

Rail freight transport cost Observatory.

Executive summary

2019
1^a edition

 Versió en català
 Versió en castellà
 Version in English
 Versió en francès



0. Presentation of the Observatory

The purpose of this Observatory is to promote multimodal transport through knowledge of the cost structure of rail freight.

The Observatory aims to continue to update its theoretical bases and to have space to expand with data from other countries in each new edition, to broaden the external costs and to add the contributions that the entities from the railway sector may make to its content.

Furthermore, the aim is to link it with the Road Transport Cost Observatory of the Autonomous Government of Catalonia to be able to define the cost of the logistics chain through a multimodal freight transport cost Observatory.

This first edition forms part of the framework of the TRAILS project, included within the European POCTEFA programme, developed jointly by entities from Catalonia and L'Occitane:



0. Presentation of the Observatory. Complete Document Index.

Presentation

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1. Context of rail freight transport in Catalonia

Privately owned freight and cargo terminals on the Adif network

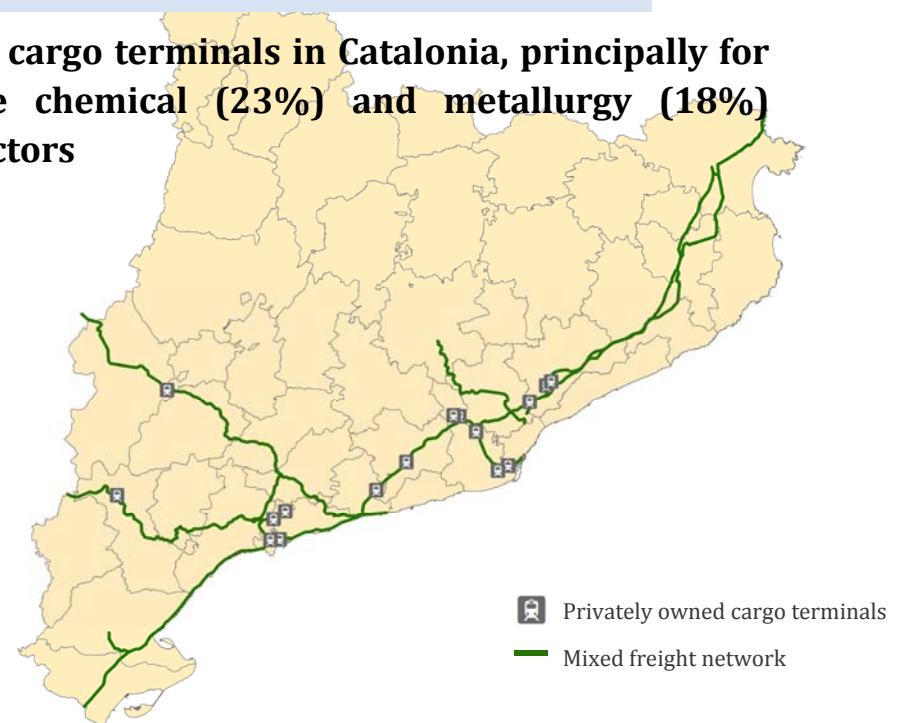
Freight terminals

18 freight terminals in Catalonia, 8 of which are intermodal.



Privately owned cargo terminals

22 cargo terminals in Catalonia, principally for the chemical (23%) and metallurgy (18%) sectors



Source: statement by the ADIF network and CIMALSA

1. Context of rail freight transport in Catalonia

Railway operators

A railway company is a company that provides freight (or passenger) transport services by railway as its principal activity, in all cases contributing to the train's traction..



19 Rail freight operators in Spain



7 operators involved only in freight activity



12 operators involved in passenger and freight activity

Mobile material fleet

The fleet is formed by locomotives and wagons. These can be the property of the railway operator (as is the case with Renfe Mercancías or FGC) or be leased to third-party companies (such as for example Renfe Alquiler)

Locomotives:

Renfe Mercancías: 83 diesel + 140 electric

FGC: 11 diesel (4 hybrid)

