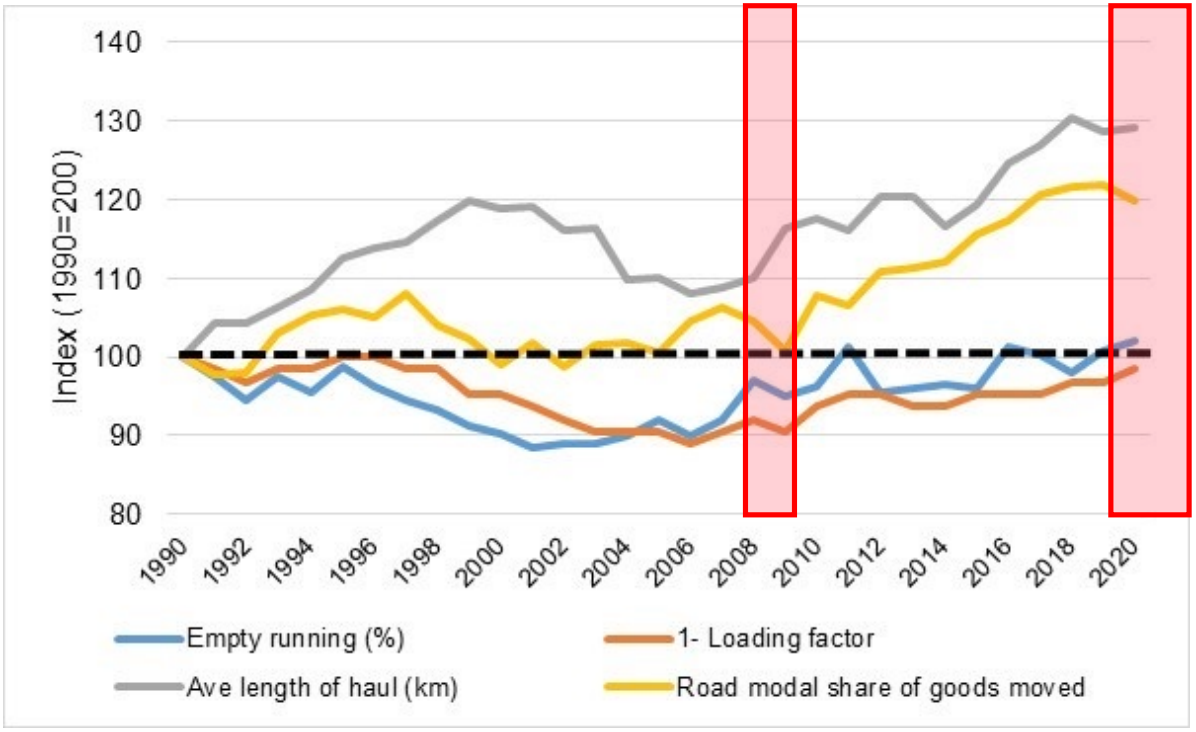
- Green Logistics project (2006-2010)
- Seven focus group discussions (58 experts)
- Large-scale Delphi survey (100 / 65 responses)

2006	2019	2020
22.6	20.3	19.3
	-10%	-15%

Million tonnes

Source: DfT 2023, Table ENV0201

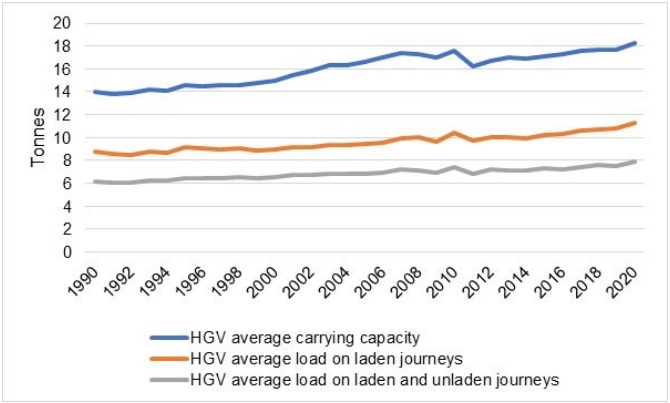
Domestic HGV operating metrics in the UK by GB-registered vehicles, 1990-2020



