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Environmentally sustainable improvement of IWT on the Danube

DI Markus Simoner

June 25th 2007, Cernavoda

Agenda

1. via donau – company profile
2. Ecological impacts of IWT
3. European activities to promote IWT
4. Framework conditions for competitive Danube navigation

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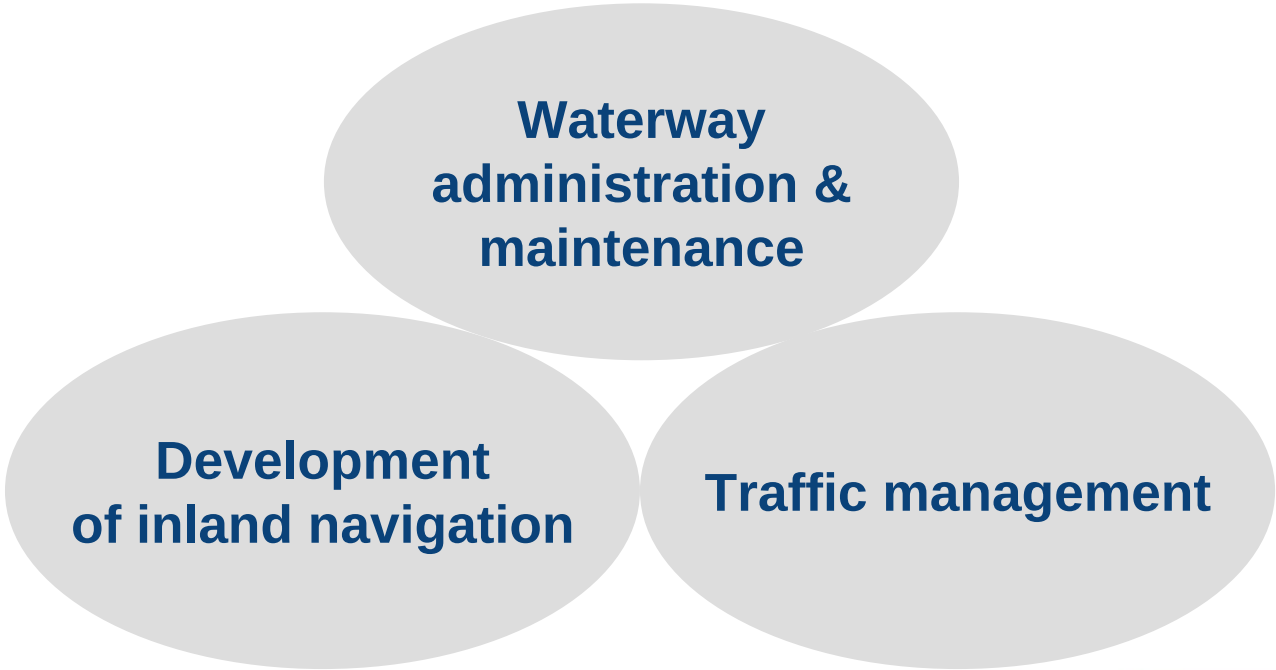
via donau – company profile

via donau is ...

- ... the Austrian national waterway operator
- ... owned by the Ministry of Transport Innovation and Technology
- ... responsible for 351 km of the Danube waterway



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Sites via donau

250 employees

Status: April 2007

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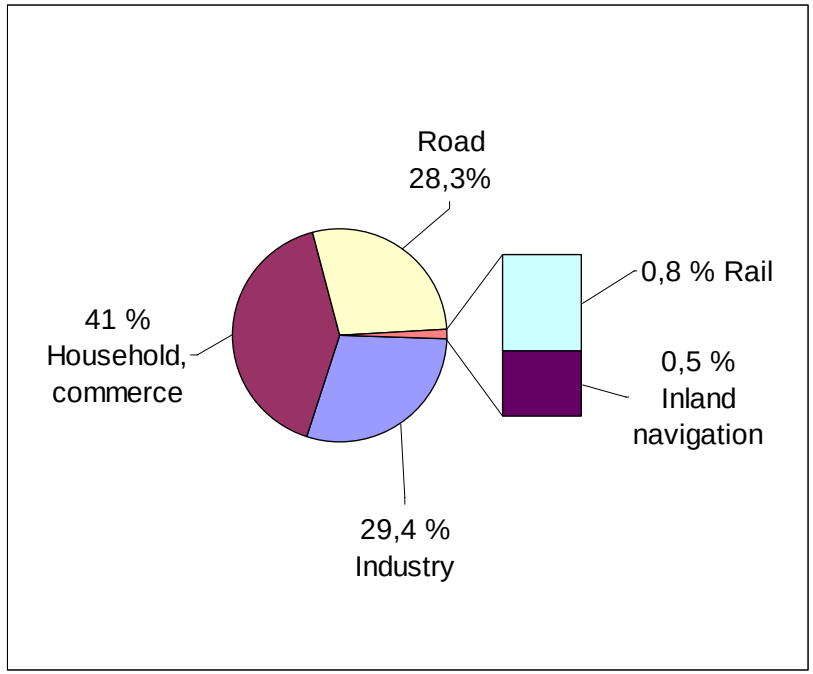
Ecological impacts of IWT

Environmental performance of IWT (1)

- IWT is a **safe** and **environmentally friendly** transport mode
- **Low contribution** to **total traffic emissions** due to very low share of **total traffic energy consumption** (road + rail + IWT, where IWT´s share is about **1,5 %!**)
- IWT cannot solve the problematics associated with the achievement of **Kyoto target**, but it can **significantly contribute to it**



Distribution of final energy consumption by sector in EU 25 (2003)
Source: EEA

Environmental performance of IWT (2)

- IWT in **comparison** to **road** transport:
  - On average approx. 1/3 **energy consumption, CO_2** emissions (per tkm)
  - **HC, CO** emissions significantly lower
  - **SO_x** emissions high due to sulphur content in fuel
  - Improvement potential w.r.t. **NO_x** and **PM** high compared to road transport adapting fast to new technologies
  - Engine age higher, engine replacement rate slower

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Ecological impacts of IWT

IWT has ecological impacts on:

1) **The river through waterway infrastructure and low-water regulation**
   - **River engineering measures (training walls, groynes)**
   - **Maintenance works (dredging)**

2) **The environment (emissions, waste) through the operation of vessels**
   - **Emissions: CO_2, HC, CO, SO_x, NO_x, PM**
   - **Waste**
     - **Ship-borne (used oil, bilge water, others)**
     - **Waste caused by cargo (washing water, slops)**
   - **Environmental pollution through ship accidents**

The first domain is subject of the ongoing process – the joint statement should minimise the ecological impacts of future infrastructure improvement measures

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IWT has the lowest CO_2 emissions

- Example transport relation Constanta – Vienna
- CO_2 emissions caused by the transport of one container (TEU):

  - Danube: **349** kg CO_2 / TEU **(100%)**
  - Rail: **567** kg CO_2 / TEU **(162%)**
  - Road: **933** kg CO_2 / TEU **(267%)**