Private: 67 diesel (3 hybrid) + 8 electric

Wagons

Renfe Mercancías: 9,397

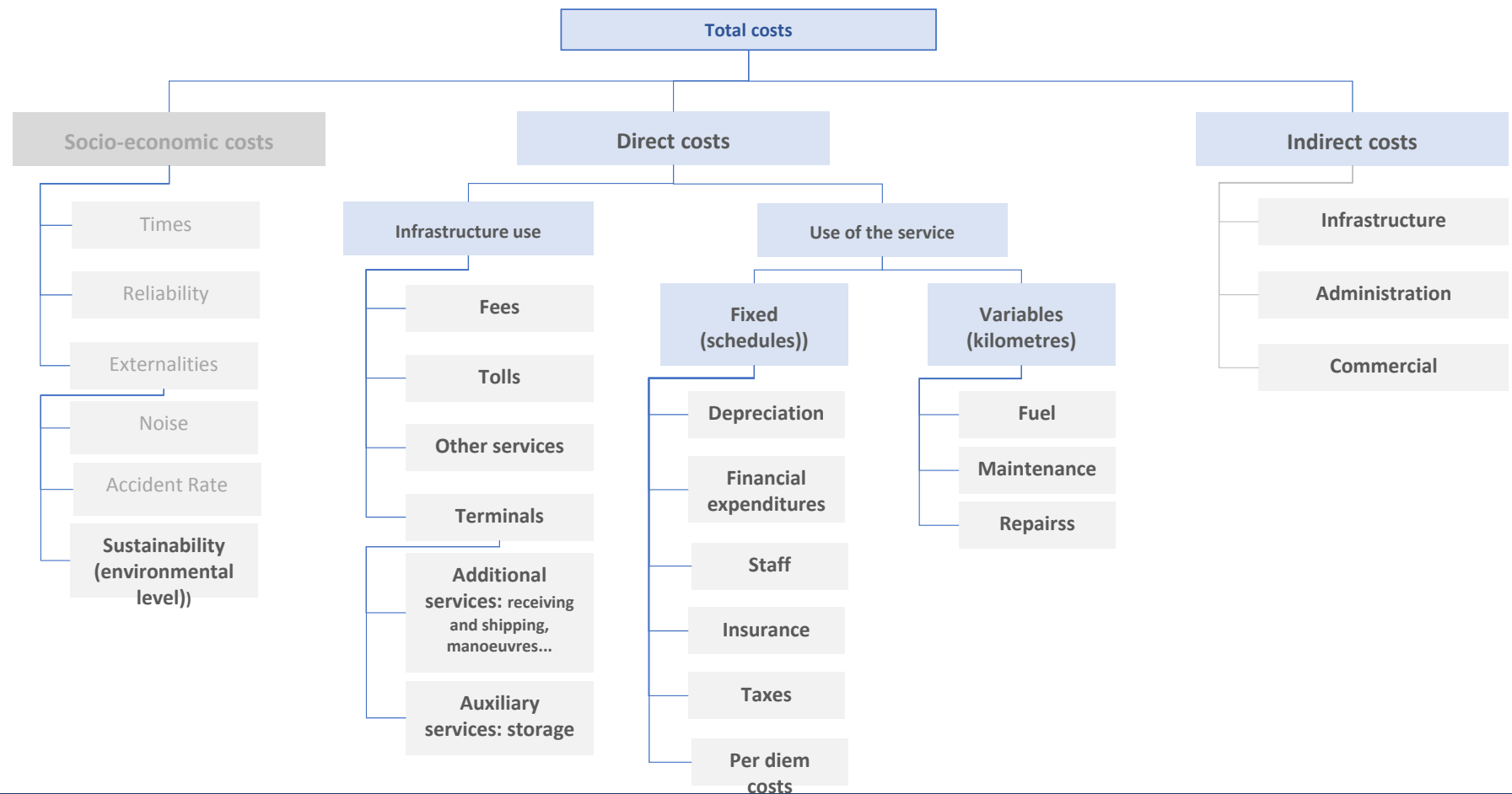
FGC: 99

Private: 165

Sources: Observatorio del ferrocarril en España (OFE) 2017 and FGC 2017



2. Cost and sustainability structure.



2. Cost and sustainability structure. Data sources used

Cost calculation

Characteristics of use

- Annual kilometres travelled: 112,600 km (OFE 2016 and confirmation by users)
- Speed: 52 km/h (OFE 2016)
- Characteristic incline: 18 mm/m (maximum incline between Barcelona-Figueres)
- Fully loaded wagons

Characteristics and cost of the mobile fleet

- The most commonly used locomotive models according to OFE 2016
- Wagons according to the Renfe Alquiler catalogue (2015), with confirmation by users
- Cost according to OFE 2008 and confirmation by users

Staff cost according to CNMC and confirmation by users: €62,000/year

Costs associated with the mobile material (depreciation, financial costs, insurance, taxes and maintenance and repairs, according to OFE 2011)

Fuel cost (Government of Spain, ADIF and SNCF Réseau)

Spain: Electric: €0.1855/km (A); €0.0287/km (no A). Diesel: €0.668/L

Costs of infrastructure use

- Railway lines (statements by ADIF network, SNCF Réseau and LFP)
- Railway terminals (ADIF, Port of Barcelona and Perpignan PSCCT Saint Charles).
Waiting times in the terminal are not considered.

