NexTrust

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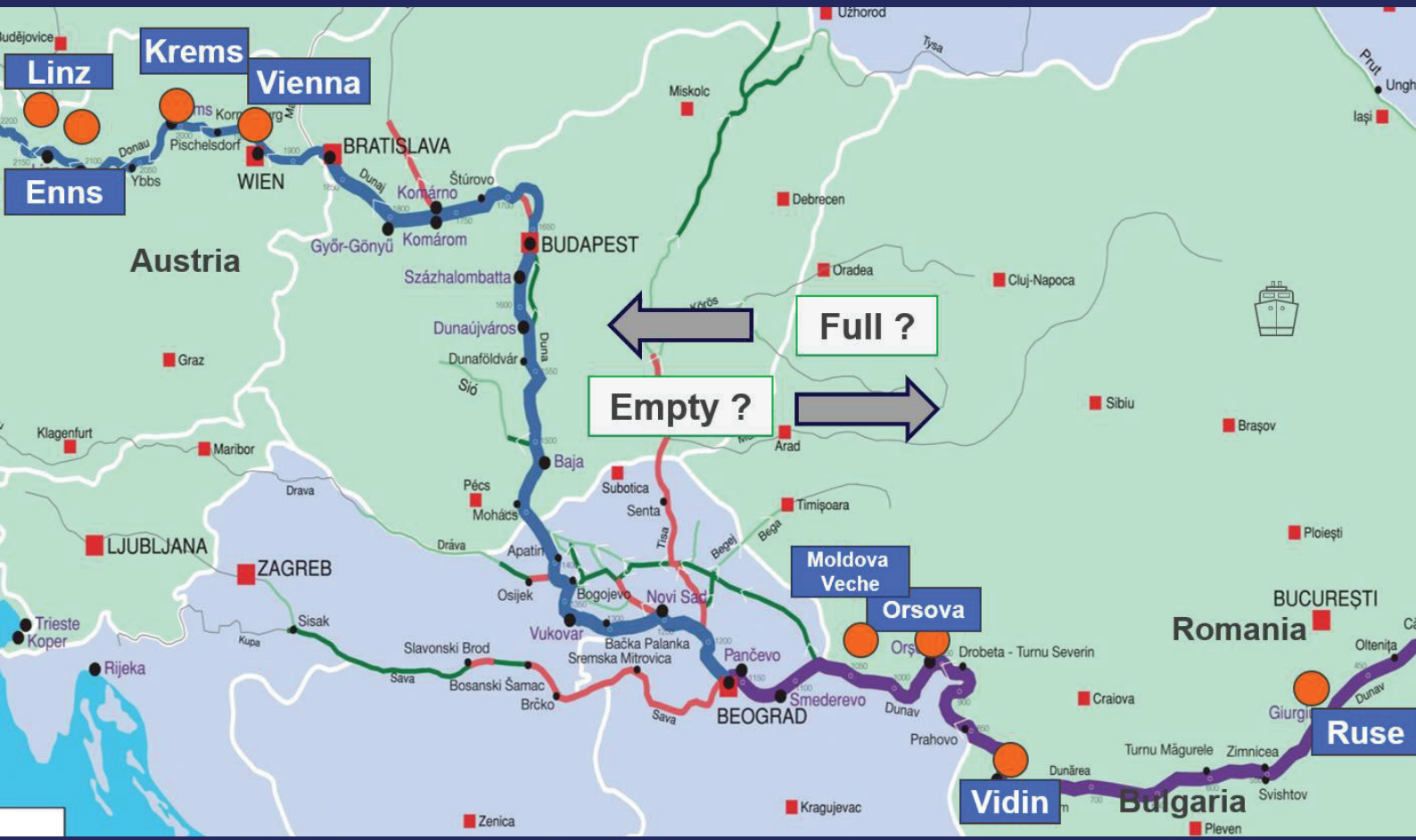
NexTrust Pilot 3.4 Case Study:

Avoiding Empty Barges on an Existing Danube Waterway Service



Main authors:
Christian Strasser (Bluewave GmbH, Vienna)
Dr. Patrick Stumm (Pastu Consult Green BVBA, Brussels)
Gerald Piller (Wenzel Logistics GmbH, Graz)

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NexTrust Pilot 3.4 Case Study: Avoiding Empty Barges on an Existing Danube Waterway Service

1. Introduction

The freight supply chains across Europe account for 25% of the CO2 and particulate emissions. In addition, the lack of collaboration in the use of motive and warehousing assets leads to high levels of inefficiency when looked at from a European perspective although for individual organisations their operations appear optimised particularly for Customer Service.

NexTrust, a EU grant funded Horizon 2020 project (Grant 635874), was setup to bring together like minded actors in the supply chain to raise asset utilisation levels and reduce Green House Gas emissions through collaborative pilots.

Up to now, actors in the supply chain, such as manufacturers, importers, retailers, exporters and logistics companies are generally reluctant to pilot or utilise new methodologies or new routes to market as there are many examples of costly implementation failure. It is a very fragmented market with 10,000s of people making day to day decisions of freight routing. Collaboration takes time to setup and these decision makers are time-poor as well. In order to overcome actors' hesitation to participate, the most important aspects for successful collaboration were identified prior to the elaboration of the pilots:

- Careful planning of the project
- An agreement to, transparently, share the savings generated net of any additional costs
- Agreements on the planning and administrative processes to be used
- Routes to deal with any disagreements

Importantly the use of a Trustee to receive data, analyse the best matched routes and distribute back the plans. This would be a daily (at least) dynamic process. The Trustee also covered the confidentiality and anti-trust concerns about the pooling of data.

The research activities of NexTrust in Pilot 3.4 looked at both the supply and demand sides of the Supply Chain to understand whether the horizontal collaboration model with a trustee function could also be applied successfully on multimodal supply chain concepts.

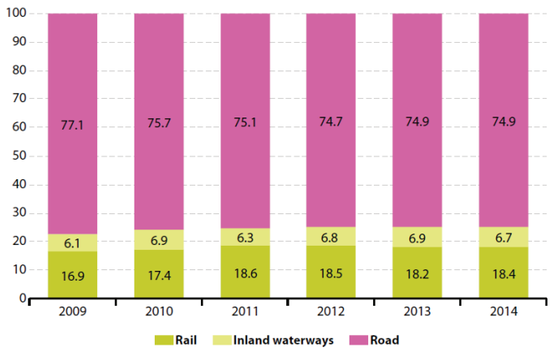
The Multimodal Supply Chains in question for this case study focussed on the barge movements of "bulky" freight loads as these can be technically better transported by barge on an Inland waterway and are part of the so called "traditional" inland waterway market. In 2016 almost 9.1 million tons of goods were transported on the Austrian section of the Danube. There were good traffic volumes for agricultural and forestry products as well as fertilizers or metal products and Austria imported raw materials through this route as well.

2. Goals and Objective

The overall freight share of total EU GHG emissions is around 8% and is one of the 'most challenging sectors' in which to achieve emission reductions. There are lot of initiatives and way to look into reducing the greenhouse gas (GHG) emissions impact of transportation.

The NexTrust project is tackling the GHG emissions problem with an innovative business model which facilitates trusted collaboration in transportation to increase efficiency and sustainability in European logistics. NexTrust therefore looked into the entire transport supply chain and in different freight transport segments.

Figure 3.2.1: Modal split of inland freight transport, EU-28, 2009–14 (¹)
(% of total inland tkm)



While freight will probably continue to be transported by truck when it comes to short distances, freight transportation over medium and long distances can be shifted to environmental friendly modes.

Within NexTrust the research activities defined the task to look into the freight segment of inland waterway, concretely of the Danube waterway. The Danube transport axis has a total length of 2,845 kilometres, and is the second longest waterway in Europe.

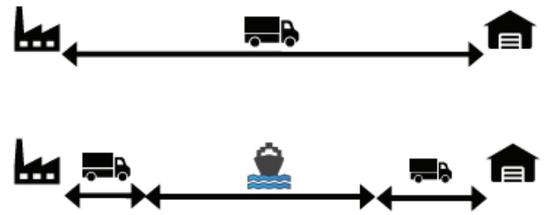
The main goal of the Danube demonstrator are the following:
- Enabling demand sided horizontal collaboration between shippers in order to bundle freight flows and avoid empty running on the Danube waterway
- Defining the appropriate trusted collaboration business model, which can be applied in the context of the Danube Inland Waterway.

