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LASTING
POWERED BY WATERBORNE

D1.4 Gap Analysis Recommendations

Handbook on Tools And Recommendations to Meet Innovation Needs, Implement Monitoring Tools, and Increase Opportunities for Participation in Research

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This deliverable has collected first-hand information from representatives of the European waterborne transport sector via two main instruments, i.e. a questionnaire as well via bilateral interviews. In this respect, with respect to the data collected, the following clarifications shall be considered:

- The lists of findings are non-exhaustive lists, therefore the input presented might not reflect the entire actual status of the entire European waterborne transport sector.
- There are diverse personal opinions leading to sometimes contradicting findings.
- The conclusions reflect the views of the industry representatives as they have been expressed via the questionnaire & during the bilateral interviews.
- Few content related mistakes have been identified in the answers received, which had to be corrected/eliminated.
- Data clearing for the present report has been processed by the LASTING project team.

As regards the developed EU project database the following clarifications shall be considered:

- The EU project database generated in the framework of the LASTING project has been generated in a complex process of compiling data available from various official and non-official sources. In terms of content there may be unintentional omissions or missing information for some projects that may be framed in the waterborne sector. Inaccuracies in the information may be due to the availability of information from the sources as well as in the processing and treatment of the information. In addition, information not included in the sources at the time of data extraction has been completed where feasible.
- The database includes additional information useful for the project in relation to the maturity of technologies, innovation trends sorted out according to a format understandable by the Waterborne sector. The exercise of filling in this information has been guided by criteria of transparency, availability of the information, analyst's perception of the information, etc. The interpretation of the data by different analysts may differ in whole or in part depending on the pre-established objectives in compiling the database and may not accurately reflect the reality of the waterborne sector as a whole.

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List of Acronyms

CAPEX – capital expenditures

CEF – Connecting Europe Facility

CORDIS – Commission database of EU-funded research and innovation projects

CRIS – Current Research Information Systems

EIB – European Investment Bank

EIBIP – European Inland Barging Innovation Platform

EIC – European Innovation Council

EIT - European Institute of Innovation and Technology

EU – European Union

FP7 - Seventh Framework Programme

H2020 - Horizon 2020 programme

HEU – Horizon Europe

IGA - Information Gap Analysis

KIC - Knowledge and Innovation Communities

KPIs – Key Performance Indicators

MFF - Multiannual Financial Framework

MSCA - Marie Skłodowska-Curie Actions

MoU – Memorandum of Understanding

OPEX – operational expenditures

OPS – Onshore Power Solutions

RFF - Recovery and Resilience Facility

RMSM - Research Management Systems and Maintenance

RD&I – Research, Development and Innovation

SME – Small Medium Enterprises

TRIMIS - Transport Research and Innovation Monitoring and Information System

TRL – Technology readiness level

ZEWT cPP – Zero Emission Waterborne Transport co-programmed partnership

Executive Summary

This document, deliverable D1.4 Gap Analysis Recommendations, is the final and concluding part of the project's Information GAP Analysis and Recommendations.

Chapter 1 is dedicated to an overview of the entire LASTING project, followed by the brief description of the project task that has required the writing of this document.

The main findings from the gap analysis on information gaps on innovation needs, research management systems and opportunities for participation in EU RD&I waterborne projects are subsequently summarised in **Chapter 2** of the document.

After the methodology employed in extracting the information is described, the reader can find in the subsequent chapter section a wealth of information on the **information gaps concerning the innovation needs** of the different waterborne transport stakeholders. In terms of innovation needs, digital green, sustainable fuels, and sustainable ports are the most relevant themes, followed by energy efficiency, (shore-side) electrification and automation of waterborne assets and operations. The three main challenges identified by all stakeholders in relation to the EU RD&I programmes are:

- the scope of EU RD&I funding programmes does not match the interest or fields of expertise;
- the projects under the funding programmes are financially not attractive enough;
- there is a mismatch between the Technology Readiness Level (TRL) covered by the EU funding programmes and the interests of the different actor groups, with some (e.g. transport operators) having more difficulties to find suitable TRL levels than others (e.g. public bodies).

These results have also shown that a large proportion of information is in fact not fully known by the waterborne transport stakeholders.

One of the reasons for these challenges is the existence of numerous but partly inadequate **research management systems** that are available to the stakeholders. The necessary prerequisites and functionalities for a dedicated and successful research management system for the waterborne transport sector are described in the next section of the chapter.

Another reason for these challenges is that the **relevant funding sources at the EU level**, some of them newly established, are not well known by the waterborne transport stakeholders. Consequently, the last section is dedicated to presenting in a concise but rich manner the financial instruments that can be accessed by the stakeholders.

- Horizon Europe, the biggest EU RD&I funding mechanism with numerous opportunities within each three Pillars, and in particular the ZEWT, Hydrogen and Batteries' partnerships (Pillar II);
- The LIFE programme;
- The Recovery and Resilience Facility;
- The Innovation Fund;
- The Connecting Europe Facility;
- The Interreg programme(s);
- InvestEU and the EIB.

Chapter 3 can be read as a handbook on tools and recommendations to fill innovation needs, implementing monitoring tools and increasing opportunities for participation in research. A step-approach can be followed in this respect. A first step is to improve the public data sources CORDIS, TRIMIS and DATA EUROPE. This can be seen as low-hanging fruit.

Subsequent steps are divided into two scenarios, a so-called extensive scenario containing a blueprint for future monitoring tools and a so-called light scenario containing a proposal on the establishment of the future tool.

Both scenarios aim to develop or contribute to a future tool to fill the gaps, that have been analysed in the first three deliverables, as regards innovation needs, research management systems and opportunities for participation in EU RD&I waterborne projects.

Chapter 4 encompasses the conclusions of the information structured so far, while **Chapter 5** provides some of the main implementing directions that the LASTING partners should take in the near future, to ensure that the information captured and analysed in this deliverable and the previous ones is properly prepared and disseminated to the waterborne transport stakeholders. This upcoming dissemination campaign is in fact the heart of the LASTING project, aiming to ensure the strengthening of the sector and its success in meeting the climate targets and other obligations through quality funding applications and implementing projects.

1. Introduction

1.1 The LASTING Project

Considering the diversity of the waterborne transport sector, its geographical scope, the international dimension and the challenges and opportunities upfront, LASTING (Let's go for Waterborne Transport Research – Broadening engagement and increasing impact) will broaden engagement of the broader waterborne transport sector in European RD&I activities, by developing a communication strategy, and implementing a long-lasting communication campaign beyond the lifetime of this project, ultimately increasing, stakeholder engagement in the sector and thereby increasing impact of European waterborne transport RD&I.

The communication strategy, and thereby the campaign will be based on clear key performance indicators (KPIs) set at the starting point of LASTING, jointly developed with the relevant European Commission Services and the broader waterborne transport sector. The achievement of the KPIs will be measured at fixed intervals, to ensure that the final communication strategy and the campaign will be fit-for purpose and ready for roll-out. An essential element of the communication strategy will be the development of a plug-and-play system for participation in European, national or regional strategic maritime and/or inland waterway transport events. In the framework of LASTING, the plug-and-play system will be tested at a number of occasions, to ensure the system is fit-for-purpose.

In addition, high quality dissemination materials (such as flyers and banners) and templates will be delivered. There will be a main focus on the use of digital tools for dissemination purposes, to ensure that the communication efforts of the waterborne transport community will easily follow the concept launched in the framework of LASTING. Finally, yet importantly, the Waterborne Technology Platform will take over the communication strategy and campaign after the lifetime of LASTING and will ensure a durable implementation of the concepts and materials developed in the framework of the project.

LASTING is coordinated by SEA Europe, counting with the participation of a total of seven partners from four EU countries. LASTING is funded by the European Commission research and innovation programme Horizon 2020, with an investment of €1,3 million over the course of 36 months, starting in January 2021.

Figure 1 LASTING Consortium Partners

1.2 Task 1.4 Consolidation of Findings, Recommendations & Proposal for Future Monitoring Tools

Deliverable 1.4 'Gap Analysis Recommendations' is the main output of task 1.4 'Consolidation of Findings, Recommendations & Proposal for Future Monitoring tools'.

It follows the tasks 1.1-1.3[1] that were conducted in parallel and can be seen as the concluding part of WP1 'Information Gap Analysis and Recommendations'. The objective of this task is to develop a consolidated overview of the performed gap analysis and recommendations following this analysis to close the information gaps on innovation needs, research management systems and opportunities for participation in EU RD&I waterborne projects.

The information gap analysis protocol allowed the task partners to assess the current and future state in the mentioned three areas, this assessment has been made through desk research, a questionnaire and semi-structured interviews with experts in field. The main findings from this analysis has been consolidated and presented in chapter 2 of the document.

Chapter 3 presents the recommendations to fill the information gaps in the three areas of innovation needs, monitoring tools and opportunities for participation in EU RD&I waterborne projects. This has the structure of a Handbook containing a practical step-approach divided into two scenarios. Both scenarios aim to develop or contribute to a future tool to fill the analysed information gaps in the three areas.

These recommendations for a future tool will be distributed to Work Package 2 'Communication strategy and stakeholder engagement' and Work Package 3 'Communications Campaign'. The future monitoring tool should build upon the expressed needs arising from stakeholders who are consulted on information gaps. The handbook also contains a proposal on governance aspects and maintenance procedures.

[1] These concern task 1.1 Information Gaps concerning Innovation Needs, task 1.2 Awareness of outcomes of research projects and activities and task 1.3 Opportunities for participation in research and deployment of their results

2. Gap Analysis Recommendations

This chapter highlights the findings of the research conducted and outlined in deliverables 1.1 to 1.3 on information gaps concerning innovation needs, requirements for research management systems and maintenance, and opportunities for participation in research and deployment of their results. The identified gaps are turned into recommendations regarding requirements for a future monitoring tool.

2.1 Methodology

From February to September 2021 the project partners conducted research using a shared framework following the Information Gap Analysis (IGA) protocol. This method follows the regular gap analysis methodology, which can be defined as a process to identify in which areas gaps exist and the nature of such gaps, i.e. the difference between an organization's current situation and "what ought to be" (desired situation). Through a gap analysis, an organisation or organisations seek to modify the current situation to reach a desired situation.[2]

The IGA followed the principles of a regular gap analysis by first defining the focus areas of the analysis: the innovation needs within the waterborne transport sector (focus area one), awareness of outcomes of research projects and activities (focus area two), and opportunities for participation in EU RD&I waterborne projects (focus area three). The current and desired situations have been analysed by means of desk research, a questionnaire, and in-depth interviews following the questionnaire with experts in field.

