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Skills of tomorrow in the European maritime sector

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[1] **R**=Document, report; **DEC**=website, videos, etc.; **DATA**= data sets, microdata, etc.

[2] **PU**=Public, **SEN**=Sensitive

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Glossary of Acronyms

ACRONYM	FULL TERM / MEANING
AI	Artificial Intelligence
CEDEFOP	European Centre for the Development of Vocational Training
DG EMPL	Directorate-General for Employment, Social Affairs and Inclusion (European Commission)
DG GROW	Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (European Commission)
DG MARE	Directorate-General for Maritime Affairs and Fisheries (European Commission)
EACEA	European Education and Culture Executive Agency
ESCO	European Skills, Competences, Qualifications and Occupations (EU classification framework)
EU	European Union
H_2	Hydrogen
LeaderSHIP	Learning European Alliance for Digital, Environmental and Resilient Shipbuilding (the project under which this strategy was developed)
LLL	Lifelong Learning
MOOC(s)	Massive Open Online Course(s)
NEET(s)	Not in Education, Employment or Training
NH_3	Ammonia
OHS	Occupational Health and Safety
SME(s)	Small and Medium-sized Enterprise(s)
STEM	Science, Technology, Engineering and Mathematics
UN	United Nations
USWE	Upskilling Shipbuilding Workforce in Europe (EU-funded project)
VET	Vocational Education and Training

Methodology

This Sectoral Skills Strategy has been developed through a structured and participatory process, designed to ensure that the resulting framework reflects the real needs and perspectives of the European maritime manufacturing industry. Rather than being built top-down from desk research alone, the strategy is grounded in direct stakeholder engagement — combining qualitative skills intelligence with the collective expertise of industry representatives, education and training providers, and other key actors from across the LeaderSHIP consortium.

At the core of the methodology was a dedicated workshop bringing together all consortium members. Participants were structured into two distinct working groups reflecting the two main stakeholder communities of the sector: industry actors on one side, and education and training providers on the other. Each group worked independently through a set of targeted questions specifically designed for their perspective — enabling industry representatives to articulate current and future skills demands, recruitment challenges and workforce development priorities, while education and training providers reflected on curriculum alignment, training supply gaps and cooperation mechanisms with the private sector.

In a second phase, both groups engaged jointly with a shared set of questions covering cross-cutting themes such as governance, sectoral attractiveness, the green and digital transitions, and European-level policy needs. The outputs of each phase, both the group-specific responses and the joint discussions, were subsequently consolidated and analysed, forming the evidence base from which the four strategic pillars, the five strategic objectives, and the policy asks of this strategy have been derived. This collaborative approach ensures that the strategy reflects a genuine convergence of industry demand and training supply perspectives, and is therefore both realistic and actionable.

Executive Summary

The European maritime manufacturing industry is a strategic sector of the European Union's industrial, defence and sustainability agenda. With an annual production value of €125 billion, over 576,000 direct jobs, 300 shipyards and more than 22,000 equipment suppliers and service companies, the sector represents one of Europe's most technologically advanced industrial ecosystems.

The sector is simultaneously undergoing profound transformations driven by the green and digital transitions, intensifying global unfair competition from Asian shipbuilders, and a rapidly ageing workforce.
These structural pressures are generating acute skills gaps that threaten Europe's industrial sovereignty in high-complexity shipbuilding and maritime technologies.

This Sectoral Skills Strategy, developed under the LeaderSHIP project, provides a structured and forward-looking framework to address these challenges. Rather than offering only an analysis of future skills needs, this strategy defines concrete actions for industry, education and training providers, social partners, Member States and European institutions.

The strategy is built around four strategic pillars: preserving and transferring core shipbuilding skills; upskilling and reskilling for the green and digital transition; strengthening cooperation between industry and education; and attracting and retaining new talent, with a particular focus on gender diversity and young people.

Successful implementation requires coordinated political commitment. This strategy calls on the European Commission, the European Parliament, Member States and industry to take four concrete policy actions, from designating maritime manufacturing as a priority sector under the Union for Skills, to establishing a permanent European Skills Observatory and ensuring sustained support for the Shipbuilding Pact for Skills.

1. Introduction

The European Maritime Manufacturing Industry encompasses 300 shipyards and over 22,000 equipment suppliers and service companies. The industry sustains approximately 576,000 direct jobs and contributes to an additional 500,000 indirect jobs throughout Europe[3].

Renowned for its technological prowess, European shipyards are at the forefront of global shipbuilding, specialising in the construction of cutting-edge vessels such as cruise ships, ferries, offshore platforms, fishing vessels, dredgers, research vessels, mega-yachts, naval ships, submarines and aircraft carriers.

European maritime equipment manufacturers play a crucial role in advancing maritime systems, technologies and equipment, from propulsion systems, large diesel engines and environmental systems to cargo handling and electronics. This industry is dedicated to enhancing the operation, safety, security and environmental performance of vessels worldwide.