2.1 The scope and need

This pilot demonstrator looked into the inbound and outbound freight flows along the Danube Inland Waterway, as visualized in the picture below.

Transportation Flows in Scope

Similar Packaged or Handled Compatible Freight Forms: Containers, Compatible dry or liquid goods movements in bulk or tankers, Full-truck RoRo loads (FTL) of Inbound and Outbound Freight Flows • From suppliers to production plants • From production plants to distribution centres (DC's) • From DC's to Customers • Between production plants, between DC's, etc Using Road only or a mixture of Road and River.



There was a particular focus on "bulky" FTL's as these can be technically better transported by Inland Waterway by barge and are part of the so called "traditional" inland waterway market.

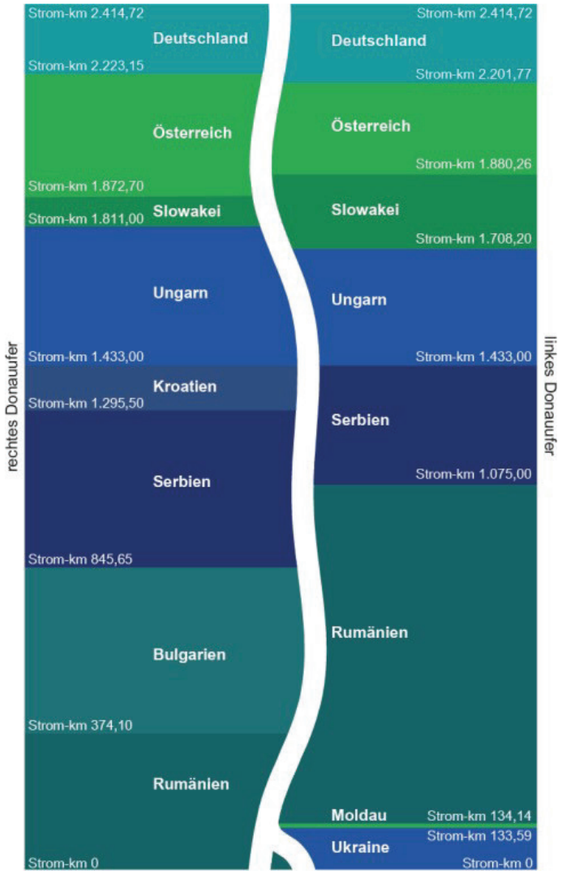
In addition the research activities identified that Austria is importing raw material from Eastern Europe for the production of goods and intermediate materials. The challenge is that the inland waterway assets (barge and motor vessels) are used for the importation of the raw material for the Austrian market, but then they return empty. At the same time, there is a lot of trade exchange and industry freight movements between the countries from Austria to Hungary, Romania and Bulgaria, areas which are close to the Danube river.

The need is to achieve a balanced traffic flow in roundtrip fashion between the different Danube levels of Upper Danube (Austria), Middle Danube (Hungary) and Lower Danube (Romania/Bulgaria).

Today the vessel operators have return loads in a non-structured way and more by coincidence and a matter of luck than really planned and structured. With a roundtrip on the Danube waterway (A->B->A), assets can be better utilized, achieve cost effectiveness and thus enhance the sustainability of the freight transportation.

3. Description of the ‘as-is’ situation of the Danube freight business

These research activities tackled a special and unique transport mode: the inland water way of the Danube. Before applying the trusted collaboration model to this mode of freight transportation, the researchers needed to look into the particularities of the Danube. It is important to understand the Danube technical specifications and the freight movements, before putting the research results into the appropriate context.



The main source for the technical information below and in the Appendices are from from Donau - Österreichische Wasserstraßen- Gesellschaft mbH, http://www.viadonau.org/home/. The latest period published is February-March 2018.

3.1 The Danube transport axis

With a total length of 2,845 kilometres, after the Volga river, the Danube is the second longest in Europe. Almost 2,415 kilometres of the river (from Kelheim to Sulina) are navigable.

The Danube flows through ten riparian countries on its way from the Black Forest (Germany) to its delta in the Black Sea (Romania and Ukraine) and is the most international river in the world. Since the opening of the Main-Danube Canal in 1992, the Rhine-Main-Danube waterway has connected a total of 14 European Countries. The total length between the mouth of the Danube at the Black Sea and the point where the Rhine flows into the North Sea is 3,504 kilometres. The connection between the Rhine-Main region and the Danube is made via the 171 kilometre long Rhine-Main-Danube Canal.

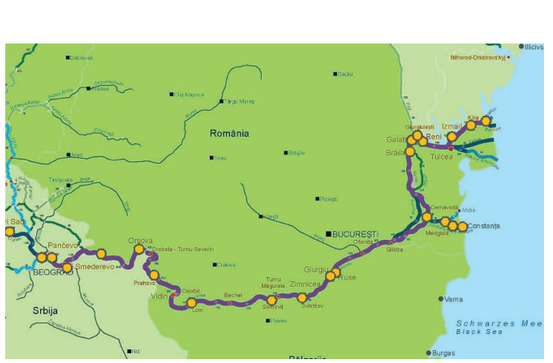
No shipping charges are levied for traffic on the international waterways of the Danube and Rhine. However, a fee is payable for traffic on the Main-Danube Canal (Germany) and the Danube-Black Sea Canal (Romania). This is due to the fact that these are national waterways that are not subject to the provisions of the Belgrade Convention of 1948. This Convention established the principle of free navigation on the Danube for all merchant ships flying the flags of the Danube riparian countries.

Length	• 2,415 km from Kelheim to Sulina as an international waterway • 2,845 km from the convergence of the headwaters of the streams Breg and Brigach at Donaueschingen in the Black Forest in Germany • 2,888 km from the source of the larger feeder stream Breg in Furtwangen
Catchment area	801,463 km² (66% of the inflow comes from tributaries on the right bank and 34% from the left-bank)
Northernmost point	Regensburg (Germany); River km 2,382
Southernmost point	Svishtov (BG); River km 554
Kilometrage	From the mouth of the central Delta arm on the Black Sea; 0-km mark at Sulina

Danube ports

Ports and transhipment sites connect the transport modes of road, rail and waterway and are important service providers in the fields of transhipment, storage and logistics.. As multimodal logistics hubs, they act as a central interface between the various modes of transport.

Danube ports and transhipment sites with regular transhipment of agricultural goods (upper Danube).

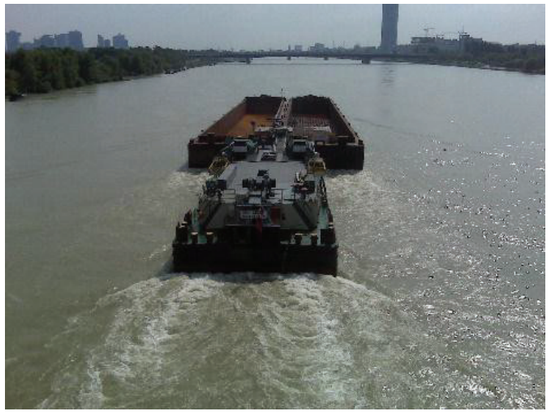


Danube ports and transhipment sites with regular transhipment of agricultural goods (lower Danube).

3.2 The type of inland waterway equipment

Depending on the combination of their propulsion systems and cargo holds, basically three types of cargo vessels are used on the Danube and its navigable tributaries:

Motor cargo vessels (or “self-propelled vessels”) are equipped with an engine and a cargo hold. Motor cargo vessels can be subdivided into dry cargo vessels, tankers, container vessels and Ro-Ro vessels (see below “Main types of vessels according to cargo type”).



Pushed convoys consist of a pusher (motorised vessel used for pushing) and one or more non-motorised pushed lighters that are firmly attached to the pushing unit. We talk about a coupled formation or pushed-coupled convoy if a motor cargo vessel is used for propelling the formation or convoy instead of a pusher.

Tugs are used to tow non-motorised vessel units, so-called barges (vessels for carriage of goods with a helm for steering). Towed convoys are rarely used on the Danube anymore because they are less cost-effective than pushed convoys.

