Magyar Közlekedéstudományi és Logisztikai Intézet

Alapítva - Since 1938

Investigation of the modal shift of road freight transport to rail and inland waterways

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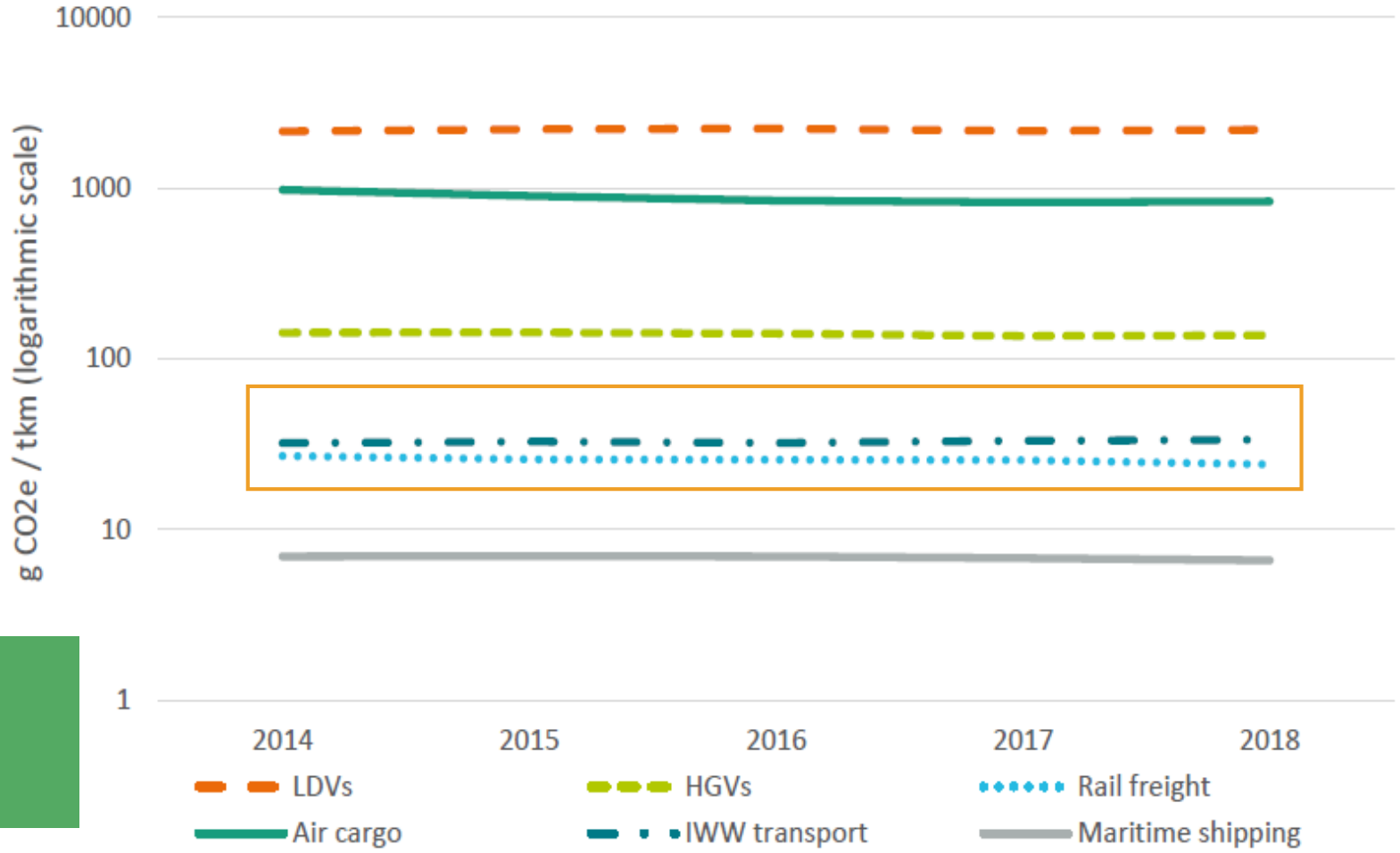
Project goal

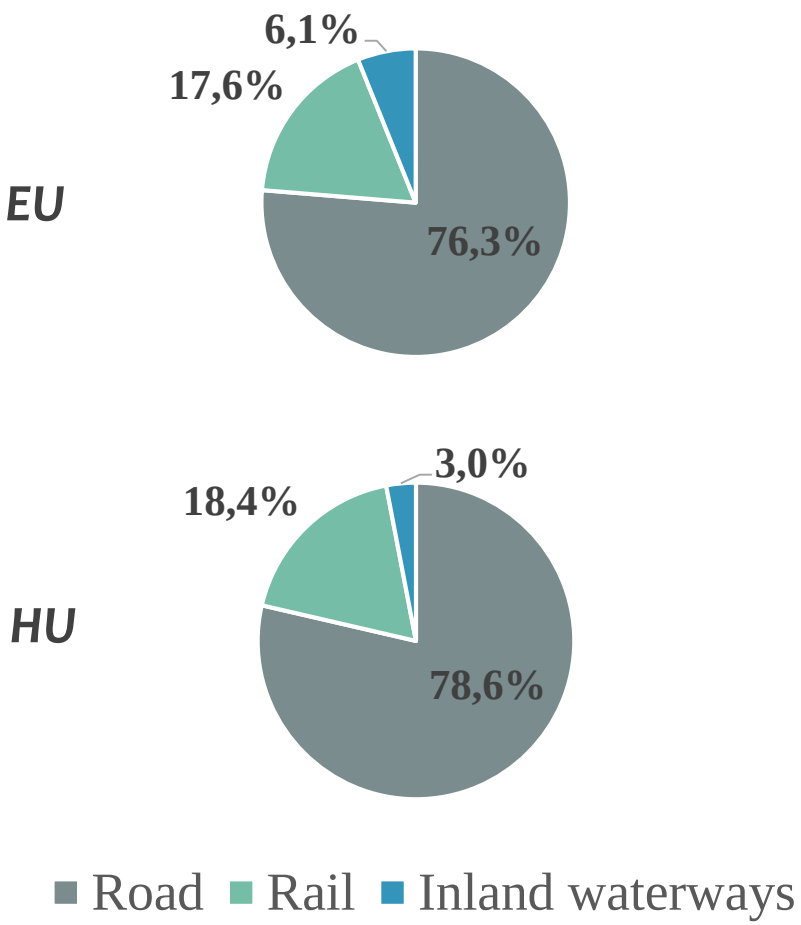
- Promotion of more energy-efficient and environmentally-friendly transportation modes
- Exploration of incentivizing and constraining (pull/push) factors, based on which recommendations can be made for governmental bodies.

Source: Fraunhofer Institute for Systems and Innovation Research (2020) Methodology for GHG Efficiency of Transport Modes