With an annual production value of €125 billion, Europe stands as a global leader in ship construction, repair and innovation, catering to both civilian and military needs. The maritime manufacturing industry plays a strategic role in supporting several key European policy priorities, including:

- the green and digital transition of maritime transport;
- the development of the **Blue Economy**: In 2020, shipbuilding and ship repair contributed 11% to the EU Blue Economy's gross value added (€14.5 billion), 11% to its gross profit (€3.1 billion), and 7% to its turnover (€55.7 billion), and supported 9% of its direct employment (305,500 direct jobs).[4]
- Europe's defence and security capabilities: European shipyards build navy ships, patrol vessels and coastguard ships, whilst Europe's equipment manufacturers produce equipment, systems, and technologies for naval applications. These assets are strategic to defend Europe's sovereignty and to protect its borders, coastlines, maritime infrastructure (both civilian and military), trade lanes, and Blue Economy activities
- technological innovation and industrial resilience.

Maintaining and developing the industry's skills base is therefore essential for Europe's long-term industrial sovereignty.

1.1 Strategic context of the maritime manufacturing workforce

In recent years, the sector has faced, and continues to face, a range of structural challenges:

- The need to adapt skills to Shipyard 5.0 and accelerating industry digitalisation;
- An ageing workforce, with approximately 40% expected to retire within the next decade creating an urgent need for structured knowledge transfer and mentoring mechanisms to preserve critical industrial know-how;
- High workforce mobility within the EU supply chain;

[3] Shipbuilding Pact for Skills - Upskilling Shipbuilding And Maritime Technology Workers In Europe

[4] The transition pathways for the EU Industrial Ecosystem, January 2024, page 8

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- Limited and fast-changing training opportunities — companies incur significant costs to establish training programmes due to the shortage of industry-specific skills;
- Persistent difficulties in attracting and retaining young talent, with women accounting for only approximately 20% of the workforce.

Addressing these challenges requires immediate and coordinated action from industry stakeholders, workers, education providers and public authorities.

The maritime manufacturing industry stands as one of Europe's most innovative industries. About 90% of the sector's jobs require high skills or specific qualifications and certifications. The workforce, comprising highly educated professionals (35%) and technically trained workers (60%),[5] is under increasing pressure from new technologies that demand ever-greater specialisation. Robust support for the upskilling and reskilling of workers across the supply chain is therefore essential.

[5] Report Forecasting trends & challenges for a 4.0 Shipbuilding Workforce in Europe - USWE project

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2. Key Transformation Drivers Shaping Skills Needs

The European maritime manufacturing industry is navigating a period of unprecedented change. Three major forces are simultaneously reshaping the sector's skills landscape: (1) the green transition, driven by decarbonisation targets and the shift towards alternative propulsion systems; (2) the rapid digitalisation of shipyard operations through automation, AI and connected systems; and (3) evolving geopolitical and economic dynamics that are putting pressure on supply chains, energy costs and Europe's strategic industrial sovereignty. Together, these drivers are redefining the competences required across all levels of the maritime manufacturing workforce and will have an impact on employment structures, working conditions and job quality, requiring proactive labour market and industrial policies. Therefore, these drivers will form the foundation of the skills strategy set out in this document.

2.1 Green Transition

The transition towards zero-emission ships and more sustainable maritime technologies is profoundly transforming ship design, production processes and maintenance activities across the maritime manufacturing sector. New regulatory requirements, decarbonisation targets and the deployment of alternative propulsion systems are accelerating the development of innovative technologies such as hydrogen, ammonia, methanol and electrification solutions.

Shipyards and maritime equipment manufacturers increasingly require specialised competences related to alternative fuels, energy systems integration, environmental compliance, lifecycle assessment and energy efficiency optimisation. The growing complexity of green technologies also requires stronger interdisciplinary skills, combining traditional shipbuilding expertise with knowledge in energy engineering, environmental management and advanced materials.

2.2 Digitalisation

Digitalisation is rapidly transforming shipyard operations through the adoption of advanced digital tools, data-driven processes and automation technologies. Smart shipyards increasingly rely on digital twins, robotics and integrated production systems, requiring workers to develop new digital and data-related competences.

Digital proficiencies form the cornerstone of implementing advanced IT systems, integrated logistics and the assimilation of emerging technologies such as AI and blockchain. Cybersecurity skills are also gaining critical importance, both to protect the know-how of European shipyards and to ensure the safety of vessels, crew and cargo.

2.3 Geopolitical and Economic Developments

The European maritime manufacturing sector operates in an increasingly complex geopolitical and economic environment. Recent geopolitical tensions, including the war in Ukraine and in the Middle East, have significantly affected energy prices, supply chains and the availability of raw materials, creating additional pressures for European shipyards and maritime equipment manufacturers.

Global competition in shipbuilding has intensified significantly, with Asian countries increasing their market share over the past decades. These developments reinforce the strategic importance of maintaining strong industrial capabilities and technological expertise within Europe.

The maritime manufacturing sector also plays a key role in supporting Europe's security and defence capabilities. The strong interconnection between commercial and naval shipbuilding contributes to the resilience of the European naval defence supply chain. Maintaining Europe's shipbuilding capabilities requires preserving critical industrial know-how, strengthening specialised engineering competences, and ensuring the transfer of knowledge between generations of workers.

