Ministry of Infrastructure and Water Management

CCNR
CENTRAL COMMISSION FOR THE NAVIGATION OF THE RHINE

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

STUDY ON FINANCING THE ENERGY TRANSITION TOWARDS A ZERO-EMISSION EUROPEAN IWT SECTOR

CCNR Member States:

Study consortium:

DST

ECORYS

Expertise- en InnovatieCentrum Binnenvaart
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July 2021

Study on a financial instrument for greening the IWT sector

Final Report

Client: Dutch Ministry of Infrastructure and Water Management

Rotterdam, 7 October 2020

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ECORYS

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List of abbreviations

BAF	Bunker Adjustment Factor'
CCNR	Central Commission for the Navigation of the Rhine
CDNI	Convention relative à la collecte, au dépôt et à la réception des Déchets survenant en Navigation rhénane et Intérieure
CEF	Connecting Europe Facility
EBU	European Barge Union
EC	European Commission
EEA	European Economic Area
EIB	European Investment Bank
ESC	European Shippers' Council
ESO	European Skippers' Organisation
EP	European Parliament
ES-QIN	European Standard for Qualifications in Inland Navigation
ES-TRIN	European Standard laying down Technical Requirements for Inland Navigation vessels
ETS	European Trading Scheme
EU	European Union
FASRB	Framework Agreement for the Sava River Basin
GBER	General Block Exemption Regulation
GHG	Greenhouse gas
I&W	Dutch Ministry of Infrastructure and Water Management
IWT	Inland waterway transport
LCA	Life Cycle Analysis
OEM	Original Equipment Manufacturer
PPP	Polluter pays principle
NRMM	Non-Road Mobile Machinery
RED	Renewable Energy Directive
TEN-T	Trans-European Transport Network
TFEU	Treaty on the Functioning of the European Union
TKM	Tonne-kilometre
TTW	Tank-to-Wake
VAT	Value added tax
WTI	West Texas Intermediate
WTT	Wake-to-Tank
WTW	Well-to-Wake

Definition list

Any kind of rights: the website of the CCNR states the following: 'In application of Article 3 of the Mannheim Convention, the Member States must refrain from imposing any toll, tax, duty or charge based directly on the fact of navigation.' As such, navigation on the Rhine cannot be subject to any payment related to the fact of navigation.

Craft: a collective term for vessels, tugs, pushers and floating equipment as referred to in the technical requirements for vessels (EU Directive 2016/1629).[1]

Cooperative: an organisation owned and run by its members, i.e. a commercial partnership. In the scope of this research this concerns a cooperative jointly run by ship owners/operators.

Inland Waterway Transport: an equivalent term to inland shipping, referring to the national and international carriage of goods and passengers by inland waterway usually done by inland vessels.

Life Cycle Analysis: emissions from Well-to-Wake including emissions involved in building vessels and end of life aspects, such as scrapping of the vessel.

Logistics service provider: the company providing services for the management over the flow of goods and materials between a start and end point. The service provider will often take care of the shipping, inventory, warehousing, packaging and security functions for the shipment.

Polluter pays principle: The polluter pays principle is a relatively old environmental principle, adopted by the OECD in 1972 as an economic principle for allocating the costs of pollution control. In the decades after the principle has progressively been generalised and extended. It moved from being a principle for pollution prevention towards a principle for full internalisation of pollution costs. It also moved from being an economic principle alone towards a principle laid down in law. Nevertheless, a uniform legal definition of the polluter pays principle is missing.

Polluter pays' scheme: a facility/program by which an instrument based on the polluter pays principle is being implemented, such as a program in which pollution surcharges are levied or a program in which earmarked contributions to a greening fund are being collected and used for greening investments.

Retribution: A retribution is a specific payment made by an economic actor (either individual person or company) for a specific service provided by the government (which can be a local or national government). The conditions for the payment and service need to be laid down in national or international law. The service provided cannot lead to profits on the side of the government. As a result, the benefits of the system cannot exceed the costs.

Ship: in general an equivalent term for a vessel, for example an inland ship or container ship.

[1] Directive (EU) 2016/1629 of the European Parliament and of the Council of 14 September 2016 laying down technical requirements for inland waterway vessels, amending Directive 2009/100/EC and repealing Directive 2006/87/EC.

Shipper: an actor in the supply chain that wants to have products transported. This is often the producer of the products. The shipper could also be the recipient of the products.

Shipping company: in general a company that transports shipments of goods. In this study the term mainly refers to inland shipping companies, i.e. companies that transport shipment of goods by inland waterways, either with their own vessel or a chartered vessel. Hence, an inland shipping company may be both the owner and operator of the vessel. Furthermore, the shipping company may be even more vertically integrated and acting as a broker or arranging pre-and post-haulage.

Ship operator: The operator is the person who operates the vessel on his behalf and at his risk, holding the operator's certificate. If the vessel is operated for more than one entity (i.e. if the vessel is utilised for more than one company), than the operator shall be the person who actually operates the vessel and is authorised to take decisions concerning the vessel's economic and commercial management.[2]

Ship owner: owner of the ship, holding the certificate of belonging. The owner of the ship may or may not be also the operator of the ship.[3]

Tank-to-Wake: an equivalent term to Tank-to-Propeller and refer to downstream emissions that occur on the vessel from the combustion of the fuel.

Vessel: in general an equivalent term for ship, for example an inland waterway vessel or inland ship. For the purpose of this report the term 'vessel' includes the categories to which the technical requirements for vessels (EU Directive 2016/1629) applies to, and in addition, in line with NRMM Stage V, all vessels with an installed net power, either for propulsion or auxiliary purposes, of ≥ 19 kW.

Well-to-Tank: indirect emissions which are created upstream resulting from the production of a fuel, including resource extraction, initial processing, transport, distribution and marketing, and delivery into the fuel tank of a vessel.

Well-to-Wake: emissions both from the Tank-to-Wake and Well-to-Tank processes.

[2] https://www.ccr-zkr.org/files/documents/modelesCertiAttest/Recommandation_autorites_en.pdf
[3] https://www.ccr-zkr.org/files/documents/modelesCertiAttest/Recommandation_autorites_en.pdf

Summary

This report answers research questions G and H of the overall main-study on financing and funding the energy transition towards a zero-emission IWT sector. This concerns the following questions:
G *"What is the potential of 'polluter pays' schemes in IWT?"*
H *"What are requirements and boundaries considering level playing field and modal share?"*

In view of question 'G', this study analyses the potential of a financial instrument based on the contribution by the IWT sector. The theory of the 'polluter pays principle' as well as possible schemes for a contribution by the sector have been described and analysed. The potential market impacts of a contribution by the sector were assessed based on literature research (e.g. studies on price elasticities), further desk research and was complemented by interviews with shippers and vessel operators for eight representative case studies. Corresponding requirements and boundaries considering level playing field were also assessed in view of question 'H'. Each main question 'G' and 'H' is broken down into sub-questions, i.e. G1 - G6 and H1 - H4. In this summary, answers are provided for each sub-question.

Important remark for the reader:
It is important to keep in mind this report for Sub Project II is only one part Main Study and the results of Sub Project II must be combined with results from other parts of the Main Study in order to arrive at overall conclusions. Hence, this report cannot be seen as a standalone document and its result cannot be treated as such. The final conclusions are provided in the document for research element I of the Main Study (Sub Project I), which takes the results of all research elements into account and hence provides the overall conclusions and recommendations.

G1: Who is the polluter in IWT? What is a proper definition?
The first action was to analyse the theory and basics of the Polluter Pays-Principle (PPP) and to assess what this means for inland waterway transport (IWT) with regards to a possible scheme based on sector contributions. An important element in this respect is the analysis of the market structure in IWT. This provides a view on the type of market players, the market segments to be distinguished as well as insights in how the market functions.

At first glance, the inland shipping company can be regarded as the physical polluter since the company operates the vessel and consumes the fuel/energy for the propulsion for transportation of goods or passengers with own and/or chartered vessel(s) on a professional basis. However, the inland shipping company is not solely responsible for the caused pollution. All involved actors in the chain are part of the pollution chain to certain extent. This mainly includes the shipper as the party to make the transport order to select the logistics service provider who selects the inland shipping company to carry out the work. As a result, it was concluded that in IWT there is a pollution chain in which multiple involved actors in the logistics chain are together responsible for the pollution. It is therefore concluded that due to the complex structure and the strong fragmentation in the supply side of the sector it is not possible to single out one polluter only. Not only are multiple parties involved, but also contractual relationships between shippers, brokers and inland shipping companies can frequently change in time. This is confirmed by the high share of contracts for inland shipping companies established on the spot market. In such case, applying the PPP in its purest form would mean that each responsible party in the chain needs to be charged pro rata with the

cost for pollution prevention and control measures determined by the public authorities. This will simply become too complex and difficult with an extreme administrative burden for the involved parties. As a result, the study did focus on investigating possible schemes in which 'pollution is paid for' with support from all the actors involved in the pollution chain. In other words, *what is the potential for a contribution by the sector?*

G2: What are possible schemes which serve the polluter pays principle and on which basis?
In order to increase the understanding of 'polluter pays' schemes, four existing practical applications were reviewed. It was clarified how these schemes serve the PPP and on which basis. These existing applications are:

- the NOx tax in Norway;
- the CO_2 tax in Sweden;
- EU Emission Trading System;
- CDNI convention.

Overall, the four practical existing applications of the PPP have their own set of advantages and disadvantages. A possible scheme for IWT should take note of these. The NOx fund initiative- as applied in Norway- is in this respect a good practice example. This remains in contrast to introducing a stand-alone levy measure such as the initially presented NOx tax (the NOx fund was led subsequently to the NOx tax) in Norway and the CO_2 tax in Sweden. A tax measure could be relatively easy implemented and administered at a national level, however on a European level this is more difficult. In addition, introducing a tax is mostly likely in conflict with the Mannheim Act. Furthermore, the introduction of a tax measure on its own will not sufficiently support the IWT sector in the transition towards becoming zero-emission in 2050 since stand-alone tax measures flow into the general budget of governments and only a part of the collected financial sources may be used for IWT in an indirect way.

Hence, earmarking needs to be applied to make sure that resources become available. This results in a budget neutral approach on sector level, i.e. financial resources originating from the sector flow back to the sector (i.e. used for the benefit of the sector). Resources provided by the sector will also become available for the sector for a specific goal to reach the 2050 ambition of (near) zero-emission performance. This also avoids the risk that the contribution will be interpreted as fines by the IWT sector and/or a taxation on IWT operations, resulting in lack of acceptancy by the industry and conflicts with legal frameworks (e.g. Act of Mannheim).

*As a result, the focus is laid on a scheme that consists of a '**greening fund**' filled with **earmarked** '**contributions**' **from the sector** which are in turn used **for the sector**, i.e. goal based: reaching (near) zero-emission performance by 2050.*

Furthermore, it should be noted that the concept of a greening fund filled with earmarked contributions, is still fundamentally based on the general principles of the polluter pays theory.

Based on this conclusion, the possible implementation of a greening fund filled with, amongst others, earmarked contributions from the sector is subsequently analysed. Based on comparison with examples in other sectors and a brainstorming session with the Steering Committee, nine different options were initially identified for a possible contribution from the sector towards a greening fund.

As a next step these options were qualitatively assessed based on four evaluation criteria. These criteria are:

- effectiveness;
- fairness;
- proportionality;
- technical feasibility.

Table S1 provides an overview of the options and their scores on the criteria:

Table S1: Options and qualitative scores for a contribution basis

Options for contribution basis	Effective	Fair	Proportional	Technical feasibility	Conclusion
Option 1 Fixed rate contribution for each active vessel.	– – –	– – –	+	+ + +	Not acceptable
Option 2 Contribution based on load capacity/length	– –	– –	+	+ + +	Not acceptable
Option 3 Contribution based on amount/number of transported freight/passengers (or per tkm/pkm).	–	–	+/–	+	Not acceptable
Option 4 Contribution per kilometre travelled	– –	– –	+/–	+	Not acceptable
Option 5 Contribution for new engines supplied to the market	– –	– –	+/–	+	Not acceptable
Option 6 Contribution based on a flat rate for the bunkered amount of fuel/energy	+	–	+	+ +	Selected for short list
Option 7 Contribution based on real-time measured emissions on board of vessels	+ + +	+ + +	– –	– – –	Selected for short list
Option 8 Contribution based on emissions calculated	+ +	+ +	–	–	Selected for short list
Option 9 Contribution based on the emission Label/Energy Index combined with the bunkered amount of fuel/energy per vessel	+ +	+ +	+	+	Selected for short list

The last four options (6 - 9) could satisfy the effectiveness and/or fairness criteria in the path towards reaching the goal, i.e. realising the (near) zero-emission performance of the European IWT sector by 2050.

However, option 8 and especially 7 have a concern about the technical feasibility and might not be a feasible option for the short term. For option 7, This could change in the near future if sensors and measuring devices further develop and become cheaper. Out of the four options, option 9 would be

the most feasible option based on the initial evaluation. This one is the contribution to a greening fund by each vessel operator based on the bunkered amount of fuel/energy per vessel. However, it would not be a flat rate contribution, but the rate would be differentiated by means of an emission Label/Energy Index. This means that vessels with a low emission per litre of fuel pollute less compared to vessels with a high emission profile.. Consequently, this gives an additional incentive and promotes cleaner vessels which ultimately results to a bigger score on effectiveness and fairness as compared to option 6.

G3: What are legal barriers to implement such schemes across the European Union and including other relevant European IWT countries as Switzerland, Serbia and Ukraine?
G4: What are the legal barriers and options as regards the Mannheim Act to enable 'polluter pays' schemes for emissions to air?
Before further elaborating the mentioned options 6-9, it is important to further assess whether the options could be introduced given the current legal framework. In other words, does the applicable legal framework allow for the introduction of a sector contribution based on the polluter pays principle?

The applicable legal framework for the inland shipping sector is complex since including not only legal regulations of national governments, which may hamper the introduction of a potential 'polluter pays' scheme, but also embrace international regimes, such as European legislation and river basin specific legislations. For each of those jurisdictions it is necessary to assess whether a sectoral contribution based on the PPP could be introduced.

EU law offers a legal framework to introduce a sectoral contribution based on the 'polluter pays' principle. The overarching PPP is laid down in Article 191(2) of the Treaty on the Functioning of the European Union (TFEU), which states that the Union shall adopt policy that aims to protect the environment. In this process, the Union has to consider several principles. Amongst those standards, the principle includes that the polluter should pay for the damage done to the environment. However, Article 191 TFEU does not disclose how this should be established and what the PPP should entail. This means that the details of the PPP must be interpreted in additional legislation (e.g. in a specific regulation or directive). Currently, no such legislation exists for the IWT sector.

Whether a sectoral contribution can be introduced given the international regimes on the different rivers depends on the specific conventions. The following can be said:

- **On the Rhine**: Article 3 of the Mannheim Act explicitly *prohibits Signatory States to impose any kind of rights based directly on the fact of navigation*. This implies that States cannot charge the inland shipping sector for activities directly connecting to shipping as such. The Act opens the possibility for two exceptions: (i) non-shipping related duties, for instance VAT on goods, and (ii) retributions – compensation for delivered services (the CDNI disposal charge is such an example).
- **On the Danube**: The Belgrade Convention *does not allow for the collection of fees related to navigation*. Nevertheless, it should be noted that the Belgrade Convention is an older convention, which was drafted in 1948. Since then, the world changed considerably. Although some levies / taxes have been included within the scope of the Convention, no proposals for additional levies have been made so far. In case the eleven Signatory States to the Convention would agree on the introduction of a new levy, it is probably possible to introduce it.
- **On the Moselle**: The Moselle Convention *allows for the collection of tolls* (Articles 22 to 27). The initiative to introduce any new form of rights on the Moselle needs to stem from the three

Contracting States. Jointly they need to decide to introduce a new right. If all agree, the new law could become part of the legal framework.

- **On the Sava**: The Protocol on the Navigation Regime *does allow for the collection of payments*. According to Article 10 vessels operating on the Sava River and its tributaries could be asked to pay a fee or toll. Nevertheless, the fee collected cannot be used freely as it should be spent on fairway maintenance or upgrading of the fairway. Based on the Protocol on water pollution it is possible to ask a contribution based on the polluter pays principle. However, this only relates to water pollution and has not been specified in practice yet.

G5: What can we learn from the CDNI protocol, the scrapping fund and 'old-for-new' regulation in terms of the used approach and developed processes for solutions incorporating sector contributions?

Three schemes for IWT were analysed, which all introduced a kind of sector contribution. The schemes analysed are:

- CDNI on oily and greasy waste;
- scrapping fund;
- old-for-new regulation.

When analysing the different schemes, some overall lessons can be learned, which will be of added value considering the introduction of sector contribution for the greening of the IWT fleet. The main lessons learned can be summarised as follows:

- The initiative needs to be *laid down in a legal act*. Otherwise, it will not be possible to ensure payment of the contribution and there will be no basis for enforcement. The scheme would be purely voluntary, making the scheme less effective.
- The initiative should be introduced *on an international level* and should be *as inclusive as possible*. Leaving some parts of the sector out of the scheme, will diminish the success of it. It also affects the level playing field within the IWT sector, which in turn decreases sector support.
- The initiative should have a *measurable objective* in order to be successful. The more concrete the objective, the easier it is to assess whether or not the objective is met. Also amending the initiative is easier when the objective is clear.
- The initiative should *not introduce a tax or any other form of right* as this can be prohibited under international law.
- The initiative should ensure *sector willingness*. Without active sectoral support, the sector will take no action or will look for ways to circumvent the new rules. Besides sectoral support also *government support* is needed. In case one or more governments do not support the initiative, the introduction of a sectoral contribution is difficult to realise.

H1: What are potential market impacts of 'polluter pays' schemes in relation to:

a. Costs for the shippers and their competitiveness

b. Competition between vessel types

c. Competition between IWT operators from different countries

d. Competition between transport modes, notably with road haulage, with respect to undesired reverse modal shift impacts

H2: What is the effect of these measures on the modal share of IWT taking into account price elasticities for different type of markets in IWT?

The study analysed (a) the potential market impacts of a possible scheme of earmarked contributions towards a greening fund,(b) a concept in principal based on the polluter pays principle, and (c) what the possible effects could be on the modal share of IWT.

From **literature research** the following findings are most relevant:

- A transport efficiency of -0.1 and -0.2 seems a realistic assessment: 10 to 20% of an initial cost increase can be offset by increasing 'transport efficiency'.
- The overall net elasticity in demand is estimated at a value of -0.15. This means that an increase of costs of 1% is expected to result in 0.15% less demand for IWT (tonkilometers).
- Research on real life examples in situations with high oil prices and low water levels conclude that atypical cost increases due to low water situation rarely results in a substantial drop in demand. The same principle applies for changes in the oil price. The oil price has shown to be quite volatile over the past decade. Yet, the number of tonnes transported via inland waterways has been quite stable.

The IWT sector consists of different market segments with their own characteristics and market dynamics, which makes it difficult to make general statements from a top-down view on how earmarked contributions related to the fuel consumption would impact the market. As a result, a more bottom-up approach was followed in addition to review of literature on studies about price elasticities and market responses to prices increases.
To complement the literature research, eight different case studies were identified and analysed. These eight cases together fairly represent the IWT market. Based on case studies, interviews with vessel operators and desk research, key indicators were identified that can provide direction on the expected market impact. These impacts can be categorised into market impacts within the IWT sector and impacts within the wider supply chain.

The findings show that when IWT operators are confronted with a new cost optimization problem due to earmarked contribution, they will most likely adapt their travel characteristics accordingly and to the extent that this is possible. The extent to which operators have the opportunity depends largely on the considered case and the (contractual) relationship with the shipper. The more these actors collaborate, the more the actors are able to offset the initial cost increase. An example of such a collaboration would be if the shipper and operator engage in a long-term contract, allowing the IWT operator to invest in more fuel efficient vessels and greening technologies, limiting the earmarked contribution, hereby assuming an earmarked contribution based on options 7 - 9 as contribution basis. On average, it is expected that around 10-20% of the (initial) cost increase can be offset by changing transport characteristics such as fuel usage and changing shipment size.

Furthermore, within the IWT sector itself, an earmarked contribution will have varying effects depending on the specific vessel used by the operators. Based on a desk study incorporating a number of representative vessel categories, an average contribution of 4 eurocent results in a total cost increase per transported ton or passenger between 0.6% and 2.1%, whereas with 8 eurocents, the cost increase fluctuates between 1.1% and 4.2% (assuming an average fuel price scenario).

It was confirmed with interviews conducted with vessel operators for the case studies and with desk research, that the cost increase due to a possible earmarked contribution equal to 4 up to (and to a lesser extent) 8 eurocent per litre bunkered fuel (or expressed by a contribution for the emitted amount of emission), would not result in drastically disruptive effects and will not disturb the competition between vessel types.

The situation is slightly different with regards to the competition between operators in different countries. Assuming an average fuel price scenario, fuel costs make up a slightly larger share in the total costs of companies active in the Danube countries compared to the Rhine countries,. These are the two main IWT markets in Europe, of which the Rhine market is by far the largest in number

of vessels. Four vessel types were taken into account which are considered to be rather common for the Danube market. Fuel costs had on average a higher share in the total costs, approximately 3% up to 8% higher for operations involving the four vessel types in the Danube market as compared to the Rhine market. Hence, an increase in the costs related to the fuel consumption will have a relatively larger impact on the overall costs of those companies active in the Danube market.

On the other hand, the market structure in the Danube countries differs significantly from the one in the Rhine market. The Danube market is being dominated by relatively big companies, previous state-owned enterprises, which are nowadays privately owned. The Rhine market is characterised by a fragmented structure, mainly consisting of small family companies owning or operating one or two vessels. Large companies on the Danube may have better access to EU funding with higher funding rates from cohesion funds (currently being explored in the GRENDEL project).

Within the wider supply chain, vessel operators are hesitant to pass on cost increases further along the chain to actors such as shippers, as this might trigger shippers to select other vessel operators instead. On the other hand, the case studies found that most of the contracts include a 'bunker adjustment factor' (fuel clauses), enabling vessel operators to pass on higher fuel costs due to fuel price fluctuations. Furthermore, several case studies showed that the costs for the CDNI disposal charge is passed on to the shipper by the vessel operator, and subsequently these costs are covered in the overall supply chain costs.

The share of the transportation cost in the overall supply chain cost is another determinant in the potential market impact. The larger the transport cost component is in the overall cost function, the larger the market impact is expected to be. Hence, market segments such as the gravel and sand sector are relatively more sensitive to cost increases due to earmarked contributions which are related to the fuel consumption, markets such as the wet bulk segment are less sensitive though.

In some cases, the shipper might be able to adapt the logistics chain. Hence, by moving production location which would lead to decreasing transport distances. For example, (i) by relocating factories, (ii) by importing goods via another seaports or (iii) by selecting another extraction site. For container and bulk transportation such as ore and coal, the risk of this impact is assessed to be low. In the gravel and sand sector however, there is a fear that cost increases would lead shipper to select other extraction sites.

In general, the price elasticity on demand is low in IWT. An example is the low water level period in 2018 which showed that the price elasticity of demand was around -0.15. This implicates that a price increase of 1% results in a demand drop of 0.15%. However, based on the case studies, it appeared that a cost increase related to the fuel consumption of 4 up to (and to a lesser extent) 8 eurocent/litre fuel will be negligible and not result in a drop-in demand for IWT.

Concerning the thresholds for the contribution, an average cost increase of 4 cent per litre seems to be acceptable. A cost increase of 8 cent per litre seems to be problematic for market segments such as sand and gravel and agribulk. The exception is inland waterway transportation in the Danube region, where there is fierce competition from other modes. In the Danube region, it is felt that an earmarked contribution of 1-2 cent per litre would already have significant market impacts.

H3: What are limitations as regards State aid regulation in view of providing funding from public bodies?

The basic framework on State aid rules applicable to the majority of the inland navigation countries has been analysed. Article 107 of the Treaty on the Functioning of the European Union (TFEU) lays down that aid granted by a Member State or through State resources should not distort competition and trade within the EU by favouring certain companies or the production of certain goods. From a legal point, there are restrictions on State aid to companies, as it can lead to market distortion at national level, but also between various European countries. However, under certain conditions, it is allowed to provide aid. Providing aid for greening the inland navigation fleet may be covered by (i) measures which are already the subject of a Commission approval decision (notified measures) (ii) measures that van be qualified as the *De-minimis* rule (no aid), or (iii) measures that fall within the General Block Exemption Regulation (GBER) (block exempted measures). Of all exemptions, the last group seems the most promising as in those, explicit references to inland navigation and greening are made.

The European State aid rules apply to all 27 Member States. This means that State aid rules apply to all inland navigation countries that are EU members. However, these rules do not apply to those inland navigation countries that are not a member. In some of those countries national rules on governmental support do exists, while in others such rules are absent. For instance, Ukraine has recently implemented new law laying down rules under which conditions government aid can be granted. In principle, the law does allow for State aid to the inland shipping sector, as long as the relevant conditions are fulfilled. In Switzerland, currently no rules on State aid for the IWT sector are available. In case the governmental support would be required, new legislation should be drafted and implemented.

G6: What could be the revenues from a 'polluter pays' scheme?
H4: What could be the contribution from the IWT industry itself to cover higher costs of ownership?

For answering the questions G6 and H4, the potential revenues from a contribution by the IWT industry are calculated based on different sources:

- the results obtained in the PROMINENT project (closed in 2018)
- the options for a contribution which are considered feasible from desk research and interviews
- literature research on market impacts
- case studies and interviews with IWT companies indicating the acceptance for and possibility of a contribution from the sector itself.
- Analyses of the Reserve Fund

In order to easily express the acceptance and possibility for a contribution, four contribution scenarios were chosen linking to a contribution based on bunkered litre of fuel. Grounded on the fuel costs' impact, one could quickly assess the effects on their operation and competitiveness. The interviewees were asked to elaborate on a contribution based on the bunkered fuel ranging from a contribution of 4 cents up to 32 cents per bunkered litre (4, 8, 16 and 32 cents per litre). Centred on these elements, an overview is provided of the possible revenues taking the four options for the contribution basis into account.

Assuming a European wide contribution of vessel operators to a greening fund, ranging from a contribution of 4 cents up to 8 cents per litre bunkered fuel, the possible revenues solely on the basis of these contributions would range from € 53mln up to €106mln on an annual basis. Over a period of 25 years the total revenues would range from approximately € 1.3 bln up to € 2.6 bln. Per

year, this amounts to an average of € 4,319 to € 8,637 per vessel. A contribution based on the bunkered fuel and the emission label/energy index of the vessel would result in differentiated rates.

The contribution levels of € 53mln up to € 106mln on annual basis, whereas the prior scenario seems more feasible as compared to the latter, can also be translated to a contribution based on the calculated or real-time measured emissions. Table S2 provides an overview for the four contribution options, with the rates expressed per litre of fuel and expressed per emission type (NOx, PM, CO_2e):

Table S2: Options for a contribution basis

Options for contribution basis	Contribution equal to 4 cent per litre on average (€ 53 mln per year)	Contribution equal to 8 cent per litre on average (€ 106 mln per year)
Option 6 Contribution based on a flat rate for the bunkered amount of fuel/energy	4 eurocent/litre bunkered fuel flat rate (not differentiated)	8 eurocent/ litre bunkered fuel flat rate (not differentiated)
Option 7 Contribution based on real-time measured emissions on board of vessels	0.79 euro/kg NOx 3.12 euro/kg PM 1.62 euro/ton CO_2e	1.59 euro/kg NOx 6.25 euro/kg PM 3.24 euro/ton CO_2e
Option 8 Contribution based on emissions calculated		
Option 9 Contribution based on the emission Label/Energy Index combined with the bunkered amount of fuel/energy per vessel	4 eurocent/ litre bunkered fuel on average (differentiated)	8 eurocent/ litre bunkered fuel on average (differentiated)

In addition, there is the Reserve Fund, also often called the 'scrapping fund'. This is an European restructuring scheme consisting of a scrapping scheme and an 'old for new' scheme which was meant to (1) scrap redundant vessel capacity by giving the respective vessel owners a scrapping fee and to (2) prevent uncontrolled fleet expansion by means of a levy on new vessels. The updated regulation in 2014 specifically included provisions to address the emission reduction of the fleet and with a clear hint towards combining the Reserve Fund resources with other financial instruments (e.g. EIB, CEF). Taking into account the budget already allocated for the IWT Platform, there is a remaining fund of € 26.87 million available.

Recommendations in view of research question I

It is recommended to take into account for research question I (added value of a European funding / financing scheme) the sector contribution based on a contribution related to the fuel/energy consumption. It was proven that 4 and to a lesser extent 8 cent per litre of fuel is acceptable and realistic. Over the time span of 25 years (e.g. 2025-2050), this may result in revenues of € 1.3 - 2.6 billion. However, IWT operators active in the Danube market are more sensitive to price increases related to fuel consumption. The question is how and if operators in the Danube should be compensated. This is subject of research in research question F and I.

An earmarked contribution by the sector would need to be:

- implemented and collected on European scale in order to secure level playing field and acceptance;
- no general tax but earmarked and dedicated to reduction of emissions with a clear measurable objective (define 'near' zero-emission 2050 in a SMART way);
- based on a legal act, for example a European Union regulation and/or convention with Member States and third countries (non-EU Member States).

For such a scheme it is already clear that there is a need (added value) for a European fund with a proper governance to facilitate the contribution by the sector. A seat in the governance board for EBU, ESO and ESC is recommended to cover the interests of the vessel owners/operators, intermediaries, and shippers.

Moreover, the available financial resources in the Reserve Fund may be used as a kick-start, while there could be a need for pre-financing of the Fund (e.g. by EIB). It can be further discussed with EBU and ESO if this can lead to a unanimous proposal from their side.

1 Introduction

1.1 Background

There is a high and growing need for the Inland Waterway Transport (IWT) sector to develop measures to facilitate the transition towards zero-emission. Greening the inland fleet can serve several goals on a societal level such as improving air quality in urban areas along waterways and contributing to a reduction of global warming. In addition, the sector itself will also benefit from a greening strategy as the sector competitiveness can be further strengthened (compared to other modes), the industry can be boosted, and both jobs in Europe and export opportunities for greening technologies worldwide can be created. In the context of this study, greening means largely and ultimately eliminating greenhouse gases and other pollutants by 2050.

On 28 November 2018, the European Commission presented its strategic long-term vision for a prosperous, modern, competitive and climate-neutral economy by 2050 – A Clean Planet for All.[4] This was followed up by the Communication on the EU Green Deal[5] on 11 December 2019. The Green Deal highlights the following:

> *"Transport accounts for a quarter of the EU's greenhouse gas emissions, and still growing. To achieve climate neutrality, a 90% reduction in transport emissions is needed by 2050. Road, rail, aviation, and waterborne transport will all have to contribute to the reduction…*
> *Multimodal transport needs a strong boost. This will increase the efficiency of the transport system. As a matter of priority, a substantial part of the 75% of inland freight carried today by road should shift onto rail and inland waterways."*

Another statement in the Communication is about the price of transport:

> *"The price of transport must reflect the impact it has on the environment and on health. Fossil-fuel subsidies should end and, in the context of the revision of the Energy Taxation Directive, the Commission will look closely at the current tax exemptions including for aviation and maritime fuels and at how best to close any loopholes."*

Similarly, the Commission proposes to extend European emissions trading to the maritime sector, and to reduce the EU Emissions Trading System allowances allocated for free to airlines. This will be coordinated with action at a global level, notably at the International Civil Aviation Organization and International Maritime Organization.

In this respect it shall be noted that IWT also possesses exemptions on fuel tax. Furthermore, there is no infrastructure charging in place on the major waterways. As a result, there is no internalisation of external costs in inland waterways.

In addition, the Green Deal states that the EU should in parallel ramp-up the production and deployment of sustainable alternative transport fuels. In this respect, the European Commission will review the Alternative Fuels Infrastructure Directive and the TEN-T Regulation to accelerate the deployment of zero- and low-emission vehicles and vessels.

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4 https://ec.europa.eu/clima/policies/strategies/2050.
5 https://ec.europa.eu/info/publications/communication-european-green-deal_en.

Another statement in the Communication is that transport should become drastically less polluting, especially in cities. This follows the 2018 Communication *"A Europe that protects: Clean air for all"* from the European Commission which provides the policy framework for the reduction of air pollutant emissions such as NOx and Particulate Matter.[6] The 2018 Communication calls for further interventions in the view of infringements in many European countries since limiting values for air quality are exceeded. It can be concluded that these recent developments ask for a European policy on the reduction of greenhouse gas (GHG) emissions by IWT.

This was confirmed by the European Parliament (EP) resolution from 15 January 2020 on the EU Green Deal.[7] This resolution stated that the EP:

> *"Underlines the urgent need for ambitious action to tackle climate change and environmental challenges, to limit global warming to 1.5 C, and to avoid massive loss of biodiversity.*
>
> *19. Welcomes the planned proposal to revise the Energy Taxation Directive with respect to environmental issues in order to apply the* ***polluter pays principle****, while taking into account national fiscal policies and avoiding any widening of inequalities.*
>
> *45. Underlines that* ***zero-emissions waterway transport is key to developing sustainable multimodal transport****; urges the Commission to develop a coordinated European framework of rules for inland waterways; asks the Commission to actively support intermodality involving inland waterways, especially the cross-border networking of national waterway systems, which must be improved.*
>
> *48. Considers that it is crucial to ensure sufficient investments in developing appropriate infrastructure for zero-emissions mobility, and that all relevant EU funds (Connecting Europe Facility, InvestEU, etc.) as well as European Investment Bank (EIB) transport lending must be tailored to this; calls on the Member States to commit to proper funding and step up the pace for the deployment of innovative strategies, charging infrastructure and alternative fuels; considers that* ***revenues from taxes or fees on transport should be earmarked to support the transition*** *to make these costs more socially acceptable.*
>
> *51. Underlines the importance of ensuring a* ***level playing field between different modes of transport****; calls on the Commission therefore to make proposals for coordinated measures to* ***close tax exemptions for aviation and maritime fuels in the Member States in the context of revising the Energy Taxation Directive, while avoiding unintended negative environmental, economic or social consequences****."*

Besides policies addressing the need for reducing air pollutants and climate emissions, the IWT-sector itself, represented by the European Barge Union (EBU) and European Skippers' Organisation (ESO), also raised the importance of greening and proposed to accelerate the process.[8]

Given the urgency, the Mannheim declaration from October 2018 emphasised the need for up-to-date, workable and harmonised environmental and safety regulations on the Rhine and inland navigation sector.[9] The Mannheim declaration specifically stresses the need for new and updated financial instruments to achieve these environmental objectives, because existing funding and financing instruments have not led to the hoped results so far, being a large scale greening of the IWT sector.

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6 http://ec.europa.eu/environment/air/index_en.htm

7 https://www.europarl.europa.eu/doceo/document/TA-9-2020-0005_EN.pdf

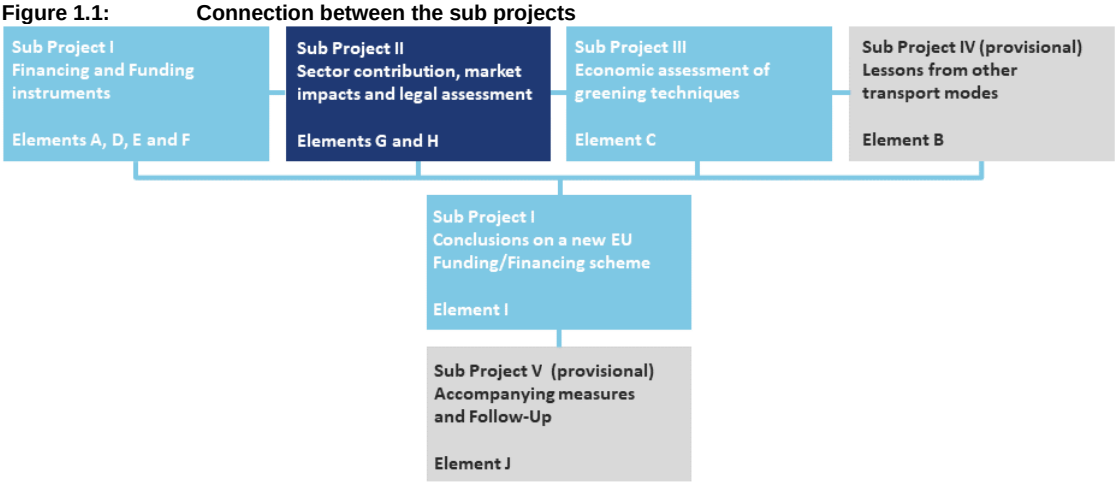
8 http://www.ebu-uenf.org/wp-content/uploads/Inland-Waterway-Transport-Industry-Declaration-Vienna-10-October-2018-final.pdf

9 https://www.zkr-kongress2018.org/files/Mannheimer_Erklaerung_en.pdf

This has led to a preparatory study (pre-study) done by EICB and commissioned by the Dutch ministry of Infrastructure and Water Management (I&W for short), which involved many stakeholders. The aim of this pre-study was to develop the technical specifications for a Terms of Reference document for a 'Main Study' concerning new and updated financial instruments to achieve the environmental objectives.

The Main Study is divided into four sub projects, each covering a certain part of the research questions. *Sub project I* analyses general financing instruments and covers research elements A, D, E and F. Sub project I also covers research question I which can be seen as the concluding part of all three sub projects. *Sub project III* focuses on the economic assessment of technical solutions and thereby covers research element C. This study, being *sub project II* and tendered by I&W, provides an analysis on 'polluter pays' schemes and corresponding market impacts and legal aspects, thereby covering research elements G and H. *Sub project IV* focusing on the developments in other transport modes is yet in a provisional state. Sub project V, for the accompanying measures and the follow-up will depend on the results of the overall conclusions and recommendations provided in the report for research element I. The connection between the sub projects is visualized in Figure 1.1.

Figure 1.1: Connection between the sub projects



It needs to be clearly stressed, that this report for Sub project II is part of the broader Main study covering all the research elements. Hence, ***this report cannot be seen as a standalone document and its result cannot be treated as such****. The final conclusions are provided in the document for research element I, which takes the results of all research elements into account and hence provides the overall conclusions and recommendations.*

1.2 Problem definition

The external costs of emissions to air of inland shipping are currently summing up to more than 1 billion euro annually.[10] Governments and authorities on both European, national and regional level are urging IWT to green. Furthermore, the sense of urgency is being strengthened due to a deteriorating competitive position as compared to road transport, given the fact that road transport is greening their fleet at a relatively fast pace.[11]

[10] The total external costs emitted by inland vessels in Europe sums up to a total of more than 1 billion euro per year, broken down into NOx-emissions (approx. 75%), PM-emission (13%) and CO2- emission (12%). Source: http://www.prominent-iwt.eu/wp-content/uploads/2018/07/2018_04_30_PROMINENT_D6.3_D6.5_Combined_Deliverable.pdf (p.35)

[11] http://www.prominent-iwt.eu/wp-content/uploads/2015/06/2015_09_11_PROMINENT_D-1.2.-best-available-technologies_final.pdf (p.23-24)

Without any measures, the IWT sector will be unsuccessful in realising the transition towards becoming a zero-emission transport mode in 2050 and as a result cannot effectively play its role to contribute to more sustainable transport and cannot support the modal shift from road to inland waterways. Th environmental objective for IWT could be achieved through new and updated financial instruments.

As defined in the Pre-Study, the drivers of the problem are:

- Lack of legislation for the existing fleet and existing engines as regards targets for emissions to air (notably NOx, PM and CO_2).
- **There is no effective internalisation of external costs or 'polluter pays' mechanism in IWT.**
- There is in general no willingness-to-pay for green vessels by the vast majority of shippers, in particular for reduction of air pollutant emissions.
- The long lifetime of vessels and their engines and the ability for the ship owner to extend the lifetime of the engine by means of overhauling it, avoiding higher expenses for engine replacement. This results in a very low demand for new engines.
- Compared with other modes, the IWT market is small with stringent requirements. Consequently, there is low interest from engine and technology suppliers to develop and offer new engines and energy solutions specifically for IWT vessels, resulting in relatively higher greening costs for IWT. Development of bunkering infrastructure and corresponding supply chain face the same difficulties.
- In general, higher total cost of ownership for greening technologies as well as risks and uncertainties in the business case development (e.g. a persistent low oil price).
- Uncertainty for ship owners about possible future emission standards.
- Uncertainty about appropriate technologies and fuels for the near future in view of a development towards decarbonization and zero-emission in IWT.
- A fragmented supply side of the sector combined with dominance of short-term or even single trip contracts in the spot-market impose barriers to acquire loans for investments. There is a lack of collaborative long-term approaches between shippers and IWT operators to green transport.

