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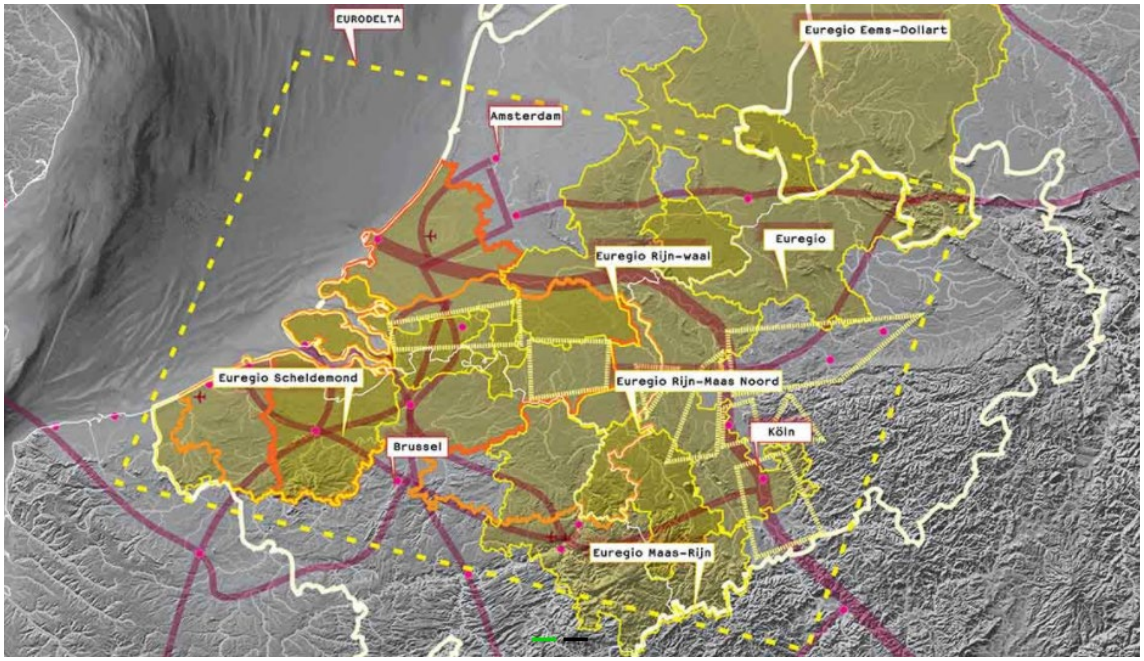
Inspire Policy Making with Territorial Evidence

# Sustainable transport in the Eurodelta: future flows and policy options

The 'Megaregion Eurodelta', a spatial synergy formed by the Northwest European metropolitan regions in the Netherlands, North Rhine-Westphalia, Flanders, Brussels and Northwest France, is a global hub for goods and services, exhibiting well-developed cross-border inter-urban connections with nearly 50 million people reachable within 3 hours of travel. This megaregion has a great potential to set an example in the ambitious pursuit of aligning transportation with EU sustainability targets.




Map 1 – Megaregion Eurodelta (Source: Vereniging Deltametropool)

This paper summarises an ESPON analysis explaining changes in sustainability parameters ($CO_2$, $NO_x$, $PM_{10}$ emissions and energy use) through changes in transport policies in the Eurodelta, compared to a baseline scenario[1]. The analysis resorts to the European transport network model Trantools3 (Tools for Transport Forecasting and Scenario testing) in order to simulate changes in transportation demand in the Eurodelta for the years 2030 and 2050. Transport demand simulations are adjusted for 6 societal challenges: 1) health and economic crises; 2) climate change and energy transition; 3) technological progress in transport; 4) globalised transport; 5) circular economy and 6) EU disintegration.