Main types of vessels according to cargo type

Types of cargo vessels can be further characterised based on cargo types

Dry cargo vessels

Dry cargo vessels are used for transporting a wide variety of goods including log wood, steel coils, grain and ore. These vessels can be used for almost anything and therefore reduce the number of empty runs (journeys with no return cargo). This class of vessel can generally carry between 1,000 and 2,000 tons of goods and is often used on the Danube in coupled formations or pushed-coupled convoys. Dry cargo vessels can be divided into the three main classes that are shown in the figure to the right along with the trucks displaced when using the barge.

Gustav Koenigs	
Length:	67 m
Width:	8.2 m
Max. draught:	2.5 m
Deadweight (dt):	900 t

Europaschiff	
Length:	85 m
Width:	9.5 m
Max. draught:	2.5 m
Deadweight (dt):	1,350 t

Large motor vessel	
Length:	95 m / 110 m
Width:	11.4 m / 11.4 m
Max. draught:	2.7 m / 3.5 m
Deadweight (dt):	2,000 t / 3,000 t

Source: Voies navigables de France

Main types of dry cargo vessels

Container vessels

Container vessels are ships constructed specifically for the transport of containers and are currently used primarily in the Rhine region. In the Danube region container convoys with four pushed lighters are regarded as the best way to increase capacity. Such a pushed convoy has a total loading capacity of up to 576 TEU – each pushed lighter can therefore carry 144 TEU, i.e. three layers of containers with 48 TEU each.

Container vessel	
Length:	135 m
Width:	17.0 m
Max. draught:	3.7 m
Deadweight (dwt):	470 TEU

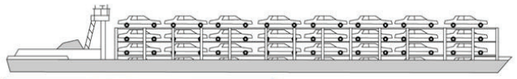
JOWI class Rhine container vessel

Source: Voies navigables de France

RoRo vessels

Roll-on-Roll-off means that the goods being transported can be loaded and unloaded using their own motive power via port or vessel ramps. The most important types of goods transported in this way include passenger cars, construction and agricultural machinery, articulated vehicles and semi-trailers (“floating road”) as well as heavy cargo and oversized goods.

The majority of Ro-Ro transport operations are carried out with specially constructed vessels such as catamarans. Catamarans are vessels with a double hull in which the two hulls are connected by the deck, which forms a large loading surface for the rolling goods.



Ro-Ro vessel	
Length:	105 m
Width:	9.5 m
Max. draught:	1.4 m

Type parameters of a Ro-Ro vessel

Source: Voies navigables de France

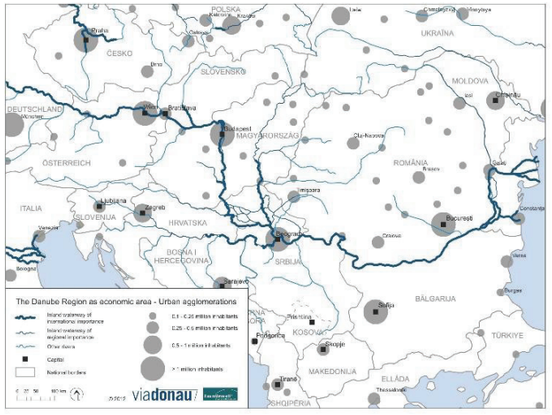
3.3 Overview of registered shipping companies and brokers

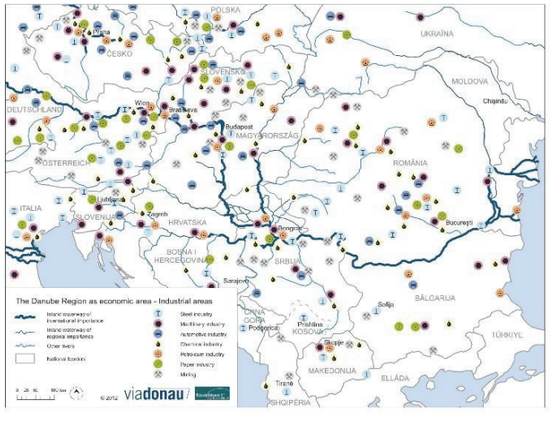
The Danube freight transportation market consists of dedicated companies, which are acting in the inland waterway sector. However, there is hardly any logistic service provider active, who is offering its service in the full truck load business on the road. Hence the market and target group of the Danube demonstrator needs to engage another freight market than the other NexTrust pilot cases. Below we summarise some main Danube players.

3.4 Potentials of the Danube market

The Danube as an axis of economic development

In its function as a transport axis the Danube connects key procurement, production and sales markets that have significant European importance. The gradual integration of the Danube riparian states into the European Union has led to the establishment of dynamic economic areas and trading links along the waterway. Slovakia’s and Hungary’s accession to the EU in 2004 followed by Bulgaria and Romania in 2007 and Croatia in 2013 has seen - the beginning of a new phase of economic development in the Danube region. Serbia received accession candidate status in March 2012.





With nearly 90 million inhabitants, the Danube region is of great economic interest due to its sheer size alone. The economic and political heterogeneity that distinguishes the region is coupled with a dynamic development that is unparalleled anywhere else in Europe. The focus of this economic development lies in the capital cities of the Danube countries. Other urban areas are also playing an ever growing role, in particular as consumer and sales markets.

The Danube waterway, as a transport mode, can make a major contribution here by supplying these centres with raw materials, semi-finished and finished products as well as with the disposal of existing substances and waste. The Danube is also of particular importance as a transport mode for the industrial sites that are located along the Danube corridor.

- Bulk freight capacity
- Proximity to commodity markets
- Ample free transport capacity and
- Low transport costs

All these factors add up to make inland navigation the logical partner for resource-intensive industries. Many production facilities for the steel, paper, oil and chemical industries, as well as for the mechanical engineering and automotive industry, are to be found within the catchment area of the Danube. Project cargo and high-quality general cargo are now being transported on the Danube in ever increasing numbers in addition to the traditional bulk cargo.

Due to its fertile soil the Danube region is an important area for the cultivation of agricultural raw materials. These not only serve to ensure the sustainable provision of the urban areas in the vicinity of the Danube, they are also transported along the logistical axis of the Danube before being processed further. The ports and transhipment

sites along the Danube play an important role in this respect as locations for storage and processing and as goods collection points and distribution-centres. A considerable amount of these agricultural goods is exported overseas via the Rhine-Main-Danube axis and the respective sea ports (the North Sea, Black Sea).

3.5 The Danube market - demand sided perspective

The demand side of the inland waterway transport market includes, for the most part, cargo owners, i.e. industrial companies that receive or convey goods. Furthermore, forwarders and logistics service providers are also active in carrying out transport for third parties as well.

Traditional markets for Danube navigation

Due to the large volume of goods that can be transported on a vessel unit, inland navigation vessels are ideally suited to the transportation of bulk goods. If planned and correctly implemented, transport costs can be reduced significantly in comparison to road and rail, a fact that adequately compensates for longer transport times. The inland vessel is especially suitable for the transport of large cargoes of low value goods.

However, the system requires the availability of high-quality logistics services along the waterway (transhipment, storage, processing, collection/ distribution). Many companies use Danube navigation as a fixed part of their logistics chain. The immense bulk freight capacity of inland navigation vessels is currently utilised predominantly by the metal industry, agriculture, forestry and the mineral oil industry.

Inland navigation is an extremely important mode of transport for the steel industry. Approximately 25-30% of the total amount of all raw materials, ore for example, is transported on the Austrian stretch of the Danube. Due to their heavy weight, semi-finished and finished goods such as steel coils can also be transported economically using inland navigation.

The most important steelworks in Austria is voestalpine, which is located in Linz. This company operates its own port at its steelworks and has an annual waterside transhipment of 3-4 million tons. This is also Austria's most important port, which has been responsible for the handling of almost half of all waterside transhipment in Austria in recent years.

Other major steel plants in the Danube region are located at Dunaújváros/Hungary (ISD Dunaferr Group) and Galați/Romania (ArcelorMittal).

Demand, and thereore also the flow of goods, from the agriculture and forestry sector can fluctuate greatly from one year to the next. Agriculture is dependent to a great extent on weather conditions (precipitation, temperature, days of sunshine per year). Crop failures in a region due to bad weather conditions can lead to an increase in the volume of transported goods required to cover the needs of the respective. Grain and oilseed are the main products transported on the Danube. The transportation of wood is also growing in importance due to the increasing demand from processing industries and biomass plants. Agricultural and forestry products together account for around 20% of the total volume of goods transported annually on the Austrian stretch of the Danube. Many companies in Austria trading in agricultural products or involved in the processing of such goods (i.e. starch, foodstuffs and animal fodder, biogenic fuel, timber) have settled directly on the waterway. Many companies have already set up factory transhipment sites or have settled in a port where they operate their silos or processing plants. This enables transport on inland vessels with no pre- or end- haulage, thereby enabling companies to benefit from particularly low transport costs.