1.3 Research question

This study analyses 'polluter pays' schemes as possible instruments to support the environmental objective. Complementary, related requirements and boundaries considering level playing field and modal share are also analysed. This study focuses on research questions G and H, and provides an outlook to research question I looking into the added value of a new European funding and financing scheme for IWT. Research questions G and H consist of a number of sub-questions:

G "What is the potential of 'polluter pays' schemes in IWT?"

- G1: Who is the polluter in IWT? What is a proper definition?
- G2: What are possible schemes which serve the polluter pays principle and on which basis?
- G3: What are legal barriers to implement such schemes across the European Union and including other relevant European IWT countries as Switzerland, Serbia and Ukraine?
- G4: What are the legal barriers and options as regards the Mannheim Act to enable 'polluter pays' schemes for emissions to air?
- G5: What can we learn from the CDNI protocol, the scrapping fund and 'old-for-new' regulation in terms of the used approach and developed processes for solutions incorporating sector contributions?
- G6: What could be the revenues from a 'polluter pays' scheme?

H “What are requirements and boundaries considering level playing field and modal share?”

- H1: What are potential market impacts of ‘polluter pays’ schemes in relation to:
  a. Costs for the shippers and their competitiveness
  b. Competition between vessel types (new vs existing, large vs small)
  c. Competition between IWT operators from different countries
  d. Competition between transport modes, notably with road haulage, with respect to undesired reverse modal shift impacts
- H2: What is the effect of these measures on the modal share of IWT taking into account price elasticities for different type of markets in IWT?
- H3: What are limitations as regards State aid regulation in view of providing funding from public bodies?
- H4: What could be the contribution from the IWT industry itself to cover higher costs of ownership?

1.4 Scope and focus areas

The Pre-Study identified the scope for the main-study and thus for this study being part of it. The geographical and market scope of this study will encompass the whole of Europe given the level playing field requirements, as well as all markets and vessel types. This means that besides EU Member States, the study also considers European countries, who are no EU Member States. More specifically, this relates to Switzerland, Serbia and Ukraine.

However, the focus lies on the main IWT markets and IWT countries in Europe, notably Rhine and Danube markets.

The analysis on research question H will be partly based on case studies. Given the scope, these case studies are designed to represent European IWT in a most proper way.

Potential ‘polluter pays’ schemes recommended by the study need to be easily accessible both for relatively small and large investments and with a minimal administrative burden, for IWT companies from all segments and countries.

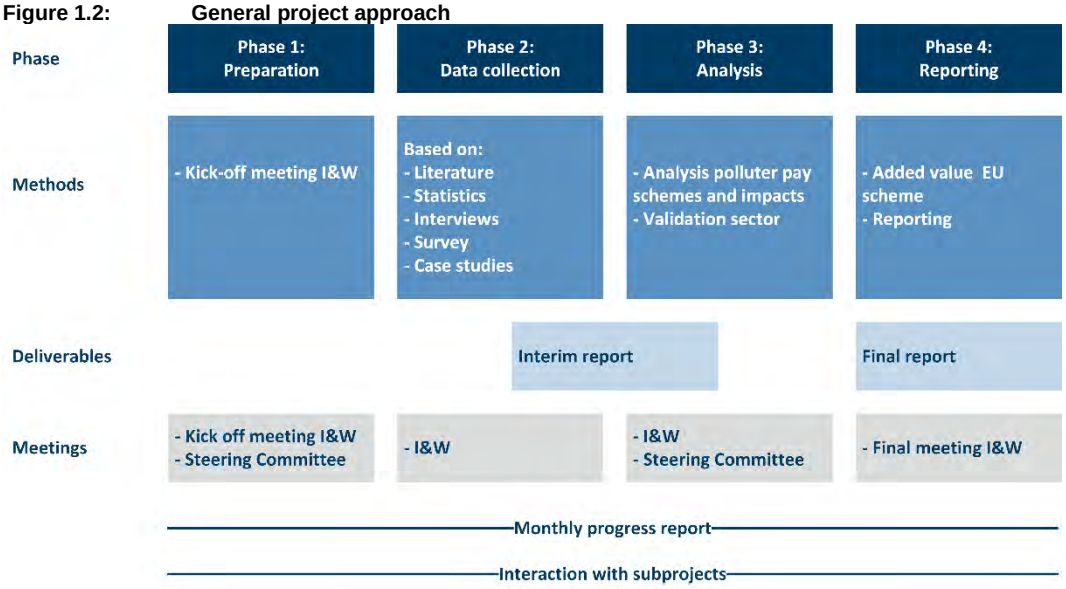
There have been exchanges with the remaining sub projects, which are also executed within the boundaries of a similar scope.

An important focus area is to raise support for the overall process towards zero-emission and to address leadership and governance of the implementation after the main-study. This will be a joint effort with the organisations executing the other sub projects. There will be close involvement and communication with the organisations active in and related to the IWT sector, since this is essential for understanding barriers on business level and to identify the opportunities. In this study, these barriers and opportunities relate to the ‘polluter pays’ schemes, market impacts and State aid.

1.5 General research approach

This study was executed in four phases as also illustrated in Figure 1.2. The figure illustrates the general approach of the study.

Figure 1.2: General project approach



The preparatory work in phase 1 was largely derived from the results of the pre-study, since the problem definition, the research questions and the scope of the study had already been elaborated during the pre-study. The required information for the analysis was collected in phase 2 of the project through various means, such as literature reviews and interviews. Phase 3, the analysis, is conducted subsequently and also in parallel with activities performed in phase 2. The last phase of the project delivered the final version of the study, in which the main conclusions and recommendations are laid down.
Throughout the project there were exchanges with the client, I&W, and the Steering Committee (consisting of I&W, EBU, ESO, ESC, IWT Platform) for their feedback and approval on the delivered results.

1.6 Structure of report

Chapter 2 of the report presents the theory and background on the 'Polluter Pays Principle' (PPP) as well as the market structure of Inland Waterway Transport (IWT). In addition, this chapter presents to what extent the theory of PPP can be applied to the IWT sector given the market characteristics. This chapter refers to the research questions G1 "*Who is the polluter in IWT? What is a proper definition?*"

Chapter 3 of the report presents some examples of 'polluter pays' schemes and answers the question what the possible ways are to organise a contribution by the IWT sector. This refers to research question G2: *"What are possible schemes which serve the polluter pays principle and on which basis?"*

In Chapter 4 presents the analysis of the legal framework with regard to the introduction of a 'polluter pays' scheme / contribution by the sector, with particular attention for the legal framework in EU, Rhine (Act of Mannheim), Danube, Sava and Moselle river basins and national levels. This refers to the research questions G3 and G4: "*What are legal barriers to implement such schemes across the European Union and including other relevant European IWT countries as Switzerland, Serbia and Ukraine? What are the legal barriers and options as regards the Mannheim Act to enable 'polluter pays' schemes for emissions to air?*"

Chapter 5 subsequently presents views and lessons learned from previous and existing schemes which are characterised by a contribution from the sector. This deals with the CDNI scheme for waste collection facilities as well as the scrapping fund and the old-for-new regulation. This chapter therefore provides the answer to research question G5: "*What can we learn from the CDNI protocol, the scrapping fund and 'old-for-new' regulation in terms of the used approach and developed processes for solutions incorporating sector contributions?*"

In Chapter 6 the potential market impacts of a scheme are assessed based on analyses of current costs structures (derived from PROMINENT) and with case studies to highlight the sensitivity for a number of representative cases in Europe. This chapter is based as well on confidential interviews with representatives from the market. In Chapter 6 the answers are provided for research questions H1 and H2: "*What are potential market impacts of 'polluter pays' schemes in relation to: a. Costs for the shippers and their competitiveness; b. Competition between vessel types; c. Competition between IWT operators from different countries d. Competition between transport modes, notably with road haulage, with respect to undesired reverse modal shift impacts". What is the effect of these measures on the modal share of IWT taking into account price elasticities for different type of markets in IWT?"*

Chapter 7 presents the answer on the research question H3: *What are limitations as regards State aid regulation in view of providing funding from public bodies?* It presents the European framework on State aid as well as the national rules applicable to State aid for specific non-EU countries.

Based on the previous chapters, the Chapter 8 presents the contribution from the IWT sector and potential revenues. This chapter answers the research question H4: "*What could be the contribution from the IWT industry itself to cover higher costs of ownership?"* A short overview is presented for earmarked contributions in 'polluter pays' schemes in IWT and related revenue scenarios of the 'polluter pays' schemes. A brief overview is also presented on the available financial resources from the European Reserve fund for inland shipping.

The final chapter of this report presents the conclusions and recommendations in view of the research question 'I' on the added value of a new European scheme for funding/funding.

2 The polluter in IWT

2.1 Introduction and approach

In order to analyse the potential of 'polluter pays' schemes in the IWT sector, first the polluter pays principle (PPP) needs to be clarified. Chapter 2 provides an analysis of the PPP and answers what the principle is about and what its essentials are. This analysis is based on existing literature on the PPP.

Subsequently, the potential polluters in the IWT sector need to be identified. This first of all requires good insight into the market structure of the sector. The market structure is analysed based on existing literature. This information, together with the analysis on the PPP, made it possible to identify the potential polluters in the sector.

2.2 The Polluter Pays Principle

Environmental resources are generally limited available, using these resources in production processes or consumption could result in their deterioration (e.g. air pollution). The scarcity of the used environmental resources should be appropriately reflected and as such included in the pricing system of the market, otherwise the market will fail to solve the process of environmental deterioration requiring public measures to counteract the deterioration. Public intervention should result in an improved allocation of resources by ensuring that products and services reflect the relative scarcity in a better way and consumers/producers react on it correspondingly. A way to ensure a better allocation of resources is by applying the PPP.[12]

The PPP as defined by the OECD

The polluter pays principle is a relatively old environmental principle, adopted by the OECD in 1972 as an economic principle for allocating the costs of pollution control.[13] Contrary to what the term suggests, the principle is not about compensation by the polluter for the damage caused by the pollution. The exact definition provided by the OECD is as follows:

> *"The Polluter Pays Principle means that the polluter should be charged with the cost of whatever pollution prevention and control measures are determined by the public authorities, whether preventive measures, restoration, or a combination of both"*[14]

The principle thus states that the polluter should rather pay for the prevention of pollution and the related control measures to ensure that the environment is in an 'acceptable state'. The concept of an 'acceptable state' is collectively decided upon by public authorities. An acceptable state represents the situation in which a further reduction of negative externalities, such as air pollution, will not be practical or even necessary given the costs involved to do so. The principle is therefore actually an efficiency principle for the allocation of costs and does not search to reduce pollution to an optimal level, however the principle does not exclude this possibility either.[15]
The original reasoning behind the PPP reveals that it was never intended to fully internalise the costs of pollution, meaning that the negative externalities (e.g. GHG and air pollutant emission and

12 https://play.google.com/books/reader?id=_OzVAgAAQBAJ&hl=nl&printsec=frontcover&pg=GBS.PA11 (p.12)
13 http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=OCDE/GD(92)81&docLanguage=En (p.5)
14 http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=OCDE/GD(92)81&docLanguage=En (p.5)
15 https://play.google.com/books/reader?id=_OzVAgAAQBAJ&hl=nl&printsec=frontcover&pg=GBS.PA15 (p.15)

noise) are not fully borne by the polluter. However, in the decades after the principle was mentioned first, the principle has progressively been generalised and extended. The meaning of the principle changed since it assumed additional functions and meanings. The principle is being interpreted in various ways, shaping it into a relatively broad interpretable principle.[16] As such, it moved from being a principle for pollution prevention towards a principle for full internalisation of pollution costs.[17,18] It also moved from being an economic principle alone towards also being a legal principle with a mandate changing from a mere recommendation to a principle laid down in law. Given the current application of the principle, it can be seen as both a general principle for pollution regulation in international law, as well as an element within the concept of sustainable development for environmental protection.[19] A condition for the application of the principle is that a polluter can be clearly identified.

Nowadays there is a distinction between the PPP as a principle for pollution prevention and a principle for full internalisation of pollution costs, as such there is a 'strict sense' and 'broad sense' of the PPP. The *strict sense* requires polluters to pay the costs for pollution prevention and control, whereas the *broad sense* requires a full internalisation of environmental costs. The OECD recommended applying the broad sense of the PPP in a document adopted in May 2001.[20] Hence, the PPP continues to lack a general accepted legal definition.[21] However, whilst full internalisation of environmental costs should be pursued, the existence of multiple interpretations of the PPP indicates that full internalisation is not obliged when the PPP is applied. It could therefore also be an option to take gradual approach and apply a PPP moving gradually from a strict sense towards a broad sense.

Another relevant aspect is that from the PPP's point of perspective, it does not matter whether the polluter passes on the environmental costs to the consumer or fully absorbs the costs himself.[22]

Defining the polluter from an EU perspective

Regardless of the interpretation, before correctly implementing the principle a first step is to identify the polluter, the proper definition of the polluter and the means to clearly identify the polluter. Determining the polluter can be a delicate matter, since the physical polluter is not always the sole responsible one, neither has the polluter always the economic and technical power to combat pollution. To illustrate this with an example: In the case of a CO2 emission from a car, the physical polluter is not the object, but the person using the vehicle. However, is this person also the sole responsible actor for the pollution? Probably not, as the characteristics of the car and fuel used are not controlled by the driver. They are controlled by the car manufacturer and the fuel supplier. As a result, both play a part in the pollution caused by the car and could be seen as polluters as well.[23]

A Communication from the European Commission to the Council[24] offers guidance in such circumstances where it is difficult to pinpoint one single polluter. The communication defines the polluter as follows:

> *"A polluter is someone who directly or indirectly damages the environment or who creates conditions leading to such damage."*

16 https://www.ejcl.org/113/article113-15.pdf (p.25-26)
17 http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=OCDE/GD(92)81&docLanguage=En
18 https://www.ejcl.org/113/article113-15.pdf
19 Fitzmaurice, M et al. (2010), 'Research Handbook on International Environmental Law' (p.243-261).
20 https://www.ejcl.org/113/article113-15.pdf (p.8)
21 https://www.mdpi.com/2075-471X/4/3/638/htm (p.643)
22 https://play.google.com/books/reader?id=_OzVAgAAQBAJ&hl=nl&printsec=frontcover&pg=GBS.PA15 (p.16)
23 OECD (2008), 'The Polluter Pays' Principle (p.26)
24 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31975H0436&from=EN (Annex)

When identifying the polluter is delicate, as given in the example above, then the advice is as follows:

> *"The cost of combating pollution should be borne at the point in the pollution chain or in the cumulative pollution process, and by the legal or administrative means which offer the best solution from the administrative and economic point of view and which make the most effective contribution towards improving the environment."*

Section 2.4 provides insight into the so-called 'pollution chain' by analysing the market structure of IWT and the relevant actors in the sector. All actors are responsible for a certain part of the emitted pollution. The extent to which each actor is responsible and thus accountable for, however, would differ from case to case. It is therefore not possible to clearly designate one polluter in the IWT sector. The concept to designate one party to bear the cost of combating pollution can therefore not apply to IWT. There should rather be a concept in which merely 'pollution is paid for' rather than a concept in which one designated 'polluter pays'.

2.3 Market structure of the IWT sector

The IWT sector can be roughly divided into two categories, passenger and freight transport, of which the latter is twice the size from an economic perspective.[25] The following chapters will analyse the market structure of both the passenger and freight sub-markets into more detail. Aspects such as the major actors and the market working, i.e. development of logistical flows, will be clarified. The analysis of the market structure for freight transport was mainly based on the extensive market structure analysis performed by STC-Nestra and Maverick in 2015 which was also used in the FP7 PLATINA II project.[26] Analysis of passenger transport was based on the CCNR market observation publications.[27]

2.3.1 Passenger transport[28]

There are three major type of operators active in the IWT passenger transport, namely:

- river cruise vessel operators;
- ferry operators;
- daytrip vessel operators.

In Europe, a total of 4,000 IWT passenger companies are active in the above-mentioned segments Currently, the number of companies and employees in passenger transport is growing. In addition, passenger transport is also increasing its economic activity in countries where not many cruise vessels are registered.[29]

In 2018, the fleet of river cruise vessels in Europe amounted to 359 active vessels. River cruises have been experiencing a boom since 2013, mainly due to the large number of American tourists booking river cruise holidays. In 2018, the increase was 14.6%, compared to 2017, reaching a total of 1.6 million river cruise passengers.

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25 The turnover of the European IWT sector is around 9 billion euro, of which approximately 6 billion euros in freight transport and 3 billion euros in passenger transport.

26 http://www.nestra.net/download/Rapport%20versterking%20marktstructuur%20binnenvaart%20-%20commerciele%20samenwerkingsverbanden%20-%20versie%205Maart15.pdf

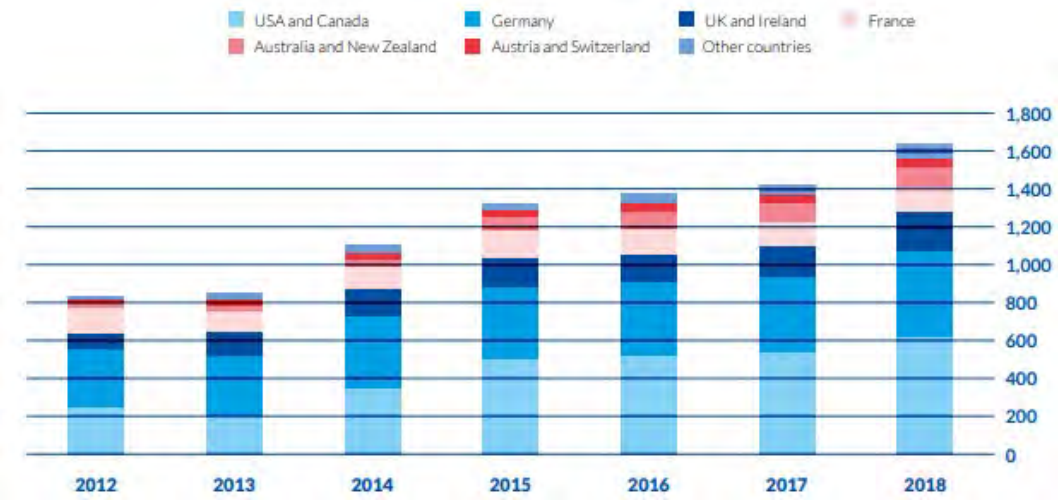
27 https://www.ccr-zkr.org/files/documents/om/om19_II_en.pdf

28 Based on the CCNR market observations: https://www.ccr-zkr.org/files/documents/om/om19_II_en.pdf

29 The focus in this study will be on the river cruise market due to a lack of available data for the daytrip and ferry market segments.

The fleet for river cruises in the EU region is mainly concentrated on Central European waterways.[30] The number of active river cruise vessels on Central European waterways represented a share close to 75% of the total river cruise fleet in the EU. The greatest concentration of river cruise vessels can be observed on the Rhine/Main/Main-Danube Canal/Danube area, with 253 vessels, including 35 on the Netherlands Rhine axis. The geographical composition of the fleet is depicted in Figure 2.1.

Figure 2.1: Number of passengers on European cruise vessels by nationality (in 1000)



Source: https://www.ccr-zkr.org/files/documents/om/om19_II_en.pdf

Over time the market mechanisms have changed. More specifically, the business model has changed fundamentally in the river cruise segment. Originally the business model was quite simple, companies did build vessels and recruited the necessary crew to run the business, possibly chartered the vessel to travel agencies or tour operators if it did not succeed in marketing the cabins. Nowadays the structure is relatively complex in which tour operators build vessels themselves, rather than chartering them. Moreover, the segment has a quite international structure, i.e. companies from diverse countries are involved in various layers of the operations and management of the river cruises.[31]

There is a relatively direct business to consumer relationship in the market though, between the tour operator and the end-consumer being the passenger on board. While this is different for freight transport, which includes many more links in the chain in a business to business environment and the consumer is usually not physically involved in the transportation itself.

2.3.2 Freight transport

The market for freight transport is relatively complex, including multiple sub-markets and links in the chain. Major actors are:

- Shippers
- Brokers
- Shipping company (owning/chartering multiple vessels)
- Private vessel owner/operators

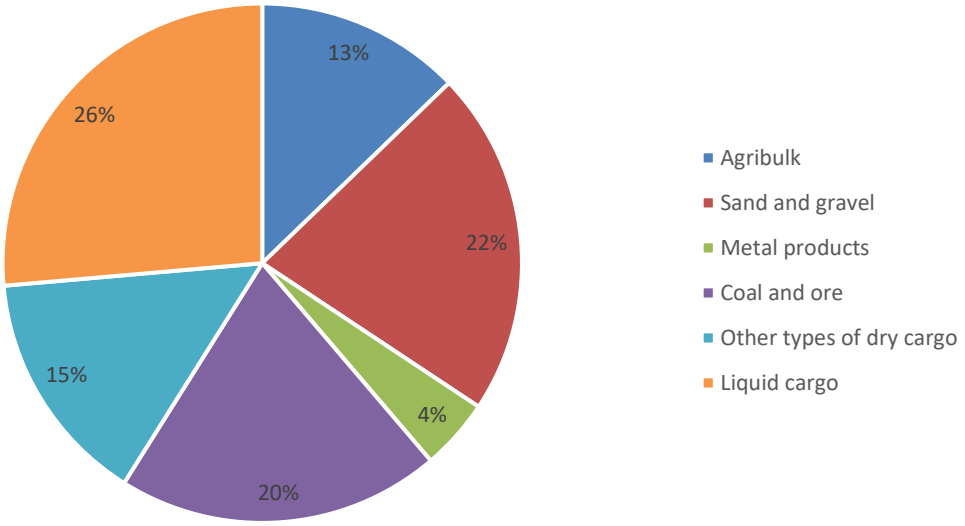
Within the freight sector 541 million tonnes of cargo were transported in Europe in 2018. Figure 2.2 below provides an overview of the share of each market segment in the overall European IWT

[30] Rhine/Main/Main-Danube Canal/Danube/Elbe-Oder waterways

[31] http://www.igrivercruise.com/pdf/Directory-V1-en.pdf

sector. Annex III provides a more in-depth analysis on the characteristics and supply chain organisation of each market segment.

Figure 2.2: Shares of various market segments in total European IWT



Source: Eurostat

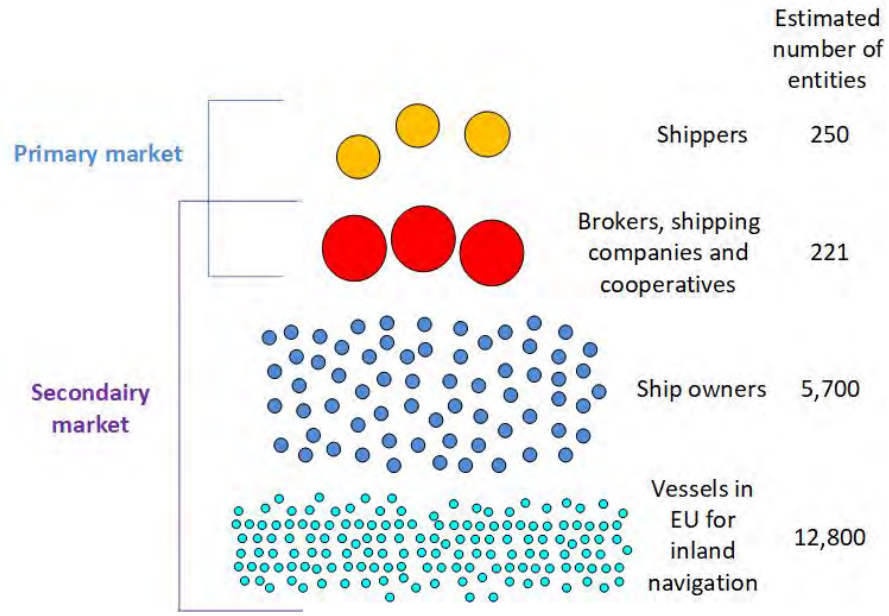
Oil and chemical products (liquid cargo), coal and ore and construction materials (sand and gravel) have the largest share in the transported tonnage in Europe. In addition, container transport (other types of dry cargo in Figure 2.2) is growing in importance. The following companies are important players in the demand for IWT services:

- oil trading companies (liquid cargo: mineral oil and biofuels);
- chemical companies (liquid cargo: chemical products);
- energy producing companies (coal: e.g. coal fired energy plants);
- metal/steel production companies (coal and ore);
- construction companies (sand and gravel);
- container terminal companies and deep-sea shipping lines (other types of dry cargo);
- agricultural companies (agribulk).

The supply side of the IWT market in Western Europe is strongly fragmented and dominated by micro-sized (family) enterprises owning/operating only one vessel. About 5,700 European enterprises (ship owners) are primarily focussed on the operational management of their freight vessels (12,800 units) often relying on more or less 86 ship brokers and cooperatives and 135 shipping lines, who represent 250 shippers and logistics service providers, to match supply to transport demand.[32] Figure 2.3 visualises the relationship between all these actors.

[32] http://www.nestra.net/download/Rapport%20versterking%20marktstructuur%20binnenvaart%20-%20commerciele%20samenwerkingsverbanden%20-%20versie%205Maart15.pdf

Figure 2.3: Relationships between market actors



Source:http://www.nestra.net/download/Rapport%20versterking%20marktstructuur%20binnenvaart%20-%20commerciele%20samenwerkingsverbanden%20-%20versie%205Maart15.pdf

Approximately **45%** of the shippers and logistics service providers carry out IWT transport for own account or have **long-term** agreements with IWT operators. Whereas **55%** of the assignments of ship owner/operators in Western Europe is traded on the **spot market** and does not concern long term relationships with the shipper, broker, cooperative or other shipping companies.

There is a big difference between the *primary market* (shippers – brokers, cooperatives and big shipping companies) and the *secondary market* (brokers, cooperatives and big shipping companies – shipowner/operators) in many aspects (degree of consolidation, individual company size, etc.). As a result, the brokers have a good view of the market situation, while the individual shipowners have much less information and therefore a relatively weak position to negotiate prices and conditions.

In contrast to the market in Western Europe, single shipowner/operators on the Danube are rather exceptional. The IWT market on the Danube is dominated by large, often (previously) state owned, enterprises of which, according to Eurostat statistics, a high percentage owns 20 vessels or more, which carry out 90% of the total transport on the Danube (commonly push convoys). The Western European market does not consist exclusively out of single shipowner/operators though and also includes large shipping companies (e.g. Interstream, Contargo and Reederei Jaegers), in particular in the operation of large container/tanker vessels or push convoys operating on a 24/7 basis.
Two main types of contract can be distinguished in the IWT market:

- contract of carriage;
- charter contract.

The *contract of carriage* is an agreement between a consignor (shipper or an intermediary party/logistics service provider representing the shipper) and a carrier (shipowner/operator or shipping company) for the transport of cargo. Contracts of carriage include both long-term contracts (for a certain duration, e.g. some months or years, including multiple trips) and single contracts of carriage (for one trip only).

The key components of a contract of carriage include:

- contract duration;

- transport quantity;
- loading and unloading locations;
- transport price (including clause for gasoil prices and low water surcharges);
- loading and unloading times, norms and conditions;
- other components (for example. insurance, quality norms, invoicing, notification, discharge from responsibilities/ obligations).

A *charter contract* is a contract for the hiring of a vessel and its crew. This type of contract is concluded between a vessel owner/operator and a charterer (which may be shippers, big shipping companies, brokers or other intermediaries).

It is customary to charter a vessel together with the crew, fuel and insurance. Different types of charter contracts are:

- time charters: this involves the leasing of a vessel for a specific time period;
- voyage charters: the leasing of the vessel for a single or more (consecutive) voyages.

The charter price specifies the remuneration for the vessel and its operation, the crew (salary and expenses) and other services. This occurs often in the form of calculated daily rates, which may depend on particular circumstances (for example fluctuations of prices and currencies in particular operating areas).

Thus, in contrast to the passenger transport market, the freight transport market is considered to be much more complex. There are relatively more actors involved in the organisation and implementation of a transport flow, which then again also depends on the specific transport flow, market segment, contract type, etc.

2.4 The polluter in the IWT sector

The Results of sections 2.2 and 2.3 make it possible to draw a conclusion on who the polluters are in the IWT sector, emitting emissions equal to external costs of more than 1 billion euros per year.[33] Pollution in this research refers to emissions to air (notably PM, NOx and CO_2) emitted by ships, thus focussing on Tank-to-Wake emissions as specified in the pre-study. Emissions from Well-to-Tank and the overall life cycle performance are important to keep in mind but are out of the scope since IWT policy makers have no influence over the emissions emitted in other parts of the energy supply chain.

Section 2.3 provided an overview of the IWT market structure in Europe. The overall structure and market working in IWT is quite complex, consisting of many actors and interrelationships. The 'physical polluter' is relatively easy to identify, since this concerns the actor responsible for operating the vessel, i.e. the inland shipping company holding the operator's certificate and transporting goods or passengers with own and/or chartered vessel(s) on a professional basis.

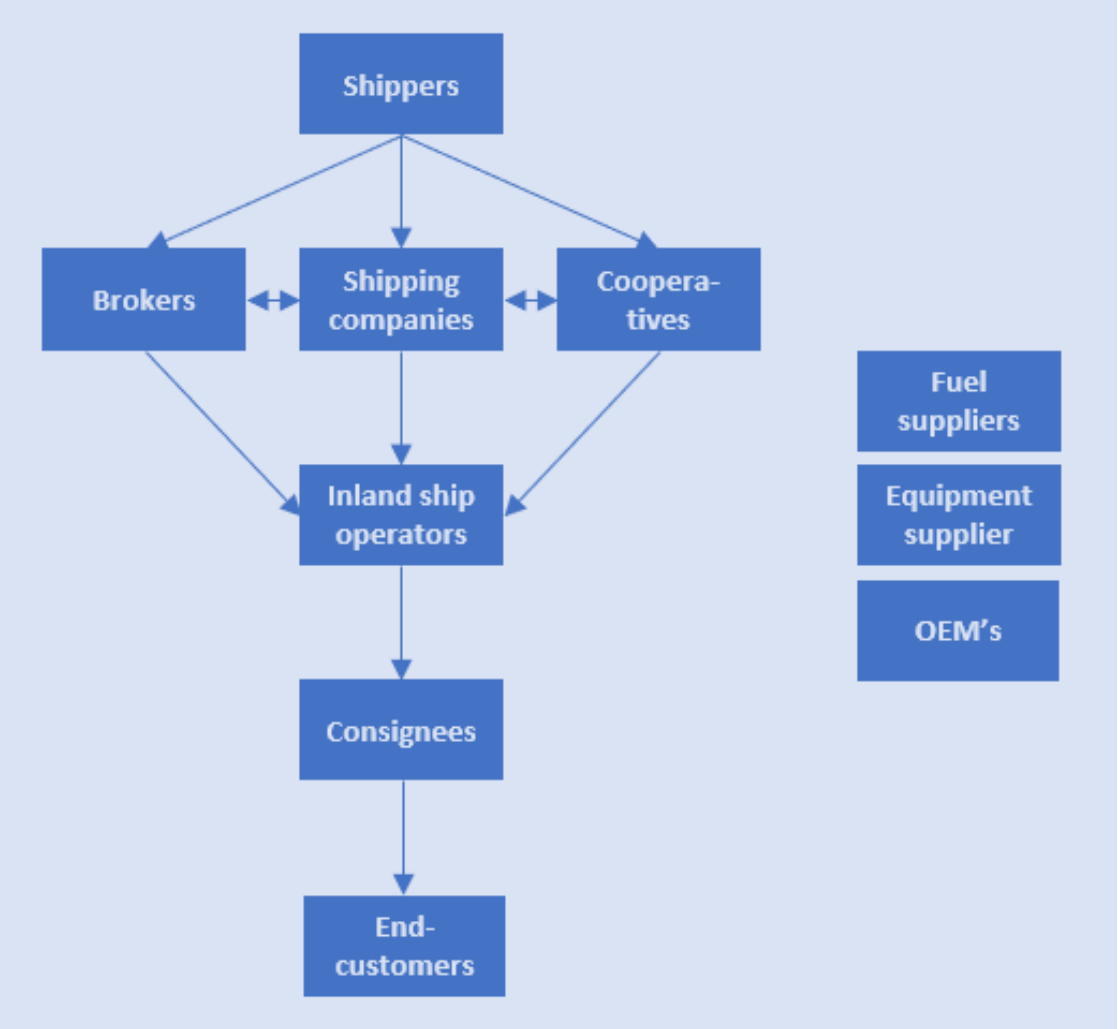
However, the inland shipping company is not the sole responsible actor for the pollution in the overall market. The shippers, brokers, inland shipping companies, cooperatives and naturally the end-customer are jointly responsible as they play a role in the creation of the logistics flows. This co-responsibility also applies to the engine manufacturers (the so-called OEM's) and fuel suppliers,

[33] The total external costs emitted by inland vessels in Europe sums up to a total of more than 1 billion euro per year, broken down into NOx-emissions (approx. 75%), PM-emission (13%) and CO2- emission (12%). Source: http://www.prominent-iwt.eu/wp-content/uploads/2018/07/2018_04_30_PROMINENT_D6.3_D6.5_Combined_Deliverable.pdf (p.35)

so actually there is a pollution chain in which the inland shipping company does not always has the technical and economic power to combat the pollution.

If the PPP would be applied in its purest form, then this would mean that each responsible party would need to be charged pro rata with the cost for pollution prevention and control measures determined by the public authorities. Figure 2.4 provides a simplified and general overview on the pollution chain in IWT. A more detailed explanation of the supply chain organisation can be found in Annex III. In general cases, the actors in Figure 2.4 would be responsible for a certain part of the emitted pollution. In specific cases, this could include even more and/or other actors. The extent to which each actor is responsible and thus accountable, would differ from case to case.

Figure 2.4: Simplified pollution chain IWT



Note: this is a simplified illustration based on own elaboration, it does not include all possible flows and actors in the 'pollution chain' which involves IWT as the sole transport mode.

However, the designation of all responsible parties (polluters), holding them accountable and charging all actors pro rata for each specific case, will simply become too difficult given the complex structure in the pollution chain(s). Such an undertaking would require a broad cross-sectoral and international approach (beyond the EU) including both the private and public sector, resulting in significant costs.

Therefore, the polluters can be identified. But rather than designating one specific polluter and thus one actor who will need to pay for the pollution, it is required to assess possible ways of the functioning of a 'polluter pays' scheme. More specifically, how the earmarked contribution can be

imposed, and on which basis. This will enable it to implicitly designate the actors who can be imposed with the earmarked contribution, who are in turn free to either pass on the environmental costs to the consumer or fully absorb the costs themselves. From the PPP's point of perspective, it does not matter whether the polluter passes on the environmental costs to another link in the chain or fully absorbs the costs. The PPP as adopted by the OECD acknowledges that these costs will often be passed on further along the chain:

> *"Although the polluter pays, as a rule he is simply the first to pay and he may often pass the cost of pollution on in his prices… In the end, the person who really pays will usually be the consumer or user."* [34]

As such, once costs are being passed on and allocated across the supply chain, there is actually merely a concept in which 'pollution is paid for' rather than a system in which only one designated 'polluter pays'. However, not every company will be able to pass on the costs to the customer equally well, given the varying market power of customers in certain market segments. This is an aspect that is taken into account for the level playing field analysis in the coming chapters.

2.5 Conclusion

Chapter 2 laid the foundation for further analysis on the potential of 'polluter pays' schemes in IWT. This chapter analysed the basics of the PPP and the market structure of IWT in order to identify the various actors in the sector as well as the complex market working. The obtained insights as regards both aspects made it possible to define the polluters in the IWT. As with all other modalities, there is actually a pollution chain in which multiple involved actors in the logistics chain are together responsible for the pollution. The inland shipping company which operates the vessel and transports goods or passengers with own and/or chartered vessel(s) on a professional basis, is the physical polluter, but not solely responsible for it. All involved actors in the chain are polluters to a certain extent. Hence, it is not possible to designate one polluter. Applying the PPP in its purest form would then mean that each responsible party needs to be charged pro rata with the cost for pollution prevention and control measures determined by the public authorities. This will simply become too difficult given the complex structure in the pollution chain(s). There should rather be a concept in which merely 'pollution is paid for' rather than 'polluter pays'.

[34] http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=OCDE/GD(92)81&docLanguage=En (p.8)

3 Possible 'polluter pays' schemes

3.1 Introduction and Approach

Building on the results from the previous chapter, Chapter 3 analyses possible schemes which serve the PPP and the basis they are built upon, hereby providing an answer to research question G2 *"What are possible schemes which serve the polluter pays principle and on which basis?"*

Existing schemes are taken as examples, it is clarified how these schemes serve the PPP and on which basis (which economic/legal/etc. instruments are used and on which basis). Next, it is analysed to what extent the existing schemes are applicable in the IWT sector for the greening objective. The objective of a potential 'polluter pays' scheme would be contributing to the greening objective rather than fully internalising the external costs arising from the emitted pollution by inland vessels. Consequently, it is been clarified that a possible deployment of a scheme and corresponding charges collected from organisations active in the overall IWT sector, should eventually flow back to the IWT sector. This is essential for the overall acceptance and therefore the effectiveness of the scheme. Thus, The IWT sector rather needs a 'greening fund' filled with contributions from the sector itself, rather than simply letting the sector pay for the pollution and not necessarily contributing effectively to the greening objective.

This analysis is mainly based on desk research, including a review on various existing instruments based on the 'polluter pays' scheme and an analysis on both the Emission Trading System (ETS) and the Renewable Energy Directive II (REDII) and how they relate to a possible instrument based on the PPP for the IWT sector.

Furthermore, an interview was conducted with SAB (Dutch national institution responsible for organising the uniform system for financing the reception and disposal of oily and greasy waste) aimed at a content-driven discussion on the CDNI protocol, how the implemented funding system for waste reception serves the PPP and on which basis.

3.2 Practical applications of the Polluter Pays Principle

The PPP can be implemented by many means, for example in the form of standards for processes and products, regulations, constraints, charges and voluntary approaches (soft law).[35] The choice for a particular instrument, to be made by public authorities, is relevant for the effectiveness of the corresponding policy. Direct regulations could be implemented to realise a relatively swift reduction of pollution; however this will be at a higher cost in cases where price mechanisms are implemented.[36]

From an economic perspective direct regulations are mostly inefficient instruments, as compared to pricing mechanisms, to reduce pollution. Imposing specified techniques to reduce pollution or specifying by which amount pollution must be reduced will eventually lead to higher overall costs. The polluter will not have the opportunity to adopt the cheapest method to reduce pollution in case specific techniques are imposed, as the polluter simply has to comply with the prescribed regulation. Moreover, pollution is reduced in a 'whatever it takes' mechanism, meaning that the

[35] https://ec.europa.eu/environment/legal/law/pdf/principles/2%20Polluter%20Pays%20Principle_revised.pdf
[36] OECD (2008), 'The Polluter Pays' Principle

costs of pollution abatement are not effectively taken into account. Furthermore, the marginal costs of further abatement will differ among the polluters, resulting in relatively higher overall costs for reducing pollution. Whereas the case could be different when the burden would be shifted in a relatively fairer way, in which polluters with relatively low marginal costs would pay more as compared to those with relatively high marginal costs for reducing pollution.[37] Thus, pricing mechanisms are in general more effective and have an overall cost advantage as compared to non-economic mechanisms. This reasoning may not apply to all possible cases, furthermore a combination of both a direct regulation and an economic instrument could provide opportunities in exploiting the benefits of both methods in the realisation of a certain objective (e.g. greening IWT). Economic instruments such as taxes/charges, targeted subsidies,[38] tradable permits and compensation mechanisms are already implemented.[39] As explained in the previous chapter, the interpretation of the PPP evolved through time and thus, not all implemented economic instruments are based on the original definition of the PPP as once defined by the OECD. The paragraphs hereafter will provide an overview of four practical applications of the PPP:

- the NOx tax in Norway;
- the CO_2 tax in Sweden;
- EU Emission Trading System;
- CDNI convention.

In addition, also an overview will be provided as regards the EU Renewable Energy Directive II (RED II) and it will be analysed what this could mean for a possible PPP based instrument for IWT.

NOx tax in Norway

Norway introduced a fiscal tax on nitrogen oxide (NOx) in 2007 in order to realise a reduction of these harmful pollutants. Initially a tax of 15NOK per kg NOx was introduced,[40] applying to:

- propulsion machinery with total installed power of more than 750 kW engines;
- boilers and turbines with a combined installed fired power of more than 10 MW;
- torches on offshore installations and facilities on land.[41].

