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viadonau

READER – BASICS OF INLAND NAVIGATION

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

The following introductory chapter provides an overview of the system of Danube navigation, its characteristics and its relevance to the European transport system. The aspects outlined in this chapter are presented in greater detail in the subsequent chapters of this manual.

System elements of Danube navigation

Danube navigation needs to be understood as a system of strongly interrelated single elements. These elements are the Danube **waterway**, the **vessels** and their cargoes (types of goods), the **ports** as hubs that link inland navigation with the transport modes of road and rail, **River Information Services** (RIS) together with the **legal and policy framework**. The potential of navigation on the Danube can only be fully realised when interaction of all of these elements is achieved.

The Danube waterway

The Danube rises in the Black Forest in Germany and empties into the Black Sea in Romania and the Ukraine. The river is **2,845 km long** – 2,415 km of which are navigable – and connects ten riparian countries. Since early history, the Danube has been a main trading route in Europe. It is an important source of energy and drinking water as well as being a unique habitat for wildlife and a recreational area.

The capacity of the Danube waterway is a key factor of the inland navigation system and is determined mainly by prevailing **nautical conditions** (i.e. the

Source: Hafen Straubing-Sand GmbH

Aerial view of the Bavarian Danube port Straubing-Sand

navigability of the Danube with a cost-effective vessel draught loaded over the course of the year). This has a direct influence on the potential capacity utilisation of vessels navigating the river. Good nautical conditions and continuous maintenance of the waterway's infrastructure enable the sector to offer reliable and competitive transport services. This is a crucial precondition for the sustainable integration of inland navigation as an environmentally friendly mode of transport within the logistical concepts of a modern economy.

Danube ports

Inland ports facilitate the **combination of the transport modes waterway, road and rail**. Working in multimodal logistical chains, rail and road act as partners to waterway transport by enabling pre- and end-haulage operations with ports fulfilling their role as an essential interface.

Over the last few decades, ports on the Danube have undergone a substantial transformation from conventional inland ports to modern **logistical hubs**. In addition to their basic function as transhipment hubs and storage sites, ports today provide a broad range of logistical services including commissioning, distribution and project logistics. Due to the fact that they serve as production sites as well as centres for cargo collection and distribution, they are extremely well integrated into regional economies and contribute substantially to economic growth and the creation of employment.

The three **most important port locations in terms of transhipment volumes on the Danube** are Izmail (Ukraine), Linz (Austria) and Galați (Romania). The seaport of Constanța in Romania occupies a special place. It is connected to the Danube via the Danube-Black Sea Canal and plays an important role as a transhipment gateway to the Black Sea, thereby facilitating trade with Asia, the Middle East and the Black Sea region.

Inland vessels

There are two fundamental types of inland vessels and these are classed as: **motor cargo vessels**, which are equipped with a motor and a cargo hold, and **convoys** comprising of a motor cargo vessel or pusher and one or more non-motorised pushed lighters which are connected to the pusher vessel. On the Danube, the predominant share of cargo traffic is carried out by such convoys.

The most common **types of cargo** transported on the Danube and its navigable tributaries are ores, scrap metal, mineral raw materials, solid fuels, construction materials and agricultural goods.

In addition to cargo transport, **passenger transport** also plays an important role with day trips and river cruises becoming more and more popular.

River Information Services

A cornerstone of the technological modernisation of inland navigation has been the implementation of River Information Services (RIS). RIS are tailor-made **information and management services** for inland navigation that raise transport safety and help improve the cost-effectiveness, reliability and predictability of transport. It comprises of electronic navigational charts, the tracking and tracing of vessels and current online information on water levels.

Transport policy framework

In addition to the goal of ensuring a high level of accessibility, **European and national transport policies** are increasingly striving to create preconditions for sustainable and energy-efficient transport. Inland navigation can contribute substantially to this due to the fact that it is environmentally friendly, safe and offers spare capacity.

In order to strengthen the share of inland navigation in an integrated transport system, the European Union has published an **Action Programme for the Promotion of Inland Waterway Transport** – "**NAIADES**" (📄 European Commission 2006). In the Danube region, the Strategy for the Danube Region of the European Union will provide an important framework for development activities until 2020 (📄 European Commission 2010b).

On a national scale, transport policy targets have been defined in specific **action programmes** for inland navigation or in **national transport master plans**, which refer to the above-mentioned political programmes at a European level.

One of the most important goals for the coming years will be to utilise the national and European programmes and strategies in order to enhance and modernise navigation on the Danube.

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.

Danube navigation at a glance

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

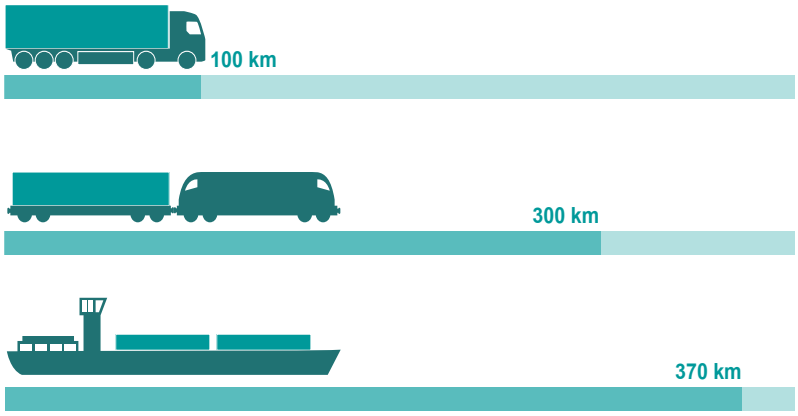
SWOT analysis of Danube navigation

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.

Specific energy use

With regard to **specific energy use**, inland navigation can be described as the most effective and most environmentally friendly mode of transport. An inland vessel is able to transport one ton of cargo almost four times further than a truck using the same consumption of energy.



