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CROSSFREIGHT

Project CROSSFREIGHT

Action plan

Deliverable no. D.3.3.1

All PPs – Joint report – done by PP7 (Port of Šibenik Authority)

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Project acronym	CROSSFREIGHT
Project ID Number	ITHR0200487
Project Title	Cross-border ICT Strategies for freight rail and port logistic integration, optimization, sustainability and security
Priority Axis	Sustainable maritime and multimodal transport
Specific objective	3.1 – Developing and enhancing sustainable, climate resilient, intelligent and intermodal national, regional and local mobility, including improved access to TEN-T and cross-border mobility
Work Package	WP3 CROSSFREIGHT transferability and exploitation
Activity	A 3.3 – CROSSFREIGHT Action Plan
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CROSSFREIGHT

1. Executive Summary

The CROSSFREIGHT Action Plan (D.3.3.1) provides a structured roadmap for exploiting and transferring the digital innovation outcomes of the CROSSFREIGHT project (Interreg VI-A Italy-Croatia, ITHR0200487) to additional intermodal nodes across the Adriatic-Ionian region and beyond. This deliverable is produced under Work Package 3, Activity 3.3, and is led by the Port of Šibenik Authority (PP7) in close collaboration with all eight project partners.

The CROSSFREIGHT project piloted seven innovative ICT solutions across intermodal and port-rail nodes in Italy and Croatia, demonstrating that digital transformation is achievable and impactful at all levels of operational complexity — from advanced AI-driven optimisation systems in major TEN-T hubs such as Ravenna and Trieste, to cost-effective Excel-based planning tools in smaller ports like Šibenik. Across all pilots, consistent benefits were documented: improved operational visibility, enhanced stakeholder coordination, reduced manual errors, optimised resource allocation, and faster information flows.

The Transferability Analysis (D.3.1.1) confirmed medium-to-high replication potential across all pilot solutions, subject to preconditions including digital infrastructure readiness, stakeholder alignment, data availability, and governance capacity. The Exploitation potential and policy recommendations (D.3.2.1) defined commercial and non-commercial pathways for the tested ICT tools, along with a set of policy recommendations addressing the Adriatic-Ionian and broader EU transport digitalisation agenda.

This Action Plan synthesises the findings of these two preceding deliverables and translates them into concrete, time-bound actions organized in three implementation horizons: immediate (0–12 months), medium-term (12–24 months), and long-term (24–48 months). Building on a dedicated questionnaire completed by all eight partners in July 2026, it distinguishes the concrete next steps partners are actually committed to taking from more exploratory replication opportunities that remain contingent on future interest and funding, assigns responsible partners for each action, defines stakeholder engagement mechanisms, and proposes a governance and monitoring framework for post-project continuity.

The CROSSFREIGHT Action Plan contributes directly to Programme Output Indicator RCO83 (Strategies and Action Plans Jointly Developed) and Result Indicator RCR79 (Users benefiting from new or upgraded digital public services, products and processes). It supports the Adriatic-Ionian

EUSAIR Pillar 2 "Connecting the Region" and aligns with TEN-T objectives and the European Green Deal modal shift ambitions.

2. Introduction and Purpose

2.1 Background

CROSSFREIGHT addresses a persistent challenge in the Adriatic transport corridor: the fragmentation, manual nature, and limited interoperability of port-rail logistics chains. Despite the strategic importance of the Italy-Croatia cross-border rail freight corridor — connecting several core and comprehensive TEN-T nodes — the sector has suffered from siloed data systems, paper-based coordination procedures, and inconsistent digital maturity across operators and terminals.

The project responded by implementing and evaluating seven Field Operational Tests (FOTs) guided by the FESTA methodology, each targeting specific operational bottlenecks at intermodal nodes of varying scale and complexity. These pilots generated validated evidence of the effectiveness of digital interventions and created a portfolio of replicable solutions suited to the diverse operational realities of the programme area.

2.2 Purpose of this Document

The CROSSFREIGHT Action Plan serves three interrelated purposes:

- Exploitation Roadmap: It defines how the project's results — including ICT tools, methodologies, and knowledge assets — can be commercialised or operationally deployed beyond the pilot sites by project partners and third-party stakeholders.
- Transferability Roadmap: Based on direct input collected from all partners in July 2026, it sets out the concrete transfer actions each partner is actually planning to take, together with more exploratory replication opportunities that have been identified and, while not yet formally confirmed, reflect the overall commitment of their respective owners, detailing implementation conditions, responsibilities, and indicative timelines.
- Stakeholder Engagement Strategy: It outlines how project partners and target-node stakeholders will be engaged, informed, and supported throughout the transfer and exploitation process.

2.3 Relationship to Other Deliverables

This Action Plan is directly informed by and builds upon the following WP3 deliverables:

- D.3.1.1 – CROSSFREIGHT Transferability Analysis: Provides the methodological assessment of transferability potential for each of the seven pilot solutions across candidate target nodes, including barriers, success factors, and preconditions.
- D.3.2.1 – CROSSFREIGHT Exploitation Potential and Policy Recommendations: Provides the market analysis for digitalized rail shunting operations, Business Model Canvas for each ICT solution tested in the pilot sites, intellectual property assessment, and PESTLE-based policy recommendations for better coordination between transport modes and logistics chain stakeholders for railway shunting management addressing EUSAIR territory and rail nodes.

