09 April 2026

ZHENIT – E-learning Programme #6: Exploitation Strategies and Replication Pathways

ZHENIT – E-learning program

Funded by the European Union

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Agenda

- Scale-up and Replication Feasibility Study
- Reference Vessels and Technology Configurations
- Replication Potential Evaluation
- Final Recommendations

- Exploitation Methodology
- Characterization table tool
- Exploitation roadmap tool
- Final consideration

- Q&A and Closing

SCALE-UP AND REPLICATION FEASIBILITY STUDY

- Task objective
- Scale-up and replication feasibility study presentation
- Reference vessels and technology configurations
- Replication potential evaluation
- Final recommendations

SCALE-UP AND REPLICATION FEASIBILITY STUDY

WP5 - Technologies evaluation and impact assessment towards replication

Work Package Leader: RINA-C
Partners Involved: RINA-C, TECNALIA, CNR, NAVTEC, ANEK, NTUA, UOB, SORTECH, ECT, KYMA, SIGLA, B4B, RINA-S
Duration: M06 – M47

T5.1 - How to Replicate ZHENIT Solutions in different vessels (size, purpose etc) towards at least 20% savings

Partners Involved: RINA-C, TECNALIA, CNR, NAVTEC, ANEK, NTUA, UOB
Deliverables: [D5.2 M21, D5.3 M47]
Objectives: Evaluate the replication of ZHENIT solutions on board of different vessels through:

1. SWOT analysis of ZHENIT “WH-2-X” solutions compared with different vessels;
2. Scale-up and replication feasibility studies in identified vessels.

SCALE-UP AND REPLICATION FEASIBILITY STUDY

WH-to-Cooling and Desalination

Sorption Refrigeration and Desalination

Innovative concept of combined desalination and cooling system for medium temperature (70°C - 100°C) waste heat recovery and conversion

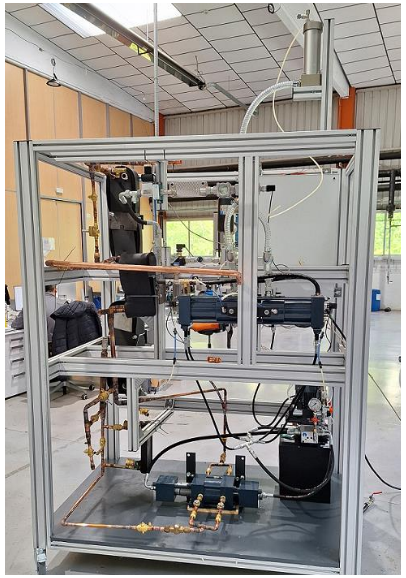
WH-to-Trigeneration (cooling, heating, power)

Organic Rankine Cycle

Marine-ready WH trigeneration system incorporating an ORC with a recuperator and a hybrid HP for producing electricity and H&C from high temperature waste Heat (> 100°C)

WH-to-Mechanical Work

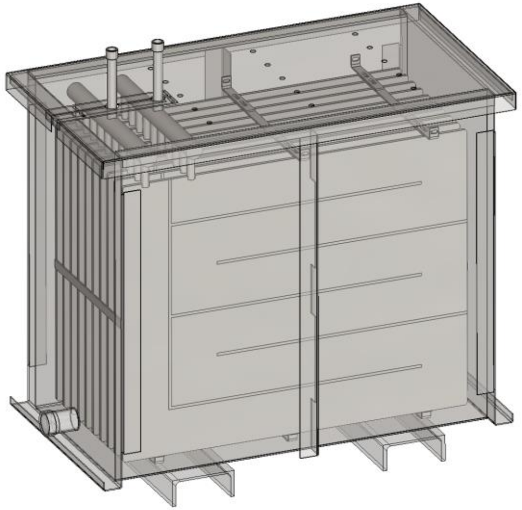
Isobaric Expansion Engine



Waste-Heat to-mechanical-work system for the compression of diesel fuel via an Isobaric Expansion Engine powered by low-grade heat (<100°C)