As such, the levy puts the focus mainly on emissions from domestic operations, including major entities in the maritime, aviation and land-based operations. A ‘competent authority’ has been assigned to each of these sectors, these are:

- Norwegian Maritime Authority;
- Civil Aviation Authority;
- The Environment Directorate for onshore operations;
- The Norwegian Petroleum Directorate.

Each competent authority is responsible for determining the basis for levy calculation for the assigned sector, they can determine and verify emission factors. In addition, the competent authorities need to assist the authorities in case of technical questions. The levy is being calculated based on the actual emissions from energy production (any combustion process where thermal energy is produced) or otherwise based on source-specific emission factors and the consumed amount of energy. Actual emissions can be determined by continuous measurement or by another calculation method which results in exact emission data.

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37 OECD (2008), ‘The Polluter Pays’ Principle

38 “In general, polluters should not receive subsidies that would create significant distortions in international trade and investment, but in special cases, including transitional periods, non-distorting subsidies can be permitted.” (p.4 https://www.ejcl.org/113/article113-15.pdf)

39 Mattheiss, V. et al (2009), ‘Which role for economic instruments in the management of water resources in Europe

40 NOx tax will be NOK 22.69 per kilo in 2020 (https://www.nho.no/samarbeid/nox-fondet/the-nox-fund/news/new-rates-of-payment-from-2020/)

41 https://www.nho.no/samarbeid/nox-fondet/the-nox-fund/articles/regulations/

In case of shipping, the levy applies to vessels operating within Norwegian territorial waters and domestic traffic, regardless the vessel's nationality and activity in the area. Vessels travelling between Norwegian and foreign ports, and fishing vessels operating in distant waters are exempted from the tax though.[42]

After its introduction the tax became financially problematic for many companies and consequently the industries joined and recommended the introduction of a NOx fund as alternative solution in reducing the NOx emissions. As a result, business organisations signed the Environmental Agreement on NOx with the Norwegian Ministry of Climate and Environment. This provided companies the opportunity to not pay the tax in case they committed to reduce NOx and participate in the fund by paying a lower rate as compared to the tax. Money paid by the companies is collected in the fund which is used by the same companies for cost-effective NOx reducing measures such as investments in cleaner powertrains. If however, companies do not reach the reduction they agreed upon, the tax will be re-imposed.

In order to join the fund though, companies must develop long-term plans for reducing their NOx profile. This profile needs to include relevant cost-effective NOx reducing measures which can be taken at first instance without applying to the fund for support. Companies can apply for support for other measures that require funding to become commercially viable. Up to 80% of the investment costs can be funded. The final amount to be reimbursed is determined after the NOx reducing measure has been installed and verified by DNV GL, who at the same times provides recommendations regarding the prioritisation of greening measures, in order to ensure the most cost-effective use of the fund's resources. The fund itself does not generate profits and is managed in accordance with the full cost principle (non-profit). This means that all the financial means which the Fund receives is utilised in accordance with its purpose of reducing NOx emissions in a cost-effective manner with the exception of necessary administrative costs.

Up till now the NOx fund has been successful in reducing the NOx emissions and reaching the targets. Paying a relatively smaller amount to the fund as compared to the levy is attractive to companies and supports them in finding cost effective ways to reduce their NOx emission. This appeared to be a successful formula.[43]

CO_2 tax in Sweden

Sweden recognizes the consequences of climate change and the connected global challenges. The country choses an economic instrument to encounter climate change by letting the polluters borne the cost of pollution. This approach supports the cost-effective reduction of pollution and promotes the development and deployment of innovative clean technologies. The carbon tax was introduced in 1991 and forms together with the already existing energy tax the core of the Swedish climate policy.

The Swedish governments highlights the advantages of implementing and administering a tax as a counter measure to curb carbon emissions. A tax measure is easy to implement and administer at relatively low cost to the authorities, especially if other systems are in place which are already levying other excise taxes on fuels.

The CO_2 tax acts as a levy on all fossil fuels (biofuels are excluded) that are combusted to generate energy (electricity generation is excluded). The height of the levy is being determined in proportion to the carbon content of the fossil fuel, since it is assumed that the emissions released in burning

[42] https://www.skatteetaten.no/globalassets/bedrift-og-organisasjon/avgifter/saravgifter/nox/2019-nox.pdf
[43] https://europe.edf.org/file/375/download?token=2fsAHP74

these fossil fuels are proportional to their carbon content. This makes it superfluous to measure actual emissions, thereby simplifying the system.

When the tax was introduced the levy on CO_2 emitted through fossil fuels stood at € 24 per tonne. This gradually increased to € 114 in 2019. Currently the CO_2 tax paid for one litre fuel amounts to approximately €0.34 per litre.[44] The revenues flow into the general budget funds, since there is no 'earmarking' of tax revenues in Sweden. However, general budget funds may be used for specific purposes related to the carbon tax.

There are some exemptions to the tax, including commercial air and maritime transport. Furthermore, industries covered by the EU Emission Trading System are also excluded from the tax.[45][46]

The tax is considered as being a successful instrument in combating CO_2 emissions since its introduction in 1991. The carbon prices, being the highest in the world, stimulated the reduction of carbon emission by 25% in the period 1991 - 2016, while the economy grew by 60%.[47]

EU Emission Trading System (ETS)

The European Union's Emission Trading System (ETS) is launched in 2005, being the first trading system on a global scale. As of today, it remains the biggest ETS and accounts for over 75% of the international carbon trading. The ETS can be seen as EU's linchpin in the strive to combat climate change.[48]

The system covers industrial activities, such as power, iron and steel and the oil industry, but also aviation. Approximately 11,000 power stations and factories are covered in the 27 EU Member States and the UK, and in addition Norway, Iceland and Liechtenstein. Also, flight operators are covered by the system for journeys within the mentioned countries. ETS covers approximately 45% of the total GHG emissions in the EU.

The ETS is based on a cap-and-trade approach. In this regard, the cap puts a certain limit on the GHG emissions. This is a limit that becomes stricter over time. The trade element on the other hand, provides companies the opportunity to buy and sell emission allowances, which can be seen as the currency and as such creates a market in which demand and supply set the price. Each allowance gives the organisation the right to emit one tonne of CO_2 or the equivalent amount of nitrous oxide (N2O) and perfluorocarbons (PFC). The allowances can be used only once and have to be surrendered for every tonne of emitted CO_2 or its equivalent N2O/PFC which are emitted in the previous year. Fines are imposed in case companies are unable to match allowances to their emissions and thus, they emit too much. The fine equals to €100 per tonne CO_2. The whole process is being monitored. Companies must monitor and report their emissions each year adhered in a report which is being checked by an accredited verifier.

The allowances are allocated either free or through auctioning of which the second is the default method, meaning that companies are in increasingly need of buying their allowances via auctions. Acquiring allowances through auctioning increases over time, since the volume of free allocated allowances decreases at a faster pace than the cap on emissions. Approximately 57% of the total

[44] Tax on CO_2 for Diesel (Environmental class 1-3): https://pinedatabase.oecd.org/QueryResult_2.aspx?Key=ee95f97b-7405-4fa2-b188-7a6fb626fa3f&QryCtx=1&QryFlag=3

[45] https://www.government.se/government-policy/taxes-and-tariffs/swedens-carbon-tax/

[46] Sectors covered by the ETS: https://ec.europa.eu/clima/policies/ets_en#:~:text=The%20ETS%20covers%20installations%20performing,%2C%20pulp%2C%20paper%20and%20board.

[47] https://ourworldindata.org/carbon-pricing-popular

[48] https://ec.europa.eu/clima/policies/ets_en

allowances are auctioned in the period between 2013 and 2020, whereas the remaining part is allocated for free. Auctions are performed on a platform provided by an exchange appointed by the Member States, platforms are open to buyers from any country which is participating in the EU ETS. Most Member States use the common auctioning platform, the European Energy Exchange (EEX) in Leipzig. However, the UK, for example, appointed ICE Futures Europe in London as its sale platform.[49] At least 50% of all industry auctioning revenues and all the auctioning revenues from aviation are being used to combat climate change in Europe or elsewhere. Member States need to inform the European Commission on how the revenues are being used.

The trade element provides an incentive for companies to cut and possibly sell their allowances. Between 2013 and 2020 the cap on emissions from the industry is reduced by 1.74% each year, resulting in a cut of 21% by 2020 as compared to 2005. As regards aviation the of average amount of issued ETS in the period 2013-2020 is 5% below the average annual emission levels in 2004-2006.

Regarding free allowances, this proportion is decreasing and will reduce to 30% of all payments for the industry sector and 82% for aviation in 2020. Free allowances are distributed to the companies based on harmonised rules, which ensures equal treatment across the EU.

A correct accounting of all issued allowances is ensured by a single Union registry which is being protected with strong security measures. The registry keeps track of ownership in electronic accounts similar to bank accounts.[50]

CDNI Convention

The CDNI Convention is analysed since it is the sole scheme in the IWT sector based on the PPP and implemented across a rather wide area in Europe. It can provide some valuable lessons learned to take into account for a potential scheme meant for stimulating the energy transition in IWT.

This paragraph analyses the practicalities related to the CDNI Convention, based on expert knowledge. Furthermore, the CDNI Convention dealt with two separate chapters. Chapter 4 includes an analysis to the legal possibilities for a greening fund from a Rhine perspective related to the CDNI Convention, and Chapter 5 explains the historical process as regards the CDNI Convention and provides lessons learned which can be relevant for a possible deployment of a greening fund.

IWT is being regarded as one of the most environmentally friendly modalities. However, the generated waste during the operation on the water vessels and through their crew is of concern for river operators. Waste management is usually being regulated in a land-based context on a national level. Given the international character of IWT though, there was a need for the establishment for IWT specific rules, meant to:

- ensure a safe and separate collection and subsequent disposal of wastes arising from operating the vessel.
- requiring those causing wastes to pay the costs of collection and disposal.
- the application of uniform regulations within all signatory states of the convention in order to avoid any unfair competition.

As result, the Convention on the collection, deposit and reception of waste generated during navigation on the Rhine and other inland waterways (CDNI) was signed in 1996 by Germany,

[49] https://ec.europa.eu/clima/policies/ets/auctioning_en
[50] https://ec.europa.eu/clima/sites/clima/files/factsheet_ets_en.pdf

Belgium, France, Luxembourg, the Netherlands and Switzerland. After ratification by all stated countries, the CDNI came into force on 1-11-2009. Its bodies are seated in Strasbourg.[51]

Article 6 of the Convention lays down the financial regime on the disposal and reception of oily and greasy ship generate waste. The ship operator has to pay a disposal charge of 7.5 euros (plus VAT) per 1,000 litres of gas oil supplied, which will increase to 8.5 euros per 1000 litres in 2021. The disposal charge is allocated exclusively to finance the reception and disposal of oily and greasy waste generated from the operation of the vessel. Cargo-related waste and other types of waste are not incorporated in this disposal charge.

Each contracting state has a national institution responsible for organising the uniform system for financing the reception and disposal of oily and greasy waste.

Each vessel operator sailing on waterways falling within the scope of the CDNI has to open an ECO-account with the National Institution of its choice:

- The operator or owner of the vessel credits his ECO-account from which the disposal fees will be deducted.
- The ECO-card, which is linked to the ECO-account, enables the skipper to pay the disposal fee when refuelling (€ 8.50 / 1,000 litres of diesel [as of 1 January 2021]).

Payment of this fee gives a right of access and allows oily and greasy waste to be deposited easily at the reception stations provided for in the Convention.

There is no differentiation in charging, and this is a recurring discussion point. Back at the time it was decided upon to introduce an indirect disposal charge and hence not based on the amount of disposed waste. This was done to prevent the illegal discharge of waste. However, vessel operators who bunker relatively much fuel but discharge relatively less waste, have to pay higher amounts as compared to small vessels bunkering far less fuel. A possible compensation could be given to the first group; however no formal decision has yet been taken on this matter.

The disposal charge applies to motorised vessels bunkering on the waterways which fall within the scope of the CDNI. Recreational craft and seagoing vessels operating according to MARPOL are exempted though. Motorised vessels include all types of vessels, including floating equipment, with auxiliary and/or internal combustion engines, except for windlass motors.

The overall system is presented as unique in IWT. Certainly, there is still room for improvement as the charge does not incorporate all types of waste and all relevant waterways, and for the charging a solution must be found for ships that bunker a lot but discharge a limited amount of waste.

EU Renewable Energy Directive II

The Renewable Energy Directive 2 (REDII) of the EU is not an instrument based on the PPP as compared to the previously analysed instruments. However, it does internalise extra costs for more sustainable fuels in the prices to be paid by the consumers. It is relevant to analyse REDII since it may have an impact on a potential 'polluter pays' scheme for the IWT sector. For this reason, this paragraph dedicates an analysis to the Directive, its possible impact will be further analysed in the subsequent chapter.

The 'clean energy for all Europeans package' was adopted by the Commission in 2015. The package consists of a comprehensive set of legislation, eight acts in total which together deliver an important contribution to the EU's long-term strategy to achieve a climate neutral EU by 2050. A

[51] https://www.cdni-iwt.org/presentation-of-cdni/?lang=en

part of this package relates to renewable energy. The EU put a binding target of 32% renewable energy sources in the energy mix by 2030. The revised directive, REDII, came into force in December 2018 for this purpose.[52] Transportation is included in REDII, Member States must require fuel suppliers to supply a minimum of 14% of the energy consumed in road and rail transport by 2030 as renewable energy. IWT is not included in REDII. However, inherent to the nature of EU directives, each Member State can draft its own means to achieve the overall result as stated in the directive.

In the Netherlands, IWT is planned to be incorporated in the policy measures for achieving the REDII results and REDII is planned to be incorporated into national law by 2021. Ensuring a minimal amount of renewable energy consumed in IWT is being mentioned in both the *"Green Deal on Maritime and Inland Shipping and Ports"*[53] and the *"Climate Agreement."*[54] The Climate Agreements states that:

> *"In the run-up to zero emissions vessels, the focus will be on a blending percentage of 30% biofuels for inland shipping vessels."*

Furthermore, the Green Deal highlights that the Dutch Ministry of Infrastructure and Water Management, branch organisations BLN-Schuttevaer and CBRB, will:

> *"work actively **at European level**, including via EBU, ESO and the IWT platform, to garner support for the introduction of a mandatory biofuel blending target for inland shipping, with a gradual increase in the mandatory blending rate. The Parties will, where possible, work at international level to ensure the goals and ambitions of this Green Deal are achieved."*

Incorporating IWT in policy measures intended to achieve the REDII results should happen at a European level, especially in case a 'polluter pays' scheme for the IWT would be developed, in order to ensure a level playing field and prevent unforeseen negative market impacts. If the IWT sector would only be incorporated in REDII policy measures in the Netherlands, then this could result in relatively higher fuel prices for IWT on site. Assuming that mandatory blending of biofuels at a strictly national level would increase the average fuel prices at the pump in that country. This could in turn have an effect on the bunkering behaviour of inland vessel operators and can lead to vessel operators bunkering elsewhere, for example in Germany or Belgium.

The market effects of a possible 'polluter pays' scheme and corresponding earmarked contribution should be carefully considered beforehand. It must be prevented that a higher fuel price as result of policies implemented to achieve the REDII results, in addition to a market-optimal earmarked contribution within a 'polluter pays' scheme, would lead to unforeseen disruptive market effects. This means that the possible implementation of an earmarked contribution must already take into account a possible price increase as a result of REDII. Or alternatively, policies incorporating IWT for achieving the REDII results, should take into account the working of a possible 'polluter pays' scheme and earmarked contributions, and hence try to limit possible price-increasing effects of the REDII policies to prevent unintended market effects. It is therefore necessary in the first instance to gain insights into the possible price-increasing effects of a national and/or European mandatory biofuel blending target for IWT. The height of a possible earmarked contribution can then be determined based on this information.

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52 https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/clean-energy-all-europeans

53 https://www.klimaatakkoord.nl/documenten/publicaties/2019/06/28/national-climate-agreement-the-netherlands

54 https://www.greendeals.nl/sites/default/files/2019-11/GD230%20Green%20Deal%20on%20Maritime%20and%20Inland%20shipping%20and%20Ports.pdf

3.3 Applying the Polluter Pays Principle in IWT

Section 3.2 analysed a number of 'polluter pays' schemes currently applied in various sectors and countries across Europe. Each scheme has its own advantages and disadvantages, a possible 'polluter pays' scheme for IWT should take note of these.

The European IWT sector is a relatively small and fragmented one, for example as compared to the European aviation industry or heavy industrial sector, which are both included in the ETS. Hence, the possible deployment of an ETS like scheme for the IWT would simply be too complex and expensive to operate. The cap-and-trade approach with its trade element and stringent accounting measures are a too heavy burden for a relatively fragmented sector such as the IWT sector. Therefore, the wider application of the ETS system in sectors in Europe, as mentioned in the EU Green Deal and the related resolution by the European Parliament, is seen as unfeasible for IWT.

Furthermore, a possible scheme should stimulate the energy transition in IWT in the best possible way. The NOx fund initiative as applied in Norway is in this respect a good practice example. This is in contrast to introducing a stand-alone tax measure such as the NOx tax (NOx tax only, not the related NOx fund) in Norway and CO_2 tax in Sweden. A tax measure could be relatively easy to implement and administered at a national level, however certainly not at an European level. Furthermore, the introduction of a tax measure on its own will not stimulate the IWT sector in the transition towards becoming zero-emission in 2050. Based on experts in field, this will not provide the required financial incentive for investments in relatively expensive zero-emission technologies, moreover, it would be rather interpreted by the sector as a fine. Such stand-alone tax measures flow into the general budget over governments and only a part of the collected financial sources may be used for IWT in an indirect way.

However, the acceptance would be higher when the earmarking principle is applied. This means that funds or resources are designated for a particular purpose. In other words, similar to the NOx fund, a possible financial contribution from the IWT sector should flow to a dedicated fund and be made available for the sector. Such a fund should be used for investments in greening techniques which are necessary to realize the energy transition.

This principle of earmarking was also stated in a recent resolution of the European Parliament EU (2019/2956(RSP), the Resolution on the European Green Deal,[55] which amongst other states:

> *"Underlines that **zero-emissions waterway transport** is key to developing sustainable multimodal transport.*
>
> *Increase interconnectivity between road, rail and inland waterways leading to a genuine modal shift.*
>
> *Urges the Commission to develop a coordinated European framework of rules for inland waterways.*
>
> *Revenues from taxes or fees on transport **should be earmarked** to support the transition."*

Hence, a possible deployment of a 'polluter pays' scheme and corresponding earmarked contributions collected from organisations active in the overall IWT sector, should eventually flow back to the IWT sector. This is essential for the overall acceptance and the effectiveness of the scheme. Otherwise there is a considerable risk that the earmarked contributions are interpreted by

[55] Full text on the EP resolution from 15 January 2020: https://www.europarl.europa.eu/doceo/document/TA-9-2020-0005_EN.pdf

the IWT sector as fines for entrepreneurs, being a system, which is also not financially stimulating the energy transition and therefore will be ineffective to reach the objective. It would be very difficult to create the required supporting base for such a system. Whereas the pre-study identified a solid supporting base for any possible financial instrument as a key to the successful deployment of an instrument.

*Therefore, there should rather be a system that consists of a '**greening fund**' filled with **earmarked** '**contributions**' **from the sector** which are in turn used **for the sector**, i.e. for the energy transition in the sector.*

Based on this starting point, the following paragraphs will elaborate on the possibilities for earmarked contributions from the sector and what the possible impacts would be from both an economic and social perspective. More specifically, the forthcoming paragraphs touch upon the scope of a possible system for contributions from the sector, the calculation basis for the contributions and the evaluation criteria. It should be noted that this concept of a greening fund filled with earmarked contributions, is still fundamentally based on the PPP. The legal analysis in Chapters 4 and 5 is therefore also based on the PPP, which is the accepted terminology in a legal context, and analyses the (im)possibilities for applying this principle in IWT. This also draws conclusions for the legal (im)possibilities for applying schemes based on the PPP, such as the proposed earmarked contributions to a greening fund.

Scope, calculation basis & evaluation criteria for a scheme

Scope

As the pre-study identified, possible financial instruments such as a greening fund, should have a geographic and market scope covering the whole of Europe. This in order to ensure a proper level playing field and not to disturb competition in the internal market.

The pre-study also prescribed though, that there should be a focus on:

> *"The main IWT markets and countries in Europe, notably Rhine and Danube markets and countries which adopted the technical requirements for vessels (Directive (EU) 2016/1629)."*

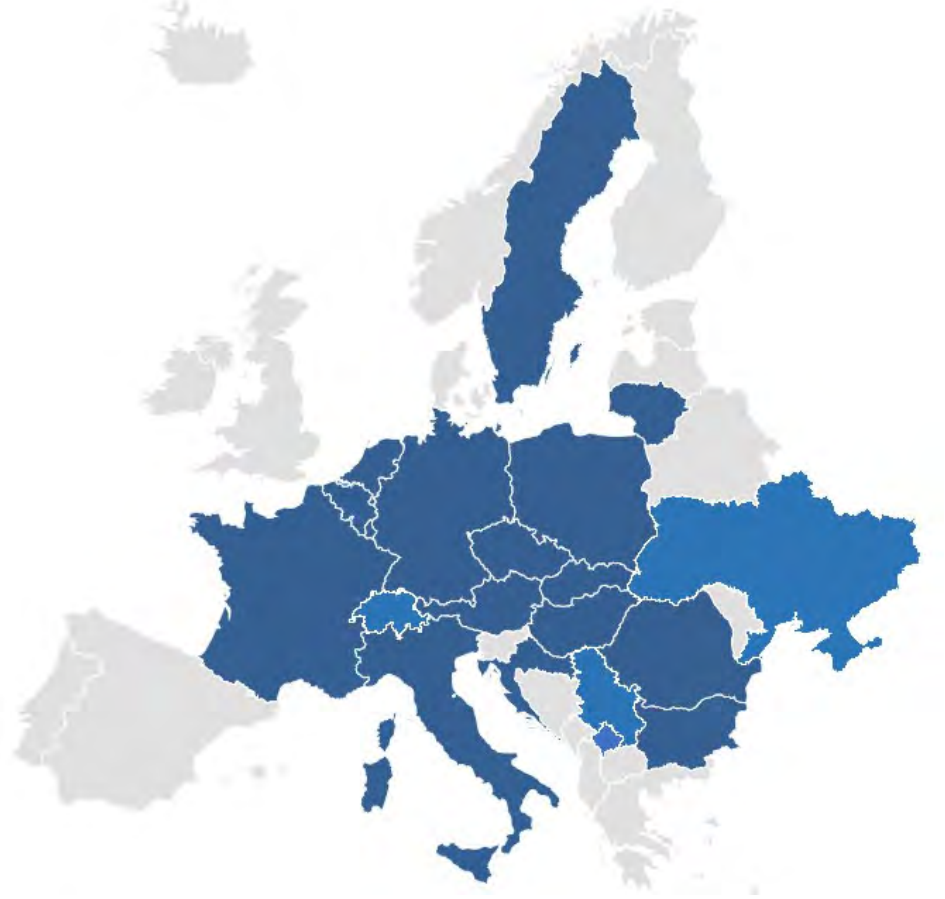
It could be indeed disproportionate and unnecessary to involve European countries in which are no inland waterways, or inland navigation is not used to a significant extent. In the EU, these are the countries that have not adopted the technical requirements for vessels as stated in Directive (EU) 2016/1629.[56] This concerns the countries: Denmark, Estonia, Ireland, Greece, Spain, Cyprus, Latvia, Malta, Portugal, Slovenia and Finland.

Moreover, as the United Kingdom decided to leave the European Union, and the inland waterways in the UK are not connected to inland waterways of the European Union, it is concluded that also the UK would fall out of the scope of a possible Greening Fund.

Figure 3.1 presents the main IWT markets and countries in Europe, including both the EU Member States that adopted the technical requirements for vessels as well as the main non-EU IWT markets where inland navigation is used to a significant extent (Switzerland, Serbia and Ukraine).

[56] Directive (EU) 2016/1629 of the European Parliament and of the Council of 14 September 2016 laying down technical requirements for inland waterway vessels, amending Directive 2009/100/EC and repealing Directive 2006/87/EC

Figure 3.1: Relevant EU and non-EU IWT countries



Note: Countries in **dark blue** are EU Member States that adopted the technical requirements for vessels EU 2016/1629. Countries in **blue** are non-EU states where IWT plays a relatively significant role.

In line with the geographic scope, the scope for the vessel types should ensure a proper level playing field but prevent a disproportionate and unnecessary involvement by including all types of vessels on the scope of possible financial instruments. The starting point for defining the scope for vessels are:

- the technical requirements for vessels (Directive EU 2016/1629);
- NRMM Stage V (Regulation EU 2016/1628)[57].

Based on expert opinions, both documents provide a comprehensive overview and the ingredients for forming a scope for the types of vessels that should be included in a possible financial instrument. The technical requirements for vessels (Directive EU 2016/1629) apply to '*craft*', defined as:

- *vessels* having a *length (L) of 20 metres or more;*
- *vessels* for which the product of length (L), breadth (B) and draught (T) is a *volume of 100 cubic metres or more;*
- *tugs* and *pushers* intended for towing or pushing either craft referred to in points (a) and (b) or floating equipment, or intended for moving such craft or floating equipment alongside;
- *passenger vessels* (carrying *>12 passengers*)[58];
- *floating equipment.*

[57] Regulation (EU) 2016/1628 of the European Parliament and of the Council of 14 September 2016 on requirements relating to gaseous and particulate pollutant emission limits and type-approval for internal combustion engines for non-road mobile machinery, amending Regulations (EU) No 1024/2012 and (EU) No 167/2013, and amending and repealing Directive 97/68/EC (Text with EEA relevance)

[58] Means a day trip or cabin vessel constructed and equipped to carry more than 12 passengers, not including recreational craft intended for sport or pleasure.

The directive does not apply to:

- ferries;
- naval vessels;
- seagoing ships, including seagoing tugs and pushers, which:
  - operate or are based on tidal waters; or
  - operate temporarily on inland waterways.

The enumeration above can be taken as starting point. For the purpose of this report all mentioned categories to which the directive applies are together referred to as **vessels**.

In addition to the technical directive, and in line with NRMM Stage V, all vessels need to have an *installed net power*, either for propulsion or auxiliary purposes, of *≥ 19 kW*. This will prevent a disproportionate and unnecessary involvement of certain type of vessels, such as floating establishments (e.g. dock, jetty, boathouse) and other floating objects as defined in the technical requirements for vessels.

Calculation basis

Next to investments in the energy transition, contributions from the sector to a greening fund should be used for the division. The contribution from the sector and the specific organisations to supply can be determined using a specific basis for the contribution.

As concluded in Chapter 2, the polluters in the IWT sector are known. But rather than designating one specific polluter and thus one actor who will need to pay for the greening, it is rather required to assess possible ways of how the contribution to the greening fund can be charged, and on which basis.

Based on stakeholder consultations and existing schemes, such as those analysed in section 3.2, 9 options are identified as the basis for a contribution from the sector itself. These options are:

1. Fixed rate contribution to be paid for each active vessel.
2. Annual contribution based on load capacity or length of vessel.
3. Contribution based on amount of transported freight or passengers on annual basis (or per tkm/pkm).
4. Contribution per kilometre travelled per vessel.
5. Contribution for new engines supplied to the market (in units and kilowatts power).
6. Contribution based on a flat rate for the bunkered amount of fuel/energy per vessel.
7. Contribution based on real-time measured emissions on board of vessels.
8. Contribution based on emissions calculated per vessel, assuming specific emission factors for the type of engine and fuel.
9. Based on the Emission Label/Energy Index of the vessel, combined with bunkered amount of fuel/energy per vessel.

The options are not compared against a single benchmark, but rather are contrasted and compared to each other. The options are evaluated based on their *effectiveness*, *fairness*, *proportionality* and *technical feasibility*.

- *Effectiveness*: A basis for the contribution should be effective in contributing to the eventual goal, i.e. fostering the energy transition in IWT and reducing the emissions caused by the vessel towards zero by 2050 in an effective way. Effective way also means addressing/influencing the actor that holds the power to make decisions to reduce emissions.
- *Fairness:* the basis should be fair and prevent a disproportionate burden, for example for vessels emitting relatively less emissions.

- *Proportionality*: the basis should be proportional and allow a practical overall system to manage the contributions and greening fund. The basis should not create a too heavy administrative burden or high overhead, or organisational costs given the sector characteristics (relatively small and fragmented) and the size of the emission problem.
- *Technical feasibility*: the basis should allow a technically feasible implementation of the contribution.

The legal (im)possibilities for a contribution from the sector to, for example, a possible greening fund is a last key element and will be analysed in the chapters. Moreover, the question to what extent the contribution can be passed on to the end-consumer will be analysed in Chapter 6. This aspect is not taken into account in the evaluation of the contribution options. Thus, the conclusions on all elements are presented in Chapter 6.

A *fixed rate contribution per each active vessel (Option 1)* by, for example, the owner or operator of the vessel could be technically feasible to implement. The reason is a corresponding system that would have to manage a quite straight forward collection of contributions. These contributions would be made by either the vessel owner or operator based on the vessel(s) they own or operate. However, the system would not be fair given the fact that there would be a flat rate which does not take into account the type of vessel and the amount of emitted emissions. The effectiveness of this contribution will also be questionable. For a start, the contribution is in no way related to the emitted emissions. Further, vessels that pollute the most will not have to contribute more as compared to vessels emitting less emissions, hence the push factor to green will be relatively small for the vessels which pollute the most.

The same reasoning also applies to the *contribution based on the load capacity and/or length of the vessel (Option 2)*. The only difference would be, that such a contribution can be related better to the emitted emissions given the assumption that relatively larger vessels (both in length and load capacity) will emit more emissions in absolute numbers as compared to small vessels.

A *contribution based on the absolute amount of transported freight or number of passengers or based on the transported freight per tonne-kilometre and passengers per kilometre* is *Option 3*. As compared to the previous two examples, this basis and the overall required system to manage it, would be relatively more complex. It therefore scores slightly worse on the criteria of proportionality. The contributing organisation could be the shipper or broker, instead of the vessel owner or operator, since the former two play a role in establishing the transport flows. This basis would also require parties to put relatively more effort in record keeping as compared to the first two options which are rather straight forward. This also applies to the organisation that would have to manage the contributions and greening fund, a contribution based on the transported amount of freight/number of passengers requires more effort in the control and monitoring of the overall contribution system.

As regards the effectiveness, the absolute amount of transported freight and number of passengers can be related relatively better to the emitted emissions as compared to the transported freight per tonne-kilometre and passengers per kilometre. Since the expression in tonne or passenger per kilometre is merely an indication for the efficiency of the transport but does not say anything about the absolute amount of emitted emissions. A large push boat could be relatively clean and efficient in the transportation of freight and hence emit less per tonne-kilometre as compared to a small vessel with an old engine. Moreover, it should also be prevented that a contribution based on respectively the amount and number of freight and passengers, as compared to tonne and persons per kilometre, will demotivate efforts to improve the efficiency per vessel.

Option 4 is the *contribution per kilometre travelled*. The reasoning as indicated with the previous basis also applies to this one. The difference, however, would be that record keeping will be easier and straighter forward.

A *contribution for new engines supplied to the market (in units and kilowatts power)* is *Option 5*. This contribution could be made by the suppliers of engines to the IWT sector, either the OEM's or distributors. The underlying idea is that the engines are the source from which the emissions arise on board the vessel, since emissions arise after combustion of the fuel in the combustion chamber of the engine. It will be a real challenge though to link this basis to the actual emitted emissions, since the engine on its own does not give a good indication of the emitted emissions, it does not take into account the amount and the actual type of fuel used. This would also not be a fair basis for the parties supplying the engines, since this option does not take the potential pollution into account but only the numbers of sold engines and the installed power per engine. Furthermore, the IWT sector is already relatively fragmented and does not have priority among OEM's and distributors of engines due to small engine sales volume. Moreover, an additional earmarked contribution on new engines could increase the financial barrier for vessel owners to invest in new engines which are less pollutant. Therefore, such a contribution can be counterproductive and could push some of the engine suppliers out of the market as well.

Option 6 is a contribution based on a *flat rate for the bunkered amount of fuel/energy per vessel* by the operator of the vessel, i.e. a certain contribution per litre of fuel supplied, depending on the fuel/energy type (this could also be electricity). This option is based on the CDNI Convention and the disposal charge. It differs slightly though from the disposal charge since it takes a certain level of differentiation into account for the different types of fuels. There should apply a lower rate for relatively clean fuels as compared to conventional diesel fuel. This basis would be relatively more effective and fairer as compared to the previous ones. The contribution is related in a better way to the emitted amount of emissions of a vessel (Tank-To-Wheel), since fuel consumption relates better to emissions as compared to the number of active vessels or their dimensions, the transported freight and passengers, travelled kilometres or engines supplied to the market. As the contribution is more directly related to the emitted emissions, there will also be a greater drive for the contributor to green and reduce those emissions.

Despite the fact of being relatively fairer as compared to the previous options, this preference still lacks the differentiation based on the emission performance of the vessel, which can make a difference of 80 - 95% between old contaminating engines and new engines on air pollutant emissions. A lesson learned from the CDNI Convention and the disposal charge is to incorporate differentiation right from the start. This did not happen with the disposal charge and is a recurring discussion point which still cannot be solved.

It would be technically feasible and also proportional to implement a system for contributions based on the bunkered fuel, similar to the disposal charge system under the CDNI Convention. The bunkered amount of fuel by each vessel is being recorded during each bunkering operation, and national institutions manage the payments made by the operators of the vessels.

Options 7 and 8 consist of a contribution by the vessel's operator based on respectively *real-time measured emissions* on board of the vessel and *calculated emissions based on specific emission factors for the type of engine and fuel* used on board of the vessel. Both options would be the fairest options in the list, since the contribution is directly related to the emissions and also depend on the specific amount of emitted emissions. This applies relatively more to the former of the two options, since measuring on board of the vessel gives much better insight into the actual emitted

emissions. As the contribution is directly related to the emitted emissions, there will be a relatively strong push factor for the contributor to invest in greening and reduce emissions.

The downside of both options is the proportionality and technical feasibility. Both options would require setting up a relatively complex system to calculate and/or measure and register the emitted emissions and manage/control the contributions based on it (controlling whether emissions are calculated correctly, measurement systems are working properly, overall required software system for this complex control and management, etc.). Furthermore, as regards the emission factors, these should be determined by a knowledge institution for both the various types of engines and fuels. This should also be updated periodically. The technical feasibility will especially be problematic for the option based on the real-time measured emissions on board. This would imply that all vessels need an emission monitoring installation on board. This requires a huge investment and is not always possible from a technical point of view. This was also concluded in the H2020 PROMINENT project and the COBALD Green Deal in The Netherlands.[59] Existing emission measurement installations are not able to continuously measure all emission types, as identified in NRMM Stage V. The latter concerns particulate matter (PM) and the particulate number (PN), while a reliable continuous measurement of NOx is rather feasible. Furthermore, not all vessels do have a certified fuel flow meter on board which is required to express the measured emissions in a good way. It is in some cases also difficult from a practical point of view to lay the necessary wiring for the measurement installation.

The last option, *Option 9*, is a contribution by the vessel operator based on *the Emission Label/Energy Index of a vessel, combined* with option six. This means a differentiated *rate for the bunkered amount of fuel/energy per vessel, based on the Emission Label/Energy Index of the vessel*. As compared to option six, this option scores better in terms of effectiveness and fairness, since it can be related in a better way to the actual emitted emissions and given the fact that there is differentiation in place. The downside, however, would be that it requires a European wide Emission Label/Energy Index in place and the overall system to manage this would be relatively more complex. The Dutch and German national authorities are currently working on respectively an Emission Label and Energy Index for inland vessels. The Emission Label will indicate the emission performance of vessels both in terms of pollutant and climate emissions-based om periodic measurements on board. The Energy Index is meant to indicate the energy performance of a vessel both based on its design and on its operations. Hence, the Emission Label and Energy Index are complementary to each other and could be combined for a possible implementation at European level. It will be assumed that such an Emission/Energy label or index will eventually be introduced for the IWT, regardless of whether or not there will be a greening fund. The reason is that also banks, ports and shippers ask for such a label system. The development of the Emission Label is part of the Dutch Green Deal.

The assessment of the nine options which could form the basis for a contribution from the sector to a greening fund, is summarised in the Table 3.1. The scores on the criteria are based on interviews, desk research, expert judgements by EICB and ECORYS and are based on the Steering Group[60] meeting which took place on 27 January 2020. At this Steering Group meeting a short list was developed of the options to be further explored.

[59] https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/rapporten/2019/02/15/eindrapport-green-deal-cobald/eindrapport-green-deal-cobald.pdf

[60] The Steering Group includes representatives from: EBU, ESO, ESC, IWT Platform, Dutch Ministry of Infrastructure and Water management

Table 3.1: Assessment of contribution options

Options for contribution basis	Effective	Fair	Proportional	Technical feasibility	Conclusion
Option 1 Fixed rate contribution for each active vessel.	– – –	– – –	+	+ + +	Not acceptable
Option 2 Contribution based on load capacity/length	– –	– –	+	+ + +	Not acceptable
Option 3 Contribution based on amount/number of transported freight/passengers (or per tkm/pkm).	–	–	+/–	+	Not acceptable
Option 4 Contribution per kilometre travelled	– –	– –	+/–	+	Not acceptable
Option 5 Contribution for new engines supplied to the market	– –	– –	+/–	+	Not acceptable
Option 6 Contribution based on a flat rate for the bunkered amount of fuel/energy	+	–	+	+ +	Selected for short list
Option 7 Contribution based on real-time measured emissions on board of vessels	+ + +	+ + +	– –	– – –	Selected for short list
Option 8 Contribution based on emissions calculated	+ +	+ +	–	–	Selected for short list
Option 9 Contribution based on the emission Label/Energy Index combined with the bunkered amount of fuel/energy per vessel	+ +	+ +	+	+	Selected for short list

The assessment above indicates that the first five options are not acceptable due to a lack of fairness and effectiveness. The Options 6, 7, 8 and 9 in the list are seen as effective and fair in the path towards reaching the goal, i.e. realising the energy transition in the European IWT sector. However, option 8 and especially 7 have a concern about the technical feasibility and might not be a feasible option for the short term. Concerning option 7 this could change in the near future if sensors and measuring devices further develop and become cheaper.

Given the last four options for a contribution, option nine would be the most feasible option, which stands for a contribution to a greening fund by each vessel operator based on the mission Label/Energy Index combined with the bunkered amount of fuel/energy per vessel. It will be slightly less fair and perhaps less effective as compared to option seven (continuous emission measurements on board), however it is more feasible both in terms of proportionality and technical feasibility. It is being assumed that an Emission/Energy label or index will eventually be introduced for the IWT sector, regardless of whether or not there will be a greening fund. Moreover, such a Label or Index may also be flexible to take into account technological developments in the field of sensors, measuring devices and data.

3.4 Conclusion

Chapter 3 analysed the possibilities as regards 'polluter pays' schemes in view of the objective to realise the energy transition in the European IWT sector. First, existing practical applications of 'polluter pays' schemes were investigated to filter out aspects from which lessons can be learned for a possible application of a 'polluter pays' scheme in IWT. Four existing practical applications were analysed, these are:

- the NOx tax in Norway;
- the CO_2 tax in Sweden;
- EU Emission Trading System;
- CDNI convention.

Furthermore, it is analysed what the effect could be of incorporating IWT in REDII. Policies implemented to achieve the REDII results, and incorporating IWT, in addition to a market-optimal 'polluter pays' scheme for IWT, would lead to unforeseen disruptive market effects. This means that the possible implementation of a 'polluter pays' scheme must already take into account a possible price increase as a result of REDII.

Overall, the four practical existing applications of the 'polluter pays' schemes have their own set of advantages and disadvantages and a possible scheme for IWT should take note of these. A possible 'polluter pays' scheme should stimulate the energy transition in IWT in the best possible way. The NOx fund is in this respect a good example, in contrast to introducing a stand-alone tax measure such as the NOx tax (NOx tax only, not including the NOx fund) in Norway and CO_2 tax in Sweden. A possible contribution from the sector should flow back to the sector, and this should be used for investments in greening techniques that are necessary to realize the energy transition. Stand-alone tax measures, however, flow into general budget funds and only a part of the collected financial sources may be used for IWT in an indirect way. Stand-alone tax measures lack the acceptance by the industry and are not in-line with most recent policy developments (EU Green Deal).