Petroleum products from the mineral oil industry account for another 20% of the total transport volume on the Austrian stretch of the Danube and therefore constitute a major market. In the Danube region there are many refineries located either on or near the Danube.

Due to their great bulk freight capacity, low transportation costs and high level of safety, inland vessels are predestined as a significant means of transport for petroleum products in addition to pipelines. The fuel tanks of around 20,000 cars can be filled with the cargo of a single tanker. Petroleum products and their derivatives are classed as hazardous goods and for this reason are transported in special shipping units equipped with the respective safety equipment.

European regulations and national hazardous goods legislation have particular relevance for tanker shipping.

Other branch-specific potentials for Danube navigation

In addition to traditional bulk cargo transport, there are numerous sectors involved in the transport of high-value goods, which, due to their specific requirements, represent a great challenge but at the same time a substantial potential for the development of logistics services along the waterway.

Due to their size and the available infrastructure, inland vessels are ideally suited for special transport such as heavy goods or oversized loads ("high & heavy"), e.g. construction machinery, generators, turbines or wind power plants. The greatest advantage here compared to conventional road transport is that no special modifications need to be made along route, e.g. the dismantling of traffic lights and traffic signs or protective covers for plants. Another benefit is the fact that there is no inconvenience to the general public due to street closures, restrictions on overtaking or noise when such goods are transported by inland vessel.

The Danube has also developed today to become a logistics axis of pan- European importance for the bundling, storage and processing of biogenic (renewable) raw materials (e.g. grain, oilseed, log wood). The increasing shortage of non-renewable resources and the creation of cross-sector value-added chains that result from this (e.g. the food and fodder industry, chemical industry and energy generation sector) enable the development of new types of cargo on the Danube.

Transport costs can be reduced and the negative im•pact on the environment minimised thanks to targeted improvement in logistic services available on the Danube (port infrastructure, special transhipment equipment) and the operation of inland vessels along the resource-intensive value-added chains. This entails the necessity of logistics chains that meet the high requirements of the respective goods.

Recycling products are mainly bulk goods of relatively low value and are therefore not usually associated with time-critical transport. Because of these characteristics, inland navigation is an interesting option for waste management. In principle, all waste material can be transported by inland vessels, regardless of whether it is in the form of bulk cargo or general cargo. The major urban areas located directly on the Danube (e.g. Vienna, Bratislava, Budapest and Belgrade) are reliable suppliers of scrap metal, waste plastic, waste glass and other secondary raw materials. The energetic utilisation of waste by power plants is currently leading to an additional demand for the transportation of waste.

A favourable development can also be expected in Central and Southern Europe as far as the construction material industry is concerned. This is due mainly to the high requirements of renovating and expanding the infrastructure, although structural and civil engineering projects and residential construction also play a significant role. The resulting transport volumes and growing exchange of goods with Southern Europe suggest a high potential for inland navigation. Inland vessels could be used here for both bulk cargoes (e.g. mineral raw materials) as well as general cargo (e.g. construction materials and construction machinery).

Strategies such as just-in-time or just-in-sequence are among the determining factors for success or failure in the automotive industry. Due to their long transport times, inland vessels only play a role in such logistic chains with the transportation of less time-critical components. However, specific potential can be exploited (high transport capacity, low transport costs) with the use of RoRo ships for the transportation of new vehicles due to the high concentration of production plants in the Danube region (e.g. in Slovakia and Romania).

Another major sector is fertilisers, which are currently being transported in large quantities on the Danube. These account for approximately

10% of the total transport volume on the Austrian Danube stretch. Plants from the petrochemical industry are often found in the immediate vicinity of refineries. These plants manufacture plastics and other oil-based products from oil derivatives and by-products. Due to its great bulk freight capacity Danube navigation is also the ideal solution for this market segment. However, financially viable concepts for the pre- and end-haulage are required here. Combined transport represents an attractive alternative for integrating transportation by inland vessel into the logistics chain of the chemical industry, along with the construction of warehouses for bulk goods.

Key data on Danube navigation 2016

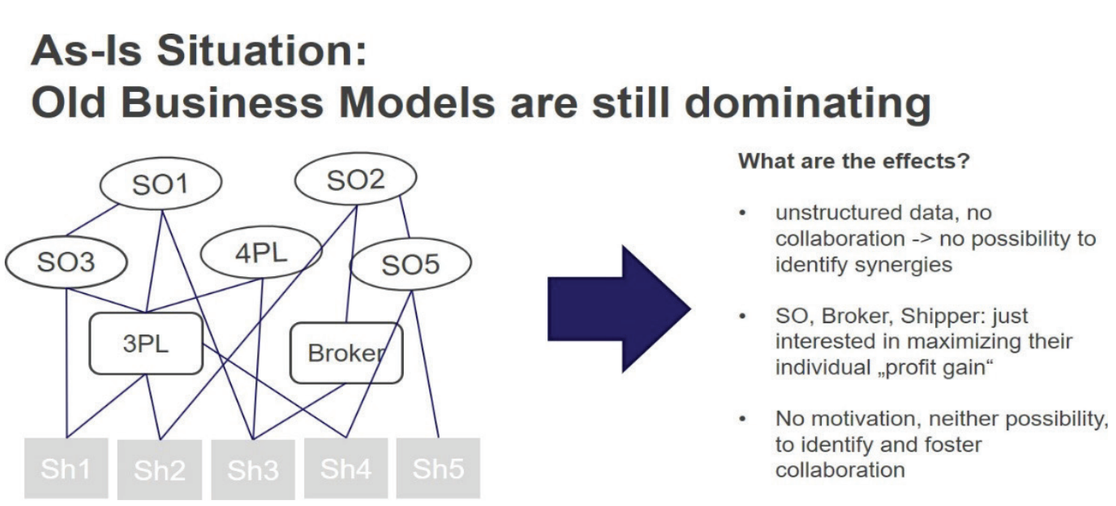
This can be found in Appendix 4

3.6 The current business model for Danube freight transport

There is a current business model dominant for the freight transportation on the Danube. This model is similar to that of an intermodal operator, but it is more diffuse and less structured than on the intermodal rail service level. The industry the Ship Owners face is very fragmented, despite some large shippers, but the decision making on routing if often carried out at a very junior level in the organisations and their main driver is to find a route, often the cheapest one that they knowand and not to worry about sustainability. Getting it there on time is more important.

Currently, there are already some ship owners (SO), brokers or 4PLs that manage to have a degree of backhaul and can design roundtrips on the Danube. However, in reality, this is more often than not “accidental” and not planned in a structured manner. For the trip owners it is a nice extra and additional business, but there is no inherent motivation for them to identify collaboration opportunities to make this more sustainable and cost effective in the future.

Below we picture the current “as-is” situation of the Danube waterway business model.



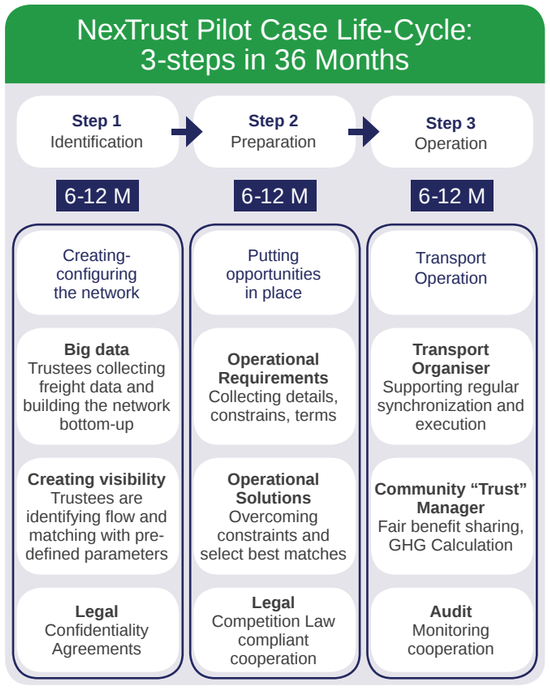
4. The Results of the ‘to-be’ situation with trusted collaboration for Danube freight business

4.1. The 3-step-methodology for setting up trusted collaboration

It was clear that the methodoloigy to set up a successful collaboration cell in a daily business operation was unknown to the partners. Indeed there was no understanding that there needs to be a structured approach approach with the appropriate and efficient business model or this objective is impossible.