Thermal Energy Storage

Thermal energy storage system (TES) for optimal controllability of the integrated ZHENIT technologies



SCALE-UP AND REPLICATION FEASIBILITY STUDY

Scale-up

A **Scale-Up Feasibility Study** assesses the transition from **lab/pilot system** to **full-scale prototype implementation in real operating conditions**.
Objective: verify whether a technology can operate reliably when **integrated into a real system**
Focus on:

- System integration (interfaces, layout, constraints)
- Operational performance under real load profiles
- Techno-economic compatibility across configurations
- Pre-commercial validation

Replication

A **Replication Feasibility Study** evaluates the potential to apply a validated solution to other similar systems or contexts.
Objective: assess scalability across applications
Focus on:

- Boundary conditions (assumptions and limitations, energy demand, operating profile)
- Target performance check
- Techno-economic viability and barriers

SCALE-UP AND REPLICATION FEASIBILITY STUDY

Methodology

Energy saving is selected as the key comparative metric to quantify effectiveness
Target: ≥ 20% energy savings compared to Business-As-Usual (BAU) scenario

Key Parameters Under Evaluation:

- Saving assessment
  - Annual energy savings
  - Fuel consumption reduction
  - Avoided GHG emissions
- Architecture constraints
  - Space availability onboard
  - Integration with existing systems
  - Layout and infrastructural limitations
- Economic assessment
  - Preliminary evaluation of financial feasibility
  - Use of simplified economic indicators

- Scenario Definition:
  - Scenario 1 — Prototype Integration
  - Scenario 2 — Optimized Configuration

SCALE-UP AND REPLICATION FEASIBILITY STUDY

Replicability potential evaluation

The replicability potential has been assessed using a combination of technical and economic criteria:

Technical Feasibility	Description
Very Low (VL)	Integration faces critical constraints (space, interfaces, power demand, safety) that require highly customized solutions.
Low (L)	Some non-negligible constraints exist, requiring tailored adjustments to ensure operability.
Medium (M)	The technology is compatible with standard ship environments, with constraints that can be managed through routine engineering solutions.
High (H)	Constraints (space, power, interfaces, operational profiles) are minimal or negligible, enabling straightforward integration.

Economic Feasibility	Description
Very Low (VL)	The payback time is too long compared to typical ship lifecycles or operational budgets.
Low (L)	The payback time is relatively long and acceptable only in specific operational conditions.
Medium (M)	The payback time is reasonable and meets standard ship investment expectations.
High (H)	The payback time is short and highly attractive for shipowners.

Technical and economic feasibility are combined using a **replicability potential matrix:**

Replicability potential		Technical Feasibility			
		Very Low (VL)	Low (L)	Medium (M)	High (H)
Economic Feasibility	Very Low (VL)	Very Low (VL)	Very Low (VL)	Low (L)	Low (L)
	Low (L)	Very Low (VL)	Low (L)	Low (L)	Medium (M)
	Medium (M)	Low (L)	Low (L)	Medium (M)	Medium (M)
	High (H)	Low (L)	Medium (M)	Medium (M)	High (H)

SCALE-UP AND REPLICATION FEASIBILITY STUDY

Fishery

Vessel Overview

- Reference vessel: TESEO, trawling fishery operating in Sicilian waters (Mazara del Vallo)
- Representative of local fleet (80 vessels currently operating)

Key characteristics:

- Length: 30 m | Gross tonnage: 100 t
- Propulsion power: 367 kW (main engine)
- Auxiliary power: 2 × 168 kW gensets
- Average age: 40 years (refit 10 years)
- Mission profile: 30-day continuous operations, 10 journeys/year

SCALE-UP AND REPLICATION FEASIBILITY STUDY

Cargo

Vessel Overview

- Reference vessel: MV ANKIE, General Cargo Ship built in 2007 (19 years old) and currently sailing under the flag of Netherlands

Key characteristics:

