READER – LOGISTICS – GENERAL CONDITIONS AND CHARGES

Extract of relevant passages from the „Manual of Danube Navigation", via donau (2012).

Strengths and weaknesses of Danube navigation

The **strengths** of Danube navigation lie mainly with its ability to convey large quantities of goods per vessel unit, its low transport costs and its environmental friendliness. Furthermore, it is available around the clock, with no prohibition on driving at weekends or during the night. In addition, it has a high level of safety and low infrastructure costs.

The **weaknesses** of this mode of transport are its dependence on current fairway conditions and the associated variable load factor of the vessels, its low transportation speed and network density which means that pre- and end-haulage by road or rail are often necessary.

The main **opportunities** for Danube navigation are the enormous amount of spare capacities that the waterway has to offer, international development initiatives such as the Strategy for the Danube Region, the internalisation of external costs on a European scale, cooperation activities with road and rail, as well as the application of modern and harmonised River Information Services (RIS).

The key **threats** to Danube navigation are its variable weighting on the political agenda, and consequently in the budget debates of the various Danube countries, as well as the need for modernisation of many Danube ports and parts of the Danube fleet.

STRENGTHS	WEAKNESSES
• low transport costs • ability to convey large quantities of goods per unit • environmental friendliness • safety • availability around the clock • low infrastructure costs	• dependence on variable fairway conditions • low transport velocity • low network connectivity, often requiring pre- and end-haulage
OPPORTUNITIES	**THREATS**
• spare capacity of the waterway • rising demand for environmentally friendly transport modes • modern and harmonised cross-border information services (RIS) • cooperation activities with road and rail • international development initiatives (e.g. NAIADES, Strategy for the Danube Region)	• inadequate maintenance of the waterway in some Danube riparian countries • high requirement for modernisation of ports and fleet

Source: via donau

SWOT analysis of Danube navigation

Danube navigation compared to other modes of transport

In comparison to other modes of transport, several factors demonstrate the advantages of inland navigation. For example, it features the lowest specific energy consumption and the lowest external costs of any land transport mode. Furthermore, it has the ability to transport large quantities of goods per unit (bulk freight capacity) and requires comparably low investment in maintaining and expanding its infrastructure.

Classification of inland waterways

A **waterway** is a body of surface water serving as a route of transport for goods and/or passengers by means of ships. Navigable inland transport routes are called inland waterways. Natural inland waterways are provided by **rivers** and **lakes**, whereas **canals** are artificial waterways.

In order to create the most uniform conditions possible for the development, maintenance and commercial use of Europe's inland waterways, in 1996 the Inland Transport Committee of the United Nations Economic Commission for Europe (UNECE) adopted the **European Agreement on Main Inland Waterways of International Importance** (AGN) (🗎 United Nations Economic Commission for Europe 2010). The Agreement, which came into force in 1999, constitutes an international legal framework for the planning of the development and maintenance of the European inland waterway network and for ports of international importance, and is based on technical and operational parameters.

@

Working Party on Inland Water Transport of the UNECE's Inland Transport Committee: www.unece.org/trans/main/sc3/sc3.html

By ratifying the Agreement, the contracting parties express their intention to implement the coordinated plan for the development and construction of the so-called E waterway network. The **E waterway network** consists of European inland waterways and coastal routes which are of importance for international freight transport, including the ports situated on these waterways. E waterways are designated by the letter "E" followed by a number or a combination of numbers, whereby main inland waterways are identified by two-digit numbers and branches by four- or six-digit numbers (for branches of branches). The **international waterway of the Danube** is designated as **E 80** and its navigable tributary the **Sava**, for example, as **E 80-12**.

Waterway classes are identified by Roman numbers from I to VII. **Waterways of class IV or higher** are of economic importance to international freight transport. Classes I to III identify waterways of regional or national importance.

The class of an inland waterway is determined by the **maximum dimensions of the vessels** which are able to operate on this waterway. Decisive factors in this respect are the **width** and **length** of inland vessels and convoys, as they constitute fixed reference parameters. Restrictions regarding the **minimum draught loaded of vessels**, which is set at 2.50 metres for an international waterway, as well as the **minimum height under bridges** (5.25 metres in relation to the highest navigable water level) can be made only as an exception for existing waterways.

The following table shows the parameters of **international waterway classes based on type of vessels and convoys** which can navigate the waterway of the respective class.

Motor cargo vessels						
Type of vessel: general characteristics						
Water-way-class	Designation	Max. length L (m)	Max. width B (m)	Draught d (m)	Tonnage T (t)	Min. height under brideges H (m)
IV	Johann Welker	80–85	9.5	2.5	1,000–1,500	5.25 / 7.00
Va	Large Rhine vessel	95–110	11.4	2.5–2.8	1,500–3,000	5.25 / 7.00 / 9.10
Vb	Large Rhine vessel	95–110	11.4	2.5–2.8	1,500–3,000	5.25 / 7.00 / 9.10
VIa	Large Rhine vessel	95–110	11.4	2.5–2.8	1,500–3,000	7.00 / 9.10
VIb	Large Rhine vessel	140	15.0	3.9	1,500–3,000	7.00 / 9.10
VIc	Large Rhine vessel	140	15.0	3.9	1,500–3,000	9.10
VII	Large Rhine vessel	140	15.0	3.9	1,500–3,000	9.10

Pushed convoys						
Typ of convoys: general characteristics						
Water-way-class	Formation	Length L (m)	Width B (m)	Draught d (m)	Tonnage T (t)	Min. height under brideges H (m)
IV		85	9.5	2.5–2.8	1,250–1,450	5.25 / 7.00
Va		95–110	11.4	2.5–4.5	1,600–3,000	5.25 / 7.00 / 9.10
Vb		172–185	11.4	2.5–4.5	3,200–6,000	5.25 / 7.00 / 9.10
VIa		95–110	22.8	2.5–4.5	3,200–6,000	7.00 / 9.10
VIb		185–195	22.8	2.5–4.5	6,400–12,000	7.00 / 9.10
VIc		270–280	22.8	2.5–4.5	9,600–18,000	9.10
		195–200	33.0–34.2	2.5–4.5	9,600–18,000	9.10
VII		275–285	33.0–34.2	2.5–4.5	14,500–27,000	9.10