Together, these three documents constitute the complete WP3 output and form the strategic basis for post-project continuation of the CROSSFREIGHT innovation ecosystem.

3. CROSSFREIGHT Project and Pilot Results Overview

3.1 Project Context

The CROSSFREIGHT project (Cross-border ICT Strategies for freight rail and port logistic integration) is co-financed by the Interreg VI-A Italy-Croatia Programme 2021–2027 under Priority 1 – A more competitive and smarter Europe. It brings together eight partners from Italy and Croatia with the common goal of improving the efficiency, sustainability, and interoperability of port-rail last-mile operations through digital innovation.

The project consortium comprises:

PP1 – ITL (Lead Partner)	Fondazione ITL – Port of Ravenna (Italy)
PP2 – Adriafer	Port of Trieste (Italy)
PP3 – AIN	Accident Investigation Body – Dry Port of Škrljevo (Croatia)
PP4 – ERF	Port of Marghera / Venice (Italy)
PP5 – Logoteam	Methodology and Harmonisation Support (Italy)
PP6 – Sangritana	Terminal Saletti / Abruzzo (Italy)
PP7 – LUŠ	Port of Šibenik Authority (Croatia) – WP3 Lead
PP8 – Transagent	Port of Rijeka – Brajdica Terminal (Croatia)

3.2 Summary of Pilot Solutions

The seven WP2 pilot actions tested a diverse portfolio of ICT solutions, ranging from advanced AI-driven optimisation to cost-effective soft-digital tools. The table below summarises the key characteristics of each solution:

Partner / Node	ICT Solution	Complexity Level	Key Benefits
ITL – Ravenna	Rail Shunting System (RSS) with AI optimisation, integrated with Rail Management Platform (RMP)	Advanced	Stable workload despite 10× volume increase; reduced dwell times; indirect CO_2 reduction
Adriafer – Trieste	Digital Decision Support System (DDS) integrating TrainShunt, PCS Sinfomar and RFI PIC	Advanced	Reduced idle times; improved reliability; environmental KPI dashboards
AIN – Škrljevo	Digital Case Management System for railway incident investigation	Medium	Improved transparency; consistent documentation; reduced case processing time
ERF – Marghera	MINOSSE infrastructure monitoring system with geolocation and digital mapping	Medium	Predictive maintenance foundation; reduced infrastructure downtime; enhanced safety
Sangritana – Abruzzo	Bluetooth gateway and magnetic sensor monitoring for locomotive/wagon localisation	Low–Medium	Faster path clearance; improved safety monitoring; better traffic planning
LUŠ – Šibenik	Excel-based planning and monitoring tool for station capacity and cargo operations	Low	Improved coordination; structured planning; major quality leap with minimal investment
Transagent – Rijeka	Freight Information System (FIS): web-based real-time monitoring and coordination platform	Medium–Advanced	Improved situational awareness; reduced communication delays; less manual intervention

3.3 Common Findings Across Pilots

Despite differences in technological complexity and operational context, all seven pilots converged on a consistent set of outcomes that validate the CROSSFREIGHT approach:

- Digital tools at all maturity levels generated measurable operational improvements.
- Improved operational visibility was the most universally reported benefit.
- Stakeholder coordination quality increased significantly once data became structured and shared.
- Even simple, low-cost digital tools (Šibenik, AIN) delivered substantial quality improvements.
- Training and change management proved as important as technical implementation.
- All pilot partners expressed willingness to support further knowledge transfer and peer-to-peer learning.

4. Transferability Assessment Summary

4.1 Methodology

The transferability assessment (D.3.1.1) was conducted by AIN (PP3) using a methodology adapted from the DocksTheFuture Transferability Framework, tailored to intermodal rail-port environments. The assessment was based on structured questionnaires submitted to all pilot partners, covering: contextual characteristics of each node, technical solution descriptions, implementation experience, KPIs, and transferability factors.

Each pilot solution was evaluated along five dimensions:

- Technical Fit – compatibility with common ICT infrastructure and systems at target nodes
- Operational Fit – alignment with typical operational workflows and complexity levels
- Organisational Fit – compatibility with governance structures and staff capacity
- Economic Feasibility – cost-benefit ratio relative to the target node's resources
- Scalability and Adaptability – potential for customisation and phased rollout

4.2 Transferability Ratings

The following table presents the transferability ratings and illustrative potential target nodes for each pilot solution. These are indicative candidates identified through the transferability assessment (D.3.1.1) — distinct from the pilot nodes where each solution was originally tested and validated — and do not represent confirmed commitments by the named nodes or partners:

Partner / Node	Solution	Transferability Rating	Illustrative Potential Target Nodes
ITL – Ravenna	RSS with AI	High (large TEN-T hubs)	Bologna Interporto (IT) – long-term, conditional
Adriafer – Trieste	Digital DDS	High (complex multimodal hubs)	Cervignano Freight Village (IT), Monfalcone (IT)
AIN – Škrljevo	Case Management System	Medium (institutional adaptation needed)	National safety bodies across EUSAIR area