Addressing these transformation drivers requires a comprehensive and forward-looking approach that combines technological innovation with a strong focus on people. Ensuring the availability of a highly skilled workforce is essential not only for competitiveness, but also for maintaining Europe’s strategic industrial capabilities. This calls for sustained investment in education and training systems, effective reskilling and upskilling pathways, and closer cooperation between industry, public authorities and social partners. Managing the transition successfully will also require attention to job quality, working conditions, occupational safety and the attractiveness of the sector, in order to recruit and retain talent and facilitate knowledge transfer across generations. A balanced approach, supporting industrial leadership while ensuring a fair and inclusive transition for the workers, will be key to strengthening the resilience and long-term sustainability of the European maritime manufacturing sector.

3. Priority Skills Areas and Skills Needs Analysis

Transversal, digital and green skills are becoming increasingly essential for the professional curriculum of shipbuilding workers. These three skill categories are closely interrelated and linked to the smart processes driving Shipyard 5.0. The EU-funded USWE project (Upskilling Shipbuilding Workforce in Europe) has conducted an in-depth analysis of these skill categories, summarised below.

3.1 Technical Skills

Core technical skills remain the foundation of the maritime manufacturing workforce. These include welding, electrical systems, piping, naval architecture, boiler and pipe-making, and mechanical fitting. About 60% of the workforce are highly skilled VET-trained professionals performing these critical tasks. Despite rapid technological change, preserving and transmitting these core competences to the next generation of workers is essential for the continuity of European shipbuilding.

3.2 Digital Skills

Digital skills have emerged as indispensable for the evolving Industry 5.0 landscape. These encompass identifying and interacting with digital tools, machinery and IA, collecting and analysing data, managing integrated logistics, and planning equipment maintenance. Cybersecurity skills are particularly critical, both to protect industrial know-how and to safeguard vessels, crew and cargo in an increasingly connected maritime environment.

3.3 Green Skills

Green skills encompass the competences necessary to mitigate pollution and environment-damaging emissions from ship operations, and to optimise energy efficiency. Their importance has grown significantly due to their direct impact on climate change, increasingly stringent regulatory requirements, and the reputational stakes for companies and the sector as a whole.

Within the context of Shipyard 4.0, workers must cultivate an ecological mindset aligned with the UN 2030 Agenda and EU Sustainable Development Goals. The shipbuilding sector serves as a technological enabler, providing the tools and innovations needed to address the environmental imperatives of the maritime industry.[6]

In this context, a set of core green skills has been identified. Amongst them, we can cite the following: alternative fuels, energy efficiency, environmental compliance, lifecycle assessment.

[6] Forecasting trends & challenges for a 4.0 Shipbuilding Workforce in Europe

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3.4 Transversal Skills

According to the ESCO framework, transversal skills are "learned and proven abilities which are commonly seen as necessary or valuable for effective action in virtually any kind of work, learning or life activity[7]." They are “transversal” because they are not exclusively related to any particular context, thus including a combination of both technical expertise and interpersonal skills.In the maritime manufacturing context, these include project management, teamwork, cross-functional communication, leadership, systems thinking and change management; in other words, competences that are increasingly required as production processes become more complex and interdisciplinary.

3.5 Current and Future Skills Needs: Survey Results

The LeaderSHIP project has developed a sustainable methodology for gathering and analysing skills intelligence (Deliverable 2.4), focused on identifying current and future skills needs and monitoring their evolution on a yearly basis. The methodology draws on credible foresight scenarios and a digital model capable of analysing and displaying results filtered by geographical area, professional profile or skills category — feeding into the EU Skills Panorama and ESCO in open data format.

The Skills Needs Survey conducted within the LeaderSHIP (WP3) and the USWE projects highlights several structural challenges affecting the maritime manufacturing workforce across Europe. Key findings include:

- Companies are facing increasing difficulties recruiting qualified workers, particularly in technical occupations and engineering profiles;
- The green and digital transitions are generating demand for new competences in digital manufacturing, data management, automation and alternative fuels;
- VET curricula are lagging behind — VET schools do not produce work-ready employees for shipyards in areas such as welding, electricity, boiler-making, pipe-fitting and electronics;
- The most in-demand occupations over the next 5 to 10 years will be: engineers, naval architects, designers, project managers, welders, fitters, electrical engineers and 3D design experts;
- The sector faces significant demographic challenges: an ageing workforce and persistent difficulties attracting young people and women to maritime industrial careers;
- The scarcity of maritime-specific VET provision in several EU regions forces companies to develop costly in-house training programmes.

