The European Vessels for the Future Initiative

EXECUTIVE SUMMARY

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- **Vision 2050:**
  By 2050 Europeans will be using their maritime and inland waterways space for transport; offshore food production, energy generation and mineral exploitation; an alternative to urban dwelling; tourism; manufacturing; and trade.

  The increased use of this maritime space will need to ensure that it is well organised, safe, and secure and see an evolution of the traditional maritime industry to adapt to the changing environment in which it finds itself.

  The challenges such an evolution could encounter are the need for drastic emissions reductions; meeting safety requirements with the advent of new technologies and operations; training highly specialized manufacturing and operating personnel in order to use these products and provide services in this evolved and competitive waterborne environment.

- **The Context:**
  Energy efficiency and safety of vessels (seagoing, inland navigation) and platforms have been identified by the industry and policy makers as decisive focal points for meeting political targets set and supporting the drive for a sustainable European transport system.

  European waterborne technologies and services are a crucial component for '*Europe 2020*' to succeed. The policy's priorities of developing an economy based on knowledge and innovation *(smart growth)* and promoting a resource efficient, greener and more competitive economy *(sustainable growth)* provide a perfect match for the opportunities to be found in the waterborne field. This also reflects the guidelines set out in the '*Limassol declaration*[1] *on a marine and maritime agenda on growth and jobs*'.

  The European Commission's Transport White Paper launched in 2011 has as its central aim the need to deliver a competitive and resource efficient transport system for Europe. This will allow for a cut in emissions and place an ever greater emphasis on safety considerations. There is a number of European and international objectives which focus on the challenges of increasing efficiency of vessels and safety which could address: reduction of emissions, prevention of climate change, maintaining energy security, increased use of renewable energies, and meeting rigorous safety standards. 'VESSELS for the FUTURE' (the initiative) will meet the European policies of Transport, Enterprise, Energy, Environment and Climate Protection.

[1] https://webgate.ec.europa.eu/maritimeforum/content/3060

Given the very crosscutting nature of the initiative, advancements for the energy efficiency of vessels and safety considerations will be built on the expertise of the WATERBORNE European Technology Platform and wider maritime stakeholders.

By developing energy efficient and safe vessels (or Vessels for the future), the initiative will address the societal challenge of moving towards sustainable transport whilst at the same time maintaining the cutting edge design, manufacturing and innovative production capacities, having a positive impact on employment and the global competitiveness of the European economy.

The initiative will follow the Horizon 2020 structure which aims at using research and innovation activities for stimulating industrial leadership. Europe's foreign competitors, when looking at the maritime industry, have become very aware of the leveraging effect public funding has. They have set up large R&D support programmes for the greening of fleets; therefore the sector in Europe should not be complacent or allow the fragmentation of a forward looking research strategy developed by the industry which, consequently, would result in reduced efficiency in the field of European R&D.

In the European industry strategy (co-authored by DG Enterprise) - ***LeaderSHIP 2020*** (published on the 20th of February 2013) - the European Commission, Member States, Regions and the maritime technology industry concluded that in order to improve the global position and competiveness of the sector it is necessary to launch a major integrated initiative on breakthrough technologies.

It was proposed that the most suitable instrument to use for this purpose is a contractual Public Private Partnership as described in article 19 of the Horizon 2020 proposal. This would engage the firm commitment from both the public authorities and the private industry to support the development and implementation of a R&D strategy which is of strategic importance to the EU competitiveness and industrial leadership, which in turn addresses societal challenges.

Furthermore the 'VESSELS for the FUTURE' Initiative is characterised by a "downstream research" nature, having a large participation of European industry, research centers and academic, active throughout the waterborne value chain. Special attention should also be given by the initiative to the participation of SMEs.

- **Research and Innovation Strategy**

  The WATERBORNE transport, technology and services platform issued a Declaration in 2011 and revised its Strategic Research Agenda (WSRA) which adopts an integrated approach for addressing the European 'Grand Challenges'. The approach focuses on the three aforementioned key areas for the maritime transport cluster: (1) sustainable waterborne

transport; (2) exploitation of off-shore resources; and (3) blue seas (marine / maritime). Together, these areas provide an integrated system that serves the maritime needs of more than 80% of the European population and therefore they are of great significance to meet the strategic needs of the "Societal Challenges".

