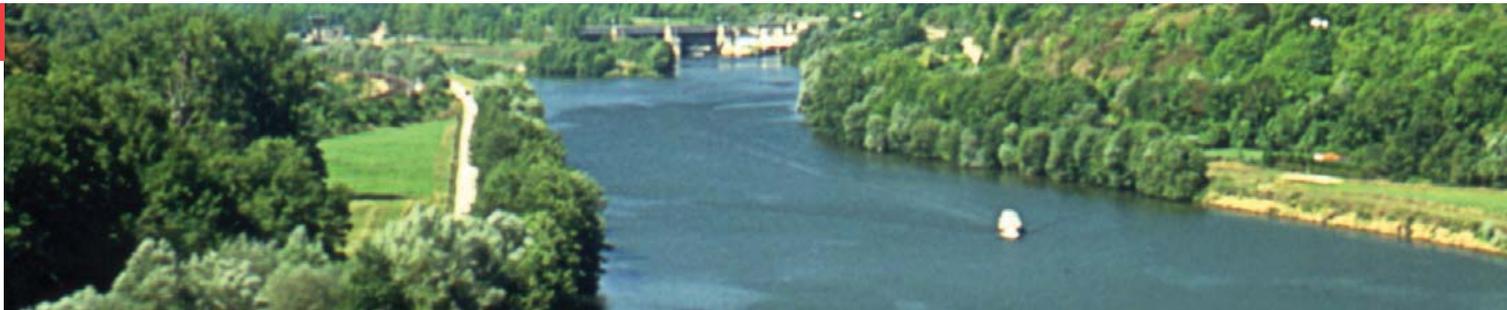


Water transport

ENVIRONMENT AND SUSTAINABILITY





Enhancing sustainable development

The contribution of the inland shipping sector

There are many challenges at stake to combine a competitive economy with more quality of life and a valuable environment. The inland navigation sector closely monitors the external effects of its activities. **Eco-efficiency** is increasingly integrated into operations. Strategies are elaborated to introduce innovation and good practices on a wide scale. Ongoing tests and demonstration projects show for example that waterway transportation will soon take a leap forward with regard to emissions. These developments are particularly helpful for the objectives of the **Kyoto protocol** in the combat against climate change.

Environment	Low % emissions and toxic spills
Energy	Makes economic use of non-renewable energy
Space	Enhances traffic savings & halts land fragmentation
Mobility	Relieves congested road & rail corridors

Further efforts are made to test **new energy sources**, to reduce emissions to zero and to create win-win situations for nature and navigation in modern **river basin management**.

Also **smart land use planning** helps. Three out of four undertakings in western Europe regularly face transport problems due to congestion! Multimodal platforms along waterways are the cornerstones of new **distribution solutions**. The presence of transport and logistics services along the waterway is attractive for companies in the vicinity. The grouping of cargo at inland hubs enhances a better capacity use of inland shipping and relieves the pressure on congested roads. Strong political support for inter-regional cooperation and the set-up of public-private partnerships have started to unlock the development potential of transport by water.

A combination of measures by all stakeholders is the way forward for more sustainability.



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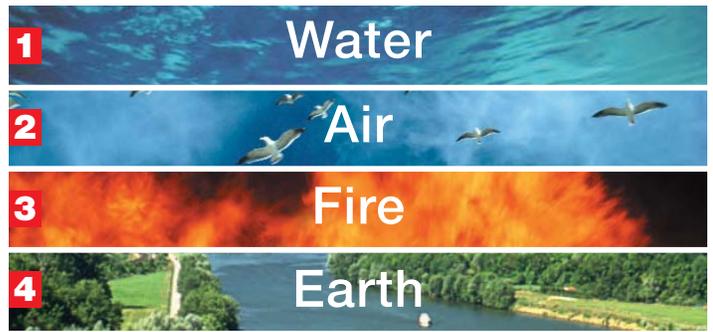
Fire: AWZ - J. Vallé/unité de production Béton de France/Ivry - VNF/P. Lemaître

