A review of public policy instruments to promote freight modal shift in Europe: Evidence from evaluations

VTI Working Paper 2021:6

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Abstract

This paper presents a review of past and present public policy instruments in Europe promoting a modal shift of freight transports. The identified policy instruments are categorized based on several shared characteristics. To the extent that ex-post evaluations are available, policy performance is discussed, and the evaluations are compared.

The study identifies 93 public policy instruments in Europe. The most common type of policy is subsidies/grants to rail and/or water implemented at the national level. Most policy instruments only focus on the promotion of one specific transport mode, which most commonly is rail.

Evaluations of policy performance were found for 20 policy instruments. The evaluated policy instruments are mainly subsidies/grants at the national level, or policy instruments at EU level. The bias in evaluation towards these types of policy instruments is partly explained by the commitment to evaluation at EU level, and the need for permission by the European Commission to implement and prolong subsidies/grants classified as state aid. The evaluations differ in methodology and regarding what type of performance indicators that are evaluated. The evaluation guidelines and criteria that exist at EU level are often followed to some extent but interpreted differently depending on for example type of policy and data availability. Thus, comparing policy performance is difficult.

In general, there seem to be a more positive performance of policy instruments promoting a modal shift to rail than to waterborne transports. Several evaluations of EU-policy instruments describe a poor or a mixed performance of the policy instruments, while the performance of subsidies/grant at national level are often considered positive by the evaluations. A commonly mentioned factor for underachievement of the policy instruments is problems related to outreach of the policy, lack of applications, long and complicated application processes and a high administrative burden for the companies applying for financial support. Targets for the policy instruments are often broad and general, with a lack of clarity, making it difficult to meet all objectives, as well as to evaluate the policy instruments effectiveness and efficiency. Thus, well-defined targets, as well as better outreach and simpler processes could be one way forward in improving modal shift policy instruments in Europe.

Keywords
Modal shift; freight transport; public policy instruments; evaluation, effectiveness, efficiency

JEL Codes
H21, H23, R41, R48, Q58

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Funding: This work was supported by Naturvårdsverket (the Swedish Environmental Agency).

Project Title: MOSEL- MOdal Shift for an Environmental Lift (2018-2021)

Content

1. Introduction

The objective of this study is to identify and classify past and present public policy instruments implemented in Europe with the aim to achieve a modal shift, as well as reviewing their performance to the extent that ex-post evaluations exist. The research is important as it helps us understand if and how public policy instruments contribute to a modal shift of freight transport in Europe.

The current growth of freight transportation, due to the development of national and international trade, has not only enlarged volumes of road freight tonnage but also intensified freight's negative externalities, including road congestion, greenhouse gas (GHG) emissions[1], air emissions, noise pollution, and accidents (Ambra et al., 2019; Lin, 2019; Nocera et al., 2018). A modal shift from road to rail and waterborne transport (short sea shipping and inland waterways), for parts of the distance (multimodal transports) or wholly, could help reduce some of the negative externalities from freight transports (Bickford et al., 2014; Nealer et al., 2012). In general, using rail and waterborne transport consumes less energy per ton and emits fewer GHG-emissions than using road transport exclusively (Breathen, 2011).

In order to reduce the negative externalities from freight transports, several public actors in Europe have set up targets and adopted policy instruments to promote a modal shift from road to rail and water. Several of these policy instruments and targets are driven by the European commission's Transport White Paper which specifies a modal shift of 30% for long distance road freight transport (above 300 km) by 2030, and more than 50% by 2050 (European Commission, 2021a; Pinchasik et al., 2020). So far, however, a modal shift from road to rail and inland waterways transport (IWT) has not been achieved at the aggregate level in the European Union (Eurostat, 2020) and several countries are far from meeting their modal shift objectives (Pinchasik et al., 2020). Road transport remains the dominant transport mode, representing more than three-quarters of all inland freight movement. Furthermore, tendencies of a modal back-shift can be seen over time as rail and IWT are losing market shares to road transports (Eurostat, 2020; Pinchasik et al., 2020). This indicates that current policy instruments have not yet been very successful in achieving the desired modal shift in Europe, at least not at the aggregate level. In response to this, it is important to evaluate the performance of past and present public policy instruments to identify efficient and effective policy instruments with potential for furthering modal shift and reduce the negative externalities from freight transport.

The performance of modal shift policy instruments has previously been investigated by several *ex-ante* studies. These studies analyse modal shift policy instruments by including simulations, models, estimations, and different types of impact assessments of how certain policy instruments are *expected* to affect modal shift. For example, Pinchasik et al. (2020) simulates the effect on transport and modal distribution for different policy scenarios in the Nordic countries, finding, among other things, that an ecobonus for rail will have a larger impact on modal shift than an ecobonus for waterborne transport. Santos et al. (2015) simulate how three different policy instruments will contribute to a modal shift to rail in Belgium and finds that while subsidies have a large potential in promoting intramodality, the internalization of external costs could in some cases have a negative impact on promoting intramodality. There are also a few academic papers which evaluate the *ex-post* performance of already implemented policy instruments. For example, Suárez-Alemán (2016) investigate the case of short sea shipping policy within the EU and find that we are not achieving sufficient modal shift in order to meet the objectives stated in the European commission's Transport White Paper. Similarly, Aperte and Baird (2013) investigate policy instruments to promote Motorways of the Sea and find that while some actions at national level have been effective in promoting modal shift to short sea shipping, there has been a limited

[1]"The main greenhouse gases include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulphur hexafluoride (SF_6), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), as well as ozone depleting chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs)" (Eurostat Statistics)

success of policy instruments at EU level. There are also some studies within the grey literature that has investigated the performance of either specific policy instruments, or a group of policy instruments. For example, KombiConsult GmbH et al. (2015) analyse combined transports in EU and discuss some of the implemented policy instruments within the region. They argue that direct grants to combined transport operations, as well as grant to intermodal facilities, could have a potential in promoting combined transports.

Even though several studies investigate policy instruments for modal shift, we are missing an updated review of the performance (ex-post) of the various public policy instruments implemented in Europe to promote modal shift. This study intends to fill this research gap by answering the following 3 research questions (RQ: s):

RQ1 - What policy instruments have been implemented in Europe with the aim to achieve a modal shift?

RQ2 - Which policy instruments have been evaluated, and which evaluation methods and performance indicators have been applied?

RQ3 - Which conclusions can be drawn regarding the effectiveness and efficiency of European policy instruments in terms of achieving modal shift and reducing negative externalities?

The research intends to improve our knowledge of what types of policy instruments that can effectively and efficiently contribute to a modal shift of freight transport in Europe.

The study delimits itself to public policy instruments in Europe and focus on a modal shift of long-distance heavy freight transports (above 300km) from road to rail and water, as it is mainly these transports that can take advantage of economies of scale and distance (European Commission, 2011a). Furthermore, the focus is on policy instruments being active at some time period from 2000 and onward.

The remainder of the paper is structured as follows: Section 2 presents state of the art regarding policy instruments and modal shift, Section 3 presents the methodology applied in the study including delimitations, Section 4 presents and discuss the results of the study, and Section 5 concludes.

2. State of the art

2.1. Modal shift

Modal shifts include both "pure" shifts to other transportation modes, e.g., from road to rail, and partial shifts to transports including both road and rail and/or waterborne transport, so-called multimodal transports. Multimodal transports also include intermodal transport, which refers to goods that are transported with a combination of at least two transport modes, but without changing loading unit (Santos et al., 2015). Furthermore, the term combined transport refer to intermodal transports where the road leg of the transport is as short as possible (European Commission, 2016a). A modal shift can be a shift of already existing transports or a mode choice of rail or water for new transport services.

A modal shift from road to rail and/or waterborne transport is desirable for many transports as it can help reduce some of the negative externalities from freight transports (Bickford et al., 2014; Nealer et al., 2012). Several researchers investigate the environmental effectiveness and feasibility of modal shift (Ambra et al., 2019; Beuthe and Jourquin, 2001; Bickford et al., 2014; Dong et al., 2018; Kreutzberger, 2008; Lin, 2019; López et al., 2009; Nealer et al., 2012). In general, freight transports by rail and waterborne transport emit less GHG-emissions than truck and result in a reduced number of accidents and congestion on road. For example, in the Handbook on the external costs of transport provided by CE Delft (2020), the external costs for the different transport modes are estimated, including accidents, air pollution, climate, noise, congestion, well-to-tank and habitat damage. According to the estimations, external costs in 2016 for heavy trucks, rail, and IWT were 4.2, 1.3 and 1.9 €-cent per tonne kilometre (tkm) respectively. However, the external costs of the different transport modes vary depending on several factors such as load factor, where the transport is performed, and what energy sources that are used. For example, according to Nocera et al. (2018) the external costs are about four times higher in the alpine areas than at flat areas.

Even though the literature generally mentions advantages of a modal shift to rail and water, it is important to note that the climate- and environmental benefits of a modal shift from road to waterborne transports have been questioned and that under certain circumstances these might be negative. For example, Svindland and Hjelle (2019) estimate the comparative CO_2 emissions of maritime freight transport compared to road and base their data on CO_2 emissions from actual container feeder transport operations in Europe over a year. They find that short sea container shipping is more CO_2 efficient than road in general, but that the comparative advantage to road is only marginal in several scenarios. They find that a relatively high capacity utilization is needed in order for maritime transport to be considered better than road in terms of CO_2 emissions. Furthermore, even though the external costs are generally lower for rail freight and IWT than for road, this is not always the case for intermodal transportation (Kaack et al., 2018). For example, Santos et al. (2015) finds that, depending on the length of the road haul, internalizing external costs can even disadvantage intermodal transport operations.

There are several factors which influence the mode choice for freight transport services. Transport costs and prices are one of the most important factors (Elbert and Seikowsky, 2017). In this study, the focus is on the shift from long distance heavy road transports (above 300 km) to rail and water, as it is mainly these transports that can take advantage of economies of scale and distance (European Commission, 2011a). However, there are also other factors which may influence the mode choice (and indirectly affect the costs), such as reliability, flexibility, transit time, frequency, accessibility, and security (Dong et al., 2018; Elbert and Seikowsky, 2017). Furthermore, the characteristics of the goods being shipped, such as volume, weight, perishability, and value may also be considered when choosing transport mode (Lindgren and Vierth, 2017). According to Pinchasik et al. (2020) the competitive advantage of road is increasing as longer and heavier vehicles are allowed (for example in the Nordic Countries) and as technological improvements and changes influence the energy efficiency and emissions from trucks. Furthermore, Pinchasik et al. (2020) emphasise the importance of recognizing the geographical differences in countries as policy instruments might have different effects on modal split given the

countries certain conditions. An international perspective is also important as the likeliness for goods to continue by rail or water is higher if the goods enter the country by rail or water rather than by road.

According to Tsamboulas et al. (2007) there has been a focus on the supply side of modal shift in research and policy when trying to strengthen the position of rail and waterborne transports compared to road. However, the mode choice decision-making process is complicated and vary between supply chains and segments. Different actors have different priorities and possibilities to achieve a modal shift, and the decision power may lay at different actors depending on supply chain and segment. It is therefore important that the above-mentioned mode choice criteria are considered when designing policy instruments, and that differences between segments and supply chains are acknowledged.

2.2. Policy instruments and theory

In this study, *public policy instruments* refer to political tools that are employed to correct for market failures and to reach one or several societal objectives, such as a modal shift to reduce the negative externalities from road freight transports. These public policy instruments are expected to make private or public actors take *measures* that are in line with the overarching goals. Measures may also be taken at own initiative, for example if a private firm shares the same goal as the government. However, this study delimits itself from private initiatives and thereby only focus on policy instruments initiated by *public* actors.

There exist several different types of policy instruments, which can be categorized in different ways. In this study we use the categories: economic (eg. taxes and subsidies), administrative (e.g., legislations, technical requirements, environmental classifications) and information (e.g., eco-labelling, advising, education, training, research, and development). These policies are mainly based on the Swedish Environmental Protection Agency (2021) where policy instruments are classified according to if they are market based (using prices and other market-mechanisms) or non-market based (e.g., regulations, informative policy instruments etc.), and on Swedish Environmental Protection Agency (2012) where policy instruments are classified as economic, administrative, informative and research.

The effectiveness and efficiency of different types of policy instruments has previously been discussed in the literature. For example, in theory, a global CO_2-tax representing the external costs of CO_2-emissions is often mentioned as the most cost-effective policy instrument for reducing CO_2-emissions (Pigou, 1920). However, the policy instruments that are considered the most optimal according to theory are not always possible to implement in practice due to for example political factors. Therefore, while the first best policy would be desirable from a theoretical perspective, the second-best policy might be the one that is possible to implement given the circumstances.

To understand the functioning and performance of a policy instrument, as well as understand if it is relevant for its purpose and achieve its objectives at a minimum cost to society, performing policy evaluations is a helpful tool (European Commission, 2017a). By performing evaluations, decision making regarding current and future policy instruments can be improved and based on lessons learned from previous experiences. According to the European Commission (2017) an ex-post evaluation should be an evidence-based judgement looking for causality between the policy instrument and the observed changes (if any), and it should be performed after a time period long enough to allow for any changes to be identified and measured.

There are several factors that need to be considered when a policy is evaluated. The OECD/DAC Network on Development Evaluation (2019) provides evaluation criteria, that were first laid out in 1991, but later revisited following the Paris Agreement and the 2030 Agenda for sustainable development. The criteria describe desired characteristics of policy instruments (included in the term "*interventions*") and include the following:

- **"Relevance:** is the intervention doing the right things?"

- **"Coherence:** how well does the intervention fit?"
- **"Effectiveness:** is the intervention achieving its objectives?"
- **"Efficiency:** how well are resources being used?"
- **"Impact:** what difference does the intervention make?"
- **"Sustainability:** will the benefits last?"

The European Commission (2017a) also provides guidelines for how to perform policy evaluations in their "Better Regulation Guidelines". Their evaluation criteria largely overlap with the criteria provided by the OECD/DAC Network on Development Evaluation (2019), and include: effectiveness, efficiency, relevance (given current needs), coherency (given other policy instruments), and EU added value. Furthermore, the European Commission (2017a) also highlights the importance of the evaluations having a high quality and following principles such as being comprehensive, proportionate, independent, objective and evidence based.

The European Commission (2017a) emphasize that even if there exists several different types of reports and activities that cover some of the above-mentioned questions, not all of them include all of the necessary elements to qualify as an evaluation. In this paper, we include evaluations that reach the European Commission (2017a) standards as well as evaluations that do not. We will call all these attempts to evaluate the performance of an already implemented policy for *evaluations*.

Although there are several different guidelines and criteria for how to perform evaluations, difficulties in evaluating policy instruments in practice exist for various reasons and may, among other things, differ between different types of policy instruments. According to Crabb and Leroy (2012), evaluating environmental policy instruments is a special case presenting new complexities compared to other policy areas. Difficulties in finding relevant and reliable data, as well as distinguishing between changes that has occurred due to a policy instrument and what changes that has occurred for other reasons are some of the problems that arise for evaluators in the environmental policy area (Crabb and Leroy, 2012; European Commission, 2017a).

Both Huitema et al. (2011) and Christie (2003) find that there is a gap between evaluation theory and how ex-post evaluations are performed in practice. Harmelink et al. (2008) study 20 policy instruments and their ex-post evaluations and find that energy policy instruments often lack quantified targets and clear timeframes, and that monitoring information is not collected at a regular basis. Furthermore, they find that policy evaluations often have different characteristics and use a large variation of methodologies to determine the effects of a policy, making comparisons between evaluation results difficult. There is also a variation in quality between different evaluations, which may jeopardize the evaluations possibilities to improve public policy (Cooksy and Caracelli, 2005). According to Haug et al. (2010) climate policy evaluations performed in the EU are in many cases not systematic which makes evidence-based policy and decision-making difficult.

