Towards an EU Water Resilience Strategy

Enabling waterway authorities to take up their responsibility for increased resilience and preparedness

1. The multi-functional role of waterway authorities

Waterway authorities manage and operate navigable rivers, canals and lakes in Europe which cross EU cities and landscapes hosting communities, economic activities and nature. In addition to providing infrastructure services for commercial and recreational navigation on different types of waterways, waterway authorities provide other important societal and economic services

The multi-functional role of inland waterway authorities includes according to their mandates:

1. **protecting the safety of critical infrastructure** and preventing irreversible damage
2. **ensuring the security of water supply for utilities** essential to society such as drinking water as well as water for energy purposes
3. **increasing water efficiency and providing water supply for economic uses** such as navigation, agriculture, industry, power generation, heating & cooling
4. **providing flood mitigation and relief** both on and along navigable waterways (ports, roads, railways,…), for a better protection of the population, economic activities, critical infrastructure
5. **supporting biodiversity** and ecosystem functioning by creating space for the river, reconnecting river branches, restoring meandering and wetlands which increase water quality and act, beyond their habitat function for a wide variety of species, as a natural sponge absorbing water during heavy rainfall and releasing it again very slowly in periods of drought.
6. **enhancing regional development** for mobility, tourism and leisure on and along waterways: cruising, boating, passenger transport, nautical sports, cycling, walking, heritage,…

This multi-functional set of tasks highlights the role of waterway authorities in ensuring water resilience. This guides waterway authorities towards integrated and multidisciplinary planning, design and management of projects, acknowledging **interdependencies** and combining functions wherever possible to maximise synergies and co-benefits.

2. How does climate change affect the waterway network and overall water resilience?

Generally, the climate change-induced fluctuations of water levels are still within the same range of fluctuations as in the past decades. There will be water in Europe's river and canals just like in the past, but waterway managers will have to **cope with bigger extremes**. Temporal and spatial changes in the frequency and intensity of precipitation and rising temperatures are increasing the risk and frequency of storms, floods, heat waves and droughts. The impacts of extreme events and progressive changes brought about by climate change **drive up the pressure on water resilience**. Climate change affects the infrastructure, services and functions provided by waterway authorities in several ways:

- **Infrastructure stability and safety** – Extreme temperatures and rainfall endanger the stability of critical infrastructure requiring increased investment to protect its safety. Water shortage, storms and flooding cause damage and subsidence to water related structures, embankments, reservoirs, bridges, hosted utilities and other structures such as roads, railways, ports etc. negatively affecting the safety and security of daily operations and increasing the risk of disruptions.
- **Increased risk of water scarcity and droughts** – In rivers, droughts lead to low water levels and river bed erosion. Canals can be affected by prolonged droughts when feeding rivers are running low. Water scarcity increases water use and abstraction, aggravating the situation, creating competing use. Events of water scarcity require an anticipated cooperative water allocation approach focusing on water co-benefits, so all water uses can continue to thrive by using water in an efficient way. Water security, safe retention and release management require concerted investment to ensure smart water supply for drinking water, emergency services, navigation, agricultural and industrial processes.
- **Floodings and overtopping** - Long lasting heavy precipitation solely or in association with snow melt will result in increased discharges, flow velocities and high water levels in rivers leading to significant changes in sedimentation and river morphology. Overtopping can result in additional pollution. Driftwood and fallen trees create clogging and barriers. Floodings damage water related and adjacent structures and endanger human life. Locks already are instrumental in regulating water flows.
- **Ecological degradation** - Changing weather patterns lead to biodiversity loss and increase the presence of invasive species and algal bloom.

Does investment in waterway infrastructure make sense given the expected impacts of climate change?

Waterway projects are integrating projects serving multiple needs. A further decline in investment would have a negative impact on the overall climate and security proofing of the waterway network, affecting structural stability, water supply, flood protection, ecosystems and public safety that underpin our economy and society.