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An inland vessel is

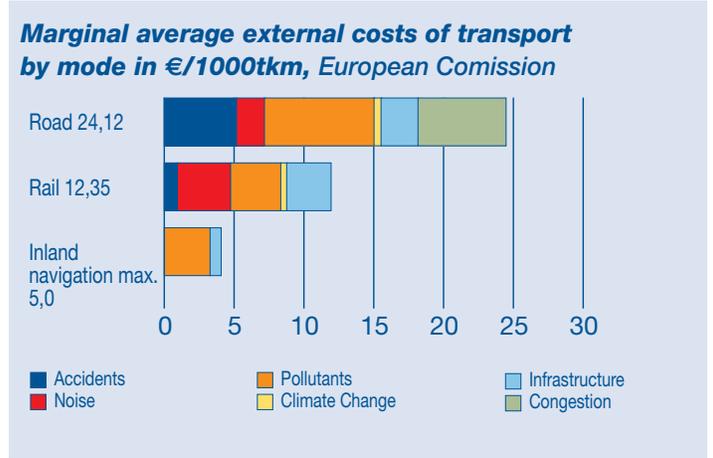
100% recyclable





The inland navigation sector is committed to actively contribute to sustainable development. Authorities can help by setting a **positive framework** with:

- Research programmes efficiently integrating & supporting the application of new environmental concepts (demonstration, validation, dissemination & training);
- Legislation setting standards to optimise an overall beneficial environmental impact;
- Cost-efficient & tailor-made incentives to make environmentally friendly technologies more attractive than conventional technologies (important in SME market).

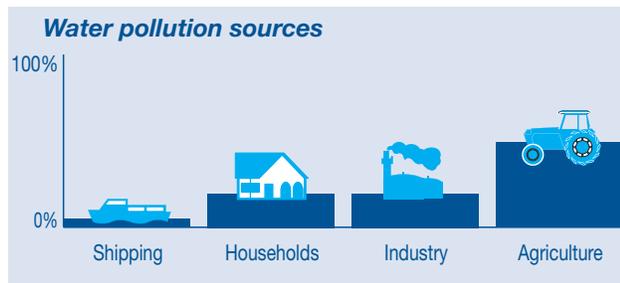


Sustainable transport is of course more than sustainable energy and low emissions alone. The inland navigation sector takes **an integrated approach**. This includes increasing traffic safety, reducing noise, relieving congestion, smart land use and halting habitat fragmentation. The final aim is to reduce all harmful effects for environment and society by achieving a positive overall impact on water and air quality, on energy and land use.



Water

Three quarters of the world consists of water. Mankind needs water as a source of life for drinking water, agriculture, industry, energy winning. Water is a common heritage. Pollution prevention is not only essential to human life, but also to all fauna and flora depending on water habitat.

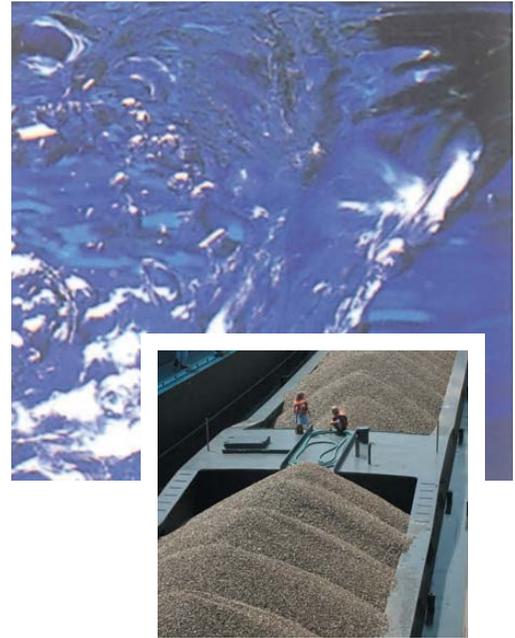


Improving water quality

Pollution due to poor sewage systems and toxic releases from agriculture, shipping and industry has taken its toll in the past decades. Water quality therefore is of increasing concern to waterway managers. According to the **European Water Framework Directive**, waterways become part of an integrated management plan conserving their biodiversity and ecological value.