[7] European Commission, CEDEFOP Towards a structured and consistent terminology on transversal skills and competences

The table below summarises the current challenges and future needs by skills area:

SKILLS AREA	CURRENT CHALLENGES	FUTURE NEEDS
Technical shipbuilding skills	Shortage of skilled welders, electricians, pipe-fitters, naval architects and technical draughtsman	Transfer of critical know-how; next-generation training in advanced manufacturing
Digital manufacturing	Limited digital competences; fragmented adoption of Industry 5.0 tools	AI, automation, digital twins, cybersecurity, data analytics
Green technologies	Lack of specialised expertise in alternative fuels and energy systems	Alternative fuels (H_2, NH_3, methanol), energy efficiency, lifecycle assessment
Transversal skills	Insufficient training in project management, leadership and systems thinking	Cross-functional competences aligned with ESCO transversal skills framework
Workforce renewal	Ageing workforce; gender imbalance; unattractive sector image ("3D sector")	Attract 200.000 of young talent, women and NEETs; diversity and inclusion programmes

Addressing these challenges requires a coordinated approach involving industry, education and training providers, social partners and public authorities, at both national and European level. Strengthening cooperation between industry and VET institutions is essential for innovation and regional development. The LeaderSHIP project contributes to these objectives by supporting the development of a European Sectoral Skills Strategy for the maritime manufacturing industry. The strategy aims to link skills development with industrial competitiveness, innovation, and sustainability objectives.

4. European Sectoral Skills Strategy: Vision and Strategic Objectives

4.1 Vision

The vision of the European Sectoral Skills Strategy is to ensure that the European maritime manufacturing ecosystem has access to a skilled, resilient and innovative workforce, capable of supporting the green and digital transitions, while preserving the critical industrial know-how.

The strategy also aims to facilitate the mobility of learners and workers across the European Union by promoting common approaches to skills development, mutual recognition of competences and stronger cooperation between education and training systems. More broadly, the strategy seeks to strengthen cooperation between industry, education and training providers, social partners and public authorities in order to ensure that skills policies effectively support the long-term competitiveness and sustainability of the sector. The LeaderSHIP project contributes to this strategy by developing and piloting training programmes addressing both urgent and emerging skills needs across different qualification levels, while fostering greater alignment of skills and training frameworks across Europe and supporting workforce mobility within the EU.

4.2 Strategic Objectives

Building on the skills needs analysis presented in Chapter 4, this strategy identifies six strategic objectives that provide a measurable and concrete framework for action:

#	STRATEGIC OBJECTIVE	EXPECTED OUTCOME
1	Increase availability of skilled workers in key technical and engineering occupations	Reduced recruitment difficulties; stronger pipeline of qualified workers
2	Reduce the structural mismatch between VET curricula and industry skills requirements	Updated, industry-aligned curricula across Member States, VET European Network in place
3	Strengthen lifelong learning and continuous upskilling across the supply chain	Higher participation in training; modular MOOC (Massive Open Online Courses) platform operational
4	Improve participation of under-represented groups, particularly women and young people	Increased diversity; targeted outreach programmes in place
5	Strengthen social dialogue and workforce involvement in skills strategies	Better anticipation of skills needs; jointly designed training initiatives; stronger ownership across industry and workforce

#	STRATEGIC OBJECTIVE	EXPECTED OUTCOME
6	Build a robust EU-wide skills intelligence system to anticipate future workforce needs (Skills Observatory) with the involvement of social partners	Annual skills monitoring; data feeding EU Skills Panorama and ESCO

5. The Four Strategic Pillars

The strategic pillars presented below build on the evidence and recommendations developed through previous work on skills and training in the maritime manufacturing sector. In particular, the 2025 WP2.3 mapping of upskilling and reskilling support and financing schemes provided by industry and public and private stakeholders at regional, national and European level identified three complementary areas for action: (i) mapping existing support and financing mechanisms, (ii) identifying best practices that could be scaled up across the maritime value chain, and (iii) developing recommendations to improve stakeholders' access to training and financing opportunities.

The Four Strategic Pillars translate these findings into a broader and long-term vision for the sector. While Pillars 1 and 2 build on the progress already achieved in preserving critical skills and supporting upskilling and reskilling, Pillar 3 aims to further strengthen cooperation between industry and education providers, and Pillar 4 addresses the challenge of attracting and retaining talent in a context of demographic change and increasing skills shortages.

Addressing the structural challenges facing the maritime manufacturing workforce requires a coordinated and forward-looking approach. Building on the skills needs analysis and the strategic objectives defined above, this plan identifies four strategic pillars designed to strengthen the skills ecosystem of the European maritime manufacturing sector.

#	STRATEGIC PILLAR	DESCRIPTION
1	**Preserving and transferring core shipbuilding skills**	Safeguarding critical industrial know-how through mentorship, apprenticeships and specialised maritime VET, ensuring knowledge continuity as a large share of the workforce approaches retirement.
2	**Upskilling and reskilling for the green and digital transition**	Equipping the workforce with competences in alternative fuels, energy systems, digital manufacturing, AI, robotics and automation through flexible, modular training and European MOOCs.
3	**Strengthening cooperation between industry and education**	Bridging the gap between curricula and industrial reality through structured partnerships between shipyards, universities and VET providers, reinforced by work-based learning and Centres of Vocational Excellence.
4	**Attracting and retaining talent — diversity and inclusion**	Addressing demographic and image challenges by promoting maritime manufacturing careers among young people, NEETs and women, and improving career development opportunities.

Pillar 1 – Preserving and Transferring Core Shipbuilding Skills

Ensuring Europe's industrial resilience and long-term strategic preparedness requires preserving core shipbuilding competences and ensuring the transfer of critical know-how between generations of workers. Particular attention must be paid to traditional technical occupations — welding, piping, electrical systems, naval engineering — that remain key for shipbuilding production processes.