Source: United Nations Economic Commission for Europe 2010

Waterway classes according to the AGN

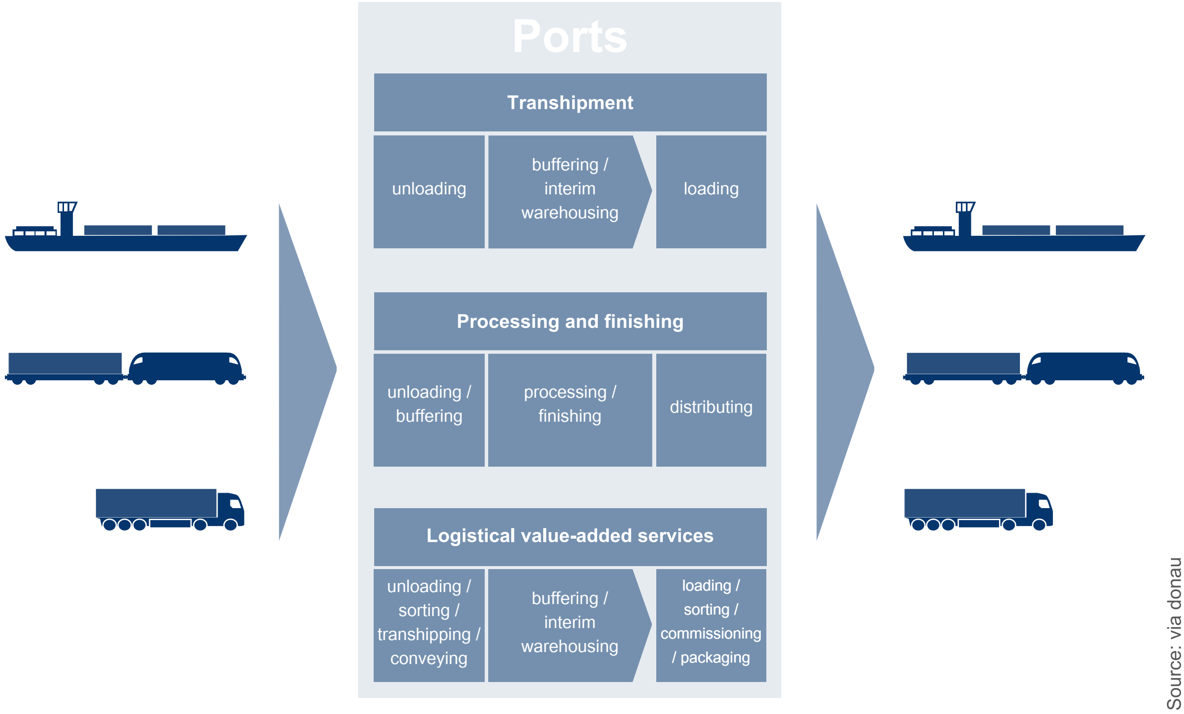
In 1998, the UNECE Inland Transport Committee first published an **Inventory of Main Standards and Parameters of the E Waterway Network**, the so-called “**Blue Book**”, as a supplement to the AGN (🗎 United Nations Economic Commission for Europe 2012). The “Blue Book” contains a list of the current and planned standards and parameters of the E waterway network (including ports and locks) as well as an overview of the existing infrastructural bottle-necks and missing links. This publication, which supplements the AGN, allows for the monitoring of the current state of implementation of the agreement on an international basis.

Ports as logistical service providers

Functions and performance of a port

Ports connect the transport modes of road, rail and waterway and are important service providers in the fields of **transhipment**, **storage** and **logistics**.

In addition to their basic functions of **transhipment** and **storage** of goods, they also often perform a variety of value-added logistics services to customers, such as **packaging**, container **stuffing and stripping**, **sanitation** and **quality checks**. This enhances ports as logistics platforms and impetus sources for locating companies and boosting the economy. As multimodal logistics hubs, they act as a central interface between the various modes of transport.



The inland port as a multimodal logistics node

The total throughput for all modes of transport is an important indicator of the **performance** of a port. A port not only handles transhipments between waterway, road and rail, but also between non-waterbound modes such as road-rail or rail-rail.

Basic structure of a port

Every port is structured into three main areas:

- Water-side area
- Port area
- Hinterland

The **water-side area** of a port is formed by a port basin and quay walls. The lengths of the quays are divided up into multiple berths. A berth corresponds approximately to the length of an inland vessel, which is around 100 to 130 metres.

The **port area** includes the loading area, which is located just behind the quay walls; this area has cranes, crane tracks and quay rails. The adjacent area is used as transhipment areas for indirect transhipment (e.g. containers from ships will be provisionally unloaded onto the quay and later brought to the container depot). The port area also consists of areas for industrial complexes

Source: via donau, EHG Ennshafen GmbH

Basic structure of a port

and logistics areas, which are available for logistics service providers who provide transhipment services to third parties.

A port concentrates and distributes traffic flows from the **hinterland**, which is the catchment area of the port. The size of this catchment area depends on an economic distance which is not only defined by the geographic distance in kilometres, but also by transport costs and transport time.

Types of ports

Sea-river ports such as the Danube Port of Galaţi in Romania or the Rhine Port of Duisburg in Germany can accomodate smaller sea vessels as well as inland vessels. However, **inland ports** may only accomodate inland vessels, due to smaller water depths.

Ports that tranship various goods, such as general or bulk cargo, are called **multi-purpose ports**. If a port handles only one kind of cargo, such as mineral oil, the term **specialised port** is used.

Infrastructure and suprastructure

Ports have both an infrastructure and a suprastructure. The **port's infrastructure** is formed by quay walls, rail tracks and roads, as well as paved surfaces. The **port's suprastructure** is built on the infrastructure and includes cranes, warehouses and office buildings.

Transhipment by type of cargo

In transport economics, a number of different **classifications of goods** can

Source: EHG Ennshafen GmbH

Port infrastructure / port suprastructure

be found. These classifications are frequently based on sectors and branches, the processing stage of the goods or their state of aggregation. The two-dimensional goods classification system chosen for the following illustration depicts the transhipment methods and the classification of the cargo, whereby a distinction is made between **general cargo** and **bulk cargo**.

<table>
<tr><th colspan="12">Cargo</th></tr>
<tr><td colspan="8">General cargo or break bulk</td><td colspan="4">Bulk cargo</td></tr>
<tr><td colspan="2">Roll-on-Roll-offe. g. cars</td><td colspan="2">High and heavy goods</td><td colspan="2">Container</td><td colspan="2">Other general cargo e. g. big bags</td><td colspan="2">Dry bulk
e. g. coal, ore, grain</td><td colspan="2">Liquid bulk
e. g. crude oil</td></tr>
<tr><td colspan="3">Ramps</td><td colspan="5">Hook, grabber, spreader, rope</td><td colspan="1">Grabber</td><td colspan="2">Suction equipment</td><td colspan="1">Pump</td></tr>
<tr><td colspan="12">Transhipment</td></tr>
</table>

Source: via donau

Transhipment by type of cargo

Performance of port transhipment equipment

The **performance** of port transhipment equipment is defined by the maximum lifting capacity as well as the hourly and/or daily output of each individual crane. Modern gantry cranes or mobile cranes can accommodate 30 tons with 20 metre outreach and thereby efficiently tranship full containers or heavy steel coils from vessel to quay or from truck to railway wagon.

Storage

Warehouses are becoming increasingly important due to the modernisation of commercial logistics, for example as **distribution warehouses** offering more added value thanks to supplementary services (value added services) such as commissioning.