Partner / Node	Solution	Transferability Rating	Illustrative Potential Target Nodes
ERF – Marghera	MINOSSE	High (any railway siding)	Terminal Tencara, Porto Marghera (IT)
Sangritana – Abruzzo	Bluetooth monitoring	High (small/medium industrial zones)	Abruzzo Freight Village (IT), regional lines
LUŠ – Šibenik	Excel planning tool	Very High (low-resource environments)	Port of Split (HR), Zadar (HR), Ploče (HR)
Transagent – Rijeka	FIS platform	High (mid-size terminals)	Rijeka Brajdica Station (HR)

4.3 Universal Preconditions for Transfer

The transferability analysis identified five preconditions that apply across all solution types:

1. Digital Infrastructure Readiness: At minimum, shared storage, stable connectivity, and basic IT literacy among operational staff.
2. Stakeholder Alignment and Governance: Clear definition of roles, responsibilities, and data-sharing agreements among all node stakeholders (port authority, railway undertaking, terminal operator).
3. Data Availability and Interoperability: Access to structured operational data including train movement records, wagon lists, slot availability, and infrastructure status.
4. Customisation to Local Operational Context: Adaptation of tools to local track layouts, workflow conventions, regulatory requirements, and stakeholder ecosystems.
5. Training and Change Management: Hands-on training, internal champions, and proactive management of resistance to new digital procedures.

5. Target Nodes for Transfer and Exploitation

Based on the transferability assessment (D.3.1.1) and a dedicated questionnaire completed by each partner in July 2026, this chapter sets out what each partner is actually doing and planning next — at its own pilot site first, and with respect to transfer opportunities second. Each profile clearly distinguishes confirmed actions, which partners have committed to carrying out, from exploratory opportunities, which are of interest in principle but not yet the subject of concrete plans, agreements, or funding. The reference to a node in this chapter should not be interpreted as a formal commitment by the node or its partner organisations to adopt any proposed solution. Any future involvement will be subject to further consultation and will depend on the node's expressed interest, priorities, and readiness to engage

5.1 ITL (PP1) – Ravenna Consolidation and Exploratory Engagement with Bologna Interporto / ER.I.C.

Solution to be transferred: Rail Shunting System (RSS) with AI Optimisation

ITL's confirmed priority is consolidating the Rail Shunting System (RSS) with AI optimisation at its own pilot site: the tool already acquires data from the Ravenna Rail Management Platform (RMP) and is ready for use by the port's shunting operators. Fully realising its potential to streamline shunting operations, however, requires integration with the operating system each shunting operator adopts, so that data can be exchanged automatically, manual entry avoided, and system responses made increasingly reliable; the timeline therefore depends on the shunting managers themselves adopting a compatible operating system, and on all operators involved progressively joining the RMP. ITL Foundation is in the process of signing an agreement granting the Port of Ravenna Authority free-of-charge use of the software module beyond the project's lifetime, and will provide the user manual to staff at both shunting operators, Mercitalia Shunting & Terminal and Dinazzano Po. Beyond Ravenna, ITL presented the tool to Bologna Interporto, which showed interest but does not currently operate a rail management software platform of its own and therefore lacks the technical maturity to adopt RSS, and to the members of the ER.I.C. (Emilia-Romagna Intermodal Cluster) at a local dissemination event on 16 June 2026. ITL's next confirmed step is to engage ER.I.C. members in bilateral discussions on potential application of the tool and to explore, provided the availability of financial means, ways of raising Bologna Interporto's technical maturity; adoption at Bologna Interporto or elsewhere in the cluster is not yet planned and depends on that maturity being reached and financing being secured.

- Lead responsible partner: ITL (PP1)
- Confirmed action: signature of the usage agreement with the Port of Ravenna Authority and hand-over of the user manual to Mercitalia Shunting & Terminal and Dinazzano Po staff;

adoption of a compatible operating system by the shunting operator; exploratory only: bilateral discussions with ER.I.C. and, provided financing is secured, work on raising Bologna Interporto's technical maturity

- Implementation timeline: Immediate (0–12 months) for the Port of Ravenna agreement, user-manual hand-over, and adoption of a compatible operating system by the shunting operator; Medium-term (12–24 months) for most terminal operators to join the Ravenna RMP and, provided the availability of financial means, for bilateral discussions with ER.I.C. and work on Bologna Interporto's technical maturity; Long-term (24–48 months and beyond) for all operators to join the RMP and, exploratory only, for any actual adoption at Bologna Interporto or elsewhere in the cluster
- Estimated impact: continuity of the 15–20% improvement in shunting planning efficiency and reduced train dwell times already achieved at Ravenna; any impact at Bologna Interporto or within the ER.I.C. cluster cannot be estimated until technical maturity and financing are actually confirmed
- Further development plans: improving system flexibility to handle unforeseen events such as mid-operation cancellations, based on user feedback from training sessions (0–12 months); investigating options for financing further development (12–24 months); and, in the long term, developing operational-simulation capabilities to test the port-rail system's capacity to absorb new services, reorganise existing ones, or activate a new rail connection from an already-connected terminal (24–48 months) — potentially drawing on CEF Transport or the next Interreg VI-A Italy-Croatia call (see Chapter 9)