- Main engine: Wärtsilä 9L20 (1,800 kW), 4-stroke, 9-cylinder, turbocharged diesel
- Fuel flexibility: MDO ↔ HFO without power interruption
- Specific Fuel Consumption (average): 195 g/kWh
- Brake thermal efficiency: 40–42%
- Auxiliary engines: 400–600 kW each
- Supply onboard electrical loads (HVAC, lighting, refrigeration, pumps, cargo handling)

SCALE-UP AND REPLICATION FEASIBILITY STUDY

Cruise

Vessel Overview

- Reference vessel: ELYROS, Ro-Ro Pax vessel operated by the Greek company ANEK Lines

Key characteristics:

- Route: Piraeus (Athens) ↔ Chania (Crete)
- Length: 192 m | Single steel hull
- Service speed: 24 knots
- Capacity: 1,874 passengers
- Main engines: 2 × Pielstick 12PC4-213,092 kW each @ 400 rpm
- Auxiliary engines: 4 × Daihatsu 6DK-26 gensets 1,324 kW each @ 720 rpm

SCALE-UP AND REPLICATION FEASIBILITY STUDY

Fishery configurations and replicability

<table>
<tr><th>Vessel</th><th>WHR Technology</th><th>WH Source</th><th>Output</th><th>Replicability</th><th>Benefits</th><th>General Comment</th></tr>
<tr><td rowspan="4">Fishing Vessel</td><td>Organic Rankine Cycle (ORC)</td><td>• Main Engines exhaust gases</td><td>Electrical Energy</td><td>Confidential results</td><td rowspan="3">Reduction of fuel (MGO) consumption by auxiliary engines used for onboard auxiliary power generation.</td><td rowspan="3">• Limited amount of waste heat available, while large amount of electricity demand onboard:
• Downscale as safer solution, but low energy saving achieved;
• The limited space and complex layout of engine rooms may complicate the installation of the technologies;
• High capital costs (except for IEE) for small-scale vessel may be less attractive.</td></tr>
<tr><td>Sorption Refrigeration and Desalination (AM)</td><td>• Main engine jacket cooling circuit</td><td>Cooling Energy</td><td>Confidential results</td></tr>
<tr><td>Isobaric Expansion Engine (IEE)</td><td>• Main engine jacket cooling circuit</td><td>Electrical Energy</td><td>Confidential results</td></tr>
<tr><td>Thermal energy storage system (TES)</td><td>• Main Engines exhaust gases
• Main engine jacket cooling circuit</td><td>Thermal Energy</td><td>Confidential results</td><td>Provide thermal energy to the WHR technology when waste heat is not available or is available only in small quantities, acting as a thermal storage system.</td><td>• Highly discontinuous operation profile may represent an opportunity for TES integration; however, charge/discharge cycles need to ensure quick energy access;
• Scaling through multiple modules significantly increases costs, limiting economic feasibility.</td></tr>
</table>

SCALE-UP AND REPLICATION FEASIBILITY STUDY

Cargo configurations and replicability

Vessel	WHR Technology	WH Source	Output	Replicability	Benefits	General Comment
Cargo Vessel	Organic Rankine Cycle (ORC)	• Main Engines exhaust gases	Electrical Energy	Confidential results	Reduction of fuel (MGO) consumption by auxiliary engines used for onboard auxiliary power generation.	• Good amount of waste heat available, while medium electricity demand onboard; • The prototype units are too small to deliver a tangible benefit; therefore, they need to be scaled up to generate a meaningful impact; • The limited space and complex layout of engine rooms may complicate the installation of the technologies; • Installing a scaled-up unit requires structural and stability verification; • Scaling through multiple modules significantly increases costs, limiting economic feasibility.
	Sorption Refrigeration and Desalination (AM)	• Main engine jacket cooling circuit	Cooling Energy	Confidential results		
	Isobaric Expansion Engine (IEE)	• Main engine jacket cooling circuit	Electrical Energy	Confidential results		
	Thermal energy storage system (TES)	• Main Engines exhaust gases • Main engine jacket cooling circuit	Thermal Energy	Confidential results	Provide thermal energy to the WHR technology when waste heat is not available or is available only in small quantities, acting as a thermal storage system.	• Cargo vessels have medium and more stable energy demand with respect to fishery; • Poor synchronisation risk between heat availability and WHR thermal needs; • Small-scale TES systems are ineffective and do not provide tangible benefits; • Meaningful TES integration requires medium/large-scale systems (hundreds of kWh to MWh); • Scaling through multiple modules significantly increases costs, limiting economic feasibility.