The first signs are already visible:

- Wetlands are gradually restored and concrete embankments are replaced by vegetal protection banks often including bio-filter plants such as reeds and willows to enhance water quality.
- Thanks to better water quality, fish return to important rivers.



Contribution of inland shipping

- **A Rhine convention** forbids the dumping of liquid and other waste by vessels into waterways. Ship operators deliver dangerous waste such as cargo residues, oily water and lubricants at dedicated reception facilities. The inland navigation sector co-finances the system by paying a tax levied on fuel.
- Furthermore, the **use of bio-lubricants** is progressively introduced for shipping and waterfront operations.
- **No TBT-antifouling products** or similar biocides that harm the aquatic environment are used for coatings of inland vessels.
- Also, in the **Danubian countries**, national and regional coordinated efforts are deployed to strive for the implementation of a sustainable collection and disposal system for all kinds of ship borne waste.

Salmon has **Re-Conquered** the busy transport river Rhine.



Strict regulations

Fortunately, navigation accidents resulting in toxic spills rarely occur on waterways. The sector invests in continuous crew training and in the use of modern information and communication technology. Strict respect of technical standards and regulations guarantee this good score. The progressive installation of RIS – River Information Services, an information and communication network for water traffic management, will secure a maximum of safety in inland shipping and port operations.

Do you know EBIS

*The chemical and oil industry has established the European Barge Inspection Scheme as part of its commitment to improve the safety of tanker barging operations. The main aim of EBIS is to operate a self-regulatory system of exchanging objective safety and quality data on tank vessels. Qualified and accredited inspectors carry out rigorous inspections.
More information on www.ebis.nl*



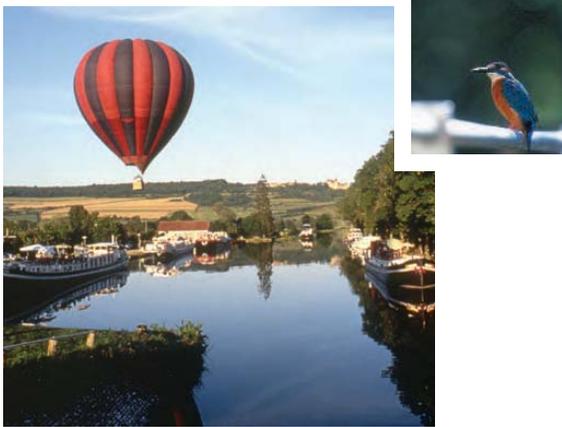
RECOMMENDED ACTION

- Multiply efforts to curb pollution at its source
- Maintain the highest standards for safety
- Extend the regime of waste reception facilities
- Encourage research in innovative techniques



Air

All transport modes using fossil fuels produce emissions that have a negative impact on the environment. The most pollutant releases stem from CO₂, particles, NO_x and SO₂. Inland navigation has a relatively positive record. Without barge transport, emissions would be at least 10% higher. Strict standards and innovation will further improve the score in the future.



Conventional fuels and emissions

■ **CO₂** emissions are the main polluter causing greenhouse effect gases responsible for climate change & global warming. The EU has committed to limit and reduce greenhouse gas emissions under the Kyoto protocol. Inland navigation offers opportunities to cut CO₂ emissions in freight transport. The inland navigation sector undertakes further improvement in CO₂ emissions through energy-efficiency measures. A proper maintenance of rivers and canals also leads to considerable energy savings.

■ **NO_x** emissions contribute to smog and ozone formation with impact on human health, crops & vegetation. The use of enhanced electronic engine management systems slightly reduces emissions. A decrease of NO_x emissions up to 50-75% can be obtained today by a high-pressure injection of water or steam in the combustion chamber. But the real breakthrough comes from SCR-converters.