'VESSELS for the FUTURE' through its multi-stakeholder participation gathers together all the actors of maritime transport research and is therefore able to cover two of the five WSRA research domains: the ***vessels and waterborne operations***. By addressing more than one of these domains it can sufficiently deliver benefits towards the societal and economic objectives. For the 'VESSELS for the FUTURE' Initiative, the Waterborne TP will extract from its roadmaps the topics needed for the specific objective of the PPP. ***Objectives*** have been set in a 2050 perspective, for an overall efficiency and safety improvement of the waterborne transport system by 2050 compared to today, and with specific targets for each of the Waterborne TP declaration areas:

i. **The Eco-Efficient Vessel:**
   - Emissions Reduction:
     i. **CO_2 >80%**
     ii. **NOx and SOx ~ 100%**
     iii. **Noise – 10dB.**

ii. **Towards Zero Accident Vessel:**
   - Accident Risk in pre, during and post-accident phases foreseen for all vessels should see:
     i. A reduction of incidents (in a pre, during, post phase) of between **20% and 50%** (eg. Collision, grounding, damage stability etc.)
     ii. **Up to 80% reduction** in casualties in a post-accident phase

- **Links with EU Policy Objectives and a European Maritime Public Private Partnership**

Horizon 2020 has recognized that a **Smart, Green and Integrated Transport System** is to be established, in Europe, in order to tackle the Societal and Economic Challenges which are a result of global trends.

In order to achieve such a transport system, major step changes have to be seen in a plethora of different technology areas such as transport, energy, ICT, etc. With the aim of achieving such a **Smart, Green and Integrated Transport System and Mobility**, and more specifically 'Clean, efficient, safe, quiet and smart vessels', the maritime sector is well placed to realise this in terms of harnessing its economic strength and potential for major innovations. It must be remembered that more than 90% of world trade is conducted by the maritime transport system.

To be able to achieve critical mass, to deliver tangible results and to attract the required public attention, the 'VESSELS for the FUTURE' initiative of Horizon 2020 should be incorporated under this heading. It should be remembered that activities will also be undertaken, in order to meet the desired objectives, in other areas such as: secure, clean and efficient energy; innovation in small and medium enterprises; leadership in enabling and industrial technologies; resource efficiency and climate action and blue growth.

With the aim of coming up with solutions to address the societal and economic challenges and to meet the recommendations of the *LeaderSHIP 2020* initiative, a well-focused and coordinated research strategy is needed for the next 10-15 years. Given the ever changing landscape of the maritime field a proper degree of flexibility should be maintained. A close cooperation between the industry and European authorities is also favored to ensure initiative credibility and to justify the allocation of such a large *tranche* of financial investment.

Therefore the Waterborne TP and wider maritime sector favors a public private partnership approach. The aim is to accelerate research, development and demonstration of those technologies which will achieve maximum vessel efficiency and safety.

- **Scope and Priorities of a European Maritime PPP (Vessels for the Future)**

The topics which are necessary to address these two strands of focus will be given priority in the scope of the 'VESSELS for the FUTURE' PPP initiative. Required technologies will be considered at all product layers, from individual products, to systems and complete vessels.