The basic function of a warehouse is to serve as a buffer, which means the **collection and distribution of flows of goods**. This is especially important when using different transport modes, since the capacity differs according to the means of transport being chosen.

Based on the different characteristics of the transported goods, a port must of-

Value-added logistics services

Ports have become increasingly multifunctional service providers over the last few decades. In addition to basic services such as transhipment and storage, ports offer an extensive range of **logistical services** such as the packing, stuffing and stripping of containers, commissioning, distribution (pre- and end-haulage) and project logistics. As **locations for commerce and industry** as well as **cargo handling centers**, ports contribute significantly to the creation of added value and employment. Due to the specialisation of comprehensive

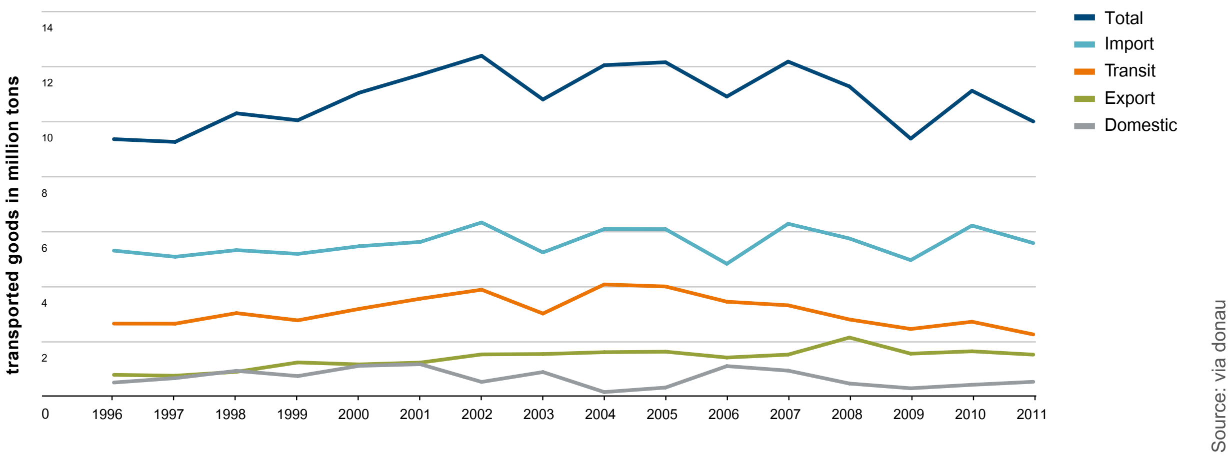
Source: via donau

Container transhipment by Mainromline in the Romanian Danube Port of Giurgiu

logistical concepts and services, ports have extended their range with value-added services in the logistics fields of containers, Ro-Ro and heavy cargo.

Transport volume in Austria

As the following diagram shows, there has also been an upward trend in goods transport on the Austrian section of the Danube over the long term. The key contributing factor here is the **intensification of trade with the Central and South-Eastern Danube region and the Black Sea region** resulting from the gradual implementation of the EU eastern enlargement.



Transport volume on the Austrian Danube 1996–2011

Economic and financial crises have, of course, also had an impact on the transport volume on the Danube (most especially in the year 2009). Several severe periods of low water levels in the second half of the year 2011 also encumbered economic development, even bringing navigation on the **Lower Danube** to a standstill. The development of transport volume on the Danube had already been impacted by similar unfavourable water conditions in the year 2003. These pronounced periods of low water levels clearly indicate the urgent need to take action in transport policy in order to remedy the nautical bottlenecks along the Danube as quickly as possible.

Traditional **bulk cargo** (coal, ore and grain) and **liquid cargo** (predominantly mineral oil) currently account for the largest share of goods transported. It is the resource-intensive industries located in Austria that reap particular benefit from the utilisation of this bulk freight capacity and, at the same time, economical form of transport. One example of this is the voestalpine steel plant in Linz, whose supply of raw material is transported for the most part by inland vessels.

On the westbound route to the North Sea ports of Amsterdam, Rotterdam and Antwerp **semi-finished and finished products** are transported to a large extent. As far as transit traffic is concerned it is mainly the transport of **agricultural products** from Hungary, Bulgaria and Romania to Western Europe that plays a major role.

However, there is also an upward trend in the transport of **high-quality general cargo** by inland vessels on the Austrian Danube. The Danube is also used for the repositioning of empty containers in addition to Ro-Ro cargo (new vehicles, agricultural and construction machinery etc.) and project cargo (heavy and oversized cargo).

Market characteristics

Liberalisation and deregulation of the transport markets have made great headway within the European Union. In the Danube region, however, the political and legal framework conditions remain relatively heterogeneous due to the recent, or rather not yet concluded, accession of individual Danube riparian states to the European Union. In this respect, **greater harmonisation** is expected over the coming years and this will favour the entry of additional buyers and sellers in the market and in turn promote the opening up of new transport potential.

To date, the largest portion of goods transported on the Danube waterway originate from a few **major shippers** who deal with only a relatively small number of service providers. The **large shipping companies** are, for the most part, derived from former state-owned enterprises mainly and provide cargo space for the transport of traditional bulk goods based on long-term open policies. Smaller shipping companies and **independent ship owners** (private vessel owner-operators) often have to be more flexible in finding cargoes and for the most part serve economic niches and short-term requirements for transport services.

Transport operations are carried out on the basis of a **freight contract** (or contract of carriage) which is concluded between the consignor and the freight carrier either directly or indirectly. In the case of direct conclusion, the contract is concluded directly between the shipper and the shipping company. In contrast, there is at least one other party involved who acts as an intermediary if a contract is concluded indirectly (e.g. a forwarder or freighting company). The freight contract is concluded consensually between the parties. There is no special form required (freedom from any formal requirements).

A consignment note that serves as documentation for the transport operation is drawn up for each individual freight order. A bill of lading often regulates the legal relationship between the freight carrier and the consignee in inland navigation. The bill of lading provides the consignee with evidence of the right to receive the consignment and obliges the freight carrier to hand over the goods only on submission of the bill of lading. This transport document is customary in inland navigation and constitutes a document of title, the submission of which leads to a transfer of ownership of the goods. In other words, the bill of lading functions as a certificate of receipt for the goods, as a carriage promise for the transport of the goods and a promise to hand over the goods to the legitimate owner of the bill.

The parties involved in the inland waterway transport market will be dealt with in detail in the following. The different forms of contract used in Danube navigation and the transport solutions upon which these are based will also be explained in this section.

Supply side of Danube navigation

Logistics providers on the Danube navigation market include primarily transport companies, port and terminal operators and companies that act as intermediaries (freighting companies, forwarders).

Transport companies

Shipping companies are commercial ship transport companies that professionally organise and implement the transport of goods using their own vessels or those from other companies. They always operate several vessels. Shipping companies are distinguished by the fact that they prepare and direct transport from land (in contrast to independent ship owners who usually do not have such a "land-based organisation").

