



Entry Classification:

Modality - Waterborne (C)

Research Topic/Area – RA4.1

- RA4.1: Resilient Infrastructure (i.e. Predictive Maintenance)
- RA3.4: Digital Transport Infrastructure (i.e. Digital Twin Locks)

Idea Title:

LOCK-INSPECTOR: A Dedicated Subsurface Inspection Radar System for Increasing Inland Waterway Infrastructure Resilience.

Abstract:

Europe's Inland Waterway Transport (IWT) network extends over 38,000km, reliably transporting over 524 million tonnes of bulk cargo per year. High-capacity lock structures enable vessels exceeding 4000 tonnes to efficiently traverse sizeable gradients, but inherently form network chokepoints. Closing locks for essential structural repairs thereby causes significant network disruption. Solutions to transition such maintenance from purely 'reactive' to 'predictive' conduct are urgently required, especially as more providers shift to IWT to decarbonise, increasing traffic and subsequent structural exacerbation.

IWT management bodies across Europe lack inspection technology capable of effectively localising, visualising and characterising hidden critical elements within existing lock wall substructures. A dedicated solution would enable surveyors to better track, prioritise and address subsurface defects across typical decennial maintenance.

We present development of a dedicated Subsurface Inspection Radar (SIR) for IWT lock substructure analysis in EU-Horizon Project: 'Climate resilient and environmentally sustainable transport infrastructure, with a focus on inland waterways' (CRISTAL). This project seeks to develop a unique Digital Twin of IWT lock operations.

Opportunity for applied technology transfer between rail and waterborne is initially explored. Focus on recent developments in hybrid-rotational Ground Penetrating Radar (GPR) for tunnel subsurface inspection identifies a potentially more time-efficient, scalable digital solution for large-scale lock infrastructure profiling. Adaption motivates development of the dedicated wall-profiling GPR apparatus LOCK-INSPECTOR. Hardware design for data acquisition and visualisation workflow for eventual 3D feature analysis are subsequently outlined, alongside system integration with the Digital Twin. Finally, preliminary profiling of a working French lock is discussed.

Abstract – Images

Figure 1 – From Report

Figure 3 – From Report

Figure 5 – From Report