5.2 Adriafer (PP2) – Trieste Consolidation; No Confirmed Transfer to Cervignano at This Stage

Solution to be transferred: Digital Decision Support System (DDS)

Adriafer's confirmed priority for the next period is consolidating the Digital Decision Support System (DDS) at its own pilot site in Trieste: extending the unified wagon master database to 100% of regular shunting lines so that it becomes the single source of truth across PCS Sinfomar and Trainshunt, rolling out internal training so that rail planners and ground crews are fully comfortable with the automated workflows, and formally updating internal operating procedures to replace legacy paper, phone, and email communication. Cervignano Freight Village was initially identified in the Transferability Analysis (D.3.1.1) as a possible candidate given its position as an inland rail hub connected to Trieste; however, Adriafer has confirmed that there are currently no concrete plans, active discussions, or set timelines for a transfer there. A possible future first step, not yet scheduled, would be a preliminary internal desk study on whether the Trainshunt software logic could fit a dry-port environment, potentially followed,

only after a positive assessment, by an early exploratory dialogue with Cervignano's terminal operators to gauge their baseline interest.

- Lead responsible partner: Adriafer (PP2)
- Confirmed action: system-wide extension of the unified wagon master database and internal training at Trieste; formal update of internal operating procedures
- Implementation timeline: Immediate (0–12 months) for consolidation at Trieste; no confirmed timeline for any transfer to Cervignano, which remains an exploratory, unscheduled possibility
- Estimated impact: full consolidation of automated, single-source-of-truth planning at Trieste; any impact at Cervignano cannot be estimated as no transfer is currently planned
- Further development plans: moving from data tracking toward predictive planning to forecast shunting times, and integrating wider logistics data such as vessel ETAs — both requiring complex algorithm training and, for the latter, ways of safely aggregating data across competing port actors (e.g. federated data spaces); relevant to Horizon Europe (Cluster 5) research funding (see Chapter 9)

5.3 LUŠ (PP7) – Šibenik Consolidation and Openness to Sharing Experience on Request

Solution to be transferred: Excel-based Planning and Monitoring Tool

LUŠ's confirmed priority is integrating the Excel-based planning tool into regular railway operations at the Port of Šibenik: adopting standardised digital planning procedures, extending use of the tool to all relevant stakeholders, continuously monitoring operational KPIs, and refining the tool based on user feedback. The Port of Split shares many characteristics with Šibenik — a relatively low-volume Adriatic port with ageing rail infrastructure and a similar stakeholder ecosystem including HŽ Cargo — and was identified in the Transferability Analysis (D.3.1.1) as a strong illustrative candidate for this low-cost tool. LUŠ has confirmed that, if other ports or intermodal rail nodes express interest, it is willing to share the experience gained during the pilot, present the methodology, and demonstrate the tool and the type of operational data and analyses it provides (train scheduling, track allocation, loading/unloading performance, railway capacity utilisation); no specific transfer to Split or any other node has been agreed, and no timeline is set until such interest is expressed.

- Lead responsible partner: LUŠ (PP7)
- Confirmed action: consolidation of the Excel-based tool into standard Šibenik operations, including stakeholder extension and staff training

- Implementation timeline: Immediate (0–12 months) for consolidation at Šibenik; no confirmed timeline for sharing the methodology with Split or any other node, pending expressed interest
- Estimated impact: improved coordination and planning transparency at Šibenik; impact of any future knowledge-sharing to be assessed once a node expresses interest
- Further development plans: if funding opportunities become available, developing beyond the current Excel-based pilot, including using it as a use case for deploying a 5G network within the port area to enable real-time data exchange and more advanced digital services — relevant to Cohesion Policy/ERDF regional programmes or Horizon Europe (see Chapter 9)

5.4 Sangritana (PP6) – Fossacesia Consolidation and Confirmed Extension to Interporto d'Abruzzo

Solution to be transferred: Bluetooth Gateway Monitoring System

Sangritana's confirmed next steps at its own pilot site, the Fossacesia–Atessa–Saletti industrial line, are installing fixed Bluetooth gateways in place of the portable units used during the pilot, establishing a procedure for rail staff to place sensors on wagons and locomotives, gradually migrating planning from the current Excel files onto the new software platform, and progressively integrating the hardware and software basis to reach a fully automated status-change process. Sangritana has confirmed a concrete plan to extend the same solution to Interporto d'Abruzzo, a second node under its own direct management with a similar need to automate and digitalise traffic: installing fixed gateways, integrating them with the software platform, and monitoring and managing traffic with the new system, following the same steps used at Fossacesia.