Hence, earmarking shall be applied. A possible deployment of a 'polluter pays' scheme and corresponding earmarked contributions collected from organisations active in the overall IWT sector, should therefore eventually flow back to the IWT sector. Otherwise there is a risk that the earmarked contributions will be interpreted as fines by the IWT sector, being a system, which is also not financially stimulating the energy transition and therefore misses the objective and will lack acceptancy by the industry.

*Therefore, there should rather be a system that consists of a '**greening fund**' filled with **earmarked** '**contributions**' **from the sector** which are in turn used **for the sector**, i.e. for the energy transition in the sector.*

It should be noted that the concept of a greening fund filled with earmarked contributions, is still fundamentally based on the PPP. Based on this conclusion, the possible implementation of a greening fund and earmarked contributions from the sector are analysed. The scope is identified and nine options for a contribution are analysed based on four evaluation criteria, these are effectiveness, fairness, proportionality and technical feasibility. The possibilities from a legal perspective are included in chapters 4 and 5.

The assessment of the nine options for a contribution to a fund is summarised in Table 3.1. The last four options would be effective and fair in the path towards reaching the goal, i.e. realising the energy transition in the European IWT sector. Out of these options, option nine would be the most feasible option, which stands for a contribution to a greening fund by each vessel operator based on the emission Label/Energy Index combined with the bunkered amount of fuel/energy per vessel.

Two important concerns were raised though during interviews with stakeholders as regards a possible contribution from the sector to a greening fund. Vessel owners who already invested in greening are afraid for a deterioration of their relative competitiveness, since due to a greening fund even those companies who would not be able to invest in greening will get the opportunity to do so with support from the greening fund. It is stressed that front runners should not face unequal competition from IWT operators that have their technology subsidized.

A second concern relates to the efficiency. Some vessel operators highlight the importance of the operational efficiency and optimal utilisation of vessels which result in low emission per tonne-kilometre. Although this is not a measure for the absolute amount of emitted emissions, it is felt that it should be taken into account. Otherwise, it could demotivate efforts to improve the operational efficiency per vessel and hence eventually the overall emitted emissions.

However, such efficiency measures are taken into account already by other schemes and instruments, such as the GLEC[61] framework for CO_2 calculations in transport (in grams per tonne-kilometre), which is more and more applied by shippers in view of their Corporate Social Responsibility.

[61] https://www.smartfreightcentre.org/en/how-to-implement-glec-framework/

4 The possibilities of a 'polluter pays' scheme from a legal perspective

4.1 Introduction and approach

The legal IWT framework is complex as it consists, not only of national legal regimes, which may hamper the introduction of a potential 'polluter pays' scheme, but also of international regimes, such as European legislation and river basin specific legislation. On a European level, the IWT sector is amongst others subject to Treaty of the Functioning of the European Union (TFEU) and IWT-related specific legislation, while on an international level, the sector can be subject to the rules laid down in the Mannheim Act, the Belgrade Convention, Sava Convention and the Moselle Convention. For each of those regimes, it is necessary to assess whether a sectoral contribution (e.g. a tax or charge) based on the PPP could be introduced.

The current analysis focuses on the possibility to introduce a sectoral contribution based on the polluter pays principle. To introduce such a contribution an assessment is needed whether a contribution, often based on the fact of navigation, is legally possible under each legal act. It should be noted that many of the applicable legal acts do allow for port charges and charges for using the port infrastructure. However, these provisions do not form the legal basis to base a PPP on. As a result, such port dues and port infrastructure related charges are not included in the scope of the analysis.

4.2 A 'polluter pays' scheme from an EU perspective

Under EU law it is possible to have someone paying for (potential) pollution caused. The overarching PPP is laid down in Article 191(2) TFEU. The article states that the Union shall adopt policy aiming to protect the environment. In doing so, the Union has to consider several principles. Amongst those principles, is the principle that the polluter should pay for the damage done to the environment. How this should be established and what the PPP entails is not laid down in Article 191 TFEU. This means that the details of the PPP need to be elaborated and specified in additional legislation.

Once the EU wishes to apply the PPP to a certain sector and/or activity, so-called secondary legislation needs to be adopted. In this secondary legislation, the principle of the polluter pays, is further detailed as well as the scope thereof. Examples of legislation further detailing the general principle of the polluter pays are Article 9(1) of the Water Framework Directive[62] and Article 15 of the Packaging Directive.[63] These examples refer to structural 'polluter pays' schemes, which means that the payments need to be made on a regular basis. An example based on article 15 of the Packaging Directive is the deposit on plastic bottles.

Next to these structural schemes, the EU has also adopted a PPP for incidents (reactive polluter pays).[64] Once an incident occurs and environmental damage is caused, the one responsible for the incident needs to pay damages (for more details please refer to box 4.1).

[62] Directive 2000/60/EC establishing a framework for Community action in the field of water policy

[63] Directive 94/62/EC on packaging and packaging waste

[64] Two PPP's can be distinguished. On the on hand, the reactive PPP, which refers to damages paid by the polluter once an accident is caused. On the other hand, the preventive PPP, which refers to payments made to avoid (further) environmental damage.

Box 4.1 The polluter pays principle under Directive 2004/35/CE

Directive 2004/35/CE[65] introduces environmental liability for certain activities. Based on Article 3(1) in connection to Annex III.8 inland vessels transporting dangerous or polluting goods could fall under the scope of the Directive. In case of an accident, the operator is obliged to take all necessary measures to prevent further damage. Under certain circumstances, the operator should repay the damage caused. Although the Directive introduces the polluter pays principle in more detail, it is not a basis for the current study, as the principle is applied to incidents (e.g. accidental oil spills) and not to structural damages caused (e.g. constant emission of CO_2).

At this moment, no directives have been adopted which lay down the PPP (in a structural way) for the IWT sector. In case, one wishes to introduce a sectoral contribution based on the PPP for the IWT sector, although only the overarching principle of Article 191 TFEU is currently available. As indicated earlier, this principle does not contain any details on how this principle would work and what it would entail.

Despite the fact that the PPP is currently not applied to the inland shipping sector, the Commission had the intention to do so in time. As part of the 2011 White paper of Transport,[66] the introduction of a PPP was mentioned as one of the ten goals. More concretely, the White paper formulates this intention as follows: *'Move towards full application of 'user pays' and 'polluter pays' principles and private sector engagement to eliminate distortions, including harmful subsidies, generate revenues and ensure financing for future transport investments.'* Whether the Commission still has the intention to introduce a charge is unclear, as in the newly adopted Communication,[67] the PPP in relation to inland navigation is not explicitly mentioned.

Although there is currently no EU legislation introducing the PPP for the IWT sector, it is possible for individual Member States to adopt such a principle in their national legislation. In case a Member State wishes to adopt a national 'polluter pays' scheme, that Member State needs to ensure that the scheme is non-discriminatory,[68] meaning that the scheme applies to similar subjects in a similar way. More concretely, Member State's nationals should not be treated more favourably than other EU-nationals. Therefore, it would not be possible to ask higher dues from vessels registered in other EU countries compared to vessels of the Member State introducing the scheme.

Based on a short survey conducted for this study, several Member States indeed adopted one or more schemes, which are based on the PPP. In, for instance, Austria, Germany and Hungary schemes are in place which charge for the use of the public roads. This user charge in Austria and Germany is used to maintain the infrastructure network, while in Hungary the money becomes part of the general budget. In the Netherlands road charging is under discussion, but until this moment no scheme is operational. In Bulgaria and Sweden charges for the IWT sector are in place. In Bulgaria the charge relates to waste collected. In Sweden fairway dues need to be paid. The money collected is used for fairway maintenance. Both Italy and Croatia responded that currently no charges based on the PPP are in place. However, under national law it is possible to introduce a charge based on the principle. Only Slovakia indicated that based on national law charging based on PPP is prohibited.

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65 Directive 2004/35/CE of the European Parliament and the Council of 21 April 2004 on the environmental liability with regard to the prevention and remedying of environmental damage.

66 COM(2011) 144 final

67 European Parliament, P8_TA-PROV(2019)0186, 'A Europe that protects: Clean air for all'

68 See art. 37(1) TFEU

4.3 A 'polluter pays' scheme from a Rhine perspective

4.3.1 The Mannheim Act

The Central Commission for the Rhine Navigation (CCNR) consists of five Signatory States: Belgium, France, Germany, the Netherlands and Switzerland. For these countries, the CCNR can enact binding rules for navigation on the Rhine and waterways connected to it. Main act of the CCNR is the Mannheim Act, which regulates navigation on the Rhine and its tributaries.[69] The Mannheim Act itself forms the fundament of free navigation on the Rhine River (see Article 1). Historically, all ships operating on the Rhine and being registered in one of the Signatory States fell within the scope of the Convention and therefore could benefit from the rights granted by it. Since the adaptation of Regulation 2919/85,[70] the freedom of navigation on the Rhine also applies to ships registered in any of the other EU Member States.

Possibilities for introducing a sector contribution

Article 3 of the Mannheim Act explicitly prohibits Signatory States to impose any kind of rights[71] based directly on the fact of navigation.[72] This implies that States cannot charge the inland shipping sector for activities directly connecting to shipping as such. The Act only allows for two exceptions:

1. Signatory States can impose *non-shipping related duties*. For instance, applying VAT to goods transported is permitted under Article 3 of the Mannheim Act.
2. Signatory States can require a *retribution* – charge a fee for services provided, e.g. port related services.

The introduction of any other right is prohibited under the conditions set out in the Mannheim Act, as often imposing rights would be contrary to the freedom of navigation. Under the Convention, it is difficult to find a legal basis for introducing sectoral financial contributions to a potential greening fund.

A sectoral contribution as retribution?

One of the options to introduce the sectoral contribution could be the retribution, an instrument allowed under Article 3 of the Mannheim Act. A retribution is a specific payment made by an economic actor (either individual person or company) for a specific service provided by the government (which can be a local or national government). The conditions for the payment and service need to be laid down in national or international law. The service provided cannot lead to profits on the side of the government. As a result, the benefits of the system cannot exceed the costs. The payment is merely meant to cover the 'production' costs. A well-known example, inside the IWT sector, is the charge paid by ship operators to hand in their oily and greasy waste, based on the CDNI-Convention. The costs that need to be paid only cover the production costs (i.e. the system of bilge boats that collect the waste). The national authority involved do not earn any profit.

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69 Mannheim Act of 17 October 1868 – latest revision 1 November 2011

70 Council Regulation (EEC) No 2919/85 of 17 October 1985 laying down the conditions for access to the arrangements under the Revised Convention for the navigation of the Rhine relating to vessels belonging to the Rhine Navigation.

71 The website of the CCNR states the following: *'In application of Article 3 of the Mannheim Convention, the Member States must refrain from imposing any toll, tax, duty or charge based directly on the fact of navigation*.' https://www.ccr-zkr.org/11020100-en.html.

72 Article 3 states that no dues, fees or charges will be required from vessels merely passing. As a result, navigational activities themselves remain free of charge. In addition, Article 3 also indicates that no buoy and beacon fees can be asked upstream from Rotterdam and Dordrecht. Based on Article 30 it is also prohibited to require any compensation for opening or closing any of the bridges along the Rhine River

Based on the strict definition of the retribution, the currently discussed sector contribution – a contribution to a greening fund, with a fund payment and greening advice in return - does not seem to fall easily within the scope of this instrument. Especially, as it is difficult to indicate whether the service provided is really a service (similar to the bilge boat system for the CDNI-charge). It is questionable whether a fund payment for which the ship operator has to pay is indeed a service. The fact that greening advice is provided as well, is probably not enough to qualify the package as a service. As a service seems to be lacking, it is difficult to qualify the contribution as a retribution. A solution would be that the Signatory States jointly[73] decide that the combination of a payment and advice is indeed a service and as a result the system could be seen as a retribution. In this case, the contribution would not be in conflict with the Mannheim Act.

If the Signatory States would decide that the combination does not qualify as a service and therefore the system could not be seen as a retribution, they could still adopt international legislation in which the system, including the contribution is laid down. In this case, a derogation to Article 3 of the Mannheim Act needs to be negotiated.

Although currently the legal basis for introducing the initiative is missing, the greening efforts are on the CCNR agenda. In the Mannheim Declaration of October 2018, the CCNR stressed the importance of improving the ecological sustainability of the sector. The CCNR pointed to the need for new financial instruments to achieve these environmental objectives. The reference made to financial instruments is broad and refers to many instruments ranging from bank loans, subsidies, governmental funding to sector contributions. The Declaration is meant to start the discussion on potential new financial instruments.[74] No decision has been made yet on how to go further.

Amending the Mannheim Act itself, to allow for the collection of environmental rights, is not seen as an option at this moment. Nevertheless, the Mannheim Act is meant to be a living text, evolving over time. Therefore, an interpretative resolution of the Mannheim Act could always be envisaged. Another option would be to draft a new international agreement dealing with the payment scheme. Such an instrument would then have the same level as the Mannheim Act, which would make the question of compatibility easier. However, also under a new convention it would still be difficult to introduce a any form of right. One should keep in mind that indirect financing of a goal, for example protection of the environment, is possible. Direct financing of shipping is never possible under the Mannheim Act.

The Mannheim act in relation to EU law

In case the European Commission would initiate a new regulation or directive introducing a sector contribution and greening fund, it needs to be assessed whether this will apply to the Rhine and its connected waterways as well. In case, the new legislative act regulates issues that also fall under the scope of the Mannheim Act, the new EU law can only be introduced on the Rhine, when the CCNR agrees with this. In such a case, all Signatory States, including Switzerland, need to agree. Only then, rules will apply to the entire Rhine.

[73] This entail the Belgium, France, Germany, the Netherlands and Switzerland all agree on this.

[74] The launch of a CCNR study on “The financing of the energy transition for a zero emission European inland navigation sector” is a first step towards the implementation of this declaration and also aims at addressing what these” new financial instruments” could be.

4.3.2 *The CDNI Convention on the collection of waste*

The only, current, example of a 'polluter pays' scheme introduced on the Rhine river, can be found in the CDNI Convention on the disposal of ship-generated waste, also touched upon in section 3.2.[75] The CDNI Convention applies to all navigable waterways in Germany, Belgium and the Netherlands, the Moselle in Luxembourg, parts of the Rhine in Switzerland[76] and parts of the French waterways.[77] Ships operating within the geographical scope of the CDNI Convention must pay a disposal charge when bunkering. In return, the charge is used to pay for the waste disposal system introduced to collect oily and greasy waste. The payment removes the incentive to dump oily and grease waste illegally.

The Convention includes three types of waste, each with its own disposal and payment regime. Waste categories included are: (i) oily and greasy ship waste, (ii) cargo related waste and (iii) all other ship waste, including household waste and batteries. For the current study question, the first category is the most relevant.[78] According to Article 1(c) oily and greasy waste includes *'waste and wastewater generated on board as a result of the operation and maintenance of the vessel; this includes oily and greasy waste and other waste generated from the operation of the vessel.'* Bilge water refers to all oily water from the engine room bilges, the peak, the cofferdams and wing voids (Article 1(d)).

Article 6 of the CDNI Convention lays down the financial regime in place for the disposal and reception of oily and greasy ship generated waste. The article states that the ship operator is obliged to pay a disposal charge in order to ensure reception of the generated waste. The obligation only applies to vessel operator using gas oil (including GTL), so inland ships using other means of combustion do not have to contribute. The CDNI disposal charge is a fee for services rendered; it finances the deposit and collection of oily and greasy waste (Article 6 CDNI).[79] The CDNI charge is by no means a tax as it aims only at financing the collection and disposal system. It can be seen as a retribution, which is allowed under Article 3 of the Mannheim Act. Therefore, the charge is compatible with the legal regime on the Rhine.

One of the guiding principles for collecting the disposal charge is that the total amount collected shall not exceed the costs made for having a collection system. In the past, more money was collected than the costs of the system to anticipate the possible cost increase of the system. However, the additional payments were saved and when the cost of the system went up, the savings were used to pay for the additional costs.[80] In 2018,[81] for the first time, costs (collection and reception) exceeded revenues (disposal charge), subsequently negotiations were started in strong cooperation with the sector. Ultimately it was decided to increase the disposal charge from € 7.50 to € 8.50 per 1,000 litres.[82] Modification of Article 3.03 of the Regulation is required.

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75 Convention on the collection, deposit and reception of waste generated during navigation on the Rhine and other inland waterway – 9 September 1996 (CDNI-Convention)

76 The Rhine between Basel and Rheinfelden.

77 Please refer to Annex II of the Convention of the precise geographical coverage.

78 In addition, only for the first category an explicit payment obligation is laid down in the Convention. For the other two categories, no explicit payment is foreseen as the waste collection needs to be laid down in contractual agreements between the ship operator and shipper (for cargo related waste) ad between the ship operator and the waste collector (for household waste).

79 The money collected is not used to finance the authorities involved in the waste collection. These costs are borne by the national governments.

80 Between 2011 and 2017, there was a substantial overage: the revenues (disposal charge) were higher than the costs (the profession did not request to reduce the price). This overage was reallocated each year to the National Institutes (agencies in charge of the organisation of the collect and in which the profession is involved) – but this overage was not used for other purposes, because of the principle of the disposal charge. So the money remains under control of the profession, but in a certain strict framework. See annual report https://www.cdni-iwt.org/wp-content/uploads/2020/01/Rapport-IIPC-RE-2019_nl.pdf

81 https://www.cdni-iwt.org/taetigkeitsbilanze/?lang=nl

82 If the official resolution is taken in July 2020 by the supreme body – Conference of Contracting Parties – the higher charge would apply from 1 January 2021 onwards.

4.4 A 'polluter pays' scheme from a Danube perspective

4.4.1 The Convention regarding the regime of navigation on the Danube

The main convention on the Danube River is the 'Convention regarding the regime of navigation on the Danube'[83] or the Belgrade Convention for short. To this Convention, eleven countries are a Member.[84] The Commission is, contrary to the CCNR, not able to issue any binding rules (and therefore cannot adopt legislation on environmental performance). The Danube Commission is only able to provide guidance and stimulate changes/initiatives. Nevertheless, for this guidance to become binding, the Danube Commission depends on the willingness of the eleven members to implement the guidance into national laws.[85]

Article 1 of the Convention states that '*Navigation on the Danube shall be free and open for nationals, vessels of commerce and goods of all States, on a footing of equality in regard to port and navigation charges and conditions for merchant shipping'* (Article 1). This article means that navigating the river, is open to all registered in one of the Signatory States. This viewpoint is repeated in Article 42, which explicitly states that *'no charges shall be levied on vessels, rafts, passengers and goods in respect merely of transit'*. This means that merely the navigation activity itself should be, in principle, free of any charge.

The only exception is provided by Article 35 of the Belgrade Convention, which provides Danube countries, with the Danube Commission's agreement, to set fees for navigation in order to ensure safe navigation. This means that when the charge aims to improve navigational conditions, it could be introduced. The money collected should be used to implement measures aimed at increasing navigational safety. In other words, the money is earmarked. Until today, no such charge is introduced.

Possibilities for introducing a sector contribution

Based on the current text of the Belgrade Convention, it is not possible to introduce a sectoral contribution based on the PPP, as such a contribution conflicts with Article 1. Nevertheless, it should be noted that the Belgrade Convention is a relatively old convention, which was drafted in 1948. Since then, the world changed considerably. Although some levies / taxes have been included within the scope of the Convention, no proposals for additional levies have been made so far. Since the signing of the Convention, the Convention was never amended or revised. Therefore, it is hard to say whether new levies / taxes can or cannot be introduced under the Convention. In case the eleven Signatory States to the Convention would agree on the introduction of a new levy, it is probably possible to introduce it.

In addition, it should be mentioned that the Belgrade Convention does not include environmental purposes in its scope. Therefore, the Convention currently cannot be used as a legal basis for introducing a PPP. Nevertheless, if another body, for instance the EU, introduces environmental legislation and would include a sectoral contribution in it, the new legislation would probably not conflict with the scope of the Belgrade Convention.

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[83] Convention regarding the regime of navigation on the Danube – signed at Belgrade on 18 August 1948 – unofficial version

[84] Members of the Danube Commission are Austria, Hungary, Slovakia, Croatia, Serbia, Ukraine, Bulgaria, Romania, Russia, Moldova and Germany.

[85] In the Convention regarding the regime of navigation on the Danube – the Convention that established the Danube Commission – no reference is made to the ability of the Commission to issue legislation.

The Belgrade Convention in relation to EU law

Although EU environmental law would not conflict with the Belgrade Convention, the EU law would not apply to the entire Danube as only seven of the eleven Signatory States are EU Member States. Any new EU legislation would apply in those countries, but it would not directly apply to the remaining four. Serbia is currently in the process of becoming an EU Member State and as part of that, the country is obliged to implement new EU law. Therefore, it is likely that an EU initiative will apply to Serbia as well.

The Danube Commission is not in a position to oblige the non-EU Member States to adopt the EU legislation as well. The Danube Commission does not have the regulatory power needed. The Commission can only issue recommendations. In such a recommendation the Commission could advise the non-EU Members to follow the EU rules and adopt them as well. Nevertheless, if those countries do not wish to follow, this has to be accepted. The Danube Commission cannot force them to accept.

4.4.2 *The Danube river protection convention*

A second convention applicable in the Danube region is the Danube river protection convention.[86] This Convention was adopted on 22 October 1998 and aims to *'achieve the goals of a sustainable and equitable water management, including the conservation, improvement and the rational use of surface waters and ground water in the Danube catchment area'* (Article 2(1)). One of the instruments used to reach this aim, is the introduction of the polluter pays principle (Article 2(4)). Although the principle is mentioned in the convention, the principle is not further detailed, and it is up to the individual Danube riparian States to further detail this principle.

As highlighted by Article 3(3), the Convention applies to inland navigation as far as problems of water protection are caused by the activities. This implies that only a specific set of activities resulting from inland navigation do fall under the scope of the convention. More concretely, mainly activities that could lead to water pollution fall within the scope of the Convention. Therefore, activities such as oil spills are part of the scope of the Convention, while emissions into the air do not.

In Article 3(2) of the Convention, certain activities are mentioned that do fall under the scope. For inland shipping the most relevant one, is the one mentioned under Article 3(2)(a), the discharge of wastewater. This means that the IWT sector can be held responsible once discharging their wastewater into the river. For this, the PPP could be used. However, to fully apply, action at national level is still required as in national law the actual conditions on the operationalisation of the PPP need to be laid down.

4.5 A 'polluter pays' scheme from a Sava perspective

The Sava Commission,[87] established by the Framework Agreement on the Sava River Basin (FASRB), governs navigation on the Sava River.[88] Aim of the Agreement, among others, is the establishment of an international regime of navigation on the Sava River and its navigable tributaries (Article 2 (1)(a)). Article 10(1) states that navigation is open to merchant ships of any state. Those ships are also entitled to enter the ports along the river. Further details of navigation on the river are laid down in a separate Protocol (Article 10(6)).

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86 Convention on Cooperation for the Protection and Sustainable use of the Danube River.

87 Members of the Sava Commission are Bosnia, Croatia, Slovenia and Serbia.

88 The Framework Agreement entered into force on 29 December 2004.

Article 3 of the Protocol on the Navigation Regime[89] states that vessels are treated equally with respect to the activities mentioned in that same article. Contrary to the Rhine and Danube, the Protocol of the Sava allows for payments for navigation. Article 3(a) indicates that all vessels have an equal status in *'payment of navigation and port fees, services and taxes.'* This view is further strengthened by Article 10(1) of the Protocol which read *'The Sava Commission is authorized to make decisions on collecting fees for the use of the fairway on the rivers referred to in Article 1 of this Protocol as well as on the amounts and the manner of collecting such fees.'* This implies that vessels operating on the Sava River and its tributaries could be asked to pay a fee or toll. Although a fee could be asked, the fee collected cannot be used freely. Article 10(b) of the Protocol states that the fees cannot serve as profit as they need to be spent on activities mentioned in Article 10(4) of the FASRB. The latter article indicates that the fees collected need to be spent on measures to maintain the waterway or measures to improve conditions of navigation. In other words, the funds collected are earmarked.

Possibilities for introducing a sector contribution

The above, shows that charging vessels for navigation on the Sava River is allowed under the current legal framework. Although Article 10 of the Protocol does allow for the collection of fees, such fees cannot be used for environmental purposes. As the purposes for which a fee can be requested are laid down clearly in Article 10(4) and environment is not one of them. Therefore, Article 10 of the Protocol could not be the legal basis for the 'polluter pays' scheme currently considered.

The only current option would be to base environmental fees on the Protocol on prevention of water pollution caused by navigational activities.[90] This protocol introduces the polluter pays principle (Article 3) and would allow for the introduction of an environmental toll / levy. Although Article 3 allows for the introduction of a PPP on waste or greasy water, the article does not allow to tax air pollution. Only pollution linked to water can be charged.

The FASRB in relation to EU law

In case the initiative to introduce a PPP for IWT would come from the European Commission, the new law would not automatically apply to all Sava countries. Croatia and Slovenia are members of the EU and therefore the law would apply to them. Bosnia and Serbia are both in the process to become a Member (Serbia is more advanced than Bosnia), however, it is up to their national governments whether they would implement the EU law or not.

The Sava Commission is able to set binding rules and therefore could adopt legislation which would introduce a PPP. In such a case, the legislation would apply to all countries along the Sava. This could either be EU law (such as the Directive on professional qualifications) or entirely new law. Nevertheless, the law must be supported by the four Signatory Members, otherwise the law could not be adopted. Currently, it seems there is no support for a new fee.

89 Protocol on the Navigation Regime to the Framework Agreement on the Sava River Basin

90 Protocol on the Prevention of the Water Pollution caused by Navigation to the Framework Agreement on the Sava River Basin

4.6 A ‘polluter pays’ scheme from a Moselle perspective

The Moselle Convention[91] was established in 1956 between France, the Federal Republic of Germany and the Grand Duchy of Luxembourg on the channelling of the Moselle. This Convention forms the legal basis of the Moselle Commission, which aims at promoting the interest of shipping as well to ensure safe and efficient navigation on the Moselle. It should be noted that the Moselle Convention does not apply to the entire Moselle, as the French part from Metz is subject to French law only. This might lead to challenges in case new legislation would be adopted.

As the Moselle is a tributary of the Rhine, the Contracting States of the Moselle wished to align the two legal regimes. Therefore, the applicable regimes on the Rhine and Moselle are, in essence, highly similar and no substantial differences occur. However, it should be noted that the Moselle Convention refers to the Mannheim Act version 1956 (Article 32). This means that changes made since 1956 do not automatically apply to Moselle, except when decided otherwise.

According to the Article 29 of the Moselle Convention, the navigation of the Moselle shall be free to vessels of all nations for the towing and transport of goods and persons. This article is similar to Article 1 of the Mannheim Act, which states that the navigation of the Rhine and its estuaries shall be free to the vessels of all nations. One major difference between the Mannheim Act and the Moselle Convention is that the Moselle Convention clearly allows for the collection of tolls (Articles 22 to 27). Article 22 of the Moselle Convention, for instance, regulates the price of the tolls by setting out the details of the principle according to which toll rates between Thionville and Koblenz (per tonne/kilometre and for passenger traffic) shall align on the rates on the Main and Neckar. The tolls are used to finance the investments made to build and maintain the needed infrastructure, such as locks and bridges.

Possibilities for introducing a sector contribution

The Moselle Commission cannot introduce any form of rights themselves. The Moselle Convention does not provide the Commission with the competence to do so. The initiative to introduce any form of rights on the Moselle needs to stem from the three Contracting States. Jointly they need to decide to introduce a new right. They have to discuss the right among themselves and once they agree, they can put the proposal to the Moselle Commission. If all agree, the new right could become part of the legal framework.

Currently it seems unlikely that the Contracting States will propose a new right. The existing dues levied on the Moselle for payment collecting the dues, managing the locks, maintaining the waterway, and paying back 1956 infrastructure investments (mainly locks), are under discussion. Contracting States are willing to abolish this due, as it does not work as envisioned. The original idea was to charge all vessels operating on the Moselle for the distance travelled and the goods transported (Article 24 Moselle Convention) to pay for the project of making the river navigable for large ships. However, the traffic volumes were not large enough to cover all costs. A new system is under consideration.

In addition to the above, taxation of IWT does not fit within the current climate initiatives where environmentally friendly transport is promoted. For example, in Germany road taxes have been increased, while taxes on rail and IWT have decreased. This to support the competitive position of the IWT sector. Also, in Luxembourg, the government in its 2018 coalition plan foresees to follow the proposed abolition of dues for inland shipping on the Moselle river, as proposed by Germany. In

[91] Convention du 27 octobre 1956 entre la République française la République fédérale d’Allemagne et le Grand-Duché de Luxembourg au sujet de la canalisation de la Moselle

addition, the government of Luxembourg wishes to support environmentally friendly modes. For instance, public transport can be used for free (since 2020).

The Moselle Convention in relation to EU law

All the Contracting States of the Moselle Commission are member to the EU as well. This means, that when the EU adopts new legislation introducing a sectoral contribution for inland shipping, this new law will apply in all three countries and therefore applies to the Moselle. The Moselle Convention does not pose conflicts, as payments for environmental purposes do fall outside the scope of the Convention. It should also be noted that the proposed schemes can be seen as a form of taxation related to fuels/consumption, which already falls outside the current scope of the Convention. As the schemes are not related to navigation, they are not covered by the Moselle Convention.

4.7 A 'polluter pays' scheme from the national perspective

Besides EU and international law, countries also do have their own national legal frameworks, which apply to the IWT sector. Many of the IWT countries in Europe are member to the European Union and therefore any initiative resulting from the EU would apply to them. Nevertheless, three countries (Switzerland, Ukraine and Serbia) are connected to the main waterways but are not a member to the EU. For these countries a more extensive legal analysis is made. For the Member States a shorter analysis is made. The results of both analyses are presented in this section.

4.7.1 The polluter pays principle from the Swiss perspective

In Switzerland, currently no legislation introducing the preventive 'polluter pays' scheme[92] is in place. No examples of schemes considered in the study can be found in Switzerland; neither in the IWT sector nor in other modes of transport a system is introduced. Only 'polluter pays' scheme laid down in Swiss law is the one introducing the reactive 'polluter pays' scheme. This scheme introduces strict liability on the polluter in case the polluter is responsible for causing an incident or accident. The liable polluter needs to pay damages for pollution caused. This reactive 'polluter pays' scheme applies both to the IWT sector as well as other modes.

Whether or not a preventive 'polluter pays' scheme can be introduced under Swiss law is difficult to say. This results from the complicated legal process that needs to be followed. On the one hand, the introduction of a 'polluter pays' scheme needs to be laid down in federal law. However, for such a change it is likely that the Swiss constitution has to be amended. Amending the constitution takes time and is not done lightly. On the other hand, the changes cannot be made solely by the federal government. As the topic relates to adopting new IWT-related legislation, also several of the cantons need to be involved in the legal process. Cantons do have their own legal powers and actively participate in legislative procedures which concern their interests. Three out of the 26 cantons do have a link with the Rhine and therefore would be actively involved in the new legislative procedure. Especially when the legislation affects ports, the cantons wish to be involved as the public port authorities are often part of the cantons.

[92] As stated earlier, two types of PPP's can be distinguished. On the one hand, the preventive PPP, which refers to payments made to avoid (further) environmental damage and on the other, the reactive PPP, which refers to damages paid by the polluter once an accident is caused.

Possibilities for introducing a sector contribution

Based on the above, introducing a 'polluter pays' scheme in Switzerland only is possible although it might be challenging. The interviewee indicated that introducing a 'polluter pays' scheme for the IWT sector might not be on the list of environment priorities. Especially as the Swiss fleet is small. Introducing a scheme on an international level would be more effective.

Switzerland is not a Member to the European Union and therefore EU law does not apply in the country unless agreed otherwise.[93] Nevertheless, as a CCNR Signatory State all legislation adopted by the CCNR applies to Switzerland as well. As the CCNR and European Union jointly develop harmonized and binding rules, e.g. ES-TRIN for the technical standards or requirements and the ES-QIN for professional qualifications, these rules are valid on the Rhine in Switzerland as well. Therefore, if the initiative is developed together, the new binding rules will most likely apply to the navigating the Rhine. As a result, there is no obvious competitive advantage for Swiss vessels compared with other nations using the river Rhine.

4.7.2 The polluter pays principle from a Ukrainian perspective

In Ukrainian law, two main types of inland shipping related payments exist. The first group of payments is based on the Ukrainian Tax Code and includes different kinds of business-related tax payments. The Tax Code applies to legal entities and therefore ship-owners also fall under its scope.[94] In the Tax Code, one article on environmental taxation is included. However, this article does not apply to the inland shipping sector nor any other mode of transport. The article only refers to damage caused by plants and factories. The second group of payments relates to services provided in the Ukrainian seaports. In total, seven different fees can be charges, amongst other fees for pilotage, the use of channels, locks, bridges, port services, berthing fees and sanitary fees. All fees are laid down in the Ministerial Decree issued by the Ukrainian Ministry of Transport.[95] In this second group no provisions regarding environmental taxation are included. One can conclude that although both sources contain rules on payments required from the inland shipping sector, none of the rules relates to environment taxation, let alone the PPP.

In Ukraine, no specific inland shipping law exists. A proposal for an IWT Law is under consideration, however it is only a draft yet. In a previous version of the draft law, there was a provision on environmental taxation for inland shipping. The article was later deleted from the draft text. Currently the only provision that relates to the environment states that the inland shipping sector is not allowed to pollute. How this will work out in practice is unclear.

Possibilities for introducing a sector contribution

Ukraine is not an EU Member State. In case the EU would adopt a new regulation or directive introducing the PPP in inland shipping, it needs to be assessed whether it will apply in Ukraine or not. Ukraine has signed an Association Agreement with the EU. Regulations and directives mentioned in the agreement will become part of Ukrainian law. However, for each one, Ukraine needs to adopt new legislation. Regulations and directives that are not mentioned in the Association Agreement, do not have to be included in Ukrainian law. As a result, for each piece of EU law, it needs to be assessed whether it is obligatory or voluntary to adopt it in Ukrainian law.

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93 In such a case, EU law needs to have a relevance to the countries in the European Economic Area (EEA). Inland shipping legislation often does not have the needed EEA-relevance.

94 Subject to the Tax Code are (i) companies, e.g. ship-owning companies or shippers, registered in Ukraine or (ii) foreign companies that do have a representative office in Ukraine. This means that ships only sailing on Ukrainian waters, but not having a (representative) office in Ukraine are not subject to the Tax Code.

95 All fees relate to a service provided and need to be made to the company that actually provided the service. For instance, the pilotage fee is paid to the company providing the piloting services. All inland ships need to pay the required fees, which means that all foreign ships using the service need to pay.

4.7.3 *The polluter pays principle from a Serbian perspective*

In early 2019, the Serbian government adopted an environmental fee based on the polluter pays principle.[96] The fee applies to SO_2, NO_2 and PM emissions resulting from the combustion of solid, liquid, and gaseous fuels for the production of energy, hot water and steam, and for heating. The fee also applies to hazardous waste produced and disposed. The main distinctive feature of the new fee is that it is based on the actual pollution caused, in other words the amount of emissions emitted. The fee is not a percentage of the company's revenue. However, if a company subject to this new legislation fails to provide the required data, a fee of 0.4% of the company's revenue will be charged. Based on the chosen scope of the new Ministerial decree, the environmental fee does not apply to the inland shipping sector. Nevertheless, the example shows that contributions based on the PPP can be introduced under Serbian law.

Possibilities for introducing a sector contribution

Serbia is in the process of becoming an EU Member State. As part of this process, Serbia has one of the most far stretching agreements with the EU, which means that the country is obliged to adopt and apply each new piece of EU legislation in order to ensure that Serbian law is in line with the European *acquis*. This means that when the EU adopts a new regulation or directive, the content of this new EU law should become applicable in Serbia as well. Otherwise, Serbian law would no longer be in line with the EU *acquis,* hampering the accession to the European Union. For inland shipping the country has made good progress and most of the relevant EU legislation has become part of Serbian law.[97]

4.8 Conclusion

The analysis above shows that the legal framework is complex and that not all sources of law allow for the introduction of a sector contribution based on the polluter pays principle. In essence, the European legislation does explicitly allow for such a contribution (see Article 191 TFEU). However, the scope and details of such a contribution need to be further specified in a new legislative act (either regulation or directive) in order to come in force.

Adopting EU law might pose conflicts with law issued by river commissions and countries not being a member to the EU. In Table 4.1, for each main actor a summary is provided, indicating whether the introduction of rights (e.g. fees, charges, tolls etc.) is allowed under the legal frameworks, whether the legal frameworks allow for the introduction of a contribution based on the PPP and how an EU initiative would work with the other legal framework.

Table 4.1: Overview of possibilities to introduce a sectoral contribution based on PPP

	Possibility for rights on navigation	Possibility for PPP	Link with EU
Rhine	No – see Article 3	No, difficult to align with Article 3	For EU law to apply on the Rhine check with Mannheim act is needed. CCNR is able to issue binding rules for all Signatory States.
Danube	No – See Articles 1 + 42	In principle no, unless all 11 countries agree	EU law only applies to 7 countries. Danube Commission cannot oblige other 4 to consider as well

[96] https://balkangreenenergynews.com/environmental-protection-fee-in-serbia-now-calculated-based-on-pollutant-emissions/

[97] https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/20190529-serbia-report.pdf

	Possibility for rights on navigation	Possibility for PPP	Link with EU
Sava	Yes, but earmarked	Yes, but currently only for water pollution	EU law only applies to two countries. Sava Commission could issue binding rules based on EU law which apply to all.
Moselle	Yes, but earmarked	Yes, but only if Signatory States wish to do this	All countries are EU Member States, so EU law will apply
Switzerland	No specific charges	No legal basis in place	Not an EU Member State. Also no agreement to adopt EU law. Nevertheless, when initiative is adopted by both EU and CCNR, rules will apply.
Ukraine	No specific IWT law yet (upcoming).	No legal basis in place	The Association Agreement should be reviewed.
Serbia	No specific charges	Not applicable to IWT, but possibility exists	In the process of becoming an EU Member State. Serbia should implement new EU law.

As Table 4.1, an EU initiative will not cover all countries connected to European waterways. This means that the initiative will most likely not cover all ships using those waterways. This will lead to a disruption of the level playing field within the IWT sector. One possibility to extent the scope of the initiative to non-EU Member States as well, is by creating a new international convention. The different river commissions together with the European Commission could play a role in drafting the convention and ask active support of their Signatory States to support the convention. Once the convention is concluded, each country should ratify the convention.

5 Lessons learned from previous schemes

5.1 Introduction and approach

In the past, governments and organisations introduced several schemes, such as the CDNI-Convention, the scrapping fund and the 'old-for-new' regulation, in the IWT sector, which are relevant to analyse for implementing a PPP based instrument in the market. These schemes all yielded different results. Such schemes, all have their strong points as well as weak points. Therefore, it is important to consider the lessons learned from previous initiatives. Not only the positive aspects could be used in a future 'polluter pays' scheme, but especially the pitfalls are interesting as by thoroughly understanding them it becomes possible to avoid them. Therefore, research question G5 aims to assess whether lessons can be learned from the previous initiatives and their processes. The abovementioned schemes are analysed in more detail to understand their strengths and weaknesses. For each of those schemes an assessment is made whether or not they could still be used under today's (market) conditions.

5.2 Lessons learned from the CDNI Convention

Background of the initiative

Before the introduction of the CDNI Convention and the charge on oily and greasy waste laid down therein, oily waste was sold to so-called bilge companies. Those companies re-sold the used oil from the vessels to other sectors, for example to the greenhouses in the Dutch 'Westland' region. During the 1980's, a discussion started whether this re-selling was a desired practice. Also, the greenhouses changed from oil to gas heating. As a result, the oil from vessels could no longer be sold. Vessels, however, still produced oily and greasy waste. Governments feared that the waste would be discharged into the surface water. To avoid this, a legal initiative was needed to ensure that oily and greasy waste was handed in.

As it was feared that a national solution would still lead to discharges somewhere else (i.e. *waste tourism*), it was decided to draft an international convention. All CCNR Signatory States decided to negotiate on a waste disposal convention. Luxembourg was invited later to join the convention. The European Commission had the role of observer and was involved in the discussion. Ultimately, the CCNR had the lead in the drafting of the convention. After discussions it was decided to give the lead to the CCNR, as CCNR procedures are deemed quicker, more practical and the CCNR has inhouse sectoral expertise.