The research activities hereby identified the NexTrust 3-step methodology as the appropriate and most effective process and tool to bring cooperation to market oriented operations.

In this context, the research activities outlined the way demand-side horizontal collaboration between shippers (manufacturing companies) can be enabled in a legally correct way in order to bundle freight flows and avoid empty running on the Danube waterway.



The Danube trusted collaboration, established first a “identification” phase, before preparing and operating the collaboration, as visualized in the diagram below.

Each phase and step has dedicated and pre-defined tasks to conduct. The first focusses on the identification of the freight flows, the technical set up and the management process to address the inefficiency and need for trusted collaboration. The Identification Phase aimed to analyze the as-is situation, create the network, match the opportunities and define the benefits.

The second phase defines the steps to prepare the actual implementation of the demonstrator, it puts the opportunities in place by addressing operational requirements and finding operational solutions.

The third phase defines the steps to start the management of the daily collaboration for planning and real time freight execution. The operation phase validates and modifies/improves the trusted collaboration framework and calculates the potential positive sustainable impact that can be achieved with this innovative collaboration business model.

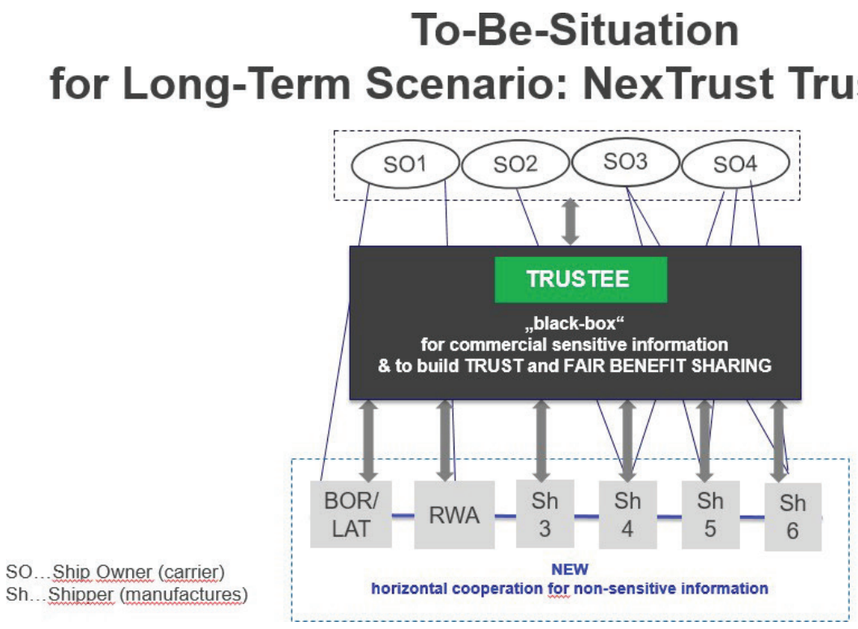
For each phase a time frame of 6 to 12 months was foreseen.

4.2. Trusted collaboration in the Danube context

The “Trustee” model was added on the Danube waterway network to support horizontal collaboration of shippers, who are already partially using the waterway for some bulky cargo and are therefore were looking to optimise their supply chain network.

The Trustee functions as black-box to protect commercially sensitive information among the partners involved. Similar to the FTL road bundling pilot cases of NexTrust, the “to-be” situation shall design combined roundtrips with significant GHG reduction.

For a variety of reasons, discussed later, the pilot case ended in the preparation phase and will need further progress before being able to validate the pilot case and potential KPIs.



There are important legal aspects to be considered when establishing business collaboration. Today in the transport market it was observed that there was lack of knowledge of how to comply with EU and national competition law. Often this is over-looked and managed in a grey or not clear area; this is hindering collaboration efforts. In other cases, collaboration initiatives do not consider enough legal aspects and risk violating EU competition law.

In NexTrust the legal compliance of collaboration is fundamental and a cornerstone of the project.

There are at least three legal compliances schemes, which shall be highlighted in the context of the NexTrust intermodal demonstrators:

- a) Competitors: Commercially sensitive information, such as confidential data, pricing etc. cannot be (in)directly shared with actual or potential competitors.
- b) Anti-dumping price behavior: Possible concerns with respect to abuse of purchasing power of competitors and non-competitors.
- c) Cost behind the price are confidential. Shippers cannot receive information concerning each other's costs and/or price structures via the logistic service provider or carrier. Such information can be regarded as commercially sensitive information and the exchange thereof is prohibited under competition law.

Further details about the legal aspects will be published in the relevant legal reports of NexTrust.

In this demonstrator report's context the role of the trustee function in the collaboration is essential.

First of all, the trustee is a service provider who shall be neutral, independent and treat information confidential. Secondly, the trustee functions as "black-box" to avoid that commercially sensitive information being shared between the actors. This is not only an important aspect to avoid anti-trust issues on horizontal cooperation level, but also in vertical cooperation the trustee must ensure that the (legal point c above) "costs behind the price" are not shared between actual or potential competitors. Note that this must be extended to the LSPs since the door-to-door logistics service providers that offer the complete transport leg, including the rail section, and the railway companies, that offer the rail leg to the door-to-door carriers, can under some circumstances be considered competitors or could become competitors. This should be determined by investigated whether the LSPs/Rail Companies are active on the same relevant market, or could reasonably become active on that market within a short period.

However, from a transport law point of view the above is a form of subcontracting. In the transport industry, and in particular, in intermodal transportation, subcontracting between logistic service providers is everyday business. Transportation is often carried out by a chain of logistics service providers, some of them are actually executing the transport or a part thereof, others are only involved as contractual carrier (carrier on paper only). Part of the deal in a chain of subcontracts is that the subcontractor mentions his price for the transport to his principal. However these companies could be (potential) competitors and therefore it is advisable that under no circumstances should they disclose the costs behind their price.

4.3. The identified market synergies on the Danube waterway

As explained in the previous chapter 2, there are certain freight commodities, in particular "bulky" freight, which can use the Danube waterway today and are fitting well to be transported by inland water way.

The research activities have looked into the market potential for collaboration on the Danube and have identified significant bulky volumes such as agricultural goods in form of grain, meal, maize, fertilizer or industrial products, such as metal or paper.

Overall around 2.890.000 tons of bulky freight goods between Austria and Hungary/Bulgaria/ Romania were identified as potential freight market for collaboration based on 23 companies as summarised in the table below.

From the 23 companies in target, there were two of them willing to cooperate and identify potential

Shipper	Commodity	Maximum quantities in MT/a	Direction to or from the factory (upstream/ downstream	Port	Country
Company 1	Grain, meal, maize, fertilizer	150.000	upstream + downstream	entire Danube region	AUT
Company 2	Meal	50.000	upstream + downstream	Pischelsdorf	AUT
Company 3	Grain	50.000	upstream + downstream	Pischelsdorf	AUT
Company 4	Grain, meal, maize, sunflower seeds	30.000	upstream	Enns	AUT
Company 5	Grain, oilseeds	100.000	upstream + downstream	Ruse	BG
Company 6	Products from steelmaking	100.000	downstream	Linz	AUT
Company 7	Slag sand	250.000	upstream + downstream	Linz	AUT
Company 8	Meal	50.000	upstream	Enns	AUT
Company 9	Metal	10.000	downstream	Ybbs	AUT
Company 10	Metal	10.000	downstream	Enns	AUT
Company 11	Fertilizer	250.000	downstream	Linz	AUT
Company 12	Oilseeds, vegetable oil, meal pellets	150.000	upstream + downstream	Swischtow	BG
Company 13	Oilseeds, vegetable oil, meal pellets	100.000	upstream + downstream	Foktö	HU
Company 14	Oilseeds, vegetable oil, meal pellets	150.000	upstream + downstream	Ruse	BG
Company 15	Oilseeds, vegetable oil, meal pellets	50.000	upstream + downstream	Ruse	BG
Company 16	Ore	1.000.000	upstream	Ismajil	UA
Company 17	Grain, oilseeds	250.000	upstream + downstream	Giurgui	RO
Company 18	Paper	20.000	downstream	Enns	AUT
Company 19	Wood	20.000	downstream	Enns	AUT
Company 20	Grain, meal	30.000	upstream + downstream	entire Danube region	AUT
Company 21	Cement	50.000	upstream + downstream	Giurgui	RO
Company 22	Rape oil	10.000	upstream	Wien	AUT
Company 23	Wood	10.000	upstream + downstream	Ybbs	AUT
		2.890.000			

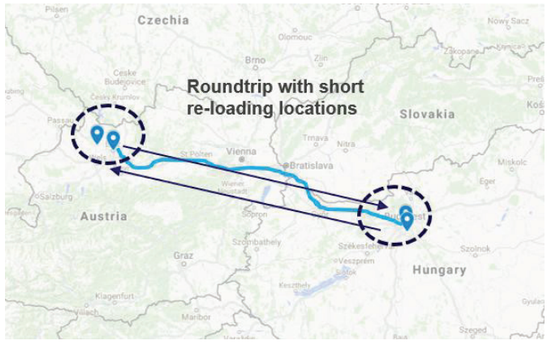
synergies for roundtrip creation for research purposes: the NexTrust partner Borealis L.A.T GmbH (part of Borealis-group) and the RWA Raiffeisen Ware Austria AG.