A recently published paper in the Swedish journal "Ekonomisk Debatt" find that even though the same types of methodologies are used, evaluations performed by private consultant firms often generate a more positive description of policy performance than evaluations performed by other types of evaluators (Colin et al., 2021). They argue that one explanation to this could be that the evaluated public authorities have incentives to choose evaluators from which they expect more positive results, as this could lead to continued financing for the authority. Thus, the consultant firms might over time generate more positive evaluations if this constitutes a competitive advantage towards other evaluators.

2.3. Previous literature on policy instruments for modal shift

Policy instruments targeting a modal shift have been investigated through several different perspectives and a number of research projects have sought to inform policymaking with respect to facilitating freight

modal shift from road to rail and/or water. Several papers that investigate modal shift from a policy instrument context use models and simulations to estimate the *expected* modal shift from different policy instruments. A study by Pinchasik et al. (2020) simulates effects from different policy scenarios where modal shift policy measures are strengthened, expanded, combined, and harmonized across borders by using the National Freight Model for Norway. Among other things, they find that an ecobonus (subsidy/grant system) for rail leads to a higher modal shift than a corresponding ecobonus for waterborne transport. They also find that the effects on GHG-emissions are relatively small even in scenarios with strong policy instruments and that some of these scenarios comes with increased local air pollution. In another study, Santos et al. (2015) simulate how three different policy instruments will contribute to a modal shift to rail in Belgium. They find that subsidies have a significant impact on promoting intermodality and that optimizing terminal location also increase the competitiveness of intermodal transport, but to a less extent than subsidies. However, they find that internalizing external costs can have a negative effect on the promotion of intermodality and that innovative last-mile transports are needed to overcome this obstacle. Beuthe et al. (2002) also investigate the case of Belgium and simulate the effect on freight transport on road, rail and IWT when external costs are internalized. In contrast to Santos et al. (2015), they find that the internalization of external cost could be very effective in achieving a modal shift from road to rail and IWT. However, they emphasize that such a policy instrument cannot be introduced in isolation only in Belgium but need to be coordinated with road pricing policy instruments in other European countries. Tsamboulas et al. (2015) investigate the implementation of the Ecobonus financial incentive in Italy and develop a model to try to estimate how modal shift will be affected by the implementation of new maritime routes under the subsidy. Based on data regarding the performance of the previous Ecobonus program, they find that the effectiveness of the policy is most significant in a context where the Ro-Ro ("roll-on/roll-off" ships) market is not very well developed, and the number of potential road haulier users is high. They therefore recommend that these characteristics should form the basis for allocating funding.

Tao et al. (2017) model the potential for freight modal shift of containers and a corresponding reduction in CO_2 emissions from introducing a subsidy policy to rail users in Yiwu City (China). They find that CO_2 emissions can be reduced by 2,2% compared to the scenario without a subsidy. Furthermore, they find that subsidies are successful in stimulating a short-term modal shift, but that a policy package encompassing financial, technological, operational, and managerial measures is required in the long-term.

Potential possibilities of policy instrument combination and integration has also been mentioned by several other papers investigating policy instruments for reducing externalities from the transport sector, such as Santos et al. (2010) and Vieira et al. (2007). In economics it is often referred to the so-called Tinbergen Rule, which states that for each and every policy target there must also be at least one policy tool (Tinbergen, 1952). This has some implications for climate and environmental policy instruments. It is common that policy instruments affect more than one target, both in positive and negative ways (Knudson, 2009). Therefore, selectivity is a positive attribute for a policy as it will lead to a better matching between policy and target. Furthermore, Knudson (2009) argue that it is important for policy makers to realise that it doesn't exist any "magic bullets" that can fix all climate and environmental problems, and that a series of policy tools need to be developed to match policy instruments and targets.

A few papers evaluate the performance of already implemented policy instruments. For example, Suárez-Alemán (2016) investigate how EU policy have contributed to shifting transports to short sea shipping. They find that maritime transport has not been properly promoted and that we are not yet on the right path to meet the objectives stated in the transport White Paper. The author argues that modal shift policy instruments in the form of outright grants to companies that shift transport mode (such as the Marco Polo Programmes) lack incentives to promote the efficiency in short sea shipping. Furthermore, little attention is being paid to efficiency in ports. Looking into EU investments in infrastructure, ports have only received 5 % of the transport investments at EU level while road has received 60%. The lack of policy instruments targeting ports is considered problematic as the role of

ports are crucial in intermodal transport chains. Aperte and Baird (2013) also investigate policy instruments for maritime transports, focusing on policy instruments to promote Motorways of the Sea. Just like Suárez-Alemán (2016), they find that there has been a limited success of policy instruments at EU level, such as the Marco Polo Programmes. However, they find that some policy instruments at national level have been effective in promoting modal shift to short sea shipping, such as the Italian Ecobonus scheme which is paid in the form of a subsidy (tariff rebate) to the users of maritime transport. They argue that some of the success of the Italian Ecobonus scheme may depend on the simplicity of the programme and the user-friendly approach. However, the policy could be further improved by more frequent payments, for example monthly, instead of once a year. Furthermore, it is important to supervise how the maritime charges evolve as there is a risk that subsidies and grants to the users of transport services, like the Ecobonus, may be followed by price increases in tariffs. In a report on Combined Transport in EU, KombiConsult GmbH et al. (2015) investigate several policy instruments promoting combined transport within the region. In accordance with Aperte and Baird (2013), they argue that direct grants to combined transport operations, as well as grant to intermodal facilities, could have a potential in promoting combined transports. However, they also discuss the different downsides of direct grants. For example, transport operations by rail or water risk being shifted back to road when the grant or subsidy expires. Therefore, policy instruments like these tend to be permanent to eliminate the risk of a modal backshift. Furthermore, the direct grants may also lead to distorted competition.

Other streams of research regarding policy instruments and modal shift involve the direct involvement of governments, which is explored by Pallme et al. (2015). The study investigates the ability of local governments to influence the success of intermodal terminals through support or direct participation in a public private partnership. They find that securing commitment and positive collaboration between the railroads, shippers and government is critical to achieving a positive outcome from public policy to influence a modal shift from road to rail. Furthermore, Meers and Macharis (2015) suggest that if geographic entities are ranked and then targeted according to their modal shift potential, then this will allow policymakers to focus their modal shift efforts on a limited number of transport flows and achieve a higher success rate. Frey et al. (2014) model the potential impact of a raft of policy instruments on freight modal choice within Germany. Applying a systems dynamic model, they find that although targets are more easily achieved in times of strong economic growth, serious capacity problems on rail are likely to emerge. Other work advocates the case of modal backshift. For example, a study by Meers et al. (2018) investigate the possibilities of a reversed modal shift to road when policy instruments allow longer and heavier trucks on the roads. According to the study, there is limited evidence of a reverse modal shift from countries which already allow longer and heavier trucks. However, the study shows that the impact of longer and heavier trucks on the Belgian market could be substantial if road transport prices are also decreased.

3. Methodology

3.1. Identification and classification of policy instruments

To understand how policy instruments can contribute to a modal shift, it is important to increase the understanding of what policy instruments that already exist, as well as the performance of these policy instruments. This study presents a review of public policy instruments within the European region and classify them according to several categories. To the extent that ex-post evaluations exist, a discussion regarding the policy instruments effectiveness and efficiency is included, as well as a discussion regarding the characteristics of the evaluations.

As there is no database, webpage or other source that already includes information regarding all modal shift policy instruments in Europe, information has been gathered from a variety of different sources to compile a comprehensive list of as many modal shift policy instruments as possible. To start with, already existing databases were examined to identify policy instruments aiming for a modal shift. This mainly included the European Commissions (2021b) database for state aid cases and the OECD (2021) database on policy for the environment. Second, we have searched for policy instruments in both grey and white literature, mainly using Google and Google Scholar. Search words included among other things "policy instrument", "freight", "modal shift", "multimodal transport", "intermodal" etc. More detailed searches were also conducted such as "subsidy, rail, Italy". This search strategy resulted in the identification of various modal shift policy instruments from several different sources. For example, information regarding existing policy instruments were identified in academic studies, websites of governmental institutions, reports published by public organizations, etc. Snowball techniques were used to further identify policy instruments, for example by checking the reference lists to academic studies and reports. The last searches for policy instruments were conducted in April 2021. Thus, policy instruments implemented after that are not included in the study.

All relevant policy instruments found during the search process were included in a database constructed during this project. For a policy instrument to be included in the database it had to fulfil the following requirements:

- Implemented by a public actor in Europe.
- Targeting a freight modal shift from road to rail and/or waterborne transports as well as policy instruments with a clear focus on reducing freight transport by truck (e.g., internalizing external costs).
- The policy being active at any time after 2000. To identify past and present public policy instruments implemented as well as their performance through ex-post evaluation, only already implemented policy instruments were included and not planned policy instruments.

As a result of the search process, 93 modal shift policy instruments have been included in the database and sorted according to several different categories to understand the policy instruments' incidence and interrelationships. The main categories that the policy instruments have been sorted to are geographical level of the policy instrument, which transport mode the policy instrument promotes, and what policy group the policy instrument belongs to.

The geographical level category sort the policy instruments according to if they are implemented at the regional, national, or local level. First, the regional perspective mainly reflects policy instruments applied by the European Commission, but it can also include cooperation between a few European countries. A national perspective encompasses policy instruments implemented by the government in a

specific country[2], for example, the Ecobonus systems implemented in Sweden, Italy, and Norway. Beyond that, the local perspective represents policy instruments applied by local governments within a specific country's region or province. For instance, the Ecobonus system promoted by the Basque Country region in Spain is a subsidy scheme for road carriers that aims to shift freight transports from road to sea.

The categorization of policy instruments according to targeted transport mode include whether the policy promotes rail, shortsea shipping, IWT, and/or road discourage.

The policy instruments are also sorted according to several policy categories and sub-categories, based on the categorization of policy instruments according to the Swedish Environmental Protection Agency (2021, 2012). Using these references, we developed a set of criteria for analysing and structuring policy instruments in two dimensions. The first was a classification of the primary categories of the policy instruments in three groups: administrative, economic, and information. The second was the identification of which sub-category the policy instrument belonged to. As a result, 3 primary categories and 14 sub-categories were considered, presented in Table 1 below.

Table 1 – Primary categories and sub-categories of policy instruments

Administrative	**Economic**	**Information**
Agreement	Fee	Advising
Infrastructure planning	Funding of infrastructure	Development research
Inspection	Grant	
Legislation	Subsidy	
Limit	Tax	
	Tax deduction	
	Toll/vignette	

3.2. Identification and classification of evaluations

For every policy instrument that was included in the database, we also searched for *ex-post* evaluations of the policy instruments to achieve information regarding their performance. The searches were conducted in Google and Google Scholar, including both grey and white literature. The last searches were conducted in April 2021. For each of the included policy instruments, we searched for the name of the policy in combination with the words "evaluation", "impact", and "assessment", in each search engine. However, some evaluations had already been found during the process of identifying the policy instruments and were therefore found using different search words and snowball techniques. We included all type of studies and documents that attempts to evaluate the performance of an already implemented policy instrument and not only those that reach the European Commission (2017a) standards for classifying as an evaluation.

3.2.1. Evaluation characteristics

It is important to not only gather information regarding the performance of the policy instruments (according to the evaluations), but also gather information regarding how the evaluations have been

[2] National category covers: Member States, European Free Trade Association (EFTA) countries (Iceland, Liechtenstein, Norway, and Switzerland) and United Kingdom.

performed. By doing so, we can increase our understanding of how policy evaluations for modal shift policy instruments are evaluated today, as well as the quality of these evaluations. This helps us understand how the performance of the policy instruments have been evaluated by the different evaluations, as well as if they are comparable with each other. As policy evaluations may vary in for example methodology, quality, and what performance criteria they evaluate, we have included information regarding the policy evaluations characteristics in the database.

Based on the different papers examining performance of policy instruments and quality of policy evaluations presented in section 2.2, we have selected four performance and quality criteria to search for in the policy evaluations:

- Actor performing the evaluation.
- Purpose of evaluation.
- Performance criteria considered by the evaluation.
- Methodology to evaluate the performance.

Some policy instruments have several different targets, where modal shift just is one of them. Therefore, we distinguish between the performance criteria that are considered by the evaluation as a whole, and the performance criteria that are considered in terms of evaluating the modal shift performance. To determine what performance criteria that were considered, we used the European Commission (2017a) definitions for relevance, coherence, effectiveness, efficiency and EU added value.

Information regarding the above performance and quality criteria were included in the database and is further described in the results and discussion (section 4).

3.2.2. Policy performance

As described in section 2.2, the performance of a policy instrument can be described according to several different criteria such as those mentioned by the better regulation and evaluation guidelines provided by the European Commission (2017a) and OECD/DAC Network on Development Evaluation (2019): relevance, coherence, effectiveness, efficiency, impact, sustainability, and EU value added. In this study, the focus is on identifying the policy instruments' *effectiveness* and *efficiency*. Therefore, information regarding effectiveness and efficiency, as well as the policy instruments targets was summarized for each of the identified evaluations.

The definitions of effectiveness and efficiency formulated by the European Commission (2017a) and OECD/DAC Network on Development Evaluation (2019) where used as guidelines when gathering information from the evaluations. The performance criteria *effectiveness* should analyse the progress towards the policy instruments objectives (European Commission, 2017a; OECD/DAC Network on Development Evaluation, 2019). This includes looking at the quantitative and qualitative effects of the policy instruments, as well as looking for evidence of why, whether and how the observed changes are linked to the policy instrument (European Commission, 2017a). Furthermore, to investigate factors such as distribution of the effects among groups in society, the performance criteria *effectiveness* should also include "results" and "differential results" to look beyond the objectives (OECD/DAC Network on Development Evaluation, 2019). According to the European Commission (2017a) the performance criteria *efficiency* should investigate costs and benefits of the policy, as well as how they accrue to different stakeholders. The OECD/DAC Network on Development Evaluation (2019) define the *efficiency* criteria as "A measure of how economically resources/inputs (funds, expertise, time, etc.) are converted to results".

3.3. Delimitations of methodology

The search process has resulted in 93 public policy instruments over Europe of which we have found evaluations for 20. This does most likely not cover *all* modal shift policy instruments and evaluations in Europe and there might be some bias in the database that have been constructed within the project. For example, language barriers might have caused a bias towards policy instruments and evaluations in those countries that provides information in English. Furthermore, there might be a bias in the database towards economic and administrative policy instruments at a regional or national level as these are often more well documented than policy instruments at the local level.

Some policy instruments are closely linked to each other. For example, the EU-programme "Motorways of the Sea" has been financed through several other EU funding programs such as CEF, TEN-T, and the Marco Polo I and II programmes. Because of these interrelations, some policy instruments are "double counted" in the database, at both the funding level and implementation level. We have chosen to include both levels, as the implementation level does not lie directly under the funding level but is governed outside the program. Often, funding from more than one source is used. At the same time, we believe it makes sense to include the overarching measures on EU-level, as these make up a large share of the total funding and enable many programs, and hence are important to evaluate.

In this study we have mainly considered policy instruments with modal shift as primary target. However, policy instruments with other primary targets, such as internalization of freight transport's external costs or funding of rail infrastructure, have also been included if modal shift is considered as a sub target or desired effect. There are however policy instruments that do not target a modal shift, but which may in fact contribute to a modal shift. For example, a CO_2 tax on fuel might lead to higher costs in the road transport sector compared to other transport modes and indirectly lead to a modal shift. These type of policy instruments have not been included in this study.