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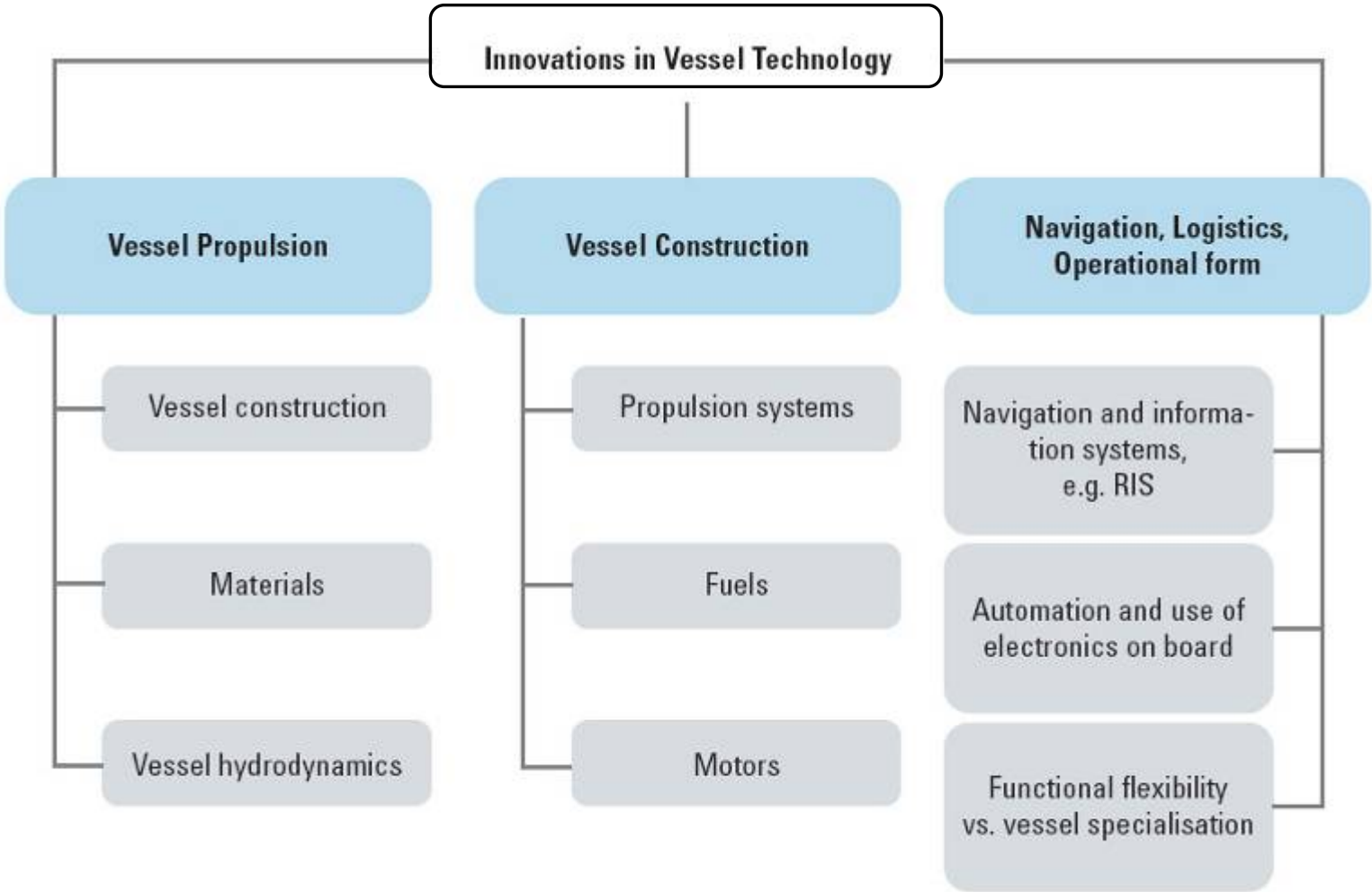
Areas of innovation for fleet



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Emission reduction technologies

MODERN DIESEL ENGINES / INTERNAL ENGINE IMPROVEMENTS

- **EGR** (Exhaust gas recirculation)
- **Steam/water injection**

ALTERNATIVE COMBUSTION ENGINES

- **Diesel electric concepts**
- **Gas engines**

NEW PROPULSION AND AUXILIARY SYSTEMS

- **FC** (fuel cell)

DRIVE MANAGEMENT IMPROVEMENTS

- **ATM** (Advising Tempomaat)

HIGHER DIESEL FUEL QUALITY / SUBSTITUTES

- **LSF** (Low sulphur fuel)
- **BD** (Bio diesel)
- **BDB** (Bio diesel blend)
- **NG** (Natural gas)
- **Hydrogen**
- **Reformed liquid fuels**

EXHAUST GAS AFTER-TREATMENT

- **PMF** (Particulate matter filter)
- **SCR** (Selective catalytic reduction)
- **Diesel oxidation catalyst**
- **Wet scrubber**

LEGEND

Short / medium term

Medium / long term
Niche applications

http://www.creating.nu

Emission reduction potentials

Achievable reduction potential with different emission reduction technologies.
Initial situation is a vessel according to **CCNR I** standards
without application of emission reduction technologies.

	NO_x	PM	Fuel consumption	CO_2	SO_x
After treatment techniques					
SCR (Selective catalytic reduction)	-81%	-35%	-7,5%	-7.5%	none
PMF (Particulate matter filter)	none	-85%	+2%	+2%	none
Drive management systems					
ATM (Advising tempomaat)	-10%	-10%	-10%	-10%	none
Diesel fuel quality / substitutes					
BD (Bio diesel)	+10%	-5%	+15%	-65%	~100%
BDB (Bio diesel blend, 20 % BD)	+2%	-1%	+3%	-13%	~20%
LSF (Low sulphur fuel)	none	-17%	none	none	~100%
New engine technologies					
NGE (Natural gas engine)	-98.5%	-97.5%	+4.5%	-10%	100%

Outlook on emissions (1)

- **EC** considers introduction of **low sulphur fuel to IWT** (300 ppm in 2009, 10 ppm in 2011)
- Implementation of **NAIADES** will contribute directly to a more environmentally friendly fleet (action: *improve logistics efficiency, environmental and safety performance of IWT*) => **EU project PLATINA**
- **Research** and **feasibility studies** are required with respect to the application of **new technologies** like **NGE** and **fuel cells** to inland navigation

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Outlook on emissions (2)

- **Research** with respect to **new vessel concepts** leading to less fuel consumption per tkm by **improved hydrodynamics** and **lighter construction** has to be carried out => first step taken with **EU project 2Create**

- **National subsidy programmes** for a modern and environmentally friendly fleet have to be established and enhanced as they are not sufficient yet – modernisation of vessel engines is an important topic

- **IWT must remain the most environmentally friendly transport mode**

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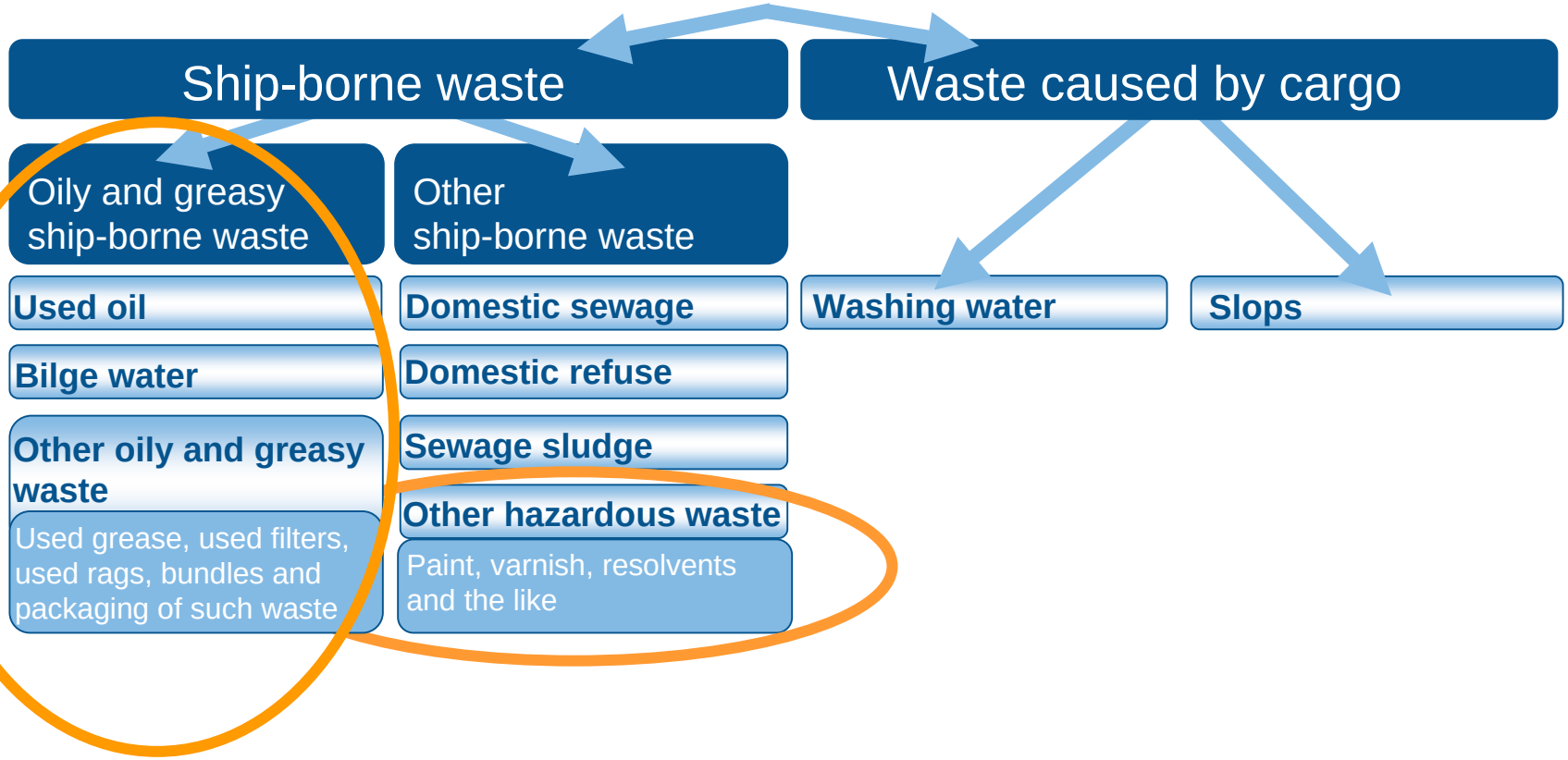
Waste caused by inland navigation