Borealis supplies over five million tonnes of fertilizers and technical nitrogen products each year via its Borealis L.A.T distribution network. Borealis L.A.T has warehouses across Europe and the distribution network stretches from its head-quarters in Linz along the Rhine and Danube, all the way from the Atlantic to the Black Sea. There are subsidiaries all across Europe: Czech Republic, Slovakia, Romania, Hungary, Croatia, Serbia and Bulgaria.

RWA Raiffeisen Ware Austria AG is the wholesale and service company of the warehouse cooperatives in Austria, with RWA providing a differentiated range of services. It ranges from marketing agricultural products, trading in agricultural capital equipment, building materials and products for the home and garden to various services. In addition to these responsibilities for the warehouses, RWA is a holding company with subsidiaries in Austria as well as in certain neighbouring eastern European countries.

The neutral trustee and task leader Bluewave captured and collected the freight shipment data details of both companies in scope. A non-disclosure agreement (NDA) was (and is) in place to guarantee that the neutral trustee does not share any information between the two companies and also not with any external parties. The i nformation must be treated as strictly confidential and only matched synergies on non-commercial sensitive information can be shared.

From the analysis and discussion of the curent transport data emerged a more sustainable and efficient network. As a test case example there were freight goods between Austria (Upper Danube) and Hungary (Middle Danube) athe were identified as a potential roundtrip. One company is shipping goods from Austria to Hungary and the other one, from Hungary to Austria. The on shore re-loading locations (unloading/loading) are close to the Danube and only 10 to 20 km from the ports as visualized in the map below.



4.4. The appropriate business model for the Danube waterway

The research activities of the Danube demonstrator followed the 3-step methodology of NexTrust and managed successfully the first two steps of identification and preparation. However, the concept could not be tested out in operations yet, due to the market challenges the Danube market and pilot partners in particular had to face.

Today, there are bulky flows on the Danube, but overall the Danube is a volatile market for the freight of the sector of agriculture, chemicals, wood, steel-products, machines, fertilizers or iron ore. The shippers do not know how many tonnes of raw material for the production is needed in advanced. The timing and quantities of freight flows are hard to plan and not structured in terms of regularity. However, the quantities are significant, eg. 25,000 tonnes of raw material, which is equivalent to 1.000 FTL's can be required to be transported within a short term period of couple of weeks. The pilot case therefore has to deal with an unforeseen and spontaneous "spot" market with high market volumes.

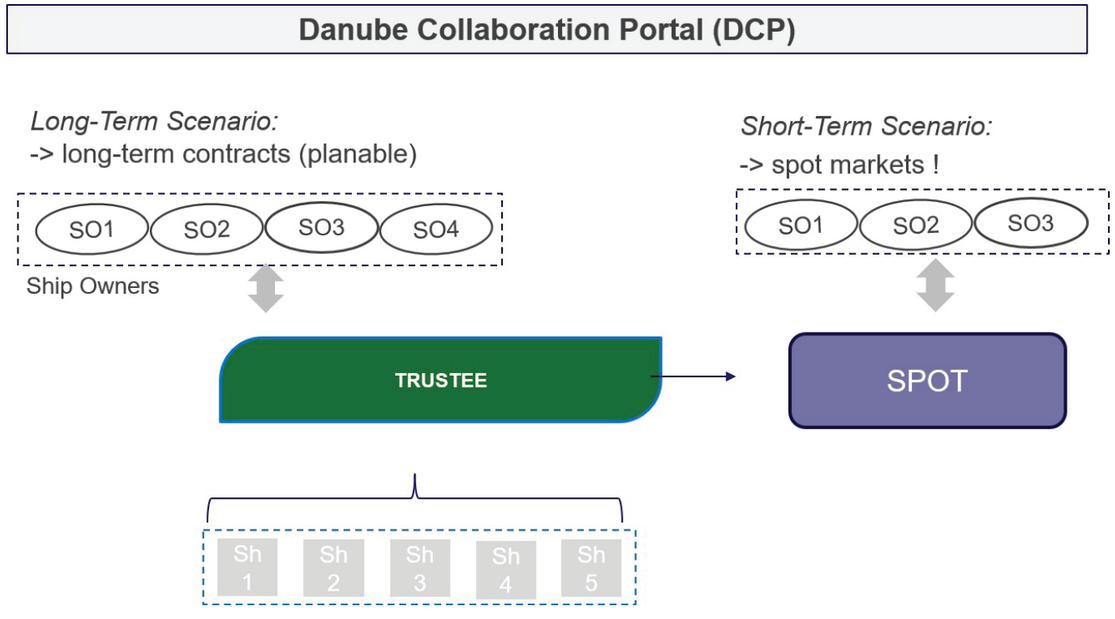
The preparation phase of the research activities managed to define the operational requirements, but as one company had not yet agreed with its customer and secured an offer for using this route, the execution of the pilot case could not happened within the NexTrust Project period.

Additionally, it emerged that generally for the other companies in scope there is still the old transport mindset that is very dominant and challenges any change. The NexTrust ideas are seen as threats by the stakeholders rather than as a positive opportunity.

A very positive outcome emerged from the Danube waterway demonstrator analysis that the frame-work has has strong conceptual synergies with the road FTL bundling pilot cases and could adopt similar approach to establish the horizontal collaboration on the Danube waterway.

The trustee can support the horizontal collaboration significantly and as "black box" achieve the break-through in efficiency.

However, to address better the volatile freight flows on the Danube, the pilot case identified that there is a need to better address the Danube spot market that transport very large quantities up and doiwn the Danube. The recommendation is that a dedicated Danube Collaboration Portal (short DCP) should be established to include the long term and short-term freight scenarios of the 'bulky' freight goods.



The more structured freight flows shall then be captured to better plan the potential horizontal collaboration of partners. The ship owners and shippers (companies producing products) will need to procure the legal and operational framework to establish the collaboration prior to the execution. The short-term scenario includes the volatile market for the freight of the sector of agriculture, chemicals, wood, steel-products, machines, fertilizers or iron ore. The shippers do not know how many tonnes of raw material for the production is needed in advanced. The timing and quantities of freight flows are hard to plan and not structured in terms of regularity.

However, the quantities are so significant that different scenarios shall be prepared with the shippers together. In this way the unforeseen and spontaneous "spot" market with high market volumes shall be better structured. In the same time the spot market can benefit from structural freight flows, which are the solid foundation of horizontal collaboration in the future.

5. Next Steps

It is to be hoped that the European Strategy for the Danube River could turn their attention to question of Freight Movements and in conjunction with the River and Road Ministries in the Countries where the Danube flows start the process of helping to engage the various commercial concerns that currently (or potentially could) use the river for transportation in a more sustainable manner.

NexTrust will be advising those Ministries and the relevant trade bodies of the results of this pilot to encourage them to take an interest in a supply chain framework that could bring major benefits to their countries.