The questionnaire has been developed around a set of 35 questions regarding the perception of the current state – status quo – as well as future needs. The questionnaire was sent to 3000 potential respondents and results were collected via Google Forms. In total 90 responses were received from a variety of persons and organisations across Europe and a few organisations with their seat in the United States. Subsequently, interviews were conducted with 28 respondents who indicated their willingness to participate in an in-depth interview. A semi-structured interview template was developed in order to align the interview approaches of EICB, Fundación Valenciaport and Pro Danube. The corresponding analyses, results, and recommendations for the three above-mentioned focus areas are outlined in deliverables 1.1, 1.2 and 1.3.

[2] https://www.researchgate.net/publication/327879112_Gap_Analysis

2.2 Recommendations on Information Gaps Concerning Innovation Needs

For the purpose of identifying information gaps concerning innovation needs in the waterborne transport sector, the principal actors have been categorized into four main stakeholder groups or so-called actor groups:

- Transport operators
- Technology suppliers
- Public bodies
- Research bodies

Representatives from all four main actor groups were surveyed and interviewed about their innovation needs, and subsequently asked to what extent they experience information gaps with special focus on European RD&I programmes. As European policy is showing an increasing trend towards more stringent emission goals, which are being translated into regulations, targets, and stimulation instruments, **reducing greenhouse gas emissions and reaching zero-emissions** – the aim of becoming emission free or achieving net-zero emission – are the primary priority themes in the future state of innovation needs.

However, since reliable and long-term information as regards capital expenditures (CAPEX), operational expenditures (OPEX), fuel availability and infrastructure is unavailable and/or not reaching the sector's stakeholders on channels and in a form suitable to their needs, there remain open questions for the sector on how to accomplish the 2050 objective and which fuels and techniques will be suitable and wise to invest in. Furthermore, since any effort to close the RD&I information gaps, including the future research monitoring tools, should be aligned with the needs of the sector's actors as much as possible, information on innovation needs should be made available in alignment with the specific needs of (each of) the four actor groups.

In terms of **innovation needs**, as reflected in the results of the questionnaires and interviews conducted by the project partners, **digital green**, **sustainable fuels**, and **sustainable ports** were some of the most relevant themes mentioned by stakeholders in all four actor groups. **Energy efficiency** is seen as a very relevant topic by both transport operators and public bodies, while ranking lower for the two others actor groups. In addition, (**shore-side) electrification such as onshore power solutions (OPS) and ports electrification** proved to be of relatively more importance to public bodies as compared to the other three groups, whereas **automation of waterborne assets and operations** is more relevant for research bodies and less for the remaining three groups.

The three **main challenges** identified by all stakeholders in relation to the EU RD&I programmes are:

- the scope of EU RD&I funding programmes does not match the interest or fields of expertise;
- the projects under the funding programmes are financially not attractive enough;

- there is a mismatch between the Technology Readiness Level (TRL) covered by the EU funding programmes and the interests of the different actor groups, with some (e.g. transport operators) having more difficulties to find suitable TRL levels than others (e.g. public bodies).

It was also frequently mentioned that the run of pilots from the industry should match with the constraints on budget and timelines of the R&D projects. A full overview of the raised issues can be found in the prior three deliverables.

While the above-mentioned challenges are partly related to the needed improvements regarding the EU funding programmes, they also provide insight into the areas in which the waterborne transport sector's stakeholders face **information gaps**, that is a mismatch between what or the form in which information is available and the information that stakeholders deem relevant, useful and needed. There is a need to better inform the different actor groups in the waterborne transport sector about the (new) funding opportunities for RD&I at European levels. The most prominent is the Horizon Europe (HEU) programme and its various sections and instruments, in particular the Co-Programmed Partnership on Zero-Emission Waterborne Transport (ZEWT). Due to both the overall funding and the first partnership dedicated to waterborne transport research, HEU addresses the sector's needs much better than had been done in FP7 or H2020.

The ZEWT partnership is essential as it is 'the tool' where, through their involvement, the waterborne transport stakeholders can help shaping many of the HEU calls dedicated to their sector. The clear advantages of ZEWT are that (i) it covers some of the highest priorities – digital green, sustainable fuels, and sustainable ports **–** underlined by **all four actor groups**, and (ii) **enables the participation of all these stakeholders in its activities** – to define the calls for projects, to compete for these projects and, should they win, to execute them. The ZEWT partnership thus ensures not just a focus only on greening the waterborne transport sector with a sizeable, dedicated budget, but also on that this is also done in a more inclusive manner, with all types of stakeholders being represented at the table.

In addition, other funding sources have been renewed or have been established for the duration of this Multi-Annual Financial Framework (MFF), and the stakeholders need to be better informed about these opportunities as well.

Other important information gaps that have been distilled in the analysis of the questionnaire and in-depth interview results are:

- Companies, in particular SMEs, may not be (fully) aware that **business models will have to be adapted and hence undergo change in order to meet and reach the climate (and circular economy) targets**, and this could happen at a very fast pace. Also, they may not be aware of RD&I activities in this direction. Such a situation actually raises a two-fold problem: the need for more RD&I activities in this direction coupled with better informing the waterborne transport community about such types of calls;
- There is a **partial mismatch in RD&I activities and implementation between the public bodies and the private companies (in particular the industry)**, hence some opinions indicate that there is too much RD&I focused on certain topics (e.g. ships). The mismatch at the RD&I level could then generate a more troublesome one in terms of mature technologies, e.g. the shore-

side vs the ships / off-shore parts of the waterborne transport sector. Another information gap which could be inferred in this case is the potential alignment on topics and TRL levels between the transport operators such as vessel owners/operators and the public authorities, which could solve some problems on both sides;

- A two-fold information gap is in connection to the **societal aspects**. On the one hand, while the authorities pay the most attention to such topics in RD&I aspects, many of the companies are less aware of them, hence sometimes the lower degree of cooperation and lack of opportunities in this field. On the other hand, it could be a mismatch in perceptions, as some companies (mostly the operators) can be very interested in societal aspects but are not aware of the other stakeholders' interests and/or these funding opportunities.
- There is information available on technical aspects, but less on the **economics and business models** for technical innovations. For example, while information on new technologies to reduce emissions exist, there is little guidance and or best-practice on how such technologies can be incorporated as part of a viable business model, especially for SMEs. Further, there is scant information available on the uptake of certain innovations following EU RD&I projects. Organisations have a great need for information in the uptake phase (e.g. experiences with the system, OPEX/CAPEX during operations, etc.) and which innovations are applied (for a longer period) in a real (business) environment to be able to incorporate learnings and benefit of best-practice.
- Much of the critical information from RD&I projects are not made public, which makes it exceedingly difficult for new projects to follow up on the detailed results of previous ones. Hence, the continuation of the research done in previous projects is not assured and this circumstance renders the development of solutions with higher TRLs more difficult.

Current content of the European RD&I programmes as well as the information flowing out of corresponding RD&I projects do not sufficiently reach the waterborne stakeholder community. Project outputs are perceived as both complex and abstract, especially from SMEs perspectives. Apart from aligning with the focus areas stated above, any future monitoring tool should thus consider, as user requirements, the **accessibility of information**. To bridge identified information gaps in areas where they arise out of information being available but not in an accessible form or and easily and publicly accessible setting, a two-step approach to disclosing information can be adopted: first provide easy to read information sources by making an editorial translation, e.g. by providing well written summaries of scientific journalistic quality, animations or video introductions to lower the threshold of knowledge transfer. As a second step, primary sources can be disclosed (e.g. providing scientific papers, or relevant links to expert platforms) for those who want to gain more in-depth knowledge and get to know specific details.

On top of making relevant information accessible, the need for **adequate filtering,** which serves to further improve the accessibility of information catalogued within databases, was also addressed. This could be done by creating relevant selecting/filtering options in the user design interface of a web-based tool, and also by explaining relevant themes within the context of the wider communication campaign. Best practices and highlights of implemented European RD&I project results, including

business case development, are a crucial need and of high relevance for the waterborne transport sector's stakeholders to inform and guide their decision-making and projects.

Lastly, primary sources of RD&I projects are widespread (see also D1.2 for an overview of available databases and project websites). They will add up to hundreds of sources and some of them will disappear after the project lifetime. The sources do not include information from other relevant sectors, such as road and rail transport (hinterland connections and cargo aspects), which may also benefit waterborne transport stakeholders. To counter this persistent problem of information gaps, the need for a dedicated future monitoring tool for the waterborne transport sector tailored to stakeholder's needs turned out to be widely acknowledged among all actor groups of the sector. This future monitoring tool should ensure that parts of the waterborne community who are currently lacking information will be better informed about, and aware of possible involvement in opportunities provided by European research and funding programmes (an overview of which is provided by D1.3 and summarized below).

2.3 Recommendations on Research Management Systems

Deliverable 1.2 on research management systems and maintenance (RMSM) analysed the research and innovation needs of the waterborne transport sector and explored best practices on research management systems available. This was done so as to compile relevant practices and outline the main results and findings relevant to the sector. This has been done by means of desk research, analysis of questionnaire results, and expert consultation through interviews.

A detailed LASTING EU projects database consisting of 585 projects has been built, resulting in a comprehensive analysis of the main European projects in the waterborne sector from 2010 to the present day (2021). This analysis was utilized to elaborate a **blueprint for a consistent, standard, and homogeneous future research monitoring tool** that helps the sector's stakeholders to be and stay informed as best as possible about relevant progress in terms of RD&I solutions arising or performed by the waterborne industry.

The interviews from the participating external experts revealed that currently internal Research Management Systems are not widely implemented amongst the LASTING actor groups. Also, where these systems are in place, it is worth noting that the degree of maturity of these (internal) tools differ from one organisation to another. Repositories tend to be more rudimentary, and users are confronted with the challenge of having them updated regularly.

A central database could provide help, although findings stress the necessity of **drafting standards** to structurally monitor RD&I activities and outcomes, ensuring the information flow to sector stakeholders is backed by strong procedures, characterized by a degree of uniformity, and occurs in a timely fashion.

From a top-down analysis, publicly available EC-backed resources were analysed. The most important Current Research Information Systems (CRIS) are: Commission database of EU-funded research and innovation projects (CORDIS), Transport Research and Innovation Monitoring and Information System (TRIMIS) and DATA EUROPE. None of the existing tools proved to be fully able to serve the waterborne

transport sector needs in terms of accessibility, information relevance and filtering options, as well as in terms of highlighting and summarising findings.

Repositories and databases from different EU programmes differ from each other with a lack of standardisation. In most cases these available sources would ideally be adjusted to serve the waterborne RD&I community needs by solving impediments, such as the lack of information on TRL levels of projects, access to the results of the project, etc. Structural monitoring of waterborne RD&I developments by using these tools would require improvements and changes to the current version of them, which lie outside the scope of and cannot be effectuated by LASTING.