■ **Ultra-fine particles (PM)** have a serious impact on human health. A PM trap is the most common way for exhaust after treatment equipment reducing PM emissions by 90%. A system combining SCR-technology and a continuous regeneration trap is expected to cut emissions by 95%.

■ **SO₂** leads as well as NO_x to acidification impacting on public health & crops. SO₂ emissions and PM emissions are linked to the sulphur content of diesel. Once low sulphur fuels commercially on hand for road transport would become available in shipping, a further decrease could easily be obtained. Low sulphur fuels are a condition for improving the effectiveness of SCR-converters and most PM traps.

How to reduce harmful emissions effectively?

CO ₂	energy-efficiency measures
NO _x	water or steam injection / SCR-converter
PM	particulate emissions trap
SO ₂	lower sulphur fuels

Thanks to inland shipping, a year at least

120 million tonnes of

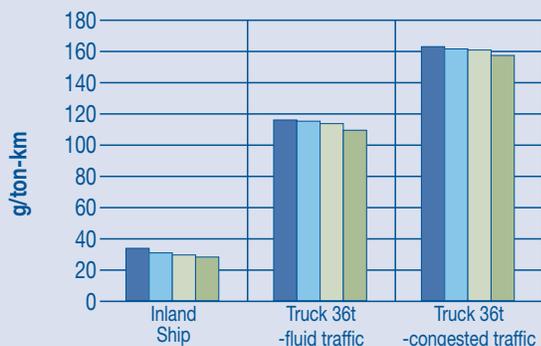
CO₂ emissions less in the atmosphere



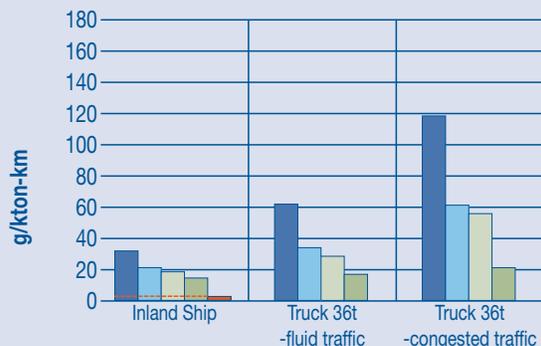
Decreasing emissions in inland shipping

■ 1990 ■ 2000 ■ 2002 ■ 2010 ■ Low emission

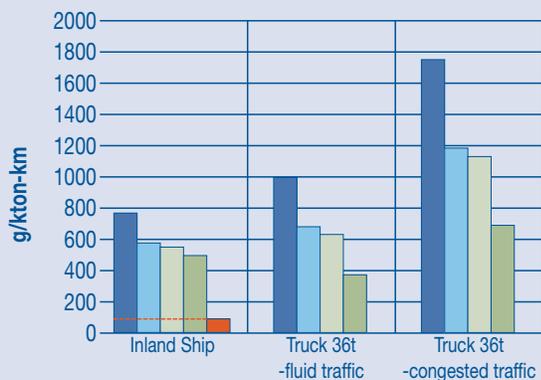
CO₂ per ton-km



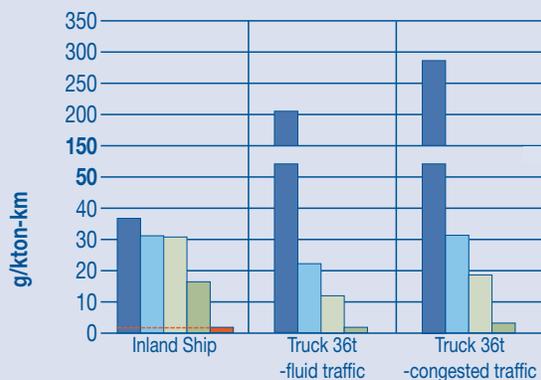
PM per 1000 ton-km: impact of PM trap



NO_x per 1000 ton-km: impact of SCR converter



SO₂ per 1000 ton-km: impact of low sulphur fuel



Source: VITO 2004

Selective Catalytic Reduction (SCR) technology will dramatically reduce ship emissions

By 2008, new inland vessel engines must comply with stricter emission standards. Enhanced electronic engine management systems can clear this task. SCR technology, however, enables the inland navigation sector to be far ahead of the EU directive on emissions for non-road mobile machinery. SCR-converters onboard can cut NO_x emissions from conventional fuels by 80% and more. NO_x after treatment equipment, at the same time, leads to less fuel consumption, less CO, HC and particulate emissions. Additional advantages are that catalytic converters can reduce emissions of existing engines and that the combined use of biofuels would form no obstacle.