4. Results and discussion

4.1. Identified policy instruments.

The first research question (RQ1) that we aim to answer in this study is: "What policy instruments have been implemented in Europe with the aim to achieve a modal shift?". The search strategy applied within the study to answer RQ1 resulted in the identification of 93 public policy instruments within Europe (see Annex A for a list of the identified policy instruments). All identified policy instruments were included in a database, where they were sorted according to different categories, as described below in section 4.1.1 to 4.1.3.

4.1.1. Geographical level

First, we have analysed the geographical level, i.e., in the place where the policy instrument has been implemented. At the regional level, 27 public policy instruments have been identified, which includes both policy instruments implemented by the European Union but also specific collaborations between countries. Most policy instruments (53 out of 93) have been identified at the national level. Finally, 13 public policy instruments have been identified at the local level, targeting specific areas of a country.

4.1.2. Transport modes targeted by policy.

Second, we have categorised the policy instruments according to what transport modes they aim to promote. First, 58 percent of the identified policy instruments focus on promoting one specific transport mode, primarily railway (34 percent), followed by waterborne transport (24 percent). Second, 22 percent of the policy instruments promotes the use of both rail and waterborne transport simultaneously. Finally, 19 percent of the identified policy instruments indirectly promotes a modal shift by discouraging road transportation, for example by internalizing the external costs of road transport by vignette/toll systems (see for example the Eurovignette Directive). Figure 1 shows the categorization of the identified policy instruments according to targeted transport mode.

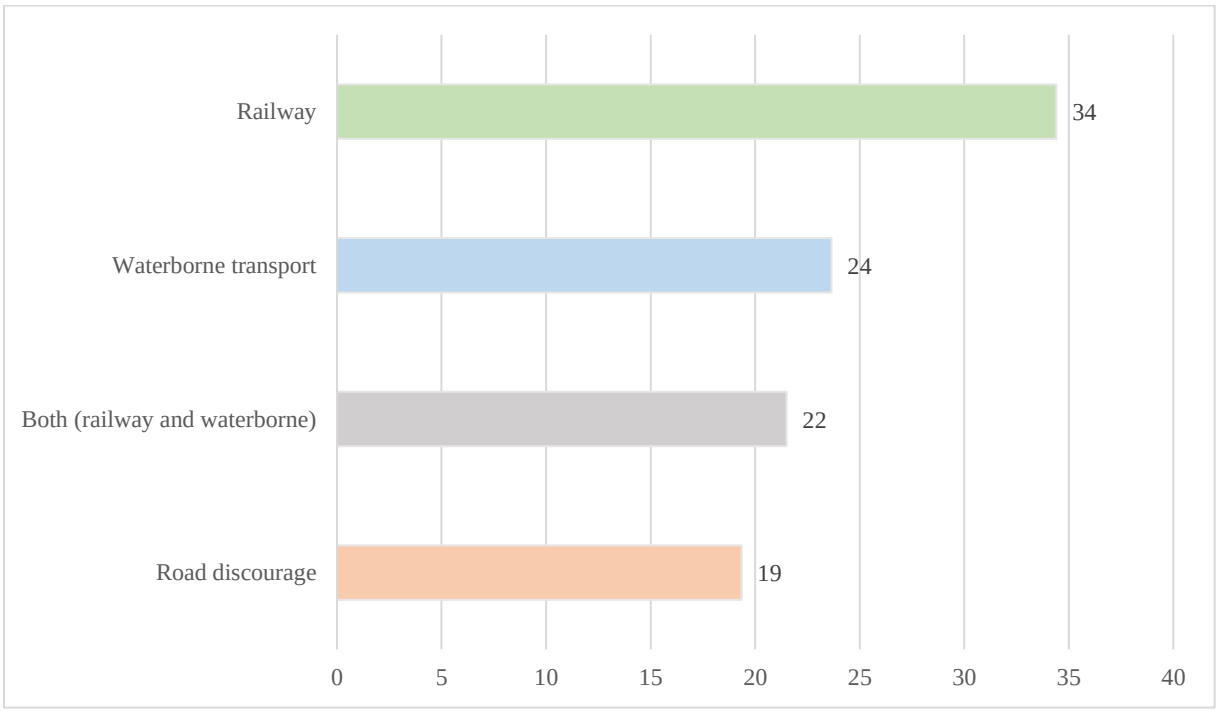

Figure 1 – Targeted transport mode by public policy instrument (%)

4.1.3. Primary categories and sub-categories of the policy instruments

Finally, the identified policy instruments are categorized into 3 different primary policy categories, as well as 14 sub-categories, as presented in Table 2. Sorted according to primary categories, the most identified policy instruments are economic (70%) followed by administrative (21%) and information (9%). The most identified administrative policy instruments are legislations, mainly EU directives and specific regulations. Second, in the case of economic policy instruments, 35% of the total cases considered are grants, such as the EU: s Marco Polo Programs or the Mode Shift Revenue Support and Waterborne Freight Grant implemented in Great Britain. This is followed by subsidies like the Ecobonus systems implemented in for example Italy and Sweden. Finally, development research, which accounts for 6 percent of the total policy instruments, comprise the most common information policy, for example the Shift2Rail Joint Undertaking. As previously discussed in section 3.3, there might be a bias in the database towards economic and administrative policy instruments at the regional and national level as these are often more well documented than policy instruments at the local level.

Table 2 – Primary categories and sub-categories of public policy instruments (%)

Administrative	**21 %**	**Economic**	**70 %**	**Information**	**9 %**
Legislation	12 %	Grant	35 %	Development research	6 %
Infrastructure planning	5 %	Subsidy	19 %	Advising	2 %
Limit	2 %	Toll/vignette	8 %		
Agreement	1 %	Funding of infrastructure	4 %		
Inspection	1 %	Fee	1 %		
		Tax	1 %		
		Tax deduction	1 %		

4.2. Policy evaluations

The second research question (RQ2) that we aim to answer in this study is: “Which policy instruments have been evaluated, and which evaluation methods and performance indicators have been applied?”. Below, section 4.2.1 presents the policy instruments for which evaluations have been identified, and section 4.2.2 discuss the evaluation characteristics.

4.2.1. Identified evaluations.

The search strategy applied to answer RQ2 resulted in the identification of publicly available evaluations for 20 out of the 93 modal shift policy instruments. Table 3 present the policy instruments for which we have found evaluations. As some policy instruments have been evaluated more than once, and some evaluations consider more than one policy instrument, the number of evaluations is not the same as the number of evaluated policy instruments. For further information regarding the evaluated policy instruments, Annex B presents a table describing the evaluation characteristics of the evaluated policy instruments, and Annex C presents a brief description of the evaluated policy instruments, as well as their targets, effectiveness, and efficiency.

As can be seen in Table 3 about half (11) of the evaluated policy instruments are implemented at EU-level, and the other half are implemented at the national level (8), or the local level (1). Only the category of economic policy instruments is covered by the evaluations at the national and local level, as all of them evaluate either subsidies or grants promoting rail and/or waterborne transports. However, the evaluated policy instruments at EU-level covers all three primary policy categories: economic, administrative and information.

Table 3 - Evaluated policy instruments.

Name of the Public Policy Instrument	**Region / country**	**Promotion of transport mode**	**Primary category**	**Sub-category**	**References regarding policy performance**
Connecting Europe Facility (CEF)	European Union	Rail and Water	Economic	Funding of infrastructure	(European Commission, 2018)
Directive 1992/62 and 2011/76/EU - Eurovignette	European Union	Road discourage	Administrative	Legislation	(European Commission, 2013)
Directive 92/106/EEC - Combined Transport of goods between Member States	European Union	Rail and Water	Administrative	Legislation	(European Commission, 2016a, 2016b)
EU Regulation 561/2006 - Rest periods on rolling/floating roads and social legislation relating to road transport	European Union	Rail and Water	Administrative	Legislation	(Windisch et al., 2016)
EU Regulation 913/2010 - European rail network for competitive freight	European Union	Rail	Administrative	Legislation	(European Commission, 2016c)
European Shortsea Network – (Evaluation for the Norwegian Short Sea Promotion Centre)	European Union	Water	Information	Development research	(Askildsen, 2005)
Marco Polo I and II	European Union	Rail and Water	Economic	Grant	(Europe Economics, 2011; European Court of Auditors., 2013; Innovation and Networks Executive Agency (INEA), 2020)
Motorways of the Sea	European Union	Water	Economic	Grant	(ICF et al., 2017)
NAIADES - Navigation and Inland Waterway Action and Development in Europe	European Union	Water	Administrative	Infrastructure planning	(European Commission, 2011b; European Court of Auditors, 2015)
National Aid - "The Mode Shift Revenue Support- MSRS	Great Britain	Rail and Water	Economic	Grant	(Department for Transport, 2014, 2020a).

National Aid - "The Waterborne Freight Grant Scheme"	Great Britain	Water	Economic	Grant	(Department for Transport, 2014, 2020a; European Commission, 2020a)
National Aid - Freight Facilities Grant - FFG	Great Britain	Rail and Water	Economic	Grant	(Woodburn, 2007)
Shift2Rail	European Union	Rail	Information	Development research	(Fontanel et al., 2017)
State aid to transfer goods to rail - the Province of Emilia Romagna	Italy (Emilia Romagna Region)	Rail	Economic	Subsidy	(European Commission, 2019a, 2014a).
State aid to transfer goods from road to rail "Ferrobonus"	Italy	Rail	Economic	Subsidy	(European Commission, 2020b, 2016d, 2011c)
State Aid - to transfer goods from road to rail "Nuovo Ferrobonus"	Italy	Rail	Economic	Subsidy	(European Commission, 2019b; Marzano et al., 2018)
State Aid - to transfer goods from road to water "Ecobonus"	Italy	Water	Economic	Subsidy	(European Commission, 2012a; RAM S.p.a, 2019; Tsamboulas et al., 2015)
State Aid - to transfer goods from road to rail "Miljökompensation"	Sweden	Rail	Economic	Grant	(Swedish Transport Administration, 2020)
State Aid - Financial support for rail operations	Austria	Rail	Economic	Grant	(European Commission, 2017b)
Trans European Transport Network (TEN-T)	European Union	Rail and Water	Economic	Funding of infrastructure	(European Commission, 2020c; Steer Davis Gleave, 2011)

4.2.2. Evaluation characteristics

Annex B presents a full list of the evaluated policy instruments and details regarding their evaluation characteristics in terms of actors performing the evaluations, purpose of the evaluations, performance criteria considered (for the evaluation in total, as well as with respect to modal shift and associated externalities), as well as methodologies applied. Below we briefly summarize and discuss the main findings regarding the evaluation characteristics.

4.2.2.1. Actors performing the evaluations.

At the EU level, the evaluations have been performed by actors such as the European Court of Auditors, different consultant firms, and/or expert groups. However, some Commission Staff working documents are lacking details regarding what specific actors and authors that has performed the evaluations.

The type of evaluators also varies at the national and local level. For example, the evaluation of the scheme on environmental compensation for rail freight transport in Sweden ("Miljökompensation för järnväg") has been evaluated by the Swedish Transport Administration (2020), which is also the organisation that administrates the policy (but the budget is decided by the government). Instead, in for example Great Britain, private consultant firms has performed the evaluations for the Mode Shift Revenue Support (grant for rail and IWT) and the Waterborne Freight Grant (grant for shortsea shipping), while an independent researcher has performed an evaluation of the Freights Facilities Grant (Woodburn, 2007). For some of the state aid cases at national and local level, the original evaluation reports have not been found. Instead, information regarding the policy performance has been found in the European Commission's decision letters regarding the prolongation of the policy instruments. In those decision letters, it is not always mentioned by the European Commission what specific actor that performed the original evaluation.

As the number of evaluations identified in this project are few, and the number of identified evaluators are even fewer, we cannot draw any conclusions regarding the relationship between evaluators and evaluation methods and/or results at the European level. Positive, as well as negative, performance of policy instruments is described by all types of evaluators. Thus, we can neither confirm nor deny the findings by Colin et al. (2021), showing that evaluations performed by private consultant firms often generate a more positive description of policy performance than evaluations performed by other types of evaluators. Further research, as well as a larger sample of policy evaluations, would be needed to understand if such a relationship exists at the European level.

4.2.2.2. Purpose of the evaluations.

It is important to understand why some policy instruments are evaluated and why some are not, as the results from the evaluations can show a biased picture of the effectiveness of modal shift policy instruments. Several different purposes are mentioned in the evaluations, ranging from legal requirements and prolongation of policy instruments, to understanding the performance and providing recommendations for further improvements.

Article 318 of the Treaty on the Functioning of the European Union (TFEU) include a commitment to evaluation, which may explain why EU policy instruments are evaluated to a higher extent than other policy instruments (European Commission, 2017a). Furthermore, there are several guidelines and frameworks within the EU such as the better evaluation guidelines and The Regulatory Fitness and Performance (REFIT) programme. In several cases it is also specifically mentioned in the legal framework of a policy instrument that it should be evaluated after a certain amount of time. This is for example the case for Connecting Europe Facility (CEF), EU Regulation 913/2010 regarding a European rail network for competitive freight, and the Shift2Rail Joint Undertaking.

As grants and subsidies at the national level are classified as state aid, the member states need permission by the European Commission to implement and continue such programs (European Commission,

2014b). Therefore, the evaluations of such policy instruments have in most cases been performed when the different member states have applied for permission by the European Commission to prolong the aid scheme. However, other purposes than just the prolongation itself are also mentioned in the evaluations, such as evaluating the performance of the policy, suggesting improvements, as well as revising the grant/subsidy levels.

A general observation in this study is that the evaluations that has been performed with the purpose of prolonging subsidies/grants at the national/local level, describe an overall positive policy performance. There are several possible explanations to this result. It could simply reflect that subsidies and grant are effective in achieving a modal shift, which would also confirm the findings from several simulation studies such as Pinchasik et al. (2020) and Santos et al. (2015). However, it could also be a result of member states only wanting to prolong a policy instrument if they already believe that the policy instrument is effective or will be effective in the future. Furthermore, if the likeliness of being allowed to prolong the policy instrument is higher with a positive evaluation, this could provide incentives to describe a more positive performance, which highlights the importance of independent evaluators. Thus, there is a possibility that evaluations with the purpose of prolongation might show a more positive performance than evaluations with other purposes. However, it would also be reasonable to evaluate policy instruments if there are any suspicions that the policy instrument is not achieving its objectives efficiently, as it would then exist incentives to evaluate if it can be improved or if it should be discontinued.

4.2.2.3. Performance criteria considered by the evaluation.

The policy instruments at EU-level most commonly follow the Better Regulation Guidelines provided by the European Commission (2017a) in terms of what performance criteria that are evaluated (relevance, coherence, effectiveness, efficiency and EU value added). However, these criteria are in some cases interpreted differently in the evaluations depending on for example type of policy instrument, type of evaluation, available data, and when the evaluation was performed (the better regulation guidelines were updated in 2017). For example, some evaluations have evaluated the management or the project selection process of the policy, rather than the effects of the policy instrument on modal shift and negative externalities from freight. This is for example the case for Shift2Rail and CEF, where management efficiency is discussed under the performance criteria "efficiency", rather than the resulting costs and benefits to society of the policy instrument. In several evaluations, it is discussed under the performance criteria "effectiveness" how much funds that have been allocated to different actions, but there is a lack of discussion regarding if the funds have effectively and efficiently contributed to policy targets, a modal shift, and reduced external costs. It is important to mention that some of the EU policy instruments have several different objectives, other than modal shift. Therefore, some of the evaluations are very well performed in terms of addressing the performance criteria of the policy in relation to the overarching objectives but are only briefly discussing the effectiveness and efficiency associated with modal shift.

The policy evaluations at the national and local level vary a bit more in what performance criteria that are considered. All of them discuss effectiveness to some extent, and most of them also discuss the relevance of the policy instrument. Out of the 9 policy evaluations at national/local level, 6 of them estimate costs and/or benefits to society of the policy instrument. However, these estimates might include different types of external costs and benefits. Coherence with other policy instruments is not commonly discussed in the evaluations for national/local policy instruments, other than the coherence with the EU internal market, which is a requirement for policy instruments classified as state aid.