Sustainability calculation

Train usage

- Locomotive (theoretical calculations, data sheets and confirmation by users)

Emissions factors by diesel locomotives

- CO₂ (Catalan Climate Change Office)
- NO_x and SO₂ (Renfe 2010 Annual Report)
- PM₁₀ and PM_{2.5} (created by the authors of this report based on the Renfe 2010 Annual Report)

Emissions factors by electric locomotives

- 2017 energy mix (Spanish Power Network -REE- and Réseau de transport d'électricité - RTE-)
- CO₂ (Renewable Energy Plan 2005-2010 of the Ministry of Industry and RTE, according to production source)
- NO_x, SO₂, PM₁₀ and PM_{2.5} (European Environmental Agency -EEA-)
- Radioactive waste (Electricity Observatories of the WWF)

Reference lorry emission factors

- Drafted by the authors with the Copert programme (EEA)
- Lorry according to EPTMC 2018 for trajectories through high capacity routes

2. Cost and sustainability structure.

Presentation and summary of cases studied:

10 types of trains, according to 4 parameters

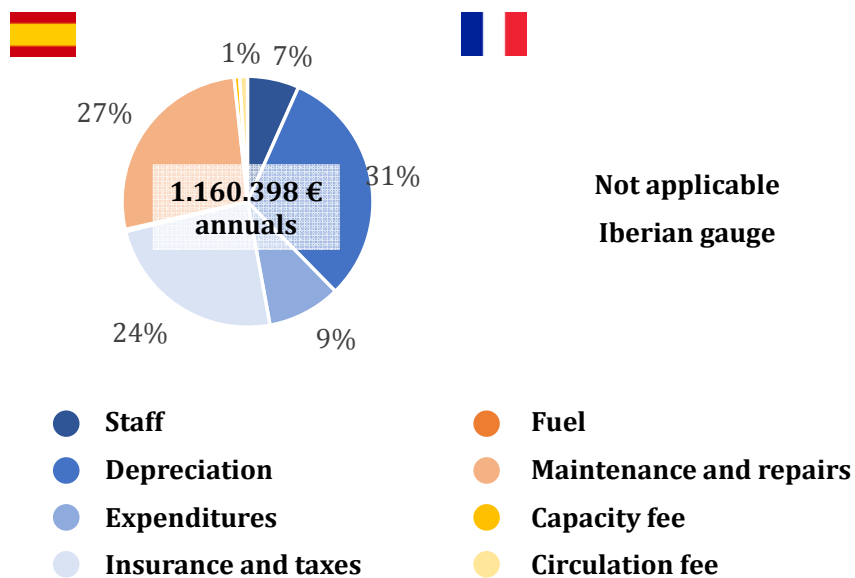
Track gauge	Length	Propulsion	Wagons	Annual cost Esp (€)	Annual cost Fr (€)
Iberian	Up to 450 m	Diesel	1. Container carriers	2.891.773	-
			2. Hopper	3.119.078	-
		Electric	3. Container carriers	1.658.497	-
			4. Car carrier	1.160.398	-
International	Up to 450 m	Diesel	5. Container carriers	3.016.982	3.290.633
			6. Hopper	3.244.287	3.517.938
	Electric	7. Container carriers	2.038.252	2.069.653	
		8. Car carrier	1.436.488	1.428.227	
	Up to 750 m	Diesel	9. Car carrier	3.522.136	3.845.485
			Electric	10. Car carrier	2.421.829



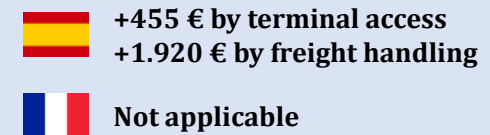
2. Cost and sustainability structure.

4. Car carrier wagons with Iberian gauge, 451 m long and electric propulsion (1 locomotive, 16 wagons, 160 vehicles, 344 T payload)