Source: via donau

Transport distances for one ton of cargo requiring the same amount of energy

External costs

External costs for inland navigation, i.e. costs deriving from climate gases, air pollutants, accidents and noise, are the lowest when compared to other transport modes. CO_2 emissions are, in comparison to other modes of transport, especially low and this enables inland navigation to contribute to the achievement of climate goals set by the European Union.

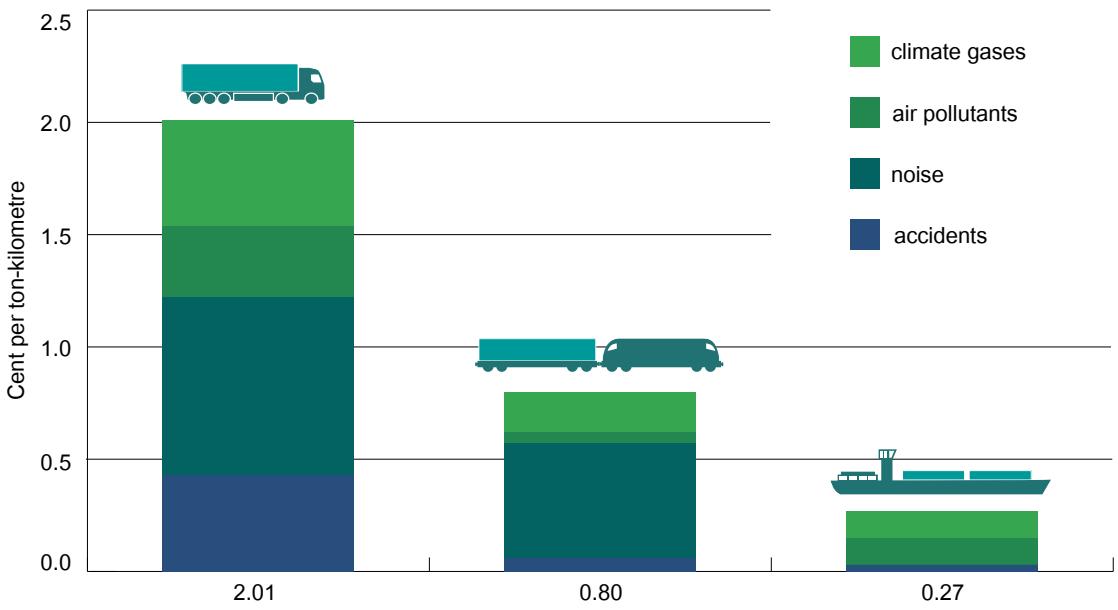
Bulk freight capacity

Compared with other land transport modes, Danube navigation offers significantly higher **transport capacity per transport unit**. A single convoy with four pushed lighters can move 7,000 tons of goods, which corresponds to a load of 175 railway wagons each containing 40 net tons or 280 trucks each containing 25 net tons. Raising the amount of goods transported on the Danube will consequently result in a reduction of traffic jams, noise, pollution and accidents on roads and relieve strain on the railway system.

Infrastructure costs

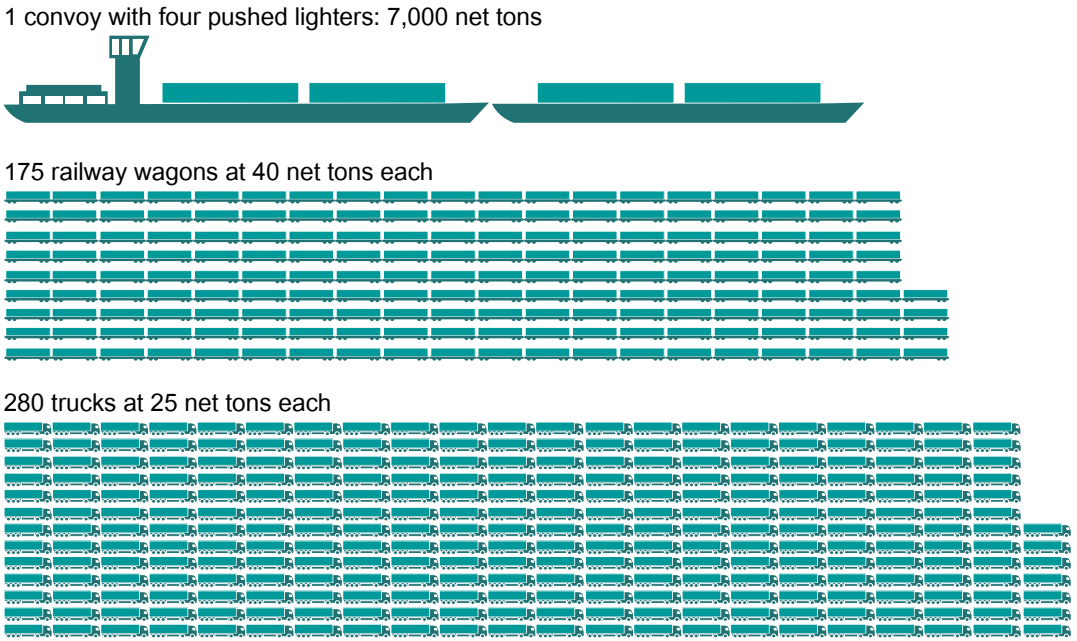
Infrastructure costs consist of **costs for constructing and maintaining transport routes**. In the case of inland navigation, natural infrastructure is usually available, resulting in comparably low infrastructure costs. Detailed comparisons of aspects regarding inland transport modes are available for Germany: infrastructure costs per ton-kilometre are roughly four times higher