Apprenticeship and mentorship are **widely recognized as essential tools for transferring knowledge and preserving core shipbuilding skills across the maritime industry**. Several organizations highlighted that structured apprenticeship schemes and mentoring programs already play an important role in training new workers, supporting recruitment, and ensuring continuity of expertise in both production and engineering roles. In some cases, apprenticeship models are closely integrated with **vocational educational and training systems,** demonstrating strong potential for effective workforce development.

However, the sector faces significant challenges in scaling these initiatives. A recurring concern is the **shortage of apprenticeship placements, particularly in specialized maritime fields**, as well as the **limited availability of qualified mentors and the lack of time within already busy production schedules.** SME(s) face major difficulties in dedicating resources to training apprentices without additional support.

Beyond **apprenticeships, mentoring and knowledge transfer should be recognised as strategic enablers of industrial resilience**. As a significant share of the workforce approaches retirement, preserving tacit know-how and transferring it to younger generations becomes increasingly important. However, **shipyards cannot realistically carry this responsibility alone, stronger support at Member State and EU level, including dedicated financial instruments, could help scale up mentoring initiatives and create more favourable conditions for workforce renewal**.

To respond effectively, the sector will need more flexible apprenticeship pathways, stronger cooperation between industry and education providers, and increased investment in mentor development within shipyards and production departments.

ACTOR	KEY ACTIONS
Industry	Strengthen apprenticeships and mentorship programmes to transfer critical shipbuilding know-how; systematically document and share expert knowledge before retirement.
Education & training providers	Develop specialised maritime curricula and practical training modules; ensure that VET programmes cover core technical shipbuilding occupations. Maintain cooperation with companies, for example, via the presence of university and vocational teachers in shipyards. This embedded cooperation allows early access to technological developments, meaning new industrial practices are integrated quickly into training.

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ACTOR	KEY ACTIONS
Member States	Support mentorship schemes and knowledge transfer in maritime universities and VET systems and shipyards through increased and dedicated financial instruments and incentives, and invest in lifelong learning (LLL) opportunities for experienced workers.
EU institutions	Recognise mentoring and knowledge transfer as strategic components of industrial sustainability and support them through Erasmus+, the Pact for Skills and other EU funding programmes.

Pillar 2 – Upskilling and Reskilling for the Green and Digital Transition

The upskilling and reskilling of workers is key across the entire supply chain, enabling workers to adeptly utilize emerging technologies such as robotics, advanced manufacturing, information technology, and advanced energy generation, storage, and distribution technologies.

Reskilling and upskilling are a major part of enhancing competitiveness in the maritime manufacturing industry. Large companies are already offering in-house training and are participating in regional initiatives to support digital and green skills development.

However, smaller companies often struggle to offer similar opportunities due to limited financial resources, lack of time, production pressures and difficulties in releasing workers for training. Cultural barriers also remain, as training is not always viewed as a long-term investment due to the high mobility of workers.

Many stakeholders highlighted the importance of **stronger cooperation between companies, education providers, and public authorities through shared training schemes, flexible learning formats, co-designed programmes, and targeted financial incentives.** Collaborative regional approaches and sector-based training models are seen as particularly effective for extending access to skills development across the wider supply chain while supporting the maritime sector's digital and green transition.

ACTOR	KEY ACTIONS
Industry	Develop and pilot common training frameworks based on shared learning outcomes and core competences. These frameworks will be implemented through modular training programmes that can be adapted to national education systems, regional ecosystems and company-specific needs, thereby ensuring both European coherence and local flexibility.

ACTOR	KEY ACTIONS
Education & training providers	Design flexible and modular training programmes; develop European MOOCs (Massive Open Online Courses) accessible to workers across companies and countries, covering digital and green skills, OHS and transversal skills.
Member States	Identify and deploy financing schemes to support industry and workers in developing and implementing in-house or joint training for upskilling and reskilling. Provide incentives that allow education and training institutions to take risks associated with developing new provision in close cooperation with industry.
EU institutions	Support upskilling and reskilling initiatives through Erasmus+, the Pact for Skills and other relevant EU funding instruments. EU subventions to support these programmes in the long run. This can also be in cooperation with other stakeholders of the maritime ecosystem, especially for financial sustainability and to ensure the trainings are consistent with the need of the industry.
Local Social Partners	Promote joint training initiatives at regional level, ensuring that programmes reflect both industry needs and workers' perspectives, particularly for SMEs with limited internal capacity. Strengthen participation in regional skills ecosystems, working with companies, training providers and authorities to develop shared training infrastructures, sectoral training centres and cluster-based solutions. Raise awareness and build a learning culture, promoting the value of continuous upskilling and reskilling among employers and workers, including in SMEs where training uptake is often lower.

Pillar 3 – Strengthening Cooperation between Industry and Education

Closer cooperation between industry and education and training providers is essential to reduce the mismatch between curricula and industry needs. This includes strengthening apprenticeships, promoting work-based learning and improving collaboration between shipyards and training institutions at regional and European level.