	2006	2020 F	2019	2020
Share of road	64%	60%	79%	77%
Empty running	27%	22%	30%	30%
Loading factor	56%	64%	61%	62%
ALH (kms)	86	86	107	107

Offset by:

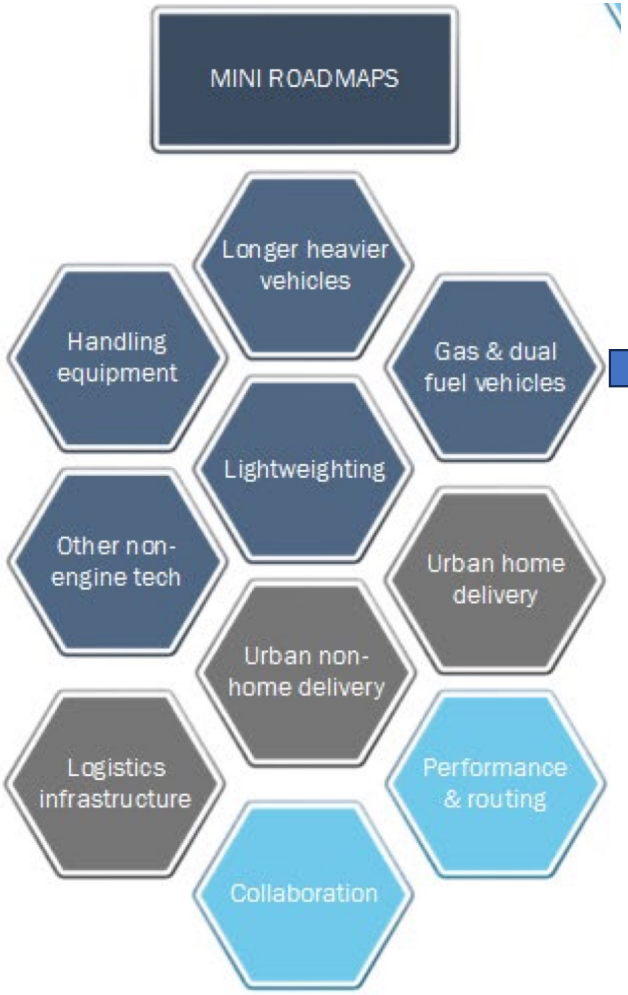
- Decrease in total tonne-kms (all modes)
- Increase in average weight of HGVs and hence loads carried
- Reduction in total vehicle kms
- Improvements in fuel efficiency & carbon intensity



Three out of four main operating metrics for HGVs in UK have worsened over last 10 years.

Source: calculated from data in Department for Transport, 2021.

Roadmapping project (ca.2012/13)