Four policy options constitute a common agenda of transport policymakers in the Eurodelta: (1) a shift from air to high-speed train travel over distances of less than 500 km within the Eurodelta, (2) zero-emission zones: better alignment of emission standards and the type of vehicles allowed in big cities in the Eurodelta, (3) Mobility as a Service in the Eurodelta, (4) from road to rail: a shift from road to rail for cross-border passenger transport.

While these measures are not new, their geographical scale is unique. The analysis shows that they could lead to considerable improvement in transport sustainability in the Eurodelta. The paper introduced the estimated the impact on sustainability parameters of these policy measures. The policy measures are scalable and replicable in other regions in Europe.

[1] In the baseline scenario the traffic demand was estimated to create an understanding of the transport flows for both passengers and freight within the study area as well as the expected growth of these flows towards 2050. These flows were then translated into emissions (for example $CO_2$), as a proxy for sustainability to understand the scope of the issues at hand.

# 1. Baseline Scenario

## Overall observations

The baseline scenario shows that, with the overall expected growth of transport (+30% to 2030 and +59% towards 2050 for freight, +10% in 2030 and +18% in 2050 for passengers), sustainability appears to be far out of reach. The share of road for both freight and passengers as a dominant mode is striking (and not surprising). The transport flows are combined with expected developments in emissions, which slightly changes the picture regarding the focus and the opportunities at hand.

On the other hand, when looking at the overall sustainability goals, the predominance of the car as the main mode of transport can be justified for example from a social inclusion perspective, displaying careful treating is necessary on this topic. Also due to the fact that the road network is congested and significant investments are necessary to alleviate specific bottlenecks, a focus on changing the way we travel is eminent.

For freight an additionally complicating factor is the connection of transport with the seaside of transport, this is currently out of scope within this study, but the emissions from the seaside are (combined with air) forming a large part of the overall transport emissions. From a Eurodelta perspective, focusing on intermodality, but also long-distance freight transport by train can change and adapt this focus and, in that sense, partly tackle the seaside emissions.

## Transport emissions

### Passenger transport

The 4 emission indicators that are quantified are the following: $CO_2$, $NO_x$, $PM_{10}$ and Energy use. For each of the indicators the emissions per mode are presented below in the table below.[2]

**$CO_2$-, $NO_x$-, $PM_{10}$-emissions and energy use – passenger transport**

| | $CO_2$ [Mton] | | | $NO_x$ [Mton] | | | $PM_{10}$ [kton] | | | Energy [$10^9$ MJ] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | **2018** | **2030** | **2050** | **2018** | **2030** | **2050** | **2018** | **2030** | **2050** | **2018** | **2030** | **2050** |
| **Rail** | - | - | - | - | - | - | - | - | - | 3,3 | 2,7 | 1,9 |
| **Road** | 96,9 | 79,3 | 41,9 | 0,3 | 0,1 | 0,0 | 3,1 | 0,8 | 0,3 | 1.411 | 1.248 | 884 |
| **Air** | 13,1 | 12,2 | 10,5 | 18,7 | 17,5 | 15,1 | 108,6 | 101,5 | 87,5 | 222 | 207 | 179 |
| **Total** | 110,0 | 91,6 | 52,4 | 19,0 | 17,6 | 15,1 | 111,7 | 102,3 | 87,8 | 1.636,4 | 1.457,7 | 1.064,7 |

- For the **$CO_2$-emissions**, the first noteworthy aspect is the high share of air transport in emissions. In 2018 the share is 12% and it increases to 20% in 2050. Secondly, the impact of the forecasted availability of electric vehicles for road transport can clearly be seen with a negative trend of road transport emissions compared to the expected growth rate.
- For the **$NO_x$-emissions** and the **$PM_{10}$-emissions**, aviation and road have comparable shares with the highest share for aviation (between 97% and almost 100% over the period). The emissions for this mode decline slightly (-20%) between 2018 and 2050. For road transport the impact of the stricter regulations and guidelines regarding emissions combined with the increased market share of electric vehicles lead to a reduction of emissions over time, with almost no emissions in 2050. Electric railways emit no $NO_x$ and $PM_{10}$.