SCALE-UP AND REPLICATION FEASIBILITY STUDY

Cruise configurations and replicability

Vessel	WHR Technology	WH Source	Output	Replicability	Benefits	General Comment
Cruise Vessel	Organic Rankine Cycle (ORC)	• Main Engines exhaust gases	Electrical Energy	**Confidential results**	Reduction of fuel (MGO) consumption by auxiliary engines used for onboard auxiliary power generation.	• Large amount of waste heat available; • The prototype units are too small to deliver a tangible benefit; therefore, they need to be scaled up to generate a meaningful impact; • The limited space and complex layout of engine rooms may complicate the installation of the technologies; • Installing a scaled-up unit requires structural and stability verification; • Scaling through multiple modules significantly increases costs, limiting economic feasibility.
	Sorption Refrigeration and Desalination (AM)	• Main engine jacket cooling circuit	Cooling Energy	**Confidential results**		
	Isobaric Expansion Engine (IEE)	• Main engine jacket cooling circuit	Electrical Energy	**Confidential results**		
	Thermal energy storage system (TES)	• Main Engines exhaust gases • Main engine jacket cooling circuit	Thermal Energy	**Confidential results**	Provide thermal energy to the WHR technology when waste heat is not available or is available only in small quantities, acting as a thermal storage system.	• Cruise vessels have very high and continuous energy demand and waste heat availability is relatively predictable due to defined routes and operating profiles; • Small-scale TES systems are ineffective and do not provide tangible benefits; • Meaningful TES integration requires large-scale systems (hundreds of kWh to MWh); • Scaling through multiple modules significantly increases costs, limiting economic feasibility.

SCALE-UP AND REPLICATION FEASIBILITY STUDY

Final recommendations

- **Base the analysis on high-quality input data**
  Ensure that technical, operational, and cost data are as complete and reliable as possible. The use of assumptions should be minimized and clearly justified, as data gaps directly increase uncertainty in results.

- **Limit reliance on purely theoretical scale-up approaches**
  Where pilot- or demonstration-scale data are unavailable, theoretical modelling may be used as a first-order approximation. Results should be treated as indicative and supported by validation activities whenever feasible.

- **Avoid linear scaling unless supported by evidence**
  Linear scaling of technical performance and cost parameters should only be applied when justified by empirical data or literature. Where scale-dependent behaviour is uncertain, non-linear effects and potential deviations should be explicitly acknowledged and, where possible, explored through sensitivity analyses.

- **Define vessel characterization and operational profiles with precision**
  Engine performance, energy demand, and system behaviour are highly sensitive to assumptions on routes, mission profiles, and task durations. These parameters should be carefully defined and validated using real operational data whenever available.

- **Explicitly assess the impact of assumptions on final outcomes**
  Key assumptions should be systematically reviewed and their influence on results quantified, to support transparent interpretation and informed decision-making.

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Exploitation Agenda

- **Exploitation methodology**
  - *What is exploitation and why it matters in EU projects*
  - *Key questions guiding the methodology: What? Who? How? When?*
- **Characterization table tool**
  - *Purpose and role of the Characterisation Table within the exploitation strategy*
  - *Structure of the tool and overview of its main sections*
  - *Detailed explanation of how to complete each section*
  - *Overview of generic results collected through the Characterisation Table*
- **Exploitation roadmap tool**
  - *Objective of the Exploitation Roadmap and its link to project results*
  - *Structure of the roadmap and key components*
  - *Step-by-step guidance on how to fill in the different sections*
  - *Overview of generic results collected through the Exploitation Roadmap*
- **Exploitation Final considerations**
  - *Key takeaways from the methodology and tools*
  - *Critical success factors for effective exploitation planning*
  - *Recommendations for improving exploitation readiness at partner level*
- **Q&A**

Exploitation methodology

What is exploitation?

