ERASMUS-EDU-2023-PI-ALL-INNO

TECONAUT

USING DEEP TECH TO FACILITATE THE ECO TRANSITION IN THE NAUTICAL SECTOR

NEW DEEP-TECH SKILLS SET

ALTERNATIVE MATERIALS FOR SUSTAINABLE BOATBUILDING

2025

Co-funded by the European Union

EXECUTIVE SUMMARY

This report presents the findings from an extensive assessment of over 120 interviews conducted with both large and small shipyards across Europe, covering the majority of the region's boat production across all segments. The primary objective was to identify emerging and potential green skills necessary for sustainable boatbuilding and to align these competencies with the ESCO skillset.

The study highlights key challenges in adopting and implementing these skills, including high costs associated with sustainable materials and processes, concerns regarding the performance of eco-friendly materials, and limited customer interest and demand. Despite these barriers, the majority of interviewees expressed confidence in their ability to integrate advanced materials into their production processes, if they have a skilled workforce.

While a wide range of skills were identified as necessary for the sector, three stood out as particularly critical and missing from the sector: promotion of sustainability, assurance of compliance with environmental legislation, and waste management. Additionally, the report underscores a significant gap between existing skills and the industry's actual needs, emphasizing the necessity for further training and upskilling initiatives to bridge this divide.

AIMS OF THE DATA-BASE

01 Identify green skills gaps in the use of deep-tech materials

02 Assess boatbuilding curricula using ESCO* green taxonomy

03 Provide ESCO with a new boatbuilding green skill set.

04 Build the baseline for VET course and train-the-trainers

To understand the **readiness of the industry** and to acknowledge a **significant transformation towards sustainability** in boat-building, driven by environmental regulations, evolving market expectations, and the **need for greener technologies**

* European Skills, Competences, and Occupations. It identifies and categorises skills, competences, and occupations relevant for the EU labour market and education and training.

INTRODUCTION & METHODOLOGY

There is a significant transformation towards sustainability in boat-building, driven by environmental regulations, evolving market expectations, and the need for greener technologies

To better understand the readiness of the industry:
Short questionnaire was made with 6 questions both quantitative and qualitative

Key insights on:

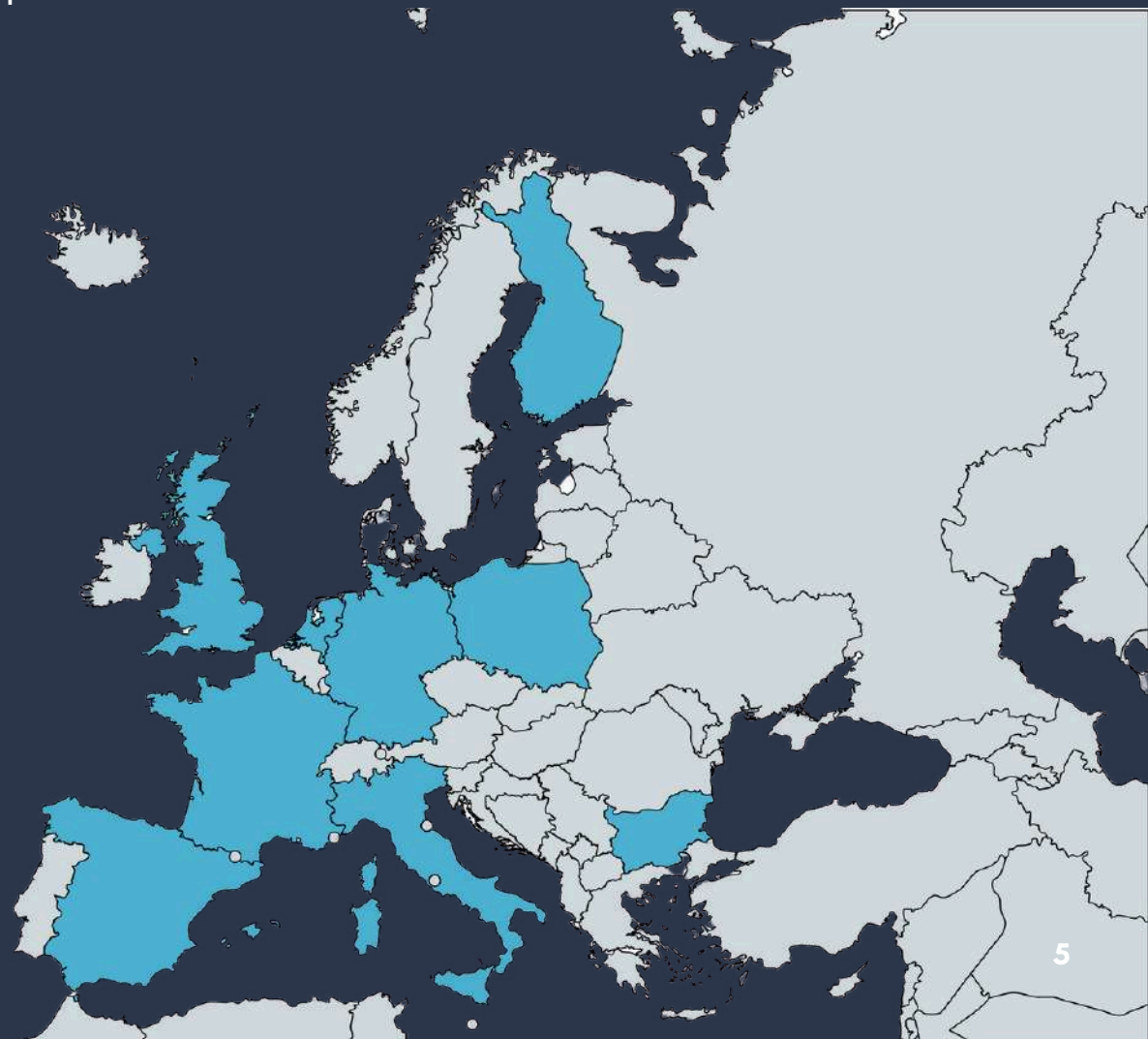
- importance of sustainability in boatbuilding.
- skill gaps in green technologies and materials.
- confidence levels in adopting sustainable materials.
- challenges companies face in implementing eco-friendly practices

124 people interviewed: Market leaders, smaller players and start-ups included

Big & small shipyards: Majority of European boat production covered by the study across all segments

Key boatbuilding countries in Europe covered:

- **ITALY**
- **FRANCE**
- **SPAIN**
- **GERMANY**
- **POLAND**
- **UK**
- **BULGARIA**
- **NETHERLANDS**
- **FINLAND**



...PREVIOUSLY...

Two researches have been made to identify green skills:

01

Curriculum Research Assessment Report

02

Skills Identification & Assessment Guidelines

01

Curriculum Research Assessment Report

"Only 22-25% of curricula include sustainable/green content."

Objective: Evaluate training programs in shipbuilding to identify gaps in green skills and advanced technologies.

Methodology: Analyze 141 validated curricula across 16 European countries.

Key Areas: Vocational Education and Training (VET), Higher Education (HE), and content on sustainability and disruptive technology.

Identified Gaps: Lack of integration of advanced technologies (deep-tech) and green skills in nautical training.

01

Curriculum Research Assessment Report

RECOMMENDATIONS:

- **Collaboration:** Strengthen the connection between industry and education.
- **Continuous Training:** Develop training programs focused on sustainability and green technologies.
- **Technology:** Incorporate digital tools for practical training.
- **Research:** Conduct comparative analyses to enhance education in the sector.

02

Skills Identification & Assessment Guidelines

Objective: Analyze EU-funded projects to identify skill gaps and training needs in the shipbuilding sector, focusing on green and blue skills.

Focus Areas: Transition to sustainable practices, adoption of green technologies, and skill development in areas like circular economy, energy efficiency, and digitalization.

Methodology: Evaluation of 23 European projects using a structured analysis to address digital, technical, and sustainable skill needs.

Identified Gaps: Lack of green, digital, and technical skills in the boating industry.