[2] It should be noted that for rail it is assumed that all trains are electric. In reality, a small percentage still runs on diesel.

- For the **energy use**, the car is by far the largest consumer during the entire period. Here, the impact of the switch from combustion to electric engines is lower since they still use energy. However, despite the increase in demand, the total energy use decreases due to the higher efficiency of electric engines. The share of rail is relatively low in comparison to the others, and for air the decrease in energy use for kerosine compensates the expected growth in transport kilometres.

**Freight Transport**

For freight transport the same indicators are presented below in the table below for the rail, road and inland waterways (IWW) modalities based on the transport figures of the baseline scenario for the entire SURE area.

**$CO_2$-, $NO_x$-, $PM_{10}$-emissions and energy use – freight transport**

| | $CO_2$ [Mton] | | | $NO_x$ [Mton] | | | $PM_{10}$ [kton] | | | Energy [$10^9$ MJ] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | **2018** | **2030** | **2050** | **2018** | **2030** | **2050** | **2018** | **2030** | **2050** | **2018** | **2030** | **2050** |
| **Rail** | 0,7 | 0,6 | 0,5 | 0,0 | 0,0 | 0,0 | 0,2 | 0,0 | 0,0 | 10,5 | 9,2 | 7,4 |
| **Road** | 14,1 | 12,3 | 5,9 | 1,5 | 1,2 | 0,1 | 5,7 | 2,6 | 1,4 | 2.543,4 | 2.360,6 | 1.569,7 |
| **IWW** | 1,9 | 1,8 | 1,5 | 0,0 | 0,0 | 0,0 | 0,8 | 0,7 | 0,3 | 18,0 | 17,2 | 14,7 |
| **Total** | 16,6 | 14,7 | 7,9 | 1,6 | 1,2 | 0,2 | 6,7 | 3,3 | 1,7 | 2.572,0 | 2.387,0 | 1.591,8 |

- For the **$CO_2$-emissions** the overall prospective share of road transport is clearly visible. However, until 2050, the emissions of road transport decrease by 58%, whereas rail and IWW reduce by 29% and 18%, thus their relative shares increase towards the future.
- For the **$NO_x$-emissions** the observations are similar. The large decrease for road transport is only expected to happen after 2030 with the increase in electric and fuel cell operated trucks. For rail and inland waterways, the decreasing trend is a positive development.
- For the **$PM_{10}$-emissions**, the share of the road transport is still large, but, with the decreasing trend, there appears to be a rather favourable evolution of these emissions. After 2030 rail will have almost zero emissions.
- For the **energy used** by road transport, we expect a decrease to result in an overall reduction of 38% in 2050 compared to the 2018 level, due to better availability of cleaner and more efficient trucks. The other modes decrease monotonic towards 2050 with reductions of 29% for rail and 18% for IWW.

## Overall impact of external trends on the baseline scenario

The baseline scenario is designed as a business-as-usual scenario and includes forecasts for 2030 and 2050. It is based on the European Transtools3 model developed between 2011 and 2016. Hence, the assumptions for the model forecasts have been defined several years before the current study has been carried out (2021). Meanwhile, a series of external trends are evolving, that are not taken into account (sufficiently) in the baseline scenario. These trends are likely to affect the forecasts for 2030 and 2050. The consortium has determined together with the stakeholders of this STISE-project an overview of external trends that may significantly affect the transport flows for passengers and freight within the Eurodelta in the future. Of these trends six have been selected and the possible impacts have been briefly studied in qualitative terms.

- An external trend analysis indicates that the demand for **freight transport** in the Eurodelta is likely to decrease for all modes compared to the baseline scenario. This decrease is mainly due to growing circular economy and changes in the world freight routes (part of the further globalisation trend of the transport sector).
- For **passenger transport** the trends indicate a shift from air and road to rail compared to the baseline scenario, when the possible impact of autonomous vehicles (part of the trend on technical evolutions in the transport sector) is neglected. If autonomous vehicles became available on large

scale, they might result in a large shift from public transport to car usage, depending on the implementation in the overall transport system.