- Exploitation refers to the use of project results beyond the project lifetime.
- It includes commercial, industrial, societal, policy, and scientific use of results.
- It transforms research outputs into real-world impact.

Why does exploitation matter in EU projects?

- It is a core requirement of EU-funded programs (e.g. Horizon Europe).
- It ensures that public funding leads to tangible economic and societal benefits.
- It increases the long-term sustainability of project results.
- It demonstrates the value and credibility of the project towards the European Commission.

From results to impact:

- Without exploitation, results risk remaining academic or unused.
- A structured exploitation strategy:
  - Clarifies who will use what, and how.
  - Identifies market and non-market opportunities.
  - Aligns project outcomes with real needs and stakeholders.

Exploitation methodology

WHAT?

- Ensure project results are properly exploited.
- Assess innovation level, market potential, competitiveness and readiness.
- Protect intellectual property.
- Plan the pathway to market.

WHO?

- RINA-C: leads and coordinates exploitation and IPR management.
- Ker Owners: provide technical content .
- All partners contribute with the BFMULO framework

HOW?

- Characterization tables: structure the analysis of each KER.
- IPR and Access Rights Procedure.
- BFMULO Strategy (Make, use, license or other).

WHEN?

- Whenever a result with exploitation potential emerges.
- During development of each KER, as new technical or market information becomes available.
- Before decisions on IP protection.

Exploitation methodology

The concrete use of project results for commercial, societal, or political purpose, transforming research outcomes into real applications

Why Exploitation matters in EU Project

It maximizes the impact of the project on society, the economy, and innovation.

It transforms results into tangible benefits (new technologies, services, policy inputs).

It contributes to evidence-based policy, supporting regulation and decision-making.

It enables other actors such as industry, researchers, policymakers to take results forward or invest in them.

It is a legal obligation for all Horizon Europe beneficiaries (Art. 16 and Annex 5 of the HE Grant Agreement).

Characterization table tool

Purpose and role of the Characterisation Table within the exploitation strategy

To support the Exploitation Activities there are some strategic tool that help data and info collection as the Characterization Table tool.

It is useful:

- *To systematically map and describe project results with exploitation potential*
- *To create a shared understanding among partners of:*
  - *what the result is*
  - *its level of maturity*
  - *its potential value and application*
  - *to transform technical outputs into exploitable assets*
- *Acts as the starting point of the exploitation process.*
- *Provides the analytical basis for defining realistic exploitation actions.*
- *Ensures consistency and comparability across all project results.*
- *Supports prioritisation of results with the highest impact potential.*

Characterization table tool

Purpose and role of the Characterisation Table within the exploitation strategy

RINA Consulting prepared the Characterization Table tool and distributed it to all partners responsible for the Key Exploitable Results (KERs) in order to collect relevant data at M24 (mid-term of the project) and M46 (end of the project).

This approach allowed partners to submit updates reflecting the developments that occurred throughout the project's lifetime.

The following slides present the template shared with the partners, which is structured into four main macro-categories related to the project results:

- *General Description.*
- *Market.*
- *IPR Management.*
- *Exploitation Strategy.*

Characterization table tool

Structure of the tool and overview of its main sections & Detailed explanation of how to complete each section

The Project result General Description outlines a project result by capturing :

- Title and short description of KER.
- Result type (product, model, software or knowledge.
- Innovation content.
- Competitive advantage.
- Legal or ethical requirements.
- Technology Readiness Level (TRL).

before during and after the project.