Danube navigation at a glance



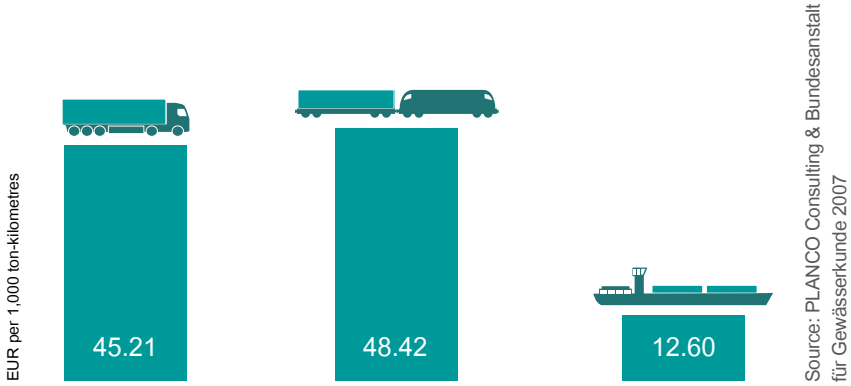
Source: PLANCO Consulting & Bundesanstalt für Gewässerkunde 2007

The sum of external costs for inland vessels is by far the lowest (average values for selected transports of bulk goods)



Source: via donau

Inland vessels beat road and rail in terms of transport capacity



Comparison of infrastructure costs (example of German inland transport modes)

for road or rail than for waterways (PLANCO Consulting & Bundesanstalt für Gewässerkunde 2007).

Improving the complete infrastructure of the 2,415 km long Danube waterway would require an investment of 1.2 billion EUR according to current cost estimations for infrastructure projects in the Danube riparian states. This corresponds roughly with the cost of constructing 50 km of road or rail infrastructure. The costs for current railway tunnel projects in Europe amount to between10 and 20 billion EUR.

Relevance of Danube navigation

Danube waterway transport in comparison to Europe

In 2010, 485 million tons of goods were transported on the **inland waterways of the European Union**. Transport performance accounted for 148 billion ton-kilometres. Accordingly, the mean average distance of freight transport on European inland waterways amounted to 305 kilometres.

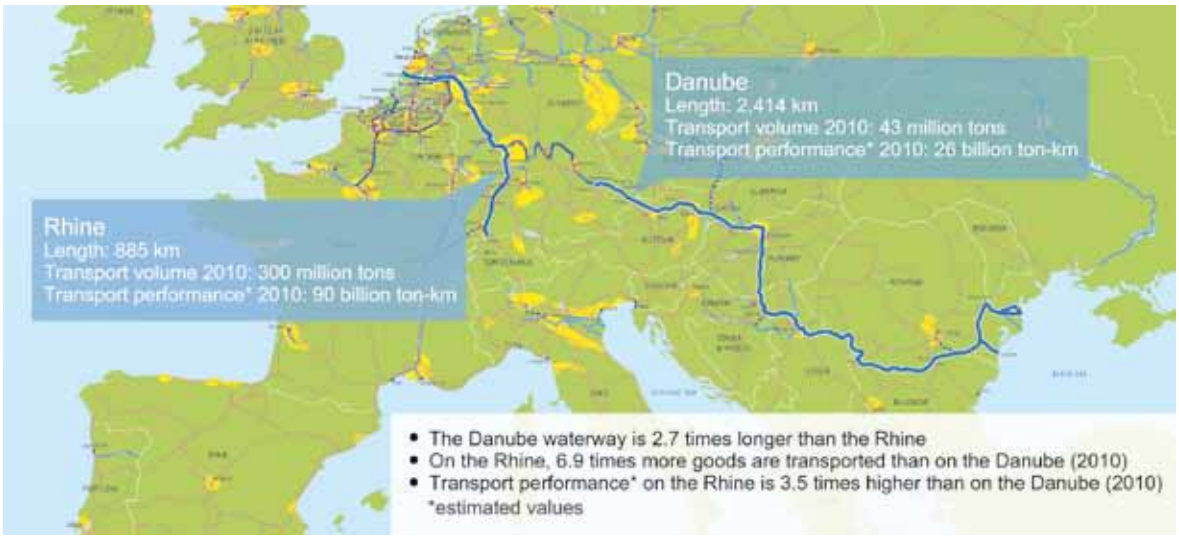
The **Main-Danube Canal** forms an important part of the Rhine-Main-Danube inland waterway which extends, with a length of 3,500 kilometres, through the European mainland from the Port of Rotterdam on the North Sea to the Port of Constanţa on the Black Sea. With a transport volume of 300 million tons, the **Rhine** clearly has a more intense utilisation of transport than the **Danube**, on which about 43 million tons were transported in 2010. Nevertheless, Danube traffic is characterised by longer distances, and this becomes obvious when comparing the transport performance of these two main European waterways: 26 billion ton-kilometres on the Danube (average transport distance of about 600 kilometres) compared to 90 billion ton-kilometres on the Rhine (average transport distance of about 300 kilometres).

Statistical data for the EU-27 countries were taken from the online database of Eurostat, the Statistical Office of the European Union: ec.europa.eu/eurostat; this comprises of estimated and preliminary values. Values for the Danube region are based on enquiries by via donau, which were conducted on the basis of national statistics.

Danube navigation at a glance

Regarding the **transport volume of single Danube riparian states** achieved on the Danube waterway and its navigable tributaries in 2010, Romania was by far the largest transporter of goods (21.6 million tons), followed by Serbia with 14.3 million tons and Austria with 11.3 million tons.

Maritime transport on the Danube, i.e. transport on river-sea or sea-going vessels on the Lower Danube (Romania and Ukraine), accounted for 4.8 million tons in 2010, the majority being handled via the Sulina Canal.



Source: via donau, Inland Navigation Europe

The European inland waterways Rhine and Danube in comparison

Modal split

For the **27 countries of the European Union**, the share of inland waterways in the modal split in 2010 was around 6.5% – meaning that 6.5% of all freight ton-kilometres were handled on waterways. This share differs sharply throughout individual EU countries. The Netherlands, for example, have important seaports and a highly integrated inland waterway network which is divided into small sections. This results in the highest inland navigation share of the EU-27 (32.9% in 2010).