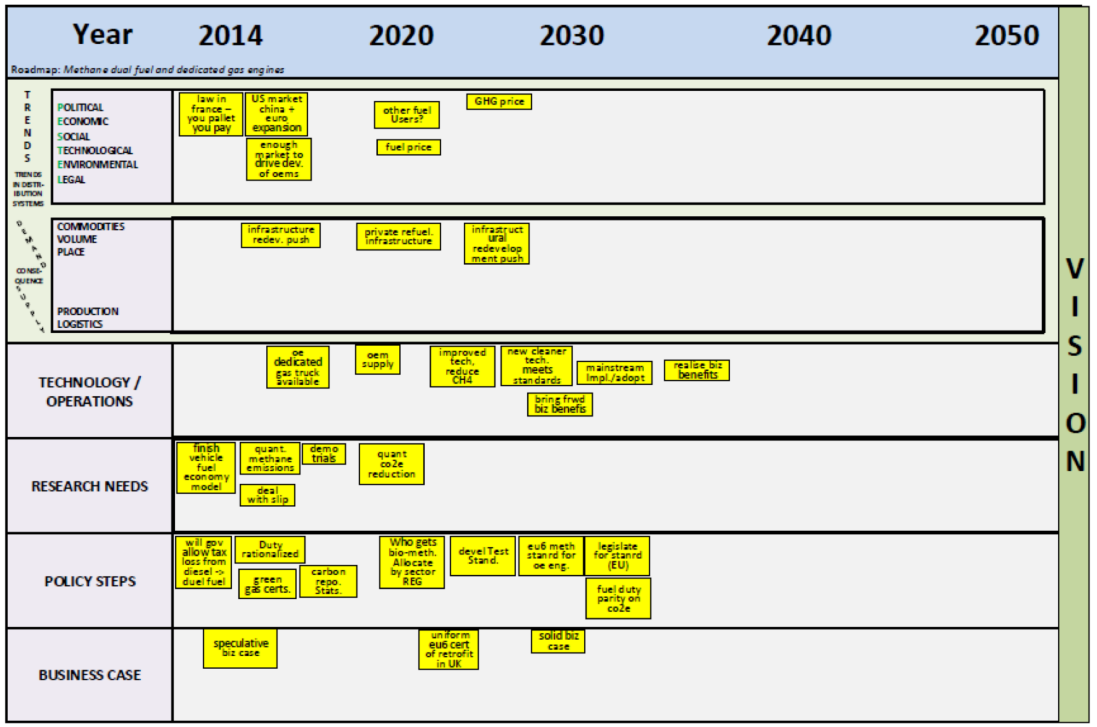
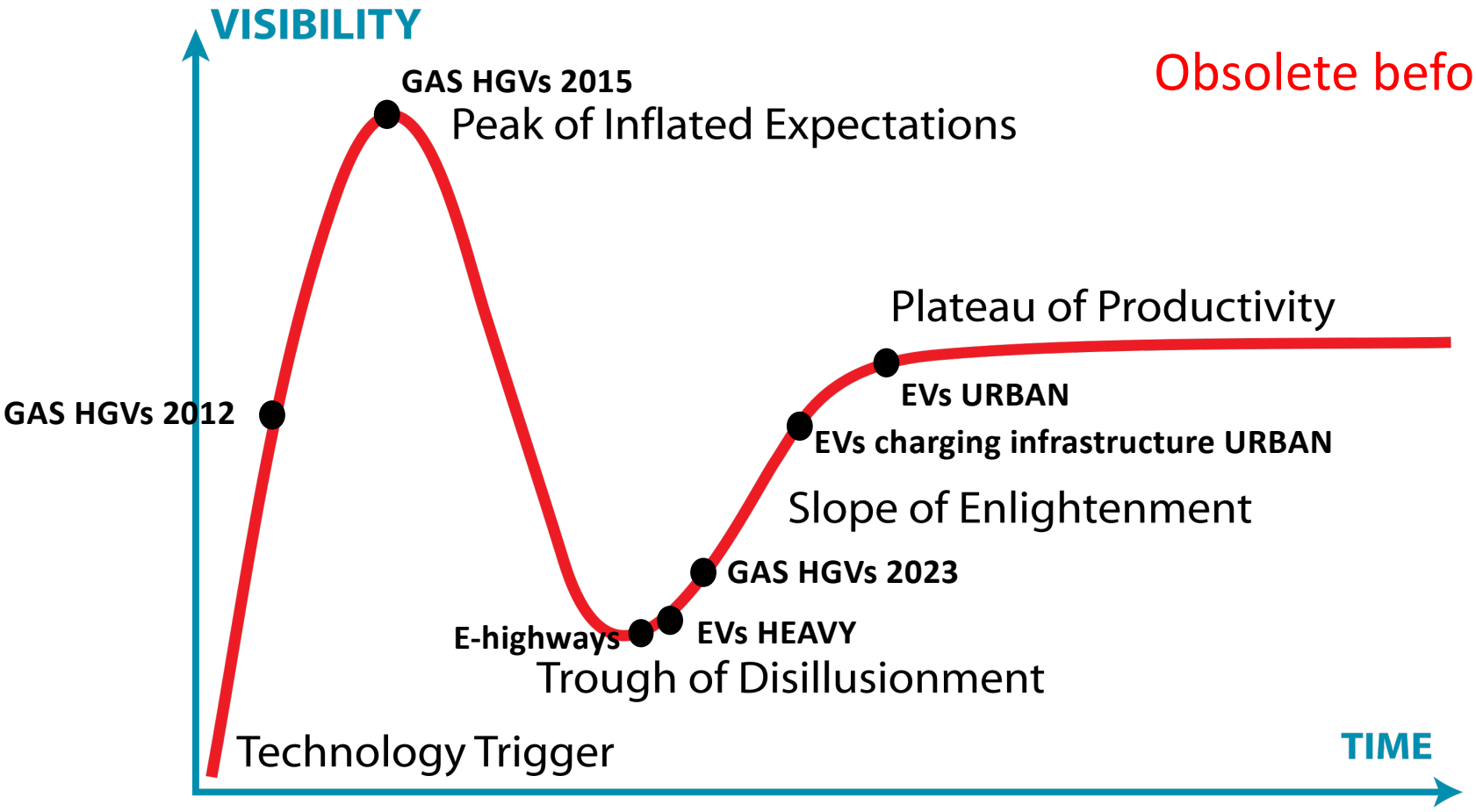