Further information on ports and terminals can be found in the chapter "Ports and Terminals")

In addition to such shipping companies, the independent ship owners – **private vessel owner-operators** – mentioned above are also active on the market. Most of these operate a single motor cargo vessel, some own up to three vessels. As a rule, independent shippers also act as captains of their own ships and do not normally run any land-based commercial offices. In many cases they are organised into co-operatives.

Source: via donau

Motor cargo vessel

Transport companies operating on the Austrian Danube

Shipping companies

Danu Transport GmbH
- A-1060 Vienna, Gumpendorferstraße 83
- ☎ +43 1 596 47 55
- Fax +43 1 596 47 55 650
- ✉ office@danu-transport.at
- www.danu-transport.at

Donau-Tankschiffahrtsgesellschaft mbH (DTSG)
- A-1020 Vienna, Handelskai 130
- ☎ +43 1 216 00 60
- Fax +43 1 216 00 60 19
- ✉ hye@dtsg.at
- www.reederei-jaegers.de

Helogistics Holding GmbH
- A-1020 Vienna, Handelskai 348
- ☎ +43 1 725 00 0
- Fax +43 1 725 00 9220
- ✉ office-management@helogistics.at
- www.helogistics.at

Stetrag Schifffahrts GmbH
- A-3562 Schönberg am Kamp, Bergstrasse 17
- ☎ +43 2733 83 42
- Fax +43 2733 8342 710
- ✉ office@stetrag.com
- www.stetrag.at

Freighting and logistics companies

Mierka Befrachtung GmbH
- A-3500 Krems, Karl Mierka Str. 7-9
- ☎ +43 2732 73571 0
- Fax +43 2732 72557
- ✉ ploech@mierka.com
- www.mierka.com

Multinaut Donaulogistik GmbH
- A-1020 Vienna, Handelskai 388
- ☎ +43 1 729 5055 0
- Fax +43 1 729 5055 19
- ✉ info@mn-dlg.com
- www.multinaut-dlg.com

Panta Rhei Befrachtungs- und Speditions GmbH
- A-2345 Brunn am Gebirge, Europaring A04 401
- ☎ +43 2236 379777
- Fax +43 2236 379777 125
- ✉ illmayer@p-r.at
- www.panta-rhei-shipping.at

Agencies

Bulgarian River Shipping J.S.Co.
- A-1020 Vienna, Handelskai 265
- ☎ +43 1 728 96 62
- Fax +43 1 728 96 62
- ✉ brp.wien@surfeu.at
- www.brp.bg

Danube Shipping Management Service GmbH
- A-1020 Vienna, Handelskai 388/832
- ☎ +43 1 728 69 34
- Fax +43 1 728 20 76
- ✉ headoffice@dsms.at
- www.dsms.at

Ukrainian Danube Shipping Company
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- ☎ +43 1 478 80 46 10
- Fax +43 1 478 80 46 14
- ✉ office@ga-udp.at
- oaoudp.com.ua

Navrom S.A. Galaţi - Agentie Vienna
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- ☎ +43 664 281 95 91
- Fax +43 1 729 1300 20
- ✉ navrom.vienna@tmo.at

Port and terminal operators

Ports and terminals can be operated privately or as public facilities. However, provision of the logistic services at one port or transhipment site often comprises of co-operation between private and public parties.

The transhipment and storage of goods are among the basic functions of ports and terminals. As a rule, ports also offer a whole series of logistical value added services for customers such as packing, stuffing and stripping of containers, sanitation and quality checks.

Companies acting as intermediaries

Companies without their own fleet of vessels can also act as intermediaries for the provision of cargo space. In such cases, contracts of carriage are concluded directly.

In order to market their services, both shipping companies as well as independent shippers often use **freighting companies**. The freighter is the contract partner of the company placing the order for transport and functions as a broker for rented cargo space. As a rule, the relationship between the owner of the vessel and the freighting company is regulated by means of a subcharter. In other words, the freighter acts as both freight carrier and consignor.

Forwarders specialised in inland waterway transport or forwarders' specialised business units also play an important role in Danube navigation. Here too, the freight contract is concluded indirectly. The forwarding company, in its function as a service provider, concludes a forwarding contract with the shipper. The forwarding contract differs from the freight contract in that it obliges to provide the transport of the goods. The shipping company or the independent ship owner is obliged to transport the cargo. A freight contract, which is concluded with a shipping company or an independent ship owner in the name of the forwarder, but at the cost of its customer, regulates the relationship between these two parties.

(Shipping) agencies mostly represent several shipping companies (one for each area or freight type) and carry out all the tasks of a commercial agent on another company's behalf but for their own account. These tasks include freight acquisition, preparation of documents, invoicing, collection of charges or complaints processing. Freight contracts are in turn concluded indirectly between agents and consignors.

In practice, it is often the case in Danube navigation that the parties involved carry out several of the above-mentioned roles at the same time. A typical example would be freighting companies that sometimes also own their own cargo space.

Demand side of Danube navigation

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

Traditional markets of 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 transport of bulk cargo. If planned and carried out correctly, transport costs can be reduced in comparison to road and rail and this in turn compensates for longer transport times. The inland vessel is especially suitable for the transport of large quantities of cargo of low-value goods.

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

Inland navigation is an extremely important mode of transport for the **steel industry**. Approximately 25-30% of the total amount of the raw material 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.

Source: Mierka Donauhafen Krems

Transhipment of steel coils

The most important steelworks in Austria is voestalpine, which is located in Linz. This company operates a factory port on its own premises that has an annual waterside transhipment of 3–4 million tons. This is also Austria's most important port in that it has handled almost half of all waterside transhipment in Austria in recent years.

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

The demand and, therefore, 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 a fluctuation in the volume of transported goods required to cover the needs of the affected region. Grain and oilseed are the main products transported on the Danube. Although the transport of wood is also growing in importance due to the increasing demand from the processing industry and biomass plants.


Source: via donau

Log wood

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 Austrian companies trading in agricultural products or involved in the processing of such goods (i.e. starch, foodstuffs and animal fodder, biogenic fuel, log wood) 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 facilities. This enables transport on inland vessels with no pre- or end-haulage, thereby enabling companies to benefit from particularly low transport costs.

Source: via donau

Tanker

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 transport 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 up 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 vessel units equipped with the

Source: via donau

High & heavy goods transport

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

Other branch-specific potential 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**


Source: via donau

Rapeseed

(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 impact on the environment minimised thanks to targeted improvement in logistic

Source: via donau

Construction material

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.

A favourable development can also be expected in Central and South-Eastern 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 as well as residential construction also play a significant role. The resulting transport volumes and growing exchange of goods with South-Eastern Europe suggest a high potential for inland navigation. Inland vessels could be used here for both bulk

Source: EHG Ennshafen GmbH

Transhipment of waste paper

Source: via donau

New cars on board an inland vessel

cargo (e.g. mineral raw materials) as well as general cargo (e.g. construction materials, construction machinery).