**Qualitative estimation of the possible impacts of the external trends in the SURE area relative to the baseline scenario [3]**

| External trend | Passenger road | Passenger rail | Passenger air | Freight Road | Freight rail | Freight inland waterways |
|---|---|---|---|---|---|---|
| **Climate change & energy transition** | – – | + | – | – | + | + |
| **Technical evolutions in the transport sector** | + + | + / – – | 0 | + | 0 | 0 |
| **The future of growing globalisation in the field of transport** | 0 | 0 | 0 | – | 0 | – |
| **Growing Circular Economy** | 0 | 0 | 0 | – | – | – |
| **Health/economic crises/effects after Covid** | 0 | – – | – – | 0 | 0 | 0 |
| **Possible (Dis)integration in the EU** | 0 | 0 | – | 0 | – | 0 |

# 2. Policy options

From the Baseline scenario it became clear that without any intervention in the policies, sustainability will not be reached. The estimations in the Baseline scenario were complemented with the analysis of the potential impact of four policy measures with a focus on cleaner and faster mobility at Eurodelta scale:

- Aviation shift on short/mid-range distances
- Zero emission zones in all major cities in the Eurodelta
- Exploring the potential of MaaS
- Improving regional cross-border public train transport

The assessment aims at showing to what extent these measures could make transport within the area more sustainable and what margin still exists when comparing the impact of these measures towards the sustainability goals. For these policy measures, indicative proposals for high-level policy roadmap for their implementation are proposed as well.

## 2.1 Aviation Shift on Short/mid-range Distances

### Scope policy measure

A policy ban of all the regular aviation services on short and mid-range distances (< 500km to 700 km) within, to and from the SURE area, with a shift to High-speed rail.

### Impact policy measure

The shift from aviation to high-speed rail for short and midrange distances could have a not neglectable impact on the $CO_2$ and noise reduction in and around the four relevant airports in the Eurodelta: a reduction of 0,94 million ton of $CO_2$ in 2030 and 0,86 million ton in 2050 would be achieved, contributing about 0,1%

[3] Qualitative estimation of the possible impacts of the external trends in the SURE area relative to the baseline scenario on a 5-point scale: + + strong increase, + moderate increase, 0 minor effect, – moderate decrease and – – strong decrease.

to the overall ambitions of the EU Green Deal[4] - which is fairly high for a geographically area that covers hardly 1% of the European territory. It will also give a boost to HST and it will possibly double or even quadruple the volumes of HST-travel on the existing tracks. Therewith it could also have a major impact on domestic and short-range travel within the SURE area and lead to a shift form car to train.

### High-level roadmap for implementation

This proposal needs to be discussed with the European Commission first, in order to bring about the necessary changes to the open skies agreements. An ambassador, with the appropriate support team should coordinate activities to achieve this modality shift.