Low emission ship equipped with SCR-converter in operation



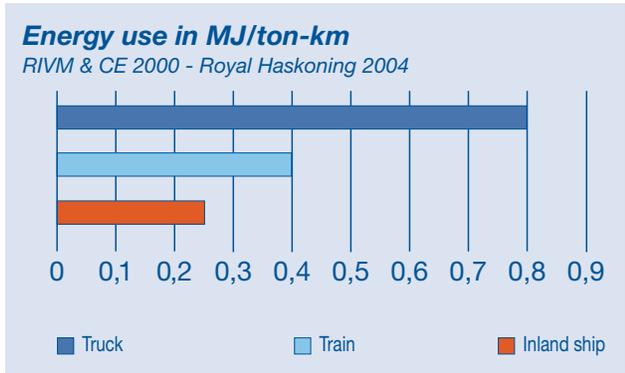
SCR-converter on board of inland vessel

RECOMMENDED ACTION

- Support for pilot projects enhancing the widespread introduction of emission reduction applications
- Strict standards for engines and sulphur content in conventional marine fuels applicable to manufacturers and refineries
- Cost-effective packages for emission-improving measures

Fire

Emissions and fuel use are closely linked. Waterway transportation is very economical in its use of non-renewable energy. A ship consumes considerably less energy per ton-kilometer than other transport means. Hence, ships can move more loads over a longer distance with less fuel. But the future definitely belongs to new energy sources leading to zero emissions.



Environmentally friendly engines

Vessel engines have a longer lifetime than truck engines. But in the last years 20% of the inland navigation fleet renewed engines and this trend continues. A recent survey learns that more than 80% of the vessel owners are ready to invest in a more environmentally sound engine. Modern engines are more fuel-efficient as they have a better performance.

Low energy consumption

- High load factor
- Economies of scale and reduction of the fleet by 1/4
- Vessel engines constantly turn for a longer time

Ongoing developments & pilots reducing energy use and emissions

- River Information Services (RIS) for optimised navigation planning
- Enhanced electronic engine management systems
- Selective catalytic reduction technology
- Tempomate: 10-20% reduction
- Z-drive: 15-30% reduction
- Jet nozzle: 30% reduction
- Whale tail wheel: 30-40% reduction

More than **80%**
of the vessel owners are ready to invest in a more environmentally friendly engine.



Towards near zero emissions

High quality diesel combined with emission-improving technology will progressively reduce emissions by 98%. Nevertheless, new research and pilot projects move away from the exclusive use of conventional fossil fuels and test carbon free and hybrid energy producing zero emissions or near zero emissions. A rapid introduction of bio-fuels and other alternative energy types however faces serious barriers due to higher energy costs in a very competitive market. Fuel cell applications will also be hampered in the beginning by high costs, limited lifetime and oversize, but mass production and technological optimisation will undoubtedly bring price reductions and more efficiency.



Testing zero-emission vessels (ZEVs)

Investigations testing fuel cells for on-board use have started. In order to avoid indirect pollution from electricity and hydrogen production, research attaches special attention to renewable energy sources. Commercial introduction of fuel cell technology onboard inland freight ships is expected by the end of this decade. Diesels & hybrid fuels will most likely bridge the transition period before the widespread introduction of alternatives such as clean hydrogen. The inland shipping sector is committed to deliver a fundamental contribution to the mitigation of harmful climate change effects and to the global energy challenge.