As the evaluations include different performance criteria, and as the same performance criteria are sometimes interpreted differently in the evaluations, making comparisons of policy performance on an equal basis is difficult. Further clarifications regarding how the performance criteria should be interpreted in the evaluations could be needed in the European Commission's Better Regulation

Guidelines to further harmonize policy evaluations. Moreover, common guidelines for evaluations at national and local level would also be desirable to facilitate comparisons of policy instruments between countries.

4.2.2.4. Methodologies to evaluate the performance.

To the extent that evaluations exist, they differ in methodology, quality and what performance criteria that are evaluated, which confirm the findings from for example Cooksy and Caracelli (2005), Harmelink et al. (2008) and Huitema et al. (2011). Out of the 24 evaluations (note that the number of evaluations is higher than the number of evaluated policy instruments), 11 evaluations use both qualitative and quantitative methods, 7 use only qualitative methods, and 6 use only quantitative methods. Within each of these categories, a wide range of more specific methodologies are applied. For example, qualitative evaluations methods range from analysing policy and strategy documents, to targeted stakeholder consultations and on-spot audit visits. Furthermore, the quantitative approaches may include analyses of trends in freight traffic over time, comparing expected and achieved modal shift, as well as estimating the costs and benefits of a policy instrument.

According to Crabb and Leroy (2012) and the European Commission (2017a), difficulties in finding relevant and reliable data, as well as difficulties to measure causality between the policy instruments and observed changes, are important problems that may arise for evaluators in the environmental policy area. This is confirmed by several evaluations, especially those at EU-level. Most of the policy instruments at EU level that lack a quantitative analysis, do instead include a qualitative discussion and an explanation of why the effectiveness and efficiency has not been estimated quantitatively. One potential solution to overcome the problem of lacking data would be to formulate policy instruments in a way that require the firms receiving payments to collect data that are needed in evaluations.

4.3. Effectiveness and efficiency of modal shift policy instruments

The third research question (RQ3) that we aim to answer within this project is: Which conclusions can be drawn regarding the effectiveness and efficiency of European policy instruments in terms of achieving modal shift and reducing negative externalities? To answer RQ3, information from the policy evaluations regarding objectives/targets, effectiveness and efficiency have been summarised and is presented in detail for each policy instrument in Annex C. Due to the limited amount of policy evaluations, it is difficult to say something general about the performance of the different policy instruments. For example, it has not been possible to draw any conclusions regarding how the effectiveness and efficiency differs depending on the policy instruments' primary categories and sub-categories. Still, some general observations regarding policy performance have been made. Below, we summarise and discuss the most important findings regarding the policy instruments objectives/targets, effectiveness and efficiency.

4.3.1. Objectives/targets

Previous literature (e.g. Svindland and Hjelle, 2019) show that external costs are not automatically lower for waterborne transports than for road. Therefore, it may be problematic when modal shift is considered as an objective itself, rather than a means to achieve reduced external costs from freight transports (Björk and Vierth, 2021). This is the case for several of the identified policy instruments in this study. Furthermore, several of the evaluations identified in this study focus only on the modal shift achieved, and do not evaluate the effect on negative externalities. Therefore, it is important that modal shift is treated as a means to reduce negative external costs, rather than as an objective itself when policy instruments are designed and evaluated.

According to the European Commission (2017a) and the OECD/DAC Network on Development Evaluation (2019), the performance criteria *effectiveness* should analyse the progress towards the policy instruments objectives. However, in accordance with Harmelink et al. (2008), this study finds that there

is a lack of well-defined objectives and measurable targets for the identified policy instruments. Furthermore, there is a lack of quantitative policy evaluations comparing the achieved results with the objectives/targets. Several evaluations for policy instruments at the EU level, such as TEN-T, CEF, NAIADES and Motorways of the Sea, mention that the lack of well-defined targets and performance indicators lead to difficulties in achieving objectives, as well as evaluating the policy instruments performance. Thus, the lack of quantified targets makes it difficult to draw conclusions regarding the effectiveness and efficiency of the identified policy instruments. This is problematic as GHG-emissions need to be drastically reduced over the coming years, making knowledge on the effectiveness of policy instruments is exceedingly valuable if climate targets are to be reached. The lack of quantitative evaluations for the policy instruments may well follow from the lack of quantitative targets to start with, which would further strengthen the argument to set measurable targets already from the start.

Even though well-defined objectives and targets are important for assessing the effectiveness and efficiency of a policy instrument, it is important that other aspects are also considered to measure policy performance. The consequences of determining policy performance in terms of target achievement are illustrated in the evaluations of the Marco Polo Programmes (2003-2013), which aimed at promoting a modal shift of freight transports by providing grant to greener transport modes (European Court of Auditors., 2013). The policy instruments had clearly defined quantitative targets, as well as information regarding expected modal shift from granted projects. In terms of target fulfilment, both Marco Polo programmes experienced a significant underachievement, and the modal shift was far below the expected levels. This underachievement is central in the discussions regarding the policy instrument's effectiveness in two evaluation reports of the Marco Polo Programmes (Europe Economics, 2011; European Court of Auditors, 2013). However, in a third evaluation report performed by INEA (2020), as well as in a reply to the European Court of Auditors (2013) by the European Commission, the Marco Polo programmes are also seen in the light of their actual achievements and their benefits to society. For example, the European Commission considers the objectives as very ambitious, and argue that deciding the effectiveness based on target fulfilment may lead to the Marco Polo programmes being considered less effective than they are (European Court of Auditors, 2013). Furthermore, the European Commission also argue that the performance of the Marco Polo Programmes should be seen in the light of the economic crisis. According to INEA (2020) the Marco Polo II programme resulted in the avoidance of 3.5 billion tonnes of CO_2-emissions, and the program generated €2.9-3.1 of environmental benefits (including air quality, noise, climate change, accidents, and congestion) for every euro spent. Thus, depending on where the focus of the evaluations is directed, the performance of the Marco Polo programmes is considered negative or positive.

4.3.2. Effectiveness and efficiency

Several evaluations of EU-policy instruments describe a poor or a mixed performance of the policy instruments. For example, the evaluations found for the Marco Polo Programmes, Motorways of the Sea, NAIADES, TEN-T and the Eurovignette all describe a poor or a mixed performance in terms of achieving a modal shift and reaching desired outputs. However, some of these policy instruments do not have a primary target of achieving a modal shift and mainly focus on other objectives. Furthermore, as previously mentioned, the negative performance of the Marco Polo Programmes is questioned in the evaluation report by INEA (2020).

For some of the evaluated EU policy instruments (Eurovignette Directive, Combined Transport Directive, EU Regulation 561/2006 regarding rest periods on rolling/floating roads) it is problematised that they are enforced differently in the member states. For example, the definition of combined transport in the Combined Transport Directive has been interpreted differently between member states, leading to delays and fines for combined transport operations in some countries (European Commission, 2016a). Furthermore, the Eurovignette directive is implemented with different charging systems, technologies and different price signals over the EU, which impose unnecessarily high administrative costs to haulers (European Commission, 2013).

The evaluations for the EU funding programmes CEF and TEN-T argue that the policy instruments contribute to a modal shift by directing funding to for example rail and IWT. However, Steer Davis Gleave (2011) mention that there is a lack of TEN-T investment in projects focusing on multimodality, which have led to several projects not meeting their full potential due to a lack of investment in other parts of the transport system. Furthermore, in the evaluation of the Shift2Rail Joint Undertaking, it is argued that when all rail research is organized by the rail sector, there is a focus on rail only and less focus on multimodal solutions and innovation.

As previously mentioned, most evaluations for subsidies and grants at the national and local level describe a positive performance of the policy instruments. The evaluations for policy instruments favouring rail transports generally describe a more positive performance than for the policy instruments favouring waterborne transports. For example, evaluations of subsidy/grant systems favouring rail freight in Austria and Great Britain estimate benefit to cost ratios of 3.39:1 to 4.27:1 (including reduced negative externalities from road transport) and have both been effective in achieving a modal shift. Also, the evaluations of different grants/subsidies in Italy show that the policy instruments have led to increased freight by rail. One exemption is the Swedish aid scheme for rail transports, which is paid retroactively to operators that perform or organize transport services at the Swedish railway network. According to the evaluation, the policy has rather prevented a modal backshift from rail to road, than promoting an actual modal shift to rail. The policy instrument is criticized in the evaluation for lacking continuity, predictability, and a long-term perspective. Furthermore, it is also criticised for including all freight transport on rail, which has resulted in about 22 % of the total funds in 2018 and 2019 going to the company LKAB (mining company) for transports of ore, where rail already is the dominating transport mode.

A lack of applications is described as an important problem for several policy instruments, especially for waterborne transports, both at national level (e.g. the Mode Shift Revenue Support for bulk and waterways and the Waterborne Freight Grant in Great Britain) as well as at EU-level (e.g the Marco Polo Programmes, Motorways of the Sea, and NAIADES). Several evaluations find that the lack of applications partly depends on long and complicated application processes and a heavy administrative burden. In an evaluation of the Mode Shift Revenue Support in Great Britain, it is mentioned that the application process for grant to rail services (intermodal) is easier to apply for than the grant for waterborne transport (Department for Transport, 2014). This is explained by the intermodal rail grant being standardised, while the waterborne grant level is decided case by case. This can partly explain the low number of applications. However, they also argue that the low number of applications might reflect the difficulties in moving freight by inland waterways in Great Britain.

5. Conclusions

The objective of this study is to identify and classify past and present public policy instruments implemented in Europe with the aim to achieve a modal shift, as well as reviewing their performance to the extent that ex-post evaluations exist. The study aims to answer the following research questions (RQs):

1. What policy instruments have been implemented in Europe with the aim to achieve a modal shift?
2. Which policy instruments have been evaluated, and which evaluation methods and performance indicators have been applied?
3. Which conclusions can be drawn regarding the effectiveness and efficiency of European policy instruments in terms of achieving modal shift and reducing negative externalities?

To answer the research questions, a search strategy was applied to identify as many public policy instruments and policy evaluations as possible. All identified policy instruments and evaluations were included in a database where they were described and sorted according to several categories and shared characteristics.

The search process applied to answer RQ1 resulted in the identification of 93 public policy instruments targeting a modal shift in Europe. Most of the identified policy instruments are subsidies or grants to rail or waterborne transports implemented at the national level. The identified policy instruments most commonly focus on the promotion of one specific transport mode, which most commonly is transports by rail.

The search process applied to answer RQ2 only resulted in the identification of policy evaluations for 20 out of the 93 policy instruments. Furthermore, the evaluations do not fully represent the actual distribution of policy instruments, and there is a bias towards economic policy instruments, mainly subsidies and grants. The lack of evaluations, as well as the homogeneity of the policy instruments for which we have identified evaluations, complicates comparisons of policy performance over different policy categories. Therefore, further research regarding the performance of different types of modal shift policy instruments is needed.

A wide range of evaluators have performed the evaluations, including among others consultant firms, public authorities, the European Court of Auditors, expert groups, and independent researchers. The sample of evaluations in this study is too small to draw any conclusions regarding possible relationships between evaluators and evaluation methods and/or results. Positive, as well as negative, policy performance is found in evaluations by all type of evaluators. Thus, further research, with larger samples, is needed to improve the understanding of the relationship between policy evaluations and how the evaluating actors may influence the evaluation outcomes.

About half of the policy instruments with evaluations are subsidies or grants at national level, while the other half represent policy instruments governed at EU-level. The large share of evaluated EU policy instruments might depend on the commitment to evaluation formulated in Article 318 of the Treaty on the Functioning of the European Union and on other evaluation guidelines and frameworks within the EU (e.g. the REFIT programme). The large share of evaluated subsidies/grants at national level could be explained by them being the most identified policy instrument in this study, but also by them being classified as state aid and therefore needing permission by the European Commission to be implemented or prolonged. Most of these evaluations have been performed when applying for prolongation by the European Commission and show an overall positive policy performance. The positive evaluation outcomes may have several explanations. It could for example reflect that subsidies/grant are effective in achieving a modal shift, but it could also reflect that member states only apply for prolongation if the policy instrument is considered effective. Thus, knowing the purpose of an evaluation is important to understand how it may affect the evaluation outcomes.

There is a large variation between evaluation studies regarding how policy performance is evaluated, both in terms of methodologies used, performance criteria considered, and how the performance criteria are interpreted. There seem to be a gap between evaluation theory and how evaluations are performed in practice, which has previously been found by Huitema et al. (2011) and Christie (2003). This makes comparisons between evaluation results difficult. Thus, further research and discussions are needed regarding how policy evaluations should be performed in a systematic way and how they can be better harmonized in order to facilitate comparisons and improve evidence-based policy and decision-making.

Difficulties in finding relevant and reliable data, as well as difficulties to measure causality between the policy instruments and observed changes, are mentioned as a problem by several evaluations. One way to overcome this problem, would be to design policy instruments in a way that facilitate evaluation, for example by requiring firms receiving funding to collect and present data.

In order to answer RQ3, we summarised targets, effectiveness and efficiency for each evaluated policy instrument. The findings show that the objectives for the policy instruments are often broad and general. Several evaluations mention that the lack of well-defined targets and specified performance indicators makes it difficult to meet all policy objectives, as well as to evaluate the policy instruments effectiveness and efficiency. Therefore, it is important that targets and objectives for policy instruments are formulated in such way that they can be evaluated. For several policy instruments, modal shift is considered as an objective itself, rather than a means to achieve reduced external costs from freight transports. This is problematic as modal shift do not automatically result in reduced externalities. Thus, when formulating policy targets, it is important to treat modal shift as a means to reach the ultimate objective of reduced external costs. Further research is needed regarding what type of objectives and targets that exist, as well as how they can be formulated in a way to improve policy performance and facilitate evaluation.

Several evaluations of EU-policy instruments describe a poor or a mixed performance of the policy instruments, while the performance of subsidies/grant at national level are often considered positive by the evaluations. In general, there seem to be a more positive performance of policy instruments promoting a modal shift to rail than to waterborne transports. A commonly mentioned factor for underachievement of the policy instruments is problems related to outreach of the policy, lack of applications, long and complicated application processes and a high administrative burden for the companies applying for financial support. Thus, a focus on better outreach and simpler application processes could be one way forward in improving modal shift policy instruments in Europe.

Even though this study has brought several interesting results, there are some limitations of the study. The sample of evaluations in this study is small, making it difficult to draw any general conclusions regarding policy performance. Furthermore, there might be a bias in the study towards policy instruments and evaluations available in English. Thus, there is still a need for improved knowledge regarding what types of policy instruments that can effectively and efficiently contribute to a modal shift and reduced external costs from the European freight transport sector.