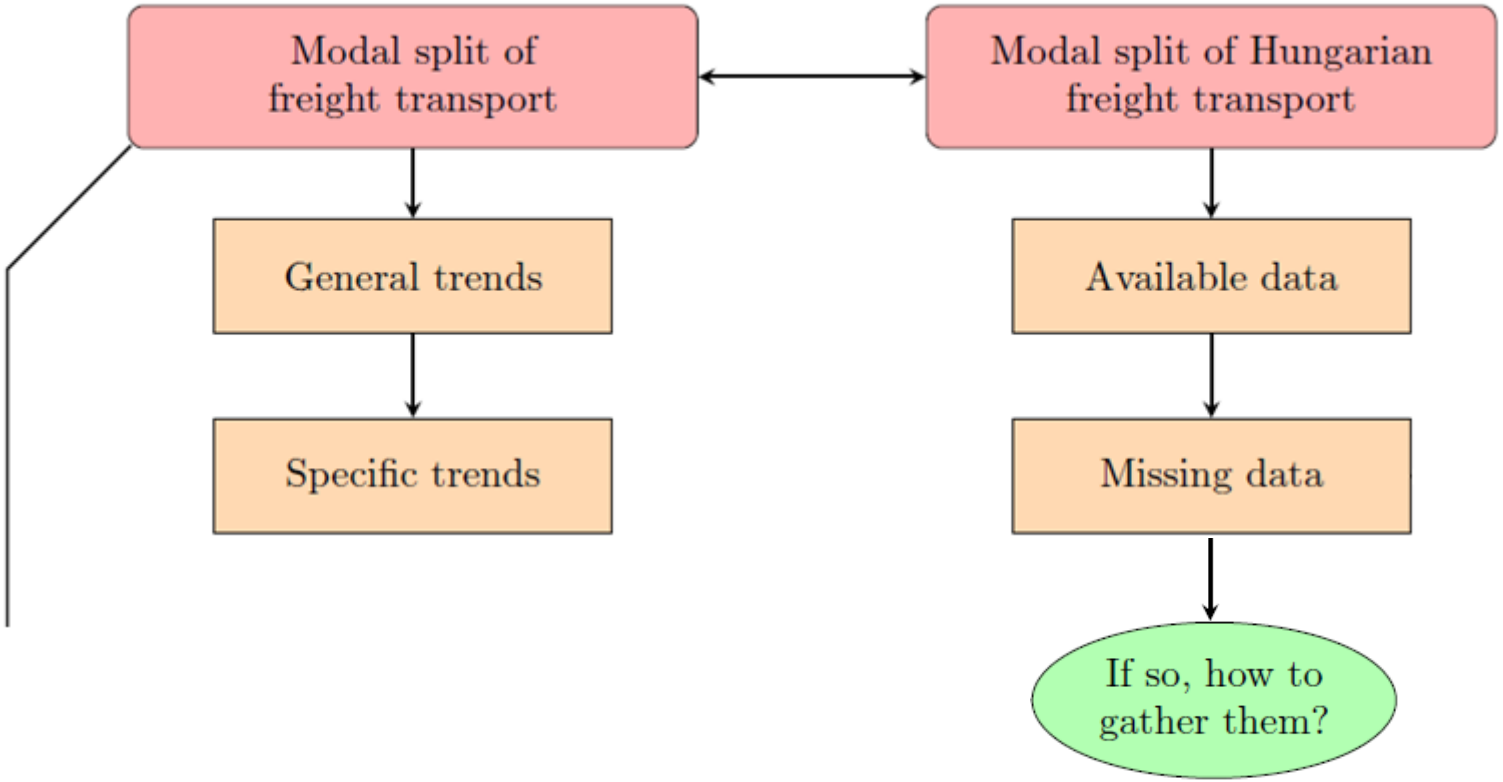
The values of greenhouse gas emissions (CO2e) related to cargo transportation, by transportation mode, per tkm, from 2014 to 2018.



Methodology (part 1 of 3)

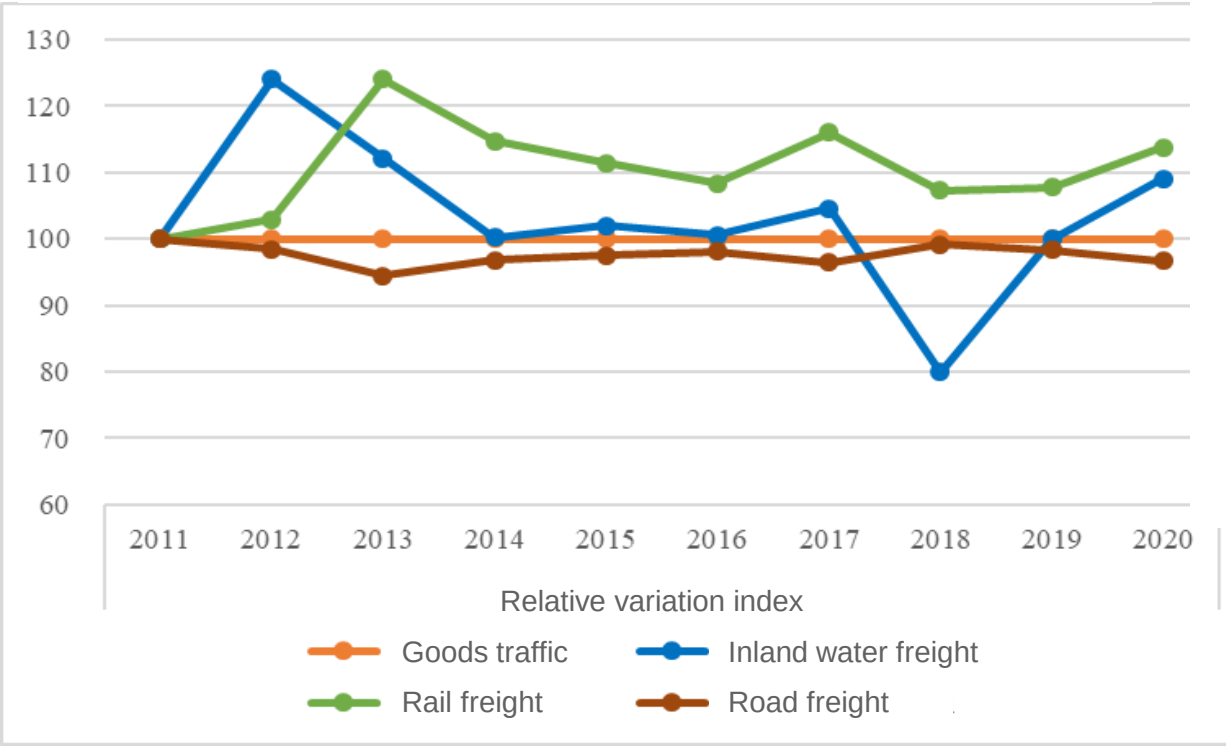


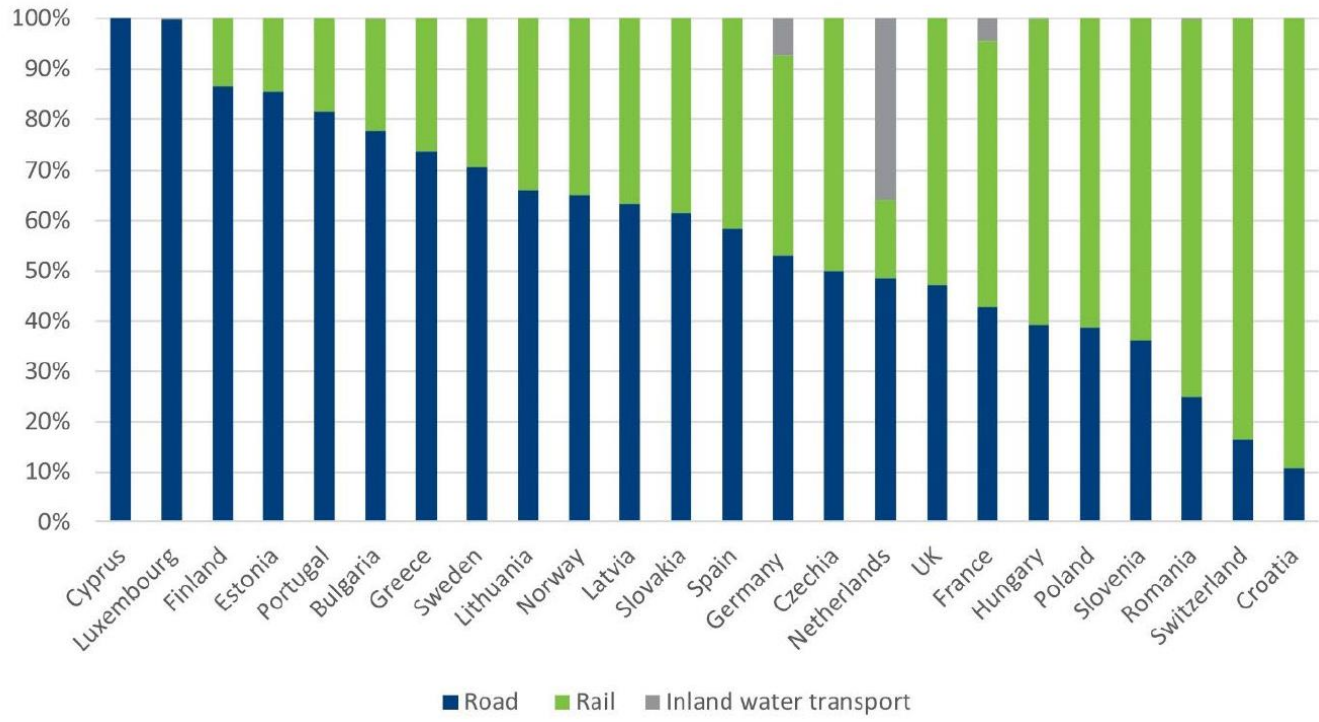
Literature research, statistical analysis, identifying freight forwarding practice



Typical practices of transporting goods

The relative variation index of each mode of goods traffic (thousand tonnes) in the EU 2011-2020
(source: own edition based on EUROSTAT data)