The time for discussions on waste collection was right according to the interviewees. At that moment (late eighties), there were hardly any rules for the IWT regarding the collection of waste, while for other modes of transport such rules existed. This motivated the sector to encourage the drafting of the CDNI Convention. Although not all vessel operators agreed to the proposed scheme and especially the way of charging, in the end they all agreed to participate.[98] This feeling of solidarity helped to swiftly introduce the new legislation.

[98] Especially the larger vessel operators had already doubts about the fairness of the disposal charge as they have to pay rather high contributions as they consume much gasoil, while often have cleaner equipment onboard producing less oily and greasy waste. From a solidarity perspective the larger vessel operators agreed to join the system.

How does the initiative work?[99]

The Convention is based on the PPP, which was a relatively new concept in those days. For all three waste types[100] included in the scope of the Convention, the PPP is leading. Therefore, for each waste type the most likely polluter is identified. Ship operators are the most likely polluters in case of oily and greasy waste as they also often have the opportunity to make changes in the engine room and have the decision power to install cleaner equipment.

Initially, the idea was to charge for the waste collection at the moment that the waste was actually handed in. However, some argued that such a system would not work as ship operators could discharge their waste before entering a port – the place where waste is collected. To avoid illegal dumping of oily and greasy waste, it was decided to charge the ship operator indirectly. The most likely point, was the moment that the ship operator bunkers the fuel. After discussions, the decision was made to link the sector contribution to the amount of gasoil consumed. This was seen as a fair connection; the more you sail, the more gasoil you need and therefore the more you pollute. Using large quantities of fuel would justify a higher contribution.[101]

As described earlier, the CDNI charge is compatible with Article 3 of the Mannheim Act as the charge is a retribution; a payment for specific services rendered (see also section 4.3.2).[102] The ship operator pays for the collection of his waste. As the charge is a retribution, the income can never exceed the costs. In each country, an authority mandated by the government[103] is responsible for the collection of the charges. It should be noted that the costs for having the authority are not paid from the CDNI charge but come from the national budget.

Stakeholder views on the initiative

To ensure successful implementation of the CDNI Convention the cooperation with bunker companies was sought. They are the ones that have to collect the charges. However, they do not benefit from the system. It is an additional activity for them. It took some time to persuade those companies to contribute, but eventually they agreed.

Another group that was not too keen on the CDNI Convention were the shippers as they feared that eventually they had to pay for the disposal charge (e.g. higher freight rates). In addition, they foresaw issues with the cargo waste for which the shippers have to pay the fees. In addition, it was difficult to involve the shippers in the discussion as they were not organised. Finding a point of contact was difficult.

One of the success factors for the introduction of the CDNI Convention was the IWT sector's involvement and support. Not only did the sector actively support the charge, the sector is also part of the International Clearance and Coordination Body, which amongst others, evaluates the height of the waste discharge. The sector has decision power in this Body. The sector actively took part in the discussion on raising the charge as mentioned above (see section 4.3.2 for more details). The national governments are also part of the Body as they have the power to adopt resolutions. To ensure compliance, they will include the sector opinions.

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99 https://www.cdni-iwt.org/presentation-of-cdni/?lang=en

100 The Convention includes oily and greasy waste, cargo waste and household waste.

101 Currently this reasoning is under debate. See later on for more details.

102 More specifically, the contribution paid can only be used to finance the waste collection system – the bilge vessels collecting the oily and greasy waste.

103 In other words, a national institution.

Although the sector is supportive of the CDNI charge and is of the opinion that the current height is not an excessive burden in their total costs, some ship operators feel some injustice towards the scheme. As stated above, the charge is based on the amount of fuel bunkered. However, recently some operators have invested in cleaner engines and after-treatment systems. As a result, they produce considerably lower amounts of oily and greasy waste. The newest vessels produce significantly less oily and greasy waste. As they still bunker large amount of fuel, they still have to pay a higher charge, while not producing oily and greasy waste and therefore not use the discharge services. Some operators feel that the system is unfair. Those operators no longer seem to be in favour of the system and call for a re-consideration of the Convention.

Lessons learned

The CDNI Convention provides the possibility to reward cleaner ships. However, the main focus lies on preventing pollution resulting from the transport of cargo. Whether emissions caused by exhaust gasses could fall within the scope of the Convention is debatable. It should also be kept in mind that the Commission has adopted some legislation on this topic as well (e.g. the NRMM-Directive). Including emissions from exhaust gasses within the scope of the CDNI Convention could lead to overlapping competences. Besides, the objective of the CDNI Convention is 'lighter'. Regulating the collection of waste is simpler than regulating the reduction of emissions.

Recent developments show that new vessels are cleaner and produce less bilge water. This leads to two points of discussion. First of all, the new vessels, which are often the larger ones, still need to pay the charge while they do not use the services anymore. Some find this system unfair and recently more ship operators are less willing to pay the charge.

Secondly, if more and more vessels would stop producing bilge water, in a few decades there might be no need for a CDNI Convention as the source of waste is no longer produced. Whether this will happen is unknown. At this moment, the Convention does not create enough incentives to change behaviour. As the system for collecting waste works well – small bilge boats can collect the waste whenever the ship operator wishes – there is no real incentive for the ship operator to stop producing waste. Besides the oily and greasy waste, the ship operator can also hand in related waste, such as filters, oil cans etc. There is no need to hand in the waste somewhere else. To incentivise change, the network should become less dense (it should become more difficult to hand in the waste) and not all waste should be accepted. Only the oily and greasy waste should be collected, all other related waste should be handed in elsewhere – preferably the supplier of the materials.

It is doubtful whether a similar system could be introduced nowadays. At the time of the negotiations the fleet was more homogenous, and it was possible to define a 'standard waste profile' on which the system could be based. Technology has changed and it is very well possible that larger vessels are less polluting than smaller ones, while currently they have to pay more (based on the amounts of fuel consumed). The larger diversity makes it difficult to maintain a fair and transparent charging system. This might lead to discussions. In addition, due to the European extension, also the Danube fleet should become part of a scheme. Until today it has been proven hard to let them fall within the scope of the CDNI Convention. When developing something for a greening scheme, it might be even harder as the Rhine and Danube fleet are very different.

5.3 Lessons learned from the scrapping fund and the old-for-new regulation

Background of the initiative

The scrapping fund and the old-for-new regulation are analysed jointly as they both envisioned the same goals and together formed a solution to the same problems. The reasons to introduce the two initiatives were twofold. On the one hand, the IWT market faced overcapacity from the mid-eighties onward. This meant that supply and demand were not in balance and too much transport capacity was offered for too little demand. As a result, transport prices were low, and the sector was struggling. On the other hand, the European Commission wished to liberalise the market. Until the mid-eighties only transport on the Rhine could be considered a free market with a level playing field and free competition. IWT in other countries was still seen as a national market, which was often highly regulated. To increase the level playing field, the Commission wished to open up the national markets as well. Underlying idea was, that when supply and demand would be more balanced, it would become easier to abolish any national market-related regulation.

How do the initiatives work?[104]

As a result, the EU adopted an initiative to introduce a scrapping fund - providing the incentive to scrap abundant capacity. Ship operators who wished to stop their business, could send their vessel for scrapping and would receive an amount of money. The main condition to keep the money was to leave the shipping business. In case a ship owner wished to buy a new vessel, the money from the scrapping fund had to be spent on the new vessel and in addition a premium had to be paid, making the vessel more expensive (the premium was required based on the old-for-new regulation). Any newcomers to the market had to either pay the market prize of a new ship plus the required premium or had to ensure that abundant tonnage would be removed from the market (buy old vessels and have them scrapped).

The initiatives had a differentiated structure. The aim was to reduce dry cargo tonnage with 10% and wet bulk tonnage (mainly tankers) with 15%. For those two vessel types different tariffs were in place. In addition, different tariffs were introduced for smaller and larger vessels, whereby tariffs for larger vessels were higher. The differentiated system allowed for the possibility to adjust the tariffs to reach the ultimate objectives of the initiative.

The scrapping of vessels took place in three rounds. The first round (in 1989/1990) was mainly financed by the sector itself, with a pre-financing from the Member States. During the years after the first scrapping round, the sector paid a contribution and thereby repaid the pre-financing made by the different Member States. Once all the money was repaid, the sector contribution stopped. The second round (in 1993/1994) was mainly financed by the Commission and the Member States. Member States contributed proportionally considering the size of their fleet. The last round was in 1998 and was not used to the full potential. Considering the several scrapping rounds, the sector financed about half, the other half was financed by governments.

Paid premiums as part of the old-for-new regulation were saved in a fund, which still exists today. This fund is virtual. The Commission is responsible for the administration related to the fund; the actual money is on the State's bank accounts of all countries participating. In case the money would be spend, each Ministry of Transport needs to earmark the expenses. The fund contains around 26 million euro. Until today, no large payments have been made out of the fund.

[104] COM(93) 553 def – verslag van de Commissie over het effect van de structurele saneringsmaatregelen in de binnenvaart en ESO (2015), 'Het Europese reservefonds voor de binnenvaart

Stakeholder views on the initiatives

During the discussions for the new initiatives, some resistance came from the shippers as they feared that a complicated system was introduced and that the system would be permanent. In case this would happen, there would be no incentive for the IWT sector to remain vital, as during a crisis a fall-back option in the form of the scrapping fund would be available. As a result, the Commission agreed to make the initiatives temporary.

The ship operators were well aware that something needed to happen. Within the IWT sector, it was clear that the market was confronted with structural overcapacity, leading to lower freight charges, problems in obtaining enough cargo and problems in covering all costs. Operators were also aware that if they would not accept the proposed scheme, vessels would be scrapped anyway, but without the operator's choice. During the discussions also no other alternatives were formulated that could solve the issue of overcapacity. In the mid-eighties there was a 'sense of urgency' in the IWT sector that action was required.

Lessons learned

Most difficult part of the initiatives was to stop them. The system worked well and especially the sector did not see the need to withdraw the schemes. Nevertheless, eventually this was done. It should be noted that on paper, the two initiatives still exist and could be re-introduced. The Commission has the competence to do so and also an individual Member State can request the Commission to re-introduce the scheme. Until today, re-introduction has not been considered by Member States. Even during the economic crisis of 2008, no application to re-introduce the schemes was made.

Re-introduction is difficult from a legal perspective as, especially the scrapping fund, which is based on a sector contribution, is not compliant with Article 3 of the Mannheim Act. The contribution is seen as a form of taxation, something which is prohibited by the Mannheim Act. When the scrapping fund was first introduced, the CCNR made a temporary exemption and specifically allowed for this sector contribution. Once the Commission withdraw the initiatives, the CCNR withdraw the exemption. In case the Commission would like to re-introduce the schemes, negotiations with the CCNR are needed to see whether the CCNR would wish to make a temporary exemption again.

Introducing the schemes nowadays is probably much more challenging than it was in the late eighties / early nineties. Back then, the sector was more homogenous consisting of similar ship types and having a similar market structure. At that time, the EU consisted of less Member States, of which only five (i.e. Belgium, France, Germany, Luxembourg and the Netherlands) had IWT fleets. Nowadays the EU is extended to 27 Member States of which about thirteen do have an IWT fleet. Especially, the fleet structure on the Danube is different from that on the Rhine. Finding a common factor on which a new scheme could be based seems difficult.

5.4 Conclusions

Based on the information collected several key points need to be considered:

- To create a successful scheme and to ensure that polluters pay, the initiative needs to be *laid down in a legal act*. A legal basis is crucial for the effective implementation of the scheme. Not only will a legal act ensure the possibility to introduce uniform tariffs, which apply equally to all in the sector, a legal act also lays the foundation for collecting money. Without a legal basis for payments, there is no instrument to guarantee that sector contributions are made.

- The initiative should be introduced *on an international level* and should be *as inclusive as possible*. In case some parts of the sector are left out, the success of the scheme will diminish. The level playing field will be disturbed and as well as competition.
- The contribution *should not be a tax or any other form of right* that is prohibited by Article 3 of the Mannheim Act. It is possible to find other grounds for sector contributions that do not conflict with Article 3. However, one needs to check whether a chosen contribution is nationally not seen as a form of taxation. On a national level, differences in what is considered as a tax and what not do exist. This might be hard to identify.
- The analysed initiatives all have a *measurable objective*. The CDNI aims at zero waste, while the scrapping fund aimed at a 10% and 15% capacity reduction. A measurable objective ensures that it is possible to measure whether the instrument is effective and efficient. It also helps to check whether money spend is done in the correct way or that adjustment is required.
- Broad *sector willingness* is key to the success of the new scheme. As shown by the CDNI Convention a high sector involvement and support increases the effectiveness of the initiative. In case the sector is not supporting an initiative either no action will be taken, or the sector will look for ways not to comply with the new rules. Besides sectoral support also *government support* is needed. In case one or more governments do not support the initiative, the introduction of a sectoral contribution is difficult to realise.
- Currently, the Commission has an *indirect access policy* for the provision of IWT-related services. This means that only operators registered in one of the EU Member States are allowed to provide the services. Operators or actors registered outside the EU cannot be active on the European waterways. Some exceptions, especially for Switzerland, Serbia and Ukraine, have been made. However, companies registered somewhere else, e.g. in Asia, cannot provided services on EU waterways. In case the indirect access policy would be changed, and the market will be open to companies not registered in one of the EU Member States, the greening scheme might be difficult to have. Especially payment guarantees will be under pressure, as it might be difficult to ensure that operators from third countries do pay their share.

6 Potential market impacts of a scheme

6.1 Introduction and approach

This chapter aims to provide an assessment on research question H1 about the potential market impacts of 'polluter pays' schemes related to:

- initial and final cost increase for the shippers and their competitiveness;
- competition between vessel types;
- competition between IWT operators from different countries;
- effect on the modal share of IWT.

The chapter first identifies a set of eight case studies that together fairly represent the IWT market and offers a description of the case studies in terms of cost structure, journey characteristics and the transported commodity and alternative transportation modes. The case studies are also accompanied by a description of alternative transportation modes (*in a status-quo situation, without a contribution)* for the selected route. The case studies are described in section 6.2. In this paragraph, first the status quo market situation is described (the situation without an earmarked contribution) per case study. After the status quo situation, the predicted cost increase as a result of an earmarked contribution is derived. Finally, the expect market impact is presented for each case study, based on interviews with organisations representing the case study.

The research to the market impacts is, in addition to the case studies, largely based on desk research and academic literature on market impacts of cost increases in transportation. Based on this information a more in-depth analysis to the market impacts will follow divided into market impacts within the IWT sector in section 6.3 and within the wider supply chain in section 6.4.

The market impacts within the IWT sector relate to:

- the ability to increase transport efficiency due to cost increases in transport;
- the competition between vessel types;
- the competition between IWT operators from different countries.

The market impacts within the wider supply chain relate to:

- The extent to which IWT operators can 'pass on' cost increases in the supply chain.
- The size of the transportation costs in the overall product costs.
- The options the shipper has to adapt logistic chains or production processes.
- The options the shipper has to use other modes.

Finally, section 6.5 provides an overall conclusion on the possible markets impacts due to an earmarked contribution based on the literature research, desk research and the complementary case studies for different market segments in IWT.

Market impact of the contribution

The situation is analysed without taking into account that the contribution is used to subsidize measures or investments that stimulate the greening of the IWT sector. Therefore, only the market impact of the contribution is analysed. As the subsidy allows IWT operators to invest in greening technologies at a lower cost, the whole scheme might also have a positive impact. It is for example likely that the investment in greening brings benefits for the ship's operator (positive image, possibility for beneficial contracts with shippers) and lower earmarked contribution costs which in turn can have a positive effect on the cost benefit ratio. This analysis is outside the scope of the current research. However, one has therefore to keep in mind that the market impact analysed in this report only offers a partial analysis as only the costs of the scheme are analysed, and the benefits are not taken into account.

6.2 Case study descriptions and specific market impacts

Because the expected market impact of a PPP based instrument depends to a huge extent on the vessel, transport and geographical characteristics, it is almost impossible to make general claims on the impact of such an instrument on the IWT sector. To overcome this issue, the expected market impacts are analysed for eight different cases in this paragraph.

Based on the findings per case study, some (general) findings are presented on how different market segments presented in the case studies are affected differently by an earmarked contribution, and what crucial factors are in the way markets are impacted by a cost increase.

Confidentiality

It has to be noted that not all inputs or characteristics of the case studies are displayed, and some data has been abstracted. The reason for this is that some of this information, such as detailed journey characteristics, is considered to be confidential by the interviewed inland shipping companies. However, this detailed information is used to analyse the impacts.

Because the case studies are based on current transport characteristics of IWT transport on the most frequently navigated rivers in Europe, the presented case studies offer a good representation of the IWT sector in Europe.

The main source that is used to quantify the costs for each case is work package 2 of the PROMINENT project (2015).[105] Work package 2 of the project concerns the identification of the best available technologies for emission reduction in IWT. The study is supported by an ex-ante cost-benefit analysis. To identify the potential reduction in emissions and the financial feasibility of the technologies, the cost structure for the most representative IWT trips in 2016 are identified and analysed in detail. Based on the identified cost structure, the journey characteristics, the transported commodity and the transport costs per ton are derived.

[105] https://www.prominent-iwt.eu/wp2-advanced-concepts-for-mass-introduction/

Based on the PROMINENT list with the most representative IWT trips[106], a stakeholder session and expert opinions, eight case studies were selected which together offer a good representation of the IWT sector in Europe:

1. Agribulk transport from the Netherlands to the North of France
2. Container transport from the Netherlands to Switzerland
3. Ore transport from the Netherlands to the West of Germany
4. Liquid bulk transport in the ARA region
5. Agribulk transport in the Danube region (middle and lower Danube basins)
6. Passenger transport from the Netherlands to Switzerland
7. Container transport in the Netherlands
8. Gravel transport in the Netherlands

The information for the case studies about journey characteristics and cost structure was discussed and validated during the interviews with inland shipping companies that are also active in the specified cases above. The initial obtained results were finetuned for the specific journey in the case study.

For each case study, a first assessment was made on how an (theoretical) increase in fuel costs per litre (as an earmarked contribution) affects the cost structure of the IWT operator in the selected case. In order to easily express an earmarked contribution, it is been chosen to express the contribution per bunkered litre of fuel.

An assessment was made for an increase of 4 cent per litre to 32 cents per litre. The resulting cost increases are validated through the interview data. Moreover, the interviewees were asked how this cost increase would affect the transport market on the link on which the IWT operator conducts transportation. These findings are also presented for each case study. A low and high fuel price scenario is used for the calculations which are equal to respectively €23.65 and €67.81 per 100 litre diesels.

> **Note**
> The assessment and the indicative range for the earmarked contribution is based on the market situation at the time of the interviews (February-May 2020). A change in the market circumstances may affect the level of the earmarked contribution that the sector can bear without this leading to significant market distortions.

Case study 1: Agribulk transport from the Netherlands to the North of France

The first case study considers a relatively small vessel (CEMT Class III) transporting agribulk (e.g. fertilizer) from the Netherlands to the North of France. The transport chain only concerns transport by barge from the starting point in the Netherlands to the destination in the North of France. The selected transport link between the Netherlands and the North of France represents a total volume of around 250 mln tkm of agribulk transport via IWT per year.

Feasibility of alternative modes in a status quo situation

It is found that both rail and road transportation are viable alternatives for IWT for agribulk transport on the specified transport chain. Road transportation is more expensive (around 20 - 25%). The benefit of road transportation is that it is 'quicker' and more flexible, reducing storage costs. However, road transport is not an option for shippers that transport rather large volumes of agribulk

[106] PROMINENT selected the most representative trips in IWT, consisting of 96 relations of flows above 1,000,000 tonnes counting for 50% of the tkm performance of IWT. Added to this list of representative journeys are also journeys which – based on expert knowledge – increase the representativeness of the European fleet. This has resulted in a list of 25 Rhine journeys, 10 Danube journeys, 18 on other waterways and 7 journeys with passenger vessels.

(>50,000 tonnes) on an annual basis. Rail transportation is often used as a safety net for transportation, in cases where IWT is not feasible anymore (for example in periods of long-lasting drought).

Transhipment, pre- and end haulage costs

It is found that there is no need to include pre- and end haulage costs, as these are not expected to differ substantially between modes. It is found that the agribulk is first consolidated at the location in the Netherlands, and then transferred to a central location in the North of France, where it is redistributed in smaller loads to the end user. Based on the interview, it is found that the same dynamic would apply to road haulage. That is, it is assumed that smaller trucks transport the goods to a central warehouse where the goods are consolidated, and then transferred to the destination in the North of France with larger trucks (long-haul) where the goods are redistributed using the smaller trucks. The costs for smaller trucks in the case of IWT are assumed to be identical for the costs of smaller trucks in the case of road transportation in this case study. The same applies for rail transportation.

Costs of a trip and cost increase resulting from a contribution

Total yearly operational costs per ton are, *before applying a 4-32 ct/litre cost increase,* estimated to be between € 17.73 and € 22.55. This includes both the fuel costs as well as other costs, such as depreciation and insurance costs.

An increase in fuel costs, as a proxy to analyse the impact of a greening fund contribution, is found to increase the total costs per ton with 2% – 20% in the low-price fuel scenario. In the high price fuel scenario, the total costs increase lies between 2% and 15%. In the high fuel price scenario, the percentage increase is relatively lower as compared to the low fuel price scenario. This is due to the higher fuel price, since an increase in the fuel price has a relatively less significant impact on the total price. An overview is presented in Table 6.1.

Table 6.1: Cost categories and cost increase for case study 1

Cost categories	Costs per ton, low fuel price scenario	Costs per ton, high fuel price scenario
Current fuel costs	€ 2.58	€ 7.39
Current other costs	€ 15.15	€ 15.15
Current total costs	**€ 17.73**	**€ 22.55**
Expected cost increase (%) *+4 ct/litre to +32 ct/litre*	**+2% to +20%**	**+2% to +15%**

Expected market impact of a (fuel) cost increase

In response to the question about the market power of the IWT operator and its ability to 'pass on' additional costs, the respondent states that on this origin-destination relation there is much competition with road transport. One expects that any additional costs cannot be passed on by the inland shipping company to the shipper, without losing market share to road transport. Besides road transport, also transport by rail is a serious competitor, although it is not cheaper or faster than transport via water. Transport by rail is an option in cases where inland navigation cannot provide enough capacity due to low water levels for instance.

In general, it will be difficult to pass on cost increases to the customer, because alternative transport modes (road and rail) on the corridor are very competitive. Shippers who have little volumes to transport (e.g. 2,500 tonnes per year) can easily shift to road transport. So, with small volumes even small cost increases might have significant impacts on inland shipping. The larger the volumes are, the less the impact on inland shipping will be. On the other hand, if cost increases

are large (e.g. 32 cents per litre), one expects that inland navigation with vessels less than 1,000 tonnes will come to a standstill.

Concluding, the impact of cost increases in the IWT sector on shippers will be minimal, because there are enough transport alternatives by road and rail. This is why inland waterway transport operators are holding back in passing on cost increases.

Case study 2: Container transport from the Netherlands to Switzerland

The second case study considers a coupled convoy sailing (CEMT Class V) with containers between the Netherlands and Switzerland. The transport chain includes transhipment from deep sea to barge at a seaport in the Netherlands, transport by barge to the terminal in Switzerland, transhipment from barge to truck, and finally end haulage by truck to the customer. The selected transport link between the Netherlands and Switzerland is estimated to represent a total volume of around 1,094 mln tkm of container transport via IWT per year.

Feasibility of alternative modes in a status quo situation

The biggest competitor for IWT in this link is rail transportation. However, the volume to be transported is so large, that transporting all containers via rail is not feasible. Therefore, both modes need each other and the potential for modal shift towards rail is therefore limited. Road haulage is increasingly more considered a competitor, as this mode can reap their mode specific benefits to a larger extent as more data becomes available and just-in-time (JIT) transportation becomes more possible. However, as road haulage is fairly expensive on this link, it is not believed to offer fierce competition. The additional benefit of road transportation is that transhipment costs and end haulage costs can be avoided, but this benefit does not offset the additional costs of transportation.

Transhipment, pre- and end haulage costs

Next to the costs of transportation by barge, other costs in the transport chain include transhipment costs at the sea terminal (around €100 to €120 per moved container) and the inland terminal in Switzerland (around € 70 per moved container). Moreover, the transport chain also entails end haulage to the end consumer in Switzerland. Based on the interview, it is found that € 250 for end haulage by truck offers a reliable average.

Costs of a trip

Total yearly operational costs per tonne are, *before applying a 4-32 ct/litre cost increase,* estimated to be between € 11.37 and € 15.07. An increase in fuel costs, as a proxy to analyse the impact of a greening fund contribution, is found to increase the total costs per ton with 3% – 24% for the low fuel price scenario. In the high price fuel scenario, the total costs increase lies between 2% and 18%. In the high fuel price scenario, the percentage increase is relatively lower as compared to the low fuel price scenario. This is due to the higher fuel price, since an increase in the fuel price has a relatively less significant impact on the total price. An overview is presented in Table 6.2.

Table 6.2: Cost categories and cost increase for case study 2

Cost categories	Costs per ton, low fuel price scenario	Costs per ton, high fuel price scenario
Current fuel costs	€ 1.98	€ 5.68
Current other costs	€ 9.39	€ 9.39
Current total costs	**€ 11.37**	**€ 15.07**
Expected cost increase (%) *+4 ct/litre to +32 ct/litre*	**+3% to +24%**	**+2% to +18%**

Expected market impact of a (fuel) cost increase

In response to the question on the market power of the IWT operator and its ability to 'pass on' additional costs (e.g. contribution based on fuel consumption) to the shipper and others in the supply chain, a comparison is made with the maritime (seaborn) transport sector. In maritime transport, there are a lot of charges (e.g. Bunker Adjustment Factor, war risk, etc.), which is a common practice. The low water charge in IWT was first introduced in the dry bulk transport and later on also in the container transport. Consequently, history shows that whenever necessary, such as with fuel and low water, charges are being introduced which are eventually passed on to the customer. Charges initiated at a public level, such as the CDNI surcharge, are being included in the transport tariffs. Based on the interview results, it appeared that these extra costs are in many cases included in the rate.

However, IWT transport operators in general are always holding back in passing on cost increases to the customer. If the cost increase is marginal, an IWT operator will tend to deduct this from its own margin. However, if the cost increase is significant and threatens the continuation of the operators' business, then the costs will be passed on to the shipper. It is difficult to say anything about the specific thresholds (e.g. 4 cent or 32 cents per litre). In general, in case of cost increases the IWT sector will lose some share to alternative modes, whereas a part will be passed on to the customer and a part will be borne by the IWT operator itself.

It is difficult to estimate what the impact would be of a cost increase and how the IWT transport operator would react. As shipment size is close to its maximum and logistics processes are already optimal, there is not much room for improving transport efficiency. On the other hand, although other modes are considered viable alternatives, other modes do not offer the capacity of IWT. Therefore, a modal shift can be observed, but the expectation is that this modal shift would be very limited in size.

Case study 3: Ore transport from the Netherlands to the West of Germany

The third case study considers a large push boat vessel (CEMT Class VI) transporting ore from the Netherlands to the West of Germany. Hence, there is no end haulage concerned in this trip; the ore product is directly transported to the final destination. The selected transport link between the Netherlands and the West of Germany represents a total volume of over 4,074 mln tkm of ore transport via IWT per year.

Feasibility of alternative modes in a status quo situation

Other transportation modes do not offer competition to a huge extent. It would be impossible to transport the amount of ore via other modes. However, there is some room for modal shift, as since a few years rail transportation is also used to transport ores from the Netherlands to the West of Germany. However, rail transportation is only considered to be a safety net, in case that the demand for IWT cannot be realised (as a result of a shortage of capacity, drought, etc.).

Transhipment, pre- and end haulage costs

Ore products being shipped to the Netherlands enter the seaport via large bulk carriers. Empty pushed lighters are placed under a conveyor belt in the port and, after being loaded, sail directly to the production location in the West of Germany. This transhipment would also be necessary in the case of road or rail transportation. Transhipment costs are therefore expected to be similar for all modes and are not taken into account (these costs would simply cancel out on each other when estimating a market impact). Therefore, no other transport costs are considered.

Costs of a trip[107]

An increase in fuel costs, as a proxy to analyse the impact of a greening fund contribution, is found to increase the total costs per ton with 3% – 28% for the low fuel price scenario. In the high price fuel scenario, the total costs increase lies between 3% and 22%. In the high fuel price scenario, the percentage increase is relatively lower as compared to the low fuel price scenario. This is due to the higher fuel price, since an increase in the fuel price has a relatively less significant impact on the total price. An overview is presented in Table 6.3.

Table 6.3: Cost categories and cost increase for case study 3

Cost categories	Costs per ton, low fuel price scenario	Costs per ton, high fuel price scenario
Current fuel costs	25% - 30%	40% - 45%
Current other costs	75% - 70%	60% - 55%
Current total costs	**100%**	**100%**
Expected cost increase (%) *+4 ct/litre to +32 ct/litre*	**+3% to +28%**	**+3% to +22%**

Expected market impact of a (fuel) cost increase

The steel industry is facing difficult times at the moment, not only in Europe but globally. Every expected cost increase will be carefully examined. Depending on the degree of cost increases alternative transport modes will be analysed. During the recent low water period, the inland shipping company in this case study started to use railway as a substitute to IWT, mainly to ensure continuity in situations of low IWT capacity (for example during low water periods). However, rail transportation will not be able to absorb all IWT capacity; the transport volumes are simply too large.

Moreover, the share of transport costs in total production costs are less important than labour costs and environmental costs. To underline this, it is stated that a change in transport costs will not result in in relocation of the production site, however a change in labour costs or environmental costs might trigger this.

Although in this case study the CDNI disposal charge is directly passed on to the shipper, direct passing on the CDNI disposal charge to the shipper is not common in the dry bulk sector. The inland vessel operator takes this disposal charge into account though, when a transport contract is negotiated. Fluctuations in the diesel price are usually covered in the fuel clause, protecting both the shipper and the vessel operator for large fluctuations in the fuel price.

Case study 4: Liquid bulk transport in the ARA region[108]

The fourth case study considers a large tanker vessel (CEMT Class VI) transporting liquid bulk in the ARA region. The origin and destination of the chain concern a terminal in the port. These terminals are (easily) accessible via water. The selected transport link in the ARA region represents a total volume of around 968 mln tkm of liquid bulk transport via IWT per year.

Feasibility of alternative modes in a status quo situation

Rail and road do not offer a viable alternative for IWT. Based on the interview, a modal shift from rail to IWT seems more likely than a modal shift in the opposite direction. There is some competition from pipelines in the ARA region, but it is felt that a shift towards pipelines is not expected. There is little capacity left and the distances are reasonably short that IWT is well positioned to conduct the transportation on this link.

[107] The interviewed stakeholder provided information that the interviewee considers to be confidential. Therefore, absolute values are not included in the cost breakdown.

[108] ARA = Amsterdam – Rotterdam - Antwerp

Transhipment, pre- and end haulage costs

The other costs that could be considered are the costs of loading and unloading the vessel at the ports in the ARA region. However, these costs are not taken into account as they are not likely to differ substantially per mode.

Costs of a trip

Total yearly operational costs per tonne are, *before applying a 4-32 ct/litre cost increase,* estimated to be between € 1.27 and € 1.72. An increase in fuel costs, as a proxy to analyse the impact of a greening fund contribution, is found to increase the total costs per ton with 3% – 26% for the low fuel price scenario. In the high price fuel scenario, the total costs increase lies between 2% and 19%. In the high fuel price scenario, the percentage increase is relatively lower as compared to the low fuel price scenario. This is due to the higher fuel price, since an increase in the fuel price has a relatively less significant impact on the total price. An overview is presented in Table 6.4.

Table 6.4: Cost categories and cost increase for case study 4

Cost categories	Costs per ton, low fuel price scenario	Costs per ton, high fuel price scenario
Current fuel costs	€ 0.25	€ 0.70
Current other costs	€ 1.02	€ 1.02
Current total costs	**€ 1.27**	**€ 1.72**
Expected cost increase (%) *+4 ct/litre to +32 ct/litre*	**+3% to +26%**	**+2% to +19%**

Expected market impact of a (fuel) cost increase

The IWT operator states that contracts with shippers include fuel clauses that pass on costs increases in fuel costs. The share of transport costs in the total production costs is small, so increases in transport costs have only a small impact. Although there is some competition from pipelines, the possibility of a modal shift is seen as very limited.

Because inland navigation is dominant and the share of transport costs in total production costs and value is very small, the interviewee expects that costs increases can be passed on to shippers, who in return are expected to pass it on to their clients.

Case study 5: Agribulk transport in the Danube region (middle and lower Danube basins)

The fifth case study considers a large push boat (CEMT Class VI) transporting agribulk in the Danube region, specifically in the middle and lower Danube basins. The transport chain only considers transport by barge. The selected transport link in the Danube region represents a total volume of around 972 mln tkm of agribulk transport via IWT per year.

Feasibility of alternative modes in a status quo situation

It is found that IWT offers the cheapest solution to transport agribulk for the selected transport link in the Danube region. Other modes are more expensive but offer benefits such as more flexibility and shorter transport times. However, there is still fierce competition from rail and road transportation. The situation in the Danube region/Eastern Europe is different from that in the Western part of Europe. The main reason for this is that there is more excess capacity on rail and road transportation. For example, congestion levels are significantly lower in Eastern Europe than they are in the Western part.

Transhipment, pre- and end haulage costs

It is found that there is no need to include other transportation or logistics costs, as these are not expected to differ substantially between modes. It is assumed that, similar to case study 1, agribulk is first consolidated at a location in the middle Danube basin, and then transferred to a seaport in the lower Danube basin. The same dynamic would apply to road haulage. That is, it is assumed that smaller trucks transport the goods to a central location in the middle Danube basin region where the goods are consolidated, and then transferred to the seaport in the lower Danube basin region with larger trucks (long-haul). The same applies for rail transportation.

It has to be noted that fuel costs are a more important determinant in the overall costs, as labour costs in Eastern European countries are lower. For example, the average wage for a truck driver in Romania is about 40% of the average wage for a Dutch truck driver.[109] This indicates that any (absolute) increase in fuel costs is more significant in the total costs per tonne transported in Eastern Europe than it is in Western Europe.

Costs of a trip

Total yearly operational costs per tonne are, *before applying a 4-32 ct/litre cost increase,* estimated to be between € 6.63 and € 8.25. An increase in fuel costs, as a proxy to analyse the impact of a greening fund contribution, is found to increase the total costs per ton with 2% – 18% for the low fuel price scenario. In the high price fuel scenario, the total costs increase lies between 2% and 14%. In the high fuel price scenario, the percentage increase is relatively lower as compared to the low fuel price scenario. This is due to the higher fuel price, since an increase in the fuel price has a relatively less significant impact on the total price. An overview is presented in Table 6.5.

Table 6.5: Cost categories and cost increase for case study 5

Cost categories	Costs per ton, low fuel price scenario	Costs per ton, high fuel price scenario
Current fuel costs	€ 0.86	€ 2.48
Current other costs	€ 5.77	€ 5.77
Current total costs	**€ 6.63**	**€ 8.25**
Expected cost increase (%) *+4 ct/litre to +32 ct/litre*	**+2% to +18%**	**+2% to +14%**

Expected market impact of a (fuel) cost increase

The situation in Eastern Europe is different from the situation in Western Europe. First, labour costs are significantly lower. This means that fuel costs are a larger determinant in total transportation costs in Eastern Europe than in Western Europe. Increases in the fuel costs are therefore expected to affect total transportation costs to a larger extent. Second, there is fierce competition from rail and road transportation. Road congestion is less of an issue in the Danube region, allowing road transportation to easily increase market share whilst still being able to offer reliable transportation times.

Although it is reckoned that IWT is (and will be) the cheapest form of transportation on this link, IWT operators are very hesitant to pass on cost increases to shippers. This is because of the (reversed) modal shift this might induce.

In order to stimulate the greening of the IWT sector, it is felt that the shipper should get involved. Otherwise, it is felt that IWT operators will try to (almost) fully absorb the cost increase. Since margins in the IWT sector are considerably low, this would mean that cost increases of 4 ct/litre

[109] Comparing with https://www.stlwerkt.nl/Media/media/Domeinen/Organisatie%20en%20leidinggeven/CAO-salaristabellen-voor-januari-2017-tm-2019.pdfS

would 'kill' the business of most IWT operators. It is felt that an increase of 1-2 ct/litre would be bearable.

Case study 6: Passenger transport from the Netherlands to Switzerland

The sixth case study considers passenger transport from the Netherlands to Switzerland (CEMT Class VI). Effects are analysed for the river cruise, any other transportation costs of passengers (e.g. from home to the port) are not taken into account.

Feasibility of alternative modes in a status quo situation

This case study is different from the others, as there are many alternative options for passengers on river cruises. In essence, the passengers have an unlimited number of alternative leisure activities. Therefore, it can be assumed that 'competition' (in terms of available alternatives) is substantial. On the other hand, the choice to participate in a leisure activity is only partially dependant on the costs involved. In case of freight transportation, costs are a more significant factor in deciding the choice of the mode. This suggests that cost increases in passenger transportation, especially if the transportation itself can be considered as a leisure activity, is less sensitive to cost increases as freight transportation.

Transhipment, pre- and end haulage costs

Only the costs of the trip with the river cruise are taken into account. Any additional transport costs (for example transportation from home to the port or parking costs) are not taken into account. The main reason for excluding these costs is that they are not likely to differ for alternative leisure trips. For example, for sea cruises or on long journeys with rail transportation, these costs are expected to be similar. The same applies for holiday trips using bus transportation.

Costs of a trip

Total yearly operational costs per passenger are, *before applying a 4-32 ct/litre cost increase,* estimated to be between € 1,168 and € 1,242. An increase in fuel costs, as a proxy to analyse the impact of a greening fund contribution, is found to increase the total costs per passenger with 1% – 5% for the low fuel price scenario. In the high price fuel scenario, the total costs increase lies between 1% and 4%. In the high fuel price scenario, the percentage increase is relatively lower as compared to the low fuel price scenario. This is due to the higher fuel price, since an increase in the fuel price has a relatively less significant impact on the total price. An overview is presented in Table 6.6.

Table 6.6: Cost categories and cost increase for case study 6

Cost categories	Costs per passenger, low fuel price scenario	Costs per passenger, high fuel price scenario
Current fuel costs	€ 40	€ 114
Current other costs	€ 1,128	€ 1,128
Current total costs	**€ 1,168**	**€ 1,242**
Expected cost increase (%) *+4 ct/litre to +32 ct/litre*	**+1% to +5%**	**+1% to +4%**

Expected market impact of a (fuel) cost increase

It is found that most tickets are sold far ahead (e.g. about two to three years in advance)[110]. Therefore, there is no real possibility to respond to sudden cost increases; tickets have already been sold. As a result, a lot of risks and uncertainties are hedged or insured. Some risks can be offset in a creative way. For example, a cost increase in the price of food category A can be compensated by changing the menu for passengers (substituting food category A for food

[110] Although this tendency is more present in North America, also in European transportation tickets are often sold (far) ahead.

category B). However, all these alterations should be discussed upon with the tour operator. The tour operator may have raised expectations on a specific service level. It is felt that in many cases, these discussions are fruitful and lead to a solution.

In case of announced cost increases in the future, operators have the ability to pass on cost increases as tickets have not been sold yet. In many cases, river cruise operators choose to pass on cost increases. In case of cost increases that are a result of financing the greening of the IWT sector, it is even more likely that cost increases are passed on to consumers.

It is found that consumers (in normal market situations) are willing to pay more if they know that the ship is of low/zero emissions. 'Green' is experienced to be a marketing tool. The extent to which greening remains a marketing tool is uncertain. After the COVID-19 crisis, consumers might have less money to spend, and prices for all kinds of services (broader than river cruises) are expected to rise as companies have to pay off the debt, they have accumulated to combat the economic impact of the COVID-19 crisis.

Case study 7: Container transport in the Netherlands

The fifth case study considers a container vessel (CEMT Class V) transporting containers in the Netherlands (West to East). The transport chain includes transhipment from deep sea to barge at a seaport, and transport by barge to an inland container terminal, transhipment from barge to truck, and finally end haulage by truck to the customer. The selected link represents a total volume of 179 mln tkm of container transport via IWT per year.

Feasibility of alternative modes in a status quo situation

Based on the interview, it is found that rail transportation on this link is not a viable alternative. The main reason for this is that the transport distance is relatively small. Road haulage is considered to be a viable alternative. Although road transportation is more expensive, it offers the benefit of increased speed and flexibility. Moreover, end haulage and transhipment costs at the inland terminal can be avoided to a large extent.