Since the gathering of information from these publicly available tools cannot be fully automated due to lack of standardisation, it can be concluded that gathering relevant information for any future monitoring tool for waterborne transport RD&I-purposes will require significant human resources to edit, maintain and complement the information. A case for the employment of such resources arises out of the fact that thematic clustering and providing additional information as a central service will in the end benefit all main actor groups by saving working time to find, collect, compile, store and treat information, and hence, will save internal resources in the companies of the waterborne sector.

The main results obtained from the questionnaires and the interviews provide one potential version of an overview of the main characteristics that the Research Management System tool should contain:

1. One of the most important features is that it is easy to use, transparent, simple, and easy to search. The flexibility of the solution must give adequate consideration to these criteria;
2. Shareability and the degree to which the system is interlinked are also factors to be considered. In this sense, value is placed on the tool being open access and with a distinction between pure research and applied research, taking into account the TRL. Further, structuring of content by subject and availability over time are additional important elements. It is also crucial that the collaborative and data aspects can be shared anonymously so as not to compromise commercial confidentiality. Collaborative platforms of open research are highly valued;
3. Solutions that meet the general Data Management Plan requirements: findability, accessibility, interoperability, and reuse of digital assets. This includes: suitable meta data structure, ease of access and access control, suitable formats for lifelong storage (the latter lifelong storage solutions should give adequate consideration to affordability, bearing in mind that individual projects that are funding the published results may no longer exist). Administrative support resources and aligned project management processes and practices are further requirements to consider.
4. One of the most valued details is that it should be easily accessible to users in general, so a way is being sought for it to be free of charge and managed by a public entity. Open repositories are of great value, as well as information on contact persons to be able to delve deeper into those publications or information that are relevant to users. As a result, collaborative platforms are highly valued, supported by published methods and research;
5. Networking/connection of the systems involved, taking data protection aspects into account, in order to provide a uniform database without media discontinuity. Mapping of

end-to-end workflows that involve the stakeholders (groups) involved in the process, such as science and administration, at the relevant points in the process and provide them with information;

6. The publication of results of the project, including information regarding pilot projects, deliverables, roadmaps, expert publications, etc., in a seamless tool is also important. The standardisation of the information is key.

It can be concluded that the **useful value proposition in terms of information on European projects**, results, etc. would be the **combination of tools made available by the European Union with some recommendations or improvements**. In this case, and based on the results of the matrix[3] and the exploratory exercise of the LASTING database, the most beneficial proposal would be a tool like CORDIS with the following improvements:

- The tool should include the information provided by TRIMIS to make it more comprehensive. Sometimes the CORDIS information is incomplete, for example references to project websites, where normally information on specific research on particular topics could be found. TRIMIS offers access to those deliverables that may be useful but require more extensive information about the project.
- CORDIS requires the integration and harmonisation of other EU funding programmes databases that collect research information in the sector but are not reflected in this tool. There are data fields included in INTERREG + ENI + MED and CEF that could be very useful to be incorporated into CORDIS and that better classify projects by theme, objectives, the "keywords" necessary to filter relevant projects, etc.
- CORDIS should be a tool that can generate reporting or data mining in the form of files by pre-selecting specific variables in the search engine. KEEP has this option and gives the possibility to download the searched file. In CORDIS, information on European projects related to the waterborne sector is not easily filterable. Options to search by sector or topic or thematic issue would help to focus on transport themes, and finally, sector themes.
- The paid tools are able to analyse the expert profiles within certain themes, the funds related to a specific theme, and have a more modern, cleaner interface with graphs, maps and statistics (similar to the EASME proposal). All these improvements would help to make the information more valuable for the user.
- Finally, the CORDIS option should be free of charge in order to encourage open research, but without forgetting that the registration of profiles would help to filter and provide statistics on searches, as well as to receive feedback from the user in order to improve the tool. Undoubtedly, without the inclusion of additional fields by sector such as TRL, innovation trend, communication channels, etc., it is very difficult for users to filter and identify the information that is relevant to their research and thus promote it in the European Union as a whole.

In relation to relevant **scientific research information (papers, patents, etc.)** the following tools can be considered:

[3] See chapter 5.2 Selection matrix proposal of Deliverable 1.2

- If the information is indexed and comes from repositories of research-linked entities such as research institutes and universities, these repositories, even if they have access limitations, are very reliable and interesting sources of data. In this sense, the RESEARCH repositories and UNIVERSITY repositories are a good approach to be used by the waterborne sector. In deliverable 1.2 all the existing repository possibilities found linked to universities and research centres in the sector have been explained. It should only be noted that these entities must share this information in open repository directories such as ZENODO. In this way, the information flows and is accessible to users.
- In relation to those entities that are not institutions and that publish or want to publish and are not linked to research centres and universities, ZENODO is a very effective tool for making information available. In an ideal scheme, ZENODO could become the tool capable of bringing together all the information. This should be accompanied by an improvement of its interface and search options to locate relevant documentation in the waterborne sector.

Finally, in relation to patents, the best option is ESPACENET, as it also links international patents.

There are also **other kinds of unstructured information sources** that are key to collect relevant and instructive information for the waterborne sector. Information that is collected from forums, events, workshops, conferences, etc., the challenge lies in ensuring that this information is not lost if it is not published or indexed. There should be some mechanism to be able to collect this information in public CRIS supported by EU tools.

There are several options for achieving this, including using tools or publishing these events or linking them to thematic repositories or catalogues of universities or other entities that are concerned with making such information available. There are search engines for university catalogues that contain this information. However, the creation of an observatory of events within the waterborne sector could help to ensure that this information can be capitalised on and made available to end users.

Considering the above limitations of CRIS, the limitation of LASTING to be able to do something about the EC-backed systems, and the main characteristics that a Research Management System for the waterborne transport sector should have, it can be concluded that the EIBIP Innovation Radar covers a majority of the needs as addressed in the analysis of information gaps concerning innovation needs as well as of the characteristics of a Research Information System for the waterborne transport sector. However, adjustments to the tool would be necessary for the EIBIP Innovation Radar to be fully in line with the needs and listed characteristics. Chapter 3 gives the necessary insights in this respect.

2.4 Recommendations on Funding Opportunities

Previous financial frameworks in the timespan of 2010-2020 have been analysed in search of best practices on and opportunities for participation in waterborne transport related RD&I projects. Additionally, reflections on the new EU financial framework (2021-2027) with its funding & financing opportunities dedicated to supporting RD&I activities in the waterborne transport sector, as well as the national schemes of Austria, the Netherlands, Belgium and Spain (four countries represented in the project consortium), have been investigated.

Concerning the opportunities for participation, after in-depth research the project partners have found that there is a wealth of EU funding sources to cater to the various needs of the **waterborne transport stakeholders and the wider waterborne community** (those that are not only involved in the transport aspects, but also the connected activities). The below first reproduces a basic tabular overview (Figure 1) of the identified and pertinent funding sources, serving as an initial orientation for stakeholders, before outlining in greater depth the specifics and noteworthy elements of the various funding programmes.

FUNDING PROGRAMME	SUB-PROGRAMMES	DEDICATED FUNDING FOR WATERBORNE SECTOR	RELATED FUNDING (NOT DEDICATED, BUT ACCESSIBLE TO WATERBORNE SECTOR)	ORGANIZATIONS THAT CAN APPLY	TRL LEVELS	NOTE
Horizon Europe	Pillar I	No	Yes, MSCA, Research Infrastructures	All, but focused mostly on universities, research centres and similar organisations	Lower TRLs as a rule	Can at times be mixed with other EU funding The three partners / 3 countries rule can apply
	Pillar II	Yes ZEWT Partnership	Yes Clean Hydrogen and BATT4EU partnerships Other calls	All types of stakeholders. Partnerships will focus more on companies. Some calls may be open only for partnership members.	From low to high TRLs (partnerships focus on the latter)	
	Pillar III	No	Yes	Any, focus on SMEs and other companies	Mostly high TRLs	
LIFE	Nature and Biodiversity Circular Economy and Quality of Life Climate Change Mitigation and Adaptation Clean Energy Transition	No	Yes, for example in the areas of 'blue growth' and depending on call descriptions	Open to all stakeholders (due to high TRLs, bigger companies and authorities are favoured)	High TRLs	Funding cannot overlap with other EU funding (exclusion criteria)
RRF	N/A	No	Yes, section dedicated to transport (dependent on MS priorities)	Open to all stakeholders (as MS led, focus is on authorities, other public bodies and companies)	Higher TRLs (lower TRLs possible)	Can be mixed with other EU funds.
Innovation Fund	N/A	No	Yes, based on past calls funding is accessible to waterborne sector	Targets in particular companies, with an attempt to bridge the gap between H2020/HEU funding	Highest TRLs (7-9)	Future funding expected to explicitly mention fund for waterborne sector. Can be mixed with other EU funds.
CEF	TEN-T segments	No	Yes, relevant funding within CEF depends on the interests of the Member-	Mainly for companies and authorities	All TRLs possible, focus on	Focused on market-level investments.

			States and the approved projects		high-level ones	Can be mixed with other EU funds
INTERREG	Different, smaller Interreg programmes covering different countries or regions	No	Yes, depending on the Interreg programmes/regions	Directed to SMEs, authorities, research-oriented entities, and other non-profit organisations	All TRLs possible (not main focus)	Eligibility depending on the regional scope of calls, often participants from 2 or more countries required

Table 1: Overview of some of the main funding programmes for waterborne transport related RD&I projects

Horizon Europe

As general considerations, the HEU is the main funding instrument for RD&I activities for the waterborne transport sector and for the wider waterborne community. It offers:

- funding from the lower TRLs up to TRL8 (each call defines the TRL level to be reached);
- EU contributions per project anywhere between approx. €100.000 and over €25 million. This can mean between 50% and 100% of the project costs, with funding levels between 50-70% being usually applicable for the companies in high TRL activities (including demonstrations);
- overall openness to all types of stakeholders to apply for its calls. Applications to the calls for projects are subject to the HEU rules:
    - in most cases, the principle of 'minimum three different partners from three countries' applies to form consortia and project proposals;
    - in some cases, the HEU rules allow for project proposals coming from less partners and/or countries, e.g. some calls targeting SMEs or universities and research centres.
    - there is also dedicated funding for some actors, in particular SMEs and research-oriented entities. In the case of Clean Hydrogen, as with any of the other institutional partnerships, some of the relevant calls may be restricted to members of the partnership alone.
- both dedicated waterborne transport funding and more general funding that can be used by the sector stakeholders under specific circumstances (depending on the details of each call);
- the funding from the HEU can sometimes be mixed with other funding mechanisms, whether from the EU or other sources. The sections below on both HEU and the other funding programmes will elaborate on this part.