Project Result General description	Expolitable Result # - Title				
	Project Result short description	Provide short description of Project Result (product/sercive/etc. provided).			
	Type of Result	**Product/Tool**	**Model**	**Software**	**Knowledge**
		Yes/No	Yes/No	Yes/No	Yes/No
		Other (specify)			
	Innovativeness Content	Describe the added value of the Project Result (product/service/etc. provided) from the end-user point of view.			
	Competitive Advantage	Specify the Competitive advantage of the Project Result, in terms of: - Technical advantage (e.g., higher performance, longer duration, different features, different standards, etc.). - Cost/financial advantage (e.g., lower CapEx, lower OpEx, lower selling price, better ROI, etc.). - Sustainability advantage (e.g., lower consumption, lower level of pollutants, positive social impact, etc.).			
	Legal, normative, or ethical requirements connected to the development	Any legal, normative, or ethical requirements that shall be kept into account during the development and, potentially after the end of the project (e.g., any legal constraints for the exploitation).			
	TRL (Technology Readiness Level)	**Before Zhenit**	**Actual**	**After Zhenit**	
		From 1 (min) to 9 (max)	From 1 (min) to 9 (max)	From 1 (min) to 9 (max)	

Characterization table tool

Structure of the tool and overview of its main sections & Detailed explanation of how to complete each section

Market section summarizes:

- The market dimension of the project results (covering target markert).
- Main customer segments.
- Potential competitors in the field.
- Indication of the expected time-to-market.

Market	Target Market	**B2B**	**B2C**
	Customer Segments	Specify the primary target market (e.g., Energy production/Distribution/Consumption; Heavy Process Industry; Manufacturing Industry; ICT; Construction; Maritime Shipping; Other (please specify).	
	Potential Competitors	Make a list of the competitors working in the same field (e.g., SME, Large Enterprise, Research bodies/Academic bodies, Others - please specify).	
	Time to Market	Make an initial high-level description of the actions to be performed during the 2 years after the end of the project, to make the solution ready to market.	

Characterization table tool

Structure of the tool and overview of its main sections & Detailed explanation of how to complete each section

This section outlines the IPR management aspects of the project results, including:

- Ownership and partner involvement.
- Joint ownership needs.
- Background and foreground IPR status.
- Partners' exploitation roles (making, using, licensing).
- Applicable protection measures such as patents, trademarks, copyrights, or industrial design.

IPR Management	Owner(s) of Result	Insert the name of the Owner(s) of Result.			
	Other Partners involved	Insert the name of the Other Partners involved, if any.			
	Joint ownership (Need of agreement before the end of the project?)	Yes/No.			
	Status of IPR: Background - B (type and partners owner). See sheet "Info" - BFMULO Analysis.	Check if there is any type of Intellectual property already secured (before the project started) and that helped the development of the Project Result (Patent, Trade secret, Copyright, Trademark).			
	Status of IPR: Foreground - F (type and partner owner). See sheet "Info" - BFMULO Analysis.	Check if the Project Result (developed within the end of the project) could be protected with one (or more) type of Intellectual property (Patent, Trade secret, Copyright, Trademark).			
	Status of IPR forms (partners interested in the exploitation of the result after the end of the project). See sheet "Info" - BFMULO Analysis.	**M - Making the Product**	**U - Using the result**	**L - Licensing the result**	**O - Other means of Exploitation**
		Insert the list of partners	Insert the list of partners	Insert the list of partners	Insert the list of partners
	Protection Measures (specify the appropriate protection measure, if any). See sheet "Info" - BFMULO Analysis.	**Patent**	Yes/No		
		Utility Model	Yes/No		
		Trademark	Yes/No		
		Copyright	Yes/No		
		Industrial Design	Yes/No		

Characterization table tool

Structure of the tool and overview of its main sections & Detailed explanation of how to complete each section

This section outlines the exploitation strategy of the project result, covering:

- Intended exploitation claims (consultancy academic use, commercial exploitation, others).
- Expected revenue streams.
- Estimated yearly costs to reach the market.
- Potential post-project financing source.