- Lead responsible partner: Sangritana (PP6)
- Confirmed action: installation of fixed gateways, sensor-placement procedures for rail staff, and full software migration, applied first at Fossacesia and then at Interporto d'Abruzzo
- Implementation timeline: Immediate (0–12 months) for consolidation at Fossacesia; for Interporto d'Abruzzo, first trials at 6 months and full operational implementation at 12 months
- Estimated impact: improved traffic planning and safety monitoring at Fossacesia, extended to Interporto d'Abruzzo as implementation proceeds on the confirmed timeline
- Further development plans: extending the solution to manage ITUs on trains and the wagon-maintenance/workshop-repair flow, and connecting it to RFI's (the Italian rail infrastructure manager) PIC system — potentially supported by national transport investment programmes (PNRR) or CEF Transport (see Chapter 9)

5.5 Transagent (PP8) – FIS Consolidation at Rijeka Brajdica; Generic Transferability across Croatian Nodes

Solution to be transferred: FIS Platform (Freight Information System)

Transagent's confirmed priority is continuing to consolidate the Freight Information System (FIS) in daily operations at Rijeka Brajdica: entering operational data (train data, documentation, work orders, safety documentation), carrying out application maintenance, and using the system to generate reports and analysis. Transagent has confirmed that the FIS platform was designed to be transferable to any railway node in Croatia given the nature of its operations, and that no significant modifications would be required for implementation elsewhere. No specific target node has yet been identified or approached; the actual timeline for any such transfer depends entirely on the operational needs and readiness of the receiving node.

- Lead responsible partner: Transagent (PP8)
- Confirmed action: continued data entry, application maintenance, and reporting on the FIS platform at Rijeka Brajdica
- Implementation timeline: Ongoing for consolidation at Rijeka Brajdica; no confirmed timeline for transfer elsewhere, as this depends on a receiving node's own operational needs and readiness
- Estimated impact: sustained improvement in operational visibility and reduced manual intervention at Rijeka Brajdica; impact of any future transfer to be assessed once a receiving node is identified
- Further development plans: Transagent has confirmed that no further development of the solution is currently planned; the focus remains on full implementation, maintenance, and effective daily use, with any future development to be considered based on operational experience and identified user requirements

5.6 ERF (PP4) – MINOSSE Consolidation at Marghera and Continued Engagement with Terminal Tencara

Solution to be transferred: MINOSSE Infrastructure Monitoring System

ERF's confirmed next steps are to fully populate the MINOSSE database with data on all railway switches under its responsibility in the Venezia Marghera Scalo Railway District, then train both the personnel responsible for on-site infrastructure monitoring and the operators at the system's central station; after three years of operation, ERF will assess whether the data collected support changes to its maintenance policy and infrastructure intervention plans. Terminal Tencara, a stakeholder already involved in the MINOSSE pilot, remains ERF's primary partner for extending monitoring into full operational use. ERF

has noted that its national infrastructure manager (RFI) inspects terminal infrastructure only twice a year, and that private terminal operators generally lack in-house railway expertise or a monitoring and maintenance plan of their own; ERF's confirmed action is therefore to keep involving Terminal Tencara while raising awareness among terminal operators more broadly about the safety of their facilities, applying the MINOSSE approach to their operations.

- Lead responsible partner: ERF (PP4)
- Confirmed action: full database population for all switches at Venezia Marghera Scalo, two-phase staff training (on-site monitoring personnel and central station operators), and continued engagement with Terminal Tencara and other terminal operators on infrastructure safety
- Implementation timeline: Immediate (0–12 months) for database population and staff training; review of maintenance policy after 3 years of operation; engagement with Terminal Tencara and other terminal operators ongoing throughout
- Estimated impact: Up to 48% improvement in infrastructure data management efficiency; transition from reactive to preventive maintenance; reduced infrastructure downtime; enhanced safety monitoring at the terminal

- Further development plans: extending monitoring from switches to track sections and correlating operational data with infrastructure degradation rates, and developing Business Intelligence and predictive-maintenance algorithms to move from condition-based to predictive maintenance — relevant to Horizon Europe (Cluster 5) (see Chapter 9)

5.7 AIN (PP3) – Institutional Application, Not a Physical Node Transfer

AIN's pilot differs from the other six in that it operates within the national institutional environment of the Accident Investigation Body rather than at a physical intermodal node. AIN's confirmed next steps are to continue entering data and documents on new safety events — notifications, serious accidents, accidents, incidents, on-site investigations, and safety recommendations — into the digital case management application, to keep the centralised database comprehensive, and to carry out the necessary application maintenance and use the system to generate reports and analytics. Because external actors do not directly access the tool and its data is kept internal to protect the information it contains, AIN is not pursuing a transfer to a specific node; it notes that the underlying logic — structured digital workflows, secure document management, audit trails — is applicable wherever safety-critical documentation must be managed, potentially including other national safety bodies across the EUSAIR area, though no specific engagement of this kind is currently planned.

- Lead responsible partner: AIN (PP3)
- Confirmed action: continued data entry, application maintenance, and reporting on the case management system — ongoing
- Further development plans: ensuring the long-term sustainability of the system, security improvements, and continuous evolutionary maintenance; the application remains managed internally without automatic external data exchange, for data-protection reasons, and no external transfer is currently planned

6. Action Plan: Implementation Roadmap

The CROSSFREIGHT Action Plan is organised into three implementation horizons. In line with the project's Application Form, its core purpose is to define the exploitation of the solutions piloted within CROSSFREIGHT and to provide guidelines for scaling these solutions to other intermodal node contexts in general. Some actions are illustrated below with reference to specific nodes or partners for concreteness; these references reflect potential identified through the transferability assessment (D.3.1.1) and are not confirmed commitments by those nodes or partners. The roadmap is designed to be flexible — some actions may be initiated concurrently, while others are sequentially dependent — and will be adapted as actual partner and node engagement is confirmed.