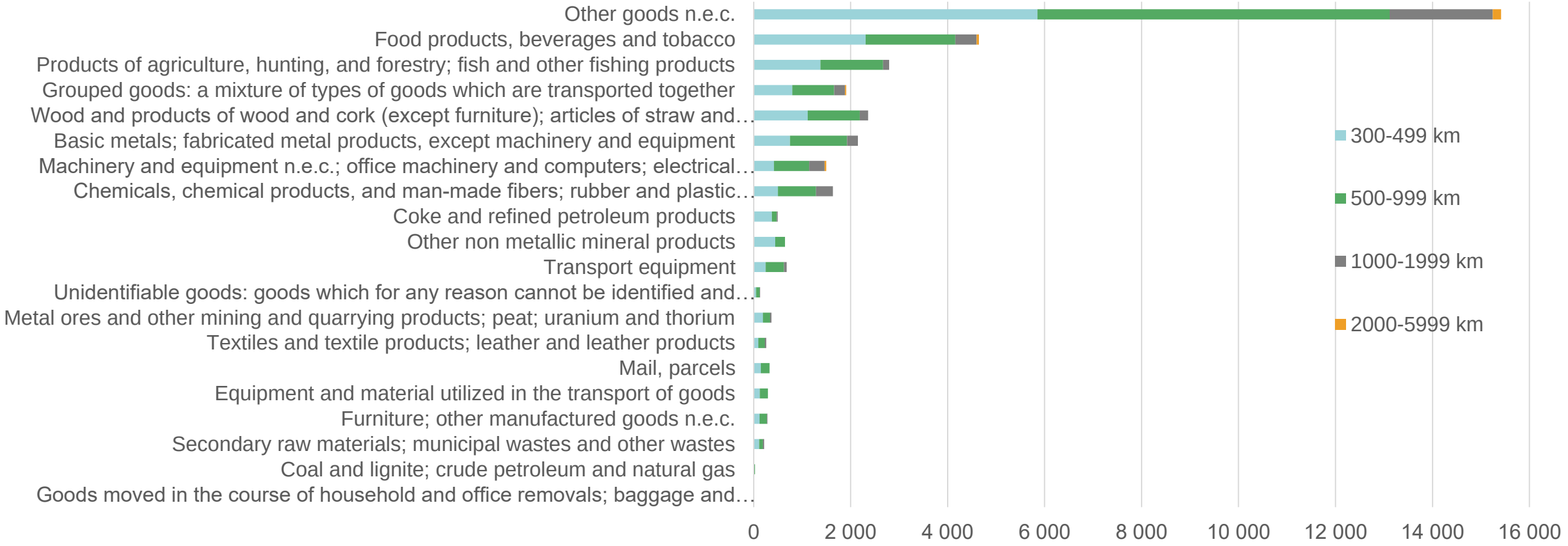




Freight transport modal split (tkm) in 2019 *(ITF 2022)*

Goods transported over long distances by road

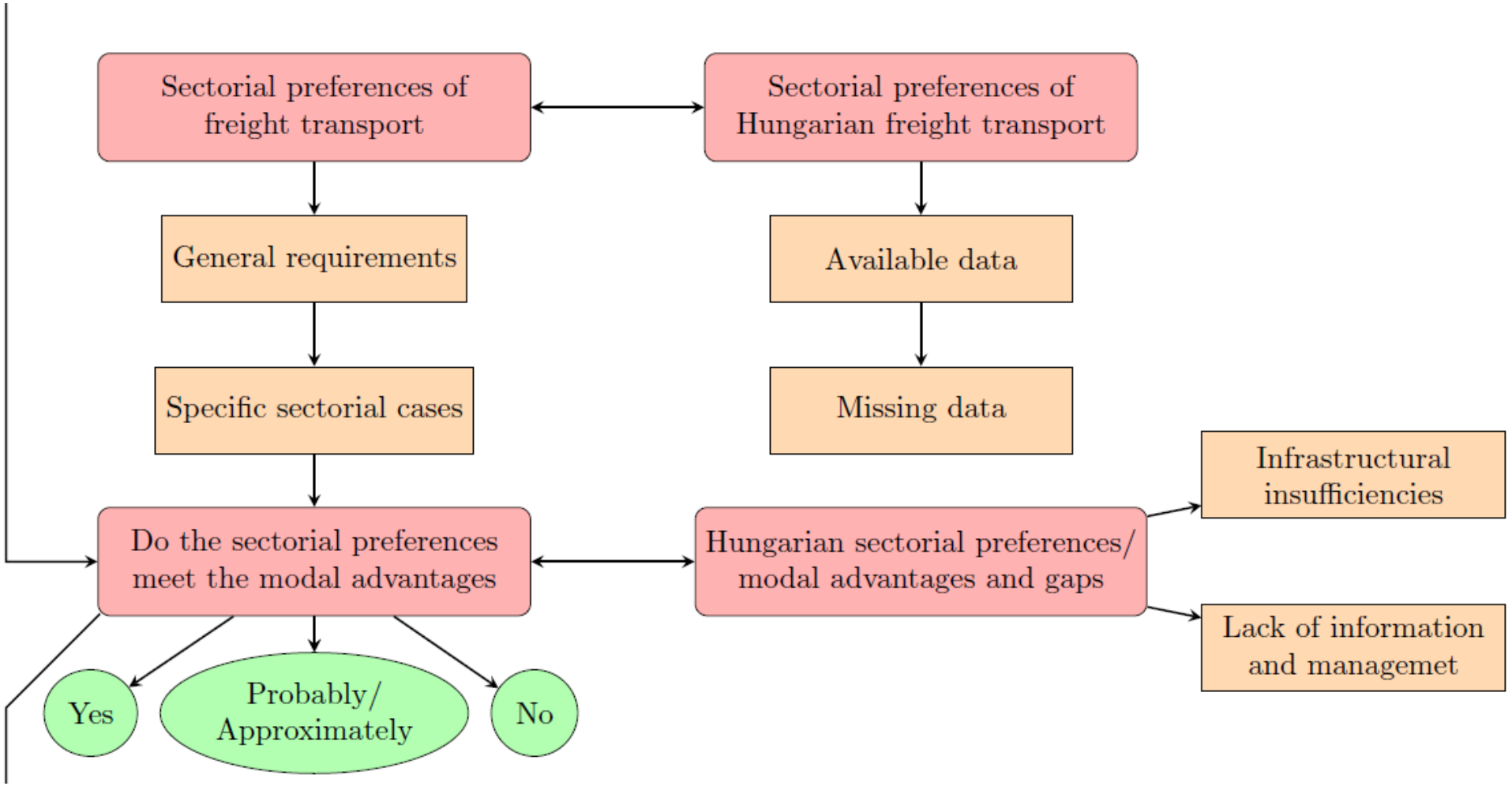
Road freight transport volume (thousand t) over 300 km in 2022 *(Source: own edition based on EUROSTAT data)*



300-499 km	500-999 km	1000-1999 km	2000-5999 km	Total (thou t)	Ratio
15 018	16 677	4 164	280	226 448	16,0%

Methodology (part 2 of 3)

Involving logistics/freight transportation professional organisations to uncover preferences.



Ranking of mode selection criteria

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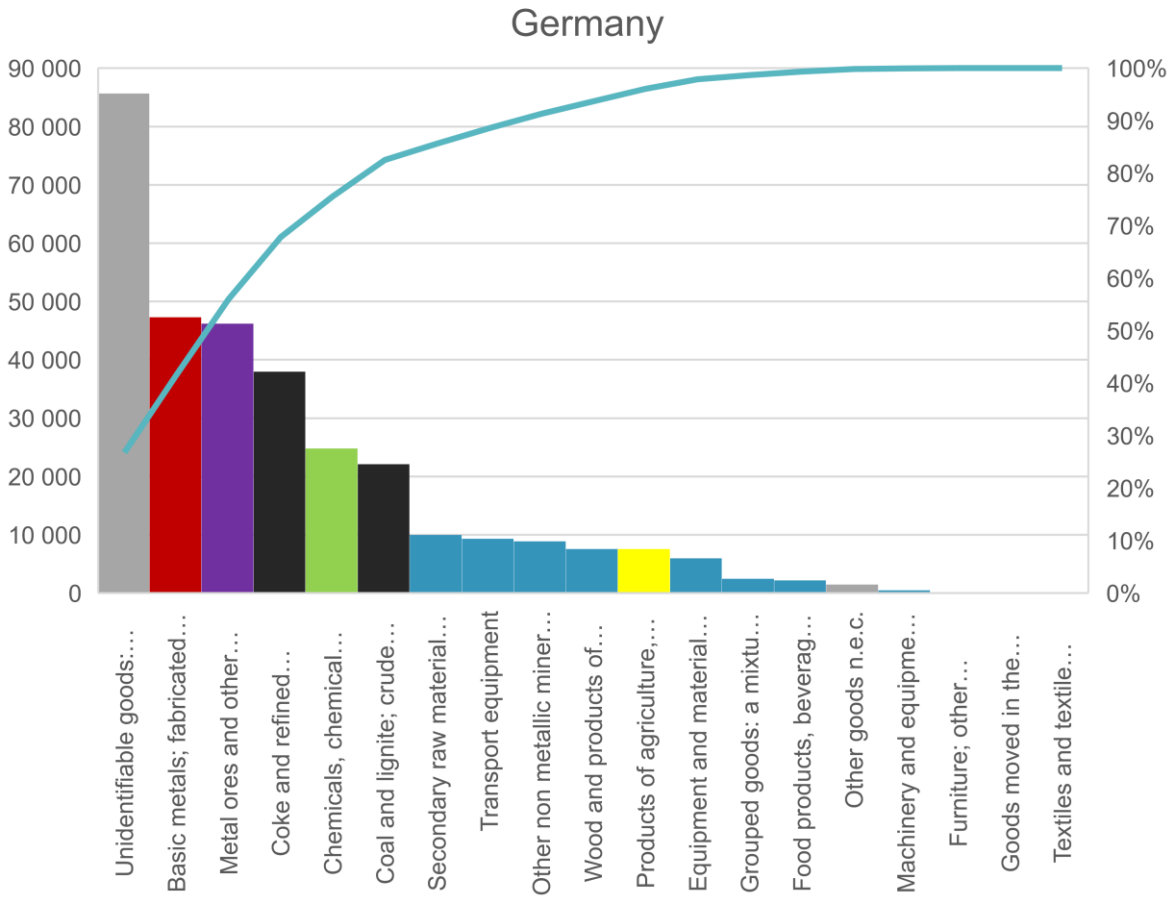
According to the customers, the most important criteria were **cost, reliability, speed, and service quality**.