Inland vessels come up trumps where the **paper industry** is concerned, thanks to their low transportation costs over long distances and the fact that it can be integrated so easily in multimodal logistics chains. Finished and semi-finished products (paper, carton, cardboard) as well as raw, additional and auxiliary materials (log wood, waste paper, bulking agents and pigments) are among the goods transported for the paper industry. Paper products, in contrast to many other bulk cargo, are sensitive logistics goods which place high demands on transport, storage and transhipment.

Strategies such as just-in-time or just-in-sequence are among the determin-

Source: via donau

Storage of chemical products

ing factors for success or failure in the **automotive industry**. Due to their long transport times inland vessels only play a role in the logistics chain here where the transport of less time-critical components is concerned. However, specific carrier potential can be exploited (high transport capacity, low transport costs) with the use of Ro-Ro vessels for the transport 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 stretch of the Danube. Plants from the **petrochemical industry** are often found in the immediate vicinity of refineries; these plants manufacture plastics and other oil-based products from the oil derivatives. Due to its great bulk freight capacity Danube navigation is also the ideal solution for this market segment. However, economical concepts for pre- and end-haulage are required here. Combined transport represents an attractive alternative for integrating the inland vessel into the logistics chain of the chemical industry in addition to the construction of warehouses for bulk cargo.

Used materials and waste are 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 alternative to road and rail 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 containers. The major urban areas located directly on the Danube (e.g. Vienna, Bratislava, Budapest and Belgrade) are reliable suppliers of waste metal, household refuse and other waste materials. Energetic utilisation by waste power plants is leading to an additional demand for the transport of waste.


Source: via donau

Scrap

Types of contract and transport solutions

Transport companies offer cargo space either in its entirety (full load) or as part of the available cargo hold (part load). However, the freight contract concluded with the client can also apply to the transport of individual "packages". This is known as general cargo transport. The transport of heavy and oversized goods (project cargo) differs from traditional shipping of general cargo primarily due to the need for special vessel and transhipment equipment and long-term transport planning.

Conventional bulk cargo transport on the Danube usually takes the form of **contract trips**, i.e. several trips on the basis of a contract for a specific period of time. Contract trips are often agreed for a longer period in the form of an annual contract. Such types of transport have the following features:

- An agreed annual total quantity, whereby the time of the transport operations involved as well as the size of the part deliveries is not specified (this allows for the prevention of goods being transported during low-water periods)
- Transport of full loads by motor cargo vessels or pushed convoys
- More generous timeframes regarding arrivals and departures
- Transport of the goods between one port of loading and one port of discharge
- Involvement of just one consignor and one consignee

In addition to contract trips, inland waterway transport is also carried out on the spot market (days' trading), i.e. on the basis of a freight contract concluded for individual trips or cargoes in compliance with current prices. **Spot transport** has the following features:

- Conclusion of a freight contract (contract of carriage) applicable to a full, part or package good load
- Specification of fixed delivery times (in part involving contractually agreed payment of penalties)
- Fiercer competition before conclusion of the contract, because several quotes from different transport companies are generally obtained at short notice
- Regular involvement of several parties (e.g. forwarders, agencies)

Decreasing shipment sizes and an increasing number of suppliers and customers means that a high degree of punctuality and reliability with regard to departure and arrival times is expected. **Multimodal liner services** offer a solution in this case. Like passenger ships or regular-service buses, the cargo vessels of a liner service travel according to a fixed timetable to specific ports in which the cargo is generally transhipped for further transport by road or rail.

The flexibility in the formation of pushed convoys enables the simultaneous transport of different types of goods (e.g. rolling goods, containers or bulk cargo) and helps to counterbalance disparity of traffic, i.e. different transport volumes on the route travelled.

Liner services on a waterway are distinguished by the following features:

- Regular departure and arrival times according to a fixed timetable
- Accessibility for all players in the market
- Possibility of shipping part loads (e.g. 10 containers)
- Concept for adhering to the timetables even in the event of nautical restraints (replacement services by rail or road could be necessary)

Business management and legal aspects

Shippers and logistics service providers always select the mode of transport based on the **price-performance ratio** for each individual consignment. Planning ability, reliability, transport duration and the handling of transport damage are regarded as the primary components of such performance.

@

Sample calculations can be retrieved in the section “Market and Organisation” at www.ines-danube.info.

This section provides an overview of the individual parts of the **transport cost calculation** for the inland vessel and includes a detailed description of the most important legal regulations pertaining to inland waterway transport. It is intended to offer a brief overview of the latest legal framework conditions applicable for Danube navigation.

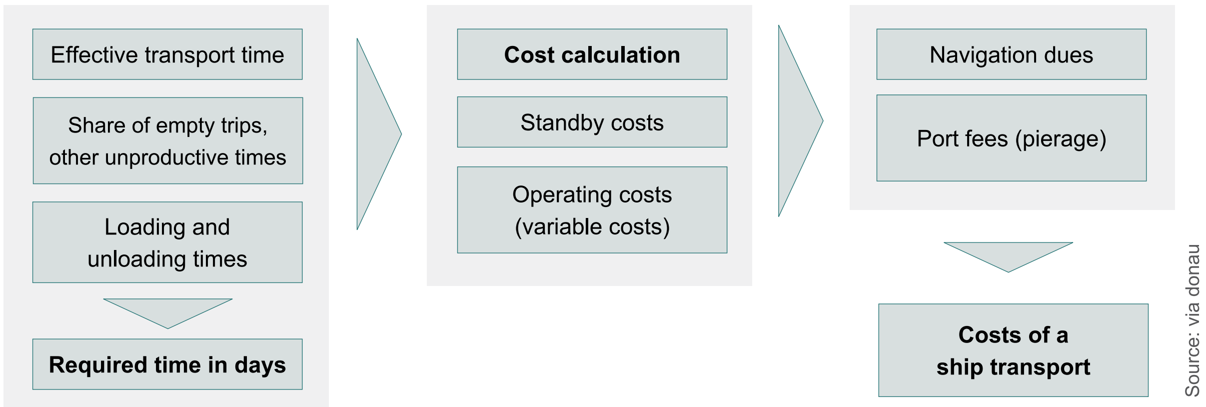
Basic principles of an inland navigation calculation

A difference is generally made between two types of costs for a transport by inland vessel, depending on whether the costs are fixed or variable: **Standby costs** and **operating costs** are both types of costs which are dependent to a large extent on individual factors and framework conditions such as the bunker costs or maximum draught loaded, and therefore need to be calculated, as far as possible, on the basis of current values. The composition of the fleet and the organisation behind it also play a key role here.

The following chart illustrates the cost structure of an inland waterway transport from the port of departure to the port of discharge excluding the costs for transhipment, pre- and end-haulage.