Figure 7. Gas and dual fuel roadmap.

EVs & hydrogen included in modelling ca.2015

Gartner Hype Cycle

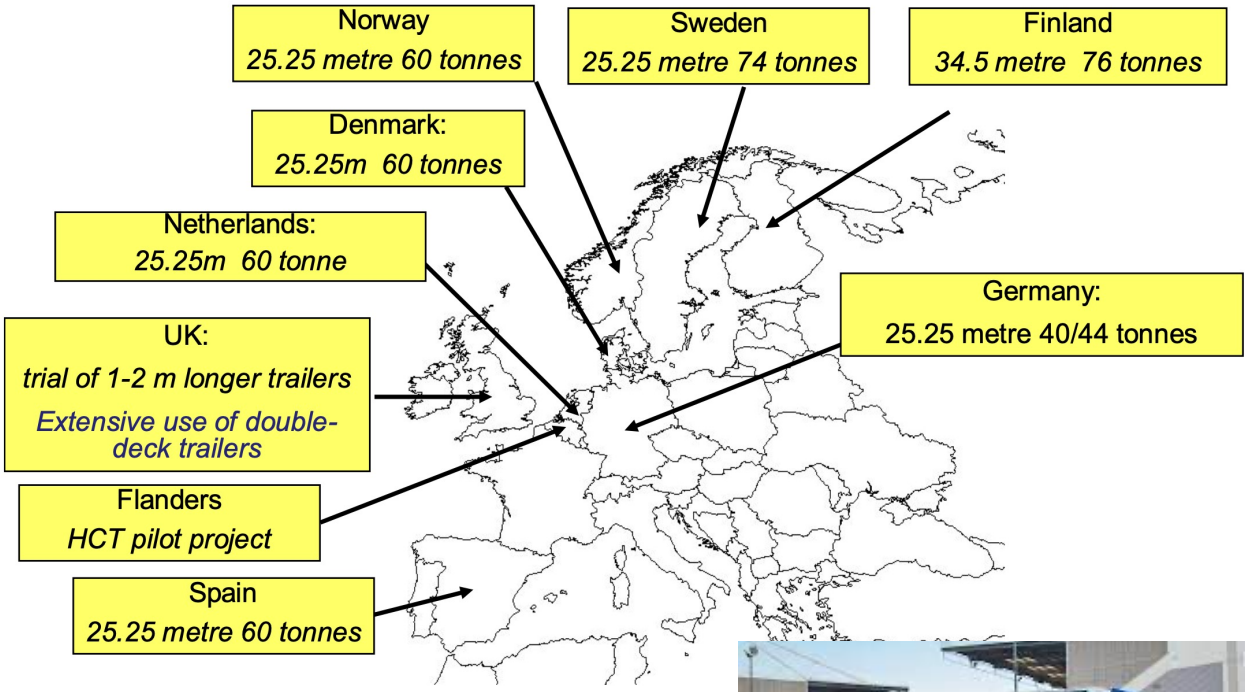


Obsolete before plateau?