Cost structure

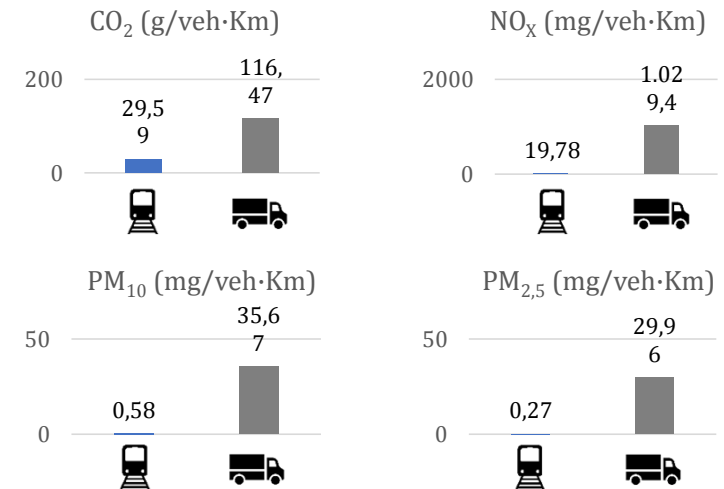


Freight terminal



Sustainability

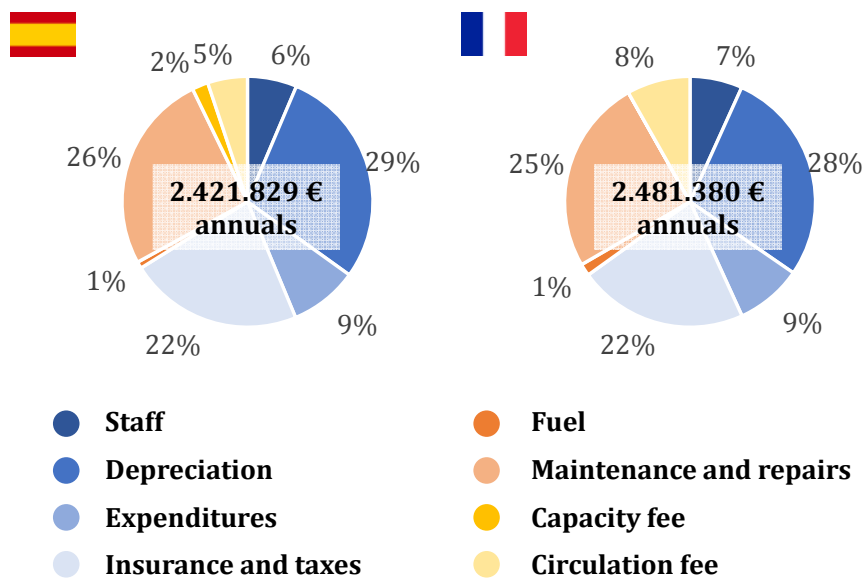
Articulated 40 T Euro III diesel lorry



2. Cost and sustainability structure.

10. Car carrier wagons with UIC gauge, 740 m long and electric propulsion (2 locomotives, 26 wagons, 260 vehicles, 559 T payload)

Cost structure

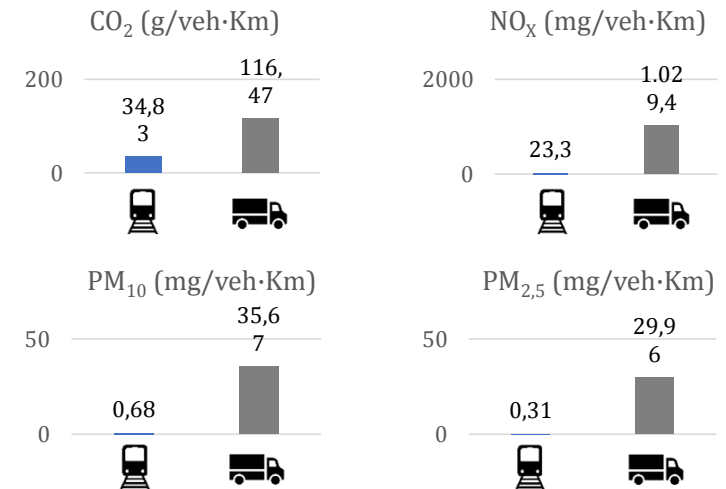


Freight terminal

	+480 € by terminal access +3.120 € by freight handling
	+1.090 € by terminal access +3.120 € by freight handling

Sustainability

Articulated 40 T Euro III diesel lorry



3. Practical cases: calculation applied to reference trajectories

Presentation and summary of cases studied:

6 trajectory types considered:

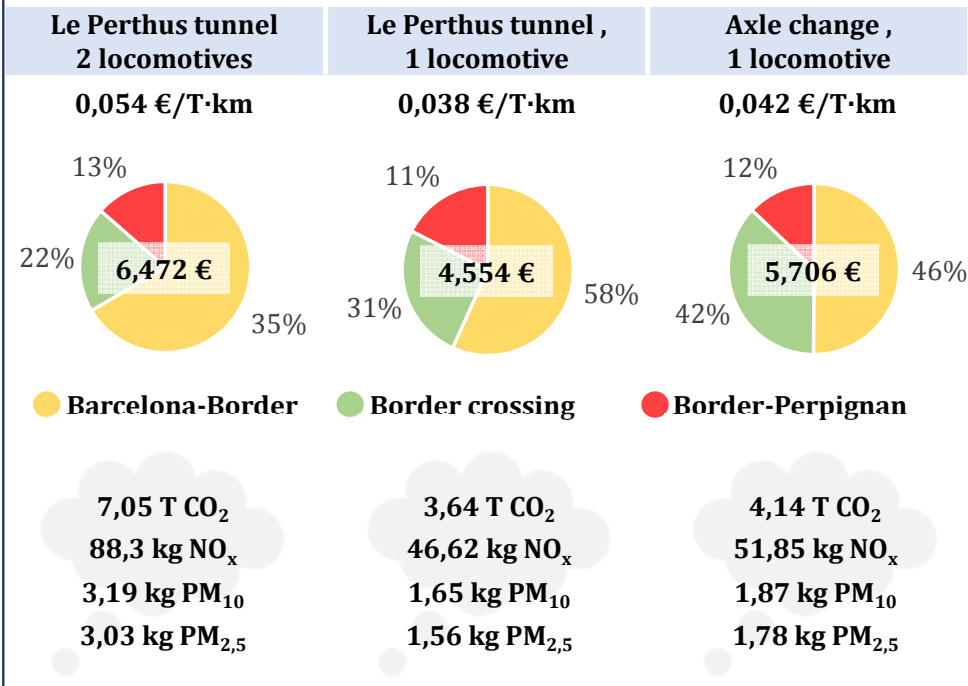
Origin	Border crossing	Destination
Barcelona	1. Le Perthus tunnel with 2 locomotives (UIC)	1A. Perpignan
		1B. Toulouse
	2. Le Perthus tunnel with 1 locomotives (UIC)	2A. Perpignan
		2B. Toulouse
	3. Axle change at Cerbère (Iberian)	3A. Perpignan
		3B. Toulouse