As a more in-depth overview, the partners' research has found that within **Pillar I** of HEU, though there is no dedicated waterborne transport funding, there are relevant programmes for the waterborne stakeholders. The preeminent such programme is **the Marie Skłodowska-Curie Actions (MSCA) funding**, aimed at doctoral and postdoctoral research and innovation, and which **has already financed waterborne-related research in the past years**. The other two sections of Pillar I – **the European Research Council (ERC) and the Research Infrastructures – can also provide some relevant opportunities for some of the sector stakeholders**. In some cases, under Pillar I, the rule of 'minimum three partners, three countries' is not applicable, with fewer stakeholders being able to apply. These HEU sections generally cover more basic research, low-TRLs or academic exchanges.

Due to the nature of research covered by these projects, their funding is generally lower, rarely going above a couple of million euros. A conservative estimate is that relevant funding under Pillar I would be in the region of tens of millions of euros for the waterborne transport. It is possible to go well over the €100 million mark, especially if looking at the wider waterborne community. The opportunities are mainly for universities, research centres and other similar organisations.

Within **Pillar II** the most relevant funding has been identified as follows:

- Within Cluster 5 Climate energy & Mobility, there is a **dedicated funding instrument for the waterborne transport sector**, **the ZEWT Partnership** with an earmarked **budget contribution**

of €530 million from the EC. It is the main funding instrument for the waterborne transport stakeholders, focusing on the decarbonisation of the sector. Apart the fact that it is the first such partnership for waterborne transport, ZEWT is allowing **all types of sector stakeholders** to collaborate and shape the calls and the directions in which the partnership will invest. The partnership will generally focus on higher TRLs, thus ensuring bigger project budgets and making them more appealing for the industry, and all its calls are also open to non-members. The rule of 'minimum three partners from three countries' applies.

- Within the same Cluster 5, **there are two other partnerships – Clean Hydrogen and BATT4EU – with a total EU allocation of almost €2 bln**. While this funding will be spread across hydrogen- and battery-related activities for different sectors, **the transport sector is one of the priorities for both partnerships.** And given the fact that other transport modes, in particular road, have already received substantial EU funding, the waterborne transport sector should have a fairly good presence in these two partnerships. Moreover, these partnerships share similarities with ZEWT: focus on higher TRLs, attractive conditions for the industry, 'minimum three partners from three countries' rule, etc. An estimate of tens of millions of euros as EU funding with relevant calls from both partnerships is realistic; it is difficult to ascertain at this moment whether the €100 million milestone can be achieved. However, there is a MoU between the ZEWT and Clean Hydrogen partnerships, and another one is being discussed between the ZEWT and BATT4EU partnerships. Consequently, the cooperation (and funding) for the waterborne transport should be reinforced in the coming period. It must also be noted that while the BATT4EU calls will also be open to non-members of the partnership, the Clean Hydrogen partnership is an institutional one, consequently some of its relevant calls may be open only for its own members.
- Other funding from Pillar II will also offer funding for the waterborne transport sector and the wider community on topics that are not covered by the aforementioned partnerships. A significant number of these topics will be cross-cutting/cross-sectorial, including cooperation with other modes of transport or other economic sectors. Most relevant would be the topics on digitalisation (Cluster 4) and those related to 'blue growth' (Cluster 6). All types of stakeholders can apply, and the principle of 'minimum 3 partners and 3 countries' remains in force, while the TRL levels can vary significantly, though they will be overall lower as compared to the partnerships'. While it is unclear what the total amount of relevant funding would be, the figures should be of at least €100 mil for the topics that include to various degrees the waterborne transport. In case blue growth or similar topics are included, the total budget available will be of several hundred million.

In conclusion, a more conservative estimate shows that Pillar II offers a dedicated budget of minimum €530 million for the waterborne transport sector, and closer to or over €1 billion in case we include other transport-related topics and topics for the wider waterborne community, such as the blue economy. Funding will cover both higher and lower TRLs (up to TRL 8, depending on the call details), but partnerships will focus in particular on the latter. The co-financing rate is between 50% - 100%, also depending on the call details and the type of stakeholders applying (see HEU rules). All types of

stakeholders can benefit from these funding opportunities, with the partnerships being more focused on helping the industry de-risk their RD&I investments.

Pillar III also does not have dedicated waterborne funding, but **the European Innovation Council (EIC) and the European Institute of Innovation and Technology (EIT) instruments are well-adapted to support the sector.**

The EIC calls have already provided funding for some waterborne transport projects and are expected to do so in the future. This will be similar for the topics applicable to the wider waterborne community, including 'blue growth' topics. This instrument is focusing on supporting SMEs, start-ups and small mid-caps **to bridge the financing gap between late stages of research activities and market take-up** (thus high TRLs), **to effectively deploy breakthrough, market-creating innovation and scale-up companies where the market does not provide viable financing**. This type of financing is of special relevance to stakeholders who are in need of support for not-yet commercially viable solutions, to bring them to a scale where they could become so or to support the development of a viable business model that incorporates said breakthrough innovation. Direct EU funding (the grant) is usually up to €2.5 mil/ company, seeking to raise equity investments anywhere between €0.5 and €15 mil/company. The rule of 'minimum 3 partners from 3 different countries' is often not applicable, but this has to be checked for the different cases.

Though it has significant differences in terms of structure and approach, the EIT is also a part of HEU and its Pillar III. Its mission is to bring together organisations from business, education and research, and find innovate solutions to pressing global challenges. The EIT is segmented into seven Knowledge and Innovation Communities (KICs), each comprising leading companies, research labs and higher education stakeholders. A KIC is dedicated to finding solutions to a specific global challenge, and for this it offers a wide range of innovation and entrepreneurship activities: education courses that combine technical and entrepreneurial skills, tailored business creation and acceleration services and innovation driven research projects[4]. The most relevant KICs are in this case the EIT Climate-KIC and EIT InnoEnergy, though others can also have relevant calls. As for previous HEU funding possibilities, the relevance and funding of the EIT calls need to be assessed on a case-by-case basis, either for the waterborne transport stakeholders or for those involved in broader waterborne topics. All types of stakeholders can apply, and the rule of 'minimum 3 partners from 3 different countries' is applicable. The EIT calls focus on different TRL levels, and there is an effort to support the higher ones.

Given the overall funding envelope for the EIC and the EITs, the funding that the sector could access should be well over the €100 million mark, and could reach even the €1 bln milestone especially if taking into consideration the potential equity investments. However, the total amount accessed will depend largely on the quality of applications, as a large part of the funding is not earmarked for the waterborne transport sector or other particular sectors.

[4] EIT at a glance | EIT (europa.eu)

The LIFE Programme

The LIFE programme, though with a smaller overall budget (€5.4 billion) and a narrower focus, **can offer funding that covers both transport-oriented and 'blue growth' topics**. It prescribes projects (usually) between €500,000 and €17 million and supports actions up to TRL 8-9 and market roll-out, even if calls often do not indicate TRLs as such. The co-financing rate will depend on the project type; the standard rate is 55% of the total eligible project costs, which can be enlarged to up to 60%, or 75% in the sub-programme nature and biodiversity. However, LIFE funding **must not overlap with other EU funding**. Thus, the LIFE project can help the waterborne community bridge certain gaps.

Also, the LIFE calls usually allow proposals from consortia that are below the HEU principle of 'minimum 3 partners from 3 different countries'. **Even though the LIFE programme is open to basically all types of stakeholders, the topics addressed and the high TRLs often required make it more suitable for (larger) companies and authorities.**

A realistic expectation is in the range of several dozen mil to up to €100 mil for the entire sector throughout the LIFE programme.

The Recovery and Resilience Facility (RRF)

The RRF is implemented by the Member-States. While the overall allocation for waterborne topics is not known, it is clear that some Member-States have a higher interest in this sector, both in terms of waterborne transport and other waterborne topics. Consequently, the overall relevant funding could be in the region of billions of euros, for both RD&I (normally higher TRLs) and implementation projects. The funding is in principle available for any types of stakeholders, but it is estimated that the States will direct it mostly to the relevant authorities and companies. This funding can certainly be used to continue the RD&I investments that have been initially supported by other EU funding mechanisms, and thus ensure that the initiatives reach the market level.

The Innovation Fund

It is designed for projects covering the highest TRLs (7-9) and targets in particular companies, with an attempt to bridge the gap between H2020/HEU funding, other RD&I funding and the financial necessities for market roll-out. The Innovation Fund investments can also be continued through the CEF and InvestEU funding mechanisms. The rule of 'minimum 3 companies from 3 different countries' is not applicable here.

While at the first glance the waterborne transport was not directly included in the scope of the Fund, the calls and the discussions with the EC have proven that the sector's projects can be funded. It is expected that in the future the Innovation Fund will explicitly mention the waterborne transport sector as one of the sectors eligible for funding.

The co-funding rate is up to 60% of the additional capital and operational costs of large-scale projects (over €7.5 million contribution) up to 10 years, and up to 60% of the capital costs of small-scale projects (between €2.5 and €7.5 million contribution). There is no earmarked budget for waterborne transport, consequently the amount of funding for the sector will depend not just on the descriptions of each set of calls, but also on the quality of applications. A more conservative estimate puts the funding that the sector will access in the region of dozens of millions of Euros, but it should be possible to go well over the €100 mil mark given the size of the fund, its duration (up to 2030) and the interest manifested by the waterborne transport stakeholders in these opportunities.

The Connecting Europe Facility (CEF)

Just as in the case of the RRF, the relevant funding within CEF depends on the interests of the Member-States and the approved projects. This funding is normally for companies and authorities, and focuses on market-level investments. Nevertheless, CEF can also fund slightly lower TRLs, such as the first-of-a-kind innovative deployments, helping them reach market level.

Given the size of the overall CEF funding and the waterborne-related components that need to be funded through this programme, it is safe to assume that the allocations will be in the region of hundreds of millions of euros, if not over €1 billion.

The Interreg Programme

This programme has a smaller and more fragmented budget among dozens of regional Interreg programmes, plus a small general programme for the entire Union. Consequently, it has lower-level of EU funding, rarely exceeding contributions of over €2 million per project. Interreg activities can sometimes cover high TRLs, but the nature of these projects is less TRL-focused. The projects are generally restricted to entities within the region covered by the respective Interreg programme, consequently the rule ‘minimum 3 partners from 3 different countries’ is not applicable; however, Interreg does not fund projects with organisations only from the same country.

Though there is no dedicated part of Interreg for waterborne at the entire programme level, some regions are comprising large riverine or sea basins, consequently funding for waterborne-related projects exists. The breadth of opportunities increases in case the ‘blue growth’ or other wider waterborne topics are considered.