**Policy Roadmap Aviation Shift – HST in the SURE aera**

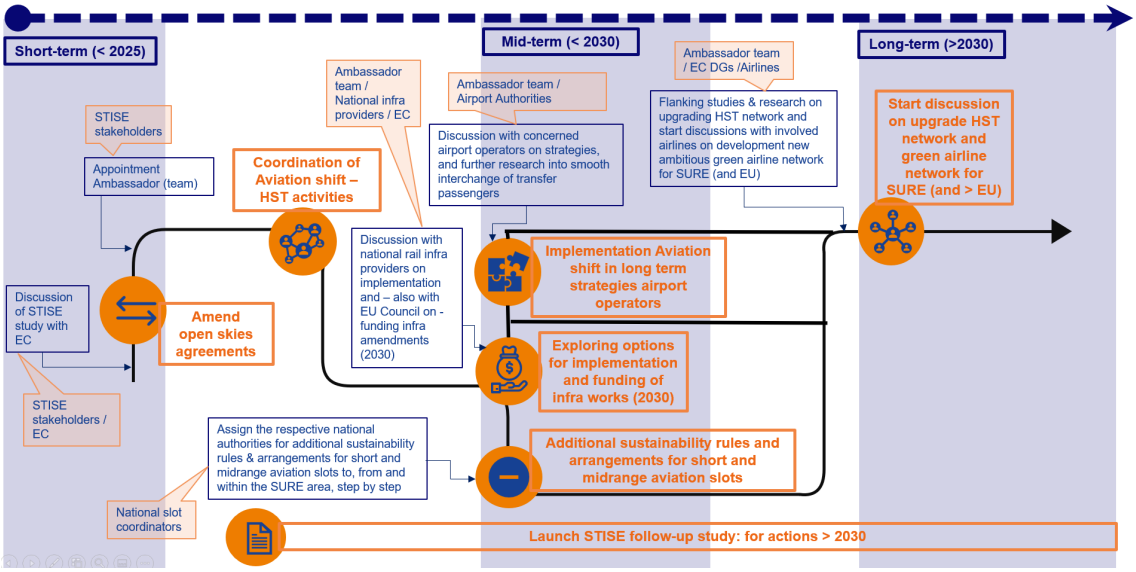



Figure 1 - Policy roadmap Aviation shift - HST

## 2.2 Zero Emission Zones in all Major Cities in the Eurodelta

### Scope policy measure

Implementation of harmonized Zero Emission Zones (ZEZs) in all major cities (> 100.000 inhabitants) located in the SURE area for passenger cars, Light Duty Vehicles (LDVs) and Heavy Duty Vehicles (HDVs), by 2035.

### Impact policy measure

By contributing with about 3% to the overall $CO_2$ ambitions of the Green Deal in 2030[5], the environmental impact of the ZEZ policy measure could be considerable – taking into account the relatively small geographical scope of this particular policy measure. Harmonising ZEZs could also have substantial efficiency and societal benefits, but specific population groups and economic actors could be adversely impacted if no targeted accompanying measures are implemented. Experience shows that it is very difficult to harmonize

[4] The EU intends to reduce its carbon emissions by some 55% in 2030 with reference to the 1990 situations (3.753 million ton); meaning emissions of 2.064 million ton $CO_2$ In 2030. In reference to the 2020 situation (some 2.550 million ton) the intention is therewith to reduce the emissions with a further 860 million up to 2030, towards climate neutrality in 2050.

[5] The EU Green Deal includes EU's general ambition on reducing greenhouse gas emissions to at least 55% (net reduction) below the 1990 levels by 2030, and to become climate neutral by 2050. With reference to the 1990 situation (3.753 million ton); this means emissions of 2.064 million ton $CO_2$ in 2030. With reference to the 2020 situation (some 2.550 million ton) the intention is therefore to reduce the emissions with a further 860 million ton up to 2030, towards climate neutrality in 2050.

access criteria due to the subsidiarity principle, while harmonizing other aspects could appear to be very challenging due to the high number of actors to be involved and the absence of institutional framework to carry out such a process at Euro-delta level. An appropriate forum for policy dialogue should be set up to assess political feasibility, options for harmonization and their impacts. If areas for consensus are identified, a structured concertation process involving national and local authorities shall be launched to design, plan and implement the harmonization process.

### High-level roadmap for implementation

An appropriate forum for policy dialogue should be set up to assess political feasibility, options for harmonisation and their impact.