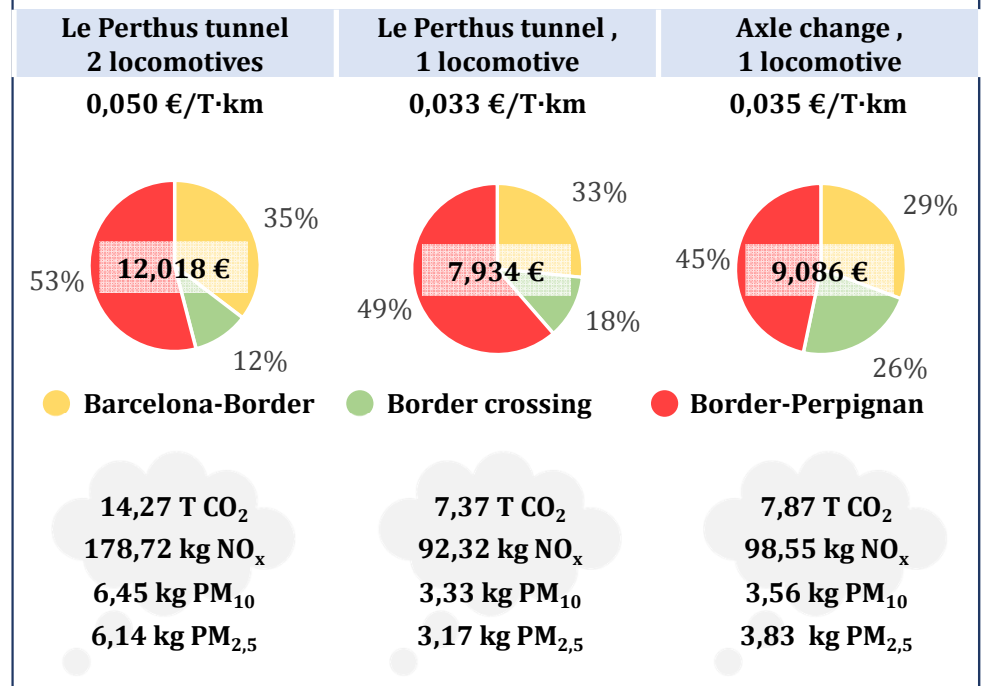
3. Practical cases: calculation applied to reference trajectories