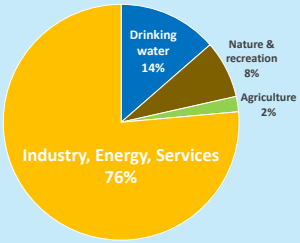
Climate change is an important factor which threatens water resilience on top of a backlog in renovation, decrease in funding and increasing danger of hybrid warfare. This causes a systemic risk to multiple and interdependent vital functions of our society and economy. Investments in waterways' capacity to attenuate the consequences of extreme phenomena are ongoing, but enormous work remains to be done

The surface waters of navigable waterways are essential for the strategic nexus drinking water, agriculture and industry

Belgium

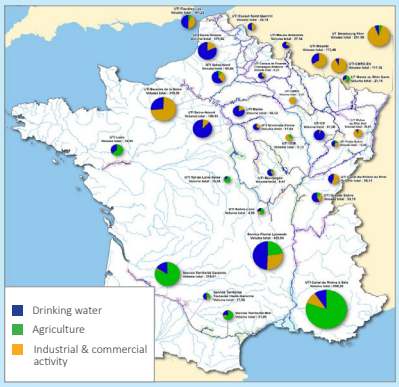
40% of the drinking water supply in Flanders is based on the intake of Meuse water at the Albertkanaal & Netekanaal. *(Source: VRAG, DVW)*

Over **75%** of water consumption from surface water of the Albert Canal is used by the industry, mainly by the chemical clusters in and around the Port of Antwerp.



Total surface freshwater usage on Albert Canal from 2005-2019, in Mm3/year
Source: Flemish Environment Agency

France



Water intake fees
Source: VNF

Surface waters managed by Voies navigables de France are essential for the supply of water. **50%** of the French population's drinking water needs are covered, and **45%** of farmers, vital to food security, depend on it, while navigation is an important mode of transport for agribulk. Industrial activities, including heating and cooling of power plants, rely for **90%** of its needs on surface waters.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During heat waves and periods of water scarcity and drought, consumption increases.

Climate change results in more extreme weather events leading to conflicting use.

In combination with innovative solutions, the ageing infrastructure of critical value requires urgent investment to be able to continue the safe provision of these essential services.

Climate change's water impact on industrial production

In the third and fourth quarters of 2018, the production losses of the German industry due to persistent low water levels on the Rhine amounted to approximatively 4.7 billion EUR. This corresponds to 0.63 % of the entire German industrial production. Several companies had to cope with substantial production losses, especially in the chemical and steel sector.

Droughts and floods can severely disrupt transport activities by temporarily blocking waterways, imposing restrictions on the amounts of loads transported, and requiring additional vessels to compensate for reduced load factors, or even a shift to other modes of transport. In consequence, under such circumstances, the supply of raw materials and manufactured goods can become insufficient or even interrupted, transportation costs will increase and the impact on the economy can be dramatic.

How important is waterway transport with its small modal share?

Navigation mainly ships the raw materials and building blocks of our economy. Disruptions impact the downstream supply chain and wider industrial production. Furthermore, the Danube proved to be the most important and reliable Solidarity Lane that allowed Ukrainian grain and oil seeds to be exported worldwide in times of crisis. Thanks to its capacity to carry large volumes, Danube navigation helped to ensure global food supply, and security, when Black Sea ports were blocked.

3. How can we respond more effectively to climate change and increase water resilience

Water is a strategic asset. The ongoing and future effects of climate change dramatically increase the need for an inter-disciplinary and proactive EU water resilience strategy given the interdependencies between sectors and regions. Our water infrastructure also needs to become resilient to all other kinds of disruptions.

To achieve a fit-for-purpose and a fit-for-future waterway network fully contributing to increased water resilience, sustainability and security, it is essential to:

- **Raise political awareness** and understanding about the multi-purpose role of our water infrastructure, including the navigable waterway network and how its interdependent functions affect and support our economy and society. Being fully aware of interconnectedness and leveraging synergies will strengthen our resilience. Breaking silos is key to avoid conflicting use, weak spots and maladaptation.
- **Ensure a systemic approach and policy coherence in governance processes and projects**. Enhance collaboration across administrative entities and sectors for a coherent integration of water resilience in and between EU policies with due consideration for geographic differences. Joint planning objectives integrate the interests of all sectors, enabling a more efficient and sustainable management of shared water resources while considering the growing climate change and security-related risks. In the face of combined challenges such as drought, floods and cyber threats to water related infrastructure, integrated approaches and proactive risk management are essential.
- **Foster research, development and innovation** to bridge uncertainties by investigating data and investment gaps; improve forecasting and monitoring capacity for navigable waterways; assess interrelations between different and conflicting uses including negative cascading; design and test how to maximise the potential of digitalization and AI in a safe and secure way; test innovative and sustainable co-benefit solutions for smart water use, circularity, retention, climate adaptation, security and pollution control at source, etc.
- **Integrate water resilience in EU funding and financing instruments**. Money sets priorities. It should enable EU strategic investment into integrated projects and the combination of resources to cover concurring needs and enabling synergies. If we are to strengthen and improve the ability of Europe's waterway network to continue at all times to provide life sustaining services for society, economy and nature, it is imperative to increase capacity building and investment in the preparedness and resilience of waterway related infrastructure with nature based solutions where possible and with other solutions where necessary.
- **Enable flexible, adaptive planning and implementation**. Traditional infrastructure has a long life expectancy. Its quality, reliability and safety must be improved where needed. At the same time, climate adaptation requires working with evolving knowledge, continuous monitoring and evaluation to expand the toolbox with no-regret and adaptive measures according to specific geographic needs. Flexibility can be achieved by carrying out large projects in stages. This allows for phased implementation and adaptive management. Such an approach supports continuous refinement of the planning and implementation of measures based on lessons learned from earlier phases. Improving responsiveness requires therefore a rolling funding programme as part of multi-annual climate and water resilience plans for navigable waterways.

As water resilience is closely linked to climate change and extreme events, we advocate close coordination with the European Climate Change Adaptation and Preparedness Strategy.

An integrated waterway management approach to address drought and riverbed erosion

Drought induced low water levels cause river bed erosion. Climate change effects associated with the withdrawal of water for the irrigation of agricultural areas, increased cooling of power plants, etc. can outweigh the direct climate impacts like changes in water availability creating negative cascading effects.

Measures to stop river bed erosion have benefits not only for navigation (stabilized fairway depth) but also for agriculture and natural habitats adjacent to these waterways (stabilizing ground water levels).

Measures are combined with optimisation of groynes, creation of fish migration routes, water body networking, wetland restoration, and ecological riverbank stabilization to ensure a systems approach.

A rolling programme for integrated waterway management

Because of climate change and rising sea levels, the Sigma Plan in Flanders combines higher and wider levees in populated areas with a chain of flood areas along tidal rivers and local depoldering to make room for rivers. The aim is to protect the entire region of Flanders from flooding from those tidal rivers at storm tides.

Restoration of natural bends and meanders creates natural buffers during periods of high precipitation, while they are barriers against drought.

It is a rolling programme to ensure water safety and security, protect nature, improve navigation and protect large adjacent areas and infrastructure from flooding.

Smart water use is multiple use

Although canals are less sensitive to direct climate change effects, in severe drought periods problems can arise as they are fed by river water, and extractions for drinking water, farming and industrial activities further lower the water level.

Locks on the Albert Canal, Bruxelles-Charleroi canal and the Upper Scheldt in Belgium have been equipped with large Archimedes screw pumps. In case of drought, water is pumped upstream to avoid water flowing downstream after lock passages. In normal circumstances, the pumps generate hydroelectricity for lock operations and households. This dual role of the pumps enables smart water use.

The locks on the Seine-Nord Canal will be climate proof too, even under very unfavourable climate conditions. All water is recycled thanks to pumping stations and lateral savings basins.

Dynamic river management

As part of the FAIRway project, flexible infrastructure elements have been tested on the Austrian Danube. A loaded barge is positioned temporarily at a critical section to act as training wall during low water. The barge is removed when no longer needed to help provide a reliable fairway. The first test was successful.

Flexible infrastructure can be removed after low water periods and has no further impact on the riverbed. In this way, the reliability of inland navigation will be improved without any permanent impact on water habitats and ecosystems.

The pilots will also be rolled out in Croatia, Romania and Bulgaria with varying numbers and angles during upcoming low-water periods.

Inland Navigation Europe (INE) is the European platform of national & regional waterway authorities and organisations promoting waterway transport, established in 2000 with the support of the European Commission, and a neutral platform without commercial interests.

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