WAste management for inland Navigation on the DAnube

WANDA

Programme

- Interreg (forthcoming call, autumn 2007)

Motivation

- Development and implementation of a sustainable and transnationally coordinated approach in ship waste management along the Danube

Objectives

- Protection of water resource Danube by implementing preventive measures
- Preparation of transnationally coordinated ship waste management concepts, setting the basis for implementation and elaboration of an international financing model for oily and greasy ship waste

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Partners

WANDA

Key activities

WANDA

- Coordinated elaboration of **national ship waste management concepts**
- **Preparation** and **implementation of pilot actions**
- Development of **financing model** for oily and greasy ship waste
- **Harmonisation** and **coordination activities**

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European activities to promote sustainable inland waterway transport

NAIADES Action Programme

- Presented by the European Commission on 17 January 2006
- Multi-annual Action Programme in order to foster transport by inland waterways in Europe (2006 – 2013)
- **Objectives:** Increase competitiveness of inland waterway transport & integrate into door-to-door logistics chains

  ⇨ More freight transport on European inland waterways
- **Addressees:** EU member states, industry, social partners, river commissions, European Commission and other EU institutions

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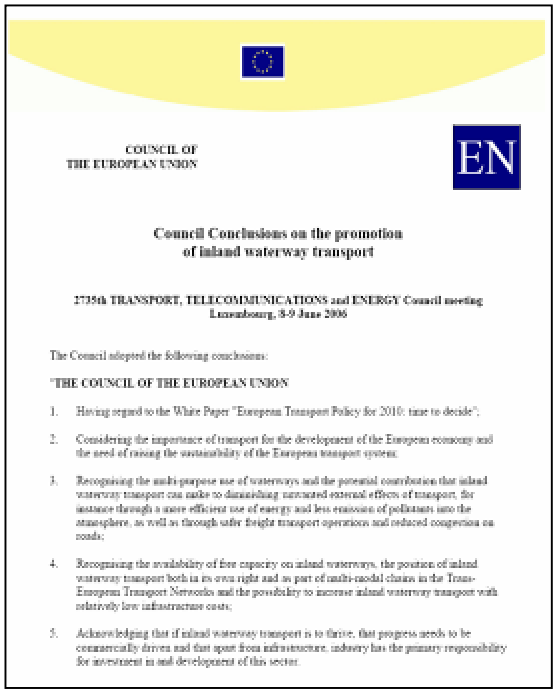
Adoption process of NAIADES



COUNCIL OF
THE EUROPEAN UNION

EN

Council Conclusions on the promotion of inland waterway transport

2735th TRANSPORT, TELECOMMUNICATIONS and ENERGY Council meeting
Luxembourg, 8-9 June 2006

The Council adopted the following conclusions:

"THE COUNCIL OF THE EUROPEAN UNION

1. Having regard to the White Paper "European Transport Policy for 2010: time to decide";
2. Considering the importance of transport for the development of the European economy and the need of raising the sustainability of the European transport system;
3. Recognising the multi-purpose use of waterways and the potential contribution that inland waterway transport can make to diminishing increased external effects of transport, for instance through a more efficient use of energy and less emission of pollutants into the atmosphere, as well as through safer freight transport operations and reduced congestion on roads;
4. Recognising the availability of free capacity on inland waterways, the position of inland waterway transport both in its own right and as part of multi-modal chains in the Trans-European Transport Networks and the possibility to increase inland waterway transport with relatively low infrastructure costs;
5. Acknowledging that if inland waterway transport is to thrive, that progress needs to be commercially driven and that apart from infrastructure, industry has the primary responsibility for investment in and development of this sector.

EUROPEAN PARLIAMENT

2004 2009

Session document

FINAL
A6-9999/2006

21.9.2006

REPORT

on the promotion of inland waterway transport: NAIADES, an integrated European Action Programme for inland waterway transport
(2006/2085(INI))

Committee on Transport and Tourism

Rapporteur: Corien Wortmann-Kool

RR\374258EN.doc PE 374.258v02-00

EN EN

- Adoption of „Council Conclusions on the promotion of inland waterway transport“ on 8 – 9 Juni 2006 in Luxembourg
- Resolution of the European Parliament on the promotion of inland waterway transport on 26th October 2006

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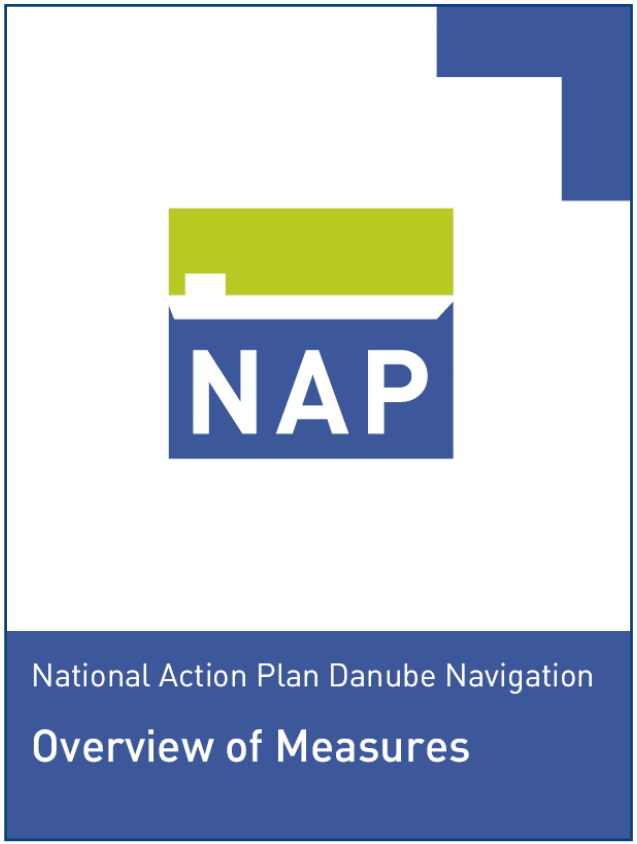
National Austrian action plan for an active IWT policy

Austrian Action Plan Danube Navigation



- Comprehensive and dynamic planning and decision-making instrument for Austrian inland navigation policy until 2015
- Austrian implementation strategy of the European NAIADES action programme
- Catalogue of measures developed in cooperation with the inland navigation sector and environmental stakeholders