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Annex A: List of Public Policy instruments

Name of the Public Policy Instrument	Geographical level (Implementation)	Specific name of the region / country	Organization responsible for the Public Policy Instrument	Promotion (transport mode)	Category of policy instrument/measure	Subcategory of policy instrument/measure
Connecting Europe Facility (CEF)	Regional	European Union	Regional organization (Intergovernmental: EU)	Both (Railway and Waterborne)	Economic	Funding of infrastructure
Directive 1992/62 and 2011/76/EU- *Eurovignette*	Regional	European Union	Regional organization (Intergovernmental: EU)	Road (discourage)	Administrative	Legislation
Directive 2015/719 - Weights and Dimensions of higher weight ILU in intermodal transport	Regional	European Union	Regional organization (Intergovernmental: EU)	Both (Railway and Waterborne)	Administrative	Legislation
Directive 92/106/EEC - Combined Transport of goods between Member States	Regional	European Union	Regional organization (Intergovernmental: EU)	Both (Railway and Waterborne)	Administrative	Legislation
Double track Iron Ore Line (*Norrbotniabanan*) between Umeå-Luleå (Sweden)	Local	Sweden (Umeå-Luleå Region)	Local government (province/specific region)	Railway	Administrative	Infrastructure planning
Ecobonus system to transfer goods from road to water -MoS (The Basque Country, Spain)	Local	Spain (The Basque Country Region)	Local government (province/specific region)	Waterborne transport	Economic	Subsidy
ERTMS corridors	Regional	European Union	Regional organization (Intergovernmental: EU)	Railway	Economic	Grant
E-toll, network wide (dist) - Several EU Member States	National*	Austria, Germany, Czech Republic, Poland (prev vignette), Slovakia (prev vignette)	Regional organization (Intergovernmental: EU)	Road (discourage)	Economic	Toll/vignette
EU agreement- Electronic documents for freight transport	Regional	European Union	Regional organization (Intergovernmental: EU)	Railway	Administrative	Inspection
EU Regulation 2017/1084 GBER Ports	Regional	European Union	Regional organization (Intergovernmental: EU)	Both (Railway and Waterborne)	Administrative	Legislation
EU Regulation 561/2006 - Rest periods on rolling/floating roads and social legislation relating to road transport	Regional	European Union	Regional organization (Intergovernmental: EU)	Road (discourage)	Administrative	Legislation
EU Regulation 931/2010 - European rail network for competitive freight	Regional	European Union	Regional organization (Intergovernmental: EU)	Railway	Administrative	Legislation
European Inland Barging Innovation Platform	Regional	European Union	Regional organization (Intergovernmental: EU)	Waterborne transport	Information	Development research
European Shortsea Network (of Shortsea Promotion Centres)	Regional	European Union	Regional organization (Intergovernmental: EU)	Waterborne transport	Information	Development research
Eurovignette (time) (Belgium)	National	Belgium	National government (State / Country)	Road (discourage)	Economic	Toll/vignette
Eurovignette (time) (Germany)	National	Germany	National government (State / Country)	Road (discourage)	Economic	Toll/vignette
Eurovignette (time)- Several EU Member States	Regional*	Denmark, Luxembourg, the Netherlands, Sweden	National government (State / Country) - Multiple	Road (discourage)	Economic	Toll/vignette
Exemption from the night driving ban (Austria)	National	Austria	National government (State / Country)	Road (discourage)	Administrative	Agreement
Exemption from the Summer holidays driving ban on lorries (Austria)	National	Austria	National government (State / Country)	Road (discourage)	Administrative	Limit
Exemption from the Weekend and holiday driving ban on lorries (Austria)	National	Austria	National government (State / Country)	Road (discourage)	Administrative	Limit

Freight Facilities Grant- FFG (Wales)	Local	Wales	Local government (province/specific region)	Railway	Economic	Grant
Freight Facilities Grant- FFG (Scotland)	Local	Scotland	Local government (province/specific region)	Both (Railway and Waterborne)	Economic	Grant
Freight Transfer Act of Heavy Goods across the Alps from Road to Rail	National	Switzerland	National government (State / Country)	Railway	Administrative	Legislation
Horizon 2020 / TEN-T	Regional	European Union	Regional organization (Intergovernmental: EU)	Both (Railway and Waterborne)	Information	Development research
INE - Inland Navigation EU	Regional	European Union	Regional organization (Intergovernmental: EU)	Waterborne transport	Information	Development research
Inland Waterways Development Fund (Poland)	National	Poland	National government (State / Country)	Waterborne transport	Economic	Funding of infrastructure
Km-tax for heavy goods vehicles (Sweden)	National	Sweden	National government (State / Country)	Road (discourage)	Economic	Tax
Liberalised area for rolling roads (Austria)	National	Austria	National government (State / Country)	Road (discourage)	Administrative	Legislation
Liberalised corridors for rolling roads (Austria)	National	Austria	National government (State / Country)	Road (discourage)	Administrative	Legislation
Liberalised initial and final road leg in combined transport (Austria)	National	Austria	National government (State / Country)	Road (discourage)	Administrative	Legislation
Marco Polo I	Regional	European Union	Regional organization (Intergovernmental: EU)	Both (Railway and Waterborne)	Economic	Grant
Marco Polo II	Regional	European Union	Regional organization (Intergovernmental: EU)	Both (Railway and Waterborne)	Economic	Grant
Motorways of the Sea	Regional	European Union	Regional organization (Intergovernmental: EU)	Waterborne transport	Economic	Grant
Mälarprojektet- Mälarregionen (Sweden)	Local	Sweden (Mälarregionen)	Local government (province/specific region)	Waterborne transport	Administrative	Infrastructure planning
NAIADES - Navigation And Inland Waterway Action and Development in Europe	Regional	European Union	Regional organization (Intergovernmental: EU)	Waterborne transport	Administrative	Infrastructure planning
NAIADES II	Regional	European Union	Regional organization (Intergovernmental: EU)	Waterborne transport	Administrative	Infrastructure planning
National Aid - "The Mode Shift Revenue Support- MSRS (Great Britain)	National	Great Britain (England, Scotland and Wales)	National government (State / Country)	Both (Railway and Waterborne)	Economic	Grant
National Aid - "The Waterborne Freight Grant Scheme" (Great Britain)	National	Great Britain (England, Scotland and Wales)	National government (State / Country)	Waterborne transport	Economic	Grant
National Aid - "Tilskudd til godsoverføring fra vei til sjø" (Norway)	National	Norway	National government (State / Country)	Waterborne transport	Economic	Grant
National Aid - Company Neutral Revenue Support Scheme (CNRS)	National	Great Britain (England, Scotland and Wales)	National government (State / Country)	Railway	Economic	Grant
National Aid - Freight Facilities Grant - FFG (Great Britain)	National	Great Britain (England, Scotland and Wales)	National government (State / Country)	Both (Railway and Waterborne)	Economic	Grant
National Aid - Rail Environmental Benefit Procurement Scheme (REPS) - replace CNRS and TAG	National	United Kingdom	National government (State / Country)	Railway	Economic	Grant
National Aid - Track Access Grant (TAG)	National	Great Britain (England, Scotland and Wales)	National government (State / Country)	Railway	Economic	Grant

Operational Programme Transport and transport infrastructure (Bulgaria)	National	Bulgaria	National government (State / Country)	Railway	Administrative	Infrastructure planning
PLATINA	Regional	European Union	Regional organization (Intergovernmental: EU)	Waterborne transport	Information	Advising
PLATINA II	Regional	European Union	Regional organization (Intergovernmental: EU)	Waterborne transport	Information	Advising
Reduction or exemption from Motor Vehicle Tax (Austria)	National	Austria	National government (State / Country)	Road (discourage)	Economic	Tax deduction
Road user charges for heavy goods vehicles (HGV)	Regional	European Union	Regional organization (Intergovernmental: EU)	Road (discourage)	Economic	Toll/vignette
Shift2Rail	Regional	European Union	Regional organization (Intergovernmental: EU)	Railway	Information	Development research
State Aid - Rail freight transport - the Province of Emilia Romagna (Italy)	Local	Italy (Emilia Romagna Region)	Local government (province/specific region)	Railway	Economic	Subsidy
State Aid - Promote shift of freight traffic from road to rail (the Netherlands)	Regional	The Netherlands	National government (State / Country)	Railway	Economic	Subsidy
State Aid - (Ecobonus system) to transfer goods from road to rail "Ferrobonus" (Italy)	National	Italy	National government (State / Country)	Railway	Economic	Subsidy
State Aid - (Ecobonus system) to transfer goods from road to rail "Miljökompensation" + Extension (Sweden)	National	Sweden	National government (State / Country)	Railway	Economic	Grant
State Aid - (Ecobonus system) to transfer goods from road to rail "Nuovo Ferrobonus" (Italy)	National	Italy	National government (State / Country)	Railway	Economic	Subsidy
State Aid - (Ecobonus system) to transfer goods from road to water "Marebonus" (Italy)	National	Italy	National government (State / Country)	Waterborne transport	Economic	Subsidy
State Aid - (Ecobonus system) to transfer goods from road to water "Ecobonus" (Italy)	National	Italy	National government (State / Country)	Waterborne transport	Economic	Subsidy
State Aid - (Ecobonus system) to transfer goods from road to water "Eko-bonus" (Sweden)	National	Sweden	National government (State / Country)	Waterborne transport	Economic	Grant
State Aid - Alternative transportation for the period 2014-2020- the Walloon Region (Belgium)	Local	Belgium (Walloon Region)	Local government (province/specific region)	Waterborne transport	Economic	Subsidy
State Aid - Combined transport - the Province of Trento (Italy)	Local	Italy (Trento Region)	Local government (province/specific region)	Railway	Economic	Subsidy
State Aid - Combined transport in Belgium 2017-2020 (Belgium)	National	Belgium	National government (State / Country)	Railway	Economic	Subsidy
State Aid - Development of intermodal transport and combined transport projects on the Danube (Austria)	National	Austria	National government (State / Country)	Waterborne transport	Economic	Grant
State Aid - Development of public inland terminals 'Subsidieregeling Openbare Inland Terminals' (the Netherlands)	National	the Netherlands	National government (State / Country)	Waterborne transport	Economic	Subsidy
State Aid - Financial support for operation (Austria)	National	Austria	National government (State / Country)	Railway	Economic	Grant
State Aid - Guidelines on the construction and replacement of railway sidings (Germany)	National	Germany	National government (State / Country)	Railway	Economic	Grant
State Aid - Innovation programme for Combined Freight transport (Austria)	National	Austria	National government (State / Country)	Both (Railway and Waterborne)	Economic	Grant

State Aid - Intermodal transport on waterway in the Brussels Region 2016-2020 (Belgium)	Local	Belgium (Brussels Region)	Local government (province/specific region)	Waterborne transport	Economic	Grant
State Aid - Intermodal Transport Units (Czech Republic)	National	Czech Republic	National government (State / Country) + Cofinanced by EU	Both (Railway and Waterborne)	Economic	Grant
State Aid - Modernisation and construction of combined transport terminals 2015-2020 (Czech Republic)	National	Czech Republic	National government (State / Country)	Railway	Economic	Grant
State Aid - Operation of regular combined freight services 2018-2022 (France)	National	France	National government (State / Country)	Both (Railway and Waterborne)	Economic	Grant
State Aid - Operational Program Infrastructure and Environment for the years 2014-2020 (Poland)	National	Poland	National government (State / Country) + Cofinanced by EU	Both (Railway and Waterborne)	Economic	Grant
State Aid - Programme to support innovation in rail freight transport (Germany)	National	Germany	National government (State / Country)	Railway	Economic	Grant
State Aid - Promotion of rail freight transport (Germany)	National	Germany	National government (State / Country)	Railway	Economic	Grant
State Aid - Rail freight transport services (Austria)	National	Austria	National government (State / Country)	Railway	Economic	Subsidy
State Aid - Rail freight transport support scheme + Extension (Italy)	Local	Italy (South and Islands)	Local government (province/specific region)	Railway	Economic	Subsidy
State Aid - Reduce cost disadvantage of bundling to promote modal shift 2018-2023 (Belgium)	National	Belgium	National government (State / Country)	Both (Railway and Waterborne)	Economic	Subsidy
State Aid - Support combined transport equipment 2006-2010 (Czech Republic)	National	Czech Republic	National government (State / Country) + Cofinanced by EU	Railway	Economic	Grant
State Aid - Support of sidings and intermodal terminals (road/rail/ship) + Extension (Austria)	National	Austria	National government (State / Country)	Both (Railway and Waterborne)	Economic	Grant
State Aid - Supporting combined transport in the Province of Bolzano (Italy)	Local	Italy (Bolzano region)	Local government (province/specific region)	Railway	Economic	Subsidy
State Aid - Transhipment facilities of the combined transport of non-federally owned enterprises (Germany)	National	Germany	National government (State / Country)	Waterborne transport	Economic	Subsidy
State Aid - transport of goods by rail 2014-1017 (Denmark)	National	Denmark	National government (State / Country)	Railway	Economic	Subsidy
State Aid- Incentives for Combined Transport (Croatia)	National	Croatia	National government (State / Country)	Both (Railway and Waterborne)	Economic	Subsidy
State Aid- Intermodal rail transport of iron slabs in the Friuli Venezia Giulia Region (Italy)	Local	Italy (Friuli Venezia Giulia Region)	Local government (province/specific region)	Railway	Economic	Grant
State Aid- Modernisation and construction of combined transport terminals (France)	National	France	National government (State / Country)	Railway	Economic	Grant
State Aid- Promote investment to rail freight transport in Saxony-Anhalt (Germany)	Local	Germany (Saxony-Anhalt)	Local government (province/specific region)	Railway	Economic	Funding of infrastructure
State Aid- Promotion of Combined Transport (Luxembourg)	National	Luxembourg	National government (State / Country)	Both (Railway and Waterborne)	Economic	Grant
State Aid- Support for rail freight transport - single wagon (Germany)	National	Germany	National government (State / Country)	Railway	Economic	Grant
Supplementary permits for using rolling roads (Austria)	National	Austria	National government (State / Country)	Both (Railway and Waterborne)	Administrative	Legislation
Swiss Heavy Vehicles charges (Switzerland)	National	Switzerland	National government (State / Country)	Road (discourage)	Economic	Fee

The INTERREG Programme - The North West Europe - Several EU Member States and countries	Regional	Ireland, the United Kingdom, Belgium, Luxembourg, Switzerland, and parts of France, Germany and the Netherlands	Regional organization (Intergovernmental: EU)	Railway	Economic	Grant
Toll (distance and emission based) (Germany)	National	Germany	National government (State / Country)	Road (discourage)	Economic	Toll/vignette
Trans-European Transport Network (TEN-T)	Regional	European Union	Regional organization (Intergovernmental: EU)	Both (Railway and Waterborne)	Economic	Funding of infrastructure
Watertruck +	Regional	European Union	Regional organization (Intergovernmental: EU)	Waterborne transport	Information	Development research
Vignette (time)- Several EU Member States	National*	Lithuania, Hungary, Bulgaria, Romania, Latvia (recent), United Kingdom (recent)	National government (State / Country)	Road (discourage)	Economic	Toll/vignette

Source: Own elaboration

Note: Regional*: Implementation of the public policy among different countries simultaneously. National*: Implementation of the public policy in each country (independently).
State Aid: EU State. National Aid: Non-EU State (i.e. European Free Trade Association countries - Iceland, Liechtenstein, Norway and Switzerland- and United Kingdom)

