

# INNOVATIVE DIGITALISATION APPROACHES FOR MANAGING HYDRAULIC STRUCTURES OF INLAND WATERWAYS

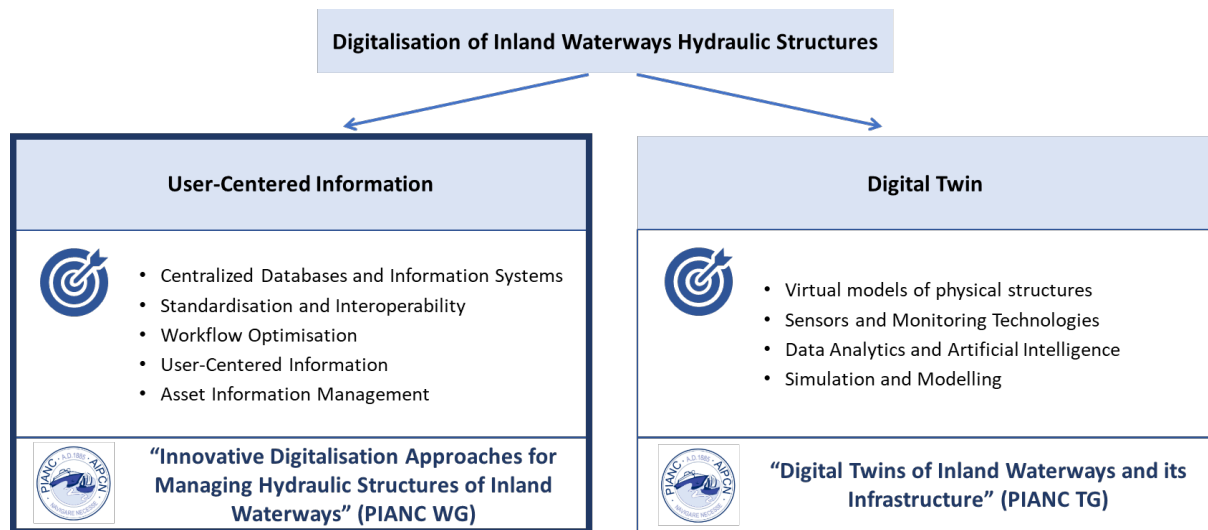
## PROPOSED TECHNICAL WORKING GROUP

### TERMS OF REFERENCE

#### 1. Historical Background Definition of the Problem

Various inland waterways and shipping administrations worldwide have been actively involved in digitalisation to enhance the efficiency and effectiveness of managing and maintaining their hydraulic structures. Information management plays a crucial role in this regard ensuring that accurate and up-to-date information is available according to user needs. While approaches like Digital Twins and Building Information Modelling (BIM) are increasingly being utilized, effective information management serves as the foundation for these approaches and must be prioritised before implementing them.

By centralising and standardising data through advanced information systems, such as object registers and integrated databases, stakeholders can optimise workflows and streamline decision-making processes. Moreover, user-centered information enhances efficiency by providing stakeholders with tailored data that meet specific needs.



It is the aim of this WG to focus on the aspects of digitalisation described above, particularly emphasising user-centered information (see next Figure). Another working group will specifically address "Digital Twins", and therefore this topic is not included in the present TOR.



## 2. Objectives and Scope of the Working Group

The primary objectives of the working group are to identify and document best practices and innovative digitalisation solutions in the management and maintenance of inland waterway hydraulic structures on an international scale. Examples of successful and efficient use of digital data will be compiled.

Digital solutions will include for example digital object registers to catalogue and manage information about hydraulic structures, or solutions for technical document management related to maintenance, or inspections and repair processes. It will be crucial to differentiate these solutions based on their stage of development, whether they are conceptual, prototypical, or fully implemented.

Moreover, the working group aims to address the following specific questions:

### Data storage & Quality:

- What standardisation efforts are underway to ensure interoperability (between different devices, users, ...) in waterway infrastructure management?
- How can data be efficiently and sustainably stored, avoiding data loss due to outdated proprietary software, hardware, and storage media?
- How can data from various sources be efficiently managed and integrated while ensuring consistency, validity, and actuality?
- How can quality assurance be operated?

### Data need & data access:

- How can a single, reliable source of data be created and made accessible to all stakeholders?
- How can access to data be made easier for different user groups with different level of experience (e.g. owners, asset managers, design engineers, operators)?
- How do infrastructure managers, etc. ensure that the collected data serves the purpose of informing decision-making rather than merely tracking information?
- Which specific data is needed for the overall management of hydraulic structures?

### Data update & Data capture:

- Which processes should be implemented to ensure the continuous updating of information, and how can roles and responsibilities for data input and maintenance be clearly defined?
- Examine ways in which electronic and physical data can be archived and then accessed over the whole operational lifetime of the infrastructure

By exploring these questions, the working group seeks to advance understanding and promote effective digitalisation initiatives in the context of information management within the field of hydraulic structures of Port & IWs. Additionally, it aims to offer actionable recommendations for stakeholders in waterway management.



### 3. Earlier Reports to be Reviewed

Some relevant technical publications to be reviewed include:

- WG 129 Waterway Infrastructure Asset Maintenance Management (2013)
- TG 181 The State and Perspectives of Waterborne Transport Infrastructure World-wide (2018)
- WG 179 Standardisation of Inland Waterways - Proposal for the Revision of the ECMT 1992 Classification (2020)
- WG 199 Health and Monitoring of Port and Waterways Structures (2023)
- WG 203 Sustainable Inland Waterways - A Guide for Inland Waterway Managers on Social and Environmental Impacts (2023)
- WG 206 Guidelines for Lock Design (Chapter 12, global vision) – in Progress
- TG 257 Digital Twins (2024, in progress)

### 4. Intended Product

The intended product of the working group is a comprehensive report documenting best practices, innovative solutions, and actionable recommendations for the management of hydraulic structures in ports and inland waterways.

### 5. Working Group Membership

Members of the working group include experts and professionals with relevant experience and expertise in digitalisation, management, maintenance and operation of port and waterway infrastructure from governmental administrations, research institutions, as well as the private sector.

Experts from IT domain may be welcome as advisors.

### 6. Target Audience

The primary target audience for the working group's output includes professionals and stakeholders involved in the management, maintenance and operation of hydraulic structures (Port and IW). This includes governmental administrations responsible for port and waterway infrastructure, researchers, industry representatives, technology providers, and other relevant stakeholders.



## 7. Relevance

### 7.1 Relevance to Countries in Transition, etc.

The findings of the Working Group are relevant for any country that operates and maintains port & waterway infrastructure. The working group expects its relevance to countries in transition, with a focus on providing practical guidance and support for enhancing digitalisation efforts in such contexts.

### 7.2 Climate Change and Adaptation

The Working Group will survey the potential climate change impacts of the digitalisation initiatives in operation and maintenance.

### 7.3 Working with Nature

The Working Group will survey the environmental impacts (WWN) of the digitalisation initiatives in operation and maintenance.

### 7.4 UN Sustainable Development Goals

Similarly to WWN, the Working Group will survey the interaction of the digitalisation initiatives in operation and maintenance with the UN Sustainable Goals

## 8. References

Huang, J., Yao, H., Chen, Z. (2023). Exploration of Digitalization System and Technical Solutions for Inland Waterway. Proceedings of PIANC Smart Rivers 2022. PIANC 2022. Lecture Notes in Civil Engineering, vol 264. Springer, Singapore.  
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