Interreg is not particularly relevant for bigger companies, being directed to SMEs, authorities, research-oriented entities, and other non-profit organisations. The overall funding that can be accessed by the waterborne sector can be anywhere from tens of millions of euros to well over €100 million, depending on both the call topics from these Interreg programmes and the applications from stakeholders.

EU-Backed Financing Options

Finally, InvestEU and EIB offer interesting funding possibilities for both RD&I and roll-out of products and services, though the funding will be more readily available for the latter type of investments. Their focus are companies, especially SMEs, unicorns, start-ups, etc. However, they can also fund other types of stakeholders. There is no dedicated waterborne transport funding here, and it is up to the stakeholders to present the products and business cases that can be supported through these funding sources. Consequently, the potentially accessible funding can vary anywhere between tens of millions (conservative figure), over €100 million (realistic figure) and over €1 billion (a very optimistic estimate) throughout this MFF.

2.4.1 Recapitulation of EU-Funding Opportunities and Barriers to Participation

Thus, the funding sources identified cover both low- and high-TRL levels, most of them have a high co-financing rate (between 70% - 100%) and are accessible to both public and private stakeholders. Some of these financing sources have dedicated subprogrammes, lines, etc. for certain types of stakeholders, in particular SMEs and public authorities, followed by research organisations. There is also a trend to offer more and more support to high-TRL projects, from both the 'traditional' programmes (e.g. Horizon, LIFE, Interreg) and the newer ones (e.g. Innovation Fund and InvestEU). Some of the latter have in fact been created specifically for the purpose of covering the so-called 'valley of death' in which many high TRL developments are stuck and cannot be progressed to market roll-out.

Moreover, while there is still room for improvement, **the current programmes cover by and large all the types of waterborne (transport) stakeholders and their RD&I needs.** It is now up to the sector representatives, including this project, to disseminate this information in a timely and easy to understand manner, so that the aforementioned information gaps are covered, and the innovation needs will be met.

Complemented by outcomes from the questionnaire and interviews, the desk research also resulted in identification of barriers experienced by the waterborne transport sector to engaging in RD&I activities in Europe, and recommendations of measures on how to overcome these barriers. Overall, providing customised information will lower the threshold and make access to support mechanisms easier, leading to more companies engaging to participate in research activities in the future.

In addition to what has been collected in the consultation on best practices of Research Management systems, the **phase** of the project lifecycle is deemed important as a first step for those actors in search of the right funding instruments. A how-to wiki and/or an application wizard which takes this as a starting point will significantly lower the threshold for potential project funding applicants. Entering the project phase of a project proposal as a Quick Scan can filter the number of available funding schemes, showing only the most relevant one(s). By proving this type of guidance one can avoid the situation where companies or other actors run into bottlenecks such as a mismatch with innovation topics. It can also reduce the pressure on internal resources for main actors while scanning for funding opportunities. Two other filter options that will provide useful in such a Quick Scan-wizard are: **co-funding rate** and **TRL level** of the envisaged project proposal.

Other than receiving reliable information on the availability of relevant funding, ensuring an adequate visibility and comprehensive awareness amongst all stakeholders involved is a vital element to raise participation. This means that targeted promotion activities, be it at EU, regional or national level, are of importance.

Lastly, there is a strong need for improved partner search services to improve the opportunities for participation in EU innovation and research programmes. There is currently an opportunity for partner search facilitated by the EC website. However, it is currently not possible to gain insights into the expertise of potential partners. There is no in-depth profile and expertise areas available of organisations. It should for example be possible to search for keywords as "software developer" which should result in a list of relevant organisations. Thus, it should not be the case that one can only search for organisations who are interested in a specific call. But one should also be able to search for organisations with specific expertise in certain areas.

In addition, brokerage events organised by the EC can supplement an extended online partner search tool. During brokerage events organisations can exchange information with each other, i.e. an energy supplier could explain the possibilities in a certain sector given specific call topics.

3. Handbook on Implementing Tools

This chapter provides a step-by-step example on establishing monitoring tools and opportunities for participation in research. First, an explanation of how some of the existing tools can be improved is presented, constituting more easily implementable fixes relative to implementing a new tool altogether. Next, two scenarios are presented for the establishment of new tools: an extensive version and a light version. For the extensive scenario, a blueprint for future extensive monitoring tools is presented in a first step, before a proposal on the establishment of the future tool is then elaborated. Following the explanation of the extensive version, the concept for a light version of the tool is then outlined and explained.

3.1 Improving Public Data Sources

To better be able to satisfy the need for information on waterborne RD&I project results, some of the most valuable top-down databases as described in D1.2 would ideally reveal some extra information per project.

While administration of these public databases is well beyond the scope of the LASTING project, the project's recommendations and findings, which reflect the views of a broad group of stakeholders of the waterborne transport sector, are worthwhile to be communicated to parties responsible for the three main public databases: CORDIS, TRIMIS and DATA EUROPE.

Step 1: recommend the inclusion of additional database fields on e.g. TRL level, to database owners of CORDIS, TRIMIS and DATA EUROPE in name of LASTING.

3.2 Blueprint for Future Monitoring Tools – Extensive Scenario

A blueprint for an extensive future tool would consist of the following main items:

- A front-end or user interface, which is visually attractive, easy to navigate and thematically organized. Inputs gathered from the consultation of information gaps concerning innovation needs have resulted in a clear set of relevant themes: zero emission, sustainable fuels, digital green, sustainable ports, shore side electricity, and automation of waterborne assets and operations.
- A back-end or administrator panel, where information can be maintained. For harmonization purposes, this will require agreement on types of data to be used. The type of data is what is called fields, the data itself are entries. Here inputs from the analysis of research management systems are useful.

3.2.1 Front-end: Upgrading the EIBIP User Interface

Following the example of the EIBIP Innovation Radar and Funding Database, an impression of the front-end user interface can be visualized. **Fout! Verwijzingsbron niet gevonden.** shows an visual example of what can be the first impression experienced by a sector stakeholder with a future monitoring tool (screenshot is static but the landing page is animated in the live-action setting).

Figure 2 EIBIP user front-end interaction design

The impression has been tailored to the specific needs of the inland waterway transport sector in the period 2016-2018. However, the graphical design as well as the typology of the labels can be upgraded to serve the needs identified by LASTING for the entire waterborne RD&I transport sector and its actors throughout the value chain. That would mean the graphic has to be extended to incorporate also for instance shipbuilders, ferries, and seagoing logistic operators.

Step 2 (Extensive scenario): organize a use case session with front-end developers to suggest action points to expand and further upgrade the EIBIP front-end of the monitoring database according to user requirements collected in LASTING deliverables D1.1, D1.2 and D1.3.

Secondly, any front-end interface would ideally be designed according to the colour scheme and visual identity of the creative concept of the tool, ideally aligning with a recognized actor within the Waterborne community. For now, the Waterborne TP, or a LASTING based sublabel, seem most appropriate.

Step 3 (Extensive scenario): adjust the visuals and colour palette of the tool's front end in line with the Waterborne platform visual identity.

3.2.2 Back-end of the database

The back-end of the future research monitoring tool is where detailed information of projects and research participation opportunities are administered. This is also the place where administrators with assigned roles and rights take care of inputs according to a standard procedure, ensuring timely and concise information on project outcomes and funding opportunities.

Based on findings from D1.2, the requirements for future monitoring tools for waterborne transportation research and development can be derived. The recommendations identify information needs that can be addressed as required fields of the blueprint back end. To be aligned with stakeholder's recommendation and need, the future monitoring tool should at least contain the fields presented below. D1.2 can be consulted for the full typology.

- *PROJECT INFORMATION*
  - *Acronym*
  - *Title of the project*
  - *Objective*
  - *Summary*
  - *Project results*
  - *Project Website*
- *INNOVATION TOPIC filter options related to the identified thematic innovation needs such as:*
  - *Digital green*
  - *Sustainable fuels*
  - *Sustainable ports*
  - *Shore side electrification*
  - *Automation of waterborne assets and operations*
- *CONSORTIUM INFORMATION*
  - *Coordinator contact details*
  - *Coordinator country*
  - *Participants and weblinks*
- *FUNDING SCHEME AND TOPIC REFERENCES PER PROGRAM*
  - *Framework programme*
  - *Specific Programme*
  - *Funding Scheme*
  - *Call*
  - *Topics*
- *MATURITY LEVEL / TRL*
- *COMMUNICATION DETAILS*
- *TRANSPORT SEGMENT*

- *DURATION*
    - *Start Date*
- *END DATE*

This list of required fields is useful while establishing the **terms of reference** for an upgraded version of the EIBIP-based back end of the future monitoring tool, or any other such tool for the sector. Together with the thematic labels, tags and user categories these are the so-called 'building blocks' of the database. For opportunities for participation a modified template can be used with additional information such as deadline of calls.

Step 4 (Extensive scenario): organize a briefing for the web development team on terms of reference for back-end database requirements, building upon the EIBIP framework.