Transhipment, pre- and end haulage costs

Next to the costs of transportation by barge, other costs in the transport chain include transhipment costs at the sea terminal (around 100 to €120 per moved container) and at the inland terminal (around € 70 per moved container). Moreover, the transport chain also entails end haulage to the end consumer in the vicinity of the container terminal. Based on the interview, it is found that an amount of € 75 - € 100 for end haulage by truck offers a reliable estimate.

Costs of a trip

Total yearly operational costs per tonne transported are, *before applying a 4-32 ct/litre cost increase,* estimated to be between € 3.94 and € 5.68. An increase in fuel costs, as a proxy to analyse the impact of a greening fund contribution, is found to increase the total costs per ton with 4% – 32% for the low fuel price scenario. In the high price fuel scenario, the total costs increase lies between 3% and 22%. In the high fuel price scenario, the percentage increase is relatively lower as compared to the low fuel price scenario. This is due to the higher fuel price, since an increase in the fuel price has a relatively less significant impact on the total price. An overview is presented in Table 6.7.

Table 6.7: Cost categories and cost increase for case study 7

Cost categories	Costs per ton, low fuel price scenario	Costs per ton, high fuel price scenario
Current fuel costs	€ 0.93	€ 2.67
Current other costs	€ 3.01	€ 3.01
Current total costs	**€ 3.94**	**€ 5.68**
Expected cost increase (%) *+4 ct/litre to +32 ct/litre*	**+4% to +32%**	**+3% to +22%**

Expected market impact of a (fuel) cost increase

The market power of the IWT operator in the container segment and specifically on the selected transport link between the Western and Eastern part of the country is rather limited. Hence, it is not easy for the IWT operator to pass on additional costs to the shipper or other parties further along the supply chain. Current fluctuations in the fuel price are partly being covered with the fuel clauses/energy surcharges.

There is competition especially from road, whereas rail transport is no real alternative to IWT (on short distances). The share of transportation costs in the value of the transported goods is very limited for the transport of goods on this specific trajectory.

A possible contribution from the sector are the 4 cents per litre bunkered fuel, however the other three scenarios (8cents/litre, 16cents/litre and 32cents/liter) are not achievable, according to the respondent. Furthermore, shippers should also be included in the initiative, since a possible cost increase due to the contribution from shipowners, should be passed on to the shippers.

Case study 8: Gravel transport in the Netherlands

The eighth case study considers a dry bulk vessel (CEMT Class III) transporting gravel from in the Netherlands. It has to be noted that this trip is not taken into account in Prominent. The main reason for this is that representative journeys for gravel (and sand) transportation are often not very large (in terms of transport volumes of tonkilometers). As sand and gravel transportation is a specific market segment in IWT transportation, it was felt that the case studies together can only offer a representative picture of the IWT sector if gravel (and sand) transportation is included in a case study. Hence, an additional source, *"Kostenstructuur zand en grindvaart 2019 en raming 2020"* (developed by Panteia in 2019), is used to develop this case study.

It is assumed that the origin and destination of the chain is easily accessible via water. Therefore, the transport chain only concerns transport by barge.

Feasibility of alternative modes in a status quo situation

Rail transport is not an option for the transport of sand and gravel. There are usually no rails alongside the extraction facilities and furthermore, trains are not desired due to the vibrations they because which could have a negative impact on the operations at the extraction site. Transportation of sand is almost always being done by ship. Gravel on the other hand, could be transported per truck, but not on the selected journey due to its significant length for this particular commodity. Compared to, for example, container transport, the transport of gravel is less time-sensitive, but the margins are also lower. This makes IWT a more attractive alternative. Stated differently, the transportation costs cover quite a large share of the overall product costs. Compared to container transport, in which mainly high value goods are transported, transportation costs are a more important factor in deciding on the model choice.

Moreover, pre- and post-haulage by truck is not necessary when gravel is transported by IWT. Production and extraction locations are located near a waterway. When transporting containers, pre- and post-haulage is often necessary though. Finally, in contrast to container transport, the full load is often also intended for just one customer (e.g. a concrete factory). Transporting a full shipload (e.g. ~ 900 tons) per truck would result in many truck movements (e.g. ~ 30 tons per truck) alternative. The truck could be a serious alternative for gravel transport on short distances, and for journeys with a shallow depth and small vessels (~400/500 tons). Concluding, there a no other modes on this transport link that offer fierce competition to IWT.

Transhipment, pre- and end haulage costs

In many cases, the extraction sites of gravel are alongside a river. Hence, there are no (significant) costs in loading the product on a ship. The costs of unloading gravel at the final are unknown. However, it is expected that the product is unloaded relatively close to the end user of gravel. Hence, also these costs are considered to be small. Therefore, only the costs of transporting gravel by barge are taken into account. The other costs are assumed to be small/negligible, and not likely to differ significantly for other transport modes.

Costs of a trip

Total yearly operational costs per tonne transported are, *before applying a 4-32 ct/litre cost increase,* estimated to be between € 6.03 and € 7.74. An increase in fuel costs, as a proxy to analyse the impact of a greening fund contribution, is found to increase the total costs per ton with 3% – 21% for the low fuel price scenario. In the high price fuel scenario, the total costs increase lies between 2% and 16%. In the high fuel price scenario, the percentage increase is relatively lower as compared to the low fuel price scenario. This is due to the higher fuel price, since an increase in the fuel price has a relatively less significant impact on the total price. An overview is presented in Table 6.8.

Table 6.8: Cost categories and cost increase for case study 8

Cost categories	Costs per ton, low fuel price scenario	Costs per ton, high fuel price scenario
Current fuel costs	€ 0.92	€ 2.63
Current other costs	€ 5.11	€ 5.11
Current total costs	**€ 6.03**	**€ 7.74**
Expected cost increase (%) *+4 ct/litre to +32 ct/litre*	**+3% to +21%**	**+2% to +16%**

Expected market impact of a (fuel) cost increase

As regards the question about the market power on this specific journey and its ability to pass on any additional costs to the shipper, the answer is that shippers don't pay more for 'green' transportation. In assignments from the contractors, there are nearly never requirements for green ships. An exception though, are assignments from asphalt plants which are currently increasingly asking for green ships.

Long term contracts, which could be an alternative to receiving more for green transport, are usually not longer than one year. However, when all IWT operators across all segments and countries are being faced with additional costs, then it will be possible to pass these costs on to the shipper.

In case of a cost increase, part of the IWT operators will deduct these cost increases from their own margins. As a result, the rest will have no choice but to go along with this or pass on the costs to the shipper and face the risk of losing business.

A contribution of 4 up to (and to a lesser extent) 8 cents per litre bunkered fuel are achievable. Higher contributions are not feasible, since this would extremely increase the fuel costs which would even become higher than the overall transportation costs in the current status.

6.3 Market impacts within the IWT sector

Building on the case studies and merely based on further desk research, this section provides a more in-dept analysis to the potential market impacts of a PPP based scheme. In this section, the potential market impacts focus specifically on the IWT market itself, i.e. potential impacts within the sector and relating to:

- The ability to increase transport efficiency due to cost increases in transport.
- The competition between vessel types.
- The competition between IWT operators from different countries

6.3.1 Transport efficiency

In section 6.2, for each case study a first analysis was made to what extent a theoretical increase in fuel costs would affect the costs per unit transported. An assessment on the market impact of an earmarked contribution was also provided.

One has to keep in mind that this cost increase assumes that all other transport characteristics are left unchanged (ceteris paribus assumption). In reality, it is likely that, as actors in the supply chain are confronted with an increase in costs for a specific cost component, will respond to this cost increase. In economic terms, operators are confronted with a new cost optimization problem, in which the costs for fuel are suddenly becoming a more important determinant in the overall costs of inland waterway transportation. It is expected that they will adapt their travel characteristics accordingly and to the extent that this is possible. They have numerous options to do so.

Most academic literature considers reactions of cost increases in the road sector, for example as a response to a kilometre charge for trucks. However, as most reactions are fairly generic, it is expected that they are also applicable to IWT.

According to De Jong et al. (2019), the operator has numerous options to limit the impact of a cost increase. In the short run, the operator could:

- Navigate more fuel efficient, thereby decreasing fuel costs and minimizing the contribution.
- Increase the cooperation between IWT operators. The contribution might induce IWT operators to cooperate to a large extent, thereby limiting the number of empty voyages and lowering the transportation costs per ton shipped.
- Increase the shipment size, increasing the tonnes transported per trip. By doing so, the required frequency of trips decreases which is expected to decrease fuel consumption. However, this a decreased frequency of trips implies that warehousing costs increase. Moreover, the feasibility of this offsetting mechanism needs to account for additional constraints in the context of IWT, such a low water level. Ecorys and MuConsult (2018) found that introducing a kilometre charge for heavy good vehicles would result in an increase of the average payload of between 0.2% and 1.3%.

In the medium to long run, the IWT operator could try to offset these costs by:

- Investing in more fuel-efficient equipment, thereby reducing fuel consumption and minimalizing the earmarked contribution.
- Investing in implementing new technologies, such as automatic sailing, IT systems to improve coordination, GPS trackers to monitor goods to facilitate a more JIT process etc. By doing so, an operator might be able to decrease the cost of transportation by limiting the number of empty voyages. Moreover, by investing in automatic sailing the operator might be able to navigate more fuel efficient.

Some studies have tried to estimate the degree to which investments as mentioned above are effective in reducing costs. This assessment is sometimes labelled as the impact the investment has on 'transport efficiency'. One of the most cited studies that estimates the impact of 'transport efficiency' on cost increases is a study from Significance & CE Delft (2010). In this study, the authors estimate the effect of changes in fuel, transport characteristics and demand on the number of vehicle kilometres in road transportation.

For transport efficiency, Significance & CE Delft (2010) found a value of -0.3. This means that around 30% of the cost increase can be internalized by increasing transport efficiency. Similar impacts on transport efficiency are found in other sources. For example, a similar elasticity is found in Ecorys (2005 and 2007) which adopts a price elasticity of -0.25 for road transportation.

Hence, the presented studies suggest the effect of an increased transport efficiency to be between -0.2 and -0.3. It has to be noted that this value is estimated for road transportation and might not be fully applicable to IWT. For example, IWT operators have fewer options for rerouting. Therefore, it is expected that the ability to offset the initial cost increase is lower for IWT. In general, it is found that a transport efficiency of -0.1 and -0.2 seems a realistic assessment: 10 to 20% of the *initial cost* increase can be offset by increasing 'transport efficiency'.

In case of river cruises, the interviewee indicates that the found transport efficiency is larger than -0.1 to -0.2. Operators have even more ways to offset initial cost increase, for example by changing food menus, staff on the vessel etc. On the other hand, it is expected that consumers are willing to accept a higher price if this means that they are enjoying a trip on a zero- or low- emission vessel. This suggest that consumers are more willing to accept a higher price if this means that their holiday is causing fewer emissions.

The extent to which transport efficiency can be enhanced depends on the specific (contractual) relation between the operator and the shipper. Moreover, it depends on market dynamics: increasing shipment size is only possible if the current shipment size is lower than the capacity of the vessel, if there are no restriction imposed by the river (for example with regards to the draught) and collaboration with other operators is only possible if there are (sufficient) other operators active on the transport link.

In special cases, it is found that the shipper and the operator are cooperating to offset cost increases. For example, they might decide to engage in long term contracts, allowing the operator to invest in greening technology whilst still being able to make a return on this investment. It is found that both shippers as operators consider this collaboration to be quite successful.

It is noted in multiple interviews that such collaboration mechanisms should be stimulated. To increase collaboration and involve the shipper in the greening of the IWT sector, one might decide to make them partly responsible on what basis subsidies are allocated.

6.3.2 *Competition between vessel types*

As result of a potential scheme, the costs related to the fuel consumption will rise, either through a sector contribution based on the bunkered fuel or based on the emitted emissions which are directly related to the fuel consumption. The impact related to this cost increase can vary among vessel types. A general approach was used to provide insight into the differences of this impact among vessel types.[111] Calculations have been made for the average annual costs, divided into fixed costs, labour costs and fuel costs. Across the selected representative vessel types the annual fuel costs, based on an average fuel price scenario (€492 per m3), make up approximately 18% of the total costs. The minimum share is 5% for push boats with two pushed barges and total propulsion power between 500-2000kW and a maximum stake of 31% for motor vessels of 105m carrying dry cargo.

Table 6.9 provides a brief overview of the average share of fuel costs assuming an average fuel price scenario, labour costs and fixed costs in the total costs for a number of vessel categories, whereby some representative vessel types are consolidated into one group for the sake of having a concise overview. Furthermore, it also provides an overview in the percentual increase in the total costs in case of an earmarked contribution of 4 up to 8 eurocent per litre bunkered fuel (or expressed by a contribution for the emitted amount of emission).

Table 6.9: Share of fuel costs in total costs (average) for consolidated vessel categories

Share of … in total average costs	Pass. vessel	Push boats <500 kW	Push boats 500-2000 kW	Push boats ≥2000 kW	Motor vessel dry bulk ≥110m length	Motor vessel liquid bulk ≥110m length	Motor vessel dry cargo 80-109m length	Motor vessel liquid cargo 80-109m length	Motor vessels <80 m. length	Coupled convoys
Share of fixed costs	48%	34%	49%	56%	43%	60%	37%	47%	30%	43%
Share of labour costs	45%	47%	42%	20%	34%	26%	38%	27%	57%	36%
Share of fuel costs	7%	19%	9%	24%	23%	13%	26%	26%	13%	21%
Effect of 4-8 ct/liter increase in fuel costs	0.6-1.1%	1.6-3.1%	0.8-1.5%	2.0-3.9%	1.9-3.7%	1.1-2.1%	2.1-4.2%	2.1-4.2%	1.1-2.1%	1.7-3.4%

Source: own elaboration based on Prominent.

The table shows that the first and third categories are characterized with a relatively low share of fuel costs in the total costs. Hotel cruise vessels have relatively high labour costs and fixed cost, explaining the relatively low share of fuel costs. Push boats with two pushed barges and propulsion power of 500-2,000kW are more common in specific waterways, for example on the Seine between Le Havre and Gennevilliers carrying containers. Whereas pushers with more pushed barges (4 or more) are commonly being used on larger waterways such as the Rhine. Apparently, the smaller size, less pushed barges and operational profile on the specific waterways such as the Seine results in a far smaller share of fuel costs in the total costs as compared to larger push boats operating on larger waterways such as the Rhine and Danube.

[111] Cost data from PROMINENT and Eurostat will be taken as a starting point for assessing the effects. Thus, this concerns the average costs for the overall fleet families. This concerns a more general approach; the calculations are therefore not based on the data obtained from the case studies. The PROMINENT project identified representative vessel types, each representing a fleet family. Based on the representative journeys which these vessels are usually used for, calculations have been made for the average annual costs, divided into fixed costs, labour costs and fuel costs. Annex IV provides an overall overview of the results.

Fuel costs have on average the largest share in total costs for vessels of 80-109m length carrying either liquid cargo or dry cargo. The share in fuel costs is relatively higher as compared to similar vessels which are larger in length (motor vessels ≥110m length). Underlying reasons could be that larger motor vessels are relatively new and have relatively higher fixed costs (depreciation, insurance, etc.).

It can be concluded that an increase in costs related to the fuel consumption will have a varying effect depending on the vessel type and its operational profile. A lot will depend on the typical journeys, the sailing distance and the share of sailing hours compared to the operational hours (e.g. time for waiting/loading/unloading). The results show that some representative vessels are characterised by a relatively higher share of fuel costs in the total costs. An increase in the costs related to the fuel consumption will on average have a relatively large impact on the total costs for the operators of those vessels. This is though no indication for the cost increase in absolute numbers. For example, the relative share of fuel costs may be smaller for passenger cruise vessels as compared to motor vessels of 80-109m length. However, in absolute numbers passenger cruise vessels can have higher annual fuel costs given a higher annual fuel consumption on average.

In the end, a possible cost increase related to the fuel consumption due to an earmarked contribution towards a greening fund, will have a varying effect depending on the vessel type and its operational profile. However, given a possible earmarked contribution equal to 4 up to 8 eurocent per litre bunkered fuel (or expressed by a contribution for the emitted amount of emission), the variation across vessel types will not result in drastically disruptive effects and will not disturb the competition between vessel types. The percentual increase in the total costs per vessel type is provided in Table 6.9. With a contribution of 4 eurocent the total cost increase fluctuates between 0.6% and 2.1%, whereas with 8 eurocent the cost increase fluctuates between 1.1% and 4.2%.

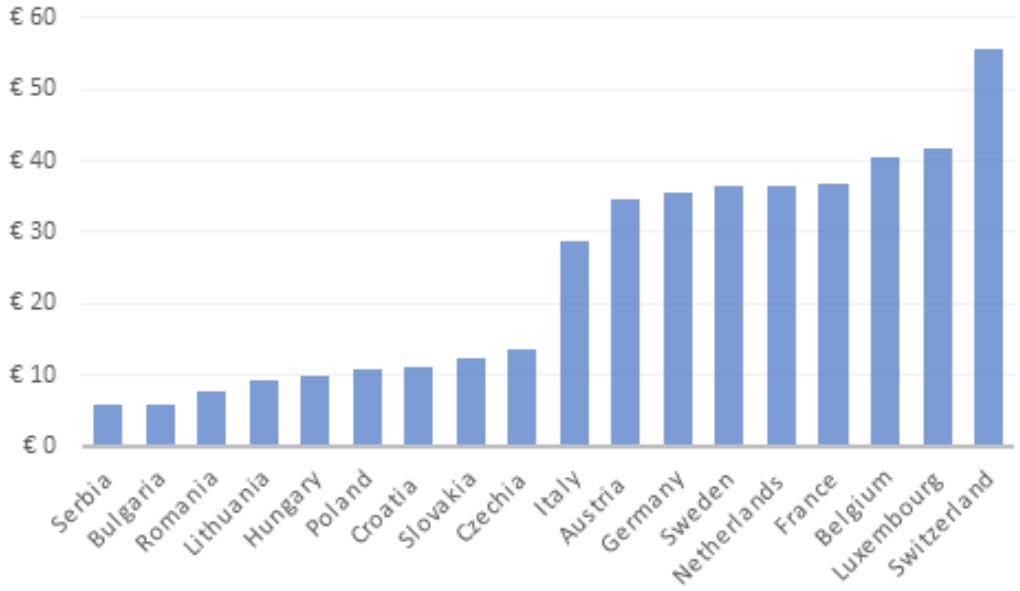
These findings are in line with the results from the case studies, that a possible earmarked contribution equal to 4 up to 8 eurocent per litre bunkered fuel would in general be acceptable and bearable for various types of vessels (although 4 cents appeared more feasible than 8 cent). Also, the case studies have not shown that operations involving a specific vessel type(s) would experience a disproportionate impact on the competitiveness. The selection covered in the case studies can be seen as a representative one covering a wide range of vessel types and operational profiles. Notably the large push convoys (e.g. operating on the Rhine) have both a relatively high share of fuel costs in the total costs and high fuel costs in absolute terms as well. But as the case study showed, there is hardly an alternative for transporting these kinds of volumes of cargoes by other modes. Moreover, in the container transport, the barge costs (including fuel) are relatively low seen also other cost types such as transhipment at the terminals and pre-end haulage by trucks.

6.3.3 Competition between IWT operators from different countries

This section analyses whether a possible cost increase related to the fuel consumption will have an effect on the competition between IWT operators from different countries. As compared to the previous section, the impact of earmarked contributions could be larger for IWT operators depending on the country/region they are operating in. Based on the PROMINENT results it can be stated that fixed costs and fuel costs would not differ much depending on the market the IWT operator is active in, these costs should be fairly equal across the various European IWT markets. However, labour costs are on average significantly lower in the Danube countries as compared to the Rhine countries. Figure 6.1 provides an overview of the average hourly labour costs across most of the European countries with a significant IWT market. This concerns the general hourly labour costs on average based on Eurostat, it is not a specific figure for the IWT sector. However, it still provides a good overview on the gap in labour costs between countries in Western Europe and

Eastern Europe or between the Rhine and Danube countries, which are the two main IWT markets in Europe.[112] The average hourly labour costs are on average 62% lower for countries along the Danube (€ 15.41) as compared to the Rhine countries (€ 40.14), and on average 36% lower as compared to the total average taking into account all illustrated counties (hourly cost of € 24.04 on average).

Figure 6.1: Average hourly labour costs



Source: https://ec.europa.eu/eurostat/databrowser/view/tps00173/default/table?lang=en

Thus, for those IWT operators active in the Danube market, especially in the eastern part of the Danube region with employees based in countries as Serbia, Romania and Bulgaria, the labour costs will be significantly lower compared to countries operating in the Rhine market. Taking the figures in Table 6.9 on the previous page as a starting point, four vessel types will be taken into account which are considered to be rather common for the Danube market. Furthermore, assuming that labour costs in the Danube market will be on average 62% lower as compared to the Rhine countries, the share of labour costs will be 11 up to 23 percentage points lower for operations involving the four fleet families in Table 6.10.

Table 6.10: Share of labour costs in Danube region

	Share of fixed costs in total average costs	Share of labour costs in total average costs	Share of fuel costs in total average costs
Danube region			
Push boats 500-2000 kW (total propulsion power) - Danube	66%	22%	13%
Push boats ≥2000 kW (total propulsion power) - Danube	64%	9%	28%
Motor vessel dry cargo 80-109m length - Danube	48%	19%	33%
Motor vessels <80 m. length - Danube	46%	34%	20%

[112] The Rhine and Danube markets are the two main IWT markets in Europe, of which the former one is by large the greatest in number of vessels. There are approximately 12,263 vessels operational in Europe of which 11,460 vessels are operational in the Rhine market (Rhine and other waterway countries: Belgium, France, Germany, the Netherlands, Luxembourg, Switzerland and Czech Republic. The remaining 803 vessels are operational in de the Danube market (Bulgaria, Hungary, Croatia, Moldova, Ukraine, Austria, Romania, Serbia and Slovakia).

	Share of fixed costs in total average costs	Share of labour costs in total average costs	Share of fuel costs in total average costs
Rhine region			
Push boats 500-2000 kW (total propulsion power) - West Europe	49%	42%	9%
Push boats ≥2000 kW (total propulsion power) - West Europe	56%	20%	24%
Motor vessel dry cargo 80-109m length - West Europe	37%	38%	26%
Motor vessels <80 m. length - West Europe	30%	57%	13%

Consequently, fuel costs will make up a slightly larger share in the total costs of companies active in the Danube countries versus the Rhine countries: 13%, 28%, 33% and 20% versus 9%, 24%, 26% and 13% respectively. This means that an increase in the costs related to the fuel consumption will have a relatively larger impact on the overall costs. This was confirmed by the interviewed IWT operator which is active in the Danube market. [113]

On the other hand, the market structure in the Danube countries differs significantly from the one in the Rhine market. The market is being dominated by relatively big companies, previous state-owned enterprises which are nowadays privately owned. About 14 large companies, with more than 20 vessels, dominate the IWT market. Whereas the Rhine market is characterised by a fragmented market with several small family companies owning or operating one or two vessels.2 Such large companies may be in a better position to submit funding requests and obtain EU funding as compared to small companies due to the required capacity, knowledge, etc. And in the case of the Danube market, companies have better access to cohesion funds, such as currently being explored in the GRENDEL project.

6.4 Market impacts within the wider supply chain

The IWT sector operates within supply chains. Goods are produced on one location and transported to another location. If transportation via inland waterways becomes more expensive, for example as a result of an earmarked contribution, this has effects in the wider supply chain.

It is hard, if not impossible, to make general claims on how supply chains will be affected. Some indication on the market impact in the wider supply chain is already provided for the case studies. This section offers some elaboration on the market impact. The market impact is broken down towards some indicators. These indicators are meant to serve as a ‘toolbox’, through which one is able to identify the magnitude of the market impact of an earmarked contribution for individual cases.

The indicators are identified on available literature, knowledge of the sector and validated (and augmented) during interviews. It should be noted that the indicators should be considered in a complete set to analyse the market impact for specific market situations, as different indicators (might) interrelate.

[113] Given the average hourly labour costs in Poland and Czechia, these finding may also apply to the situation in these two countries.

The four identified indicators are:

1. The extent to which IWT operators can 'pass on' cost increases in the supply chain.
2. The size of the transportation costs in the overall product costs.
3. The options the shipper has to adapt logistic chains or production processes.
4. The options the shipper has to use other modes (modal shift).

In the following paragraph, the indicators are discussed and, where possible, will be made specific for specific sectors or geographic regions.

6.4.1 Passing on the initial cost increase in the supply chain

The market impact depends largely on the extent to which costs can be passed on in the supply chain. The smaller the (overall) market impact, the more costs can be passed on the wider supply chain. [114] However, the impact for different actors is different. If costs can be fully passed on to the shipper, the market impact for IWT operator is very small (and substantial for the shipper). On the other hand, if no costs can be passed on to the shipper, the impact for the IWT operator is very substantial (with almost no impact for the shipper).

It is assumed that each actor will first try to offset initial cost increases they face, after which the resulting cost increase is passed on to the following actor (to the extent possible). This actor also tries to offset the cost increase, after which is passed on to the consumer. This aspect is also closely related to (transport) efficiency. For example, if the operator is not able to pass on any costs to the shipper, the shipper has no incentive to adapt his behaviour (for example by adapting the shipment size etc.).

The extent to which the transport operator is able to pass on an increase in costs depends on the market segment and the contractual agreements made between the transport operator and shipper).

In markets which are highly competitive (competition with other inland waterway transport operators and/or with other modes of transport) transport operators may decide to absorb a large part of an increase in transport costs, in order to maintain market share. This could for example be the case for container transportation that (in general) faces competition from other transportation modes or on transport links in which the vessel size is relatively small (thereby having a lower competitive advantage compared to road or rail transportation). In (long-term) contracts, parties can make agreements on how to deal with price changes (e.g. cost increases due to rising oil prices). In turn, shippers will take into account the extent to which their own price increases can be passed on to their customers when entering into contracts.

In many cases, the CDNI disposal charge is directly passed on the shipper. Also, most contracts between operators and shippers involve a 'bunker adjustment factor' (BAF) clause, allowing changes in bunkering costs to be directly transferred to the shipper.

6.4.2 Share of transportation costs

In most cases, the costs of (IWT) transportation are only a fraction of the total costs the end-consumer has to pay for a product. There are a lot of other cost components that together add up to the total costs, for example the cost to produce raw material, manufacturing etc. The lower the cost component of transport is in the overall cost structure, the lower the expected market impact is. In

[114] The overall market impact is considered to be 'societal' impact.

case of high value goods that are transported, a small cost increase in transportation has only a small impact on the total product costs.
For container transportation, often transporting 'high value goods', one can expect that the share of transportation costs is expected to be low. In interviews, it is found that transportation costs are negligible, although it depends on the product in the container. Information obtained from the interviews indicated that a ballpark figure would be that transportation costs account for 1 to 10%. The more valuable the load (in case of electronics for example), the lower the share of transportation costs in the product value. For the transportation of bulk products (coal, iron, agri, oil), interviewees indicate that the share of transportation costs to be somewhat higher, at around 3 to 15%. For gravel and sand, the interviewee indicate that the transportation costs are a significant part of the overall product costs. It is found that transportation costs are around 30 to 40% of the total product costs. Therefore, one can expect the market impact for the gravel and sand sector to be quite substantial, especially at shorter distances.

On this indicator, there is no reason to provide a distinction in impact for different actors. The higher the share of the transportation costs are in the overall product costs, the larger the market impact of an increase in transport costs is expected to be for all actors in the supply chain.

6.4.3 The options the shipper has to adapt logistic chains or production processes

Instead of dealing with a cost increase in transportation costs, a shipper might also decide to strongly adapt the logistics chain. For example, the shipper could decide to produce or import goods from locations at a closer distance, thereby decreasing the transport distance.

A shipper is only expected to adapt the logistic chain if this leads to lower overall costs compared with a case in which the shipper not decides to adapt the logistics chain. Therefore, the market impact of increasing transportation costs (overall) becomes smaller as the number of options the shipper has to adapt logistic chains or production process increases, as this implies that the overall product cost increase becomes lower.

However, the market impact differs significantly for different actors. In case the shipper decides to adapt the logistic chain, the market impact for shippers and consumers becomes smaller (lower total costs). The IWT operator, however, is no longer conducting transport, or is transporting on a shorter distance. Therefore, the market impact for the IWT operator increases as more options to adapt the logistic chain are available to shippers.

In case of container transportation, the shipper might for example decide to import his goods via a different seaport. In case of gravel and sand transportation, a shipper might decide to extract the product from a different site. No general remarks can be made on this issue. However, there is a larger fear in the gravel and sand sector that these options are going to be explored than there is in a sector transporting containers.

6.4.4 The options the shipper has to use other modes (modal shift)

One of the options a shipper has to further reduce his transportation costs is to substitute between the modes through which the goods are transport. As the earmarked contribution increases the cost price of IWT, the competitiveness of IWT vis-à-vis road and rail transport is expected to deteriorate.

The extent to which this happens depends on a lot of factors, for example related to the transport distance, viable alternatives and transported product.

Academic literature

According to Pastori et al. (2018), the choice of a shipper to choose a specific mode of transport depends on the *generalized costs of transportation.* Besides the monetary costs (e.g. fuel costs, labour costs, depreciation costs etc.), a shipper also takes into account costs that are not directly monetary such as 'reliability' and 'speed'.

According a study commissioned by ACEA (2011), the mode selection revolves around the following indicators:

- **Accessibility:** the extent to which origin and destination are reachable using a single mode.[115]
- **Transport distance:** the extent to which transportation costs offset handling and transhipment costs.
- **Product characteristics:** for products with a low value density (€ per m3 transported) and package density (packages per m^3), handling and interest costs are relatively low. Transportation costs thus become a more important overall determinant in the overall costs.
- **Size of shipment:** larger shipment sizes are more attractive to transport on larger vessels.
- **Speed:** the extent to which short delivery times are desirable.

Container transport

If we consider container transport, it is often the case that origin and/or destination are not reachable using a single transport mode (except for road transport). The end user is often not located at a port or at a railway terminal (accessibility). On the other hand, Ecorys (2008) concludes that in the Netherland the number of IWT terminals is relatively high, ensuring that domestic container transport via IWT is also feasible for most corridors.

Moreover, the value and package density are expected to be high. Although a variety of products are shipped in containers, it can be assumed that the value density is relatively high (at least compared to other commodities, such as bulk transportation). Since shippers often have to pay a price per container, they have an incentive to increase the package density (product characteristics).

In the majority of cases, speed is an important determinant. This claim is backed by PRC (2007), in which it is stated that the (reliability of) travel time is becoming more and more important in container transport, as goods are increasingly transported according to the just-in-time principle (speed).

Bulk transport

If we consider bulk transport, it might be the case that origin and/or destination are reachable using a single transport mode. Large factories are coal plants or refineries which are often located near rivers and railways. Consider for example large industrial plants as Tata Steel in IJmuiden, ThyssenKrupp in Duisburg or Arcelor Mittal in Ghent (accessibility).

Moreover, the value and package density are expected to be low (especially when compared to container transport). However, this depends on the specific nature of the transported bulk product (product characteristics). The shipment size is expected to be relatively high (shipment size). In the majority of cases, speed is less of an issue as most end users are able to plan production levels far in advance and can therefore 'order' their products well in advance (speed).

[115] It is assumed that each region is reachable with road transportation.

Based on this first analysis, it seems that container transport is in general more susceptible to changes in modal shift. Accessibility via rivers requires end haulage, product characteristics are in favour of road transportation and speed seems to be an important factor. This indicates that a difference in transportation costs becomes a smaller determinant in the choice for a specific transport mode when considering container transport.

On the other hand, bulk transportation seems be less susceptible to a modal shift, as the shipment size is high, and the end user is well reachable with IWT. This indicates that transportation costs are considered to be an important factor, favouring IWT.

Moreover, the classification of ACEA (2011) indicates that cases with a higher transport distance are expected to be less susceptible for modal shift effects.

PRC (2007) and PBL & CE Delft (2010) find that, as transport distance increases, the cross-price elasticity is lower. This means that a cost increase on relations with a long transport distance induces a smaller modal shift than an identical cost increase on a relation with a relatively short transport distance. This also suggested by ACEA (2011).

PBL & CE Delft (2010) find that the cross-price elasticity of general cargo products and container products is largest (at around -1.0), and that the cross-price elasticity of dry and liquid bulk transportation is lowest. It is interesting to see that these findings contradict the findings of PRC (2007), who found that the cross-price elasticity for containers is lowest. This might have to do with the availability of other transportation modes. Once again, the contradiction in findings supports the claim that the IWT sector is a very diversified sector, in which it is hard (if not impossible) to make general claims.

Nevertheless, Tavasszy et al. (2011) concern a study to the modelling of a freight prediction model that is used for policy making (BasGoed). The authors develop a cost function for the different modes and describe to what extent a direct cost (and time) increase in the cost function reduces the number of tonkm's transported. They find that a 1% increase in the IWT costs decreases the number of tonkm's with 0.3%.

Finally, one of the oldest but also most well-known study regarding price elasticities in freight transportation is the study conducted by Oum et al. (1990) for the World Bank. Interestingly, the researchers find that the cross-price elasticity of IWT-road transportation is between -0.12 and +0.13, indicating that an increase in the costs for IWT does not necessarily increase the amount of goods transported via road. The main reason for this is that a cost increase in the IWT indirectly also affects road transportation, as transhipment is often performed with trucks. This estimate of the price elasticity stems from observations in Canada from 1950-1974. Oum et al. (1990) find that the cross-price elasticity for product categories is very close related to the product value. The lower the product value (in relation to the transportation costs), the more susceptible this product category is for modal shift effects.

Real-life examples

All studies presented in this section have been conducted some time ago. Although recent academic studies are lacking, there are some examples from practice that provide some guidance on the price elasticity of IWT.

Example: impact of drought on IWT sector in 2018

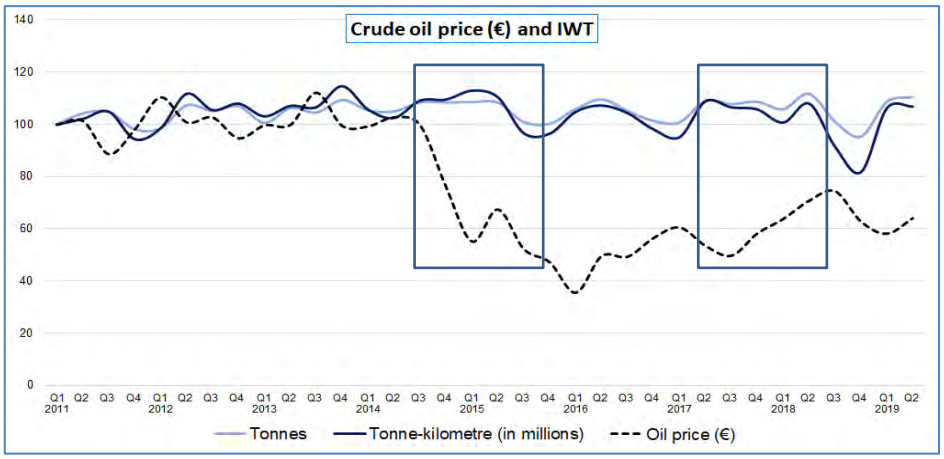
In 2018, the North Western part of Europe suffered from extreme drought. The drought had consequences for the IWT sector, since this affected the draft of inland waterways. As a result, IWT operators were not able to operate on full capacity, limiting the number of tonnes transported per trip. In order to transport all goods, operators had to increase the number of trips, increasing the costs per ton. Although the impact on costs is not easily identified, the Netherlands Bureau of Statistics (CBS) found that the turnover (as a proxy for costs) increased with 13%, whereas the number of tonnes transported only decreased with 2%. This implies a price elasticity of around -0.15. However, it also has to be noted that the decrease in tonnes was also a result of a lack of capacity. That is, there were no ships available to transport all goods. This indicates that the true price elasticity would be even lower than -0.15.

Although there is a severe pressure on cost reductions, atypical cost increases rarely result in a substantial drop in demand. The same principle applies for changes in the oil price. The oil price has shown to be quite volatile over the past decade. Yet, the number of tonnes transported via inland waterways has been quite stable. Of course, changes in oil prices also affect transportation costs for other modes (notably road transportation). Nevertheless, the total amount of transported tonnes seems to be quite inelastic to changes in the oil price. In the IWT sector, changes in the oil prices are often directly transferred from the shipper to the operator, via fuel clauses.

Example: effect of changes in oil prices on IWT

The graph below shows the total amount of tonnes transported in IWT in 13 European countries since 2011. Data is derived from Eurostat for transport volumes, and from the West Texas Intermediate (WTI) index for the crude oil price (retrieved from Macrotrends.net). The WTI serves as a benchmark for crude oil prices. The year 2011 is chosen because Eurostat offers data for each quarter for all 13 IWT-countries. Next to the total amount of tonnes transported, the figure presents the total number of tonne-kilometres (tkm) transported. Lastly, the figure presents the crude oil price (converted to euros). The time series are presented as an index, in which the first observation (Q1 2011) is set at 100.

Figure 6.2: Time series of crude oil price (in €) and IWT transportation



Source: Eurostat and West Texas Intermediate (WTI), own calculations.

From the figure, it can be observed that the number of tonnes transported, and the number of tkms is reasonably constant. The drop-in tonnes and tkms in Q4 2018 can be attributed to drought. But moreover, the effect of changes in the oil prices on the demand for IWT are small. For example, in the period Q3 2014 to Q4 2015, the oil prices dropped with almost 50%, while the number of tonnes/tkm remained rather constant. In the period Q2 2017 to Q2 2018, the oil price increased with almost 50%. Still, the number tonnes/tkm remained quite constant.

Is has to be noted that the relationship is stronger for Danube countries. The inland waterway transportation in these countries is more susceptible to changes in the oil price. However, the reaction is still small; for all counties, an elasticity (of oil price and transported tonnes) of -0.02 is observed whilst for Danube countries, an elasticity of -0.05 is observed. This indicates that a 1% increase in the oil price is associated with a decrease of 0.02% in tonnes transported in all IWT countries, and a decrease of 0.05% in Danube countries specifically. A possible reason for this lack of impact is that most IWT operators are able to pass on cost increases as a result of volatile fuel costs (through the bunker adjustment factor) to shippers, and that also other modes experience the impact of changing fuel costs.

All findings in this paragraph indicate that the IWT sector is quite inelastic; changes in costs rarely result in substantial changes in demand for transportation.

Calculation example

To substantiate this finding more, let us consider an earmarked contribution of 4ct/litre. This contribution was generally considered achievable by the sector. This contribution is (initially) expected to increase transport costs with 2 – 7%, depending on the case considered. As actors will adapt their 'behaviour' (transport efficiency), it is found that around 10-20% of the cost increase can be offset. This would mean that the resulting cost increase is 'only' 1.6% to 6.3%. Based on the findings above, it seems reasonable to (in general terms) adopt a price elasticity of demand of around -0.15.

Applying this price elasticity on the cost increase, this suggest that the cost increase results in a drop-in demand for IWT of 0.2% to 0.9%. It has to be noted that it is uncertain to what extent this drop-in demand for IWT induces a modal shift effect. It is expected that the drop-in demand for IWT is partly a result of an overall drop in demand for transportation, and partly a result of modal shift to other transport modes**. Based on the conducted interviews to support the case studies, it is expected that modal shift effects are negligible. Hence, it is expected that the drop-in demand for IWT does not result in significant modal shift effects.**

It has to be noted that it is impossible to make a general claim on the modal shift. In specific situations (for example in the Danube region), the modal shift effect might be larger whilst for other cases (e.g. liquid bulk transportation), the modal shift effect might be lower. Moreover, the only effect taken into account is the contribution costs. However, as IWT operators will be able to receive subsidies to invest in greening technology, investments can also be made at a lower cost. The assessment performed is therefore only part of the story.

6.5 Conclusion

The IWT sector is a very diverse sector. It is therefore almost impossible to make general statements on how earmarked contributions related to the fuel consumption would impact the market. Based on case studies, interviews and desk research key indicators are identified that can provide some direction on the expected market impact.

Market impact is only a partial analysis

In this chapter, only the impact of the earmarked contribution is analysed. As the contribution is meant to set up a greening fund, which provides financial sources to the IWT sector, analysing the market impact of the contribution is considered to be a partial analysis. To assess the market impact of the whole fund, one should take into account that IWT operators would be able to invest in greening technology at a lower cost. The market impacts in this chapter are therefore an overestimate of the total market impact of the greening fund (and contributions from the sector).