As limiting factors, both the draught loaded and the maximum available cargo space volume play a key role when planning a transport.

Where inland waterway cargo transport is concerned, the available fairway depth and, therefore, the **possible draught loaded** of a cargo vessel is a decisive economic criterion in shipping operations. A fairway depth of 10 cm,



Schematic overview of the cost calculation

for example, corresponds to a load of between 50 and 120 tons, depending on the size of the cargo vessel used. Higher draughts loaded, and therefore better load factors of the vessels used, reduce transport costs per ton drastically. For this reason, the continuous availability of suitable fairway depths is a decisive factor for the competiveness of inland navigation. In the case of long-haul traffic, critical fairway locations are not reached for five to ten days. As it is difficult to predict water levels, the possible draught loaded during loading (departure) of the vessel cannot be determined exactly and a safety margin is therefore usually necessary. The safety margin is based on the empirical values of the shipping company.

In addition to the actual possible immersion depth, the shipping company must also determine whether the **maximum available cargo hold volume** is sufficient to take the planned size of the cargo. The specific weight of the cargo indicates the ratio of the weight force to volumes and therefore also the utilisation of the available space in the cargo hold.

Calculation of transport times

The **effective transport time** is determined by the speed of the vessel, the flow velocity of the body of water as well as the number of locks and time spent for lockage. Lockage from Vienna westwards generally takes approximately 40 minutes or downstream from Vienna eastwards approximately 1.5 hours.

The following **table of travel times**, which takes the Austrian Danube port of Linz as the start and end point, has been calculated for typical types of vessel or convoy using the travel times for the most important routes in the Danube Corridor. The calculated durations include times for lockage but exclude intermediate stops at ports, delays caused by unfavourable nautical conditions and waiting times at borders. The mode of operation for all types of vessel

Direction

Travel time in hours							Travel time in hours			
4-unit pushed convoy	2-unit pushed convoy	Motor cargo vessel 2,000 tons	Motor cargo vessel 1,350 tons	Distance in km	Port	Number of locks	Motor cargo vessel 1,350 tons	Motor cargo vessel 2,000 tons	2-unit pushed convoy	4-unit pushed convoy
	174	161	172	1454	Ghent	62	159	149	165	
	170	157	168	1419	Antwerp	61	155	145	161	
	163	151	160	1325	Amsterdam	61	149	140	154	
	163	151	161	1336	Rotterdam	58	147	138	152	
	145	135	142	1119	Duisburg	58	135	127	141	
	119	113	113	835	Mainz	58	119	111	125	
	115	109	109	808	Frankfurt	56	116	108	122	
	43	41	41	380	Nürnberg	17	55	47	55	
	26	25	25	280	Kelheim	8	39	31	39	
	23	22	22	242	Regensburg	6	33	26	34	
	14	13	13	153	Deggendorf	4	21	17	21	
				0	**Linz**	0				
2	2	2	2	19	Enns	1	3	2	3	3
7	6	6	6	73	Ybbs	3	10	8	10	11
13	10	10	10	133	Krems	4	17	14	17	19
20	17	17	17	211	Vienna	7	27	22	27	30
26	22	22	22	263	Bratislava	7	36	30	37	41
42	37	37	37	491	Budapest	8	60	51	61	70
51	45	45	45	652	Baja	8	75	63	76	88
61	54	54	54	798	Vukovar	8	90	76	91	106
67	60	60	60	878	Novi Sad	8	99	85	100	117
73	65	65	65	978	Belgrade	8	109	93	110	128
98	88	88	88	1340	Vidin	10	142	120	140	164
115	103	103	103	1639	Giurgiu	10	167	140	163	191
135	121	121	121	2007	Reni	10	197	164	192	224
142	128	128	128	2131	Sulina	10	208	173	201	236
133	120	119	120	1891	Constanţa	12	190	159	185	216
139	125	125	125	2074	Izmail	10	203	169	197	231
141	127	127	127	2120	Kilia	10	207	172	200	235

Direction

Source: via donau

Table of travel times from/to Linz

and convoy is considered as continuous navigation for 24 hours a day with the exception of the 1,350 ton motor cargo vessel, which is usually operated for 14 hours a day.

Empty trips occur primarily due to disparate traffic, i.e. transport of goods that takes place in only one direction – upstream or downstream. However, they may also occur due to different transport flows between two areas. Another key reason for empty trips is the fact that the loading and unloading ports for subsequent transports are often far apart. Empty trips can vary according to the different sections of the route or the different companies and are incorporated into the transport time as surcharge rates.

Other unproductive times occur due to unplanned waiting caused by lightening (i.e. when the cargo of a ship has to be divided among several vessels due to shallow water) or due to suspensions of navigation in the case of ice or high water levels.

Loading and unloading times vary greatly from one case to another. They depend on the transhipment facilities and their availability at the respective ports.

Cost categories

The following **ship parameters** should be taken into account and calculated on the basis of current values when working out the cost of a ship transport.

- Size and capacity of the vessel as well as draught and possible draught loaded (maximum dimensions in accordance with the waterway class)
- Age and condition of the ship to be used
- Flag under which the ship is registered
- Operator structure (independent ship owner, shipping company)
- Mode of operation (operating time 14, 18 or 24 hours a day)
- Crew (number, qualification, kind of contract)

Standby costs are the costs for maintaining a vessel ready for use not taking operating costs into account and that fall due even while the vessel is standing still. These include, for example, crew wages, maintenance and repairs, amortisation of the vessel or interest and insurance.

Operating costs are costs incurred during operation of the vessel, i.e. dependent on the number of kilometres or hours travelled. These include, for example, bunker and lubricant costs, commission for brokering the contract or dues and fees.

Inland vessels are normally driven by combustion engines and use gasoil as fuel. Average **fuel consumption** is dependent on three factors: the utilisation

More information concerning the Danube Commission and the Belgrade Convention can be found in the chapter “Targets and Strategies”.

of the vessel (due to loading limitations), the parity of traffic (empty trips) and the prevailing fairway depths (shallow water resistance). Nautical conditions (impounded sections, free-flowing sections, characteristic current velocities) also have a great impact on fuel consumption in each individual case. Fuel prices are linked to the price of oil and can therefore fluctuate considerably.

As the section of the Danube from Kelheim to Sulina is defined as an international waterway, in compliance with the "Convention Regarding the Regime of Navigation on the Danube" dated 18th August 1948 ("Belgrade Convention"), and can therefore be used free of charge by navigation, it is not subject to any **navigation dues**.

The 63-km-long Sulina Canal used almost exclusively by sea-river or seagoing vessels is an exception. The Romanian River Administration of the Lower Danube charges dues calculated per ton deadweight of a vessel for maintenance purposes.

The authorities charge dues for infrastructure maintenance on national waterways that do not fall under the Belgrade Convention. Such waterways include the Ukranian Bystroe arm (maritime stretch of the Danube), the Romanian Danube-Black Sea Canal (links the Danube to the Black Sea and the seaport of Constanţa at Cernavodă) and the German Main-Danube Canal.