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Catalogue of measures

COMPREHENSIVE STRENGTHENING OF DANUBE NAVIGATION WITHIN THE AUSTRIAN FREIGHT TRANSPORT SYSTEM

INFRASTRUCTURE Maintain and improve waterway infrastructure I	PORTS Further develop Danube ports into multimodal logistics centres II	INFORMATION SYSTEMS Implement and further develop River Information Services (RIS) on the Danube III	FLEET Modernize the Austrian fleet IV	EDUCATION & TRAINING Invest in jobs and qualifications V	PROMOTION Raise awareness and boost the image of Danube navigation VI	FACTS & FIGURES Disseminate knowledge and improve the fundamental data on Danube navigation VII	NEW MARKETS Exploit the Danube waterway's transport potential VIII	GRANTS Provide supporting resources for the modernisation of Danube navigation IX	INTERNATIONAL ACTIVITIES Strengthen European inland navigation X
1 Remove bottlenecks on the Austrian Danube	1 Draw up a development and investment strategy for the Austrian Danube ports and transshipment sites	1 Implement DoRIS in Austria	1 Improve the environmental performance of the Danube fleet	1 Launch a training offensive	1 Create and implement a coordinated PR-strategy	1 Collect and process fundamental data on Danube navigation	1 Provide logistics advice in the field of Danube navigation	1 Fund flexible and competitive transshipment facilities	1 Push the development and implementation of the European action plan
2 Ensure adequate waterway maintenance and management	2 Push for the modernization of ports and transhipment sites	2 Further develop RIS for official and commercial use	2 Increase the safety of inland navigation	2 Improve the availability of education	2 Create a national platform for pro-Danube navigation public relations work	2 Provide web-based facts and figures about Danube navigation	2 Stimulate cooperation between inland navigation and road/rail	2 Fund an environmentally friendly and market orientated Austrian fleet	2 Contribute to the harmonization of legislative and institutional framework conditions
3 Minimize lock closing times due to revision works	3 Stimulate industrial settlements along the Austrian Danube	3 Further develop technologies relevant to RIS	3 Improve the framework conditions for investment in the fleet	3 Facilitate the employment of qualified foreign workers	3 Strengthen pro-Danube navigation national lobbying activities	3 Introduce Danube navigation to training and education	3 Support the construction of scheduled liner services on the Danube	3 Fund the development of scheduled container liner services and new multimodal transport	3 Improve the image of European inland navigation
4 Support an integrative improvement of fairway conditions on the entire Danube	4 Support the further development of South-Eastern European Danube ports	4 Support the Danube countries in implementing of RIS	4 Push innovative plans in the inland navigation sector	4 Improve framework for labour and social conditions through social dialogue	4 Implement a pro-Danube navigation image campaign	4 Construct an information and training centre at the Enns-Ennsdorf port	4 Push the foundation of national inland navigation development agencies in the Danube countries	4 Fund an innovative use of technology in Danube navigation	4 Play an active role in the development of the Pan-European Corridor VII

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Selected projects of via donau with relevance to environmental protection

Donau River Information Services

DONAU RIVER INFORMATION SERVICES

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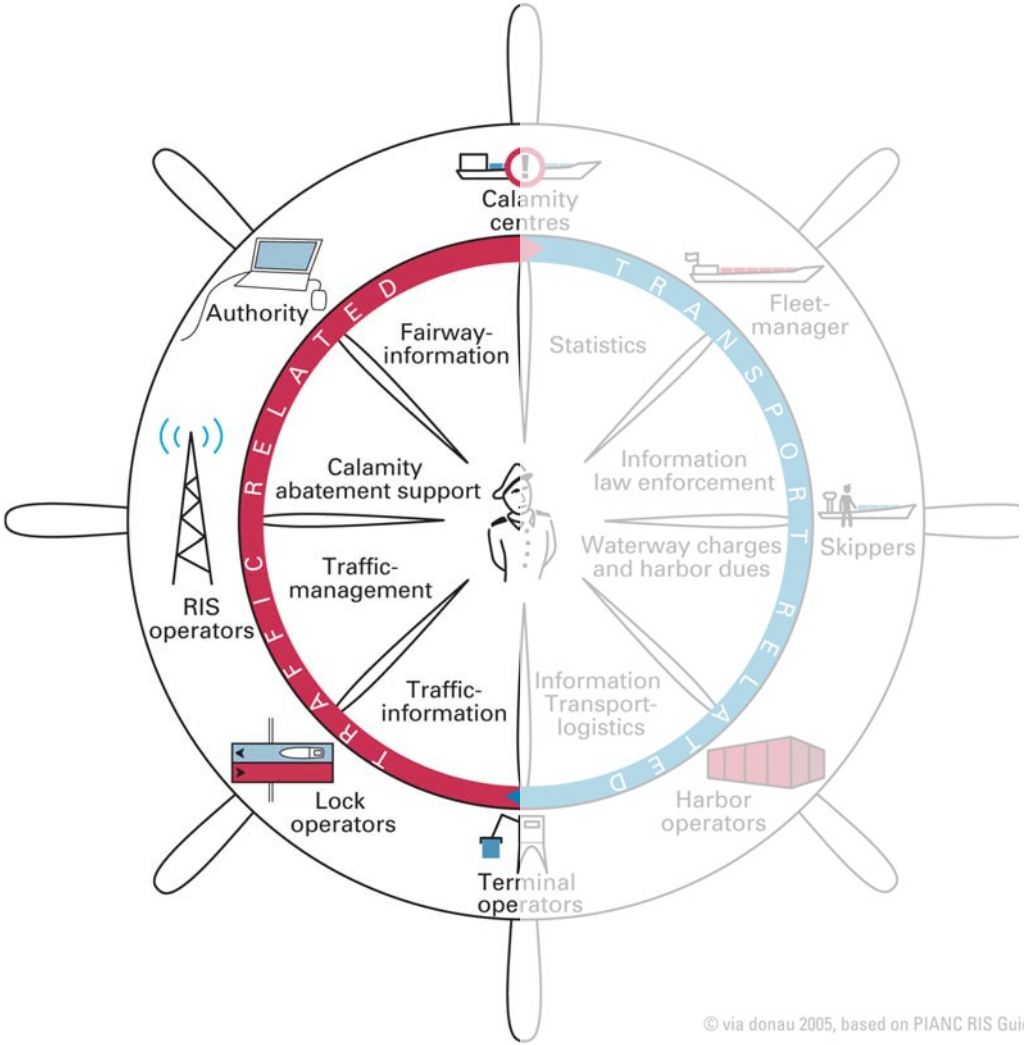
River Information Services (RIS)



Traffic related services

- Fairway information
- Traffic information
- Traffic management
- Calamity abatement

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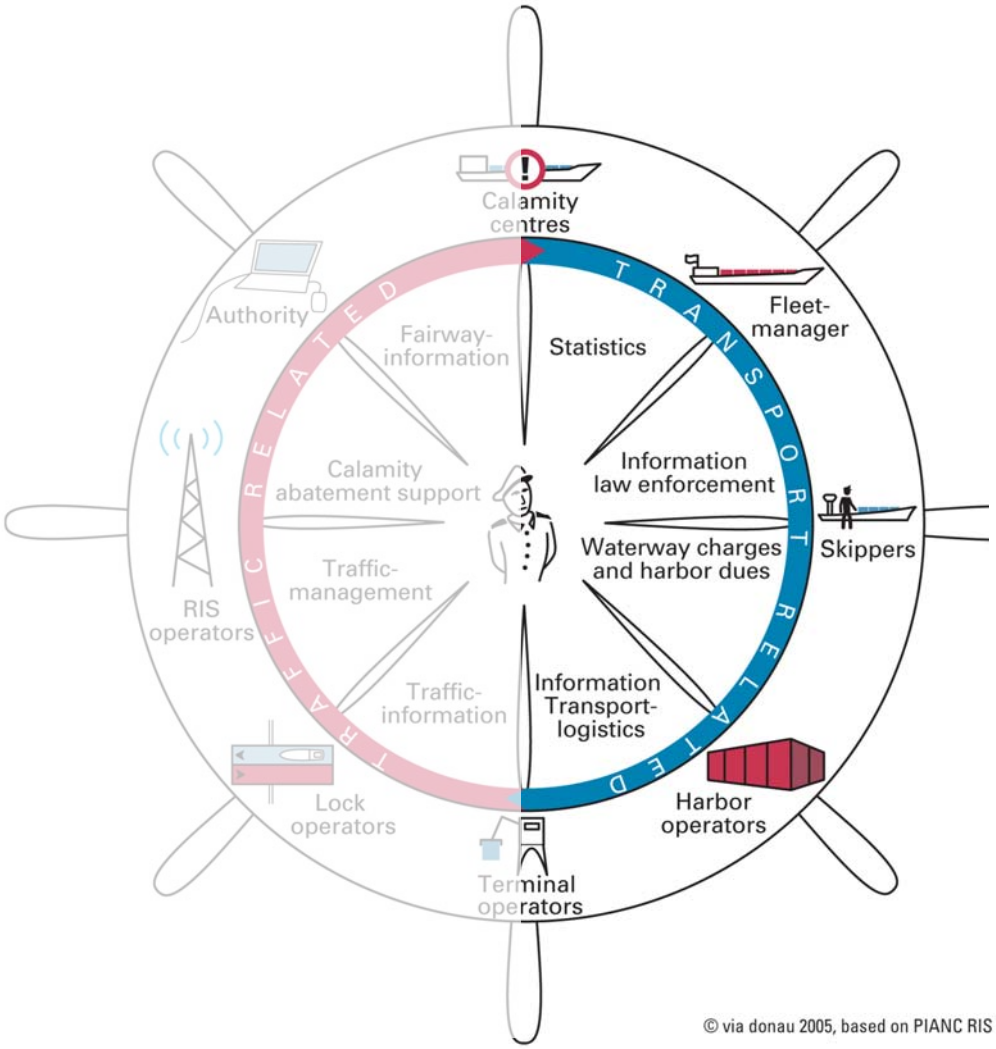
River Information Services (RIS)