6.1 Horizon 1: Immediate Actions (0–12 Months Post-Project)

Goal: Ensure continuity of project results, initiate the simplest and most ready transfers, and establish the governance framework for longer-term exploitation. Actions marked with an asterisk (*) reflect best-effort initiatives or exploratory possibilities identified through partner input gathered in July 2026; they are not guaranteed deliverables and depend on partner capacity, expressed interest from receiving nodes, or securing additional funding.

Action ID	Action Description	Responsible Partner(s)	Timeline	Target / Output
A1.1	Consolidate Excel planning tool into standard operations at Šibenik: adopt standardised digital planning procedures, extend use to all relevant stakeholders, and monitor operational KPIs	LUŠ (PP7)	0–12 months	Excel tool fully embedded in Šibenik operations
A1.2	Begin confirmed transfer to Interporto d'Abruzzo (second node under Sangritana's own direct management): install fixed Bluetooth gateways and begin software-platform integration	Sangritana (PP6)	0–6 months (first trials)	First trials operational at Interporto d'Abruzzo
A1.3	Populate MINOSSE database with all switches at Venezia Marghera Scalo and deliver two-phase staff training (on-site monitoring personnel and central station operators); in parallel, continue FIS data entry, maintenance, and reporting at Rijeka Brajdica	ERF (PP4) + Transagent (PP8)	0–12 months (ERF); ongoing (Transagent)	MINOSSE database complete and staff trained; FIS in continuous operational use
A1.4	Sign usage agreement between ITL Foundation and the Port of Ravenna	ITL (PP1)	0–12 months	Signed usage agreement; RSS

Action ID	Action Description	Responsible Partner(s)	Timeline	Target / Output
	Authority for the RSS software module (provided free of charge), fully integrated with the Ravenna Rail Management Platform; deliver training and hand over the user manual to Mercitalia Shunting & Terminal and Dinazzano Po			integrated with Ravenna RMP; operators trained

6.2 Horizon 2: Medium-Term Actions (12–24 Months)

Goal: Execute the main technology transfers to identified target nodes, engage institutional and funding stakeholders, and consolidate commercial exploitation pathways. As in Horizon 1, actions marked with an asterisk (*) are best-effort or exploratory only and are not guaranteed deliverables.

Action ID	Action Description	Responsible Partner(s)	Timeline	Target / Output
A2.1	Exploratory: engage ER.I.C. (Emilia-Romagna Intermodal Cluster) members in bilateral discussions on RSS adoption; explore, provided the availability of financial means, options for raising Bologna Interporto's technical maturity so that RSS could eventually be adopted there	ITL (PP1)	12–24 months, contingent on financing	Bilateral discussions held; technical-maturity roadmap for Bologna Interporto, if financing is secured
A2.2	Exploratory only, not yet scheduled: preliminary internal desk study on whether the Trainshunt	Adriafer (PP2)	Not yet scheduled	Internal feasibility

Action ID	Action Description	Responsible Partner(s)	Timeline	Target / Output
	software logic could fit a dry-port environment such as Cervignano Freight Village; no concrete transfer plan or timeline currently exists			desk study, if undertaken
A2.3	Extend MINOSSE monitoring toward full operational use at Terminal Tencara and continue raising awareness among other Marghera-area terminal operators on infrastructure safety monitoring	ERF (PP4)	12–24 months	Extended MINOSSE monitoring in operational use at Terminal Tencara and, where interest is confirmed, additional terminals
A2.4	Reach full operational implementation of the Bluetooth gateway and software integration at Interporto d'Abruzzo	Sangritana (PP6)	6–12 months	Interporto d'Abruzzo fully operational with the new system
A2.5	Develop CEF Transport or Interreg funding application: prepare a joint proposal for scaling CROSSFREIGHT solutions to additional TEN-T nodes, leveraging project evidence	ITL (PP1) + LUŠ (PP7) + partners	12–20 months	CEF application submitted
A2.6	Organise CROSSFREIGHT Learning Exchange Event: two-day knowledge transfer event for pilot partners and target-node representatives, including site visits and technical	LUŠ (PP7) + all partners	14–16 months	Learning event held

Action ID	Action Description	Responsible Partner(s)	Timeline	Target / Output
	workshops (best-effort initiative, tentatively targeted for Month 14–16, subject to securing the necessary funding and partner availability)			
A2.7	Review KPI data after 12 months of consolidated use of the Excel tool at Šibenik and assess whether to pursue a next-generation solution; respond to any expressions of interest received from other ports in the meantime	LUŠ (PP7)	12–15 months	Evaluation report and next-step plan

6.3 Horizon 3: Long-Term Actions (24–48 Months)

Goal: Institutionalise the CROSSFREIGHT approach, secure sustainable funding, and embed the project's innovations within EU-level policy frameworks and funding programmes. Actions marked with an asterisk (*) remain contingent on expressed interest, available resources, or host-organisation engagement, and are not guaranteed deliverables.