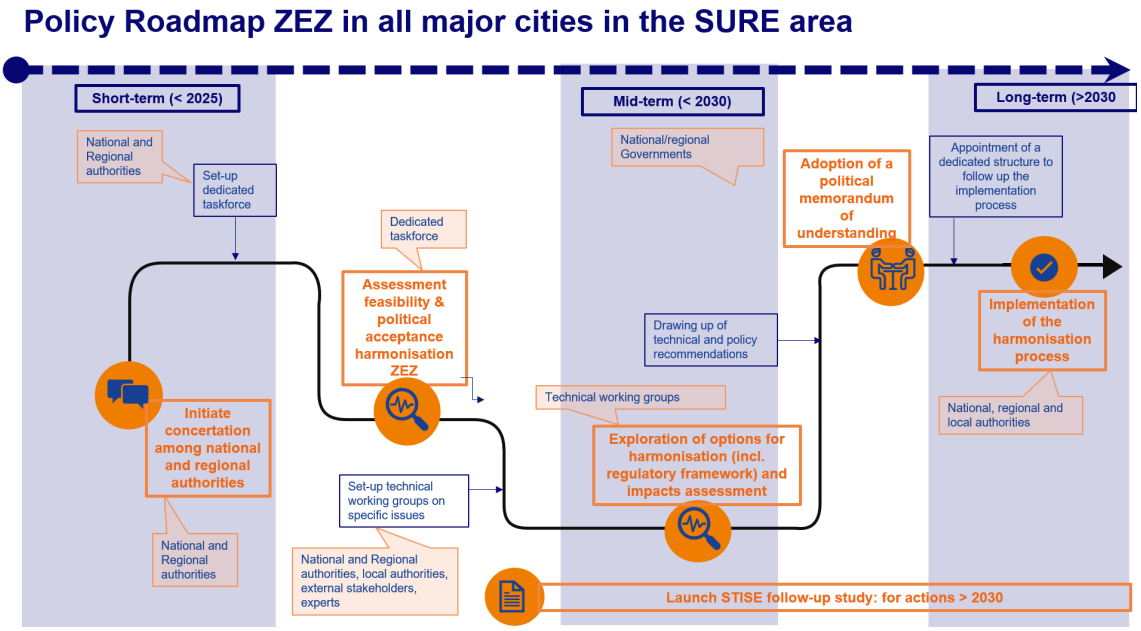



Figure 2 - Policy roadmap ZEZ in all major cities in the Eurodelta

## 2.3 Exploring the Potential of MaaS in the Eurodelta

### Scope policy measure

Exploring Mobility as a Service (MaaS) – with focus on passenger transport - from the public authority's perspective: defining the role public authorities have in this development, how can they operate and what the potential benefit is they can realize if the measure is effective - considering the required accompanying measures in order to realize this benefit.

### Impact policy measure

The Potential of MaaS measure shows a potential in realising more sustainable transport, however this potential is largely uncertain, strongly depends on the position public authorities take and the necessary investments in both digital and physical infrastructure that need to be done to facilitate a larger modal shift. This being said, the prerequisites as defined (regarding standardisation and sharing of data and in-formation) are no-regret measures that can be started immediately. Furthermore, development of a vision and implementation plan for MaaS and how it can contribute to the relevant societal goals is essential to grasp the potential at hand.

### High-level roadmap for implementation

A first step for policy makers is to set up an organisation to coordinate the unlocking and governance of MaaS-relevant data.