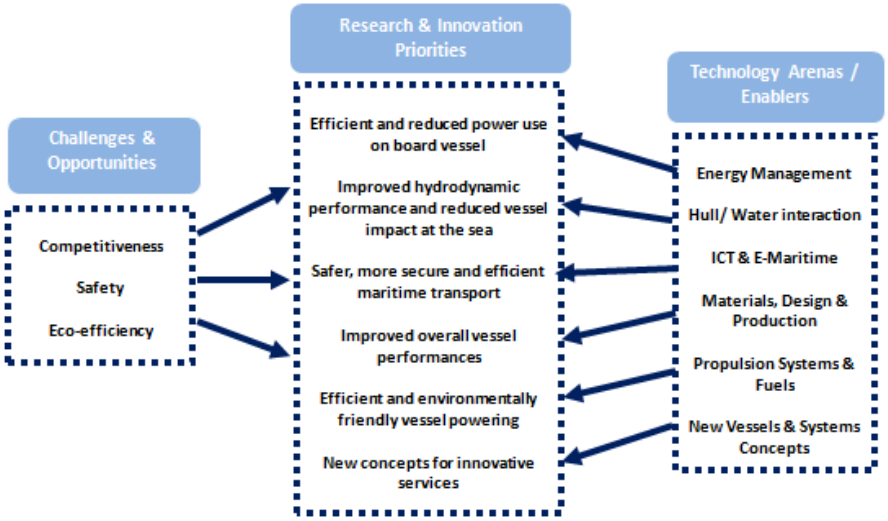
The exploitation of marine resources and the creation of land-based infrastructure are not being considered in the scope of the PPP. However the integration of vessels into the exploitation of resources and infrastructures is of great interest. Furthermore, there is no focus on one vessel type. The full range of maritime vessel is so diverse in functionality that it would not be possible to focus on one or two 'types'. This initiative will look at three main vessel groups: passenger, cargo, and complex special (e.g. dredgers, workboats, tugs, research vessels, off-shore service vessel, platforms, cable, pipe-laying systems, fishing vessels, etc.).

By addressing various 'Technology Arenas' from individual products, to the vessel as a whole, the integrated research approach will cover the entire process chain from resource application to demonstration, creation of services and ultimately to innovation. The process and the outcomes which will result thereof will be essential for the improvement of products and technologies and ultimately innovation too.

Bottlenecks in the innovation chain can be identified and fed back into research work. As a parallel action, in order to allow policy makers to meet targets and objectives policy

recommendations can be offered which will benefit the uptake of technologies, e.g. standardization requirements, etc.

The initiative intends to focus on a part of the WATERBORNE-TP Strategic Research Agenda and specifically will have its foundation under the Sustainable Waterborne Transport along the focused main domains "Vessels" and "Operations", and setting its extent to the Exploitation of Off-Shore resources and the Marine Science community only for the aspects related to "Vessels".



LeaderSHIP 2020 identified research needed in existing and emerging markets and the relative innovation challenges. Industrial competitiveness and jobs creation in existing and emerging markets can be met and strengthen if advances will be carried out in **five key maritime technologies areas:**

i. New Materials and Processes
ii. Fuels
iii. Communication and Information Technology (incl. e-maritime)
iv. Hull Water Interaction
v. Energy Management

Building on these five key maritime technology areas 'VESSELS for the FUTURE' is proposing **seven Technology Arenas (areas of focus) and Enablers** deemed to deploy a set of Key Actions to meet the objectives of the initiative; each Key Action will indeed deliver measurable scientific and technological progresses in its own area of intervention.

If proper R&D actions in those Arenas are undertaken, scientific progresses, breakthrough technologies, product's demonstration, new processes, methodologies, business models in a regulatory controlled environment, will be achieved and made available for market uptake.

TECHNOLOGY ARENA	RESEARCH and INNOVATION PRIORITIES
Pan European Vessel Demonstrator	Technology Arenas' Integrator
TA.1 Energy Management	Reduced and efficient power use on board
TA.2 Hull/Water Interaction	Improved hydrodynamic performances and a reduced vessel impact on the sea
TA.3 ICT and E-Maritime	Safer, secure and more efficient maritime transport
TA.4 Materials, Design and Production	Improved vessel and process performance
TA.5 Propulsion Systems and Fuels	Efficient and environmentally friendly powering
TA.6 New Vessels and Systems Concepts	Innovative services

Overcoming the 'valley of death' between research and deployment and up-scaling eco-efficient and safer products and vessel design onto the market requires significant technological innovations addressing a series of major challenges. Together with these innovations, 'VESSELS for the FUTURE' requests further efforts in the realm of standardization, new manufacturing requirements and cost reductions to drive the uptake onto the market. It would be proposed that throughout the 'VESSELS for the FUTURE' PPP bottlenecks and policy recommendations are identified and where necessary careful demand side measures and regulatory framework should be implemented. As a partnership, Member States, European Commission and industry are in a unique place to share their knowledge and policy tools to act as 'leverage' towards this innovation onto the market.