A first short overview on the possible market impacts has been provided, based on the case studies and interviews with organisations representing the case studies. Followed by a more in-depth analysis to the market impacts within the IWT sector and within the wider supply chain.

The findings show that when IWT operators are confronted with a new cost optimization problem due to earmarked contributions, then they will most likely adapt their travel characteristics accordingly to the extent that this is possible (navigating more fuel efficient, invest in greening technologies or increasing shipment size). This will be a first logical move to perform, which, however, will only result in a marginal gain. Around 10-20% of the initial cost increase can be offset by changing transport characteristics such as fuel usage and changing shipment size.

Furthermore, within the IWT sector itself, an earmarked contribution may have an impact on the competition between various vessel types and IWT operators across Europe. An earmarked contribution of 4 up to 8 eurocent per litre bunkered fuel would have varying effects depending on the specific vessel used. However, based on the interview results and desk research it is found that operations involving a specific vessel type(s) would experience a negligible impact on the competitiveness. The situation is slightly different as regards the competition between operators in different countries. Fuel costs make up a slightly larger share in the total costs of companies active in the Danube countries versus the Rhine countries. An increase in the costs related to the fuel consumption will have a relatively larger impact on the overall costs of those companies. This was confirmed by the results of the case study focusing on the Danube market. It needs to be taken into account though that the market structure in the Danube countries differs significantly from the one in the Rhine market.

It is found that operators are hesitant to pass on cost increases to shippers, as this might lead shippers to shift modes, effectively moving the IWT operator out of business. On the other hand, based on the interview results it is found that a lot of contracts include a ‘bunker adjustment factor’ or a possibility to directly pass on the CDNI disposal charge. It is found in many cases that the costs for these are directly passed on to the shipper.

Another important determinant in the assessment of the market impact is the share of transportation costs in the overall product cost. The larger the transport cost component is in the overall cost function, the larger the market impact is expected to be. It is found that transportation costs in the gravel and sand sector are a very important factor in the overall product costs, with transportation costs accounting for 30 to 40% of the product value. For bulk transportation, the share is 3 to 15% and for container transport the share is estimated at 1 to 10% (depending on the product).

In some cases, the shipper might be able to adapt the logistics chain. Hence, by moving production location which would lead to decreasing transport distances. For example, by relocating factories, import goods via another seaport of selecting another extraction site in the case of gravel and sand transportation. For container and bulk transportation, the risk of this impact is assessed to be low. In the gravel and sand sector however, there is a fear that cost increases would lead shipper to select other extraction sites.

A final effect that has been analysed is the possibility of a modal shift. In general, it is found in academic literature that cross-price elasticities are quite low, indicating that an increase in costs for IWT transportation does not affect demand for transportation to a large extent. This finding is also substantiated by interviews to substantiate the case studies. The costs of transportation are in many cases fairly low compared to the overall product value. Moreover, it is found that in many cases modal shift effects are low, as other modes (rail and road) simply do not offer the capacity

that is needed to transport the IWT volumes. This indicates that other modes would not even be able to absorb a substantial part of the volumes that are currently transported via IWT. Finally, it is found through two real-life examples (related to low water levels in 2018 and shocks in the price for crude oil) that the IWT sector is quite inelastic; changes in costs rarely result in substantial changes in demand for transportation.

A simple calculation based on theoretic models would indicate that a contribution of 4 ct/litre linearly decreases the demand for inland waterway transportation by 0.2 to 0.9%. However, based on the conducted interviews for the case studies, it became clear that modal shift effects are negligible. Hence, it is expected that the drop-in demand for IWT does not result in significant modal shift.

Concerning the thresholds, a cost increase of 4 cent per litre seems to be acceptable (although some state that shippers should definitely be partner in the discussion), a cost increase of 8 cent per litre seems to be problematic for market segments such as sand and gravel and agribulk, whereas even higher thresholds may have significant impacts in terms of losing market share to other transport modes. The exception is inland waterway transportation in the Danube region, where there is fierce competition from other modes. In the Danube region, it is felt that an earmarked contribution of 1-2 cent per litre would already have significant market impacts.

7 Limitations as regards State aid regulation

7.1 Introduction and approach

The previous chapter assessed the impact on the modal share of inland shipping as a result of price increases due to contributions from the sector towards a greening fund, a concept fundamentally based on the PPP. To partly overcome the higher costs, public bodies could (partly) cover for these costs by funding the IWT sector. Nevertheless, it is important to know whether this is in line with the current European State aid rules.

Article 107 of the Treaty on the Functioning of the European Union (TFEU) lays down that aid granted by a Member State or through State resources should not distort competition and trade within the EU by favouring certain companies or the production of certain goods. From a legal viewpoint, there are restrictions on State aid to companies, as it can lead to market distortion at national level, but also between various European countries. However, under certain conditions, it is allowed to provide aid. As providing aid to a sector is not always forbidden under the EU State aid regime, it is important to clarify the possibilities and impossibilities under the current system. This chapter assesses the possibilities regarding public support for companies active in the IWT sector receiving aid for greening the fleet purposes.

7.2 The European State aid Framework

As stated in Article 107 of the TFEU, State aid is defined as 'any aid granted by a Member State or through State resources in any form whatsoever which distorts or threatens to distort competition.' Such an advantage is considered as incompatible with the common market. Despite the general prohibition, State aid that promotes a legitimate objective can be compatible with the internal market. This is the case when State aid facilitates the development of certain economic activities (Article 107(3)c TFEU) and/or economic areas as long as it does not adversely affect trading conditions to an extent contrary to the common interest. Greening of the IWT sector seems to be such an area, especially since the new president of the Commission stated in her speech of 27/11/2019[116] that "*we have the duty to act*" against climate change. However, even if legitimate, State aid must also meet certain procedural obligations. Indeed, there are different options to recognize the lawfulness of State aid.

Firstly, according to a combined reading of Articles 107(3)c and 93 TFEU, Member States have to *notify the Commission of a State aid measure* and the latter has to approve the measure.

Secondly, there is *the rule of De-minimis aid* under which aid can be granted without being considered as State aid. To fall under the scope of this rule, the aid shall not exceed € 200,000, - to a single undertaking and should be spread over a period of 3 fiscal years. As long as the conditions of the de minimis rule are respected, the aid is not considered as State aid.

[116] Speech in the European Parliament Plenary Session, Ursula von der Leyen President-elect of the European Commission 27/11/2019 available at: https://ec.europa.eu/commission/presscorner/detail/en/SPEECH_19_6408

Thirdly, State aid can fall under an exemption set out in EU legislation because it is considered compatible with the internal market. Based on Regulation 733/2013,[117] the Commission is enabled to adopt the so-called *Block Exemption Regulations (GBER) for State aid*. According to this Regulation, the Commission declares specific categories of State aid compatible with the internal market if they fulfil certain conditions. By grouping State aid per category, this option saves time and avoids the requirement of prior notification and Commission approval. The list of specific categories of aid compatible with the TFEU is given by the Regulation No 651/2014[118], which was amended by Regulation 2017/1084[119] in order to include ports and airports. According to Article 59 of Regulation 651/2014, the GBER applies until 31 December 2020.

With regard to IWT, Regulation No 651/2014 contains some articles that could be a relevant ground for the greening of the IWT:

- Article 36 concerning the investment aid enabling undertakings to go beyond Union standards for environmental protection or to increase the level of environmental protection in the absence of Union standards;
- Article 37 concerning aid for early adaptation to future Union standards;
- Article 38 concerning aid for energy efficiency measures;
- Article 41 concerning aid for the promotion of energy from renewable sources;
- Article 49 concerning aid for environmental studies.

Finally, it is important to note that aid shall not be granted for investments to ensure compliance with EU standards. On the contrary, aid shall be granted in order to enable undertakings *to go beyond Union standards* such as in environmental protection (article 36 Regulation No 651/2014). However, aid encouraging undertakings to comply with new Union standard, which increases the level of environmental protection and which are not yet in force shall be compatible with the internal market. In this particular case, the aid falls within the meaning of Article 107(3) of the Treaty and shall be exempted from the notification requirement of Article 108(3). The investments should be fully implemented at least one year before the new Union standards enter into force.

7.3 National rules applicable to State aid

For all inland waterway countries that are EU members, the above legal framework will apply. The rules laid down in Article 107 TFEU are applicable to any governmental support scheme. Providing aid to the IWT sector will only be allowed when the conditions mentioned above are fulfilled. Besides Member States also non-Member States are connected to the European waterways. In this section, an overview is presented of their possibilities to provide governmental support to the sector.

[117] Council Regulation (EU) No 733/2013 of 22 July 2013 amending Regulation (EC) No 994/98 on the application of Articles 92 and 93 of the Treaty establishing the European Community to certain categories of horizontal State aid.

[118] Commission Regulation (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty.

[119] Commission Regulation (EU) 2017/1084 of 14 June 2017 amending Regulation (EU) No 651/2014 as regards aid for port and airport infrastructure, notification thresholds for aid for culture and heritage conservation and for aid for sport and multifunctional recreational infrastructures, and regional operating aid schemes for outermost regions and amending Regulation (EU) No 702/2014 as regards the calculation of eligible costs.

Possibilities for State aid in Switzerland

Currently, no State aid programmes for the IWT sector are active in Switzerland. In case a subsidy scheme would be introduced in Switzerland, a new law should be adopted as a legal basis which is currently not in place. It is questionable how easy this would be, as probably both federal and constitutional law need to be changed. In addition, active governmental support for greening the inland shipping sector seems currently unlikely, especially as the sector is small and greening priorities seem to be elsewhere, e.g. in other modes of transport or other economic sectors.

Possibilities for State aid in Ukraine

In Ukraine a relatively new law on State aid has been implemented. This law gives clear rules under which conditions State aid can be granted. In principle, the law does allow for State aid to the inland shipping sector, as long as the relevant conditions are fulfilled. Although it is possible to start a State aid scheme, it is questionable whether there will be budget to fund the initiative. Whether or not budget can be made available will depend on the specific scheme. Until today, no dedicated State aid scheme has been applied to the inland shipping sector.

Possibilities for State aid in Serbia

As was described in Chapter 4, Serbia is in the process of becoming an EU Member State. As part of this process, Serbian law needs to be brought fully in line with the European acquis, including the rules on State aid. This means that the rules described above in section 7.2 also apply to Serbia. In case Serbia wishes to introduce an initiative, this initiative should comply with the EU State aid rules.

7.4 Conclusion

The basic framework on state aid rules applicable to the majority of the inland navigation countries has been analysed. Article 107 of the Treaty on the Functioning of the European Union (TFEU) lays down that aid granted by a Member State or through State resources should not distort competition and trade within the EU by favouring certain companies or the production of certain goods. From a legal point, there are restrictions on State aid to companies, as it can lead to market distortion at national level, but also between various European countries. However, under certain conditions, it is allowed to provide aid. Providing aid for greening the inland navigation fleet may be covered by (i) measures which are already the subject of a Commission approval decision (notified measures) (ii) measures that van be qualified as the De-minimis rule (no aid), or (iii) measures that fall within the General Block Exemption Regulation (GBER) (block exempted measures). Of all exemptions, the last group seems the most promising as in those explicit references to inland navigation and greening are made.

The European State aid rules apply to all 27 Member States. This means that State aid rules apply to all inland navigation countries that are member to the EU. However, these rules do not apply to those inland navigation countries that are not a member. In some of those countries national rules on governmental support do exists, while in others such rules are absent. For instance, Ukraine has recently implemented a new law laying down rules under which conditions State aid can be granted. In principle, the law does allow for State aid to the inland shipping sector, as long as the relevant conditions are fulfilled. In Switzerland, currently no rules on State aid for the IWT sector are available. In case governmental support would be required, new legislation should be drafted and implemented.

8 Contribution from the IWT sector and potential revenues

8.1 Introduction and approach

This chapter analyses the potential revenues from earmarked contributions out of the IWT sector to financially stimulate the energy transition, a potential scheme which is fundamentally based on the PPP. This chapter hereby provides an answer to research question G6 *"What could be the revenues from a 'pollute -pays' scheme?"*

Potential revenues will be calculated based on the results obtained in the PROMINENT report[120], the feasible options for a contribution basis as indicated in Chapter 3 and based on interviews with IWT companies indicating the willingness for and possibility of a contribution from the sector itself. The willingness for a contribution from the sector itself has been discussed on the basis of four contribution scenarios. Based on these elements an overview will be provided of the possible revenues taking the four options for the contribution basis into account.

In addition, also the option to use resources from the Reserve Fund is described in this chapter.

8.2 Short overview of possibilities for earmarked contributions in 'polluter pays' schemes in IWT

Chapter 3 identified four options for a contribution basis that would be effective and fair in the path towards reaching the goal, i.e. realising the energy transition in the European IWT sector. These options are:

- Option 6: Contribution based on a flat rate for the bunkered amount of fuel/energy per vessel.
- Option 7: Contribution based on real-time measured emissions on board of vessels.
- Option 8: Contribution based on emissions calculated per vessel, assuming specific emission factors for the type of engine and fuel.
- Option 9: Based on the Emission Label/Energy Index of the vessel, combined with bunkered amount of fuel/energy per vessel.

Options 6 and 9 have a relatively acceptable level of technical feasibility and proportionality for the required overarching system to collect and manage the contributions. As opposed to options 7 and 8 which would be more complex, both from a technical perspective (e.g. calculating the emissions / installing emission measurement systems on board of vessels) as well as from the point of proportionality, since both systems would require a more complex overarching system to manage and control the contributions.

In addition to the evaluation criteria in Chapter 3, a legal analysis has been performed in the subsequent chapters. Apart from the practical difficulties to implement a European wide (including the main non-EU IWT markets) system for contributions from the IWT sector to financially stimulate greening, there are also legal challenges. The Mannheim Act is the most significant one and applies to the major IWT markets in Western Europe. Article 3 of the Mannheim Act explicitly

[120] PROMINENT Deliverable D6.3 and D6.5.

prohibits Signatory States to impose any kind of rights[121] based directly on the fact of navigation.[122] This implies that States cannot charge the inland shipping sector for activities directly connecting to shipping as such. Contrary, States are allowed to impose non-shipping related duties.

Similarly, vessels in Eastern Europe operating on the Danube River fall within the scope of the 'Convention regarding the regime of navigation on the Danube'[123] or the Belgrade Convention for short. Similar to the Mannheim Act, vessels are allowed to navigate the river freely and that navigation activity should be free of any charge. This viewpoint is addressed in Article 42, which explicitly states that *'no charges shall be levied on vessels, rafts, passengers and goods in respect merely of transit'.*

Hence, implementing exclusively a 'surcharging' system or 'taxes' will be very difficult given the legal barriers, even assuming that there might be some possibilities to overcome these legal barriers after all. These legal bottlenecks could be less of a concern in case of a system consisting of earmarked 'contributions' from the IWT sector. Given the four feasible options for a contribution basis, this would mean that contributions from vessel operators could flow towards a greening fund, which in turn could provide financing/funding and greening advice to vessel owners. The earmarked contributions should not exceed the granted funding/financing, costs for providing advice, and other costs for managing the overarching system. The overall system should be non-profit. This also indicates the relevance of grants supplementing the fund. The possibilities for additional funding, either indirectly through a possible greening fund or directly from the EU and/or national governments, will be analysed with research questions 'F' and 'I'.

8.3 Possible revenue scenarios of the 'polluter pays' schemes

Assuming the feasibility of the four options for a contribution, possible revenues are calculated based on interviews with vessel operators and their indication of how much the IWT sector itself is willing and able to contribute to greening.[124] In order to easily express the willingness and possibility for a contribution, four contribution scenarios were chosen in which the interviewees had to elaborate on a contribution based on the bunkered fuel ranging from a contribution of 4 cents up to 32 cents per bunkered litre (4, 8, 16 and 32 cents per litre).

All interviewees stated that a contribution of 4 eurocent per litre bunkered fuel, base case diesel, would be an acceptable contribution, irrespective of whether the IWT company could pass on these costs to the shipper or not. A contribution of 8 cents per litre bunkered fuel would become more difficult to accept, especially for those companies active in the dry bulk sector such as sand and gravel. The share of transportation costs as compared to the overall value of the transported cargo is relatively high as compared to other market segments.

Contributions of 16 and 32 cent per litre bunkered fuel would result in serious financial problems, especially for market segments such as sand and gravel transport and dry bulk transport with relatively small vessels on small waterways (e.g. Netherlands-Northern France).

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121 The website of the CCNR states the following: 'In application of Article 3 of the Mannheim Convention, the Member States must refrain from imposing any toll, tax, duty or charge based directly on the fact of navigation.' https://www.ccr-zkr.org/11020100-en.html.

122 Article 3 states that no dues, fees or charges will be required from vessels merely passing. As a result, navigational activities themselves remain free of charge. In addition, Article 3 also indicates that no buoy and beacon fees can be asked upstream from Rotterdam and Dordrecht. Based on Article 30 it is also prohibited to require any compensation for opening or closing any of the bridges along the Rhine River

123 Convention regarding the regime of navigation on the Danube – signed at Belgrade on 18 August 1948 – unofficial version

124 Those concern the same interviews as conducted for the case studies in Chapter 6. See Annex II for the interview list.

There is currently no reliable overview on the total number of active vessels in Europe and the corresponding fuel consumption. Therefore, for the purpose of this calculation, we rely on the PROMINENT results, notably in deliverables 6.3 and 6.5. Based on the PROMINENT scope of the fleet and assuming a European wide contribution of vessel operators to a greening fund, ranging from a contribution of 4 cents up to 8 cents per litre bunkered fuel, the possible revenues solely on the basis of these contributions would range from € 53mln up to € 106mln on an annual basis. This is based on the estimated fuel consumption of the European IWT fleet, which is also detailed in Table 8.1

Table 8.1: Estimated annual fuel consumption and emissions per fleet family

Vessel information			Estimated current emissions per year		
Fleet families Vessel type	Total number of vessels	Estimated fuel consumption in m3	NOx [tons]	PM [tons]	CO2 [tons]
Passenger vessels (hotel/cruise vessels)	2553	106516	3895	177	281201
Other push boats <500 kW	890	28644	995	49	75620
Push boats 500-2000 kW	520	81970	2966	125	216400
Push boats >=2000 kW	36	74520	2647	116	196733
Motor vessels dry cargo >=110m	610	206740	6681	234	545794
Motor vessels liquid cargo >=110m	602	83168	6089	211	544582
Motor vessels dry cargo 80-109m	1801	291470	11386	551	769482
Motor vessels liquid cargo 80-109m	647	153209	5171	219	404473
Motor vessels <80 m. length	4463	219456	8707	432	579363
Coupled convoys	140	78155	2432	85	206328
Total	**12262**	**1323847**	**50969**	**2200**	**3819976**

Source: http://www.prominent-iwt.eu/wp-content/uploads/2018/07/2018_04_30_PROMINENT_D6.3_D6.5_Combined_Deliverable.pdf (p.53)

Assuming that a system for contributions would start in 2025 and continue until at least 2050, by which greenhouse gases and other pollutants should be largely and ultimately eliminated, the total revenues within this period would range from approximately € 1.3 bln up to € 3.2 bln. This roughly amounts to respectively € 4,138 up to 8,637 on average per ship per year and € 129,556 up to € 259,112 per ship during the overall period of 30 years. Based on interview results, the scenario assuming earmarked contributions of 4 cents appears more feasible as compared to the one assuming contributions of 8 cents per litre bunkered fuel.

A contribution based on the bunkered fuel and the emission label/energy index of the vessel would result in differentiated tariffs. For example, 4 cents per litre bunkered fuel could be the starting point with an additional differentiation depending on the label or index which could either reduce or increase the contribution by certain percentages (e.g. 5%, 10%, 20%, ...). This should be calculated in such a way that the total potential revenue of € 53 mln up to € 106 mln is collected on an annual basis. The differentiation should also take the increasing number of green vessels into account and thus prevent the greening fund from completely draining before reaching the target.

The willingness to contribute € 52 mln up to € 106 mln on an annual basis can be translated to a contribution based on the calculated or real-time measured emissions for respectively options 7 and 8. Based on Table 8.2 it could be assumed that 1 litre diesel fuel could on average result in 37gr NOx, 2gr PM and 2,640gr CO_2. Assuming prices of 16.192, 63.778 and 33 €/ton for respectively NOx, PM and CO_2,[125] the contribution could be 0.79 euro per emitted kilogram NOx, 3.12 euro per emitted kilogram PM and 1.62 euro per emitted ton CO_2 which would equal a contribution of 4 cents per litre consumed diesel fuel. The numbers can be multiplied to equal a contribution of 8 cents per litre consumed diesel fuel. Table 8.2 below provides an overview.

[125] http://www.prominent-iwt.eu/wp-content/uploads/2018/07/2018_04_30_PROMINENT_D6.3_D6.5_Combined_Deliverable.pdf

Table 8.2: Contribution based on bunkered amount of fuel or emitted emissions

Options for contribution basis	Contribution equal to 4 cent per litre on average	Contribution equal to 8 cent per litre on average
Option 6 Contribution based on a flat rate for the bunkered amount of fuel/energy	4 eurocent/litre bunkered fuel flat rate (not differentiated)	8 eurocent/ litre bunkered fuel flat rate (not differentiated)
Option 7 Contribution based on real-time measured emissions on board of vessels	0.79 euro/kg NOx 3.12 euro/kg PM 1.62 euro/ton CO_2e	1.59 euro/kg NOx 6.25 euro/kg PM 3.24 euro/ton CO_2e
Option 8 Contribution based on emissions calculated		
Option 9 Contribution based on the emission Label/Energy Index combined with the bunkered amount of fuel/energy per vessel	4 eurocent/ litre bunkered fuel on average (differentiated)	8 eurocent/ litre bunkered fuel on average (differentiated)

8.4 The European Reserve fund for inland shipping

8.4.1 History and developments

There is a fund that the inland navigation sector still can rely on, the so-called reserve fund. It is also often called the 'scrapping fund'. But what kind of fund is this? Where does the money come from? Who owns the money anyway? To give some clarity about this, we should go back in time. In the mid-80s of the last century the European inland navigation sector was in a major crisis. The fleet was obsolete, future expectations were not bright and there was a large overcapacity, especially in smaller tonnages.

After previous national scrapping schemes in 1989, a start was made with a European restructuring scheme consisting of a scrapping scheme and an 'old for new' scheme.
The objectives of the restructuring scheme were:

1. to get old and redundant vessel capacity off the market by means of giving the respective owners a scrapping fee; and also
2. to prevent uncontrolled fleet expansion by means of a levy on new vessels.

Both the scrapping fee and the levy were based on the tonnage of the vessel. During the period 1989 - 1998 various scrapping rounds took place. The money for the scrapping fees was brought up by (1) a scrapping contribution from actively sailing ship-owners, (2) the 'old-for-new' levies paid by entrepreneurs who added new vessels to the fleet and (3) a contribution from the EU and involved member states.

The scrapping fee, the 'old-for-new' levy and the scrapping contribution were based on the tonnage of the ship. Herewith the principle of equal tonnage was applied. A large ship has on average a higher rate of circulation and consequently puts greater pressure on overall capacity than a small ship. The amount of the scrapping contribution was determined by the sum of the scrapping fees (reduced by any 'old for new' - and governmental contributions) divided by the total tonnage of the active fleet.

The sector paid for a large part its own restructuring and obviously benefited from it. After the last scrapping round in 1998, the fleet of dry cargo was reduced from 10.6 million tonnes to 8.6 and tanker shipping from 2 to 1.6 million tons.

8.4.2 Legal basis

The legal basis for the restructuring of the IWT sector was formed by Council Regulation (EEC) 1101/1989. This regulation lasted for 10 years, which already shows that the restructuring was intended as a temporary measure. There was (even then) no political support for a permanent capacity policy. For a long time, parties quibbled whether 1101/1989 should be continued or not. Eventually, in early 1999 a compromise was found in Council Regulation (EC) 718/1999.

The essence of the latter regulation was to gradually phase out the 'old for new' scheme to zero (no more levies on the introduction of new vessels onto the market) and only possible activation of (capacity) measures in case of a serious disturbance of the market. Regulation 718/1999 required Member States to also establish a reserve fund with three separate accounts: dry cargo, liquid cargo and pusher tugs (Article 3 paragraph 1, 2 and 3). In this fund, the money had to come from:

1. Any surpluses of the financial contributions of the inland navigation sector to the restructuring actions organised under the (old) 1101/89 (scrapping contributions and old-for-new). The surplus for the period before April 1999 was estimated to be approximately 6 to 7 million euros. At the time one did consider to 'give' it back. But due to high execution costs, the limited amount per beneficiary and the complex issue of allocation (who is entitled to what and how much) this did not happen.
2. 'Old for New' contributions from April 1999 onwards. These amounts were levied till 29 April 2003. Under the Regulation it was not allowed to levy any longer thereafter. Moreover, the entrepreneurs who ordered a new vessel then also had the choice between handing in old tonnage for scrapping or pay to the fund. Some paid, others bought old vessels for scrapping. Combinations also occurred.
3. Any contributions (government, industry) in the context of a serious disturbance of the market. Those contributions have however never been made. The financial and economic crises of 2008 did not lead to a recognition of a crisis in the IWT sector.

For the vast majority (over 80%) the money has been raised by entrepreneurs who put a new inland vessel (or increased tonnage as extension) into service from April 1999 until the end of April 2003. Furthermore, the percentage breakdown between tanker shipping and dry cargo is approximately 60 and 40 percent.

The question who owns the money, is easy to answer if we limit ourselves to the facts and legal provisions. Is it from those who ever paid a scrapping fee? No, that was finished in 1999 and in any case, it can no longer be figured out to whom these amounts belong. Is it from those who once paid an 'old for new' contribution? No, certainly not, this was a kind of penalty which you knew in advance you had to pay.

The money is in fact from nobody, but the IWT sector can use it for its benefit. Article 3.5 clearly defines how a request to spend the money can be made:

> *3.5. The reserve fund may be used in the course of measures referred to in Article 8 if unanimously requested by the organisations representing inland waterway transport. In this case, the measures must be the subject of an action at Community level.*

Therefore, the two organisations at European level, ESO and EBU have a key role in this respect.

718/1999 indicates what the money can be spent on (Article 3 paragraph 4 and 5). This very issue has been adapted in 2014 in order to expand the scope to greening the fleet. This is explicitly arranged by means of Regulation EU 546/2014 with the following considerations:

"Whereas ….

(10) The Commission should support measures for innovation and the adaptation of the inland waterway fleets to ***technical progress as regards the environment****, by promoting the use of financial instruments from existing Union funds, such as the Connecting Europe Facility and Horizon 2020, and should suggest ways to* ***leverage the reserve funds*** *by means of those existing funds as well as of financing instruments from the European Investment Bank.*

(11) As reserve funds have been set up by means of contributions from the industry, it should be possible for them to be used for the ***adaptation of vessels to technical and environmental requirements*** *adopted after the entry into force of this Regulation, including their adaptation to the* ***further development of European standards on engine emissions****, as well as for the encouragement of* ***engine fuel efficiency,*** *of the* ***use of alternative fuels and of any other measures to improve air quality, and for environmentally-friendly vessels, including river-adapted vessels.***

(12) Regulation (EC) No 718/1999 should therefore be amended accordingly,"

"— encourage innovation in respect of vessels and their adaptation to technical progress as regards the environment, including environmentally-friendly vessels, — encourage ways of leveraging the use of the reserve funds in conjunction with available financial instruments, including, where appropriate, under Horizon 2020 and the Connecting Europe Facility, and with financing instruments from the European Investment Bank"

It is therefore clear that the Reserve Fund can be utilised to play a direct role in the financial instruments for the greening of the fleet.

The revised 'article 8' as defined in Regulation EU 546/2014 is:

'Article 8

Without prejudice to Article 3(5), any Member State may take measures in particular to:

- make it easier for inland waterway carriers leaving the industry to obtain an early retirement pension or to transfer to another economic activity, inter alia, by providing comprehensive information,
- organise vocational training or retraining schemes for crew members, including workers and owner-operators, leaving the industry and provide appropriate information about those schemes,
- improve skills in inland navigation and knowledge of logistics in order to safeguard the development and future of the profession,
- encourage owner-operators to join trade associations and strengthen the organisations representing inland waterway transport at Union level,
- encourage adaptation of vessels to technical progress in order to improve working conditions, including health protection, and promote safety,
- **encourage innovation in respect of vessels and their adaptation to technical progress as regards the environment, including environmentally-friendly vessels,**
- **encourage ways of leveraging the use of the reserve funds in conjunction with available financial instruments, including, where appropriate, under Horizon 2020 and the Connecting Europe Facility, and with financing instruments from the European Investment Bank.'**

The utilisation of the funds according is subject to the precondition that the European organisations representing inland navigation (ESO and EBU) request this jointly (or agree on the spending) and it should be implemented at Community level. If it is part of a European program this requirement will be met).

8.4.3 *Available funds*

The available amount by end of 2008 as reported by the European Commission is presented in Table 8.3.

Table 8.3: Available amounts reserved fund at 31.12.2008

Member State	Dry cargo	Push boats	Tanker shipping	Total
Austria	€ 90,706	€ 2,327	€ 83,830	€ 176,863
Belgium	€ 1,044,412	€ 205,843	€ 4,244,401	€ 5,494,657
Germany	€ 2,237,885	€ 30,963	€ 3,721,791	€ 5,990,639
France	€ 172,000	€ 43,000	€ 207,000	€ 422,000
The Netherlands	€ 9,829,841	€ 398,964	€ 11,552,659	€ 21,781,464
Total	**€ 13,374,844**	**€ 681,097**	**€ 19,809,681**	**€ 33,865,623**

On 5 October 2017 there was the Decision by the European Commission (C2017/6663 final) to agree with the unanimous request of EBU and ESO to use a part of the RF for the IWT Platform organisation with the aim to contribute to all elements mentioned under Article 8. This concerns a budget of 7 million euro for the period 2017-2027, provided by accounts in:

- Austria € 35,000
- Belgium € 1,120,000
- Germany € 1,260,000
- France € 105,000
- The Netherlands €4,480,000

Therefore, taking into account this budget, based on the pro-rata deduction, Table 8.4 presents the remaining budget from the Reserve Fund.

Table 8.4: Available amounts reserve fund, taking into account 7 mln euro budget for IWT Platform (2017-2027)

Member State	Dry cargo	Push boats	Tanker shipping	Total
Austria	€ 72,756	€ 1,867	€ 67,241	€ 141,863
Belgium	€ 831,525	€ 163,885	€ 3,379,246	€ 4,374,656
Germany	€ 1,767,195	€ 24,451	€ 2,938,994	€ 4,730,639
France	€ 129,204	€ 32,301	€ 155,495	€ 317,000
The Netherlands	€ 7,808,045	€ 316,905	€ 9,176,514	€ 17,301,464
Total	**€ 10,610,273**	**€ 540,315**	**€ 15,715,034**	**€ 26,865,622**

Therefore, it can be concluded that 26.87 million euro could be made through the reserve fund for measures on greening at community level.

8.5 Conclusion

It can be concluded that the contribution by the sector could consist of € 53 – 106 mln per year, based on the (average) contribution per litre of fuel of 4 – 8 cents. If such a contribution would be made during a time span of 25 years (e.g. 2025 – 2050 period) this can run up to a figure of € 1.325 to 2.65 bln, whereas the 4 cent scenario seems more feasible as compared to the 8 cent scenario.

In addition, there is the available money from the Reserve Fund which amounts to 26.87 million euro. As mentioned in the Regulation it is suggested to leverage the reserve funds by means of those existing funds as well as of possible financing instruments (direct or indirect) from the European Investment Bank. This will be further elaborate in research question I in the study coordinated by the CCNR Secretariat.

9 Conclusions and recommendations

9.1 Conclusions: answers on research questions

Each main question 'G' and 'H' is broken down into sub-questions, i.e. G1 - G6 and H1 - H4. In this chapter, answers are provided for each sub-question.

Important remark for the reader:
It is important to keep in mind this report for Sub Project II is only one part Main Study and the results of Sub Project II must be combined with results from other parts of the Main Study in order to arrive at overall conclusions. Hence, this report cannot be seen as a standalone document and its result cannot be treated as such. The final conclusions are provided in the document for research element I of the Main Study (Sub Project I), which takes the results of all research elements into account and hence provides the overall conclusions and recommendations.

G1: Who is the polluter in IWT? What is a proper definition?

The first action was to analyse the theory and basics of the Polluter Pays-Principle (PPP) and to assess what this means for inland waterway transport (IWT) with regards to a possible scheme based on sector contributions. An important element in this respect is the analysis of the market structure in IWT. This provides a view on the type of market players, the market segments to be distinguished as well as insights in how the market functions.

At first glance, the inland shipping company can be regarded as the physical polluter since the company operates the vessel and consumes the fuel/energy for the propulsion for transportation of goods or passengers with own and/or chartered vessel(s) on a professional basis. However, the inland shipping company is not solely responsible for the caused pollution. All involved actors in the chain are part of the pollution chain to certain extent. This mainly includes the shipper as the party to make the transport order to select the logistics service provider who selects the inland shipping company to carry out the work. As a result, it was concluded that in IWT there is a pollution chain in which multiple involved actors in the logistics chain are together responsible for the pollution. It is therefore concluded that due to the complex structure and the strong fragmentation in the supply side of the sector it is not possible to single out one polluter only. Not only are multiple parties involved, but also contractual relationships between shippers, brokers and inland shipping companies can frequently change in time. This is confirmed by the high share of contracts for inland shipping companies established on the spot market. In such case, applying the PPP in its purest form would mean that each responsible party in the chain needs to be charged pro rata with the cost for pollution prevention and control measures determined by the public authorities. This will simply become too complex and difficult with an extreme administrative burden for the involved parties. As a result, the study did focus on investigating possible schemes in which 'pollution is paid for' with support from all the actors involved in the pollution chain. In other words, *what is the potential for a contribution by the sector?*

G2: What are possible schemes which serve the polluter pays principle and on which basis?

In order to increase the understanding of 'polluter pays' schemes, four existing practical applications were reviewed. It was clarified how these schemes serve the PPP and on which basis. These existing applications are:

- the NOx tax in Norway;
- the CO_2 tax in Sweden;

- EU Emission Trading System;
- CDNI convention.

Overall, the four practical existing applications of the PPP have their own set of advantages and disadvantages. A possible scheme for IWT should take note of these. The NOx fund initiative- as applied in Norway- is in this respect a good practice example. This remains in contrast to introducing a stand-alone levy measure such as the initially presented NOx tax (the NOx fund was led subsequently to the NOx tax) in Norway and the CO_2 tax in Sweden. A tax measure could be relatively easy implemented and administered at a national level, however on a European level this is more difficult. In addition, introducing a tax is mostly likely in conflict with the Mannheim Act. Furthermore, the introduction of a tax measure on its own will not sufficiently support the IWT sector in the transition towards becoming zero-emission in 2050 since stand-alone tax measures flow into the general budget of governments and only a part of the collected financial sources may be used for IWT in an indirect way.

Hence, earmarking needs to be applied to make sure that resources become available. This results in a budget neutral approach on sector level, i.e. financial resources originating from the sector flow back to the sector (i.e. used for the benefit of the sector). Resources provided by the sector will also become available for the sector for a specific goal to reach the 2050 ambition of (near) zero-emission performance. This also avoids the risk that the contribution will be interpreted as fines by the IWT sector and/or a taxation on IWT operations, resulting in lack of acceptancy by the industry and conflicts with legal frameworks (e.g. Act of Mannheim).

*As a result, the focus is laid on a scheme that consists of a '**greening fund**' filled with **earmarked** '**contributions**' **from the sector** which are in turn used **for the sector**, i.e. goal based: reaching (near) zero-emission performance by 2050.*

Furthermore, it should be noted that the concept of a greening fund filled with earmarked contributions, is still fundamentally based on the general principles of the polluter pays theory.

Based on this conclusion, the possible implementation of a greening fund filled with, amongst others, earmarked contributions from the sector is subsequently analysed. Based on comparison with examples in other sectors and a brainstorming session with the Steering Committee, nine different options were initially identified for a possible contribution from the sector towards a greening fund.

As a next step these options were qualitatively assessed based on four evaluation criteria. These criteria are:

- effectiveness;
- fairness;
- proportionality;
- technical feasibility.

Table 9.1 provides an overview of the options and their scores on the criteria.

Table 9.1: Options for a contribution basis and their assessed scores

Options for contribution basis	Effective	Fair	Proportional	Technical feasibility	Conclusion
Option 1 Fixed rate contribution for each active vessel.	– – –	– – –	+	+ + +	Not acceptable

Options for contribution basis	Effective	Fair	Proportional	Technical feasibility	Conclusion
Option 2 Contribution based on load capacity/length	– –	– –	+	+ + +	Not acceptable
Option 3 Contribution based on amount/number of transported freight/passengers (or per tkm/pkm).	–	–	+/–	+	Not acceptable
Option 4 Contribution per kilometre travelled	– –	– –	+/–	+	Not acceptable
Option 5 Contribution for new engines supplied to the market	– –	– –	+/–	+	Not acceptable
Option 6 Contribution based on a flat rate for the bunkered amount of fuel/energy	+	–	+	+ +	Selected for short list
Option 7 Contribution based on real-time measured emissions on board of vessels	+ + +	+ + +	– –	– – –	Selected for short list
Option 8 Contribution based on emissions calculated	+ +	+ +	–	–	Selected for short list
Option 9 Contribution based on the emission Label/Energy Index combined with the bunkered amount of fuel/energy per vessel	+ +	+ +	+	+	Selected for short list

The last four options (6 - 9) could satisfy the effectiveness and/or fairness criteria in the path towards reaching the goal, i.e. realising the (near) zero-emission performance of the European IWT sector by 2050.

However, option 8 and especially 7 have a concern about the technical feasibility and might not be a feasible option for the short term. For option 7, This could change in the near future if sensors and measuring devices further develop and become cheaper. Out of the four options, option 9 would be the most feasible option based on the initial evaluation. This one is the contribution to a greening fund by each vessel operator based on the bunkered amount of fuel/energy per vessel. However, it would not be a flat rate contribution, but the rate would be differentiated by means of an emission Label/Energy Index. This means that vessels with a low emission per litre of fuel pollute less compared to vessels with a high emission profile.. Consequently, this gives an additional incentive and promotes cleaner vessels which ultimately results to a bigger score on effectiveness and fairness as compared to option 6.

G3: What are legal barriers to implement such schemes across the European Union and including other relevant European IWT countries as Switzerland, Serbia and Ukraine?
G4: What are the legal barriers and options as regards the Mannheim Act to enable 'polluter pays' schemes for emissions to air?
Before further elaborating the mentioned options 6-9, it is important to further assess whether the options could be introduced given the current legal framework. In other words, does the applicable

legal framework allow for the introduction of a sector contribution based on the polluter pays principle?

The applicable legal framework for the inland shipping sector is complex since including not only legal regulations of national governments, which may hamper the introduction of a potential 'polluter pays' scheme, but also embrace international regimes, such as European legislation and river basin specific legislations. For each of those jurisdictions it is necessary to assess whether a sectoral contribution based on the PPP could be introduced.

EU law offers a legal framework to introduce a sectoral contribution based on the 'polluter pays' principle. The overarching PPP is laid down in Article 191(2) of the Treaty on the Functioning of the European Union (TFEU), which states that the Union shall adopt policy that aims to protect the environment. In this process, the Union has to consider several principles. Amongst those standards, the principle includes that the polluter should pay for the damage done to the environment. However, Article 191 TFEU does not disclose how this should be established and what the PPP should entail. This means that the details of the PPP must be interpreted in additional legislation (e.g. in a specific regulation or directive). Currently, no such legislation exists for the IWT sector.

Whether a sectoral contribution can be introduced given the international regimes on the different rivers depends on the specific conventions. The following can be said:

- **On the Rhine**: Article 3 of the Mannheim Act explicitly *prohibits Signatory States to impose any kind of rights based directly on the fact of navigation*. This implies that States cannot charge the inland shipping sector for activities directly connecting to shipping as such. The Act opens the possibility for two exceptions: (i) non-shipping related duties, for instance VAT on goods, and (ii) retributions – compensation for delivered services (the CDNI disposal charge is such an example).
- **On the Danube**: The Belgrade Convention *does not allow for the collection of fees related to navigation*. Nevertheless, it should be noted that the Belgrade Convention is an older convention, which was drafted in 1948. Since then, the world changed considerably. Although some levies / taxes have been included within the scope of the Convention, no proposals for additional levies have been made so far. In case the eleven Signatory States to the Convention would agree on the introduction of a new levy, it is probably possible to introduce it.
- **On the Moselle**: The Moselle Convention *allows for the collection of tolls* (Articles 22 to 27). The initiative to introduce any new form of rights on the Moselle needs to stem from the three Contracting States. Jointly they need to decide to introduce a new right. If all agree, the new law could become part of the legal framework.
- **On the Sava**: The Protocol on the Navigation Regime *does allow for the collection of payments*. According to Article 10 vessels operating on the Sava River and its tributaries could be asked to pay a fee or toll. Nevertheless, the fee collected cannot be used freely as it should be spent on fairway maintenance or upgrading of the fairway. Based on the Protocol on water pollution it is possible to ask a contribution based on the polluter pays principle. However, this only relates to water pollution and has not been specified in practice yet.