1. Container carrier wagons, 221 m long and diesel propulsion (10 wagons, 20 ITUs, 580 T payload)

Barcelona-Perpignan



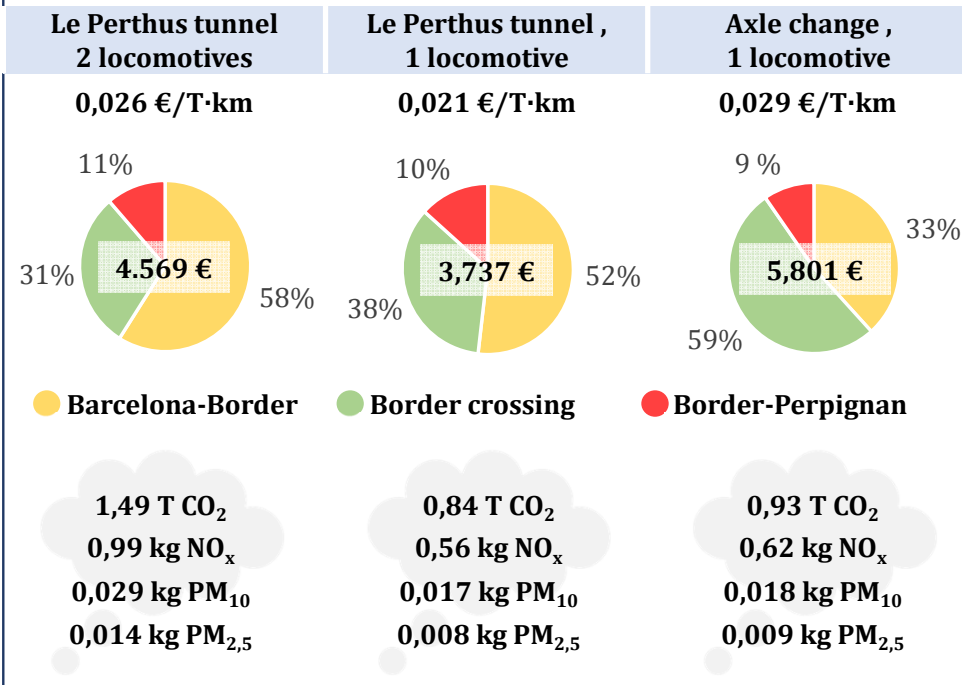
Barcelona-Toulouse



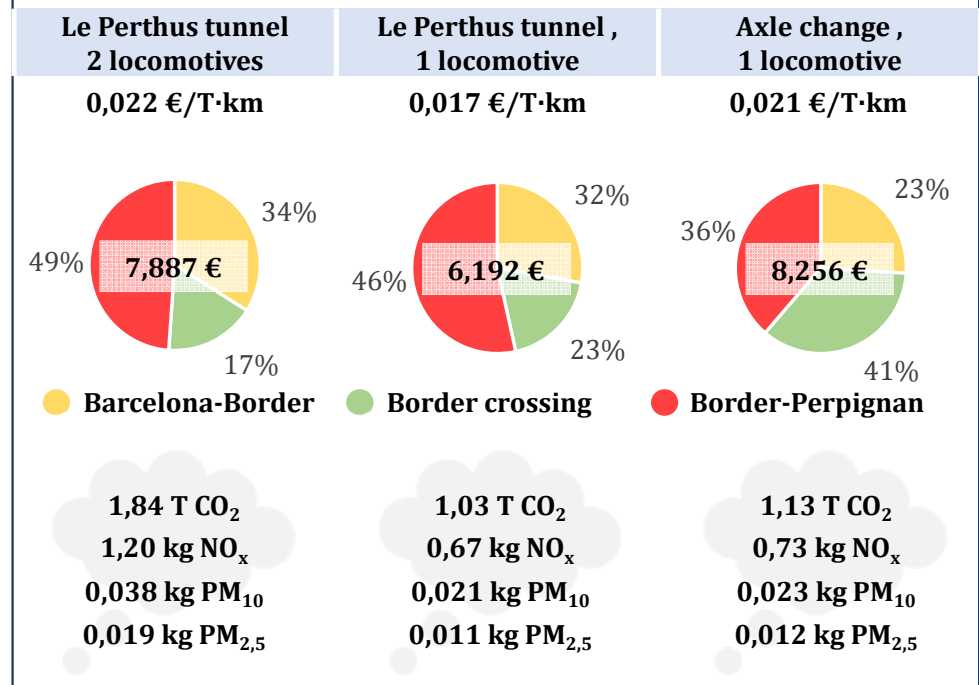
3. Practical cases: calculation applied to reference trajectories