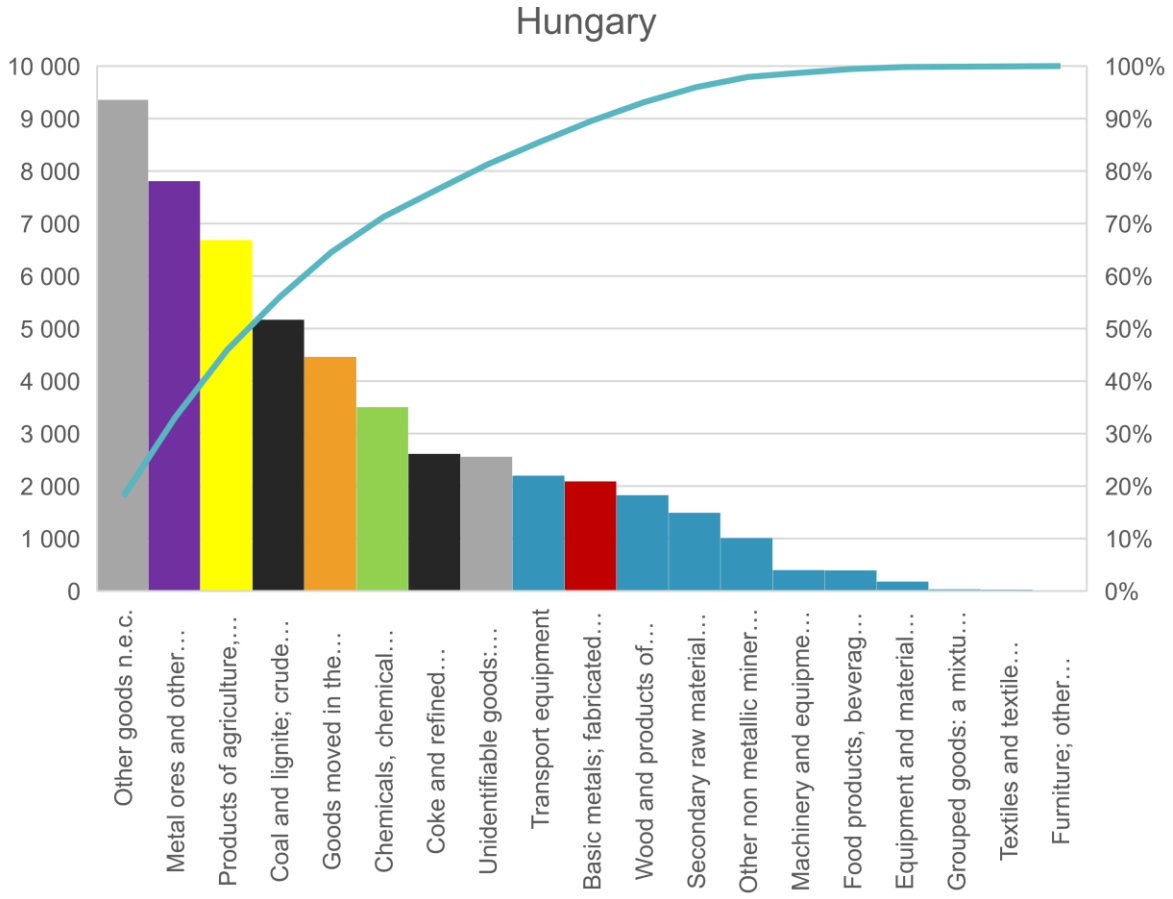
Importance of criteria (rank)	Electronics industry	Pharmaceutical industry	Machine manufacturing	Construction industry
1	Quality	Speed	Pricing	Pricing
2	Speed	Comfort	Reliability	Frequency
3	Pricing	Safety	Accuracy	Accuracy
4	Comfort	Information flow	Speed	Comfort

Ranking of mode selection criteria by industry sector *(Source: Punakivi, M. & Hinkka, V., 2006)*

Sectorial allocation in the rail freight transport

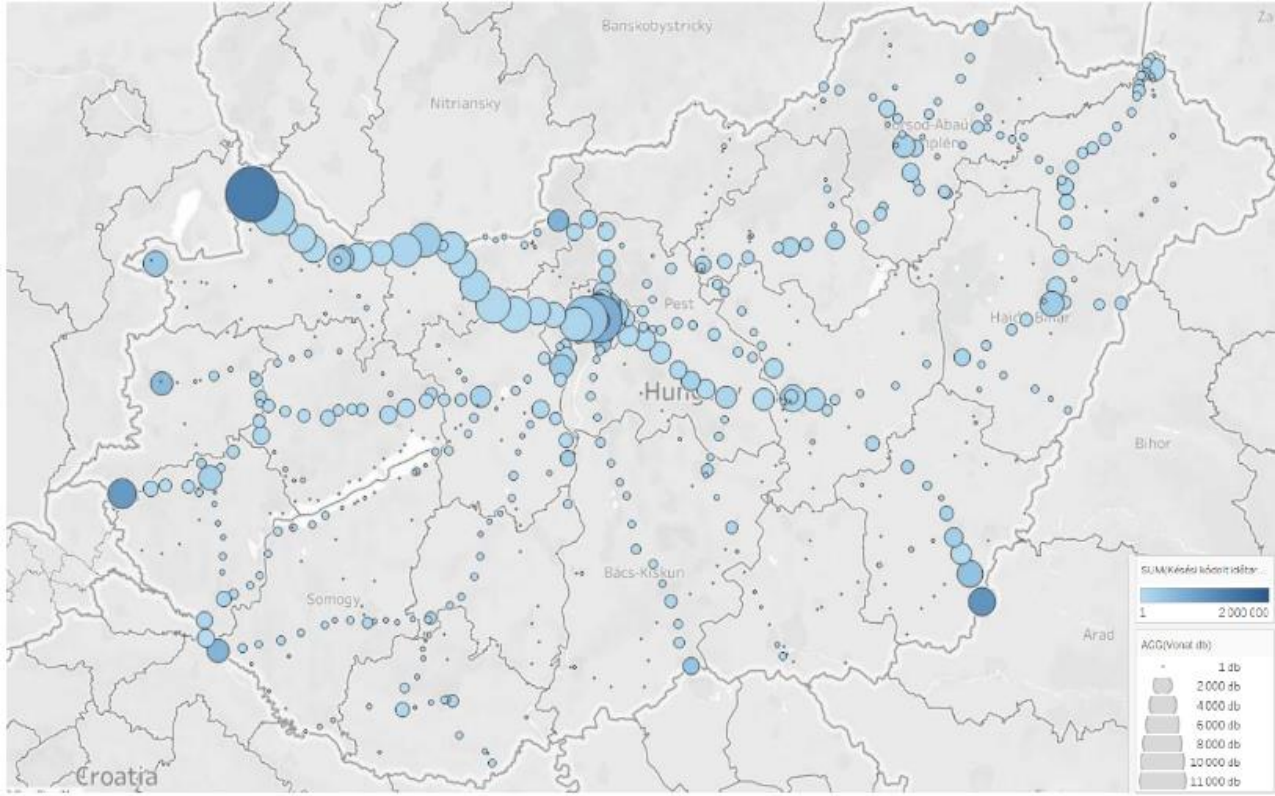
- EU: motor vehicles and parts, mineral fuels and plastics
- HU: metal ores, agricultural products and coal are transported (machinery is transported in tiny amounts)





Railway transport and the automotive industry

- In the automotive industry, **reliability is paramount** because production plans are pre-determined and time-sensitive, and even a short downtime is a huge (monetary) loss.
- Strong transport and economic ties with Germany are both an advantage and a constraint.