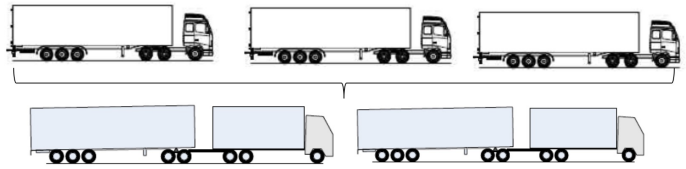
Note: Background image from Wikipedia

Longer, heavier (& higher) vehicles

increases in truck size and /or weight limits since 2013



Source: McKinnon A. (2023)



Load consolidation cuts truck-kms, fuel use, emissions, accidents and labour demands

Net CO_2 savings even after allowance made for modal shift and induced traffic

https://bit.ly/30JBCKf

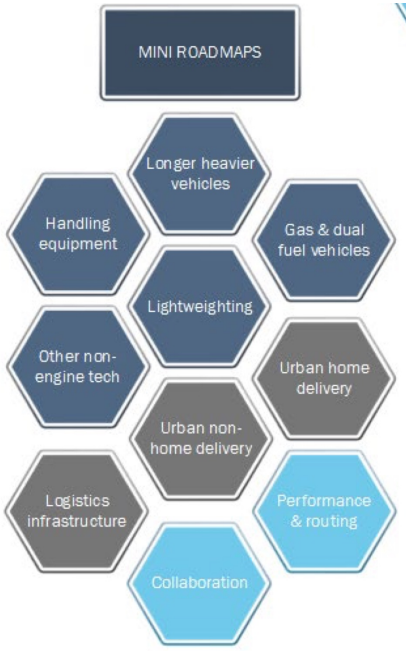
Case study

48% reduction in CO_2 emissions

Example: collaboration

Functional factors affecting road freight demand.

What will be the uptake of the following management practices by 2020 relative to today? (where −2=much less and 2=much more)	**Mean (round 1)**	**Mean (round 2)**	**Reduction of standard deviation (%)**
Use of telematics	1.4	1.4	−10
Use of vehicle routing and scheduling systems	1.3	1.4	0
Logistical collaboration between companies	1.3	1.4	−4
Integration of production and distribution	0.8	0.8	0
Matching of vehicle fleet to transport demands	1.0	1.1	−16
Investment in double-deck/high-cube vehicles	1.2	1.3	−8
Use of vans for deliveries	0.7	0.7	−1
Backloading of vehicles	1.2	1.3	1
Focus on service quality rather than costs	0.5	0.5	−13