Annex B: Characteristics of policy evaluations

Name of the Public Policy Instrument	Actor performing evaluation	Purpose of evaluation	Performance criteria considered (total evaluation)	Performance criteria considered (regarding modal shift and associated externalities)	Methodology for analysing effectiveness and efficiency
Connecting Europe Facility (CEF)	The evaluation is a Commission staff working document (European Commission, 2018), which was performed by the Commission DGs responsible for CEF (DG MOVE, DG ENER and DG CNECT), as well as the consultant PriceWaterhouseCoopers.	Article 27 of the CEF Regulation lays down a legal requirement to evaluate the policy instrument. Other than the legal requirement, the purpose of the evaluation was to serve as basis for decisions regarding renewal, suspension, or modification of CEF.	Relevance Coherence Effectiveness Efficiency EU added value	Relevance Coherence Effectiveness	**Qualitative:** Review of legislative documents and reports, open public consultation, surveys, targeted stakeholder consultation, case studies. **Quantitative:** Data collection, selection, and analysis
Directive 1992/62 and 2011/76/EU - Eurovignette	The evaluation is a Commission staff working document performed by the European Commission (2013).	The purpose of the evaluation was to analyse whether the directive fulfil its key objectives and to identify possible gaps.	Relevance Coherence Effectiveness Efficiency EU added value	Effectiveness Efficiency	**Qualitative:** The only available information regarding data and methodology is that information was received from member states and from research literature.
Directive 92/106/EEC - Combined Transport of goods between Member States	The evaluation is a Commission staff working document (European Commission, 2016a, 2016b). A Steering Group assisted the evaluation process, including representatives from DG TAXUD, DG ENV, DG GROW, DG CLIMA, and the Secretariat General. DG COMP was also consulted.	The evaluation was performed under the European Commission's regulatory fitness and performance programme (REFIT). The purpose of the evaluation was to assess if the legislations still was relevant, achieved its objectives, and if any inconsistencies or gaps needed to be considered.	Relevance Coherence Effectiveness Efficiency EU added value	Relevance Coherence Effectiveness Efficiency EU added value	**Qualitative:** Stakeholder consultations (public online consultation and workshop), desk research. **Quantitative:** Data gathering and analysis, calculations of external costs, estimating benefits.
EU Regulation 561/2006 - Rest periods on rolling/floating roads and social legislation relating to road transport	The evaluation was performed by Ricardo, Milieu and TRT (Windisch et al., 2016), commissioned by European Commissions Directorate-General for Mobility and Transport.	The purpose was to "provide insight into the actual performance of the three legislative acts and the overall impacts (both intended and unintended)." (Windisch et al., 2016).	Relevance Coherence Effectiveness Efficiency EU added value	Effectiveness	**Qualitative:** Interviews, surveys, case studies.
EU Regulation 913/2010 - European rail network for competitive freight	The report presents the results and analysis from an open public consultation performed by the European Commission (2016c)	Article 23 of the regulation require the Commission to submit a report to the European Parliament and Council examining the application of the regulation. Beyond Article 23, the Commission decided to	Relevance Coherence Effectiveness Efficiency	Relevance Coherence Effectiveness Efficiency	**Qualitative:** Open public consultation

		perform a broader analysis of the regulation's effects.			
European Shortsea Network – (Evaluation for the Norwegian Short Sea Promotion Centre)	Askildsen (2005) at the Department of Transport Economics (TØI) has carried out an evaluation of Short Sea Promotion Center Norway (SPC Norway) on behalf of the Ministry of Trade and Industry (NHD), the Ministry of Transport and Communications (SD) and the Ministry of Fisheries and the Ministry of Coastal Affairs (FKD).	The purpose was to evaluate if the policy had achieved its target and followed its plan.	Relevance Effectiveness	Relevance Effectiveness	**Qualitative:** Interviews, questionnaires, analysing EU-documents.
Marco Polo I and II	Three evaluation reports: 1. Performed by Europe Economics (2011) on behalf of Directorate-General for Mobility and Transport. 2. Performed by European Court of Auditors (2013). 3. Performed by the European Commissions' Innovation and Networks Executive Agency (INEA) (2020).	1. The purpose of the evaluation by Europe Economics (2011) was to assist in the evaluation of the Marco Polo programme covering the period 2003-2010. 2. The purpose of the evaluation performed by the European Court of Auditors (2013) was to assess the effectiveness of the Marco Polo programmes in terms of planning, management, supervision, and target fulfilment of funded projects. 3. INEA (2020) do not mention a specific purpose of the report. However, it is mentioned that the report presents main facts, figures, and an outlook regarding the results from the Marco Polo II programme and includes an outlook on the results achieved.	1. Europe Economics (2011): Relevance Coherence Effectiveness Efficiency 2. European Court of Auditors (2013): Effectiveness 3. INEA (2020) Effectiveness Efficiency	1. Europe Economics (2011): Relevance Coherence Effectiveness Efficiency 2. European Court of Auditors (2013): Effectiveness 3. INEA (2020) Effectiveness Efficiency	1. Europe Economics (2011): **Qualitative:** Stakeholder interviews, survey, review documents, desk research. **Quantitative:** Data analysis, comparing expected and achieved modal shift, estimating effect on externalities. 2. European Court of Auditors (2013): **Qualitative:** Among others: examination of files, interviews, analysis of impact assessments, surveys, review of evaluations of project proposals, on-site verification of the achievements of completed projects. **Quantitative:** Data analysis, comparison between targets and reported achievements. 3. INEA (2020) **Qualitative:** Questionnaire to beneficiaries **Quantitative:** Data analysis, comparing targets with achievements, ex-post calculation of external benefits of the programme.

Motorways of the Sea	The evaluation was performed by ICF, the Institute of Shipping Economics and Logistics (ISL), and Trasporti e Territorio (TRT), commissioned by the DG MOVE of the European Commission (ICF et al., 2017).	According to ICF et al. (2017): "The purpose of this contract is to provide the European Commission (EC) with: * An ex-post evaluation of the Motorways of the Sea (MoS) concept, covering the period 2001 to 2013. * An analysis of prospects for the further development of the concept."	Relevance Coherence Effectiveness Efficiency EU added value	Relevance Coherence Effectiveness Efficiency EU added value	**Qualitative:** Consultations with stakeholders and commission officials via semi structured interviews, written consultation to relevant stakeholders, desk-based research and analysis, literature review. **Quantitative:** Data analysis of short sea shipping trends, project data assembly and analysis.
NAIADES - Navigation and Inland Waterway Action and Development in Europe	Two reports: 1. European Commission (2011b) performed a mid-term progress report for NAIADES in 2011. 2. European Court of Auditors (2015) performed a special report regarding IWT in Europe, which include some information regarding NAIADES performance.	1. No specific purpose is mentioned by the European Commission (2011b): "The report gives an overview on the achievements reached so far, the measures still underway or to be tackled and outlines the next steps until 2013". 2. No specific purpose is mentioned by the European Court of Auditors (2015). They examine if IWT strategies have been implemented effectively in the EU, if they contribute to improved conditions and an increased modal share of IWT, as well as if they are coherent and based on relevant and comprehensive analyses.	1. European Commission (2011b): Relevance Coherence Effectiveness 2. European Court of Auditors (2015): Relevance Coherence Effectiveness	1. European Commission (2011b): Relevance Coherence Effectiveness 2. European Court of Auditors (2015): Relevance Coherence Effectiveness	1. European Commission (2011b): **Qualitative** No methodology is mentioned. The report qualitatively summarizes the policies and actions taken on the IWT-area. 2. European Court of Auditors (2015): **Qualitative** On-the-spot audit visits, analysing policy and strategy documents and other available information from the Commission, UNECE and other third parties., **Quantitative:** Data analysis regarding financial, transport and navigability indicators.
National Aid - The Mode Shift Revenue Support- MSRS	Two evaluation reports: 1. Performed by ARUP in 2014 on request by Department for Transport (2014). 2. Performed by Arup, AECOM and Port Centric Logistics Partners (PCLP) consortium, also requested by the Department for Transport (2020a).	The purpose of both reports was to provide updated evidence to support decisions on regarding the prolongation of the support scheme. The evidence should consider the financial need for the grant, which include calculating cost differences between freight transports by road, rail and water. Department for Transport (2020a) also had as purpose to review support levels under the MSRS scheme and analyse how a similar policy instrument could be implemented for coastal shipping.	Department for Transport (2014): Relevance Coherence Effectiveness Efficiency Department for Transport (2020a): Relevance Coherence Effectiveness Efficiency	Department for Transport (2014): Relevance Coherence Effectiveness Efficiency Department for Transport (2020a): Relevance Coherence Effectiveness Efficiency	Department for Transport (2014): **Qualitative:** Stakeholder consultations, interviews with grantees, workshop, model review and development. **Quantitative:** Data collection and analysis, impact assessment, estimating lorry journeys removed and cost benefit ratio. Department for Transport (2020a): **Qualitative:** Stakeholder consultation, workshop, interviews with grantees, discussions at

					conference, email response to "engagement pack" (including background information, excel spreadsheet and questionnaire). **Quantitative:** Data collection and analysis, impact assessment, estimating lorry journeys removed and cost benefit ratio.
National Aid - "The Waterborne Freight Grant Scheme"	Two evaluation reports: 1. Performed by ARUP in 2014 on request by Department for Transport (2014). 2. Performed by Arup, AECOM and Port Centric Logistics Partners (PCLP) consortium, also requested by the Department for Transport (2020a).	The purpose of both reports was to provide updated evidence to support decisions on regarding the prolongation of the support scheme. The evidence should consider the financial need for the grant, which include calculating cost differences between freight transports by road, rail and water. Department for Transport (2020a) also had as purpose to review support levels under the MSRS scheme and analyse how a similar policy instrument could be implemented for coastal shipping.	Department for Transport (2014): Relevance Coherence Effectiveness Efficiency Department for Transport (2020a): Relevance Coherence Effectiveness Efficiency	Department for Transport (2014): Relevance Coherence Effectiveness Efficiency Department for Transport (2020a): Relevance Coherence Effectiveness Efficiency	Department for Transport (2014): **Qualitative:** Stakeholder consultations, interviews with grantees, workshop, model review and development. **Quantitative:** Data collection and analysis, impact assessment, estimating lorry journeys removed and cost benefit ratio. Department for Transport (2020a): **Qualitative:** Stakeholder consultation, workshop, interviews with grantees, discussions at conference, email response to "engagement pack" (including background information, excel spreadsheet and questionnaire). **Quantitative:** Data collection and analysis, impact assessment, estimating lorry journeys removed and cost benefit ratio.
National Aid - Freight Facilities Grant - FFG	Published paper in Transport Reviews by Woodburn (2007).	The purpose of the evaluation paper is expressed by Woodburn (2007) as follows: "The paper has four key objectives: to catalogue the evolution of the rail freight grant funding process in Britain; to identify the schemes that have received Freight Facilities Grants (FFGs) since 1997/98; to assess the extent to which the planned flows resulting from those FFG awards have materialized; and to evaluate	Relevance Coherence Effectiveness Efficiency	Relevance Coherence Effectiveness Efficiency	**Qualitative:** Questionnaire survey to recipients of FFGs between 1997 and 2005. **Quantitative:** Desk based gathering data regarding freight grant funding, comparing freight volumes applied for and volumes achieved.

		the role of rail freight grants in influencing rail freight volumes, particularly in a liberalized rail-operating environment."			
Shift2Rail	The evaluation report was performed by an expert group on request by European Commission (Fontanel et al., 2017)	Article 11 of the Shift2Rail regulation require an evaluation of the policy instrument with assistance of independent experts (Fontanel et al., 2017). Furthermore, an interim evaluation is also a key requirement in the regulatory framework of Horizon 2020. The purpose of the evaluation, other than fulfilling the requirements, was to assess the progress and mid-term achievements of Shift2Rail over the time period 2014 - 2016.	Relevance Coherence Effectiveness Efficiency EU added value	Relevance Coherence Effectiveness Efficiency EU added value	**Qualitative:** Interviews, stakeholder consultations, analysing documents.
State aid to transfer goods to rail - the Province of Emilia Romagna	The original report was not found. The performance of the aid scheme is summarized in a decision letter from the European Commission regarding the prolongation of the policy instrument (European Commission, 2019a). In the decision letter it is stated that the legislative Council was provided a final report by the Regional government of the Emilia Romagna province, and that an environmental report was drafted by the regional Directorate of the Environment and Territorial Protection.	Prolongation of the state aid.	Relevance Coherence (with EU internal market) Effectiveness Efficiency	Relevance Effectiveness Efficiency	**Quantitative:** Data analysis regarding trends in rail traffic under the scheme, comparing expected and achieved modal shift and savings in emissions, estimating energy savings and costs.
State aid to transfer goods from road to rail "Ferrobonus" (Italy)	The original report was not found. The performance of the aid scheme is summarized in a decision letter from the European Commission regarding the prolongation of the policy instrument (European Commission, 2016d). In the decision letter it is stated that the original evaluation report was provided to the European Commission by "Italian Authorities".	Prolongation of the state aid.	Relevance Coherence (with EU internal market) Effectiveness	Relevance Effectiveness	**Quantitative:** Data analysis regarding trends in rail traffic under the scheme.

State Aid - to transfer goods from road to rail "Nuovo Ferrobonus" (Italy)	The original report was not found. The performance of the aid scheme is summarized in a decision letter from the European Commission regarding the prolongation of the policy instrument (European Commission, 2019b). In the decision letter it is stated that the original evaluation report was provided to the European Commission by "Italian Authorities".	Prolongation of the state aid	Relevance Coherence (with EU internal market) Effectiveness	Relevance Effectiveness	**Quantitative:** Data analysis regarding trends in rail traffic under the scheme
State Aid - to transfer goods from road to water "Ecobonus" (Italy)	1. The performance of the aid scheme is summarized in a decision letter from the European Commission regarding the prolongation of the policy instrument (European Commission, 2012a). In the decision letter it is stated that the original evaluation report was provided to the European Commission by "Italian Authorities". However, the original report was not found. 2. RAM S.p.a (2019) present some state of the art regarding best practices in the Croatian and Italian territories regarding modal shift policy instruments in a report for the project "Capitalization and Harmonization of the Adriatic Region Gate of Europe (CHARGE)". Among others, they present information regarding the Ecobonus performance. However, they do not mention how they have gathered the information and where it comes from.	1. European Commission, 2012a): Prolongation of the state aid. 2. RAM S.p.a (2019): The report aims to analyse policy instruments and best practices for promoting intermodality in the Italian and Croatian territories.	1. European Commission, 2012a): Relevance Coherence (with EU internal market) Effectiveness 2. RAM S.p.a (2019): Effectiveness Efficiency	1. European Commission, 2012a): Relevance Effectiveness 2. RAM S.p.a (2019): Effectiveness Efficiency	1. European Commission, 2012a): **Quantitative:** Data analysis, estimating number of journeys on subsidized routes. 2. RAM S.p.a (2019): **Quantitative:** It is not mentioned if the information presented in the report comes from already published work, or if the presented Ecobonus results have been estimated within the RAM S.p.a (2019) study. However, the presented results are of a quantitative nature and include estimations of cost-benefit ratios and number of journeys on subsidized routes.
State Aid - to transfer goods from road to rail "Miljökompensation" (Sweden)	The policy was evaluated in 2020 by the Swedish Transport Administration (2020).	Article 15 of the regulation for the environmental compensation require the Swedish Transport Administration to follow up the	Relevance Coherence (with EU internal market) Effectiveness	Relevance Effectiveness	**Qualitative:** Interviews with grantees, discussion regarding how the

		policy instruments performance and ensure that the purpose of the policy instrument is met.			funding was split between different actors.
State Aid - Financial support for rail operations (Austria)	The performance of the aid scheme is summarized in a decision letter from the European Commission regarding the prolongation of the policy instrument (European Commission, 2017b). In the decision letter it is stated that the original evaluation report was performed by the Austrian state-owned company SchiGmbH. However, the original report was not found.	Prolongation of the state aid	Relevance Coherence (with EU internal market) Effectiveness Efficiency	Relevance Effectiveness Efficiency	**Quantitative:** Data analysis, estimations of modal shift, externalities, and cost benefit ratio.
Trans European Transport Network (TEN-T)	A midterm evaluation report of TEN-T was prepared for the European Commission in 2011 by the consultant firm Steer Davis Gleave (2011). Furthermore, a review of the TEN-T programme was planned to be published by the end of 2020 but have still not been published by April 2021.	The objective of the evaluation was to evaluate the methods and impacts of TEN-T projects, and to provide conclusions and recommendations on the implementation of the TEN-T programme.	Relevance Effectiveness Efficiency	Relevance Effectiveness	**Qualitative:** Stakeholder interviews, desk research. **Quantitative:** Analyzing statistical data on the different calls and work programs.