More than 40 demonstration activities are planned in 'VESSELS for the FUTURE' to meet the aforementioned *objectives*, e.g.:

TECHNOLOGY ARENA	EXAMPLES of DEMONSTRATION ACTIVITIES
ENERGY EFFICIENCY	Onboard energy recovery from waste (in particular for passenger vessels): process control (e.g. avoidance of runaway reaction), produced gases assessment, management and use as syngas;
HULL/WATER INTERFACE	Field application of air lubrication concepts; Field application of anti-fouling coatings for drag reduction.
ICT AND E-MARITIME	Pilot commercial application with incorporated method of route optimisation using weather forecasts.
MATERIAL, DESIGN AND PRODUCTION	Composite vessel components testing Standardisation and Yard logistics
PROPULSION SYSTEMS AND FUELS	Fuel cells powered ferry
NEW VESSELS AND SYSTEMS CONCEPTS	Offshore service vessel // Breakthrough superstructures concepts for cruise liners Daily fishing vessel //

- **Commitment of the Industry**

  The industry is ready to commit to the objectives and the strategies shared with the European policy makers. It has prepared technical roadmaps to achieve those targets, and is keen to establish annual research priorities and framework conditions for innovation based on a continuous consultation process involving all relevant stakeholders. The industry considers that a public private partnership is considered the most effective instrument to drive this process forward.

  A PPP at European level can be viewed as an action offering added value and complements national and regional actions – vessels have to be developed for international markets given the global competitive nature of the waterborne industry.

- **Why a contractual PPP?**

  i. To stimulate **industrial competitiveness** through emphasis on RDI in an integrated way and fostering cooperation between partners.
  ii. **Long term commitment** from industry and EU to meet shared objectives and deliver research results in a coherent and effective way can be ensured.
  iii. To promote and **stimulate innovation** to accelerate the uptake of technologies by deploying an integrated and dedicated program of research and **demonstration activities**.
  iv. To set-up a **collaborative research infrastructure** where public and private actors pool together their specific competences to research effective solutions to bottlenecks along the innovation chain, fulfilling business and policy objectives and promote lasting cooperation.
  v. **Transparency** in setting RDI priorities can be guaranteed for interested stakeholders if the PPP is further institutionalized given the fragmentation of the waterborne sector which includes several large competitors and many SMEs.
  vi. To guarantee **flexibility** and **coherent adaptability** of technology coverage in a fluid economic and policy environment, whilst reflecting the research outcomes of the initiative.
  vii. To tackle the specific Societal Challenges and furthering industrial leadership, a **critical mass** of research resources and relevant actors is ensured.
  viii. To foster the right environment to upscale the research outcomes on to the market by **leveraging** the necessary resources from the industry.

  Industry is committed to reaching the objectives of flagship EU policies, in particular the White Paper for Transport by delivering innovative technologies will help to reach the EU environmental targets and facilitate a modal shift to more efficient modes of transport.

The Waterborne stakeholders are ready to commit for a medium term scientific and technical program and are ready to match EU funding according to H2020 rules. Considering the scope and objectives of the 'Vessels for the Future' initiative a **total program funding of 0,40 Bn€ is necessary throughout HORIZON2020** to allow it to reach tangible outcomes.

This figure should be compared with the 5 Bn€/Year invested in RDI by the waterborne sector out of any public support scheme. From successfully demonstrated technologies to market deployment, waterborne industries are investing 2 – 3 times the R&D budget for incremental type innovation and up to 7 - 8 times for break-through innovation.

It therefore results in a **Leverage Factor** with respect to the requested level of funding which can be estimated at least around a factor of 5.

- **Expected Impacts**

  The 'VESSEL for the FUTURE' program 2014-2020 is expected to increase the knowledge in key maritime technologies and to demonstrate the transferability of this to the industry. Innovative elements and concepts should demonstrate benefit in cost vs. efficiency and cost vs. performance. The initiative will stimulate the market uptake of demonstrated solutions promoting innovation in the waterborne sector.

  By addressing the two strands of focus within 'VESSELS for the FUTURE', the eco-efficient vessels and towards zero accidents vessels, by developing new vessels, systems, components and innovative operational methodologies, will have a significant impact on the European industrial and societal landscape.