RECOMMENDED ACTION

Short-term

- Firm support for research into alternative energy applications
- Incentives and cost-effective packages to enhance the introduction of near-zero and zero-emission propulsion
- Eco-award and label for near-zero and zero-emission ships

Mid-term

- Prepare strategy to build up renewable energy production capacity
- Prepare strategy to plan an alternative energy refuel infrastructure





Earth

4

Throughout history, mankind has always taken advantage of the opportunities offered by waterways. Optimising the use and re-use of rivers' rich resources has been and still is at the core of human activities: for drinking water, for the cultivation of food crops, as a source of power, as a component of industrial processes, for leisure and recreation and as a ready transport means.



A strong historical link between land and water

Rivers have been arteries of development for thousands of years, because human activities are unthinkable without water. But they also exercise pressure on the water environment. Canalisation of rivers, deforestation, urbanisation and land reclamation for agriculture and industry have reduced rivers' floodplains. A considerable percentage made way for housing and the creation of arable land. Groynes and dikes have been installed to regulate navigation, to ensure fresh water supply for cities and to help prevent flooding of populated areas.

Sustaining the ecological value of the water environment

Mankind will continue to interact with river systems, but preserving the ecological value of the water environment and its rich biodiversity has become a full part of sustainable development. The external effects of inland shipping are limited but can be further improved. Specific measures facilitating navigation are examined according to their impact on ecological processes and on other economic and social activities. Adequate flood protection and water retention in dry periods are an additional advantage. Old situations are being reversed creating more space for the rivers.



Good practice

The upgrade of the waterway depth conditions between Vienna and Bratislava is a win-win situation for navigation and nature, since the project is combined with the restoration and development of wetlands of the Donau Auen Park. The network of side arms will be reconnected to the river Danube. With the re-naturalisation of river embankments, it forms an integral part of a project co-financed by the European Commission to improve navigation by 2005. A strategic environmental impact assessment maps all the effects of planned measures.

In the European Union **50%**
of the population lives close to the coast
and in the river valleys of the 15 largest rivers



- Canals created for human activities such as water supply and navigation offer a unique opportunity to create new nature zones with a rich water habitat.

- Locks are now adapted in such a way that sediment accumulation is controlled and substantially reduced.

Mechanisms ensure that water is not trapped in river sections but continues to flow, except in extremely dry periods.

Increasingly equipped with fish stairs, another barrier effect of locks is lifted. Migratory species can freely move between river sections. Monitors observe the development and behaviour of fish stocks.

- As for the riverbeds, bed load management prevents riverbed erosion and protects the rivers' soil.

- Wetlands are restored and developed to allow nature to take over in floodplains, to help control floods and to filter water. Except for transshipment installations, fixed embankments are progressively replaced by vegetal riverbanks using biodegradable materials leading to re-conquest by fauna and flora. Stairs are constructed to prevent animals from drowning.



Smart land use planning to maintain living landscapes

Waterway managers are responsible for an efficient command of rivers and canals, combining all aspects. By balancing social, economic, cultural and environmental interests, they aim at attaining a sustainable development of waterways in a joint dialogue with all stakeholders. Integrated river management today covers a lot of issues including mobility strategies and sound ecologic engineering. The final aim is to increase win-win situations by using waterways without further harming them.



Partnership for a better quality of life

In the framework of the "Leading Green Scheme", the Urban Community of the French city Lille, French Waterways and Natural Metropolitan Space have set up a partnership for a better quality of life. Together they signed a convention to implement a strategy for sustainable city logistics and urban regeneration along a water eco-corridor with active involvement of the population. The region of Lille has a long tradition of river traffic and is keen to preserve its living water infrastructure and to fully integrate it in its vision on mobility and landscape development.

RECOMMENDED ACTION

- Create cross-cutting mechanisms to improve communication and cooperation between all public and private stakeholders to valorise the water environment
- Multiply efforts to improve the cross-sector integration of water policy
- Foster win-win situations for sustainable waterway transport and sound environmental management