Exploitation Strategy	Exploitation Claim	**Consultancy Service**	**Academic Exploitation**	**Commercial Exploitation (e.g., selling licensing)**	**Other**
		Yes/No	Yes/No	Yes/No	Yes/No
	Revenue streams associated to the above exploitation claim.	Insert a list of revenue streams with a preliminary monetary (€) estimate, if applicable.	Insert a list of revenue streams with a preliminary monetary (€) estimate, if applicable.	Insert a list of revenue streams with a preliminary monetary (€) estimate, if applicable.	Insert a list of revenue streams with a preliminary monetary (€) estimate, if applicable.
	Estimated costs/activities to bring the project result to the market (yearly).	Insert a list of costs item/activities and a preliminary monetary (€) estimate, if applicable.	Insert a list of costs item/activities and a preliminary monetary (€) estimate, if applicable.	Insert a list of costs item/activities and a preliminary monetary (€) estimate, if applicable.	Insert a list of costs item/activities and a preliminary monetary (€) estimate, if applicable.
	Sources of financing foreseen after the end of the project	E.g., Equity, Venture Capital, Loans, Grants, etc.			

Characterization table tool

Overview of generic results collected through the Characterisation Table

Portfolio scope

6 Key Exploitable Results combining waste-heat-to-X technologies (cooling, fresh water, electricity, thermal storage) with digital energy monitoring/control and wind-assisted propulsion.

Technology maturity (TRL)

most results sit at mid TRL (≈4–6) and require scale-up and validation; eSAIL® and the on-board energy monitoring/management software appear closest to market deployment (higher TRL / "market-ready" positioning).

Value proposition

solutions aim to increase on-board energy efficiency, reduce fuel consumption and emissions, and improve operational performance by recovering and optimally using waste heat and by supporting decision-making/automation.

Target markets (mainly B2B):

primarily shipowners, shipyards, system integrators and marine technology providers; selected KERs show cross-sector potential (industrial waste heat / process industry).

Common go-to-market approach

prevalence of direct selling by technology owners; for more research-driven KERs, licensing/spin-off is considered; software-oriented KERs combine product + services/consultancy.

Key barriers & needs

recurring requirements for maritime integration, demonstration at relevant scale, and classification/certification; additional optimization needed on compactness, efficiency, reliability, and integration interfaces.

Time-to-market outlook

heterogeneous, but overall mid-term; several KERs target market entry late 2020s–early 2030s, while wind propulsion and digital tools show shorter commercialization horizons.

Exploitation roadmap tool

Objective of the Exploitation Roadmap

- To plan and structure concrete actions after the end of the project.
- To reduce the key risk of EU projects:
  - Project results not being exploited due to lack of resources, planning, or follow-up.
- To bridge the gap between project completion and real use, including:
  - TRL increase
  - market entry long-term sustainability of results.
- Translate project results into clear post-project activities (3–6 months and beyond).
- Identify non-technical actions required for exploitation, such as:
  - business planning
  - IP protection
  - certifications and authorizations
  - investment and funding needs.
- Ensure that exploitation is realistic, financed, and actionable.

Link to Project Results

- Each roadmap is built on previously characterized project results.
- Only results with exploitation potential are included
- For each result, the roadmap defines:
  - specific actions
  - responsible partners
  - milestones and KPIs
  - financial costs
  - revenues
  - funding sources
  - Impact in 3-year time.

Exploitation roadmap tool

RINA Consulting prepared the Exploitation Roadmap tool and distributed it to all partners responsible for the Key Exploitable Results (KERs) in order to collect relevant data at M46 (end of the project).

This approach allowed partners to clearly define the exploitation roadmap at the end of the project, supported by more robust and consolidated results.

The following slides present the template shared with the partners, which is structured into seven main macro-categories .

Exploitation roadmap tool

Structure of the roadmap and key components & Step-by-step guidance on how to fill in the different sections

This tool outlines the roadmap for implementing the exploitation strategy of the project results, covering:

- Key post-project actions required to move from results to market uptake.
- Roles and responsibilities of partners involved in the exploitation phase.
- Milestones and KPIs for monitoring progress and implementation..
- Estimated financial resources needed in the short and medium term.
- Expected revenues and sustainability of the exploitation.
- Additional sources of funding to bridge the gap to market.
- Expected impact in 3 years, in terms of growth, jobs created, investments mobilized, and turnover generated.