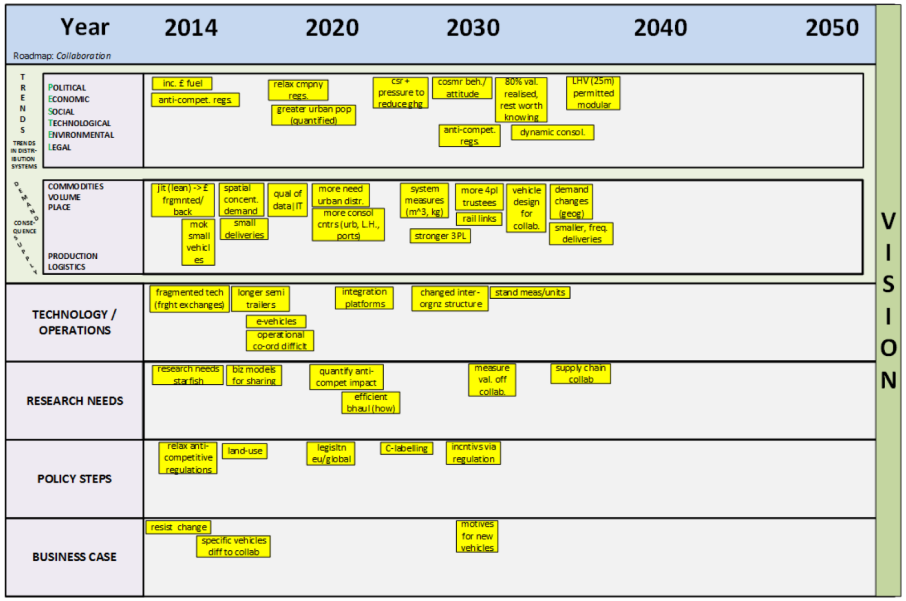
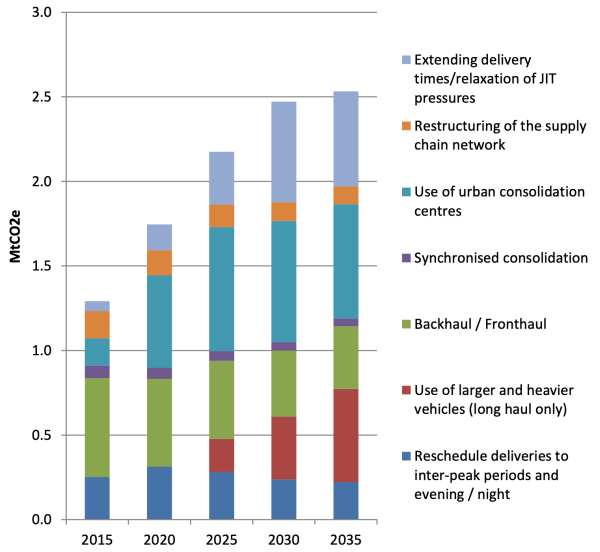


Figure 10. Collaboration roadmap.

Figure 2: Modelled CO_2 savings from logistics measures – central take-up



NOW

2050

TESCO

United Biscuits

Nestlé

Late 1990s
Supplier collection programme

2007
Shared distribution

Vertical collaboration

Horizontal collaboration

Starfish I

FTC 2050
FREIGHT TRAFFIC CONTROL

Starfish II

CityLab

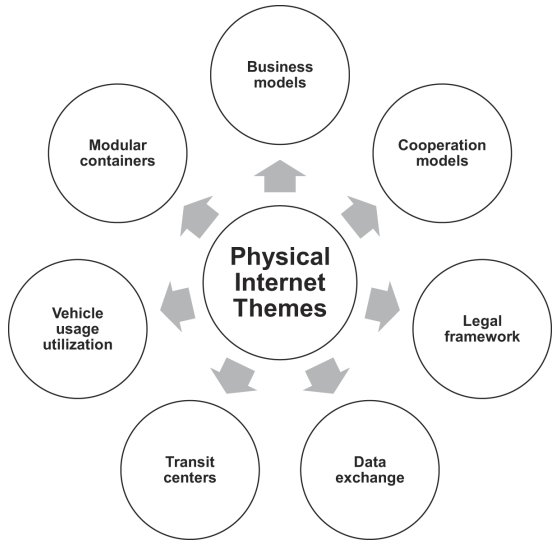
Starfish III

LOGISTAR

and many more…

Multilateral collaboration

?