In the **Danube region**, however, different infrastructural preconditions exist: waterway cargo transport is mainly concentrated on a principal river, on which very large amounts of cargo can be handled. However, the limited ramification of the waterway enables only a spatially concentrated use, confining the Danube to a limited form of transport requiring longer pre- and end-haulage by road or rail. For this reason, inland navigation in the Danube region usually has a lower share of national modal split figures.

Detailed statistics on transport in the European Union:
epp.eurostat.ec.europa.eu

Statistics on Danube navigation from the Danube Commission:
www.danubecommission.org

Annual reports on Danube navigation in Austria are published by via donau and are available for download on www.donauschifffahrt.info/en.

Danube waterway transport in Austria

In Austria, between 9 and 12 million tons of goods are transported on the Danube annually. About one third of these goods are ores and scrap metal; about one fifth accounts for petroleum products as well as agricultural and forestry products.

The waterway share in the modal split in the Austrian Danube corridor is about 14%. The Danube plays an important role mainly in upstream transport, especially in imports via the eastern border and in transit. In these transport segments, the Danube is approximately neck and neck with rail. With regard to the entire territory of Austria, the Danube has a share of approximately 5% of the modal split.

Glossary

Agency – organizes a transport by ship and acts as an agent between the → shipper and the → shipping company

Aggregate state – the qualitatively different physical condition of materials depending on temperature and pressure

AIS transponder → transponder

ARA ports – Abbreviation for the → universal ports in Antwerp (Belgium), Rotterdam (the Netherlands) and Amsterdam (the Netherlands)

Ballasting – reducing the height that a ship projects over the waterline by holding ballast water in the ballast tanks or by loading solid ballast

Barge – vessel without its own motor that is pulled by a → tug and is provided with a helm stand for steering

Barrage – facility for damming a river to control its water level

Berth – on land: wharf; on the water: anchorage

Berthing time – time that is estimated according to the agreement for loading or clearing a ship at a port or a → transhipment site

Big bags – flexible bulk cargo receptacles that are similar to big sacks (the international designation is Flexible Intermediate Bulk Container – FIBC)

Bilge – lowermost space over the ship's base in which seepage accumulates

Bilge water – water containing oil from the engine room area of a ship; see also → bilge

Bill of lading – the transport document customary in inland navigation that controls the relationship between the → freight carrier and the consignee and serves as the evidence of the right to receive the consignment

Block train – cargo train that travels from the loading point to the point of unloading as a unit without intermediate stops

Boatmaster – captain of a ship who bears responsibility for the ship

Bow – front part of a ship

Bow thruster – active steering gear at the → bow of a ship

Branch canal – a shipping canal branching off from a → waterway that forms a "dead end"; for connecting cities or industrial zones that lie near a main waterway

Bulk cargo – unpacked goods (e.g. coal, ore or grain) that are loaded with grabs, dredgers and similar equipment

Bulk freight capacity – the capability of a → means of transport to move a large quantity of goods at one time

Bunker boat – ship that is used to supply other ships with fuels, consumables and foodstuffs (possibly also for waste disposal)

Bunker costs – costs for supplying a ship with fuels, consumables and foodstuffs

Cabotage – transport between two ports in the same country or between two ports of two different countries that are located on a coast or a river; in most cases, this is associated with restrictions for foreign vessels (prohibition of cabotage)

Canal (navigation) – generally, in its most part artificially created → waterway with or without → locks, ship lifts or sloping levels to bridge differences in heights between impounded sections of a → waterway

Cargo handling centre – also termed "hub"; location that is connected to various → transport modes and provides different logistics services

Catchment area (of a river) – the entire drainage area of a river and its tributaries, both over-ground and underground

Cavitation – formation and then the immediate implosion of cavities in a liquid which reduces the → efficiency of ship propellers

Central Commission for the Navigation of the Rhine (CCNR) – International organisation, whose main task is to review and revise ordinances on all issues of navigation on the Rhine which are to be issued by the member states of the Commission on the basis of the "Revised Convention for Navigation on the Rhine"

Central Danube – according to the definition of the → Danube Commission, it is that section of the navigable Danube between the Hungarian port of Gönyű (river-km 1,791) and the Romanian port of Drobeta-Turnu Severin (river-km 931); see also → Upper Danube or → Lower Danube

Charter contract – freight contract in shipping, which covers the entire cargo hold of a vessel (complete or full charter), individual indefinite cargo holds (partial charter) or specific cargo holds (space charter)

Class certificate – confirmation by an authorised institution (= class) that a ship meets the technical regulations necessary for travelling on a specific → waterway

Clearance (bridges, overhead cables) – vertical distance between the waterline at the → highest navigable water level (HNWL) and the lowest limit imposed by a bridge or any other overhead span above and across the → waterway

Coil – steel sheet, wide tape, wire or steel tube that has been rolled up ("coiled")

Combined transport – special type of → intermodal transport in which the major part of the route is covered by inland vessel or cargo train and the → pre- and → end-haulage is covered by road but kept to a minimum

Commissioning – customised compilation of items from a total quantity (assortment) for one order

Consignment note – record of the contents of the → freight contract concluded; to be prepared by the consignor (→ shipper)

Container – basic term for a receptacle that is used for goods transport, robust enough for repeated utilisation, usually stackable and fitted with elements for transfer between various → transport modes; it represents an → intermodal loading unit

Container vessel – → motor cargo vessel that has been constructed specifically for transporting → containers

Continuous conveyor – technical equipment for continuous transport of goods (e.g. conveyor belt or → elevator)

Contract trip – transport covering several trips on the basis of a contract agreement for a certain time period