Appendix 1. Danube River: Nautical characteristics

Navigable sections of the Danube	Upper Danube (Kelheim - Gönyü)	Middle Danube (Gönyü - Turnu- Severin)	Lower Danube (Turnu- Severin - Sulina)
Section length	624km	860km	931km
River km	from 2,414.72 to 1,791.33	from 1,791.33 to 931.00	from 931.00 to 0.00
Avg. Gradient per km	around 37 cm	around 8 m	around 4 cm
Height of drop	around 232 m	around 68 cm	around 39 m
Speed of ships upstream	9 - 13 km/h	9 - 13 km/h	11 - 15 km/h
Speed of ships downstream	16 - 18 km/h	18 - 20 km/h	18 - 20 km/h

Appendix 2. Overview of registered shipping companies and brokers

Austria	Bulgaria	Moldova
• Danu Transport GmbH • Danube Shipping Management Service GmbH • Donau- Tankschiffahrts-gesellschaft m.b.H. • Felbermayr Transport- und Hebetechnik GmbH & Co KG • First-DDSG Logistics Holding GmbH • IMET Handelsges.mbH • Michael Spedition GmbH • MULTINAUT Donaulogistik GmbH • Navromsa AG Basel • PAN EUROPE LINE GmbH Reederei • Panta Rhei Befrachtungs- und Speditions GmbH • Rhenus Danube Shipping GmbH • TTS (Transport Trade Services) GmbH	• Donau Star BG EOOD • RODASHIPS LTD. • Rubiships Ltd • Croatia • HRB Dunavski Lloyd Sisak d.o.o. • Germany • Bavaria Schiffahrts- und Speditions-AG • Euro Bevrachting Germany AG • Gebr. Väth GmbH & Co. KG • izb-cargo & co gmbh • Kühne + Nagel Euroshipping GmbH • MSG eG • Reederei Jaegers GmbH • Rhenus Danube Shipping GmbH & Co.KG • Hungary • BENSHIP Hungary Ltd. • Fluvius Schifffahrts und Speditions GmbH • ISD Portolan Ltd • Plimsoll Kft	• Danube Logistics • Romania • GP Trans • IHORKS SHIPPING AND TRADING • Lion Shipping & Chartering Ltd • Navrom S.A. Galati • North Star Shipping • SC TTS (Transport Trade Services) SA • SOL Maritime Services Ltd • Traba Logistics Romania • Trading Line Ltd • Serbia • Agent Plus • CFND • Danube Transport and Logistic • Jugoagent • SRL Logistics d.o.o. • Slovakia • DANUBE SHIPPING s.r.o. • Slovak

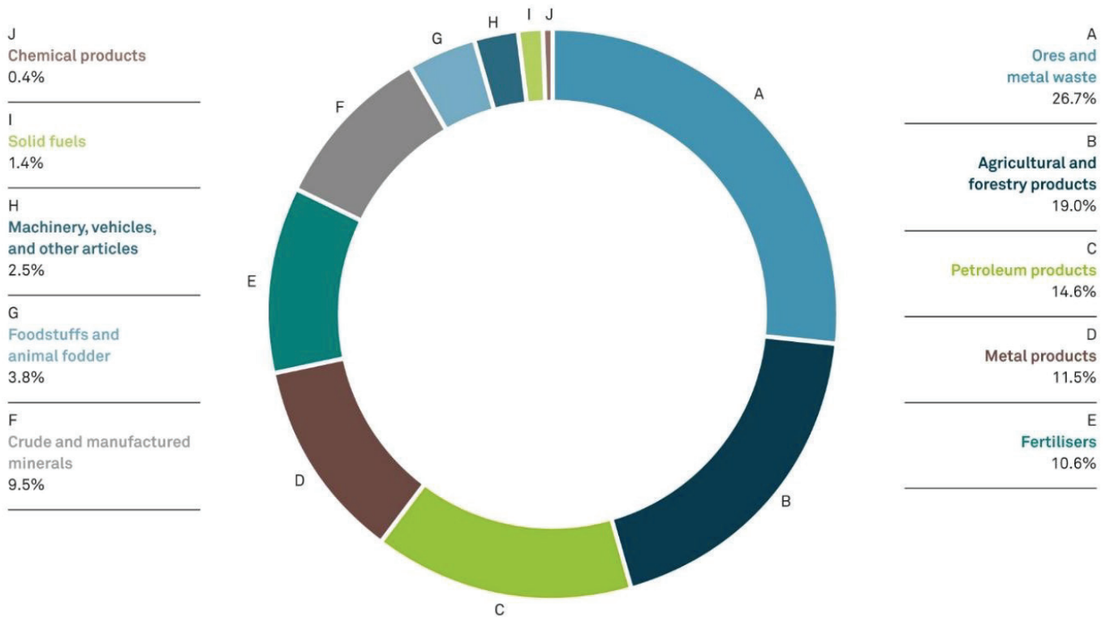
Appendix 3. Major shipping companies on the Danube

Company	Fleet		Transported Cargo
First-DDSG Logistics Holding GmbH Shipping company Handelskai 348 1020 Wien Austria	motorized vessels non-motorized vessels total capacity in tons	58 160 311.202	• Dry bulk • Liquid bulk • High & heavy cargo • Container • Petroleum products refined • Agricultural cargo • Part load shipments
Panta Rhei Befrachtungs- und Speditions GmbH Shipping company Europaring A04 401 2345 Brunn am Gebirge Austria	motorized vessels non-motorized vessels total capacity in tons	15 3 20.000	• Dry bulk • Break bulk • Moisture sensible break bulk • High & heavy cargo • Container • Agricultural cargo • Part load shipments
Rhenus Danube Shipping GmbH Shipping company Karl-Mierka Straße 7-9 3500 Krems Austria	motorized vessels non-motorized vessels total capacity in tons	9 18 34.200	• Dry bulk • Break bulk • Moisture sensible break bulk • High & heavy cargo • Container • RoRo cargo • Agricultural cargo • Part load shipments
Rubiships Ltd Shipping company Duhovno Vazrazhdane Str. 1 7000 Rousse Bulgaria	motorized vessels non-motorized vessels total capacity in tons	9 0 15.880	• Dry bulk • Break bulk • High & heavy cargo • Container • Agricultural cargo • Part load shipments
HRB Dunavski Lloyd Sisak d.o.o. Shipping company Antuna Cuvaja 16/II 44000 Sisak Croatia	motorized vessels non-motorized vessels total capacity in tons	7 42	• Dry bulk • Liquid bulk • Break bulk • High & heavy cargo • Container • RoRo cargo • Agricultural cargo • Part load shipments
Bavaria Schiffahrts- und Speditions-AG Shipping company Werftstraße 3-5 63741 Aschaffenburg Germany	motorized vessels non-motorized vessels total capacity in tons	22 7 57.195	• Dry bulk • Break bulk • High & heavy cargo
Euro Bevrachting Germany AG Shipping company Prinz-Ludwig-Str. 9 93055 Regensburg Germany	motorized vessels non-motorized vessels total capacity in tons	15 16 50.000	• Dry bulk • High & heavy cargo • Container • RoRo cargo • Agricultural cargo • Part load shipments

Company	Fleet		Transported Cargo
Kühne + Nagel Euroshipping GmbH Shipping company Budapester Straße 20 93055 Regensburg Germany	motorized vessels non-motorized vessels total capacity in tons	25 4	• Dry bulk • Break bulk • High & heavy cargo • Container
Container MSG eG Shipping company Südliche Hafenstraße 15 97080 Würzburg Germany	motorized vessels non-motorized vessels total capacity in tons	70 0 140.000	• Dry bulk • Break bulk • High & heavy cargo • Container
Navrom S.A. Galati Shipping company Portului street 34 800025 Galati Romania	Cooperation with SC TTS (Transport Trade Services) SA		• Dry bulk • Liquid bulk • Break bulk • High & heavy cargo • Container • Petroleum products refined • Crude oil
SC TTS (Transport Trade Services) SA Shipping company Vaselor 34 021254 Bucharest Romania	motorized vessels non-motorized vessels total capacity in tons	63 466 812.000	• Dry bulk • Liquid bulk • Break bulk • High & heavy cargo • Container • Petroleum products refined • Agricultural cargo • Part load shipments
Slovak Shipping and Ports JSC Shipping company Horárska 12 81524 Bratislava Slovakia	motorized vessels non-motorized vessels total capacity in tons	33 110	• Dry bulk • Liquid bulk • High & heavy cargo • Container • RoRo cargo • Petroleum products refined • Crude oil • Agricultural cargo

Appendix 4. Key data on Danube navigation 2016

Transport volumes by commodity groups on the Austrian Danube 2016



Goods classification according to NST/R*	Domestic	Import	Export	Transit	Total 2016	Change
Agricultural and forestry products	–	472,143	156,506	1,098,552	1,727,201	8.5%
Foodstuffs and animal fodder	573	188,769	57,659	98,990	345,991	–7.2%
Solid fuels	358	120,872	1,973	6,999	130,202	–41.5%
Petroleum products	302,591	543,697	389,035	88,571	1,323,894	5.8%
Ores and metal waste	1,026	2,406,819	10,759	–	2,418,604	4.0%
Metal products	–	167,585	591,597	286,365	1,045,547	27.5%
Crude and manufactured minerals, building materials	302,295	228,879	233,740	92,593	857,507	4.7%
Fertilisers	1,999	151,473	502,841	305,465	961,778	2.3%
Chemical products	–	504	3,411	30,546	34,461	139.3%
Machinery, vehicles and other articles	–	19,111	28,071	179,109	226,291	–6.7%
Total	**608,842**	**4,299,852**	**1,975,592**	**2,187,190**	9,071,476	**5.5%**

* NST/R = Standard Goods Classification for Transport Statistics/revised.