Cooperation between industry, VET providers, and universities is already **well developed in many regions through regular meetings, advisory boards, joint projects, internships, shipyard visits,**

guest lectures, and curriculum collaboration. These partnerships help align education with labour market needs, support recruitment, and strengthen understanding between industry and training institutions. However, while these partnerships are well established in many regions and represent a key success factor, **they cannot fully address the gap on their own, particularly when curriculum adaptation does not keep pace with industrial change. In practice, many critical maritime manufacturing skills are developed through structured work-based learning in real production environments, where workers acquire the level of readiness required for increasingly complex technical, digital, and green transitions.**

Continuous cooperation, stronger policy support and long-term commitment from public authorities were identified as essential to sustain these partnerships and make them more effective in attracting and preparing future talent for the maritime industry. Stakeholders emphasised that effective cooperation requires a shared commitment from both sides. Education and training providers bring pedagogical expertise and methodological capabilities, while industry possesses practical know-how, operational experience and many of the core shipbuilding competences that are no longer formally documented but are transmitted through daily practice and experience.

Industry should therefore continue opening its doors to learners, teachers and young researchers, creating opportunities to experiment with emerging technologies and innovative solutions related to digitalisation and the green transition. At the same time, education and training providers should further involve experienced workers and industry professionals in teaching and learning activities, helping preserve and transfer critical industrial knowledge to future generations. In this context, **exchanges of personnel between industry and education, including temporary placements of teachers in companies and industry experts in training institutions, could represent an effective instrument to strengthen mutual understanding, accelerate knowledge transfer and ensure that training remains closely aligned with industrial realities.**

At the same time, stakeholders emphasised that implementing and sustaining such partnerships can be particularly demanding for SMEs and smaller enterprises, which often have limited resources and training capacities. The successful implementation of this strategy will therefore require practical, accessible and SME-friendly cooperation mechanisms, supported by appropriate financial incentives, simplified administrative procedures and targeted public support at regional, national and European level.

ACTOR	KEY ACTIONS
Industry	Strengthen partnerships with universities and VET providers to support the development of industry-aligned curricula; provide opportunities for apprenticeships and work-based learning; organise regular joint industry-univeristy/VET meetings at regional level. Industry could commit to provide annual inputs on skill needs, invite guest lecturers and providing case studies. Promote participation of teachers and trainers in industrial environments, in order to facilitate knowledge transfer and keep training aligned with technological and industrial developments.

ACTOR	KEY ACTIONS
Education & training providers	Develop closer cooperation with industry to ensure training programmes reflect technological developments and emerging skills needs; integrate practical learning components into all relevant programmes. This cooperation includes both formal and informal structures, such as voca tional advisory boards with regional company representatives. Modernizing training initiatives such as e-learning modules and maritime training labels. Promote the active involvement of industry professionals in teaching and training activities
Member States	Support national and regional cooperation platforms facilitating dialogue between industry and education and training systems; fund regional maritime skills partnerships. Develop schemes for the temporary exchange of personnel between education and industry, including placements of teachers in companies and industry experts in training institutions, to strengthen mutual understanding, transfer tacit knowledge and foster innovation. Provide dedicated financial support and incentives for SMEs engaging in training activities, mentoring programmes and partnerships with VET providers and universities. Promote shared training facilities, regional training centres and Centres of Vocational Excellence to facilitate SMEs' access to specialised equipment, expertise and training opportunities.
EU institutions	Promote cooperation through Erasmus+, the Pact for Skills and Centres of Vocational Excellence; develop a European network of sectoral maritime VET centres. Provide dedicated financial support and incentives for SMEs engaging in training activities, mentoring programmes and partnerships with VET providers and universities.

Pillar 4 – Attracting and Retaining New Talent: Diversity and Inclusion

The maritime manufacturing industry faces significant challenges in attracting and retaining skilled workers, particularly young talent and women. This is compounded by an ageing workforce, with approximately 40% expected to retire within the next decade, and the sector's persistent image as a "3D sector" (difficult, dangerous and dirty). This image no longer reflects the reality of today's maritime manufacturing industry, where European shipyards are among the most advanced and innovative industrial players. The sector plays a key role in developing environmentally friendly ships, retrofitting vessels to support the green transition, and contributing to Europe’s defence capabilities, maritime transport and the blue economy.

Gender imbalance remains a significant structural challenge, with women representing only approximately 20% of the workforce and are even less represented in technical roles. Expanding the sector's talent pool, particularly among young people, women and those not in education, employment or training (NEETs), is therefore essential to address current and future skills

shortages. Promoting the sector's technological transformation and highlighting the wide range of career opportunities it offers will be crucial to addressing current and future skills shortages and ensuring a diverse, skilled and resilient workforce for the future.