Source: Treiblmaier et al. 2020

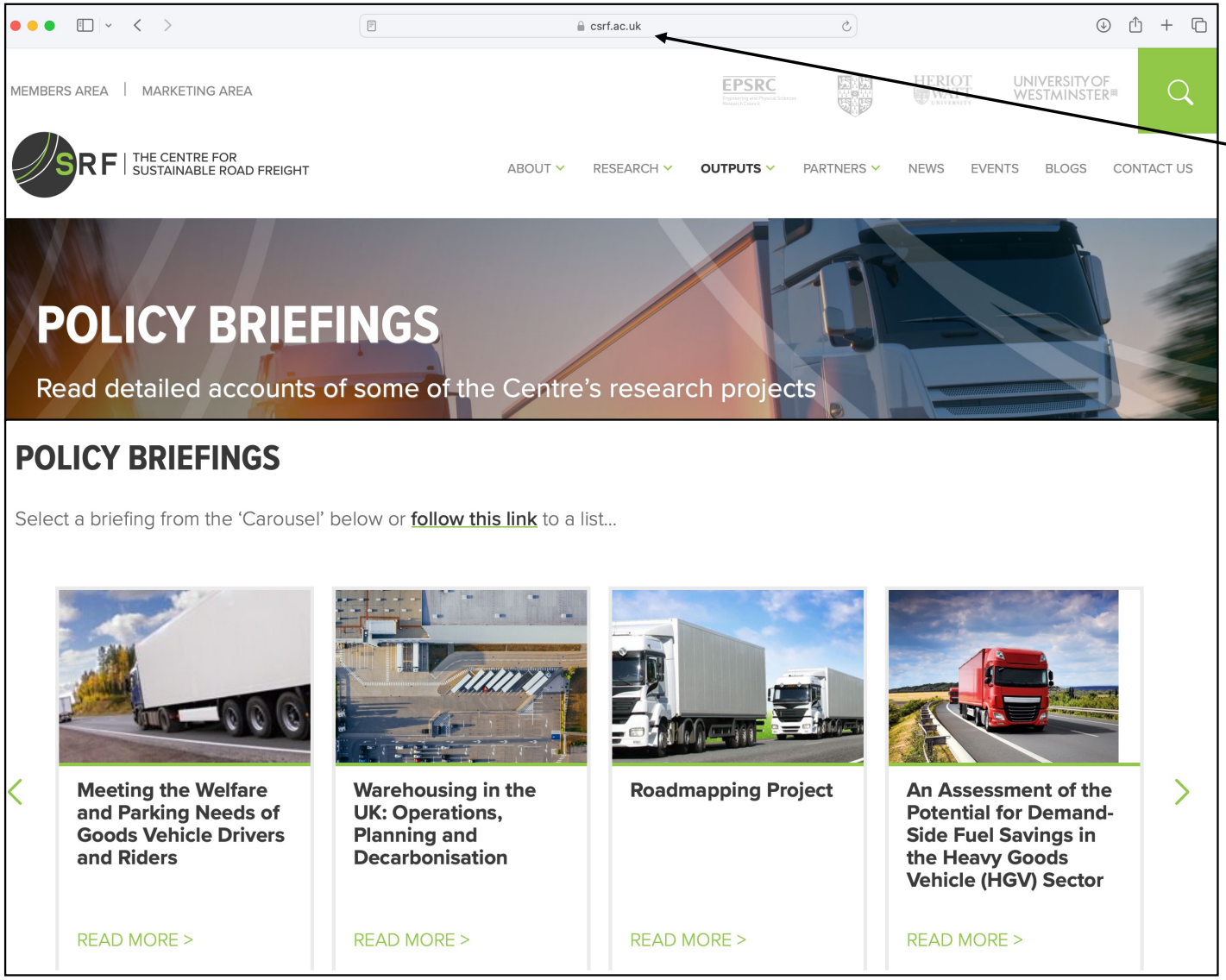
Final thoughts

- Methods utilizing collective knowledge and expertise can generate reliable high-level projections of the future
  - Detailed predictions are more difficult
  - Black swans likely to be missed when consensus is sought
  - How do we move on from BAU to Optimistic Scenarios?
- What are the key lessons from decarbonisation experiences so far, and how can we use them to do better in future?

Two forthcoming reports:

- Allen J. & Piecyk M., **Analysis of the Approach Taken by Government in Decarbonising Freight Transport and Logistics in the UK**, Centre for Sustainable Road Freight, London

- Allen J. & Piecyk M., **Analysis of Freight Transport and Logistics Decarbonisation in the UK: Achievements to Date and the Challenges Ahead**, Centre for Sustainable Road Freight, London



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