Port fees are charged for the use of the port basin and also frequently for waste disposal, power connections or drinking water supply, and are calculated according to the volume of transhipped cargo.

Operative cost management

Full-costing systems for calculating the daily rates for keeping a vehicle on standby are traditionally widespread in inland navigation. This entails registering and adding up of all periodic individual and overhead costs – e.g. costs for the crew, amortisation and insurance – and dividing the total by the number of operating days in the given period. Costs calculated in this way are called daily standby costs and are average values or **fixed costs** incurred independent of the contract.

In addition, operating costs per travelled hour are charged for specific routes and types of vessel. These are **variable costs** that can be added to each individual contract. Variable vessel costs include:

- Fuel and lubricant costs
- Costs for non-permanently employed crew members, e.g. temporary workers
- Costs that vary depending on the route, e.g. pilot costs
- Commissions for brokering the contract

- Levies and dues, e.g. navigation dues or port fees
- Costs for cleaning the vessel

A contract is not accepted on principle unless the standby and operating costs, i.e. the fixed and variable costs, are covered and a profit over and above this amount can be generated. If no such contract can be found for a vessel, a transport price can also be accepted if it is higher than the variable costs but lower than the fixed costs. This means that at least a sum can be achieved that will cover the fixed costs, the so-called **contribution margin**. Any commercial activity will only increase losses if the transport price is lower than the variable costs.

Multimodal transport

This chapter was developed together with the LOGISTIKUM, the logistics research institution of the Upper Austrian University of Applied Sciences and is partially based on the **Manual on Intermodal Transport** (Gronalt et al. 2010).

Introduction

According to a study drafted on behalf of the European Commission about "The future of Transport" (Petersen et al. 2009), cargo transport in the 27 member states of the European Union is predicted to rise significantly by 2030. Compared to the year 2005, transport performance, measured in ton-kilometres, will rise by about 50% (baseline-2030-scenario including land transport modes but excluding maritime transport).

The reasons for the predicted sharp rise in cargo transport volume lie with the **internationalisation of production activities** and the **high level of consumption** in Europe. Production sites have been relocated to cheaper, and usually, more distant regions. This particularly affects the production of labour-intensive goods in low wage countries. Due to the fact that single product components have to be combined into one joint product, transport of the components to a suitable location is necessary.

Another reason for an increase in traffic volume is the trend towards a **minimisation of warehousing** in order to safeguard costs. This requires just-in-time delivery and has been leading to a reduction in delivery quantities. Warehousing usually takes place on route – highways are often called "the Storehouse of Europe".

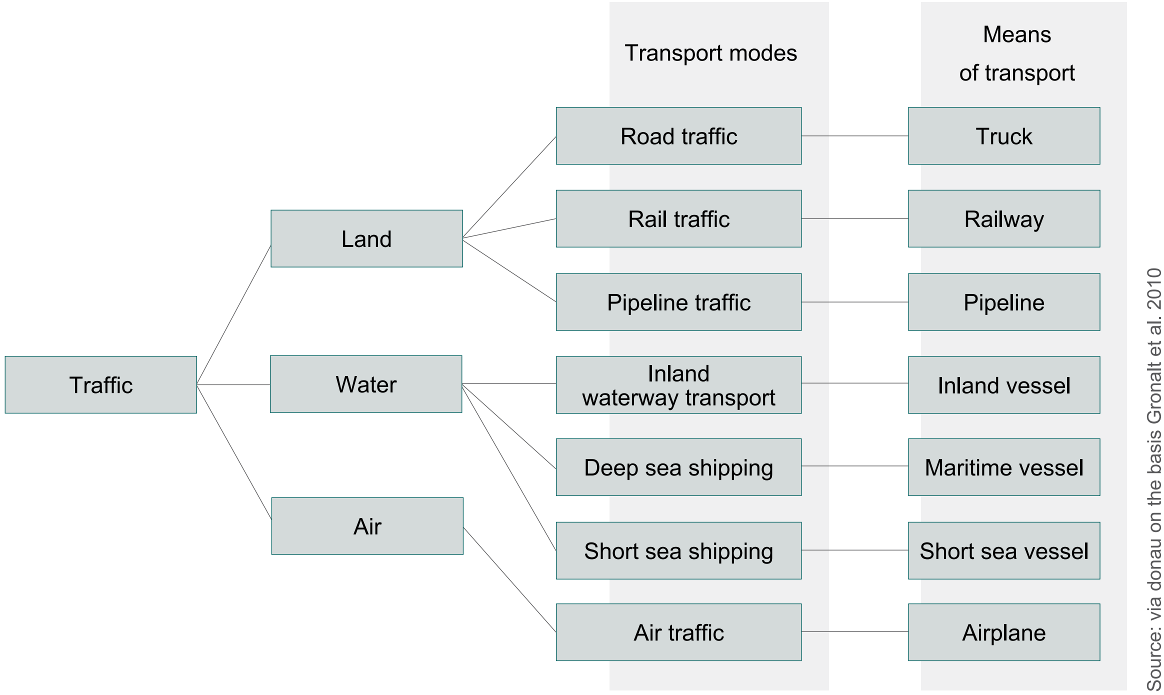
In order to minimise the negative results of rising traffic volumes on society and the environment, a **shift towards more environmentally friendly transport modes** such as waterways and rail is inevitable. This shift can reduce negative results such as noise or CO_2-emissions significantly. An improvement of the situation can be consequently achieved by multimodal transport solutions, i.e. the ideal combination of vessels, rail and trucks.

Terminology

Modes and means of transport

There are several transport modes and means of transport. A **transport mode** provides the necessary infrastructure for using a certain means of transport. Without this infrastructure, no transport would be possible. The transport modes are situated on land, on the water and in the air. Land transport comprises of road, rail and pipeline transport; waterborne modes are inland waterway, deep sea and short sea shipping; the air mode comprises of air traffic.

Means of transport are technical facilities and equipment for the transport of people or goods. Transport means in freight transport are, for example, the inland vessel, the truck or the plane. Due to the fact that transport cannot usually be handled using a single mode or means of transport (e.g. because of geographic conditions), varying forms of transport have been developed, which are described as "transport processes".



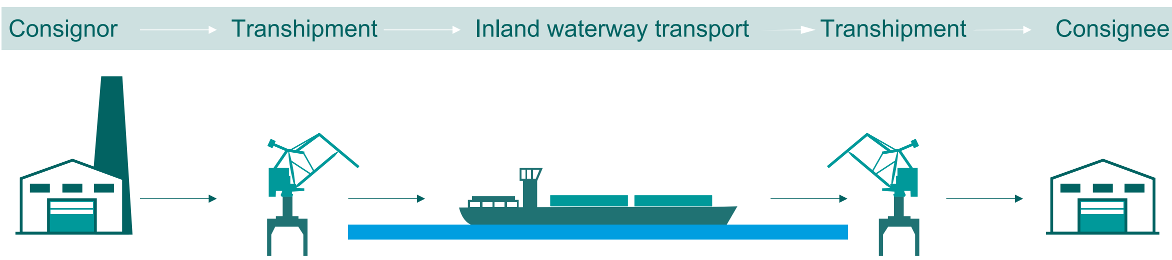
Overview of the transport modes and means of transport

Transport processes

Transport can be processed in several forms (e.g. either directly or by making use of several modes of transport) and it is therefore necessary to specify these processes more clearly.