Exploitation Roadmap	
Actions	Briefly describe actions planned to be executed 3-6 months after the end of the project Make sure you do not just focus on technical activities (realisation of a prototype, software interface, etc) but also consider the finalisation of a business plan, the protection of intellectual property, the collection of authorisations, all it will be needed to start implement what is in your exploitation plan
Roles	Roles of partners involved in the actions defined above.
Milestones	List the milestones and KPIs to be used for monitoring the implementation of the actions listed above. Add timeline.
Financial Costs	Cost estimation to implement planned activities (1 year, 3 years). Provide information on the costs/investments needed to bridge the end of the project to the next steps planned and increase TRL or go to market (you may invest in a patent, in the realisation of a prototype, etc.).
Revenues	Projected revenues and eventual profits once the KER will be used (1 and 3 years after use) Consider revenues you will expect to collect by licensing, or thanks to service provision or sale of devices. They generate the cash flow that will make the use of the result sustainable over time (provide an estimation concerning the first year and what is expected after 3 years, if possible). It is recommended that you estimate the revenues according to your early adopters and potential customers and include the information in the draft exploitation plan.
Other sources of coverage	Resources needed to bridge the investment needed to increase TRL and ensure the result is used. Financial resources to cover costs incurred before collecting the first revenues (during the "time to market" – see costs) and their sources. Sources can be partners` own budget, other project grants, national/regional incentives, risk capital, loans, etc. Make sure to obtain them at the right timing.
Impact in 3-year time	Describe impact in terms of growth/benefits for the society Impact should mobilise measurable changes in terms of growth/benefits for the society (i.e. jobs created, investments mobilized, turnover generated)

Exploitation roadmap tool

Overview of generic results collected through the Exploitation Roadmap

Overall approach

Roadmaps consistently aim to bridge the post-project gap by combining TRL scale-up, partner/market engagement, and funding acquisition to ensure continuity beyond the project end.

Common first steps

Focus on market scouting / customer identification, business planning, and partner outreach (often shipowners/shipyards/system integrators), plus preparation of pilot/demo concepts.

Mid/early-stage:

Four KERs roadmaps are more technology development–driven, with strong emphasis on optimization and pilots, and longer timelines to market.

Recurring enablers

Most roadmaps rely heavily on follow-up R&I projects and grants as primary financing (especially for research-led KERs), while industry-led solutions include direct sales + private investment/loans.

Key dependencies & barriers

Across almost all KERs, successful exploitation depends on demonstration at relevant scale, on-board integration engineering, and crucially-marine classification / certification (

Maturity split

Near-market, two KERs present more commercially oriented roadmaps (product integration, certification updates, sales enablement).

Milestones & KPIs

Roadmaps typically use milestones such as securing demo customers, pilot success, industrial partner engagement, and production/scale-up readiness; however, several would benefit from adding clearer technical KPIs aligned with certification needs.

Strategic direction

The exploitation logic is mainly individual KER commercialization (not a joint consortium business model), targeting B2B maritime stakeholders, with some KERs explicitly considering cross-sector industrial applications.

Exploitation Final considerations

Key takeaways from the methodology and tools

- Effective exploitation requires a structured and progressive approach, not ad-hoc actions.
- The Characterization Table helps clarify what can be exploited and by whom.
- The Exploitation Roadmap translates results into concrete, realistic post-project actions.
- Tools work best when used together, ensuring coherence from results to impact.

Critical success factors for effective exploitation planning

- Early involvement of partners responsible for exploitation.
- Clear ownership and roles for each exploitable result.
- Realistic assessment of TRL, market readiness, and resources.
- Integration of non-technical actions (IP, business, funding, authorizations).
- Continuous alignment between technical progress and exploitation strategy.

Recommendations to improve exploitation readiness at partner level

- Think beyond the project: plan exploitation already during implementation.
- Focus on few, high-potential results.
- Allocate time and internal resources to exploitation-related activities.
- Strengthen internal capabilities on business planning, IP, and market analysis.
- Use the roadmap as a living document, updated as results evolve.

Thank you for joining!

Q&A

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