Annex C: Performance of evaluated policy instruments

Name of the Public Policy Instrument	Brief description and policy objectives/targets	Effectiveness	Efficiency
Connecting Europe Facility (CEF)	Connecting Europe Facility (CEF) for Transport is an EU funding instrument aiming at realising European transport infrastructure policy by supporting the upgrading of existing infrastructure and investment in new infrastructure (European Commission, 2021c). There are several general objectives for CEF, and specific objectives for CEF Transport, including among other things: removing bottlenecks, enhancing rail interoperability, bridging missing links, improving cross-border sections, ensuring sustainable and efficient transport systems, optimising the integration and interconnection of transport modes, as well as enhancing the interoperability of transport services, while ensuring the accessibility of transport infrastructures.	The evaluation does not quantify any effects on modal shift or associated externalities, but rather describe what type of projects that CEF supports, how the funding is allocated between these projects, and how the program is managed and communicated. According to European Commission (2021c), the lack of a proper ex-post analysis comparing the performance of the program with the policy objectives (targets), is a result of the policy lacking relevant, well-defined, and robust key performance indicators as well as well-defined targets. The existing key performance indicators focus on effects in the longer term, such as number of multimodal logistic platforms, including inland and maritime ports and airports connected to the railway network. As these types of projects require a certain amount of time to be realised, the current key performance indicators lack the ability to provide information in a timely manner regarding necessary improvements and corrections of the programme. According to the evaluation, the projects selected between 2014 and 2016 will contribute to transport modes being better integrated by 2020 by an investment of EUR 287 million (EUR 91 million from CEF) connecting 5 inland ports, 9 maritime ports, and improving 7 rail-road terminals. It is stated that CEF Transport is contributing to EU modal shift targets (stated in the 2011 White Paper) and the decarbonisation of the transport sector by allocating about 81% of the currently allocated funding to rail and IWT. When it comes to CEF's effectiveness in achieving operational objectives, it is stated that the programme triggers additional investments that would not have been kicked off without the EU support (for example infrastructure investments with lifespans of 30-50 years). CEF is however criticized in the evaluation for not reaching its objectives of promoting synergies at project level, which is explained by a rigidity of the legal and budgetary framework regarding eligibility of projects and costs. When it comes to information and outreach of the program, it is concluded that the program effectively manages to reach the relevant participants. The majority (74%) of the stakeholders have a positive view of the programmes activities for raising	Efficiency is not discussed in terms of the policy instruments' effects on modal shift and negative externalities. Instead, efficiency is discussed from a perspective of project selection, implementation, and management of CEF. According to the evaluation, heavy calls oversubscription has resulted in a competitive process, where the best project proposals are selected based on relevance, maturity, quality of applications, and highest EU added value. For CEF Transport, the assessment of the funding gap based on cost benefit analysis submitted by the applicants has been improved since the implementation of CEF but could still be reinforced. The management of the program is considered efficient, according to the evaluation. However, it is stated that the administrative burden imposes disproportionate costs on smaller projects and could be better adapted.

		awareness and promoting the programme. Improvements are however suggested, such as giving feedback on rejected project proposals, further efforts in promoting CEF as a climate policy, as well as further efforts in promoting CEF to smaller stakeholders and to the public.	
Directive 1992/62 and 2011/76/EU - Eurovignette	The internalization of external costs for road transports could potentially lead to a modal shift of freight to rail and/or water as road transports become more expensive. The Eurovignette directive provides a legal framework which allows the member states to charge freight transports by truck in accordance with their impact on infrastructure, environment, air quality and noise levels. However, the directive does not obligate the member states to introduce charging schemes, but only provide the possibility to do so. The objective of the directive is to "encourage differentiated charging based on external costs as a means towards sustainable transport" (Directive 2011/76/EU).	According to the evaluation, statistics on freight transports show some potential evidence of a modal shift to rail in Germany and Austria due to the distance-based system. However, it is difficult to prove the causality between the modal shift and the introduction of the tolls and to isolate the effects from other policy instruments and effects on the transport sector. Charging levels and systems vary a lot between the member states, and there is a wide range of price signals within the union. In some countries, the road charging systems are time-based vignettes (e.g. in Sweden, Denmark, Netherlands, and Luxembourg) while other countries (e.g Germany and Austria) apply distance based tolls. Some of the systems are electronic, while other systems include physical barriers. Thus, the directive fails to contribute to a fully integrated internal market.	According to the evaluation, distance-based toll systems are more efficient than time-based vignettes as they can internalize the external costs in a more efficient way (user pays principle). Time-based vignettes and tolls that only apply to specific roads are not considered very efficient in changing behaviour compared to network-wide integrated tolling systems. The wide range of charging systems in the member states and the wide range of technologies applied within the systems impose unnecessarily high administrative costs to haulers.
Directive 92/106/EEC - Combined Transport of goods between Member States	The Combined Transport Directive is an EU policy instrument promoting modal shift. As stated in the evaluation, the objective of the directive is to "better utilise the existing transport infrastructure and resources and to reduce negative externalities of road transport to the environment by incentivising the use of other means of transport." (European Commission, 2016a). Furthermore, the numerical modal shift target stated in the 2011 white paper (30% of freight over 300km by 2030 and 50% by 2050) constitutes a new objective for the Combined Transport Directive. To achieve the objectives, the policy instrument aims at eliminating quantitative restrictions and authorisation procedures for combined transports, clarifying the non-application of road cabotage restrictions on road legs, and providing financial support to some combined transport operations.	According to the evaluation, the policy has been effective in terms that it has contributed to combined transport operations that had not been possible without the directive. However, the modal shift has been slower than expected and, and the growth of the share of combined transport operations (estimated to 4.2% on average) will not be sufficient to reach the targets set out in the 2011 White Paper. According to the evaluation, the most effective parts of the policy are the liberalisation of combined transport road legs from quotas and authorisations (in Article 2), as well as the elimination of compulsory tariffs (in Article 8). The fiscal incentives within the policy could be effective in theory but have not been so in practice due to methodologies not leading to the support translating into price reductions for the users of combined transports. The tax- and reimbursement levels vary between countries and give, in many cases, too small incentives to be able to counterbalance the price disadvantages of combined transports compared to pure road transports. Furthermore, the definition of combined transport has been interpreted differently between member states, leading to delays and fines for combined transport operations in some countries.	Both qualitative methods such as stakeholder consultations, and quantitative methods were used for analysing the performance of the policy. However, there are some limitations in the quantitative analysis due to difficulties in finding relevant data for several of the evaluated years. Still, according to the evaluation, the Combined Transport Directive has resulted in reduced externalities (accidents, noise, congestion, air pollution, climate change) from road transport, representing benefits to society of €2.1 billion annually. The costs of the policy have not been possible to quantify in the evaluation due to lack of data. However, as an example of costs it is mentioned that the annual cost for tax reimbursements and exemptions in Germany amounts to €2 million annually. The qualitative consultation says that stakeholders do not think that the benefits could have been achieved to lower costs, but they argue that some things should be done electronically instead of paper and stamps.

EU Regulation 561/2006 - Rest periods on rolling/floating roads and social legislation relating to road transport	The EU regulation (EC) No. 561/2006 establish rules for, among other things, how often and how long professional drivers must rest. Article 9 in this regulation covers the rest periods for rolling and floating roads (road transports which have a part of the route on railway or water). According to the regulation, this part of the transport is allowed to be counted as rest time, favouring the use of multimodal transports. As stated in Regulation (EC) No 561/2006: "This Regulation lays down rules on driving times, breaks and rest periods for drivers engaged in the carriage of goods and passengers by road in order to harmonise the conditions of competition between modes of inland transport, especially with regard to the road sector, and to improve working conditions and road safety. This Regulation also aims to promote improved monitoring and enforcement practices by Member States and improved working practices in the road transport industry."	Article 9 of the regulation is not evaluated in terms of modal shift or negative externalities. However, it is evaluated according to its enforcement in the member states. According to the evaluation, there are still some uncertainties regarding when the drivers are allowed to rest or not. Some drivers have for example been issued with penalties in France because the authorities did not understand how to enforce the rest periods. Thus, the enforcement of the policy is not uniform in all countries, and it need to be further harmonized and remove uncertainties.	
EU Regulation 913/2010 - European rail network for competitive freight	Regulation (EU) No 913/2010 concerning a European rail network for competitive freight set the rules for the establishment, organisation, and management of international Rail Freight Corridors. The policy aims at boosting rail freight and achieving the modal shift objectives in the White Paper on Transport. Among other things, it aims at promoting intermodality between rail and other transport modes by integrating terminals into the corridor management and development. As stated in Regulation (EU) No 913/2010: "The aim of this Regulation is to improve the efficiency of rail freight transport relative to other modes of transport. Coordination should be ensured between Member States and infrastructure managers in order to guarantee the most efficient functioning of freight corridors. To allow this, operational measures should be taken in parallel with investments in infrastructure and in technical equipment such as ERTMS that should aim at increasing rail freight capacity and efficiency."	The evaluation does not specifically evaluate the policy in terms of modal shift, but rather consider opinions regarding the policy. Most stakeholders seem to believe that the regulation is effective, even though member states and advisory groups are only considered somewhat effective in promoting the implementation of the rail freight corridors according to several respondents. Some respondents said that the Regulation focuses on establishing (as opposed to operating) the rail freight corridors, which the stakeholders do not consider sufficient to achieve the policy objectives. Most respondents believe that it would be beneficial to have specific targets to monitor the effectiveness.	Several stakeholders considered the policy as efficient but meant that the benefits will start to be felt only in the medium or long term.
European Shortsea Network – (Evaluation for the Norwegian Short Sea Promotion Centre)	European Shortsea Network is a network which connects all the Shortsea promotion centres in Europe. The purpose is to be a platform for exchanging ideas and to be the main source of information for the transport mode. The shortsea promotion centres aim is to contribute to a modal shift by providing information about the transport mode.	Even though the European Shortsea Network has not been evaluated as a whole, there is an evaluation of the Norwegian Shortsea Promotion Centre (Askildsen, 2005). According to the evaluation, the shortsea promotion centre has not been effective. Existing data show that no modal shift has been achieved and there are no success-examples at all. They argue that the policy has not at all fulfilled its aims.	

Marco Polo I and II	The Marco Polo programmes aimed at promoting a modal shift of freight transports by providing grant to greener transport modes such as rail, IWT and maritime transport (European Court of Auditors., 2013). According to INEA (2020), the objective of the Marco Polo I programme (2003 to 2006) was to contribute to maintaining the modal split of freight transport between the transport modes at 1998 levels by shifting the expected increases in road freight to other transport modes. The overall target established for the program was a modal shift of 48 billion tkm, and the expected modal shift by the selected actions were 47.7 billion tkm. The available budget was €102 million. The target of the Marco Polo II programme (2007-2013) was to shift 143.5 billion tkm of freight transport from road to other transport modes. The available budget amounted to €435 million and was available for following actions: modal shift; catalyst; common learning; motorways of the sea, and traffic avoidance.	According to Europe Economics (2011) there has been a significant underachievement of the Marco Polo I programme. The achieved modal shift has been far below expected levels. The European Court of Auditors (2013) also find the Marco Polo Programmes ineffective due to several factors. For example, even though the reported modal shift (for Marco Polo I) equal to 22,1 billion tkm of freight, only 46% of the expected modal shift was achieved according to the evaluation. Furthermore, there have been few relevant project proposals, the sustainability of the projects have been limited, and the program has come with heavy administrative burdens. Moreover, several of the funded projects would have started without support from the scheme. However, in a reply to the European Court of Auditors (2013) by the European Commission, it is mentioned that the European Commission considers the objectives as very ambitious, and that deciding the effectiveness based on target fulfilment may lead to the Marco Polo programmes being considered less effective than they are. According to the Commission, the modal shift under the Marco Polo Programmes is substantial. Between 2003 and 2012, more than 4 million trucks were shifted away from road, resulting in estimated benefits of avoiding above 4.5 million tonnes of CO_2 emissions, reducing traffic jams by about 64,000 kilometres, and saving more than 75 lives. Furthermore, the European Commission also argue that the performance of the Marco Polo Programmes should be seen in the light of the economic crisis. In the final report on the Marco Polo II programme, INEA (2020) discuss the effectiveness of both Marco Polo programmes, but with focus on Marco Polo II. According to INEA (2020), Marco Polo I had available €102 million. Grant agreements were signed for €73.8 million. But by the end of the programme only €41.8 million were paid, representing 41% of the initial available funding. The funded actions resulted in a modal shift of 21.9 billion tkm, representing 46% of the overall modal shift target. The target for Marco Polo II of shifting 20.5 billion tkm per year (143.5 billion tkm during the entire programme) was set up in accordance with the expected increases of EU freight transport over the same time period (INEA, 2020). However, due to the financial crisis, the EU freight market decreased by 8.33% representing 302 billion tkm. This made the economic context less favourable for reaching the target. Out of the total budget of €435, an initial funding of €315.5 was awarded to actions with an expected modal shift of 113.9 billion tkm. However, by the end of the program only €130.9 were paid and resulted in the shift of 41.9 billion tkm. Thus, there was a	According to Europe Economics (2011) the achieved efficiency for Marco Polo I projects were 326 tkm per EUR of subsidy when measured in terms of committed funds. This is way below the expected efficiency of 741 tkm per € of subsidy on average. However, some projects achieved more modal shift than expected but were not able to receive more funding than was specified in the Grant Agreement. According to INEA (2020) the Marco Polo II programme resulted in the avoidance of 3.5 billion tonnes of CO_2-emissions. The external cost reduction of the programme resulting from the achieved modal shift range between €385.4 million and €408.8. As the total amount of grants provided were €131 million, the program generated € 2.9-3.1 of environmental benefits (including air quality, noise, climate change, accidents and congestion) for every euro spent.

		significant underachievement of several actions supported under the programme. Closed actions on average achieved 50% of their initial targets. However, the level of target achievement for the MarcoPolo II actions differed depending on transport mode, with rail actions having the highest level of achievement. Rail actions represented 46.5% of the programmes total achieved modal shift followed by maritime transport (35.3%), traffic avoidance actions (8.6%), mixed actions (7.9%), and IWT (1.7%). The lower level of success for IWT actions was mainly explained by stronger competition from road transport at shorter distances, unstable water levels and infrastructure limitations. Even though there were several efforts from Marco Polo II to facilitate a wider participation of the programme, the responsiveness to the calls for proposals was low. There were also several applicants that withdrew their proposals during the grant preparations. The INEA (2020) report highlights a set of problems that complicated the achievements of the targets: overestimation of demand in the applications, infrastructure limitations, lack of interoperability and cooperation, changing market conditions, and the persistent attractiveness of road transport.	
Motorways of the Sea (MoS)	The maritime pillar of TEN-T is called Motorways of the Sea (MoS), which is a policy for promoting the maritime transport sector as an alternative to road freight transport. Since its implementation, the MoS concept has been financed through several other EU funding programs such as CEF, TEN-T and the Marco Polo I and II programmes (2003-2013). According to Decision no 884/2004/EC: "The trans-European network of motorways of the sea is intended to concentrate flows of freight on sea-based logistical routes in such a way as to improve existing maritime links or to establish new viable, regular and frequent maritime links for the transport of goods between Member States so as to reduce road congestion and/or improve access to peripheral and island regions and States." MoS has however evolved over times with changing objectives and do now also include environmental concerns, integration of maritime transport in logistic chains, maritime safety, traffic management, and training (ICF et al., 2017).	A frequently mentioned comment by stakeholders was that the policy is lacking clarity regarding overall goals and objectives (ICF et al., 2017). This also leads to difficulties in evaluating the policy instrument in terms of target achievement. Furthermore, a lack of data makes it difficult to quantify the effects of the policy instrument. The measurable performance has been mixed. Some modal shift from road to shipping have been encouraged by the policy instrument but there has not been a significant improvement of shortsea shipping compared to road transport under the programme. The qualitative evidence shows that reductions in road congestion seem to be minimal. There is however evidence that MoS has contributed to innovation and technological advancements. Most of the quantified targets within MoS are those set up for the Marco Polo Programs. Therefore, the results regarding effectiveness overlap with the results for the Marco Polo Programs and are not considered very effective in terms of target achievement. However, the evaluation highlights the importance of the economic crisis and its effects on the sector.	According to ICF et al. (2017) MoS has mainly relied on grants instead of financial instruments, which can often tackle market imperfections more efficiently. They argue that there are therefore possibilities to further improve efficiency by developing MoS financial infrastructure.