Action ID	Action Description	Responsible Partner(s)	Timeline	Target / Output
A3.1	Capitalise CROSSFREIGHT within a successor Interreg or Horizon Europe project: use validated results and cross-border partnerships as foundation for a new cooperative project proposal	All partners	24–40 months	New project application

Action ID	Action Description	Responsible Partner(s)	Timeline	Target / Output
A3.2	Respond to expressions of interest from additional Croatian and Italian ports (e.g. Zadar, Ploče) in adopting the Excel planning tool, building on experience at Šibenik; pursued only if and when such interest is confirmed by the receiving port	LUŠ (PP7) + Logoteam (PP5)	24–36 months, contingent on expressed interest	Tool deployed at additional ports where interest is confirmed
A3.3	Contribute to ERA and EU policy processes: submit written position papers and contribute to public consultations, and present CROSSFREIGHT evidence (transferability results, KPI data, BMC/IPR findings) at relevant thematic meetings, to inform EU interoperability standards (ERA technical specifications), TEN-T corridor digitalisation guidelines, and EUSAIR Action Plan / Pillar 2 updates.	ITL (PP1) + AIN (PP3) + LUŠ (PP7)	24–48 months	Policy contributions

7. Stakeholder Engagement Strategy

7.1 Stakeholder Categories

The CROSSFREIGHT Action Plan identifies four primary categories of stakeholders to be engaged throughout the implementation of the roadmap:

Category	Examples	Engagement Mode	Priority
Target node operators	Port of Split Authority, Bologna Interporto, Cervignano operators	Direct transfer, training, site visits	High
Institutional stakeholders	ERA, RailNetEurope, EUSAIR TSG, national transport ministries	Reports, presentations, policy consultations	High
Funding bodies	CEF Managing Authority, Interreg programme JS, Horizon Europe NCPs	Project applications, briefings, letters of support	High
Industry and market actors	ICT providers, rail undertakings, terminal operators, logistics companies	Exploitation events, licensing negotiations, factsheets	Medium
Academic and research community	Universities, research institutes working on rail digitalisation	Publications, conference presentations, open data	Medium
Civil society and policy makers	Regional authorities, transport planning agencies	Policy recommendations, PESTLE evidence sharing	Low–Medium

7.2 Engagement Mechanisms

- Peer-to-Peer Learning: Direct partner-to-partner knowledge transfer through site visits, remote technical support, and shared documentation, leveraging the strong relationships established during WP2 pilots.
- Knowledge Repository: An openly accessible, indexed repository of project documentation including ICT tool guides, methodology handbooks, KPI frameworks, and policy recommendations.

8. Governance and Coordination Framework

8.1 Action Plan Coordination

The CROSSFREIGHT Action Plan will be coordinated by the Port of Šibenik Authority (LUŠ, PP7) as the WP3 Lead and deliverable leader. A lightweight post-project coordination structure is proposed, consisting of:

- Action Plan Coordinator: LUŠ (PP7) — overall responsibility for monitoring progress, facilitating partner communication, and reporting to stakeholders
- Technical Transfer Leads: Each pilot partner retains responsibility for implementing and monitoring transfers related to their specific ICT solution

8.2 Decision-Making Principles

The governance of the Action Plan is guided by the following principles:

- Consensus-based decision-making for all significant roadmap adjustments
- Flexibility to adapt timelines and target nodes in response to emerging opportunities or constraints
- Transparency in sharing progress, challenges, and lessons learned across the alumni network
- Inclusiveness, ensuring that smaller partners and less-resourced nodes are not excluded from transfer activities

8.3 Legal and IPR Framework

The intellectual property (IP) landscape across CROSSFREIGHT solutions is varied: most tools were developed for operational use rather than commercial exploitation, and IP ownership resides with the respective developing partners. The Action Plan proposes the following approach:

- Open/free tools (Šibenik Excel tool, AIN case management modules): to be shared freely with target nodes under a Creative Commons Attribution licence
- Commercially viable tools (FIS, RSS, DDS): IP agreements to be negotiated between technology providers and target-node operators on a case-by-case basis, with project partners facilitating introductions
- Infrastructure monitoring tools (MINOSSE): implementation to be supported by ERF on a non-commercial knowledge-transfer basis in the first instance

9. Funding and Resource Strategy

9.1 Post-Project Funding Landscape

Since EUSAIR does not have its own financial instruments, the scaling and continuation of CROSSFREIGHT solutions must be funded through coordinated use of EU, national, and regional funding streams. The following mechanisms are identified as most relevant:

Funding Instrument	Relevance to CROSSFREIGHT	Key Actions
Connecting Europe Facility (CEF) Transport	Directly supports TEN-T digital infrastructure and multimodal node development; covers both hardware and software investments	Joint application by ITL, Adriafer, and selected target-node authorities for further development of the solutions created in CROSSFREIGHT project
Interreg Central Europe	Most natural successor funding vehicle; existing partnerships and results provide a strong basis for follow-up project	Develop concept note for a capitalisation or scale-up project; engage JS and Managing Authority early
Cohesion Policy / ERDF regional programmes	Relevant for nodes in less-developed regions; Croatia and Abruzzo both benefit from Cohesion Policy funding	Engage regional managing authorities in Croatia and Abruzzo to co-finance local deployment at target nodes
Horizon Europe (Cluster 5)	Relevant for R&D components, particularly AI-based optimisation, predictive maintenance, and cross-modal data interoperability	Explore participation in relevant calls with academic/research partners
National transport investment programmes	National Recovery Plans (Croatia) include digital infrastructure for transport	Map specific calls and engage national focal points in both countries

9.2 Resource Contributions

In addition to external funding, the implementation of the Action Plan will draw on the following in-kind and institutional resources:

- Partner expertise and staff time: All eight project partners intend to contribute specialist knowledge and personnel time to support transfer and exploitation activities within their

areas of competence, subject to their internal resource availability following project closure; this cannot be guaranteed in advance.