Transport processes can be initially classified into direct and non-direct transport. In the case of a **non-direct transport** process, the transhipment of goods takes place, whereas in **direct transport** no such transhipment is needed.

In **direct transport**, goods are transported directly from a point of departure to the destination. For this reason, it is also called door-to-door transport. In this case, the means of transport (e.g. vessel, truck or railway) is not changed and there is also no change of transport mode (e.g. rail or inland waterway). In short, direct transport can always be classified as **unimodal** (goods are transferred from the starting point to the end point by one means of transport). An example is port-port transport by inland vessel (e.g. transport of mineral oil from storage facility A to storage facility B).



Source: Günthner 2001

Direct transport by inland vessel

Multimodal transport is characterized by the transport of goods using two or more different transport modes (e.g. change from waterway to rail). In order to change the means of transport, transhipment of the goods is required. In doing this, the strengths of the several individual transport modes can be used and the cheapest and most environmentally friendly combination can be chosen. Since each transhipment involves additional time and causes additional cost, multimodal transport is often used for long-distance transport where delivery time is not an important factor.

Source: Günthner 2001

Multimodal transport by inland vessel

The first part in a transport chain is called **pre-haulage** and constitutes the delivery of a cargo to the first point of transhipment (such as a port). Pre-haulage is mostly carried out by trucks. Nevertheless, if companies have access to the railway network, they are also able to use the railway for pre-haulage.

Transhipment signifies the switching of the cargo or intermodal loading unit from one means of transport to another. A shift of transport modes, e.g. from road to inland waterway (multimodal transport) can also take place.

The term **main leg** describes the transport of goods or loading units from the consignor's transhipment point to the consignee's transhipment point. The word "main" results from the fact that the longest part of the transport is performed between these points. Vessels or railway are mostly used in this case.

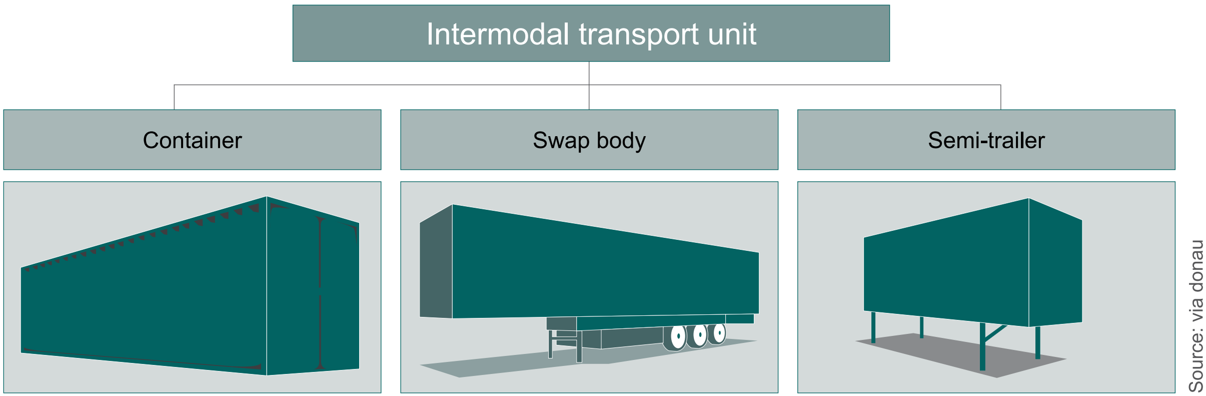
The **end-haulage** signifies the delivery of the cargo from the consignee's point of transhipment to the consignee's location. Usually, the end-haulage is carried out by trucks.

Pre- and end-haulage activities should be kept to a minimum, due to the fact that their costs are especially high. Additionally, the transhipment process itself should be optimized in order to save on time and costs.

Intermodal loading units

To reduce time and costs during the transhipment process, **standardised loading units** are used in intermodal transport. Because of the standardisation of the loading units' size and the necessary equipment (spreader), easier handling, better scheduling and higher exploitation of space (stackability of containers) can be achieved. Intermodal loading units – also: intermodal transport units (ITUs) – are transhipped between road, rail and waterway using specialized facilities.

Containers are standardised receptacles made of metal and available in different sizes and forms. Their main advantages are their extreme robustness and high stackability, resulting in optimum utilisation of space. In addition, the container protects its load from theft and damage.



Classification of intermodal loading units

Containers can be classified into different types:

- **ISO containers** are the best-known and most frequently used containers and can be divided into 20-foot or 40-foot containers. They are used for road, rail and waterway transport. Unfortunately, they do not efficiently match the size of euro-pallets and are therefore mainly used for maritime and international exchange of goods.
- **Continental containers** have been designed according to the UIC standard to fit the size of euro-pallets. As a result, these containers are usually used for continental intermodal transport in Europe.
- In general, containers are available in various **shapes and sizes for special purpose**, e.g. containers for reefer cargo or liquid cargo.

An important international term for container transport is the **Twenty-foot Equivalent Unit** (TEU). This standardised unit is used to calculate a cargo vessel's maximum loading capacity (e.g. the number of 20-foot containers that fit onto a vessel). A 40-foot container is the equivalent of two TEUs.

Swap bodies (also known as swap trailers or swap containers), are trailers for trucks without a chassis and fully compatible with euro-pallets. The sizes of swap bodies are principally standardised, although many companies use numerous company-specific lengths. The body can be either made of metal and wood (so-called box body) or can also consist of a light-alloy frame with tarpaulin (i.e. tarpaulin structure). The main advantage of a swap body is its ability to stand freely using four foldable legs that enable easy loading and unloading. However, swap bodies are not often used for inland waterway transport because – unlike containers – they are difficult to stack.

Semi-trailers are non-motorised vehicles used for the carriage of goods intended to be coupled to an articulated vehicle. They can be divided into craneable and non-craneable trailers.

- **Craneable semi-trailers** are equipped with biting edges which enable them to be grabbed by a crane or mobile device (such as a reach stacker) for loading purposes. For this reason, craneable semi-trailers are perfectly suited to intermodal transport.
- In contrast, **non-craneable semi-trailers** cannot (or only by using special equipment) be lifted, as they do not have biting edges. As a result, an articulated vehicle is required to roll them onto an inland vessel ("floating road") or a special low-floor wagon ("rolling road").