NAIADES - Navigation and Inland Waterway Action and Development in Europe	The NAIADES action programme is an overarching strategy of the European Commission to strengthen the position of IWT as part of intermodal freight solutions. According to the European Commission (2011b), the overall objectives of the NAIADES program is: "Competitiveness, intermodal integration, awareness raising; energy-efficiency and environmentally friendliness of the fleet; removal of infrastructure bottlenecks; research and technological development; technology and innovation transfer into the sector and last but not least employment, education and training and working conditions."	According to the (European Commission, 2011b) NAIADES contributed to valuable and tangible results. However, the lack of dedicated resources to the action programme, as well as the financial crisis has been a disadvantage for the implementation of the programme. According to the European Court of Auditors (2015), the modal share of IWT grew after 2006 when NAIADES was implemented (and when financial support to TEN-T increased). However, at the aggregate level the Court considers the European IWT strategies to not have been effectively implemented, as the policy objective of shifting freight transport from roads to IWT has not been achieved and overall navigability conditions have not improved. Furthermore, it is mentioned that the policy lacks precise objectives regarding IWT.	
National Aid - "The Mode Shift Revenue Support- MSRS	The Mode Shift Revenue Support (MSRS) is an aid system in Great Britain promoting a modal shift of freight transport to rail and IWT. The MSRS exist in two versions: MSRS intermodal and MSRS bulk and waterways. MSRS intermodal provides a standardized support for which the grant level differs depending on if the modal shift is achieved in port or other terminals. The MSRS bulk and waterways grant level is decided individually and depends on the expected environmental benefits. According to the European Commission (2014c), the objective of the MSRS is to shift freight transports from road to rail or IWT in order to reach environmental benefits. By covering some of the extra costs of rail and IWT compared to road, the policy instrument aim to allocate available funds to those transport services which offer the greatest environmental benefits for the money.	In the evaluation report from 2014, interviews with stakeholders show that there is a general agreement that the MSRS intermodal has played an important role in achieving a modal shift to rail, with around 700.000 containers moved annually under MSRS support (Department for Transport, 2014). The MSRS bulk and waterways is considered effective for rail transports. However, the uptake of awarded grants to IWT is low. According to the water industry, this reflects the difficulties of moving IWT in the United Kingdom. According to the evaluation report performed in 2020, the most likely outcome if tampering or withdrawing the grant is that transport flows performed by rail or IWT will shift back to road or cease altogether (Department for Transport, 2020a). Both evaluation reports suggest some improvements to the MSRS. For example, reviewing the application process and undertaking a communications program to encourage a wider range of applicants to the MSRS is suggested by the Department for Transport (2020a). Furthermore, interviews with the water industry expressed a wish for the standardized intermodal rail grant to also be available for waterborne transports on an equal basis, as they believe this could induce more industry interest and create a level playing field between rail and water (Department for Transport, 2014).	Even though the uptake of IWT grants is low, a benefit to cost ratio of 4.27:1 for every £1 of grant expenditure was estimated for the MSRS scheme (including both intermodal and bulk and waterways) in 2014 (Department for Transport, 2014). Furthermore, when the MSRS was prolonged in 2020 it was estimated that the impact of ending the scheme would result in a net worsening for society of up to £57.9 million per annum (Department for Transport, 2020a).
National Aid - "The Waterborne Freight Grant Scheme"	The Waterborne Freight Grant (WFG) is an aid system in Great Britain which aims at promoting the development of coastal and short sea shipping transport in the United Kingdom, and thereby reducing the environmental, health and social impact of road traffic (European Commission, 2020a).	According to the Department for Transport (2014), the WFG had a very low uptake with only 4 awarded WFG:s at the time of the evaluation. When prolonged again in 2020 no more grant supports had been awarded between 2015 and 2019 (Department for Transport, 2020a). It is expressed a wish to increase the grant period to more than 3 years as well as to	Even though the uptake of the WFG has been low, the granted projects has effectively achieved a modal shift, and resulted in reduced externalities from road transports. According to the Department for Transport (2014), the support scheme has generated a benefit to cost ratio of approximately 4.66:1 for every £1 grant.

	WFG assist companies for up to 3 years with the operating costs associated with costal and short sea shipping flows compared to road transport (Department for Transport, 2020b). The grant level is decided depending on the expected environmental benefits and financial needs associated with the modal shift, but the maximum grant is 30% of the total operating costs or €2 000 000.	promote a more active engagement between grant fund managers and the industry in order to increase the uptake of the policy.	
National Aid - Freight Facilities Grant - FFG	The Freight Facilities Grant (FFG) has existed in Great Britain since 1974 in different versions. Today, it only exists in Wales and Scotland. The objective of the FFG scheme is to encourage a modal shift away from road freight transports, by helping companies invest in new rail or water-based handling facilities, where the absence of the grant would lead to the companies choosing road transports over less environmentally damaging transport modes (European Commission, 2012b).	Woodburn (2007) evaluate the performance of the policy between 1997/98 to 2005/06 by comparing the freight volume achieved with the volume applied for, as well as a questionnaire survey with recipients of FFG. Out of the 36 granted awards, 23 had achieved their planned volume or more, resulting in an aggregate impact in line with predictions. For the granted awards that did not reach the expected volumes, rail service problems such as lacking network capacity, reliability, and costs, were mentioned as main causes. Overall, the study considers the FFG as effective.	During the period 1997/98 to 2005/2008 an additional £0.50 of private sector money has been invested in rail freight facilities for every £1.00 of grant funding. However, recipient companies expressed a felt that the grant decision-making process is complex and time-consuming and that the scheme can be improved by simpler, more flexible and user-friendly procedures.
Shift2Rail	The Shift2Rail Joint Undertaking is a public-private company under the Horizon 2020 EU policy instrument. Shift2Rail aims at coordinating research and innovation within the railway sector and to contribute to a more integrated, sustainable, competitive, and effective railway sector within the EU. The major objectives of the Shift2Rail Joint Undertaking is to support the achievement of the Single European Railway Area, increase the attractiveness and competitiveness of the European railway system in order to promote a modal shift, and help the European rail industry to keep its position as leader on the global market for rail products and services (Fontanel et al., 2017). These objectives will be achieved through coordinated research and development within the railway sector.	The objective of the evaluation was to assess progress and mid-term achievements of the policy for the time period 2014-2016 (Fontanel et al., 2017). There were however no completed projects by the time of the evaluation, and therefore it is mainly a focus on the functioning of the administration of the programme in the evaluation. According to the evaluation, Shift2Rail is a well-functioning program that has resulted in increased visibility of rail research and improved the coordination of many technical aspects. However, some concern regarding multimodality is expressed by some of the interviewed stakeholders. When all rail research is organized by the rail sector there is a focus on rail only and less focus on multimodal solutions and innovation. Another identified problem for the policy is that the project applications are unevenly distributed between the EU member countries and that it is mainly larger actors that dominate the projects, while small and medium enterprises are less represented.	Only operational efficiency is discussed in the evaluation report due to the lack of completed projects by the time of the evaluation. Overall, the management of Shift2Rail is considered efficient.
State aid to transfer goods to rail - the Province of Emilia Romagna	The Emilia Romagna Region in Italy provides an aid scheme for the promotion of rail transports. The aid is paid in the form of a subsidy to logistics companies and railway undertakings and corresponds to the difference in external costs between rail and alternative modes of transport. The support is set at € 0.007 per tkm and is only paid to new rail transports. However, the subsidy is limited to the kilometres within the region and with a maximum amount of € 150,000 to each actor. The objective of the subsidy is to reduce environmental pollution and improve road safety and security by rebalancing	When prolonged in 2014 and later in 2019, the performance of the subsidy was evaluated (European Commission, 2014a, 2019a). According to the Regional government and regional Directorate of the Environment and Territorial Protection, rail freight has increased steadily since the introduction of the subsidy. Over the three year period 2014-2016, the subsidy has resulted in the removal of 140 931 heavy trucks from the regions roads, exceeding the removal of 80,000 heavy trucks which was expected (European Commission, 2019a). Most of the subsidized services either has their origin or destination at a port (European Commission, 2019a).	According to the evaluation, the modal shift subsidized under the scheme contributed to 70% more emission savings than expected (assuming a full road scenario without the subsidy). The report estimates that the subsidy has resulted in energy savings by approximately 60 %, about 86.4 GWh. Given a price of electricity of EUR 0.176/kWh, they estimate that total savings resulting from the subsidy exceeds EUR 15.2 million, compared to the state aid expenditure of approximately EUR 1.9 million.

	the division of freight transport in the region and to promote a modal shift to rail (European Commission, 2019a).		
State aid to transfer goods from road to rail "Ferrobonus" (Italy)	The Ferrobonus Scheme was first implemented in Italy in 2010 and have been prolonged several times since then (European Commission, 2020b, 2016d, 2011c). The aim of the aid scheme is to address structural imbalances between road and rail freight transportation, to strengthen the intermodal transport chain, and contribute to a modal shift to rail. The ultimate objective is to reduce the environmental, health and social impact of road freight transports (European Commission, 2016d). The Ferrobonus provides subsidies to companies using rail transport services which commission multimodal transport or transhipment services on the Italian territory (European Commission, 2016d). To achieve the subsidy at least 80% of the freight volume had to be maintained the following year when introduced in 2010. The Ferrobonus have been re-approved up to 2021 with a maximum subsidy level of EUR 2.5 per train kilometre (European Commission, 2020b).	According to Italian Authorities the Ferrobonus led to an increase in intermodal traffic of 17.3% when it was first initiated (European Commission, 2016d). The end of the aid scheme coincided with a decrease in rail freight, but was recovered by the time of a new provision of the incentive during 2015 (Marzano et al., 2018). The aid that was effectively paid under the scheme amounted to EUR 1,05 per train kilometre compared to the expected grant level of EUR 2 per train kilometre, which was lowered due to budgetary constraints.	
State Aid - to transfer goods from road to rail "Nuovo Ferrobonus" (Italy)	The rail support was introduced in Italy in 2015 and targets railway undertakings. The aim is to promote a modal shift from road to rail by providing a subsidy based on external costs and infrastructure access charges (European Commission, 2019b). The aid is paid in the form of a discount of the infrastructure access charge that need to be paid to the rail infrastructure manager. When it was introduced, it specifically targeted the south of Italy but was then extended to cover the entire country, however with different subsidy levels (Marzano et al., 2018).	In the prolongation letter by the European Commission (2019b) it is observed that rail freight increased with about 13,7 % in the southern regions of Italy and the islands compared to about 7.9% in the rest of the country over the period 2014-2018. This illustrates positive impacts of the policy in promoting modal shift. However, this positive trend in freight transport by rail then slowed down from 2017.	
State Aid - to transfer goods from road to water "Ecobonus" (Italy)	The Ecobonus scheme in Italy provided support to road haulage companies making use of maritime routes instead of road transport between 2007 and 2010. The aim of the Ecobonus was to facilitate a modal shift from road to sea (European Commission, 2012). The subsidy was decided on a basis of reduced external costs, maritime distance, and land distance avoided. According to the model deciding external costs, 100 km shifted from heavy trucks to sea contributed to €133 of positive externalities (RAM S.p.a, 2019). A maximum of 30% of the RoRo fares charged to truckers were paid with a minimum requirement of 80 trips per year on the subsidized route. The transport volumes had to be maintained for three years after the end of the subsidy.	According to European Commission (2012) there was a steady increase in the frequency of the number of journeys on national routes during 2007-2010 under the Ecobonus scheme. However, there were less accepted grants than expected and a decrease in EU trips, which is explained by the economic crisis in 2008. According to Ram S.p.a (2019) the Ecobonus-induced modal shift of 3.184 thousand tons on RoRo routes between Italy and Spain.	According to Ram S.p.a (2019), the modal shift induced by the scheme generated environmental and socio-economic benefits of approximately €1.1 or up to €5.81 per Euro invested, depending on the assumptions.

State Aid - to transfer goods from road to rail "Miljökompensation" (Sweden)	In Sweden, an environmental compensation is paid retroactively for already performed transports to operators that perform or organize transport services at the Swedish railway network. The objective of the environmental compensation is to strengthen the competitive position of rail and support rail as the more environmentally friendly mode of transport, thereby encouraging a modal shift from road to rail (European Commission, 2021d).	According to the evaluation, the policy has rather prevented a modal backshift from rail to road, than promoting an actual modal shift to rail. The policy instrument is criticized in the evaluation for lacking continuity, predictability and a long-term perspective. According to the EU state aid rules, prices should be adjusted so that transport buyers benefit from the environmental compensation. However, according to the evaluation the prices has not been lowered according to the expectations of the transport buyers, which can partly be explained by the lack of predictability of the policy. The compensation scheme is also criticised in the evaluation for including all freight transport on rail. This has resulted in about 22 % of the total funds in 2018 and 2019 going to the company LKAB (mining company) for transports of ore, where rail already is the dominating transport mode and where competition from road transports already is weak.	
State Aid - Financial support for rail operations (Austria)	Austria provides a non-repayable direct grant to rail carriers in Austria that offers or plan to offer freight transport services. The aim of the policy instrument is to encourage a modal shift of freight transports from road to rail and to avoid a modal backshift, and thereby reduce the negative external costs related to freight transports by road (European Commission, 2017b).	When prolonged in 2017, the policy was evaluated by the Austrian state-owned company SchiGmbH (European Commission, 2017b). According to the evaluation, the initial scheme resulted in transport services increasing by 2,8% in tkm for the supported production forms (rail transport services in the forms of single wagonload traffic, unaccompanied combined transport and accompanied combined transport) between 2013 and 2015.	A benefit cost ratio of EUR 3,41 to 1 during 2013-2015 and EUR 3,39 to 1 in 2016 is estimated for the scheme (European Commission, 2017b).
Trans European Transport Network (TEN-T)	The Trans European Transport Network (TEN-T) programme is an EU policy aiming at developing and implementing a Europe wide transport network covering all transport modes (European Commission, 2019c). The ultimate objective of the policy instrument is to close gaps, remove bottlenecks, remove technical barriers, and to strengthen social, economic, and territorial cohesion in the EU (European Commission, 2019c).	As TEN-T is not only a modal-shift policy instrument, it has not been evaluated in terms of achieving a modal shift, even though some aspects concerning co-modality and interoperability between modes are discussed. In the mid-term evaluation performed in 2011, Steer Davis Gleave (2011) mentions several positive effects of TEN-T, such as contributing to key pieces of transport infrastructure in Europe, increased mobility for citizens and goods, and contributing to more focused transport investments in Europe and thereby a more structured transport network. However, several aspects of TEN-T need to be improved. For example, the TEN-T objectives are very broad and defined at a general level. This makes it impossible to meet all objectives, but also very difficult to perform an ex-post evaluation. Even though broad objectives offer flexibility, they lack focus and do not define what TEN-T is trying to achieve. Steer Davis Gleave (2011) therefore suggest that the objectives of TEN-T need to be redefined, clarified as well as prioritised for the program to achieve desired outputs. When it comes to multimodality, Steer Davis Gleave (2011) mention that rail receives most of the TEN-T funding, but that few projects have aimed at integrating rail with other transport modes. The lack of investment in projects focusing on multimodality seem to be a	

		problem within TEN-T as there are several projects which are not meeting their full potential due to a lack of investment in other parts of the transport system, which lead to less possibilities for interoperability and intermodality.	