Contribution margin – Contribution to covering of → fixed costs

Conveying and lifting machinery – a vehicle used for the horizontal transport (in contrast to cranes) of goods in the area of ports or → transhipment sites; it is deployed in most cases within a company on even ground

Conveyor equipment – machinery that is used to move goods; there are special systems for → bulk cargo (e.g. trough chain conveyors and bucket elevators) and also for → general cargo

Convoy – formation consisting of one motorised (or self-propelled) vessel and one or more non-motorised vessels; → pushed convoy, → coupled formation, → pushed-coupled formation, → towed convoy

Coupled formation – → convoy consisting of one → motor cargo vessel and one or two non-motorised load carriers (→ pushed lighter or → pushed barge) that are coupled to the drive unit on the side; see also → pushed-coupled formation and → pushed convoy

Crane bridge – horizontal part of a → gantry crane

Crane cycle – movement of a crane within its technically feasible range of manoeuvring

Curve radius (fairway) – radius of curvature of the → fairway

Danube Commission – international inter-governmental organisation that was formed in accordance with the "Convention regarding the Regime of Navigation on the Danube" signed on 18th August 1948 in Belgrade

Demurrage – remuneration charged by the port operator for a loading and/or unloading period exceeding the time either stipulated in a contract or by law

Depth at pointing sill – distance between the water surface and the pointing sill, i.e. the ground sill of a lock gate that closes with the gate in a water-tight manner in order to prevent discharge from the → lock chamber

Direct transport – also called "door-to-door transport"; transport between a point of delivery and a point of receipt without changing the → means of transport and the → transport mode

Discharge – the quantity of water that flows through a certain river cross-section per unit of time at a specific point in time; discharge is usually specified in m^3/sec

Discharge (vessel) – unloading of a vessel

Discharge regime – characteristics of the → discharge of a water body, governed by the critical regime factors, i.e. the climatic conditions and characteristic regional features of the → catchment area being considered

Disparity of traffic – transport of goods that takes place only in one direction – on the Danube → upstream or → downstream

Distribution – physical distribution of goods

Document of title – a document, the submission of which leads to transfer of ownership of goods

Donau River Information Services (DoRIS) – name of the Austrian inland navigation information and communication system

Door-to-door transport → direct transport

Downstream voyage – movement of a vessel in the

flow direction (downstream) of a natural → waterway; see also → upstream voyage

Draught (of a ship) – total of → draught loaded (loaded vessel when stationary) and → squat (vessel in motion)

Draught loaded – the distance between the lowest point of the bottom of a vessel when stationary and the → water surface

Dry cargo vessel – → motor cargo vessel that may be deployed for transporting various dry cargoes, including log wood, → steel coils, grain and ore

Efficiency – ratio of power output to power input

Electronic lock management system (LMS) – Austrian system for automating the statutory recording of service operations on → locks

Electronic Reporting (ERI) – electronic reporting of → hazardous goods

Elevator – mechanical → continuous conveyor for vertical delivery

End-haulage – part of the transport chain that stretches from a transhipment point or → terminal – last in most cases – to the point of delivery

Energy efficiency – scale of energy input to achieve a specific benefit or use

E port – port, whose parameters conform to the UNECE classification of European ports of international importance (as specified in the AGN – European Agreement on Main Inland Waterways of International Importance)

Erosion – in the geological sense, it is the erosion of weathered rocks and soil, primarily by bodies of flowing water, glaciers and wind

Euro-pallet – standardised, multi-use transport → pallet; it can be lifted from all four sides and transported with → conveying and lifting machinery

E waterway – → waterway whose parameters conform to the UNECE classification of European waterways of international importance (as specified in the AGN – European Agreement on Main Inland Waterways of International Importance)

External costs – costs or disadvantages arising for a community without the person(s) causing them paying for the same (e.g. contamination of air and water); in traffic management, also referred to as “negative external effects”

Fairway – the part of a → waterway in which specific widths and depths are maintained to enable continuous navigation

Fairway parameters – variable parameters that determine the quality of the → fairway currently available, primarily the depth and width of the fairway

Fillers – suction or pumping equipment used for the transhipment of liquid cargo

Fixed costs → standby costs

Floating crane – crane that is installed on a floating unit

Floating road – → Roll-on-Roll-off transport of loaded and unloaded road transport vehicles (articulated trucks and → semi-trailers) with the inland vessel

Ford – shallow section in a river that stretches across the entire width of the river

Forwarder – company that provides transport and other associated services on behalf of the consignor

Freight carrier – commercially accepts the transport of goods at its own responsibility using its own or other ships

Freight contract – contract between the consignor and the → freight carrier regarding the transport of goods, which specifies the rights and obligations of the parties to the contract

Freight rate – also known as “freight tariff”; price that is paid for a particular type of cargo and for a specific route under certain conditions

Freighting company – company that schedules cargo loads of inland vessels and acts as a cargo agent

Fuel cell – galvanic cell that converts the energy generated by the chemical reaction of a continuously fed fuel and an oxidation agent to electrical energy; used in most cases for hydrogen-oxygen fuel cell

Gantry crane – rail-mounted crane for efficient loading and unloading operations; stretches across the vessel on the waterside and the road or tracks on land; the goods to be transhipped can be moved with the help of the → crane bridge in the dimensions of height, width and length

Gauge zero – elevation of a gauge staff with respect to the mean sea level (reference value for specifying the elevation on the earth’s surface)

General cargo – goods transported in packages (→ containers, boxes, bags) or in pieces (log wood,

machinery) (in contrast to → bulk cargo)

Gondola propeller – ship propulsion that is enclosed by a streamlined gondola and may be rotated by 360° around the vertical axis

Granulometric riverbed improvement – the use of coarse gravel to cover lower zones of the → riverbed in order to halt riverbed degradation of a river

Gross domestic product (GDP) – total value of all goods (goods and services), which are manufactured in the course of one year within the national borders of an economy and serve the purpose of end consumption