ACTOR	KEY ACTIONS
Industry	Promote maritime careers through outreach activities, internships and stronger cooperation with schools and universities; Invest time in engaging with young people before they make their educational choices. Team up with other maritime stakeholders facing similar challenges; Strengthen work-life balance policies and inclusive working environments to attract more women.
Education & training providers	Develop programmes highlighting modern maritime technologies; strengthen links between STEM education and maritime careers.
Member States	Support initiatives improving the attractiveness of technical careers; strengthen school-to-work transitions; fund targeted programmes for NEETs and women in maritime sectors.
EU institutions	Promote maritime careers through EU skills initiatives and programmes such as the Union for Skills; support the attractiveness campaign of the sector.
European and Local Social Partners	Support inclusion and accessibility, ensuring that training opportunities are accessible to all workers, including older workers, low-qualified workers, and those in precarious employment situations. Help reshape the sector's image, by communicating the evolving nature of jobs, including the shift towards digital, green and high-tech production environments. Support EU-wide awareness and attractiveness campaigns, highlighting the modern, innovative and sustainable nature of maritime manufacturing careers, including targeted communication towards young people and women.

6. Implementation and Governance

The successful implementation of this Sectoral Skills Strategy requires coordinated action from a wide range of stakeholders, including industry, education and training providers, social partners, national authorities and European institutions. Given the rapidly evolving technological and industrial landscape of the maritime manufacturing sector, effective governance mechanisms are essential to support the long-term development of skills and to maintain alignment between education and training systems and industry needs.

6.1 Governance Framework

The table below sets out the roles, key actions, implementation horizons and monitoring indicators for each category of stakeholder:

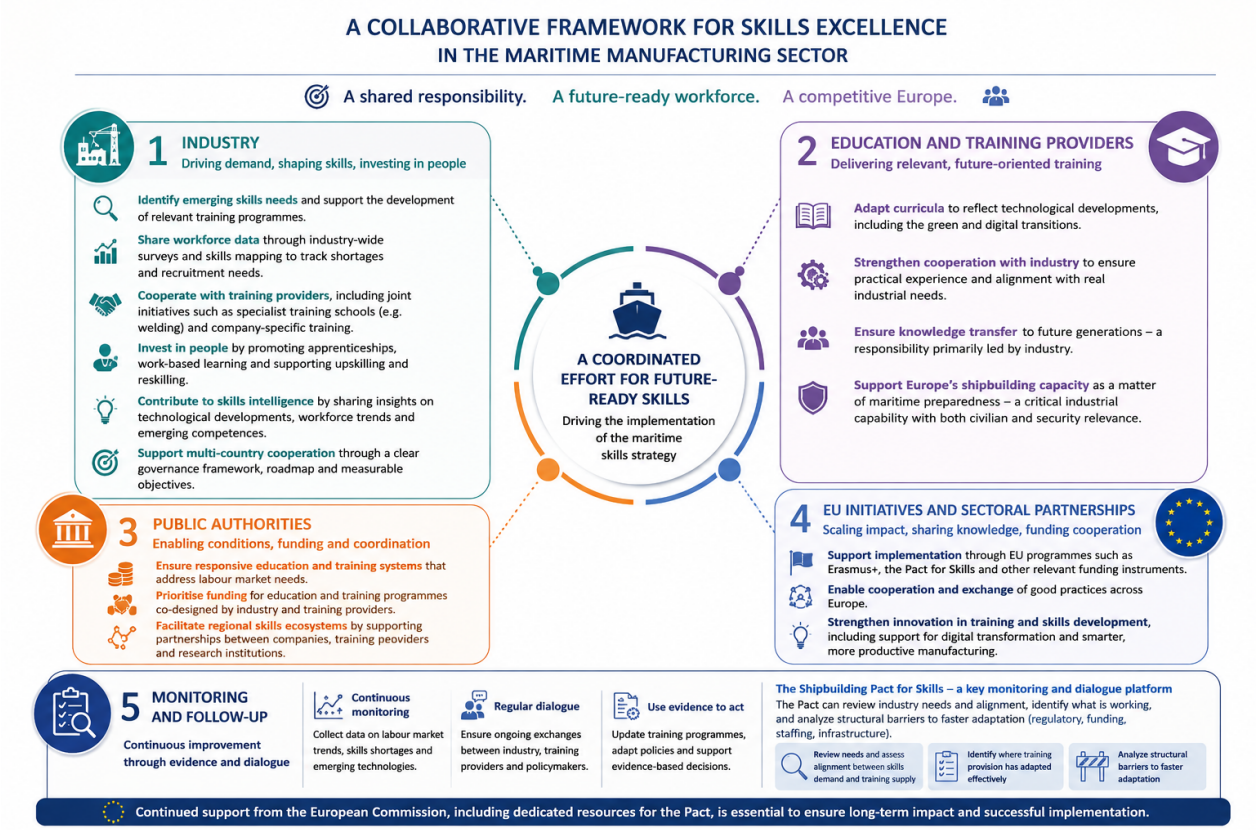

Figure 1: Collaborative framework for skills excellence in the maritime manufacturing sector

The figure illustrates the collaborative governance model underpinning the European maritime skills strategy. It highlights the complementary roles of industry, education and training providers, public authorities, and EU initiatives and sectoral partnerships in developing a future-ready workforce for the maritime manufacturing sector. At the centre of the framework lies a coordinated effort to anticipate skills needs, promote vocational excellence, strengthen cooperation across stakeholders and support the green and digital transitions. Continuous monitoring and follow-up, notably through the Shipbuilding Pact for Skills, ensure that training

provision remains aligned with labour market needs and that skills policies are regularly adapted to emerging technological and industrial developments.