Transport related services

- Cargo & fleet managment
- Waterway charges and harbour dues
- Information for law enforcement
- Statistics

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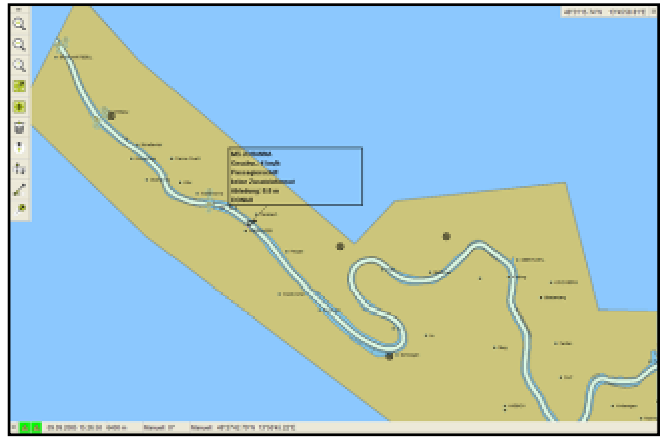
DoRIS Components

- 23 base stations
- 9 work stations at Danube locks
- 12 fixed authority work stations
- 15 mobile work stations
- 1 national control center

- Equipped ships (per 24.05.07):

78	passenger vessels
198	cargo vessels
25	authority vessels
301	**total**



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Status Quo of RIS on the Danube (June 07)

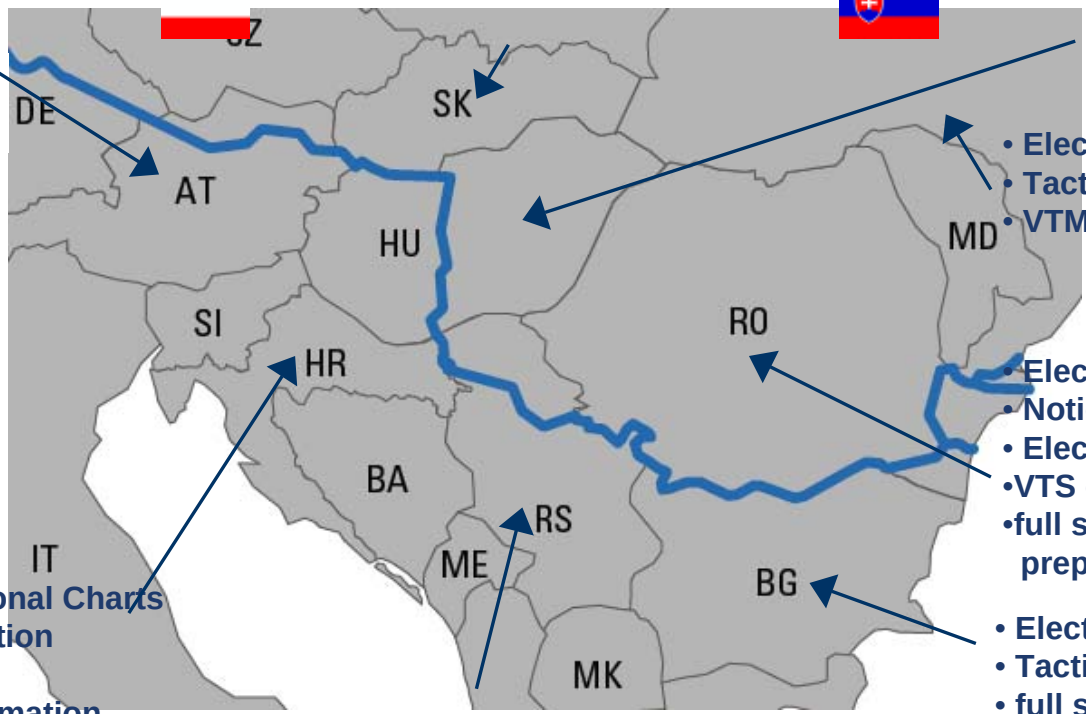
- Electronic Navigational Charts
- Water level information
- Notices to skippers
- Electronic reporting (in prep.)
- Tactical traffic information
- RIS Centre

DORIS DONAU RIVER INFORMATION SERVICES

- Electronic Navigational Charts
- Notices to skippers
- Electronic reporting (in prep.)
- Tactical traffic information (in prep.)

- Electronic Navigational Charts
- Notices to skippers
- Calamity abatement support
- Tactical traffic information
- RIS Centre

HuRIS



- Electronic Navigational Charts
- Tactical traffic information (test)
- VTMIS for maritime Danube

- Electronic Navigational Charts
- Notices to skippers
- Electronic reporting
- VTS centres along Danube
- full scale implementation under preparation with EU Support

CRORIS Croatian River Information Services

- Electronic Navigational Charts
- Water level information
- Notices to skippers
- Tactical traffic information
- RIS Centre
- Electronic Reporting (in prep.)

- Electronic Navigational Charts
- Tactical traffic information (test)
- full scale implementation under preparation with EU Support

- Electronic Navigational Charts
- Tactical traffic information (test)
- full scale implementation under preparation with EU Support

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Project is funded by the European Union (EC / DG-TREN / TEN-T)

Environmental benefits of DoRIS

- Reduced fuel consumption / less emissions through better fairway information
  - water depth info in electronic navigational charts (ENCs)
  - better resource management at locks and in ports
- Increased traffic safety through
  - tactical traffic image on board of vessel
  - continuous monitoring of hazardous goods
- Reduced impact of accidents through
  - improved calamity abatement / traceability of accidents
- Higher share of IWT in transport market / less emissions through
  - acceleration of logistical processes
  - close-to-real-time tracking of shipments