Groyne – hydraulic structure for river training made of loose boulders across the flow that restricts the cross-section of a river when the water levels are low, as a result of which the water level in the → fairway is raised; see also → training wall

Hawser – rope of large diameter made of steel cable or synthetic material

Hazardous goods – materials and objects that may be hazardous to human beings, animals and the environment in the case of accidents or improper handling during transport

Headwater – stretch of a → waterway that is directly above a river power plant; compare → tailwater

High & heavy – designation for a group of goods that include heavy and over-sized cargo

Highest fixed point (of a vessel) – vertical distance between the waterline and the highest immovable point of a vessel after movable parts such as, for example, masts, radar or wheelhouse have been folded or lowered

Highest navigable water level (HNWL) – in accordance with the definition of the → Danube Commission, it is the water level that is reached or exceeded at a → water gauge over a long period of time (stretching across several decades) on an average of 1% of the days in a year (i.e. on 365 days), excluding periods of ice

Hinterland (of a port) – catchment area of a port that has good traffic connections

Hinterland traffic – inland port: connecting traffic by rail or road; seaport: connecting traffic by a → land transport mode

Hopper barge – open vessel with a hinged bottom for transporting and dumping dredged material

Hub (ship's propeller) – element for connecting a propeller with the axis of the drive motor

Hydrodynamic resistance – resistance offered to a body when it moves in water

Hydrodynamics – study of laws of motion of the water and the forces acting in the process; a sub-area of hydraulics

Hydrography – science that concerns itself with the survey of the shape of the bottom of rivers, lakes and oceans

Hydrology – science that concerns itself with the water above, on and below the land surface of the earth

Hydromorphology – physical characteristics of river structures such as the → riverbed, river bank, the connection with the adjacent landscapes as well as longitudinal river continuity and habitat continuity

Immersion depth (of a ship) – total of → draught loaded (loaded ship when stationary) and → squat (ship in motion)

Impounded (river section) – section of a river or other body of water that lies between two consecutive barrages

Impounded water level – water level above a → barrage

Infrastructure costs – costs for the erection and maintenance of transport infrastructure

Inland AIS – ship → tracking and tracing system for inland navigation; extension of the scope of news of the maritime AIS standard for catering to the needs of inland navigation (Inland Automatic Identification System)

Inland ECDIS – basic standard for the visualisation of electronic navigational charts (Inland Electronic Chart Display and Information System)

Intermodal loading unit – → loading unit, which is suitable for → intermodal transport, i.e. → container, → swap body or → semi-trailer

Intermodal transport – transport of goods in one and the same → loading unit or the same road vehicle on two or more → transport modes, whereby the loading unit is changed but the goods being transported are not

Intermodal transport unit (ITU) → intermodal loading unit

Internalisation of external costs – incorporation of → external costs in the financial calculation by the responsible party

Just-in-sequence (JIS) – advanced development of

→ just-in-time to achieve sequencing synchronism

Just-in-time (JIT) – production and logistics strategy that has the objective of executing goods exchange processes exactly in line with the need, i.e. production and delivery at the correct point in time, with the right quality, in the exact quantity and at the right place

Land transport mode – → transport modes that represents the transport infrastructure on land, i.e. road, rail, inland waterway and pipeline (excluding oceans and air)

Lift-on-Lift-off (Lo-Lo) – loading or unloading → intermodal loading units with the help of hoisting gear; the → loading units are lifted or raised in the process

Liner service – navigation services with specific loading and clearing ports as well as arrival and departure times that are notified on a regular basis

Load factor (of a ship) – extent of goods loaded expressed as a percentage of the maximum possible loading of a cargo vessel

Loading hopper – equipment for transhipment of → bulk cargo from an inland vessel to the railway or truck; a crane fills the hopper from above with the bulk cargo from the vessel, while trucks or railway wagons that are under the hopper are loaded independently

Loading unit – transport unit that is composed of a loading device (→ pallet, → container etc.), locking mechanisms and load (goods)

Lock – hydraulic system to overcome differences in height along a → waterway (for example, as part of a river power plant), in which vessels may be raised or lowered by filling up or emptying out one or more → lock chambers

Lock chamber – a rectangular space located between the gates of a → lock, in which a vessel may be raised or lowered in the course of locking

Lock overhaul – maintenance or replacement of the elements of a → lock

Logistics chain – chain made up of processes and locations along which goods are transported on their way from procurement to the ultimate consumer; the transport of goods along a logistics chain can be made by different → means of transport

Logistics service provider – organises the entire logistics chain from the production facilities to the customer's warehouse or depot, and may also have transport resources

Low navigable water level (LNWL) – in accordance with the definition of the → Danube Commission, it is the water level that is reached or exceeded at a → water gauge over a long period of time (stretching across several decades) on an average of 94% of the days in a year (i.e. on 343 days), excluding periods of ice

Lower Danube – according to the definition of the → Danube Commission, it is that section of the navigable Danube between the Romanian port of Drobeta-Turnu Severin (river-km 931) and the estuary of the Danube into the Black Sea (including the Sulina Canal and the Kilia arm); see also → Upper Danube or → Central Danube

Luffing and slewing crane – crane which stands on a portal construction and is provided with a rotary pole and a bent arm

Main leg – in → intermodal transport, it is the → transport mode that clearly has the longest route of a transport chain; lies between → pre-haulage and → end-haulage

Major shipper – → shipper that transports large quantities of goods over a long period by inland vessels

Mean discharge – also: mean or average "water yield"; that quantity of water that flows through a certain river cross-section per unit of time on an average over a certain period of time (usually one year); the flow rate is usually specified in m^3/sec

Mean water level – the average water level measured at a → water gauge over a specific time period (of several years)

Means of transport – technical equipment and devices that serve to transport goods and passengers such as, for example, trucks, railways or inland vessels