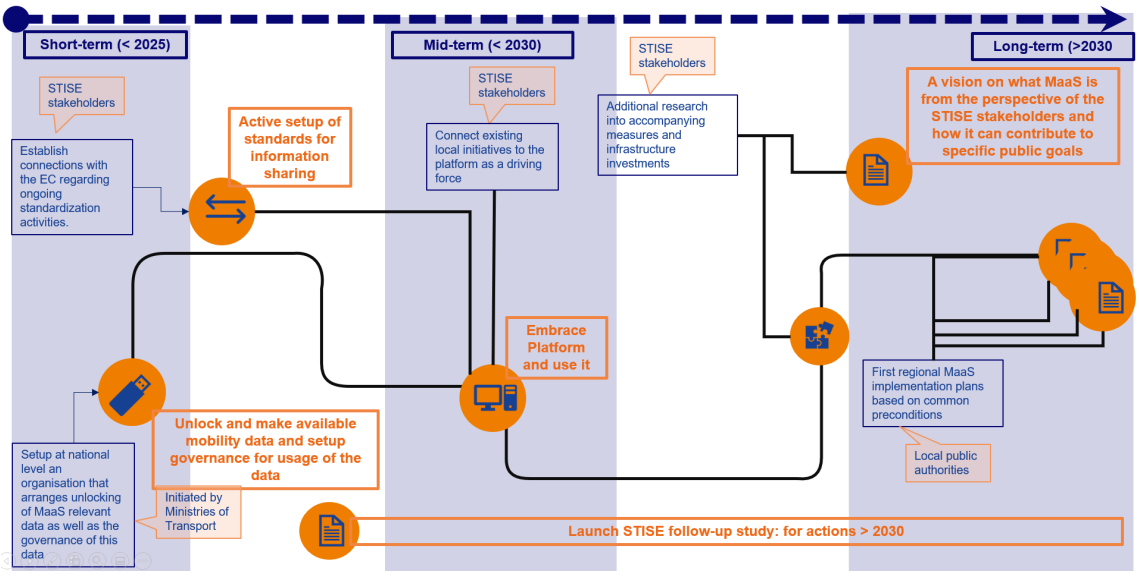



Figure 3 - Policy roadmap Exploring the potential of MaaS in the Eurodelta

## 2.4 Improving the Regional Cross-border Public Train Transport

### Scope policy measure

This policy focuses on the improvement of regional cross-border public train transport in the 3 STISE project corridors Rhine-Waal, Rhine-Scheldt and Lille-Brussels. The goal of this measure is to result in a shift from road to rail transport for regional cross-border passenger travel.

### Impact policy measure

The assessment of the policy ambition to improve cross-border rail transport has shown that a shift from road to rail could be realised for several cross-border corridors in the Eurodelta. There is sufficient demand to operate profitable rail services, if the cross-border connections are well integrated with the national rail and bus services and passenger-friendly services are provided. The measure has the potential to contribute to more sustainable transport and is in-line with plans of the European Green Deal. Compared to the overall emissions in transport, the potential emission reduction of this measure is limited, since the regional cross-border passenger segment is rather small. However, the policy should be seen in the broader context of a shift from road to rail.

### High-level roadmap for implementation

The challenge here is optimizing cross-border cooperation, as rail transport and infrastructure are currently organised by national or regional bodies, and controlled by national authorities. First step is for regional and local stakeholders to learn from existing successful projects.