2. Container carrier wagons, 317 m long and electric propulsion (15 wagons, 30 ITUs, 870 T payload)

Barcelona-Perpignan



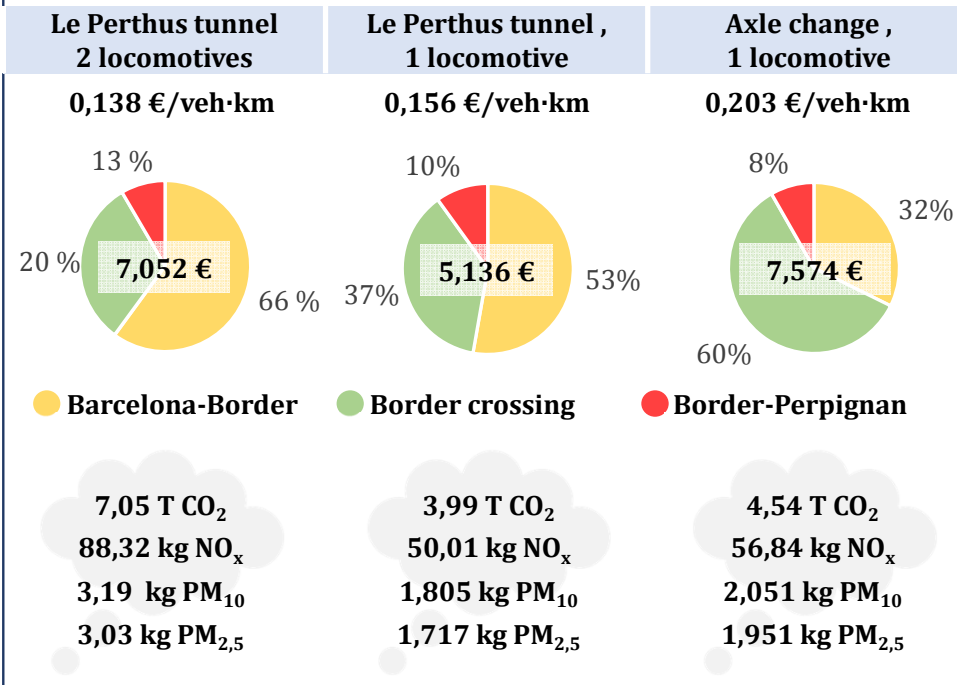
Barcelona-Toulouse



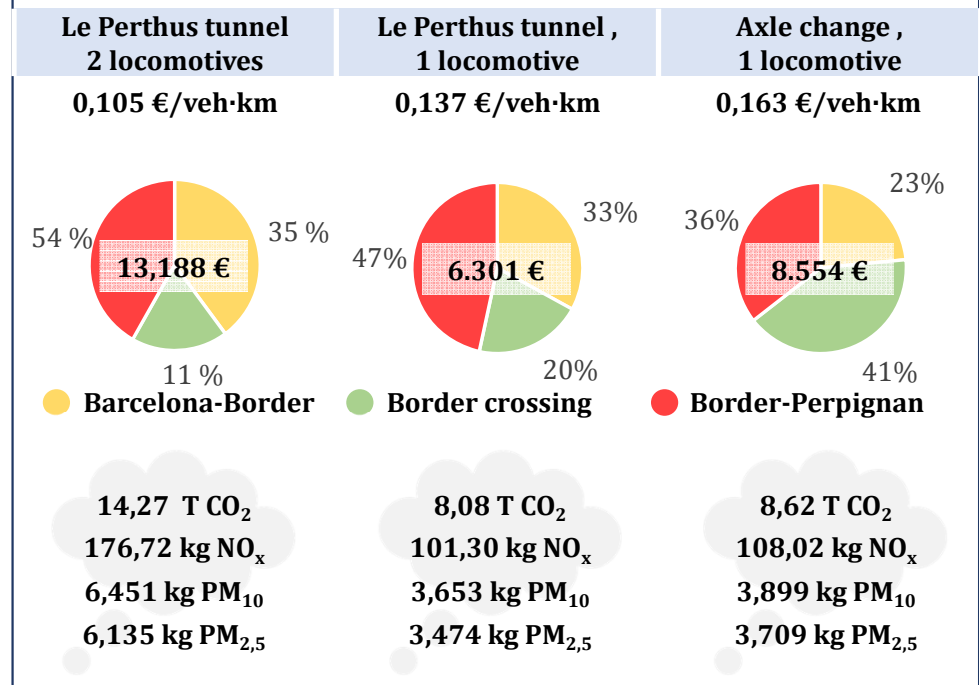
3. Practical cases: calculation applied to reference trajectories