Mineral raw materials – solid, liquid and gaseous minerals such as, for example, ores, coal, crude oil, asbestos or bauxite

Mobile crane – a crane that can be moved or driven on a wheeled chassis or crawler drive

Modal split – term from transport statistics that specifies the distribution of the total transport on different → means of transport

Morphology (river) – shape of a body of flowing water that results from tectonics, rock, climate, vegetation and human influences

Motor cargo pusher – → motor cargo vessel that is

fitted with → pushing shoulders to push non-motorised cargo carriers (→ pushed lighter, → pushed barge)

Motor cargo vessel – self-propelled vessel with its own motor drive and cargo hold for transporting goods; generic term for → dry cargo vessels, → tankers, → container vessels and → Ro-Ro vessels

Multimodal – using two or more different → means of transport and → transport modes

Multimodal transport – transport of goods using two or more different → means of transport and → transport modes

Nautical bottleneck – section of a → waterway that restricts or hinders continuous navigation; it may have morphological (depth or width of the → fairway, → curve radius), → hydrological (flow velocity, gradient) or traffic-related (direction of traffic, oncoming traffic, vessel types) causes or reasons

Network density – in the transport segment: ratio of the length of all transport connections within a region to its surface area

Notices to Skippers (NtS) – standardised electronic notifications about restrictions and specifications for navigation that are usually of a temporary nature

Open water efficiency – the → efficiency of a ship's propeller under homogeneous water flow (so-called open water) without being mounted on a ship

Operating costs – variable costs of ship transport that are incurred depending on the travel performance (number of kilometres or hours of travel covered); see also → standby costs

Pallet – flat construction – usually made of wood – onto which the goods are packed

Parity (of traffic) – the amount of traffic within a certain period of time that is equally dense in both traffic directions (e.g. on the Danube upstream and downstream)

Pierage – → port fee, especially for the use of the (cargo) pier at a port (calculated on the basis of transhipment weight)

Port fees – charges for using a port or a → transhipment site

Port infrastructure – quay walls, paved surfaces and railway tracks at a port

Port suprastructure – port facilities that are erected on the → port infrastructure, e.g. cranes, warehouses or depots and office buildings

Portal crane → gantry crane

Pre-haulage – the partial route at the beginning of a transport chain that is then completed by the → main leg and, if necessary, by the → end-haulage

Private vessel owner-operator – independent ship owner with maximum three vessels without any supporting organisation on land (in contrast to a → shipping company); often the ship owner and the boatmaster are a single person

Project logistics – management of temporary → logistics chains

Propulsion – drive

Public port – port that is owned by the government or the state; use of the port by all navigation companies under identical terms and conditions

Purchasing power parity – designates the "parity of purchasing power" between two geographical regions; it is present if goods and services of one basket may be purchased for equal amounts of money. If two different currency zones are being compared, the amounts of money are made comparable by using exchange rates. For the purpose of international comparison of the → gross domestic product (GDP), the purchasing power parity is used as a correction factor. Mere conversion of the GDP with the exchange rates would not be adequate, since the purchasing power may vary substantially when comparing different currency zones.

Pushed barge – → barge that is deployed in a → convoy and whose helm stand therefore does not need to be occupied

Pushed convoy – → convoy consisting of one → pusher and one or more → pushed lighters or → pushed barges that are tightly connected with the pushing unit; see also → coupled formation and → pushed-coupled formation

Pushed-coupled formation – → convoy consisting of one → motor cargo vessel, having one to two non-motorised freight carriers on its sides (→ pushed lighter or → pushed barge) and having multiple non-motorised freight carriers placed in front of it; see also → coupled formation and → pushed convoy

Pushed lighter – vessel without its own drive that is pushed by a suitable motorised vessel (→ pusher, → motor cargo vessel) or is coupled or attached to it

Pusher – motorised vessel that does not transport any freight on its own and is used only to push non-mo-

torised freight carriers (→ pushed lighters, → pushed barges)

Pushing shoulder – coupling mechanism placed at the → bow of → pushers and → motor cargo pushers for pushing non-motorised freight carriers (→ pushed lighters, → pushed barges)

Quay wall – vertical or almost vertical wall having a solid construction in most cases that can bear the stress caused by waterside cranes, railway wagons or stacked loads; loads are turned over at the edge of the quay wall in a port

Reach stacker – vehicle with hoisting gear at the front for moving or stacking → intermodal loading units

Reconnection of sidearms – opening of former cut-off sidearms to a regulated river for the supplying of water to ecologically valuable regions

Relation (transport) → transport relation

River Information Services (RIS) – harmonised information services in support of traffic and transport management applying → telematics in inland navigation, including the interfaces with other → transport modes

Riverbed – the base of a river

Rolling road – transport of vehicles on trains using low-loader wagons with continuous loading surface, whereby the → Roll-on-Roll-off technique is used

Roll-on-Roll-off (Ro-Ro) – loading or unloading a motor vehicle, a railway wagon or an → intermodal loading unit on or from a ship using its own wheels or using wheels that are placed below it for this purpose

Ro-Ro ramp – facility at the port to load and unload a vehicle using its own wheels or wheels that have been placed below it for this purpose

Ro-Ro vessel – → motor cargo vessel or → pushed lighter for the transport of rolling goods (passenger cars, trucks, → semi-trailers), which reach the vessel via a ramp and leave it in the same manner (→ Roll-on-Roll-off)

Scour – depression in the → riverbed parallel to the river bank

Screw conveyer – mechanism using a rotating helical screw blade, usually within a tube, to move liqquid or granular materials

Sediment – deposit

Sedimentation – settling movement of particles in a liquid with the effect of the force of gravity

Semi-trailer – trailer used for freight transport in road traffic, which is drawn by a pulling vehicle based on its design and fittings

Shallow water resistance – → hydrodynamic resistance in shallow water; the less the distance between the → riverbed and the base of the ship, the greater is the drive power required with constant speed of the ship