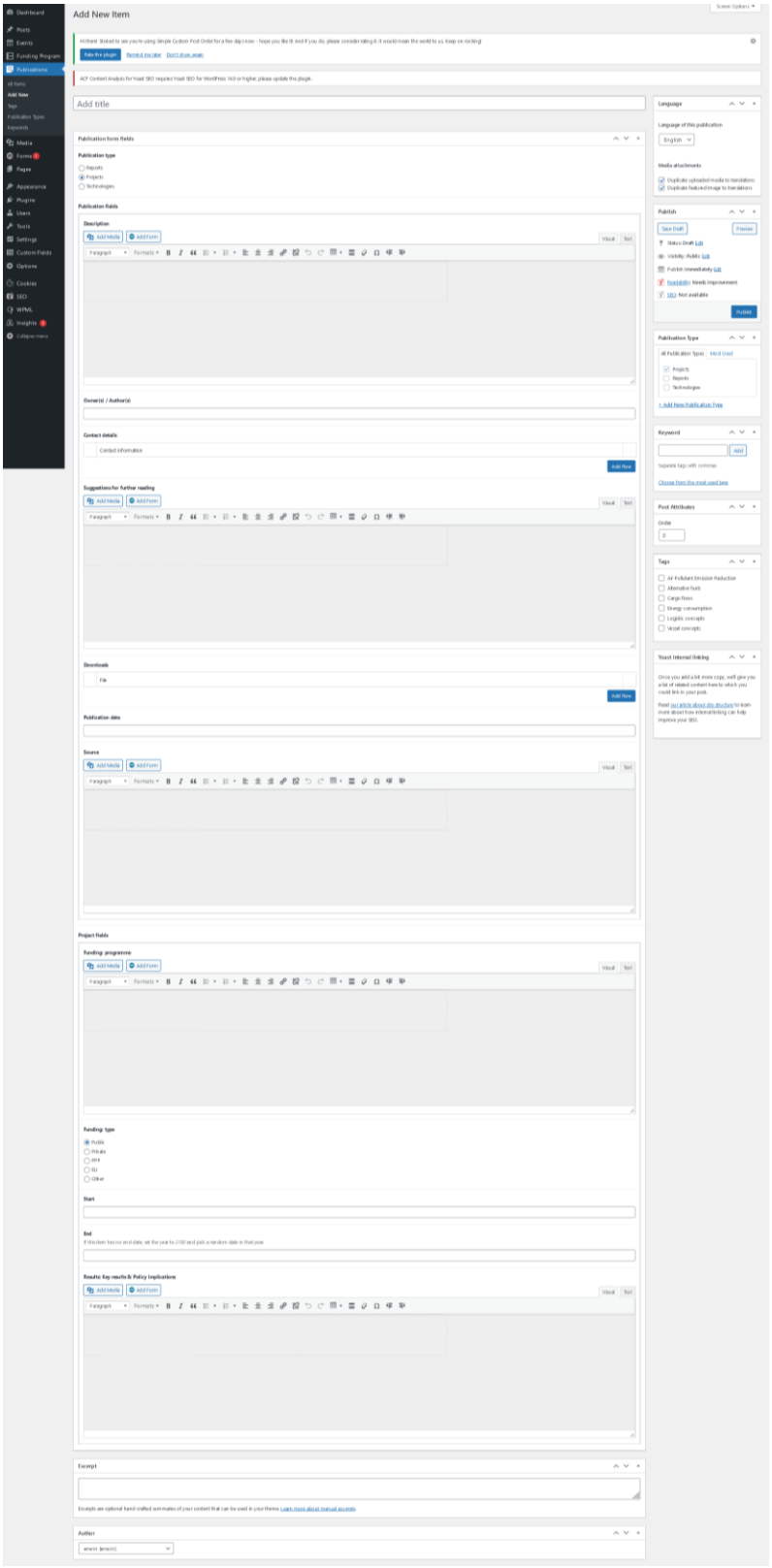

Figure 3 Example of current EIBIP back-end fields: Title, publication type (Report, Project, Technology), Description, Owner(s), Suggestion for further reading, Download links, Publication date, Source. Project fields: funding programme, funding type, Key results, Policy implications, Excerpt, Author.

As for the main (research) funding and financial programmes and instruments that need to be adopted in the future monitoring tool on research participation, the main sources and programmes are identified as follows:

- Horizon Europe
- The LIFE programme
- The Recovery and Resilience Facility (RRF)
- The Innovation Fund
- Connecting Europe Facility (CEF)
- Interreg
- InvestEU
- EIB

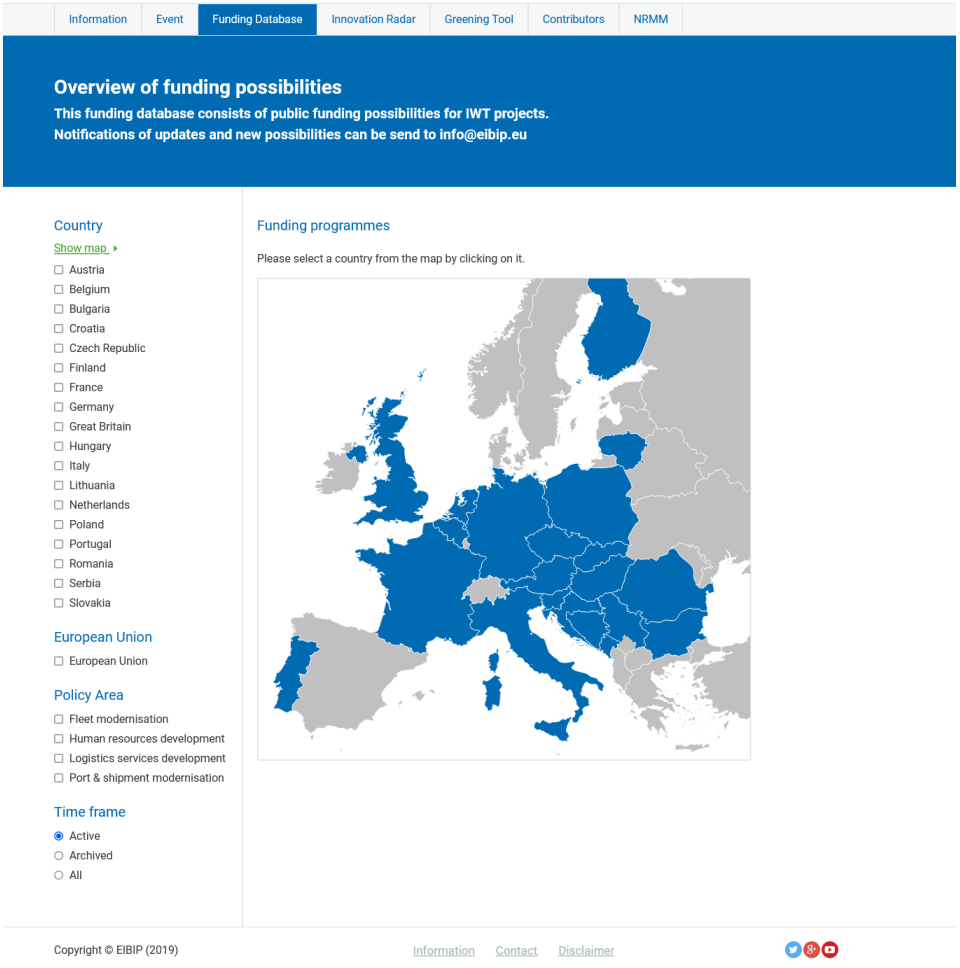

Figure 4 Front end user interface of EIBIP regarding research participation opportunities and funding schemes per country.

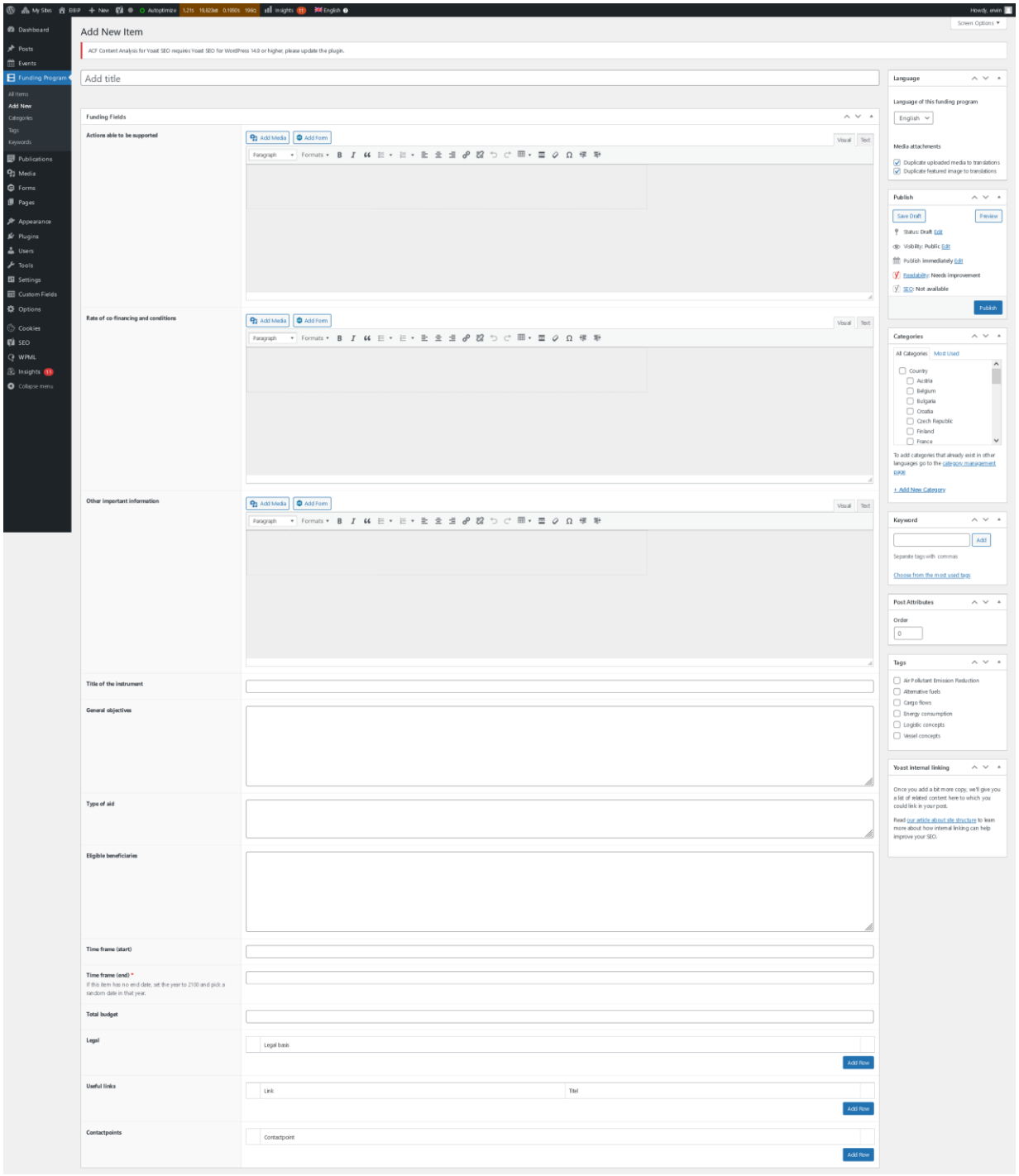

Figure 5 EIBIP funding database back-end: Title, Actions able to be supported, Rate of co-financing and conditions, Other important information, Title of the instrument, General objectives, Type of aid, eligible beneficiaries, time frame, total budget, legal, useful links, contact points, excerpt, author.

3.2.3 Additional requirements

The monitoring tool will be part of a broader communication campaign. Static facts and information on RD&I projects outcomes and opportunities for participation can be accompanied by proactive and dynamic communication items such as video updates, infographics, expert guest contributions,

dedicated events, columns and a regular trend analyses update. This, together with an event calendar, will significantly enrich the tool and the overall project approach as the go-to source for information. A mix with social media channels and easy to use share and like buttons will help in creating visibility. Ideally, the offline and online content and dissemination campaigns will reinforce each other, helping to achieve the LASTING goals for the benefit of the sector.

Step 5 (Extensive scenario): ensure the future tool forms an integral part of the communication mix by including as core anchor of linking and referencing.

3.3 Proposal on the Establishment of the Future tool – Extensive Scenario

This chapter highlights some important aspects that will need consideration of the consortium members and are to be decided later in the project.