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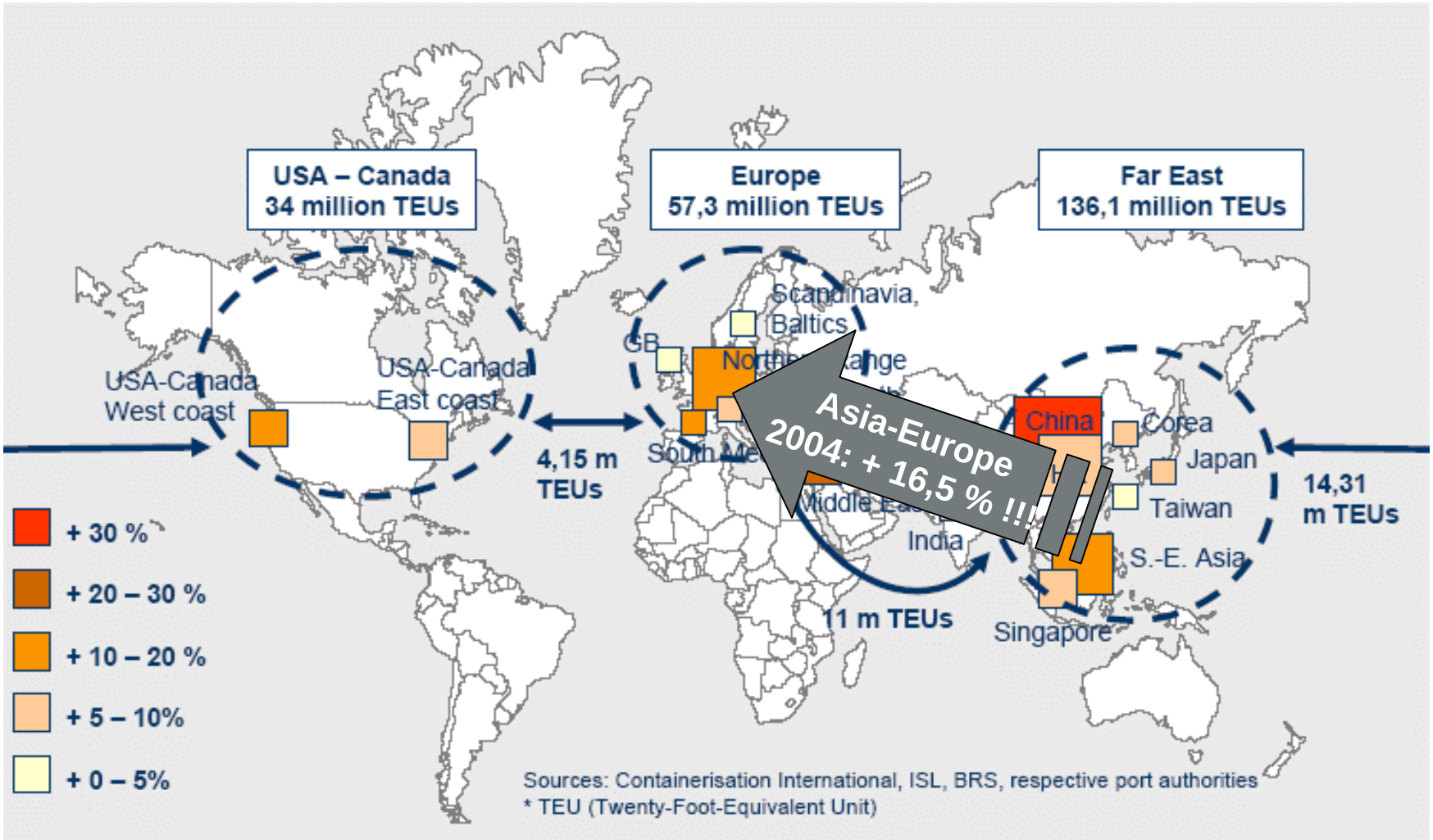
Project COLD
Container Liner Service Danube

… a new transport route: Constanta and the Danube waterway

Enormous growth of container traffic



Quelle: Hulocon 2005

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Project COLD
Container Liner Service Danube

- Austrian – Romanian initiative
- Provides unbiased and comprehensive information on potentials to all interested stakeholders
- Feasibility study covering:
  - Starting situation: Congestion in North Sea ports, worldwide growth of container transport etc.
  - Market and peer analysis: Container market in Austria, Hungary and Slovakia, forecast 2010 – 2020, rail tariffs
  - Inland navigation concept
  - Analysis of supply chain Krems – Shanghai in terms of duration, cost and environmental balance
  - Conclusions and recommendations for action

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Conclusions

- **Alternative routing via Constanta and Danube highly attractive for trade between Asia and Central Europe:**
  - ⇨ Significant advantage in total cost (10-30 %)
  - ⇨ Similar transit time for total supply chain
  - ⇨ Environmental balance very positive (16 % less CO_2 per container)

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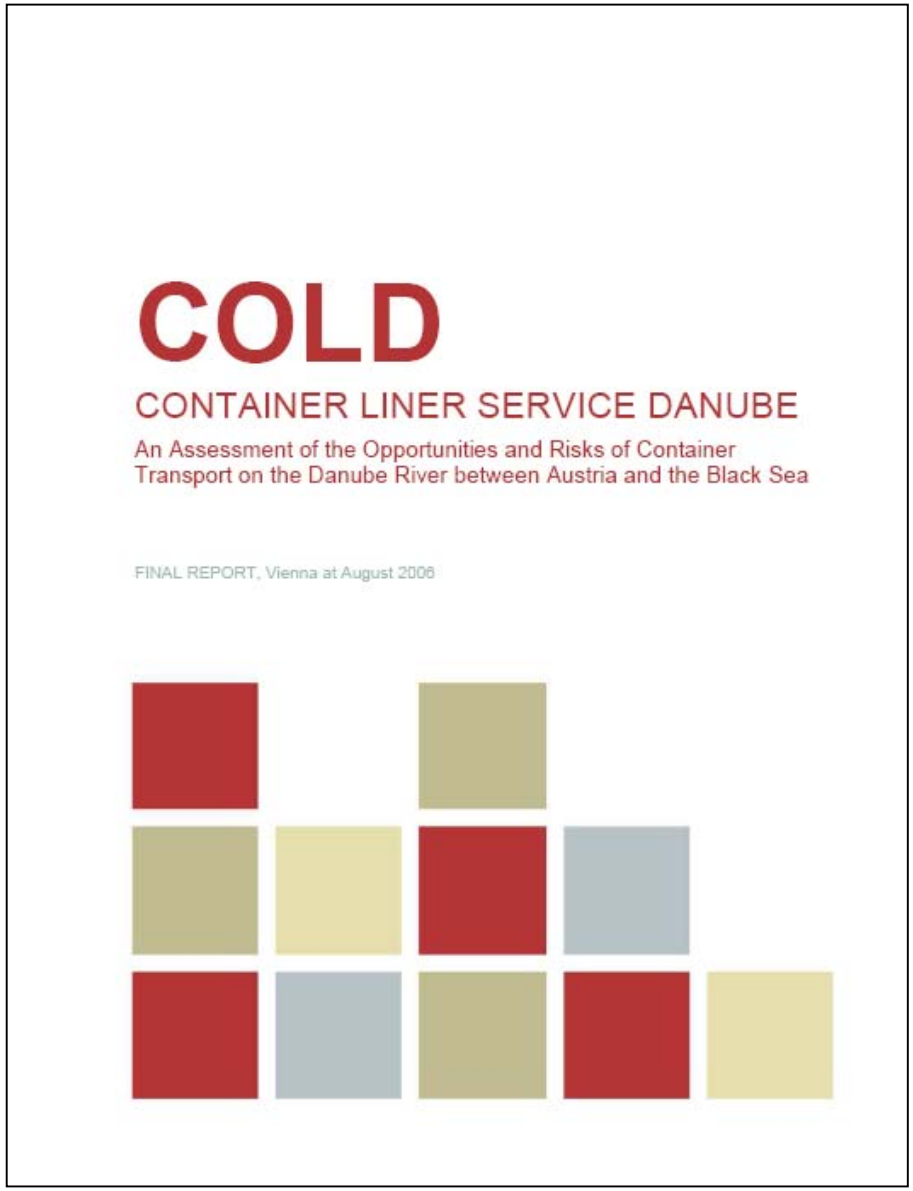

Feasibility Study of Container Liner Services on the Danube

Download:
www.via-donau.org/cold
resp.
www.via-donau.org/en/cold

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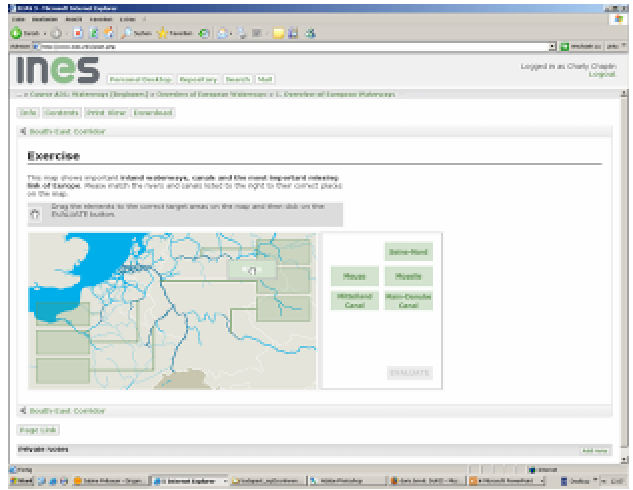
Inland Navigation eLearning System

= **eLearning Platform** for the Danube

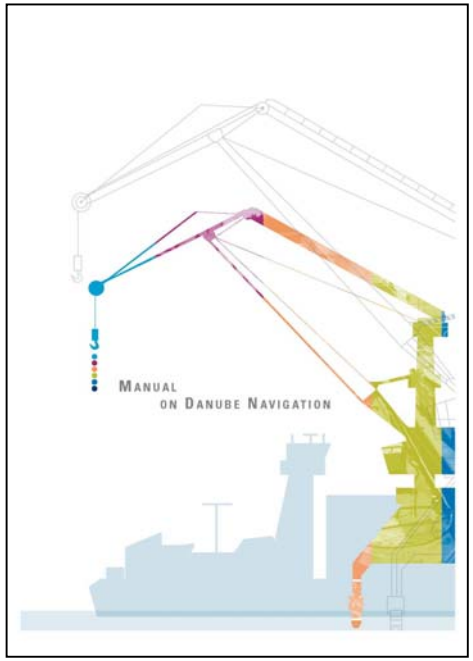
- **Target groups**
  - Logistics schools
  - Universities and Fachhochschulen
  - Pracititioners
  - Private individuals

- **7 learning topics** prepared for **3 learning levels**
  - Content is clearly structured
  - Usage of multimedia material, interactive elements, pictures and graphs

- **Access** free of charge for all interested parties at www.ines.info



Manuals on Danube Navigation



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Framework conditions for competitive Danube navigation

Competitive factors of freight transport

main factors: 1. transport price
2. quality of service

The predominant factor is transport price in relation to quality indicators.