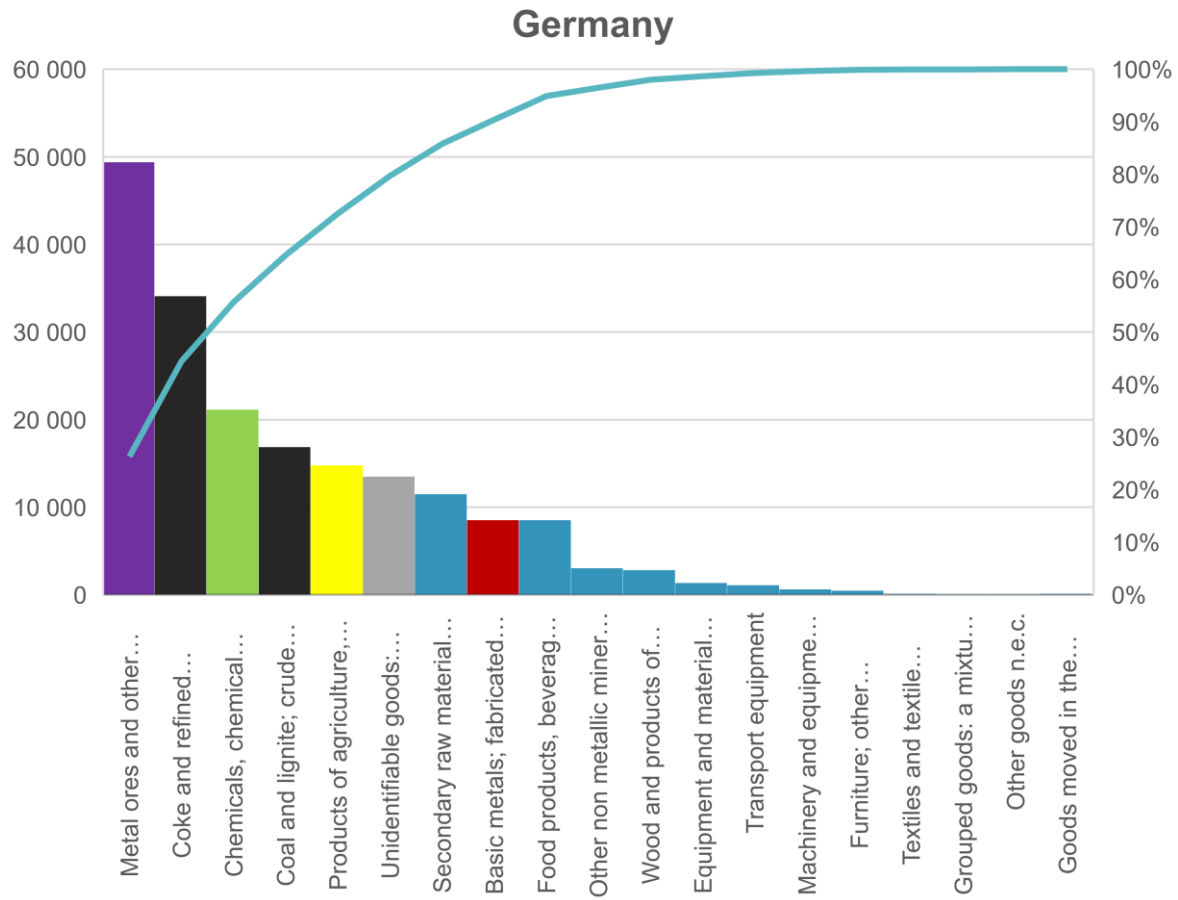


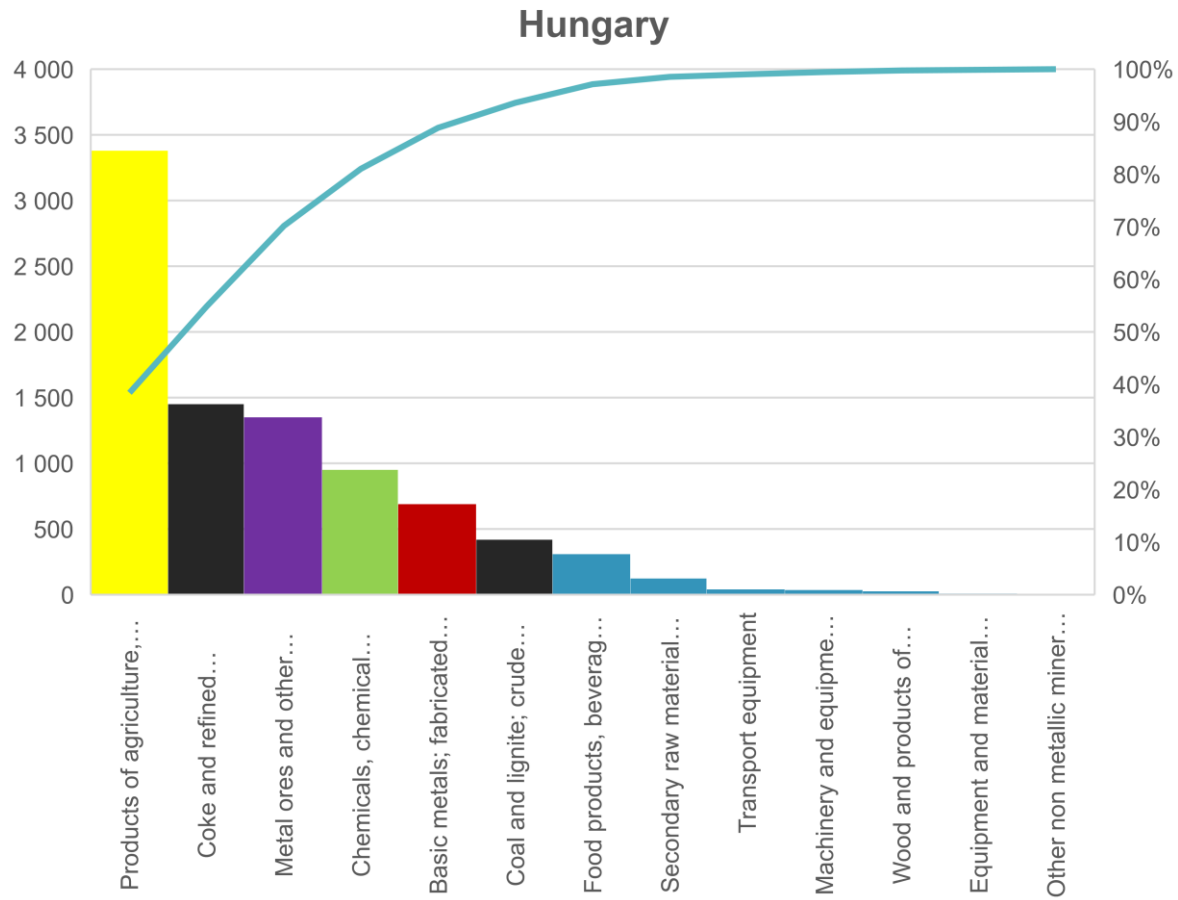
Delay focal points 2020/2021 Schedule period – Freight transport
https://www2.vpe.hu/teljesitmenyosztonzo-rendszer-tor/hipotezis

- The **freight transport is fairly balanced and relatively predictable**.
- It should fit perfectly with rail transport as it is based on time windows and strict timetables.
- In Hungary, passenger transport has increased significantly in recent years, and rail passenger traffic is always a priority. This means that it is extremely sensitive to disturbances, the effects of which can be aggravated and cause significant disruption to freight traffic.

Sectorial allocation in the inland water freight transport

- EU: metal ores, coal, sand, stones, gravel, mineral oil products, and agricultural products (bulk)
- HU: the largest proportion of transport is of agricultural products (mostly cereals).