3.3.1 Roles and procedures

The future tool will need to be embedded, that is: brought into a web environment where it can be maintained. EIBIP was built in the open-source content management system platform WordPress and one party has to be responsible for hosting such a content management system.

Step 6 (Extensive scenario): decide on who is assigned the task of embedding the tool and designate the main administrator (so-called superadmin).

The superadmin is responsible for appointing contributors. This group consists of specialists who are able to convert primary sources (project database, funding schemes) into the content management system.

Every contributor is assigned a specific scope (covering specific themes and/or financing schemes) and sends a notification to the superadmin if and when a contribution to the tool has been completed in draft form. The superadmin will run a check on the draft and be the final responsible for the publication of the content. In case the information will be provided in multiple languages, the superadmin is also responsible for translations.

Step 7 (Extensive scenario): Superadmin appoints contributors and grants contributing rights to the database.

3.4 Proposal on the Establishment of the Future Tool – Light Scenario

The previous sections have explored the blueprint and the proposal for an extensive variant of the future tool. In an alternative scenario, a light version of a 'tool' that requires fewer resources can also be envisioned to be set up.

The purpose of the light scenario is to draw on existing project databases and develop inspirational stories based on representative groups of projects to show the diversity and wide spectrum of European RD&I programmes, which serve to illustrate the multitude of opportunities on offer for various organisations and types of innovations. The overall objective of such inspirational storylines is to raise and generate interest among the broader waterborne transport sector for RD&I in EU programmes and increase participation in the latter. Storylines can be developed by drawing on a project database tool (this can be the LASTING project database or other existing databases), which is updated regularly, and allows for the continued creation of new inspirational storylines over time.

For the purpose of this document and based on the LASTING project database developed for deliverables 1.1-1.3, a first selection has been made of six diverse sets of projects – with the focus on the FP7, H2020 and Interreg programmes – on the basis of which a first set of inspirational storylines could be drafted. The selected sets can be found in Annex II (on pp. 41 et seq.).

The listed projects in the various funding programmes are just a few of the completed and ongoing projects. Naturally, there are many other (types of) projects and EU RD&I programmes that can be included in the inspirational storylines.[5] Of relevance in the selection in Annex II is that it represents a balanced and representative sample of the wide spectrum of projects – from small-scale to large-scale, low TRL as well as high TRL, etc. – innovation topics and segments of the waterborne transport sector. The represented innovation areas in the selection range across biofuels, wind assisted propulsion, social innovation, port area innovation, and innovations characterized by region – the Danube region as example – rather than an innovation field. In line with the latter's focus, projects from other programmes such as CEF, and other INTERREG programmes than the ones selected below, should also be considered for inclusion in future storylines.

Step 2 (Light scenario)[6]: select set of projects from an existing project database, agree on a set of projects, and draft as well as disseminate the inspirational storylines.

[5] Some examples of other projects than the ones listed in Annex II are PROMINENT, NOVIMAR, Green Ports, H2ships, PIONEERS, MAGPIE and AUTOSHIP.
[6] Step 1 under subchapter 3.1, cf. p. 26, remains applicable, hence the step at hand is step number 2.

4. Conclusions

This document, deliverable '1.4 Gap Analysis Recommendations', is the final and concluding part of the work on 'Information Gap Analysis and Recommendations'.

The main findings from the gap analysis are presented in chapter 2 of the deliverable. These concern the gaps on innovation needs, research management systems and opportunities for participation in EU RD&I waterborne projects.

Information gaps concerning innovation needs in the waterborne transport sector are identified for the four main actor groups in the sector, being transport operators, technology suppliers, public bodies and research bodies. In terms of innovation needs, the topics digital green, sustainable fuels, and sustainable ports were some of the most relevant themes mentioned by all stakeholders.

EU RD&I programs are partly designed to meet these innovation needs. However, three main problems are identified by all stakeholders. These are the mismatch in scope of EU RD&I funding programmes and the interest or fields of expertise of the organization, financial unattractiveness of projects under the funding programmes, and a mismatch between the TRL levels in EU funding programmes and the interests of the different actor groups.

While these problems are partly stemming from the improvements that the EU funding programmes need, they also show where the information gaps appear among the stakeholders. There is a need to better inform the different actor groups in the waterborne transport sector about suited and especially the new funding opportunities (e.g. Horizon Europe) for RD&I at the European level. The ZEWT partnership is also essential as it is 'the tool' where, through their involvement, the waterborne transport stakeholders can help shape many of the HE calls dedicated to their sector.

The findings about Research Management Systems illustrated that internal systems are not widely implemented amongst the main actor groups. A central database could provide helpful although findings stress the necessity of drafting standards to structurally monitor RD&I activities and outcomes, ensuring the information flow to sector stakeholders is backed by strong procedures. Existing European tools such as CORDIS, TRIMIS and DATA EUROPE are not able to serve the waterborne transport sector needs in terms of accessibility, information relevance and filtering options, and are not optimized to meet the sector's needs concerning the highlighting and summarising of findings. Based on the analysis of the questionnaire and interview results, the main characteristics that a Research Management System tool should contain could be established, with one of the preeminent features being that such a tool should be easy to use, transparent, simple and easy to search. The flexibility of the solutions must give adequate consideration to these criteria. Five other main characteristics are listed in chapter 2.

As regards opportunities for participation in EU RD&I waterborne projects, there is a wealth of EU funding sources to cater for the various needs of the waterborne transport stakeholders and the wider waterborne community. Barriers are identified that are experienced by the waterborne transport

sector to engaging in RD&I activities in Europe, and recommendations of measures on how to overcome these barriers. Overall, providing customised information will lower the threshold and make access to support mechanisms easier, leading to more companies engaging to participate in research activities in the future.

The phase of the project lifecycle is deemed important as a first step for those actors in search of the right funding instruments. A how-to wiki and/or an application wizard which takes this as a starting point will significantly lower the threshold for potential project funding applicants. Other than receiving reliable information on the availability of relevant funding, ensuring a proper visibility amongst all stakeholders involved is a vital element to raise participation. This means that targeted promotion activities, be it at EU, regional or national level, is of importance. Last, there is a strong need for improved partner search services to improve the opportunities for participation in EU innovation and research programmes. Brokerage events organised by the EC can supplement an extended online partner search tool.

Following these main findings of the gap analysis, Chapter 3 provides a handbook on tools and recommendations to fill the gaps as regards innovation needs, to implement monitoring tools and increase opportunities for participation in EU RD&I waterborne projects.

The handbook presents a practical step-by-step approach. A first step is to improve the public data sources CORDIS, TRIMIS and DATA EUROPE. This can be seen as low-hanging fruit. Subsequent steps are divided into two scenarios, a so-called extensive scenario containing a blueprint for future monitoring tools to be reached following a 6-step approach. The blueprint contains recommendations for both the front-end and back-end of the tool, as well as additional requirements, roles and procedures. A so-called light scenario contains a proposal for the establishment of a future tool that can be set up requiring fewer resources. The purpose of the light scenario is to develop inspirational stories based on representative groups of projects to highlight the diversity and broad range of European RD&I programmes, illustrating the multitude of opportunities for various organisations and types of innovations.

Both scenarios aim to develop or contribute to a future tool to fill the gaps that have been analysed in the first three deliverables as regards innovation needs, research management systems and opportunities for participation in EU RD&I waterborne projects.

The findings and recommendations in this deliverable will be taken up in the Communication strategy and stakeholder engagement and the Communications Campaign of the project.

5. Outlook – Recommendations for Upcoming Actions

Recommendations for the LASTING Communication Strategy

It is crucial that the planning of the communication activities takes into account the information gaps that each stakeholder category has, and the ways in which they can be bridged by the project. Specific attention needs to be given to disseminating the information regarding the different funding programmes and their opportunities, to both the waterborne transport community at large and to targeted segments of it. The strategy needs to determine which category/categories need to be addressed in which circumstances, with which messages, how often, etc. It can also be the case that the information gathered so far needs to be further refined and updated, in order to reflect significant changes in the RD&I funding landscape.

The (online) future monitoring tool repository as such will need to be strongly interlinked with the (offline and social media) LASTING promotion campaign that will be conducted.

It is therefore recommended that the monitoring tool shall be an integral part of the creative concept (deliverable 2.2) to be developed by the project, as to integrate the future monitoring tool into something hybrid.

Recommendations for the LASTING Communication Campaign

Establishing good communication channels (e.g. regular updates) from the contributors of the monitoring tools to the communication team can provide for quality content for infographics, quotes and/or other visually attractive activities.

The campaign will need to make sure that the more general planning prepared in the strategy is implemented in a proper an timely manner, and that it is flexible enough to adapt to specific conditions and requirements. Messages, tools, materials, etc. need to be fine-tuned so that they can be used both for specific messages to specific stakeholders – e.g. an Innovation Fund call for waterborne transport companies – and for wider segments of stakeholders.

Each type of communication channel or opportunity (e.g. event) should have a dedicated preparation, so that the maximum of stakeholders is reached with the greatest possible number of messages and information pieces.

Annex I – interviewed organisations

Interviews have been conducted with the following organisations for the analysis in deliverables 1.1-1.3:

Transport operators
Danser Group
Fluvius Schifffahrts und Speditions
Grimaldi
Inland shipping cooperative NPRC
Royal Association of Netherlands Shipowners
Royal Belgium Shipowners association
Transport Trade Services

Public/ports/classification bodies
Bureau Veritas

Central Commission for the Navigation of the Rhine (CCNR)
Det Norske Veritas (DNV)

European Commission
Fundación Valenciaport

Hungarian Federation of Danube Ports / Centroport / Plimsoll
Port of Amsterdam

Port of Valencia
Swedish Maritime Administration

Technology suppliers
Asea Brown Boveri (ABB)
Corvus Energy
Fincantieri
Ship Design Group
Wärtsilä

Research bodies
Expertise and Innovation Centre inland Barging (EICB)
Fraunhofer

Logistikum - Department of Logistics at the University of Applied Sciences Upper Austria
MARIN
National Research Council (Consiglio Nazionale delle Ricerche, CNR)
SINTEF

the Netherlands Organisation for applied scientific research (TNO)

Annex II – Selected Projects for Storylines

Annex II contains a first selection of six diverse sets of projects, on the basis of which a first set of inspirational storylines could be drawn up. The listed projects are just a few examples of completed and ongoing projects in the FP7, H2020 and Interreg programmes. Naturally, there are many other (types of) projects and EU RD&I programmes that can be included in the inspirational storylines. Of relevance in the selection at hand is that it represents a balanced and representative sample of the wide spectrum of projects – from small-scale to large-scale, low TRL as well as high TRL, etc. – innovation topics and segments of the waterborne transport sector. The represented innovation areas in the selection below range across biofuels, wind assisted propulsion, social innovation, port area innovation, and innovations characterized by region – the Danube region as example – rather than an innovation field. In line with the latter's focus, projects from other programmes such as CEF, and other INTERREG programmes than the ones selected below, should also be considered for inclusion in future storylines.