Quality:

- Reliability
  - punctuality – just in time and door-to-door
  - Care for cargo (no damage to cargo during transport)
  - Integration into logistics chains – interfaces between modes of transport
- Regularity of transport service (liner services)
- Speed
- Security
- Environmental compatibility

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Inland navigation as a system

„Hardware“ of the IWT system:

- **waterway infrastructure** (navigation fairway width and depth)
- **ports** (interface for transshipment and auxiliary services)
- **vessels** (means of transport)

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Cost factors for operating a vessel

- Standby costs = fixed costs
- Operating costs = variable costs (fuel consumption)

Total costs = fixed costs + variable costs

Standby costs amount 70 - 80% of total costs

Operating costs amount 20 - 30% of total costs

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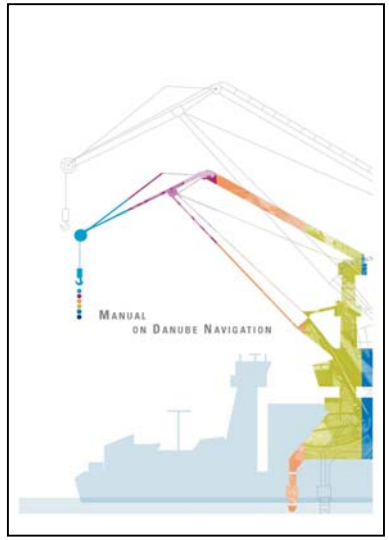
Standby costs and daily rates of vessels

Operating Mode	A 14 h/d	C 24 h/d	C 24 h/d		C 24 h/d
Vessel category	**MCV**	**MCV**	**MCPV**	**PL**	**Push boat (Danube)**
Current value €	500,000	1,000,000	1,150,000	290,000	1,900,000
Operator	Private	Private	Company	Company	Company
tdwat/Drive power	1,350 t	2,000 t	2,000 t	1,700 t	2,200 kW
Days in use/year	320	320	330	330	330
Costs in €/year					
Crew	112,000	173,000	184,000	-	207,000
Repairs	25,000	30,500	32,500	9,000	50,000
Insurance	15,000	23,000	23,000	7,300	39,000
Miscellaneous	20,000	23,000	11,000	-	14,500
Amortisation/Depreciation[1]	40,000	80,000	92,000	23,200	152,000
Interest[2]	15,000	30,000	34,500	8,700	57,000
Overhead shipping company (30 %)	-	-	113,000	14,500	155,700
Total costs	227,000	359,500	490,000	62,700	674,700
Daily costs	**709**	**1,123**	**1,485**	**190**	**2,045**

[1] Assumed remaining period of use 12.5 years

[2] 6% of 50% of the current value



Source: Manual on Danube navigation, via donau

Operating costs (fuel consumption)

Development of average annual fuel price:

Year	2002	2003	2004	2005
Price of 100 litres, in euros	28.50	30.07	35.88	46.67

Source: Market Observation for European Inland Navigation 2005, CCR and EK

Criteria for competitiveness

Freight rates depend on:

- Cost structure of IWT (fixed and variable costs)
- Possible utilization degree of vessels
- Market situation (competitive position towards road and rail)
  - transport relation
  - type of good
  - logistics factors

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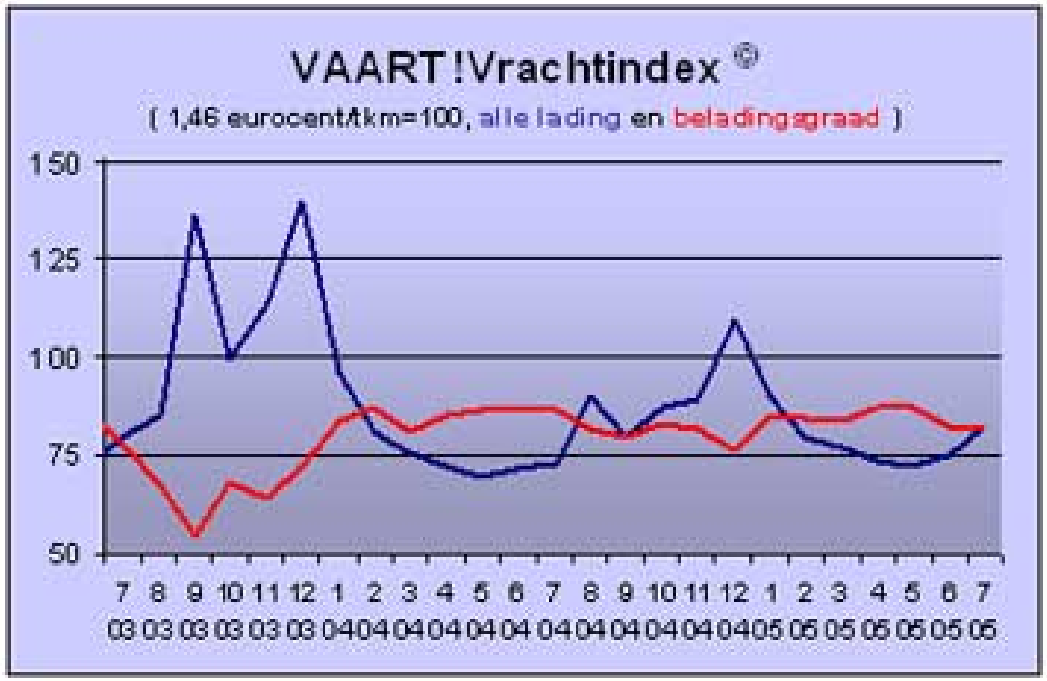
Interdependency of utilization degree of vessels and freight rate



Source: Vaart! freight index, the Dutch Internet portal for inland navigation: www.vaart.nl

Low water periods (as in autumn 2003) lead to lower utilization degrees of vessels and herewith to higher transport costs and prices

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Impacts of insufficient and extremely varying water depths

- Failures in transport operation (waiting time, lightering, substitute traffic)
  - divergent price-performance ratio
  - reduced efficiency
  - reduced transport safety
- Necessity of high storage capacity for companies
  - limited market potential
  - reduced competitiveness of inland navigation

⬇

- Decision to opt for other transport mode!
  - smaller share of inland navigation in modal split