- Existing operational infrastructure: Target nodes will contribute their operational environments, staff, and connectivity to facilitate pilot transfers.
- Project knowledge assets: All documentation, tool guides, and datasets produced during CROSSFREIGHT remain available as a non-financial resource base for all future activities.

10. Monitoring, Evaluation, and Reporting

10.1 Monitoring Framework

The implementation of the Action Plan will be monitored through a lightweight framework that tracks progress against defined milestones and outputs without imposing excessive administrative burden on partners.

Monitoring Dimension	Indicator	Measurement Method	Frequency
Transfer progress	Number of target nodes where transfer is initiated / completed	Partner self-reporting via CROSSFREIGHT Alumni Network	Quarterly
Stakeholder engagement	Number of engagement events held; number of institutional stakeholders reached	Event reports; attendance lists	Semi-annual
Knowledge dissemination	Number of downloads/accesses to knowledge repository; number of factsheet distributions	Repository analytics; partner reporting	Semi-annual
Funding leverage	Number of applications submitted; volume of funding sought / awarded	Application tracking log	Annual
Policy impact	Number of submissions to ERA/EUSAIR; references to CROSSFREIGHT in policy documents	Media/policy monitoring; partner reporting	Annual

10.2 Review and Adaptation

The Action Plan Steering Group will conduct an annual review of implementation progress, assessing whether milestones have been achieved, whether timelines require adjustment, and whether new opportunities or constraints have emerged that necessitate changes to the roadmap. The annual review will be shared with all partners and, where relevant, with the Interreg programme's Joint Secretariat.

10.3 Success Criteria

The CROSSFREIGHT Action Plan will be considered successfully implemented if, by the end of Horizon 3 (48 months post-project):

1. Concrete progress has been made on the transfer or scale-up of CROSSFREIGHT ICT solutions — at Interporto d'Abruzzo (Sangritana) at a minimum — with further transfers pursued wherever partner capacity, receiving-node interest, and funding actually allow.
2. At least one follow-up funding application (CEF, Interreg, or Horizon Europe) has been submitted, building on CROSSFREIGHT results.
3. Some form of best-effort post-project coordination among partners — whether a CROSSFREIGHT Knowledge Hub, the Alumni Network, or another lightweight mechanism — is maintained, meeting at least twice per year where partner resources allow.
4. CROSSFREIGHT results have been presented to at least two EU-level institutional stakeholders (ERA, RailNetEurope, EUSAIR TSG, or equivalent).
5. All pilot ICT solutions are documented and accessible in the open knowledge repository.

11. Conclusions

The CROSSFREIGHT project has demonstrated, through rigorous real-world testing across seven intermodal nodes in Italy and Croatia, that the digital transformation of port-rail logistics is not only technically feasible but operationally impactful at all levels of node complexity and digital maturity. Whether through advanced AI-driven shunting optimisation in Europe's major TEN-T ports or through a cost-effective Excel-based planning tool in a small Adriatic port, the project's pilot solutions consistently delivered improved coordination, reduced errors, enhanced visibility, and greater operational efficiency.

The CROSSFREIGHT Action Plan translates this validated innovation portfolio into a concrete, implementable roadmap. By defining clear actions across three time horizons, assigning responsibilities to specific partners, identifying target nodes with strong replication potential, and proposing a lightweight governance and monitoring structure, this document provides the strategic foundation for ensuring that the project's outcomes outlast its formal lifecycle.

The following key take-aways are essential for the successful implementation of this Action Plan:

- Digital solutions must be matched to operational context: not every node needs the same level of sophistication. The CROSSFREIGHT portfolio offers options for nodes at every stage of digital readiness.
- Transfer and exploitation require sustained partnership: the relationships, trust, and shared understanding built among CROSSFREIGHT partners during the project are the most valuable asset for post-project continuation.
- Systemic change requires policy engagement: individual node transfers, however successful, will not achieve macro-regional impact without alignment with EU transport policy, TEN-T investment priorities, and EUSAIR strategic frameworks.

The Port of Šibenik Authority, as WP3 Lead and Action Plan coordinator, is committed to facilitating the continued collaboration of all CROSSFREIGHT partners in implementing this roadmap. The project has built a strong foundation — the task now is to build upon it.

CROSSFREIGHT positions itself as a strategic reference point for future investments and collaborative initiatives, supporting long-term harmonisation, improved logistics performance,

and sustainable growth in the Italy-Croatia Programme area and the broader Adriatic-Ionian region.