1. Five H2020 projects focusing on biofuels:
   - BioSFerA
     - Objective in short: the development of cost-effective interdisciplinary technology to produce sustainable fuels.
   - Bac-To-Fuel
     - Objective in short: validating a disruptive prototype system which is able to transform CO2/H2 into added-value products.
   - Echaea
     - Objective in short: upscaling a validated biological methanation technology in industrial prototypes that turn CO2 into e-methane.
   - GLAMOUR
     - Objective in short: design, scale-up and validation of an integrated process that converts the waste bio-based feedstock such as crude glycerol into aviation and marine diesel fuels
   - LIGNOFLAG
     - Objective in short: demonstrates an integrated and whole value chain oriented approach to drive forth the bio-based production of ethanol as sustainable transport fuel or chemical building block.

Three of the projects (1st, 2nd and 3rd) are Research and Innovation Action projects, whereas the fourth concerns a project that made use of the SME instrument and the last one concerns an Innovation Action project. This already shows the diversity in the nature of the project for a single topic as biofuels in the H2020 programme. The TRL is also quite diverse ranging from 5 to 7. There is also a large variety in the size of the project consortia, the SME project has only one participant whereas the consortia of the first project consists of 11 participants.

2. Three H2020 projects focusing on wind assisted propulsion:

- SeagateSail
    - Objective in short: a feasibility assessment to the development of the industrial chain to set-up and validate the scale-up production of the Seagate Sail. An innovative collapsible-automatic-retrofittable delta wing sail that can be applied to commercial vessels that will convert the driving force into fuel saving, by proportionally reducing the engine power.
- RotorDEMO
    - Objective in short: implementation of Norsepower Rotor Sail Solution in full scale on a RoPax vessel to boost sales of the solution, which offers auxiliary wind propulsion for freight vessels enhancing energy efficiency and reducing emissions and pollution.
- LEWIATH
    - Objective in short: finalising engineering and market study to innoative wind-based technology inspired by aeronautics that combines reversible rigs, telescopic and free-rotating masts and wing-sail automation.

All three projects made use of the SME instrument and herewith also show the opportunity for SME's. The first and third projects had a relatively short project duration, respectively 6 and 3 months, whereas the second project had a duration of 2 years. The TRL level ranged between 7 and 8. The mentioned projects had either one or two participants.

3. Three FP7 projects focusing on social innovation:
    - EU-PORTRAITS
        - Objective in short: facilitating the implementation of broad & open dialog with the social stakeholders for the establishment of a mutually recognizable framework on the training of port workers in different fields of port activity.
    - EUROVIP
        - Objective in short: co-ordinate European maritime SMEs, associations, larger companies, and research institutions to promote the application of research results and innovative technologies in SMEs, by service, technology and information (STI) transfer in terms of operational and technical collaboration support.
    - KNOW-ME
        - Objective in short: engendering a modern 'image of shipping' which attracts young people to maritime careers at sea and ashore and instils an awareness of the industry as a driver of EU development and an attractive employer.

The first two projects concern coordination actions whereas the third concerns a collaborative project. These projects illustrate the possibilities within European RD&I programmes for also social/non-technological projects focussing on education, jobs and the exchange and transfer of know-how to SME's. All three projects were led by universities/research institutes consisting of fairly large consortia consisting of 8 up to 21 project participants and with a duration of 30 up to 40 months.

4. Four H2020 projects focusing on innovations in the port area:
   - SafeShore
     - Objective in short: to cover existing gaps in coastal border surveillance, increasing internal security by preventing cross-border crime such trafficking in human beings and the smuggling of drugs. It is designed to be integrated with existing systems and create a continuous detection line along the border.
   - SafePort
     - Objective in short: upscaling and deployment of a technology for providing port managers with the most complete and reliable decision tools to manage the operations of the vessels and increasing safety in the port area.
   - LoCOPS
     - Objective in short: demonstrating and further commercializing a competitive Onshore Power Supply (OPS), to provide electricity for large sea-going vessels when at quayside in port. The OPS system not only reduces the consumption of fuel and the associated air pollution but also eliminates acoustic noise and vibrations from the running engines.
   - COFASTRANS
     - Objective in short: the design of an integrated intermodal system ideally suited for fast loading/unloading of the new Ultra Large Container Vessels and the subsequent fast terminal stowage of the containers.

The four projects show that a variety of types of projects are carried out in the port area focusing on safety, sustainability, and efficiency. The first project concerns a research and innovation action (RIA) with a large consortium of 12 participants, whereas the latter three projects fit into the SME instrument and consist of 1 project participant only. The TRL levels range from 6 for the RIA to 7 and 8 for the SME projects.

5. Four H2020 projects focusing on blue growth:
   - CEFOW
     - Objective in short: increase the speed of wave power development, decrease the levelized cost of ocean energy by improving technical solutions used for multiple device system, and create an efficient supply chain to support larger wave power projects in the future.
   - EKKO
     - Objective in short: further developing and upscaling more advanced, efficient and sea ecology friendly fishing trawl doors. Due to its superior engineering design and airplane wing shape, the trawl doors never touch the seabed, are multi-function, consume less fuel, decrease weight on board, lessens handling time and maintenance cost besides protecting the marine environment and increase profitability and economic growth of our seas.
   - Space at Sea

- Objective in short: to develop multi-use platforms with the objective to develop safe and cost efficient deck space at sea, due to increasing need for sustainable food and renewable energy from the ocean as a result of to increasing population and scarce usable space on land

- TechOceanS
  - Objective in short: produce and demonstrate in multiple underwater vehicles, 9 new technologies enabling a step change in ocean biology, chemistry and plastic observation.

The four projects illustrate a diverse set of projects in the field of Blue Growth, a topic related to support sustainable growth in the marine and maritime sectors as a whole, which endorses the importance of the seas and oceans as drivers for the European economy with potential for innovation and growth. In these example project topics focus on both ways to retrieve energy from waves, to innovative fishing techniques and ways to make use of available space at sea and techniques to observe ocean biology, chemistry and plastic underwater. The second project concerns a SME project with one project participant, whereas the others concern Innovation Actions consisting of large consortia ranging between 10 and 17 project partners. The Space at Sea project has a low TRL level of 4 whereas the TRL for the other three projects range between 7 (IA projects) and 8 (SME project).

6. Six Interreg (Danube transnational programme) projects focusing on many aspects of waterborne transport in the Danube region:
   - DANTE
     - Objective in short: DANTE aimed at identifying and eliminating the administrative barriers for inland waterway transport (IWT) on the Danube & its navigable tributaries as a joint initiative of the private sector and the national public authorities responsible for these barriers. The project partners developed good practices and guidelines for effective administration of IWT activities in relation to the identified barriers.
   - DAPhNE
     - Objective in short: DAPhNE aimed to facilitate a balanced development of Danube Ports as eco-friendly, well accessible multimodal hubs for the transport system of the region and to turn Danube Ports into buzzing economic centres functioning as catalysts for economic growth and creation of high value jobs. The project established a well-managed and permanent working platform (“Danube Ports Network”) which tackled the most urgent insufficiencies with the help of guidelines, recommendations and concrete pilot activities based on best practices and leading into an overall development strategy and action plan.
   - GRENDEL
     - Objective in short: The project aimed to support the Danube vessels operators and their public counterparts in ecological and economic modernisation of the inland navigation sector and in definition and deployment of necessary transition measures. Dedicated activities raised the awareness of the Danube fleet operators

& sector concerning the impact of new regulations, advanced technologies which reduce air pollutants & energy consumption of inland vessels as well as improved transport & logistics management processes making use of digitalisation. On the other side, GRENDEL supported ministries and public authorities in elaborating public support measures (State Aid schemes) based on investment priorities of relevant Danube inland waterway fleet operators.

- Danube Skills
  - Objective in short: The project addressed on one hand (i) the lack of transparency and knowledge on how to integrate green Danube Navigation into sustainable transport solutions. Increased institutional and organisational capacity will help equip public service providers with a critical mass of information and support to understand (=mind shift) and use (=modal shift) Danube transport and help them to jointly respond to common challenges as well as on the other hand (ii) the shortage of qualified personnel on-board inland vessels and the fragmented legal framework governing skills and qualifications in the Danube inland transport sector that is hindering the recognition of qualifications and mobility of work force.
- Green Danube
  - Objective in short: Green Danube addresses major challenges in the Danube transport system and provides practical solutions to be used in subsequent emission reduction strategy and for further development of safer and low emission IWT as well as for the implementation of innovative green technologies. The project focused on emission reductions from IWT in particular in ecologically sensitive areas such as the Danube Delta. The project aimed to contribute to better integrated policies and practical solutions for further development of IWT while limiting its negative impacts on the Danube ecosystem.
- Dionysus
  - Objective in short: The project's overarching goal is to facilitate the integration of DR ports into multimodal and intermodal freight and passenger transport systems. To this end, a growing consensus recognizes the need for a smart and sustainable Danube port development planning together with an overall national transport infrastructure planning and regional economic development plans. The project will carry out a multi-layered assessment (the infrastructure layer, the transport market layer and the logistics & port services layer) across different levels of infrastructure planning and governance (local, national and regional) in line with Danube Inland Waterway Transport (IWT) market, trade (volume and structure) considerations and realities, with a particular focus on Danube port-related infrastructure needs. Ports digitalisation capabilities are assessed at the corridor level and dedicated measures are proposed.

The Interreg Danube Transnational projects mentioned above are in general "soft" projects – mostly comprising of studies (such as market analyses, status-quo analyses, prefeasibility studies), complemented on a case by case basis by real life applications such as emissions measurements,

development of know-how transfer digital centers, development of a barrier reporting tool, port community system module applications as well as proposal of policy recommendations and dedicated measures. The six projects show the variety of types of projects carried within the context of a specific geographic and regional focus, exemplifying that within the focus on one waterway (the Danube in this case), projects range from green technologies, over infrastructure development & integration of ports, digitalisation, all the way to education & training and identification and elimination of the administrative barriers. Consortia have between 10 to 15 partners, including both public and private entities. In terms of budget size, this ranges usually between 1 – 2 mil Euro, benefitting from a funding rate of 85%. In case of the projects including dedicated applications, these have a TRL level of 7-8 (e.g. DAPhNE – for the PCS modules, Green Danube – for the know-how transfer centers, DANTE – barrier reporting tool).