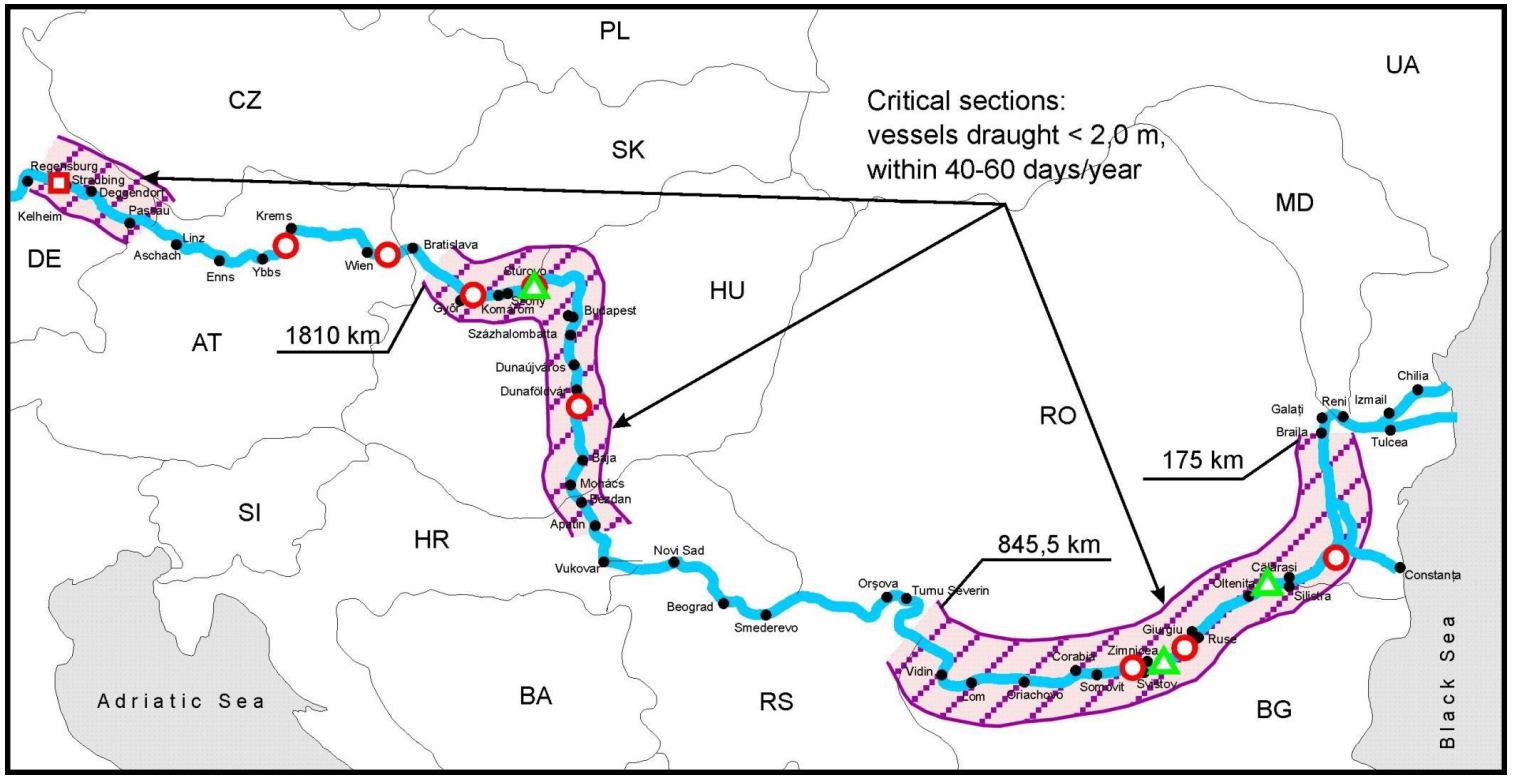


Inland waterways and the agricultural products

- Agricultural bulk products are very **cost sensitive** (shall be low and predictable);
- **Strong seasonality** (transportation must be reliable and flexible);
- Manpower and storage **capacity demand** (need sufficient transport frequency).

Extremely low water levels for longer periods cause problems in:

- Agriculture sector (irrigation) *and key industries:*
- Oil refinery (Százhalombatta)
- Steel factory (Dunaújváros)
- Nuclear Power Plant (Paks)
- and for navigation and freight transport as well.



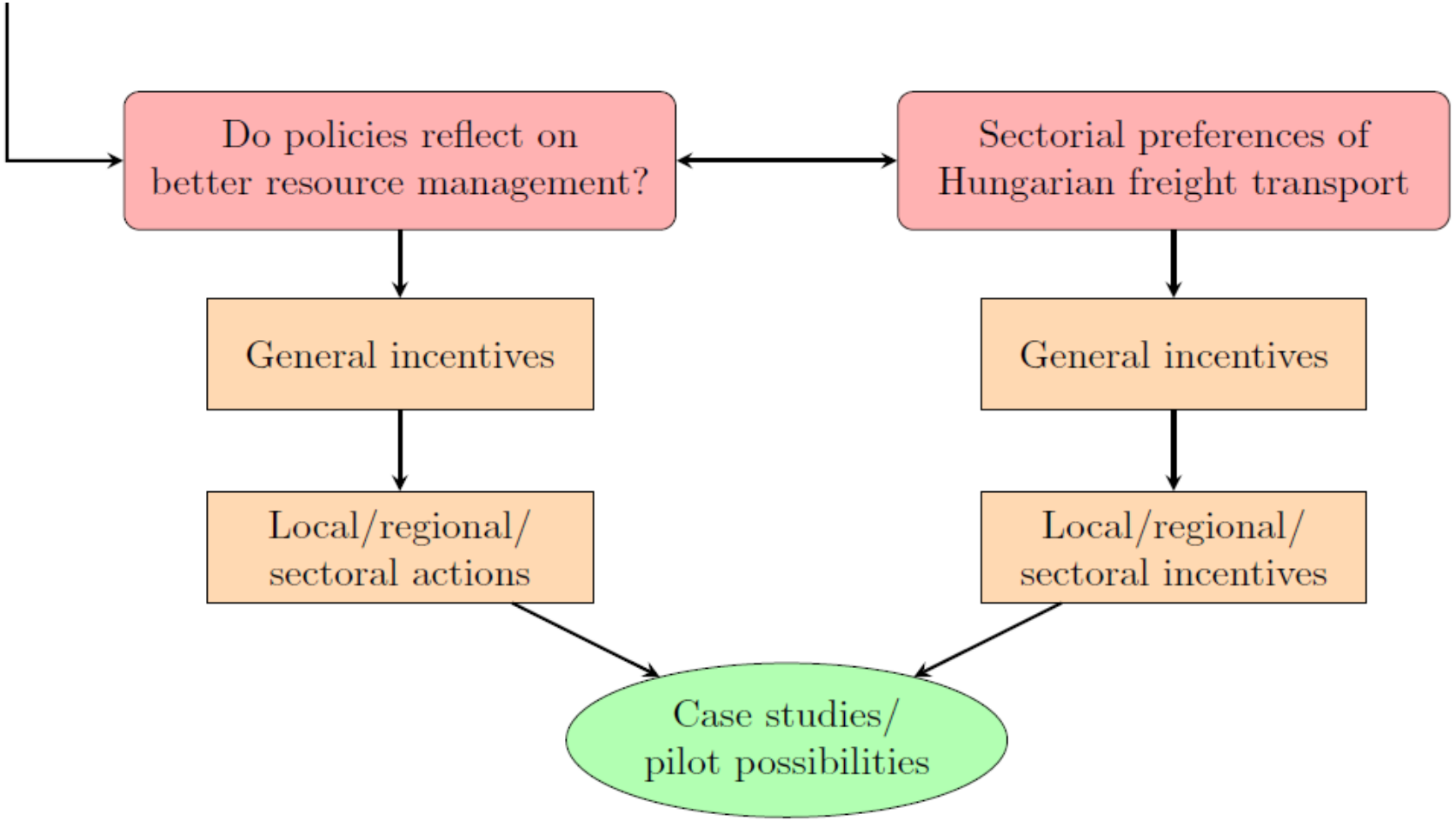
Critical shipping sections on the Danube. Source: BPMMK-MDKSZ

Preferences of sectoral actors

Attributes/ Product type	Products of agriculture	Products of agriculture in Hungary	Machinery and equipment	Machinery and equipment in Hungary
Cost	**Most important**	**Highly important**	**Most important**	**Highly important**
Reliability	Very important	**Most important**	**Highly important**	**Most important**
Transit time	**Highly important**	Very important	Very important	**Highly important**
Flexibility	Important	Important	Important	**Highly important**
Service frequency	Important	**Highly important**	Important	Important
CO_2 emission	Least important	Least important	Least important	Important

Methodology (part 3 of 3)

Definition of policy incentive elements (general/sector specific)