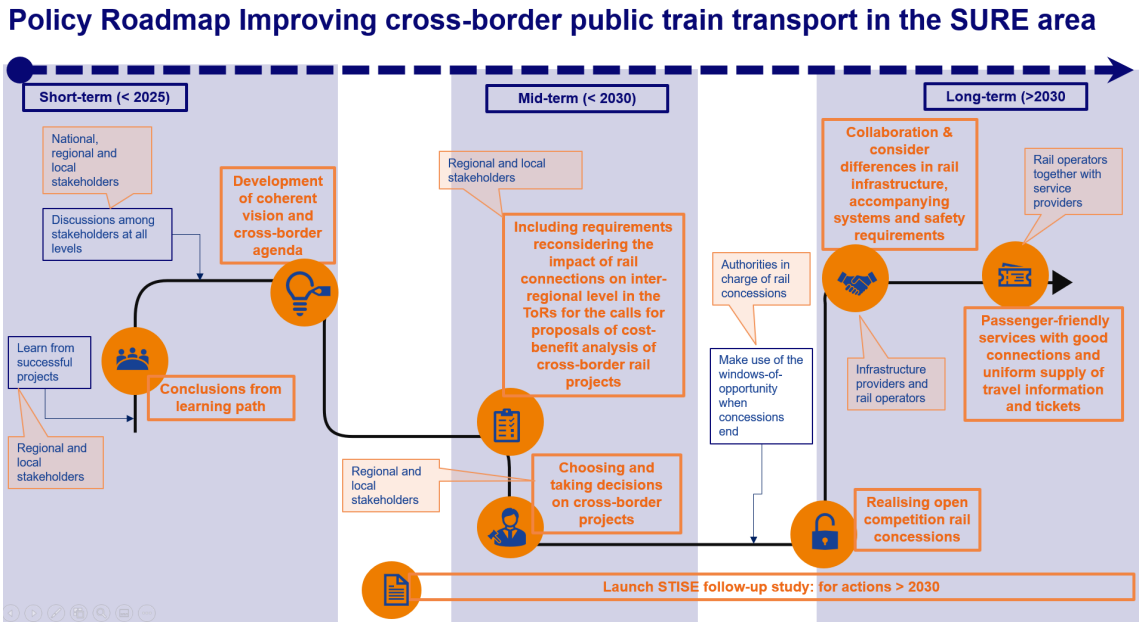



Figure 4 - Policy roadmap Improving regional cross-border train transport in the Eurodelta

## 2.5 Overview of the policy options

The summary table below (Figure 5) shows an overview of the impacts of each of the 4 assessed policy measures, without emphasizing the comparison of measures as each measure has its own scope and different approaches were used for the analysis.

None of the policy measures can be regarded to outweigh the other in importance. All four measures are recommended to be implemented, base on the degree of feasibility and on the framework policy priorities of the concerned competent authorities in the Eurodelta. These measures interact with each other and thus multiply each others' effects. Moreover, they are expected to generate positive externalities for national or local transport policies. For instance, accomplishing a stronger shift to high-speed trains as a result of an aviation ban would stimulate demand by means of improved national and subnational train connections. Depending on the choice to implement one or more measures simultaneously, the implementation processes require coordination mechanisms at all governance level in order to increase efficiency. Sustainable mobility in the Eurodelta is a supranational and multi-level policy domain, and shall overcome fragmentation in space, jurisdictions and competences.

| Estimated impacts of development / policy measures | Impact on modal shift | Environmental impact (Comparison with the situation without the policy measures) | | | | | |
|---|---|---|---|---|---|---|---|
| | | $CO_2$ emissions | | $NO_x$ emissions | | $PM_{10}$ emissions | |
| | | 2030 | 2050 | 2030 | 2050 | 2030 | 2050 |
| Units | | Mton (TTW) | Mton (TTW) | Mton (TTW) | Mton (TTW) | kton (TTW) | kton (TTW) |
| Estimated impact of **(extra) measure Aviation shift** | Modal shift of aviation to, from and within the SURE area on short and midrange distances. | -0,94 Mton | -0,86 Mton | -0,002 Mton | -0,002 Mton | -0,03 kton | -0,03 kton |
| Estimated impact of **(extra) measure Zero Emissions Zones (ZEZ)** | ZEZ schemes primarily aim at accelerating vehicle fleet renewal. They have very limited impacts on modal shift, unless they are coupled with additional modal shift policies and measures. | -25,9 Mton | -15,3 Mton | -0,06 Mton | -0,01 Mton | -0,95 kton | -0,60 kton |
| Estimated impact of **(extra) measure Potential of MaaS** | MaaS, with the right prerequisites can create a modal shift of up to 10% | -0,59 Mton | -2,59 Mton | -0,001 Mton | -0,001 Mton | 0,006 kton | 0,019 kton |
| Estimated impact of **(extra) measure Improving Regional Cross-border public train transport** | In the border regions with sufficient traffic a shift from road to rail can be realized | -0,014 Mton | -0,007 Mton | +0,000017 Mton | +0,000002 Mton | -0,002 kton | -0,003 kton |

Figure 5 - Summary table with key figures of the impact of each of the 4 assessed policy measures (*each measure with its own scope and assessment approach)

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