Shipper – contracting body of a transport

Shipping company – ship transport company which has its own vessels as well as administration and sales organisation on land

Special port – port that specialises in the → transhipment of certain types of goods such as, for example, mineral oil (in contrast to → universal ports)

Specific energy consumption – energy consumption per unit, such as, for example, the quantity of fuel that a vehicle consumes over a distance of one kilometre

Specific weight – ratio of the force of weight of a body (numerator) and its volume (denominator)

Split transport – type of → multimodal transport in which the goods (packages) are reloaded on their own, in contrast to → intermodal or → combined transport

Spot market – market in which supply and demand transport capacities are traded in real time (in contrast to long-term contractual binding)

Spreader – hoisting equipment of → gantry cranes; a telescopic frame that can be adjusted to the length of a → container; the studs of the spreader hold the corner fittings of the container and are locked; thereafter, the container may be lifted

Squat – level to which a ship sinks while it is in motion compared to its stationary condition on → waterways having a limited cross-section (i.e. rivers and → canals) (dynamic sinking)

Standby costs – costs for keeping a ship on standby without taking the → operating costs into consideration

Steel coil → coil

Stern – rear part of a ship

Storage space – space for storing goods

Stowage – the → storage space required for respective goods under normal conditions; it indicates the m^3 of storage space taken up by one ton of a particular item taking the stowage loss in the cargo hold into consideration

Strategic traffic image – information that affect the medium-term and long-term decisions of the users of → River Information Services; it displays all relevant vessels in the RIS area with their characteristics, loads and positions

Stuffing and stripping (of containers) – loading and unloading of → containers

Sustainability – utilisation of a renewable system in a manner that this system is maintained as far as its important characteristics or properties are concerned and its stock level may be regenerated in a natural way

Swap body – receptacle for freight transport which has been optimised to the dimensions of road vehicles and is provided with grasping edges for transhipment between various → means of transport, generally, truck-railway

Tailwater – section of a → waterway that is directly below a river power plant; see also → headwater

Tanker – → motor cargo vessel that is equipped to transport liquid goods, including mineral oil and derivatives, chemical products or liquefied gases

Telematics – integrated application of telecommunication, automation and information technology; see also → transport telematics

Terminal – facility with special infrastructure and equipment for the → transhipment of goods (e.g. container terminal, heavy cargo terminal) in which → loading units are transhipped between water-based and land-based → means of transport, i.e. vessel, truck and railway

TIR Carnet – customs document that is used for the purpose of customs clearance required for the dispatch procedure in temporary import or transit of goods

Ton-kilometre (tkm) → transport performance

Tons deadweight (of a vessel) – difference in weight between a fully loaded and empty vessel; including cargo, fuel, water, lubricating oil, crew and provisions; this weight represents the utilisation value of cargo vessels

Towed convoy – convoy with one → tug which uses a → hawser to tow one or more → barges behind it

Tracking and tracing – electronic tracking of consignments, via GPS in most cases, for the localization of the goods transported and → loading units and their status information

Training wall – a hydraulic structure erected in the longitudinal direction of a river to control the flow conditions of a water body; see also → groyne

Transhipment – shifting of transport units or goods from one → means of transport to another

Transhipment site – transhipment point located on the bank of a → waterway without its own artificial port basin

Transponder – wireless communication, display or control device that accepts incoming signals and responds to them automatically (composed from the English terms “transmit” and “respond”)

Transport mode – in a narrow sense: transport infrastructure that is the basic prerequisite for the deployment of → means of transport (roads, rail, pipeline, inland waterways, oceans and air); in a wider sense: the same traffic and transport services provided with the same → means of transport and on the same traffic routes

Transport pallet → pallet

Transport performance – a statistical parameter in transport that also takes the distance covered into consideration apart from the weight of the goods transported; unit: ton-kilometre (tkm) = product of the weight in tons (t) transported and the route covered in kilometres (km)

Transport relation – transport route

Transport telematics – acquisition, transfer, processing and utilisation of transport-specific data with the aim of organising, providing information and controlling the traffic with the help of information and communications technology; see also → telematics

Tug – motorised (or self-propelled) vessel for towing non-motorised freight carriers, so-called → barges

Twenty-foot Equivalent Unit (TEU) – a statistical parameter based on a 20-foot ISO → container for describing transport flows or capacities

Under-keel clearance – safety clearance that the keel of a ship in motion has to the highest point of the → riverbed; it should not be less than 20 cm for a gravel river bed or 30 cm for a rocky bed

Universal port – port that does not specialise in the → transhipment of certain types of goods, but instead, undertakes transhipment of goods such as → bulk cargo and → general cargo (in contrast to → special ports)

Upper Danube – according to the definition of the

→ Danube Commission, it is the section of the navigable Danube between the German Federal waterway of the Danube at Kelheim (river-km 2,414.72) and the Hungarian port of Gönyű (river-km 1,794); see also → Central Danube or → Lower Danube

Upstream voyage – movement of a vessel against the flow direction (upstream) of a natural → waterway; see also → downstream voyage

Voyage planning – application for voyage planning in the context of → River Information Services

Water Framework Directive (WFD) – EU Directive (2000/60/EC) which harmonises the legal framework for water policy within the European Union and aims to align water policy more intensively with → sustainable and environmentally friendly water utilisation

Water gauge – equipment for measuring the water level of over-ground water bodies

Water level – water height at a certain point in the reference profile of a body of water (→ water gauge)

Water surface – smooth form of an undisturbed water body as is assumed under the influence of gravity

Water yield → discharge

Waterline level model – determining the position of the → water surface for a section of a flowing body of water using a mathematical formula

Waterway – navigable body of water for which there are legal provisions for the safety and flow of commercial navigation

Weir – a dam across a stream or a river to back up or divert water

WLAN hotspot – public wireless Internet access points (Wireless Local Area Network)