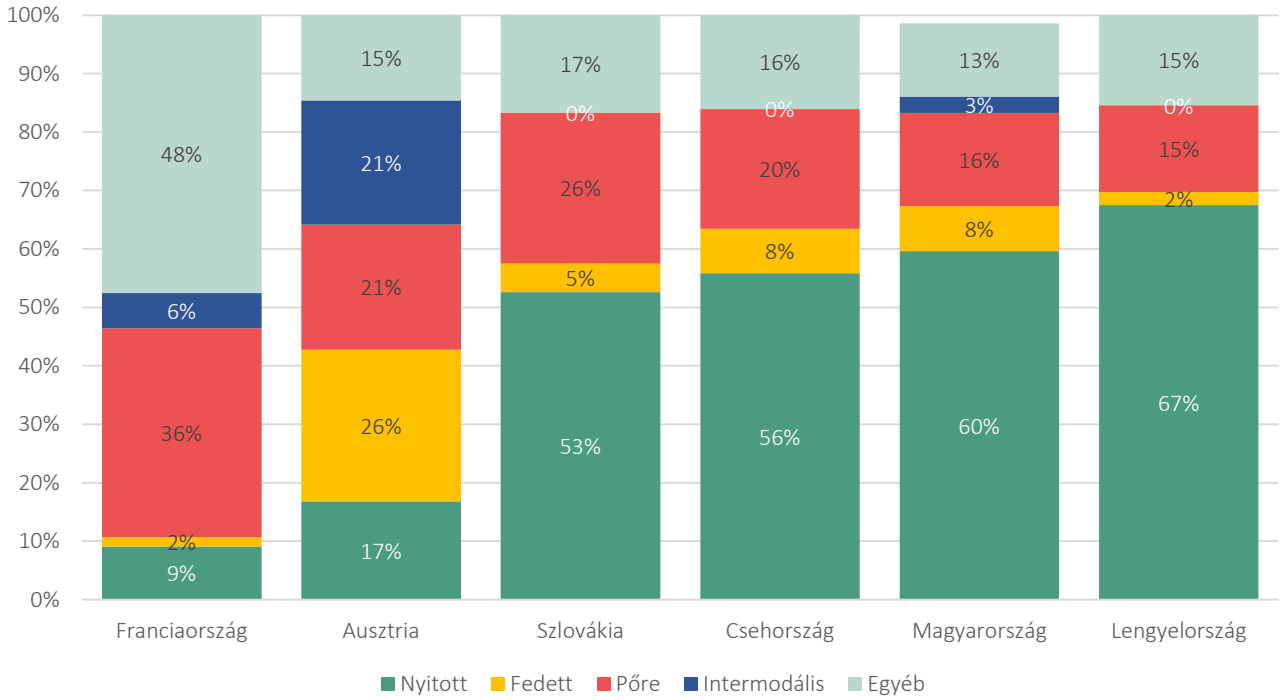


Typical modal share of freight transport in Hungary

Modal share of freight transport (thousand tonnes) in Hungary (based on EUROSTAT data 2022)

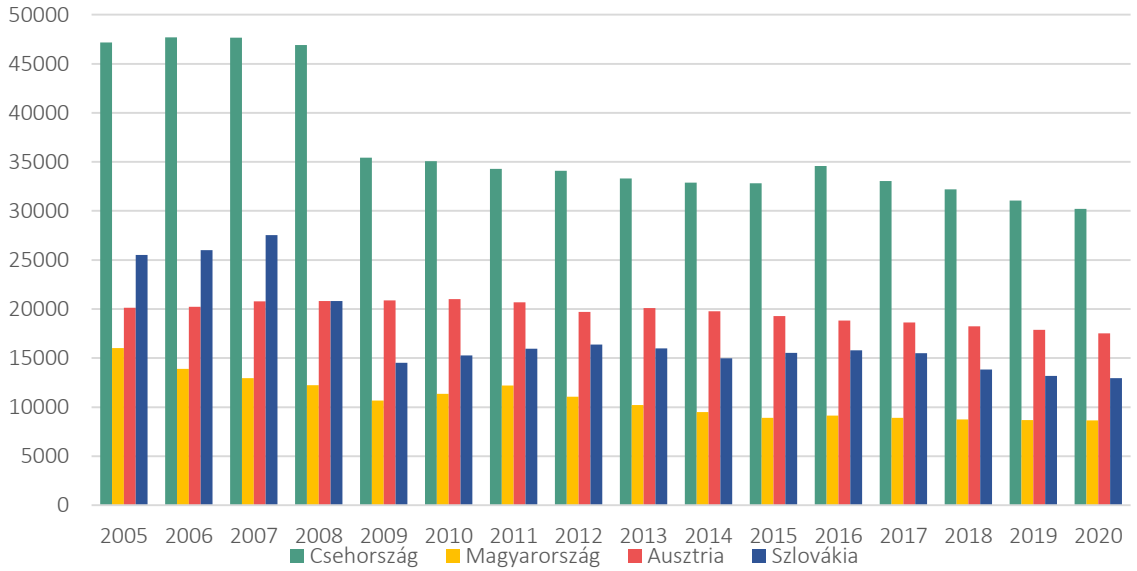
Rolling stock of rail freight

Distribution of the stock of the railway freight carriages by type in the V4 countries, Austria and France (2019). *(Source: EUROSTAT)*



2005	2006	2007	2008	2009	2010	2011	2012	
16.027	13.253	12.203	11.786	10.683	11.357	12.206	11.066	
2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
10.217	9.509	8.916	9.070	9.043	8.750	8.679	8.640	8.806

Number of rail freight carriages in public traffic. *(Source: CSO)*

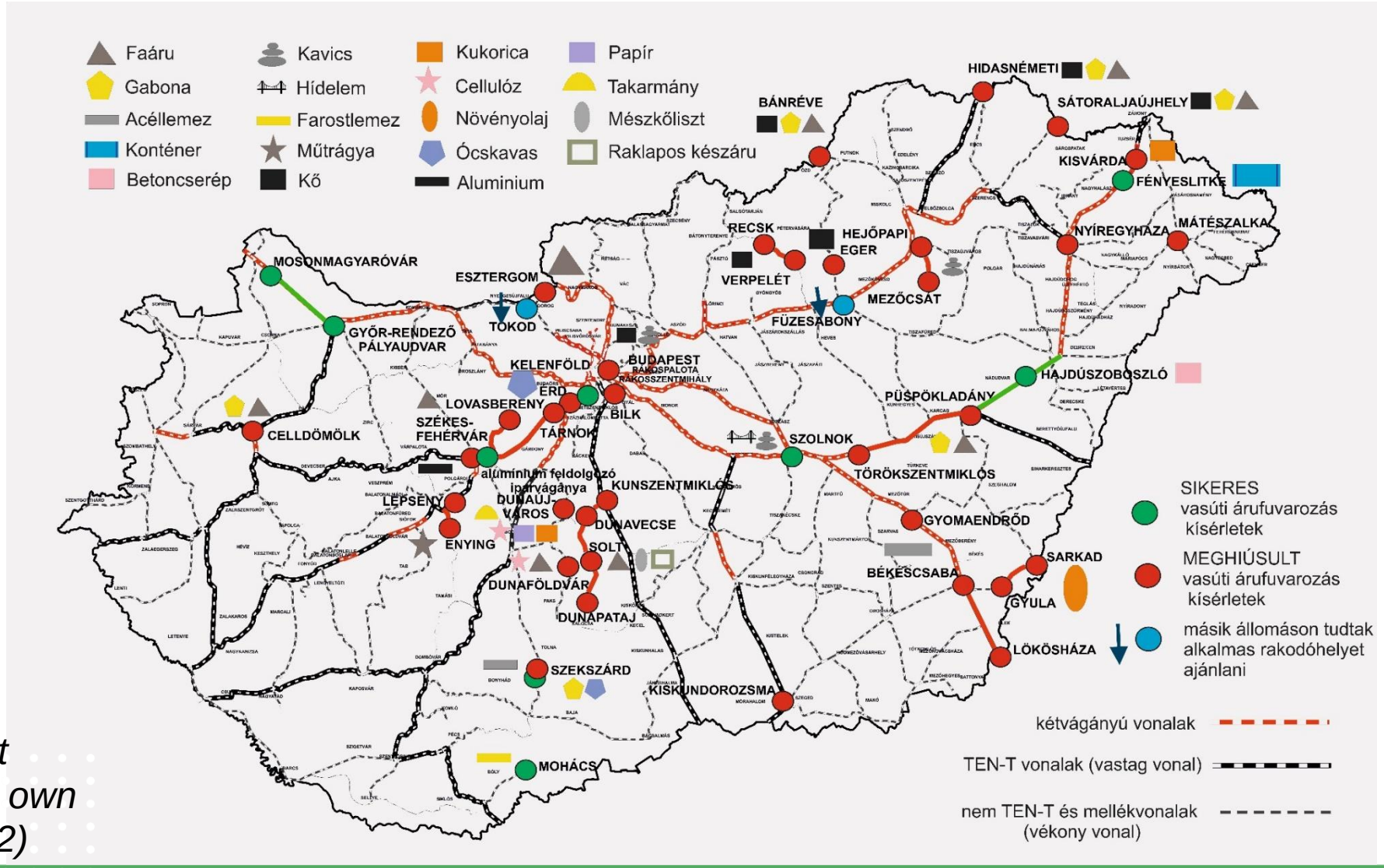


Stock of railway freight carriages by country.
(Source: own edition based on CSO)

Attempts to expand Hungarian rail freight traffic up to the present day

Between 2011-2021

- 26 failed
- 4 was realized



Attempts to expand railway freight traffic in Hungary to date (source: own edition based on HUNGRAIL 2022)

Pairwise comparison

A: Vehicle and track-side improvements and modernizations alone, without significant development of domestic storage and handling infrastructure, provide suitable conditions for shifting road freight transportation to rail and waterways.