6.2 Monitoring and Follow-up

Ensuring the long-term impact of this Sectoral Skills Strategy requires continuous monitoring of skills needs, regular dialogue between stakeholders, and a structured follow-up mechanism that translates evidence into action. Monitoring is not a one-off exercise: it must be embedded as an ongoing process that allows the strategy to remain relevant in a rapidly evolving industrial and technological landscape.

Monitoring mechanisms should encompass the systematic collection of data on labour market trends, recruitment shortages, emerging skills needs and the pace of technological change across the maritime manufacturing sector. This intelligence should feed continuously into the EU Skills Panorama and ESCO, ensuring that sectoral data contributes to the broader European skills governance architecture. The results of monitoring activities should in turn be used to update training programmes, adapt policy initiatives and support evidence-based decision-making at company, national and European level.

The **Shipbuilding Pact for Skills** is the natural platform to anchor the monitoring and follow-up of this strategy. As a sectoral partnership bringing together industry, education and training providers, social partners and other key stakeholders, the Pact is uniquely positioned to facilitate strategic dialogue, track implementation progress and identify where adjustments are needed. In this role, the Pact can:

- **Review industry needs and assess alignment** between skills demand and the supply of education and training across the sector.
- **Identify where education and training provision has adapted effectively,** highlighting good practices that can be scaled and replicated.
- **Analyse structural barriers to faster adaptation,** including regulatory, funding, staffing or infrastructure constraints that slow the responsiveness of training systems.

By facilitating dialogue between key stakeholders and providing a forum for shared analysis, the Pact for Skills can ensure that monitoring leads to concrete action rather than remaining a reporting exercise. To fully perform this role, continued support from the European Commission will be essential, including through dedicated resources for the Pact's monitoring and coordination activities.

The Shipbuilding Sectoral Social Dialogue Committee plays an equally important role in the monitoring and follow-up of this strategy. Trade unions and employer organisations are often the first to detect emerging workforce challenges at company and sector level, and their involvement in monitoring processes ensures that the strategy remains grounded in the day-to-day reality of workers and employers. Through their participation in the Pact for Skills and in national and European social dialogue structures, social partners can contribute to skills intelligence, flag implementation gaps, and advocate for the policy adjustments needed to accelerate progress.

In particular, social partners can support monitoring by sharing insights on workforce adaptation, training uptake and working conditions across the sector; and by ensuring that the perspectives of workers are integrated into the governance of skills initiatives. This inclusive approach to monitoring strengthens both the legitimacy and the effectiveness of the strategy's implementation.

7. Policy Asks and Conclusions

7.1 Policy Asks

The successful implementation of this strategy requires coordinated political commitment at European and national level. The LeaderSHIP partnership calls on EU institutions and Member States to take the following four concrete policy actions:

#	ADDRESSED TO	POLICY ASK
1	European Commission (DG GROW / DG EMPL)	Designate maritime manufacturing as a priority sector under the Union for Skills, with dedicated funding streams under Erasmus+ targeting maritime VET and workforce transition.
2	European Commission (DG GROW / DG MARE)	Establish a permanent European Skills Observatory for the maritime manufacturing sector, building on the LeaderSHIP methodology, feeding continuously into the EU Skills Panorama and ESCO.
3	Member States	Increase public investment in maritime-specific VET systems; support regional maritime Centres of Vocational Excellence; establish co-financing mechanisms enabling companies — especially SMEs — to implement structured upskilling and reskilling, and attractiveness programmes.
4	European Commission & Member States	Provide sustained institutional and financial support to the Shipbuilding Pact for Skills as the primary governance platform for the implementation and monitoring of this strategy, ensuring its long-term operability beyond individual project cycles.

7.2 Conclusions

The European maritime manufacturing industry is undergoing profound transformation driven by the green and digital transitions, evolving geopolitical dynamics and intensifying global competition. Ensuring the availability of a highly skilled workforce will be essential to support this transformation and to maintain Europe's technological leadership and industrial competitiveness in the maritime domain.

This strategy highlights the key workforce challenges facing the sector, identifies the main drivers shaping future skills needs, and defines five measurable strategic objectives. The four strategic pillars provide a structured and actionable framework to strengthen vocational education and training systems, support upskilling and reskilling, improve cooperation between industry and education providers, and increase the attractiveness of maritime careers.

Addressing these challenges requires strong cooperation between industry, education and training providers, social partners, public authorities and European institutions. Through coordinated action and continued stakeholder dialogue, the maritime manufacturing sector can build the resilient, diverse and highly skilled workforce needed to support innovation, sustainability and competitiveness for the decades ahead.

At the same time, the success of this strategy will depend on ensuring that the transformation of the sector goes hand in hand with quality job creation, good working conditions and inclusive labour market outcomes. A strong and structured involvement of social partners will be essential to anticipate change, support workers through transitions and foster a shared ownership of skills development efforts.

By combining industrial leadership with a people-centred approach, based on investment in skills, effective social dialogue and fair transition pathways, the European maritime manufacturing sector can reinforce both its global competitiveness and its social sustainability.

The four policy asks to set out in this document represent the minimum necessary political commitment to make this strategy a reality.

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