3. Car carrier wagons, 454 m long and diesel propulsion (16 wagons, 160 vehicles, 344 T payload)

Barcelona-Perpignan



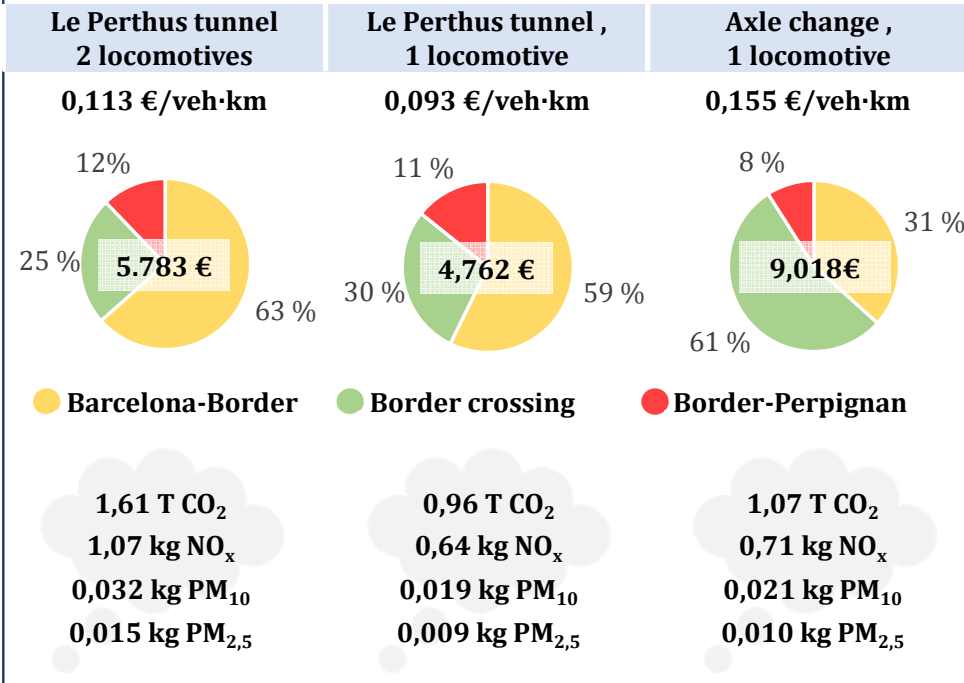
Barcelona-Toulouse



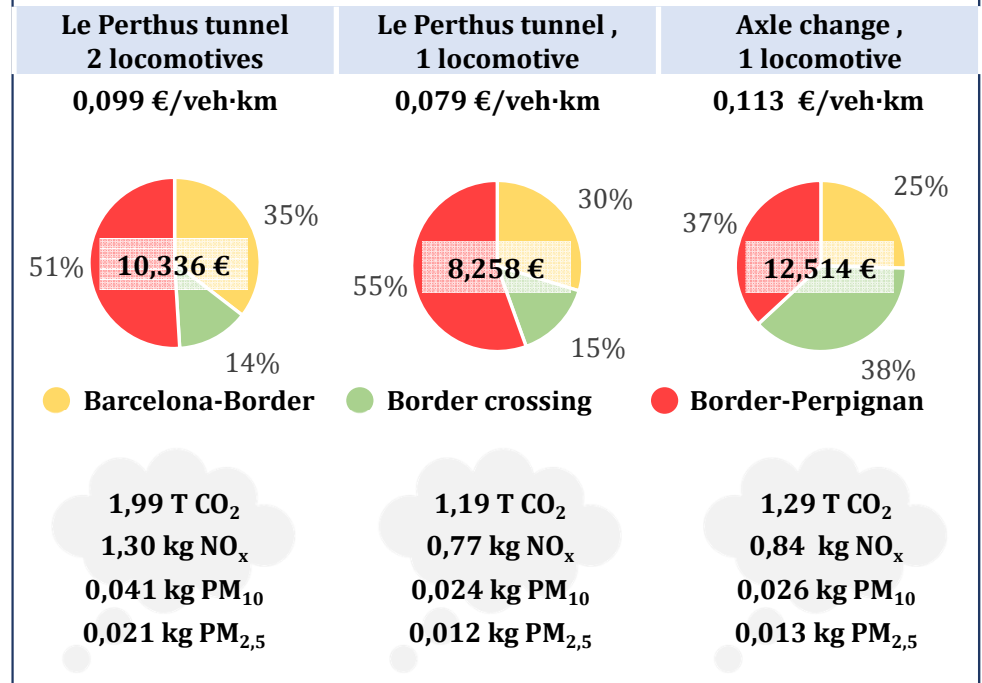
3. Practical cases: calculation applied to reference trajectories

4. Car carrier wagons, 694 m long and electric propulsion (25 wagons, 250 vehicles, 538 T payload)

Barcelona-Perpignan



Barcelona-Toulouse



* Cas teòric atesa la limitació en la longitud dels trens

3. Six practical cases: calculation applied to reference trajectories

Case: Car carriers. 694 m long and electric locomotive. 25 wagons, 250 vehicles, 538 T payload.

No inclou costos de terminal



Barcelona-Perpinyà

Car carrier, 40 T 6-car payload

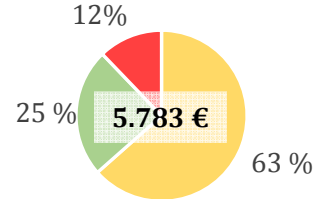
0,134 €/veh km

198 km x 0,8092 €/km =
160 €

Source: Freight transport cost observatory. MIFO. January 2019

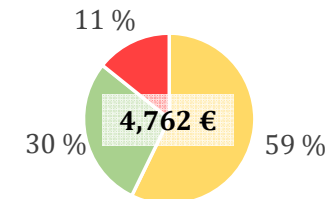
Le Perthus tunnel, 2 locomotives

0,109 €/veh·km



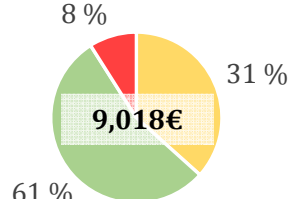
Le Perthus tunnel, 1 locomotive

0,093 €/veh·km

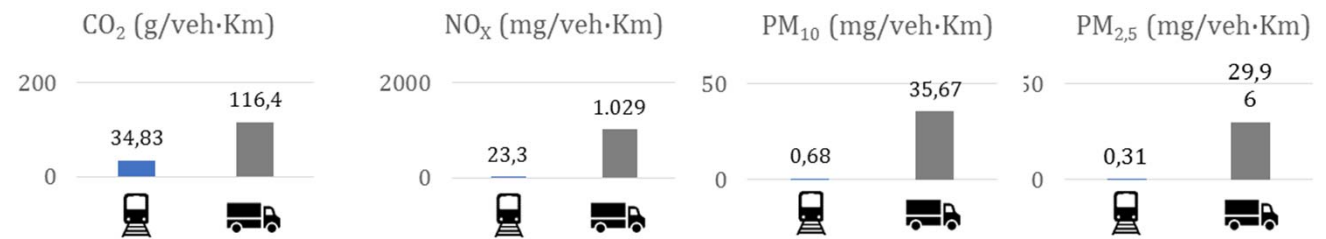


Axle change, 1 locomotive

0,155 €/veh·km



● **Barcelona-Border** ● **Border crossing** ● **Border-Perpignan**



4. Some notes

As an Observatory: it is important to focus more on the change in the theoretical bases (types of wagon, locomotive, etc.) than on the increase of costs, which are much more stable.

It is important to promote the change to the new eco-diesel locomotives to reduce the excessive pollution due to this type of traction

The problem of the length of the trains is focused on the car carriers. Other payloads depend more on the drag capacity

Crossing the border through Portbou - Cerbère is more expensive than passing through the Le Perthus tunnel. Other factors need to be taken into account such as the gauge and traction availability in UIC vs Iberian

Logically the Barcelona - Border cost and crossing the border is relatively different based on the route in Europe
Competitiveness comes from improving efficiency in the terminals

In the general the costs in France are higher

Each contribution will help to improve
upcoming editions

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