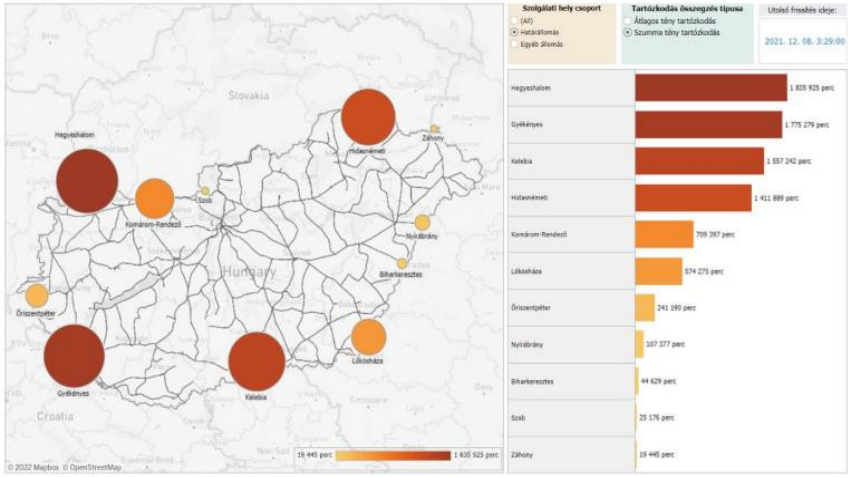
OR

B: Increasing the **fleet of craneable semi-trailers** can effectively contribute to shifting road freight transportation to rail.

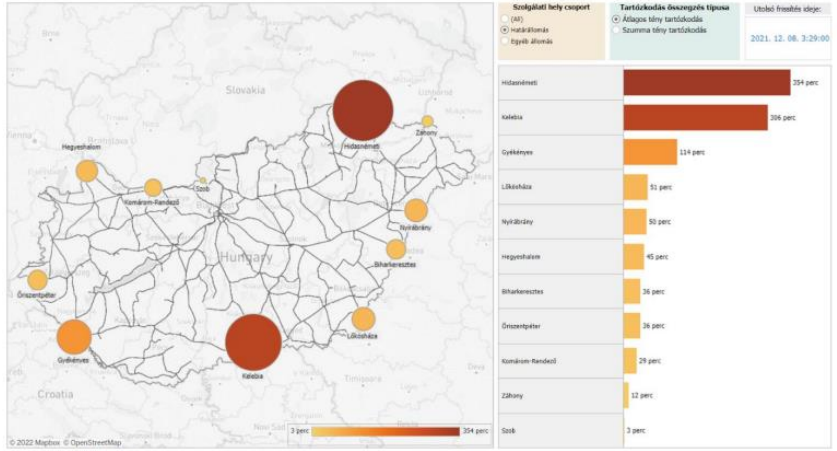
Summary of the professional community's position based on the workshop

Ranking	Normalised scale value	Statements
1	100	Creating the workforce mobility for locomotive drivers plays a key role in increasing the **service level of cross-border rail freight** transportation and ensuring faster border crossings. This would significantly enhance the competitiveness of rail freight transportation at a considerably lower cost compared to technological developments.
2	83,67	**Ensuring the navigability of the Danube** is a necessary and indispensable condition for inland waterway transport. Until this is achieved in line with international expectations and previous domestic commitments, we cannot expect substantial growth in inland waterway freight transportation.
3	63,27	**Vehicle and track-side improvements and modernizations** alone, without significant development of domestic storage and handling infrastructure, provide suitable conditions for shifting road freight transportation to rail and waterways.
4	26,53	**Renovating and modernizing existing industrial rail tracks** that are either limited or not used at all could result in significant growth in shifting road freight transportation to rail.
4	26,53	Establishing the necessary **infrastructure for** transporting **non-craneable semi-trailers**, which are preferred by road hauliers, by rail is in the national interest.
6	16,33	**Increasing the fleet of craneable semi-trailers** can effectively contribute to shifting road freight transportation to rail.
7	0	A comprehensive review, modernization, and **complete digitization** of the railway regulatory environment and the technical-economic operational model, as well as providing appropriate IT support and data sharing for clients, can significantly enhance the competitiveness of rail freight transportation.

Recommendations in the short, medium and long term

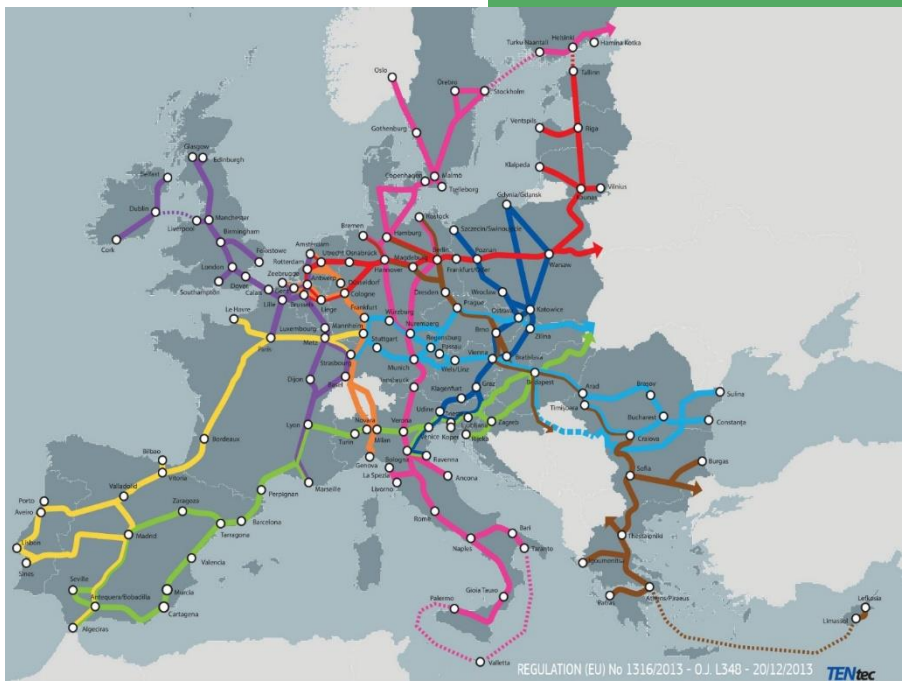


45. ábra: Tehervonatok tartózkodási idők - 2020/2021 (szumma tényleges tartózkodás perc). (Forrás: - OpenDatatableau_riportok/03-terv-teny-/06_tartozkodasi_idok_alakulasa_20_21 (tpe.hu))



44. ábra: Határátkelői tartózkodási idők alakulása - 2020-2021 között tehervonatok esetében (tartózkodási összegzés típusa átlagos tényleges tartózkodás. (Forrás: - OpenDatatableau_riportok/03-terv-teny-/06_tartozkodasi_idok_alakulasa_20_21 (tpe.hu))

Time horizon	Proposal
Short term	• Management of border crossings • Revision of regulations, gradual harmonization.
Medium term	• Opening up the (existing) destination trains to transport communities, timewise optimization of first-mile delivery (reusable containers; not time-sensitive products); • Locomotive driver training, professional development; • Implementation of EU R&D results, benchmarking.
Long term	• Freight traffic map for 10km^2 (EKAER, GPS, BiReg); • Reducing the number of slow signals; • Effective development of infrastructure (rail and IWW).



Research proposals for the transfer of goods from road to rail

- Analysis of **innovative intermodal technological solutions** for optimal modal share in rail and road freight transport;
  - Innovation of the railway **traction energy purchasing system;**
  - **Reviewing** the effects **of the performance incentive system** based on experience in order to develop a system of targeted subsidies and to stimulate the competitive rail transport market;
  - Examining the conditions and conditions of use of **the goods transport corridors.**