G5: What can we learn from the CDNI protocol, the scrapping fund and 'old-for-new' regulation in terms of the used approach and developed processes for solutions incorporating sector contributions?

Three schemes for IWT were analysed, which all introduced a kind of sector contribution. The schemes analysed are:

- CDNI on oily and greasy waste;
- scrapping fund;

- old-for-new regulation.

When analysing the different schemes, some overall lessons can be learned, which will be of added value considering the introduction of sector contribution for the greening of the IWT fleet. The main lessons learned can be summarised as follows:

- The initiative needs to be *laid down in a legal act*. Otherwise, it will not be possible to ensure payment of the contribution and there will be no basis for enforcement. The scheme would be purely voluntary, making the scheme less effective.
- The initiative should be introduced *on an international level* and should be *as inclusive as possible*. Leaving some parts of the sector out of the scheme, will diminish the success of it. It also affects the level playing field within the IWT sector, which in turn decreases sector support.
- The initiative should have a *measurable objective* in order to be successful. The more concrete the objective, the easier it is to assess whether or not the objective is met. Also amending the initiative is easier when the objective is clear.
- The initiative should *not introduce a tax or any other form of right* as this can be prohibited under international law.
- The initiative should ensure *sector willingness*. Without active sectoral support, the sector will take no action or will look for ways to circumvent the new rules. Besides sectoral support also *government support* is needed. In case one or more governments do not support the initiative, the introduction of a sectoral contribution is difficult to realise.

H1: What are potential market impacts of 'polluter pays' schemes in relation to:

a. Costs for the shippers and their competitiveness

b. Competition between vessel types

c. Competition between IWT operators from different countries

d. Competition between transport modes, notably with road haulage, with respect to undesired reverse modal shift impacts

H2: What is the effect of these measures on the modal share of IWT taking into account price elasticities for different type of markets in IWT?

The study analysed (a) the potential market impacts of a possible scheme of earmarked contributions towards a greening fund,(b) a concept in principal based on the polluter pays principle, and (c) what the possible effects could be on the modal share of IWT.

From **literature research** the following findings are most relevant:

- A transport efficiency of -0.1 and -0.2 seems a realistic assessment: 10 to 20% of an initial cost increase can be offset by increasing 'transport efficiency'.
- The overall net elasticity in demand is estimated at a value of -0.15. This means that an increase of costs of 1% is expected to result in 0.15% less demand for IWT (tonkilometers).
- Research on real life examples in situations with high oil prices and low water levels conclude that atypical cost increases due to low water situation rarely results in a substantial drop in demand. The same principle applies for changes in the oil price. The oil price has shown to be quite volatile over the past decade. Yet, the number of tonnes transported via inland waterways has been quite stable.

The IWT sector consists of different market segments with their own characteristics and market dynamics, which makes it difficult to make general statements from a top-down view on how earmarked contributions related to the fuel consumption would impact the market. As a result, a more bottom-up approach was followed in addition to review of literature on studies about price elasticities and market responses to prices increases.

To complement the literature research, eight different case studies were identified and analysed. These eight cases together fairly represent the IWT market. Based on case studies, interviews with

vessel operators and desk research, key indicators were identified that can provide direction on the expected market impact. These impacts can be categorised into market impacts within the IWT sector and impacts within the wider supply chain.

The findings show that when IWT operators are confronted with a new cost optimization problem due to earmarked contribution, they will most likely adapt their travel characteristics accordingly and to the extent that this is possible. The extent to which operators have the opportunity depends largely on the considered case and the (contractual) relationship with the shipper. The more these actors collaborate, the more the actors are able to offset the initial cost increase. An example of such a collaboration would be if the shipper and operator engage in a long-term contract, allowing the IWT operator to invest in more fuel efficient vessels and greening technologies, limiting the earmarked contribution, hereby assuming an earmarked contribution based on options 7 - 9 as contribution basis. On average, it is expected that around 10-20% of the (initial) cost increase can be offset by changing transport characteristics such as fuel usage and changing shipment size.

Furthermore, within the IWT sector itself, an earmarked contribution will have varying effects depending on the specific vessel used by the operators. Based on a desk study incorporating a number of representative vessel categories, an average contribution of 4 eurocent results in a total cost increase per transported ton or passenger between 0.6% and 2.1%, whereas with 8 eurocents, the cost increase fluctuates between 1.1% and 4.2% (assuming an average fuel price scenario).

It was confirmed with interviews conducted with vessel operators for the case studies and with desk research, that the cost increase due to a possible earmarked contribution equal to 4 up to (and to a lesser extent) 8 eurocent per litre bunkered fuel (or expressed by a contribution for the emitted amount of emission), would not result in drastically disruptive effects and will not disturb the competition between vessel types.

The situation is slightly different with regards to the competition between operators in different countries. Assuming an average fuel price scenario, fuel costs make up a slightly larger share in the total costs of companies active in the Danube countries compared to the Rhine countries,. These are the two main IWT markets in Europe, of which the Rhine market is by far the largest in number of vessels. Four vessel types were taken into account which are considered to be rather common for the Danube market. Fuel costs had on average a higher share in the total costs, approximately 3% up to 8% higher for operations involving the four vessel types in the Danube market as compared to the Rhine market. Hence, an increase in the costs related to the fuel consumption will have a relatively larger impact on the overall costs of those companies active in the Danube market.

On the other hand, the market structure in the Danube countries differs significantly from the one in the Rhine market. The Danube market is being dominated by relatively big companies, previous state-owned enterprises, which are nowadays privately owned. The Rhine market is characterised by a fragmented structure, mainly consisting of small family companies owning or operating one or two vessels. Large companies on the Danube my have better access to EU funding with higher funding rates from cohesion funds (currently being explored in the GRENDEL project).

Within the wider supply chain, vessel operators are hesitant to pass on cost increases further along the chain to actors such as shippers, as this might trigger shippers to select other vessel operators instead. On the other hand, the case studies found that most of the contracts include a ‘bunker adjustment factor’ (fuel clauses), enabling vessel operators to pass on higher fuel costs due to fuel price fluctuations. Furthermore, several case studies showed that the costs for the CDNI disposal

charge is passed on to the shipper by the vessel operator, and subsequently these costs are covered in the overall supply chain costs.

The share of the transportation cost in the overall supply chain cost is another determinant in the potential market impact. The larger the transport cost component is in the overall cost function, the larger the market impact is expected to be. Hence, market segments such as the gravel and sand sector are relatively more sensitive to cost increases due to earmarked contributions which are related to the fuel consumption, markets such as the wet bulk segment are less sensitive though.

In some cases, the shipper might be able to adapt the logistics chain. Hence, by moving production location which would lead to decreasing transport distances. For example, (i) by relocating factories, (ii) by importing goods via another seaports or (iii) by selecting another extraction site. For container and bulk transportation such as ore and coal, the risk of this impact is assessed to be low. In the gravel and sand sector however, there is a fear that cost increases would lead shipper to select other extraction sites.

In general, the price elasticity on demand is low in IWT. An example is the low water level period in 2018 which showed that the price elasticity of demand was around -0.15. This implicates that a price increase of 1% results in a demand drop of 0.15%. However, based on the case studies, it appeared that a cost increase related to the fuel consumption of 4 up to (and to a lesser extent) 8 eurocent/litre fuel will be negligible and not result in a drop-in demand for IWT.

Concerning the thresholds for the contribution, an average cost increase of 4 cent per litre seems to be acceptable. A cost increase of 8 cent per litre seems to be problematic for market segments such as sand and gravel and agribulk. The exception is inland waterway transportation in the Danube region, where there is fierce competition from other modes. In the Danube region, it is felt that an earmarked contribution of 1-2 cent per litre would already have significant market impacts.

H3: What are limitations as regards State aid regulation in view of providing funding from public bodies?

The basic framework on State aid rules applicable to the majority of the inland navigation countries has been analysed. Article 107 of the Treaty on the Functioning of the European Union (TFEU) lays down that aid granted by a Member State or through State resources should not distort competition and trade within the EU by favouring certain companies or the production of certain goods. From a legal point, there are restrictions on State aid to companies, as it can lead to market distortion at national level, but also between various European countries. However, under certain conditions, it is allowed to provide aid. Providing aid for greening the inland navigation fleet may be covered by (i) measures which are already the subject of a Commission approval decision (notified measures) (ii) measures that van be qualified as the *De-minimis* rule (no aid), or (iii) measures that fall within the General Block Exemption Regulation (GBER) (block exempted measures). Of all exemptions, the last group seems the most promising as in those, explicit references to inland navigation and greening are made.

The European State aid rules apply to all 27 Member States. This means that State aid rules apply to all inland navigation countries that are EU members. However, these rules do not apply to those inland navigation countries that are not a member. In some of those countries national rules on governmental support do exists, while in others such rules are absent. For instance, Ukraine has recently implemented new law laying down rules under which conditions government aid can be granted. In principle, the law does allow for State aid to the inland shipping sector, as long as the relevant conditions are fulfilled. In Switzerland, currently no rules on State aid for the IWT sector are

available. In case the governmental support would be required, new legislation should be drafted and implemented.

G6: What could be the revenues from a 'polluter pays' scheme?
H4: What could be the contribution from the IWT industry itself to cover higher costs of ownership?

For answering the questions G6 and H4, the potential revenues from a contribution by the IWT industry are calculated based on different sources:

- the results obtained in the PROMINENT project (closed in 2018)
- the options for a contribution which are considered feasible from desk research and interviews
- literature research on market impacts
- case studies and interviews with IWT companies indicating the acceptance for and possibility of a contribution from the sector itself.
- Analyses of the Reserve Fund

In order to easily express the acceptance and possibility for a contribution, four contribution scenarios were chosen linking to a contribution based on bunkered litre of fuel. Grounded on the fuel costs' impact, one could quickly assess the effects on their operation and competitiveness. The interviewees were asked to elaborate on a contribution based on the bunkered fuel ranging from a contribution of 4 cents up to 32 cents per bunkered litre (4, 8, 16 and 32 cents per litre). Centred on these elements, an overview is provided of the possible revenues taking the four options for the contribution basis into account.

Assuming a European wide contribution of vessel operators to a greening fund, ranging from a contribution of 4 cents up to 8 cents per litre bunkered fuel, the possible revenues solely on the basis of these contributions would range from € 53mln up to €106mln on an annual basis. Over a period of 25 years the total revenues would range from approximately € 1.3 bln up to € 2.6 bln. Per year, this amounts to an average of € 4,319 to € 8,637 per vessel. A contribution based on the bunkered fuel and the emission label/energy index of the vessel would result in differentiated rates.

The contribution levels of € 53mln up to € 106mln on annual basis, whereas the prior scenario seems more feasible as compared to the latter, can also be translated to a contribution based on the calculated or real-time measured emissions. Table 9.2 provides an overview for the four contribution options, with the rates expressed per litre of fuel and expressed per emission type (NOx, PM, CO2e).

Table 9.2: Options for contribution basis

Options for contribution basis	Contribution equal to 4 cent per litre on average (€ 53 mln per year)	Contribution equal to 8 cent per litre on average (€ 106 mln per year)
Option 6 Contribution based on a flat rate for the bunkered amount of fuel/energy	4 eurocent/litre bunkered fuel flat rate (not differentiated)	8 eurocent/ litre bunkered fuel flat rate (not differentiated)
Option 7 Contribution based on real-time measured emissions on board of vessels	0.79 euro/kg NOx 3.12 euro/kg PM 1.62 euro/ton CO_2e	1.59 euro/kg NOx 6.25 euro/kg PM 3.24 euro/ton CO_2e
Option 8 Contribution based on emissions calculated		

Options for contribution basis	Contribution equal to 4 cent per litre on average (€ 53 mln per year)	Contribution equal to 8 cent per litre on average (€ 106 mln per year)
Option 9 Contribution based on the emission Label/Energy Index combined with the bunkered amount of fuel/energy per vessel	4 eurocent/ litre bunkered fuel on average (differentiated)	8 eurocent/ litre bunkered fuel on average (differentiated)

In addition, there is the Reserve Fund, also often called the 'scrapping fund'. This is an European restructuring scheme consisting of a scrapping scheme and an 'old for new' scheme which was meant to (1) scrap redundant vessel capacity by giving the respective vessel owners a scrapping fee and to (2) prevent uncontrolled fleet expansion by means of a levy on new vessels. The updated regulation in 2014 specifically included provisions to address the emission reduction of the fleet and with a clear hint towards combining the Reserve Fund resources with other financial instruments (e.g. EIB, CEF). Taking into account the budget already allocated for the IWT Platform, there is a remaining fund of € 26.87 million available.

9.2 Recommendations in view of research question I

It is recommended to take into account for research question I (added value of a European funding / financing scheme) the sector contribution based on a contribution related to the fuel/energy consumption. It was proven that 4 and to a lesser extent 8 cent per litre of fuel is acceptable and realistic. Over the time span of 25 years (e.g. 2025-2050), this may result in revenues of € 1.3 - 2.6 billion. However, IWT operators active in the Danube market are more sensitive to price increases related to fuel consumption. The question is how and if operators in the Danube should be compensated. This is subject of research in research question F and I.

An earmarked contribution by the sector would need to be:

- implemented and collected on European scale in order to secure level playing field and acceptance;
- no general tax but earmarked and dedicated to reduction of emissions with a clear measurable objective (define 'near' zero-emission 2050 in a SMART way);
- based on a legal act, for example a European Union regulation and/or convention with Member States and third countries (non-EU Member States).

For such a scheme it is already clear that there is a need (added value) for a European fund with a proper governance to facilitate the contribution by the sector. A seat in the governance board for EBU, ESO and ESC is recommended to cover the interests of the vessel owners/operators, intermediaries, and shippers. Moreover, the available financial resources in the Reserve Fund may be used as a kick-start, while there could be a need for pre-financing of the Fund (e.g. by EIB). It can be further discussed with EBU and ESO if this can lead to a unanimous proposal from their side.

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Annex II – Interviews and meetings

#	Organisation	Date
	Research question G2	
1	SAB	
	Research question G3 and G4	
2	Moselle Commission	3 February 2020
3	Danube Commission	3 February 2020
4	CCNR	9 March 2020
5	Legal expert Switzerland	10 March 2020
6	Legal expert Ukraine	16 March 2020
7	Sava Commission	10 April 2020
	Research question G5	
8	Individual expert – CDNI	23 March 2020
9	Individual expert – all schemes	25 March 2020
10	EBU	9 April 2020
11	ESO	9 April 2020
	Research question H	
12-19	8 interviews with inland vessel operators	February-April 2020

Note: interviews that were conducted to gather input for the elaboration of the research questions.

#	Meeting	Date
1	Steering Group meeting (I&W, EBU, ESO, ESC & IWT Platform)	27 January 2020
2	Steering Group meeting (I&W, EBU, ESO, ESC & IWT Platform)	23 April 2020
3	Presentation to and discussion with the members of the Innovation & Greening Committee of the IWT Platform	26 May 2020
4	Meeting with Steering Group of Sub project I (CCNR Secretariat and national delegations)	04 June 2020
5	Stakeholder Group[126] meeting	30 June 2020

Note: the meetings were meant to present the obtained findings and results and to discuss these with the meeting participants. All participants had the opportunity to raise feedback either during and after the meeting. During the project, care has always been taken to incorporate received feedback in the best possible way in the report.

[126] Organisations which were invited to the Stakeholder Group meeting are: CCNR Secretariat and national delegations, EBU, EFIP, EIB, IWT Platform, VBW-EV, Rabobank, Via-Donau, Danube Commission, ESO, Sea Europe, CITBO, Mosel Commission, ESC and the project consortia of sub projects I,II and III.

Annex III – Market characteristics

Characteristics and supply chain organisation of sub-markets in IWT

1. Transport for coal fired power plants

Characteristics

Power generation in particular requires reliable coal delivery from seaports. Therefore, often coal shuttles with dedicated vessels are operated. They continuously supply large coal volumes from seaports and directly return without payload for the next coal shipment. The decision to choose IWT for coal transport is cost-driven, so that shippers have an incentive to use large dry bulk ship configurations realising significant economies of scale. Large push convoys consisting of a push boat and up to six barges, carry coal from seaports to destinations along the Rhine such as Duisburg. These convoys provide capacities of up to 18 000 tonnes and result in an extensive decrease of transport costs. Smaller trains with two barges supply power plants within domestic markets. Push convoys with vessels and up to two pushed barges as well as large self-propelled vessels are other alternatives.

Decreasing waterway dimensions and fairway depths between seaports and plants limits the size and load of ships for direct delivery. Transhipment and use of adjusted ships and loads may be an option. Larger ship configurations on sections with more favourable waterway dimensions allow more extensive cost reductions. For instance, in the German canal network adjacent to the Rhine the maximum small pushed trains with two barges or consisting of one vessel and one barge are allowed. However, power generators usually choose direct deliveries from seaports with smaller ships. Barge-barge transhipment often applies jointly with interim coal storage in inland terminals. Coal is mostly transhipped to rail at these terminals for plants without suitable waterway access.

Supply chain organisation

Coal logistic concepts of currently constructed plants along the German canal network show the relevance of customised solutions with respect to local conditions. Long-term agreements/contracts between plant operators, such as shippers and shipping lines are required to allow investments in adjusted ships. Logistic concepts include direct deliveries and avoid transhipments. Some customers, who choose to organise the supply chains themselves, use the spot market to attract vessel capacity. However, in most cases vessels operate under long term contracts, which are concluded between the customer on the one side and groupings of operators or large brokers on the other side of the market. Push convoys deliver to one plant. Low transport costs are an important factor for decisions on plant location and ship configuration. Furthermore, dedicated storage facilities in seaports and ships running continuously ensure a reliable coal supply.

2. Transport of coal, ore and metal products for the steel industry

Characteristics

Regular barge transports supply steel plants with raw materials. Often dedicated vessels run shuttle operations to ensure a reliable supply. Large ships carry bulky commodities to ensure low transport costs per unit. The largest ships operate along the Rhine between ZARA-ports and Duisburg. Push convoys with six barges carry up to 17 000 tonnes of iron ore. Waterway capabilities limit ship size and load on other sections of the waterway network. Depending on conditions, smaller pushed trains with about a 4 000 tonne capacity and self-propelled vessels with about a 2 500 tonne capacity are used on waterways adjacent to the Rhine.

Self-propelled vessels dominate the transport of break-bulk products. Ship size varies depending on size of consignments and waterway conditions. Small-sized vessels transport a significant share of steel industry products carried on inland waterways to customers at lower class waterways.

Supply chain organisation

Shippers use facilities in seaports and inland ports to store raw materials. Steel producers hold additional buffers on site at plants. In general, the strategic transport decisions depend on the location of steel plants and on the input source. Multimodal hinterland chains with transhipment from inland navigation to railway are an option and often such transhipments are connected with buffering raw materials in inland ports.

Steel producers are central actors in the supply chain and they decide on sourcing of inputs. A plant supply of inputs is already considered when planning. The organisation of chains depends on their sourcing strategy. If purchasing inputs directly at the source, the producers are usually involved in transport decisions. In contrast, traders might organise shipments of commodities. Apart from that, steel producers may outsource transport decisions.

In any case, the requirements of steel producers determine the modal choice. Customised logistic concepts are developed for regular standardised shipments of raw materials. Logistic concepts include sources, modes, frequency and shipment size as well as storage of raw materials.

As in other industries, the reliability of input flows is very important in the steel industry. A reliable input flow including buffers is one condition to avoid costly production stops. Among modes with sufficient reliability, cost dominates decisions on transport of inputs. As outlined regarding the coal supply of power plants, waterway conditions determine reliability and cost of inland navigation. IWT is very well positioned for input flows of the steel industry due to affinity of bulk commodities. Good links and direct waterway access of steel plants contribute to cost-efficiency of IWT. Plants without access to waterways and weakening waterway conditions distant to seaports give rise to integration of IWT in intermodal chains. Although for both transport of coals and ores, on some connections IWT has to compete to rail transport. The cost position of IWT relative to rail transport varies from case to case.

In particular, transport of raw materials is a large market for IWT. Transport volumes are related to production volumes of plants supplied by waterways. In competition with railways, low cost is a factor to choose IWT, provided there is reliable waterway connection and access near the plant. Among modes, IWT is the best and most able to accommodate the large bulk volumes. A reduction of steel related IWT of raw materials is likely related to a shift of production to non-European plants. Supply of raw materials from Ukraine and Russia are expected to gain importance. In many instances this type of IWT activity is strongly connected to the (planning of) infrastructure projects. IWT has a lower share in transport of steel products. Due to usually smaller batches and many destinations distant to waterways, these transports have a lower affinity to IWT. Rail transport is therefore mainly used for the distribution over Europe of heavy steel products (e.g. coils). For locations that are near waterways however, the heavy weight and bulkiness of goods could be a reason to choose IWT.

3. Liquid bulk transport for the petroleum and chemical industry

Characteristics

IWT related to mineral oil products and chemical industry is mostly the regular transport of raw materials. Shippers usually contract capacities in the long term. Logistic concepts often include dedicated ships for regular supply of particular commodities. Cost intensive cleaning of tanks, often required before carrying other commodities, is a reason for commodity-specific ships. IWT is

adjusted to conditions such as the volumes required and the storage available. Shuttles from seaports or between plants without return freight dominate. However, depending on supply chain characteristics return freight may be available and ship routing is adjusted to these freight flows. An example is a circle routing with subsequent transports.

Tank ships dominate in the chemical industry with its large share of liquid bulks. Large tank ships are used for bulk commodities shipped in large volumes such as mineral oil products. Along the main corridors with corresponding capabilities capacities above 3 500 tonnes ensure low costs per unit. On other waterways, smaller units adjusted to local capabilities are used. In general, shippers require ships with less capacity for smaller consignments. Ships with separate small-sized tanks for different commodities are an alternative. Furthermore, special tanks may be required due to the characteristics of the commodities. This applies in particular to gases, which account for a large share of IWT in the chemical industry. The prohibitive cleaning costs of tanks before carrying different commodities, tends to be dedicated to smaller tanks.

Double-hull tank ships are required for the transport of chemicals on waterways. An additional hull reduces the tank capacity of ships and increases the empty draught of vessels, which influences the price during periods of low water. Tank ships of a larger size are required to suit capacity requirements and allow comparable levels of cost reduction.

Supply chain organisation

Petroleum and chemical industry supply chains are interrelated and both include large liquid bulk flows. In the petroleum industry, crude oil imports arrive in seaports and are transported to refineries. Refineries either supply large consumers such as chemical plants or depots for further distribution with mineral oil products. A share of crude oil supplies is transported by pipeline. IWT accounts for a large share of other bulk transports depending on the location of the refinery and destination. Commodities have an affinity with IWT and plants within the petroleum and chemical industry are often located near water. Smaller mineral oil consumers are usually supplied from depots by road transport. Several plants within the chemical industry are large consumers supplied directly with mineral oil.

The chemical industry includes producers of base chemicals and special chemicals. They use mineral oil and chemical raw materials in production. Furthermore, semi-finished products are used as inputs to produce high-value chemicals. The interdependency of chemical production is one reason for the emergence of large chemical plants including different productions. A large share of raw materials is imported via seaports. Pipelines transport a significant volume of bulk. IWT relies in particular on wet connections for a large share of remaining bulk transports. While raw materials tend to be shipped in large volumes suitable for IWT the batch, size usually decreases along the supply chain towards finished products. The batch size of base chemicals is larger compared to special chemicals. Overall, products including a wide range of commodities and different degrees of vertical integration within the chemical industry make supply chains and related transports rather individual. However, all plants require the regular supply of large volumes of raw materials.

The most relevant actors for supply chain decisions are mineral oil product suppliers, producers in the chemical industry and end users of chemicals. They decide on product flows in production and distribution and corresponding transports. Decisions are determined by the requirements of production processes in the chemical and related industries. Relevant requirements arise on the supply and demand side of commodities. Furthermore, traders of mineral oil products and other chemicals decide on transport. Shippers' requirements (e.g. EBIS) are binding for brokers, who are assigned to organise transport along supply chains. The chemical industry outsources a large share of logistic activities to external providers.

The organisation of supply chains in the complex chemical industry is a challenging task. Producers require reliable transport of raw materials and semi-finished products to ensure continuous production. Frequent navigational restrictions could reduce reliability of IWT below acceptable levels. Storage along the chain and on site at plants reduces adverse impacts (e.g. on transport delays). However, emerging floating storage concepts tend to decrease a plant's reserves. They depend on the reliability of IWT.

Sufficient reliability provided, cost is the most important factor in transport decisions within the chemical industry. This applies in particular to large volumes of inputs. Relevance of inland navigation for particular transport flows depends on waterway access at origins and destinations as well as waterway connections. Corresponding to product flows connections with seaports and between plants are important. Availability of product pipelines negatively affects the share of IWT on particular liquid bulk routes. If a pipeline connection is available, it is superior to inland navigation for transporting liquid bulk transports. IWT is regarded as reliable despite restrictions such as changing water levels of rivers. Although changing water levels of rivers may limit payload, IWT of liquid bulk commodities achieves cost advantages in particular on wet connections when compared to railway and road transport. Furthermore, fairway depth and bridge clearance may limit ship size and cost advantage of IWT. The cost advantage is, depending on tank ship capacity, up to 50% on a typical liquid bulk route between Antwerp and Ludwigshafen.

Restrictions for the transport of dangerous goods by railway and road are another reason to choose IWT as a large share of goods in the chemical industry is classified as dangerous. The relevance of speed for transport decisions increases with the finishing of products along the supply chain. Packed chemicals account for a larger share among finished products. Furthermore, increasing volumes of chemicals are shipped in containers. Road and railway transport dominate transport of packed chemicals, while IWT accounts for a small share of volumes.

4. Container transport

Characteristics

The position of IWT along corridors depends on corresponding seaports as well as waterway conditions and inland terminal density in their hinterland. Strong seaports, good waterway links and a high quality network of inland terminals lead to above average IWT shares in the hinterland of Western seaports.

Liner services usually carry containers by inland waterways and in particular, between seaports and hinterland terminals shipping lines operate regularly scheduled services. These services carry containers from different shippers (merchant and carriers haulage). Large ships allow cost reduction and make IWT more competitive. However, waterway capabilities and sufficient demand are required for the operation of large ships. Waterway dimensions and in particular bridge clearance determines capacity. With respect to cost reduction, usually three-tier container transport on waterways is required to achieve cost levels competitive with railway and road transport. However, some two-tier container services are in operation. The Rhine corridor accommodates high capacity container transport. Depending on the section of the waterway up to six tiers are permitted.

Along the Danube pushed trains with four barges are regarded as optimum for future container transport. Three tiers yield a capacity of 576 TEU. In the hinterland of the Constanta port, four tiers are theoretically possible for transports to Belgrade. The number of maximum container levels decreases to three on the Danube further to the West, for example in Austria and Bavaria, due to bridge clearance. Additionally limited water levels on the Danube affect the loading capacity of vessels.

Supply chain organisation

Overseas containers are, especially along the River Rhine, transported into the hinterland by IWT. Containers are predominantly loaded with small sized consumer goods imported or destined for export. In the origin region, either single shippers with sufficient volumes dispatch loaded containers or logistic enterprises (for example inland terminal operators) consolidate LCL (Less than Container Load). In destination regions, wholesalers and large retailers receiving FCL (Full Container Load) usually deconsolidate containers. Apart from that, logistic providers deconsolidate container shipments and distribute consumer goods. With the growing logistic efficiency of IWT, container transport increases continuously on waterways in seaports in the hinterland. However, road and railway transport still dominate in this market segment. A major share of container transport on inland waterways is a component of long intermodal transport chains passing terminals for instance inland ports. Container transport accounts for a large share of sea-river transport. Sea transport directly from and to inland ports avoids transhipments of containers in seaports.

A wide range of actors such as suppliers, importers and retailers determine global shipping decisions. Shippers dispatch a different number of individual consignments with a limited batch size. In particular, shippers with few shipments outsource transport organisation to forwarders and logistic service providers. In general, third parties have a strong influence on global supply chains of consumer goods. They operate global container networks and provide door-to-door transport. A large number of different shippers use such networks. In the seaport hinterland transport maritime shipping lines have a strong influence (e.g. Maersk, CMA CGM, MSC). They decide on what containers are shipped under carrier's haulage. Costs are less relevant for modal choice in container transport, as costs are very low in relation to the high value of consumer goods. However, hinterland transport accounts for a large share of cost in the door-to-door intercontinental container transport. Therefore, costs of IWT and related transhipments are an important factor. This applies in particular to maritime shipping lines deciding on container hinterland transport ('carrier haulage). This intercontinental container cargo transport by IWT is generally not time-critical. Many import goods from Asia for example stay on deep-sea vessels for a few weeks (e.g. transport from Shanghai to Rotterdam takes approximately 28 days).

The container capacity of ships determines competitiveness of IWT in terms of cost. Capacity of particular ships depends on the number of container levels possible. Bridge clearance is a limiting factor. Low clearance reduces tiers and may lead to non-competitive cost levels per container.

IWT has a significant cost advantage on typical container routes. IWT is more than 40% cheaper compared to other modes between Rotterdam and Duisburg employing high capacity ships of Jowi-class or coupled convoys. The cost advantage further upstream, i.e. between Rotterdam and Basel, is also considerable when operating coupled convoys, although when pre-/end haulage distances to shippers increase rail transport becomes an interesting alternative. However, considering limited pre-/end haulage IWT remains cost leader also due to better access to the large number of different terminals in the seaports compared to rail.

Quality aspects are becoming more and more important in container transport. Relevant criteria in this respect are reliability, speed and flexibility of modes. Relevance of reliability becomes apparent, as container shippers often back transports by other modes to ensure in-time delivery. Container transport on waterways is very reliable. Congestion is no issue on waterways and changing waterway levels are usually not that critical for container ships. However, congestion in the seaports occurs frequently, which causes additional costs due to the increase of waiting times for vessels for loading/unloading.

In particular, in the continental cargo market the limited speed of IWT may increase the time to market of goods to above acceptable levels as these chains are used to the speeds of road haulage and rail. However, unloaded containers are usually not that time critical and they have an affinity to IWT. The waterway network limits spatial flexibility of IWT. Flexibility in terms of time is provided with regular liner services connecting seaports and inland ports. A growing inland terminal network and more frequencies of container lines improve flexibility for container shippers using IWT. In particular, container transport demands the implementation of information and communication technologies in IWT in order to optimise port processes and load rates of vessels.

5. Transport of agribulk

Characteristics

Mainly dry cargo motor vessels are used to transport the products in the agribulk-market but occasionally push barges may also be used. Generally, the smaller and medium-sized motor cargo vessels specialise in the agribulk supply chains. The vessels, therefore, often do not require the maximum dimensions of the waterways.

Most of the IWT services are demanded via spot markets although some cargo flows are transported under longer-term contracts. In general, transport volume developments in this sector are quite stable and are not really influenced by the economic climate. Often more important drivers are the weather, which influences the size of the harvest (e.g. grain), the size of the livestock and changes in the size of the population.

In the future, it can also be expected that more and more agricultural bulk products will be used for the production of energy and bio fuels to replace fossil fuels. This is expected to create a gradually increasing transport demand for IWT. This will, in addition, increase the dependence of this sector on development in the general economy. This type of product will then be transported by liquid cargo motor vessels.

Supply chain organisation

Looking at the composition of animal bulk products transported one could distinguish four distinct supply chains/ sub-segments in the market: Animal feed, Grains/Wheat, Fertilizers and Oil seeds.

Animal feed customers are often large co-operations of farmers and the final consumer here is of course cattle breeding farms. IWT is primarily used in the transport from seaports to large agricultural co-operations. The animal feed generally does not originate in seaport areas but is shipped to these from overseas. Road freight transport companies usually do the final distribution in the supply to cattle breeding farms.

The final consumers in the supply chains of grains are both farmers (cattle feed) and the food processing industry. As can be seen, sourcing within the continent is more important in this supply chain than the animal feed market.

Fertilizers are produced by the agro-chemical industry. Raw materials (e.g. phosphates) are shipped to these companies by sea. IWT is being used for hinterland transport to plants or to agricultural co-operations from where farms are being supplied. The type of farmer is grows crops.

Oil seeds are used by some chemical plants and to a lesser extent the food processing industry. Many vegetable oils are used to make soaps or other skin products, candles, perfumes and other cosmetic products. This is also a flow, which is strongly related to seaports

6. Transport for the construction industry

Characteristics

For the transport of raw materials to construction industry plants, usually small, medium and large vessels are use. For example, concrete plants are often located along smaller waterways, as they depend on the benefits of lower transport costs by IWT and secondly are required to be close to their clients/service due to limitations to the specific nature of their products (e.g. limited transport range in urban areas of concrete trucks). Obviously when plants are located along rivers or in ports accessible to large vessels, the shipper can benefit from even lower freight rates in comparison to other modes.

In the transport to/from large infrastructure projects both small and medium-sized, motor vessels are used with the occasional push barge. Because the locations of construction sites vary over the course of time, different vessel types might be useful in different projects. In the market segment of transport of river or sea sand, however, a substantial number of specific IWT vessels operate that are also used in the process of mining/pumping up the sand. Those vessels, which are active primarily in the Netherlands and Belgium, are characteristic for this particular IWT market segment. Generally, this type of transport is not time-critical and can be planned and scheduled.

Supply chain organisation

The supply chains of material (mainly gravel) from mining/win locations to production plants, which manufacture specific materials for construction, are comparatively simple and the geographic patterns are fixed. Most plants are located close to waterways and the market share of IWT in this supply chain is very significant in countries with a dense waterway network (e.g. the Netherlands). The IWT services required in this particular market segment are frequently contracted via the spot market although a sizeable part of the transport volumes is also channelled through the term market or by means of internal contracts for own account transport. Some of the raw material trading and production companies have their own fleet of vessels to ensure transport capacity.

The supply chain of sand to infrastructure projects or large housing projects is more complex because those projects will not necessarily be located close to waterways. Although the destinations for the time being are fixed in the longer term, this market does not have fixed destinations. In many instances this type of IWT activity is strongly connected to the (planning of the) infrastructure project itself and therefore, the marketing and pricing of the transport flows is primarily realised in long term contracts with the contractor of the infrastructure project or the builder of the project.

Annex IV – Average annual costs for representative fleet families / vessel types

Fleet family	Passenger vessels (hotel/cruise vessels)	Push boats <500 kW	Push boats 500-2000 kW	Push boats 500-2000 kW	Push boats >=2000 kW		Motorvessel dry cargo >=110m length		Motorvessel liquid cargo >=110m length	M11	M12	Motorvessel dry cargo 80-109m length	Motorvessel dry cargo 80-109m length	Motorvessel dry cargo 80-109m length	Motorvessel liquid cargo 80-109m length	Motorvessels <80 m. length				Coupled convoys (mainly class Va + Europe II lighter)
Vessel type representative vessels	**PAX 135m**	**PB <500 kW**	**PushB2L 500-2000kW**	**PushBII-1, 500-2000kW**	**Push B4 > 2000 kW**	**Push B6 > 2000 kW**	**MVS 110m**	**MVS 135m**	**MTS 110m**	**MTS 135m**	**MTS 135M**	**MVS 80m**	**MVS 86m**	**MVS 105m**	**MTS 86m**	**MVS 67m**	**MVS 55m**	**MVS 50m**	**MVS 38,5m**	**C3L/B**
Length	135,00		3,00		116,50		110,00	135,00	110,00	135,00	135,00	80,00	86,00	105,00	86,00	67,00	55,00	50,00	38,50	110 + 80
Width	11,45		11,40	11,40	15 / 11,4		11,40	11,45	11,40	11,45	17,00	8,20	9,50	9,50	9,50	8,20	7,20	6,60	5,05	11,40
Draught	2,00		3,00		1,72 / 4		3,50	3,30	3,50	4,00	3,80	2,70	2,90	3,00	3,20	2,70	2,60	2,60	2,50	3,40
Max payload (t)			5000 / 352 TEU		11200,00		3043,04	3300/268 teu	2908,00	4290 (5320 m3)	6228,00	1250,00	1522,00	2050,00	1680 (1918m3)	985,00	652,63	650,00	400,00	5500,00
Operational hours/year	4318,00	3360,00	8064,00	4313,00	8064,00	8064,00	4318,00	7898,00	4318,00	7898,00	7898,00	3499,00	3971,00	4013,00	3971,00	3778,00	3874,00	3830,00	3265,00	8064,00
engines	2,00	1,00	2,00	2,00	3,00	3,00	1,00	2,00	1,06	2,00	2,00	1,00	1,09	1,10	1,00	1,16	1,00	1,00	1,00	2,00
Installed kW	1492,00	400,00	1249,00	1249,00	4080,00	4080,00	1526,77	1492,00	1549,95	2347,00	2370,00	700,00	756,09	1286,00	1209,67	444,55	318,50	300,00	220,00	2351,00
Payload			243 TEU / 2550 ton		11200,00		2038,84	187 TEU / approx. 1960 ton	1948,36	2917,20	4750,00	750,00	1095,84		1209,60	758,45	502,52	500,00	350,00	3795,00
Total fixed costs per year	**€ 1.502.144**	**€ 71.755**	**€ 756.343**	**€ 266.877**	**€ 1.629.215**	**€ 2.155.408**	**€ 286.821**	**€ 436.038**	**€ 546.535**	**€ 950.553**	**€ 1.127.251**	**€ 78.621**	**€ 128.192**	**€ 186.361**	**€ 239.454**	**€ 62.493**	**€ 59.418**	**€ 52.557**	**€ 26.850**	**€ 568.370**
Total labour costs per year	**€ 1.429.672**	**€ 98.655**	**€ 480.060**	**€ 310.133**	**€ 610.746**	**€ 687.780**	**€ 171.686**	**€ 451.196**	**€ 219.353**	**€ 469.743**	**€ 469.743**	**€ 102.914**	**€ 128.817**	**€ 150.286**	**€ 141.246**	**€ 96.904**	**€ 100.733**	**€ 98.437**	**€ 73.478**	**€ 475.698**
Total fuel costs per year (average fuel price)	**€ 215.956**	**€ 40.547**	**€ 69.625**	**€ 87.812**	**€ 545.370**	**€ 1.157.684**	**€ 153.092**	**€ 235.064**	**€ 177.111**	**€ 175.620**	**€ 175.620**	**€ 54.780**	**€ 76.297**	**€ 153.014**	**€ 134.000**	**€ 39.742**	**€ 23.464**	**€ 16.670**	**€ 11.168**	**€ 274.815**
Total costs	**€ 3.147.773**	**€ 210.956**	**€ 1.306.029**	**€ 664.822**	**€ 2.785.331**	**€ 4.000.872**	**€ 611.598**	**€ 1.122.299**	**€ 942.999**	**€ 1.595.916**	**€ 1.772.614**	**€ 236.315**	**€ 333.306**	**€ 489.660**	**€ 514.700**	**€ 199.138**	**€ 183.615**	**€ 167.664**	**€ 111.496**	**€ 1.318.883**
Share of fixed costs in total average costs	**47,72%**	**34,01%**	**57,91%**	**40,14%**	**58,49%**	**53,87%**	**46,90%**	**38,85%**	**57,96%**	**59,56%**	**63,59%**	**33,27%**	**38,46%**	**38,06%**	**46,52%**	**31,38%**	**32,36%**	**31,35%**	**24,08%**	**43,09%**
Share of labour costs in total average costs	**45,42%**	**46,77%**	**36,76%**	**46,65%**	**21,93%**	**17,19%**	**28,07%**	**40,20%**	**23,26%**	**29,43%**	**26,50%**	**43,55%**	**38,65%**	**30,69%**	**27,44%**	**48,66%**	**54,86%**	**58,71%**	**65,90%**	**36,07%**
Share of fuel costs in total average costs	**6,86%**	**19,22%**	**5,33%**	**13,21%**	**19,58%**	**28,94%**	**25,03%**	**20,94%**	**18,78%**	**11,00%**	**9,91%**	**23,18%**	**22,89%**	**31,25%**	**26,03%**	**19,96%**	**12,78%**	**9,94%**	**10,02%**	**20,84%**

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