Source: Statistics Austria, adapted by viadonau

Ores and metal waste remained the strongest commodity group in 2016, with more than 2.4 million tons and an increase of 4.0% over the previous year. The share of the total volume was 26.7%. Agricultural and forestry products accounted for 19.0% of the total volume, corresponding to more than 1.7 million tons. Over 60% of the total volume can be attributed to transit traffic, while no domestic transport for this commodity group was recorded in 2016.

Freight traffic on the Austrian Danube 2001–2016

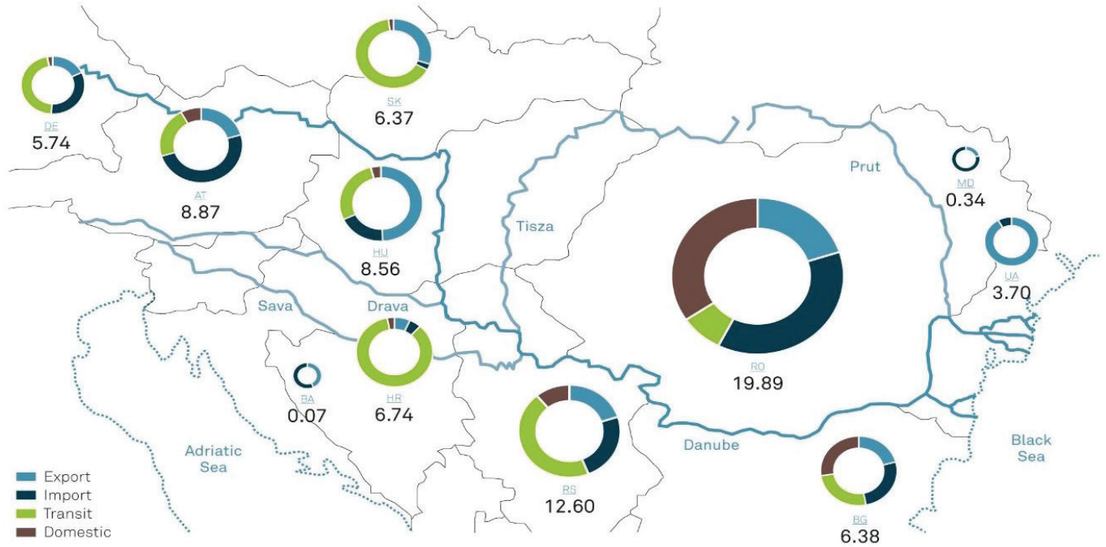
In 2016 almost 9.1 million tons of goods were transported on the Austrian section of the Danube. Better fairway conditions led to an increase of 5.5% or almost 0.5 million tons compared to the previous year. There was a clear growth in transit traffic volumes for agricultural and forestry products as well as fertilizers. Exports, particularly the transportation of metal products, were also up.

The total transport performance (the product of transport volume and distance travelled) in the federal territories increased by 8.7% to just under 2 billion ton-kilometers. The entire transport capacity, both within and outside of Austria, rose by 11.0% to 9.3 billion ton- kilometers. The number of trips made by loaded vessels on the Austrian section of the Danube decreased slightly by 2.4% (from 8,658 to 8,448).

Cross-border freight traffic (the sum of export, import and transit) recorded an increase of 6.9% or more than 0.5 million tons compared to 2015. The strongest increase in transport volumes on the Austrian Danube was recorded for transit traffic (around 19.5% or approximately 357,000 tons). Exports also saw an increase in the volume of goods transported (approximately 12.0% or just under 212,000 tons).

In contrast, import and domestic traffic decreased slightly: domestic traffic on the Danube waterway – which had the smallest share of the transport volume in 2016 with 6.7% – fell by a substantial 10.5% or almost 71,500 tons to 608,842 tons. Import volumes decreased only slightly, by 0.6% or 25,166 tons to approximately 4.3 million tons. Imports continue to account for the largest share of total transport.

Freight transport on the entire Danube 2015



In millions of tons	DE	AT	SK	HU	HR	BA	RS	RO	BG	MD	UA
Export	1.03	1.85	2.07	4.29	0.34	0.03	2.46	3.98	1.34	0.07	3.38
Import	1.91	4.43	0.10	1.61	0.17	0.04	3.06	7.45	1.66	0.27	0.31
Transit	2.64	1.91	4.18	2.44	6.18	0.00	5.71	1.68	1.68	0.00	0.00
Domestic	0.16	0.68	0.02	0.22	0.05	0.00	1.37	6.78	1.70	0.00	0.01
Total	**5.74**	**8.87**	**6.37**	**8.56**	**6.74**	**0.07**	**12.60**	**19.89**	**6.38**	**0.34**	**3.70**

The most current available figures regarding the volume of freight transport on inland waterways in the Danube region are from the year 2015. In total, 38.3 million tons of goods were carried on the Danube waterway and its tributaries that year – a minus of 4.5% or around 1.8 million tons less than in 2014.The figures for inland waterway transport on the Danube (including tributaries) are laid out in the following paragraphs and the chart opposite. River-sea transport is dealt with further below.

As in previous years, the largest transport volume was achieved by Romania, amounting to just under 19.9 million tons, followed by Serbia with 12.6

million tons and Austria with around 8.9 million tons. While countries in the upper regions of the Danube recorded a double digit percentage decrease in the amount of goods shipped on the waterway compared to 2014 (Germany: –17.1%, Austria: –13.9%, Slovakia: –10.9%), transport volumes in the middle and lower regions of the Danube grew once again in 2015 (Hungary: +5.4%, Croatia: +23.8%, Serbia: +1.5%, Romania: +11.0%, Bulgaria: +7.4%, Moldova: +19.9%, Ukraine: +21.0%). This was despite the prolonged period of low water that characterised the second half of the year.

With almost 4.3 million tons of goods shipped (+15.6% compared to 2014), Hungary was, after two years in second place to Romania, once again the largest exporter on the Danube. Romania exported almost 4.0 million tons (+3.1%) in 2015, followed by the Ukraine with around 3.4 million tons (+13.4%) and Serbia with nearly 2.5 million tons (–1.2%). With a considerable increase of 35.5% compared to 2014, Romania yet again boasted the largest volume of imports on the Danube with approximately 7.5 million tons. The second strongest import country on the Danube was again Austria with over 4.4 million tons (–11.0%) in 2015, followed by Serbia with over 3 million tons (+1.3%).

A total of 13.9 million tons were transported on the Romanian Danube-Black Sea Canal (including its side channel) in 2015. This figure includes river-sea shipping amounting to approximately 141,000 tons. This represents a significant decrease amounting to nearly 3% or around 0.4 million tons of goods, compared to 2014.In 2015, maritime transport on the Danube, i.e. transport by river-sea vessels or by sea-going vessels, accounted for a total of nearly 4.3 million tons – a decrease of 17.5% or more than 0.9 million tons compared to 2014. The majority of this traffic, some 3.8 million tons of goods transported, was shipped via the Romanian Sulina canal (+4.9% compared to 2014).

6. References

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Authors	Christian Strasser, Bluewave GmbH, Austria Dr. Patrick Stumm, Pastu Consult BVBA, Belgium Gerald Piller, Wenzel Logistics GmbH, Austria
Authorized by	TX Logistik, Co-ordinator

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