  The 'VESSELS for the FUTURE' results will significantly increase the introduction of innovative enabling waterborne technologies. They will further improve the profitability of industrial research, increasing revenue by increasing market share, yielding higher added-value product segments, allowing for more investments in longer term technological **competitiveness**. Moreover, the importance of technology leadership in waterborne key technologies is not only impacting on the competitiveness of sector, it also sustains Europe in external trade.

  Strictly connected with the above European industry improved competences there are at least three aspects to be considered:

  i. An increased propensity of the European maritime industry in mobilizing private investments for the take up of the many breakthrough and incremental innovation research achievements for the market introduction of new products.
  ii. An overall potential increase in the **industry turnover**. Its evaluation is particularly challenging and depending on the actual market conditions and

other volatile factors; in any case an overall 5% turnover increase for the waterborne industry can be estimated as a potential economic benefit coming from the initiative.

iii. An increased participation of waterborne SMEs. Given the structure of the European waterborne sector, counting for nearly 20000 SMEs, any initiative cannot disregard their involvement. In the waterborne sector the SMEs involvement is always twofold: to push the uptake of innovative high-tech solutions; to pull knowledge from large companies implementing well consolidated methodologies, to improve market-ability of their products and services. This approach will be realized throughout the implementation of the VESSELS for the FUTURE Road map.

- **Summary:**

  The proposed PPP 'VESSELS for the FUTURE' is a multi-disciplinary initiative. The roadmap is designed to increase the sector capability to address existing and emerging markets in an economic, social and environmental sustainable way; and therefore its impact on employment is substantial.

  It generates impact on a multitude of technological domains, such as energy, materials, physics, communication, biology. These technologies drive several supply chains, including those supplying Key Enabling technologies (KETs): ICT, advanced materials, biotechnologies, advanced manufacturing and processing.

  Innovative services for growth markets will define new working environments with multimodal collaboration, advanced human machine interfaces and new forms of cooperation between human and artificial systems. New human-machine interaction will improve staff health and safety contributing to decreasing the overall risks.

  Throughout the 'VESSELS for the FUTURE' initiative, the program will be monitored and assessed on the success of its implementation by a set of Key Performance Indicators (KPIs) addressing the scientific and technological developments and by a set of Operative Indicators (OPIs) through quantitative measures of programme performances indexes.

  Overall the 'VESSELS for the FUTURE' initiative will contribute to achieving the following high level targets for the European work force:

  i. Fulfill the new skills demand for high tech specialized jobs which require life-long learning approach
  ii. Improve the image and carrier path of waterborne jobs
  iii. Create conditions to develop harmonized curricula and certificate throughout Europe easing job mobility

iv. Development of completely innovative skill sets

The initiative will also offer clear **added value** at European level:

- 'VESSELS for the FUTURE' is a targeted initiative. Through its industrial relevance, transparency and clear thematic focus, it is attractive for industry participants and it will trigger new participants in the European framework programmes.
- A Pre-defined budget for a long-term horizon raises confidence in private sector investors and encourages industry to make long-term investment plans. Incentives will be provided to industry and Member States, attracting additional national support and leveraging a greater industry funding.
- The Work Programme covering basic and applied research right through to industrial pilots and large-scale demonstration, bringing research outputs closer to market.
- By bringing together different technologies and through an integrated and multidisciplinary approach, it will help to identify technological barriers, maturity/supply chain gaps and synergies.
- Increased the process transparency with more experts / evaluators involvement
- There will be more emphasis on industrial innovation and impact of the development of waterborne roadmaps, boosting the knowledge level and stimulating exploitation.
- The 'VESSELS for the FUTURE' will consolidate the network and links between the relevant maritime actors. Networks between the relevant actors enable the flow of knowledge and mutual learning. Due to the heterogeneous community, it is expected that results are disseminated in an effective way and that there is a substantially higher potential for transactions, uptake, exploitation and post-research activities. It will enhance a research community, which facilitates the transfer of results (PAN European Vessel Demonstrator), generates synergies and knowledge spill over and will finally lead to a substantially higher effectiveness of research expenditure.


Vessels
for the
FUTURE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