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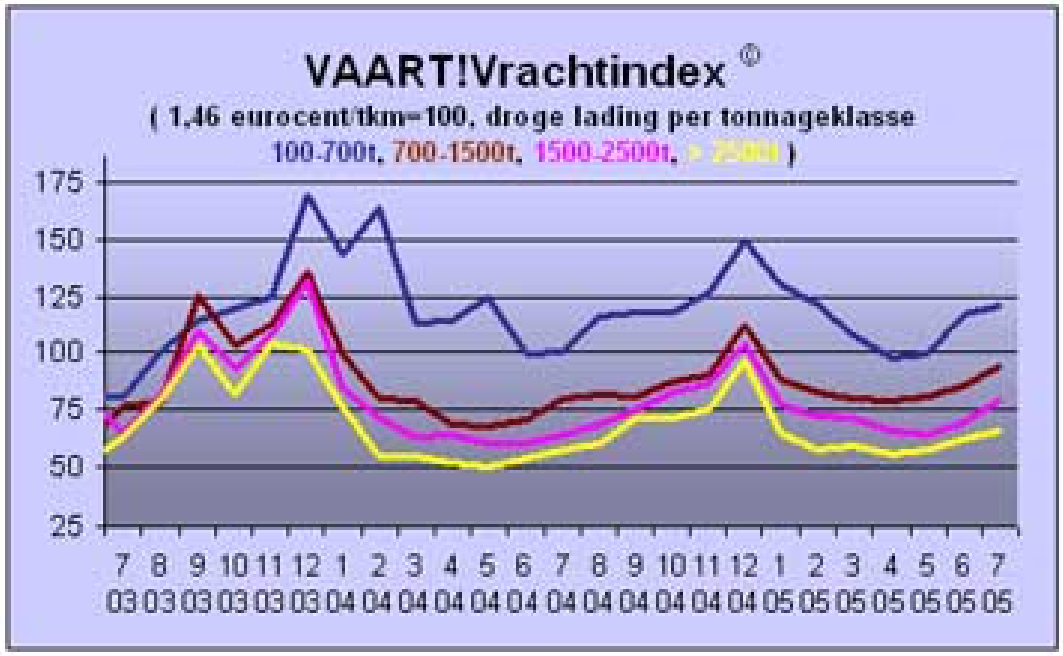
Interdependency of size of a vessel and freight rate



Source: Vaart! freight index, the Dutch Internet portal for inland navigation: www.vaart.nl

The vessel size has a direct relation to the freight index. As a general rule, smaller vessels have higher freight rates.

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Economic reality of Danube transport

Cargo transports of an Austrian shipping company between 20.-23.10.2006

Transport Relation	vessel	tons loaded	draught	**possible payload + 2 dm**	difference in tons	difference in Euro
Vienna-Csepel	xy	420	13 dm	650	230	
Vienna-Csepel	xy	606	13 dm	830	224	
Vienna-Linz	xy	878	15 dm	1.050	172	
Vienna-Linz	xy	869	15 dm	1.050	181	
Vienna-Linz	xy	514	16 dm	630	116	
Vienna-Linz	xy	513	15 dm	670	157	
		3,800		4,880	1,080	8,144

If the possible draught were +2 dm, the additional income would amount to 8,144 € within this period.

One dm draught corresponds to on average 90 tons additional payload; average freight rate/ton = 7,5 €; average additional income per vessel and additional dm payload = 675 €

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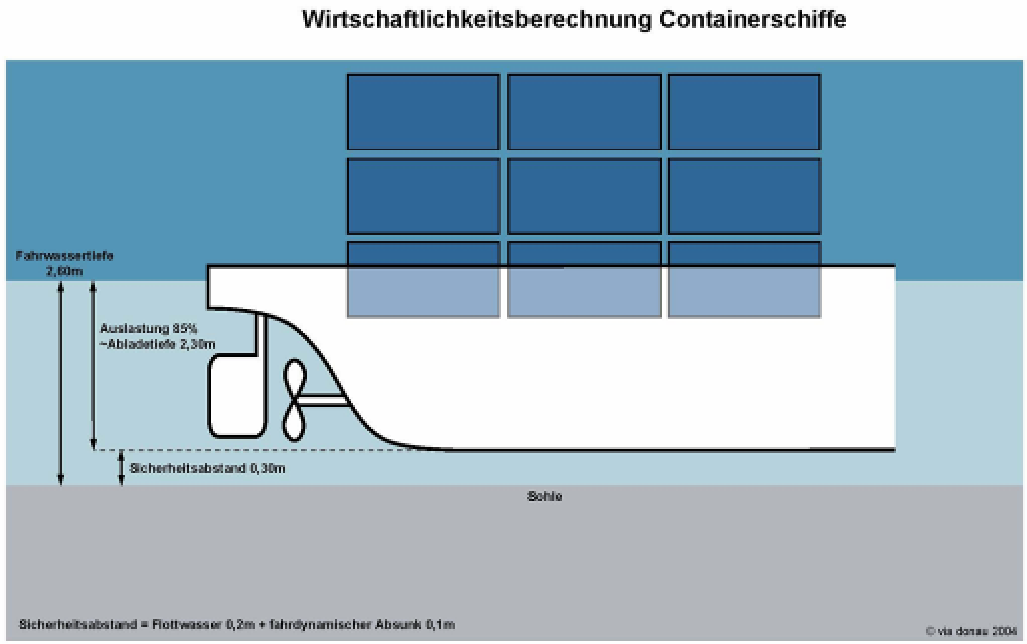
Competitive container transport on the Danube



Annahmen:
Containeradaptiertes MGS 105m Länge x 11,4m Breite x 2,7m Tiefgang
Transportkapazität 144 TEU (12x4x3 Container)
durchschnittliches Containergewicht 14 Brutto-Tonnen

Auslastungsberechnung:
100% Auslastung 144x14 = 2016t+80t Schiffsvorräte=2096t
2096t~2,60m Abladetiefe

85% Auslastung 1714t+80t Schiffsvorräte =1794t
1794t~2,30m Abladetiefe

ıires a minimum

ıght of 2,30 m

Calculati

Optimised Co

Transport cap

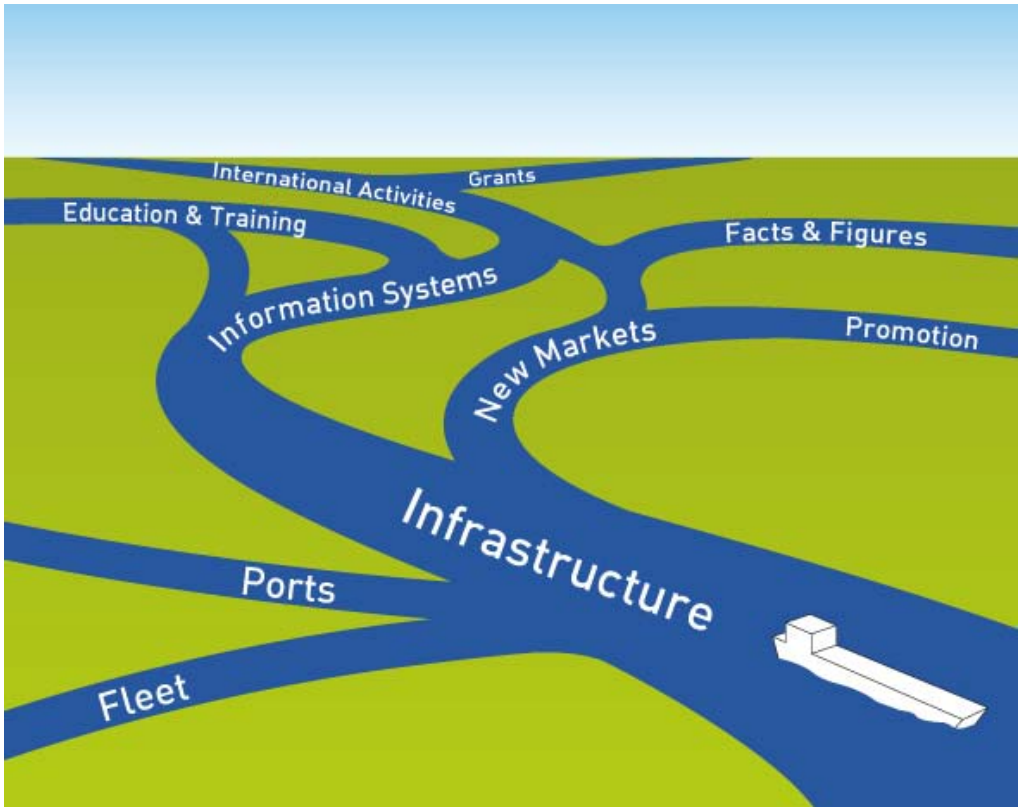
Average conta

.6t + 80t supply = 2,096 t
m

.,794 t

1,794t correspond to **2,30m draught**

Conclusion



Inland waterway transport is an interlinked system with many parameters to be taken into consideration

The river Danube is the most international river of the world with 10 riparian countries

Integrated actions, international cooperation and **active national policies** are needed to maintain and restore the Danube as a natural living space and habitat as well as a European transport axis!

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