02

Skills Identification & Assessment Guidelines

RECOMMENDATIONS:

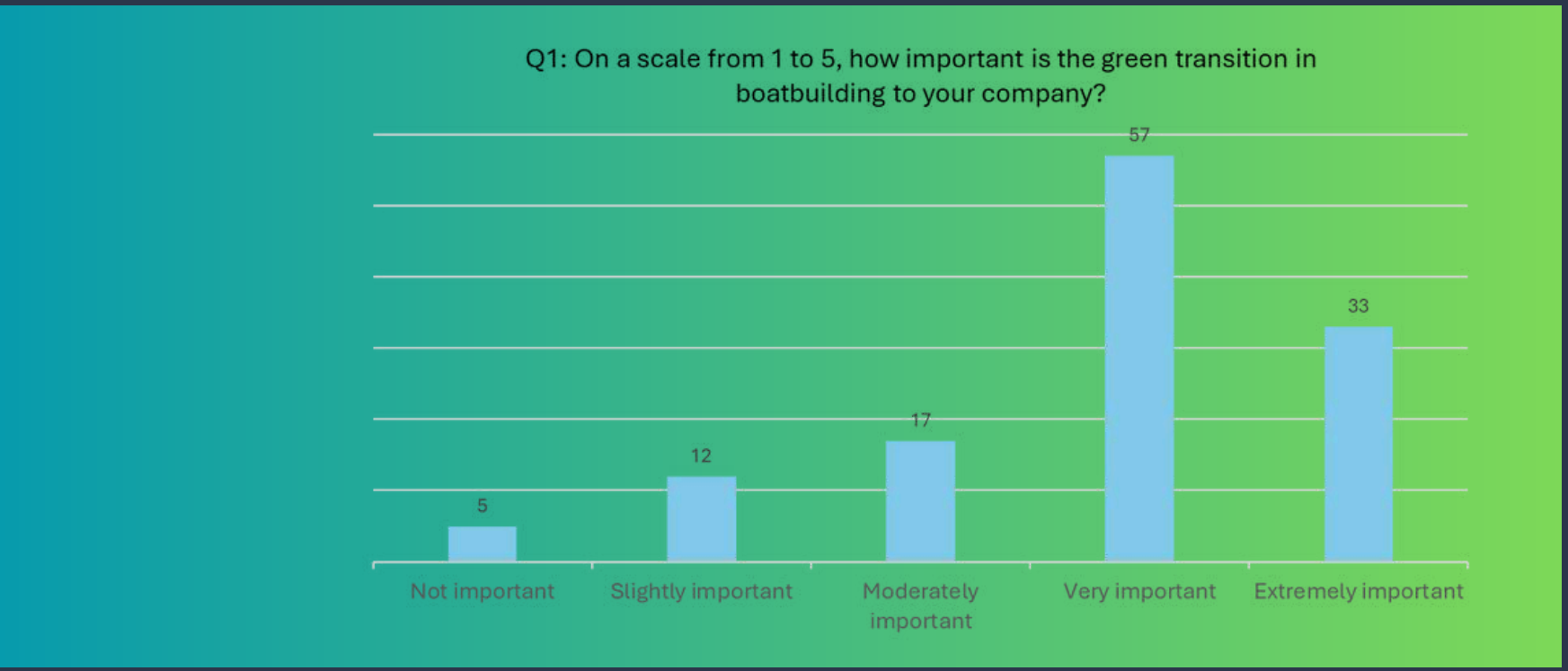
Align training with market needs, promote industry partnerships, and advance green and digital skills for a sustainable boat industry.

LINKS WITH DEEP-TECH SKILLS DEVELOPMENT

- **Identified Skill Gaps:** All reports emphasize significant deficiencies in green skills and advanced technologies (deep-tech) for the maritime sector, especially in sustainable material management and digital tools.
- **Alignment with Deep-tech skills:** It focuses on creating a "Deep-Tech Skill Set Database," which directly addresses the gaps identified in the previous analyses (1 & 2), ensuring better curriculum integration.
- **Strategic Relevance:** The skill database supports aligning vocational and higher education with market needs, fostering green and digital competencies essential for the EU Green Deal.
- **Implementation Pathways:** Collaboration between industry, VET, and HE institutions is vital for designing effective training programs.
- **Outcome:** Together, the reports and the database form a comprehensive framework to modernize training, ensuring the boat industry's sustainable and competitive future.

SUMMARY OF INTERVIEWS

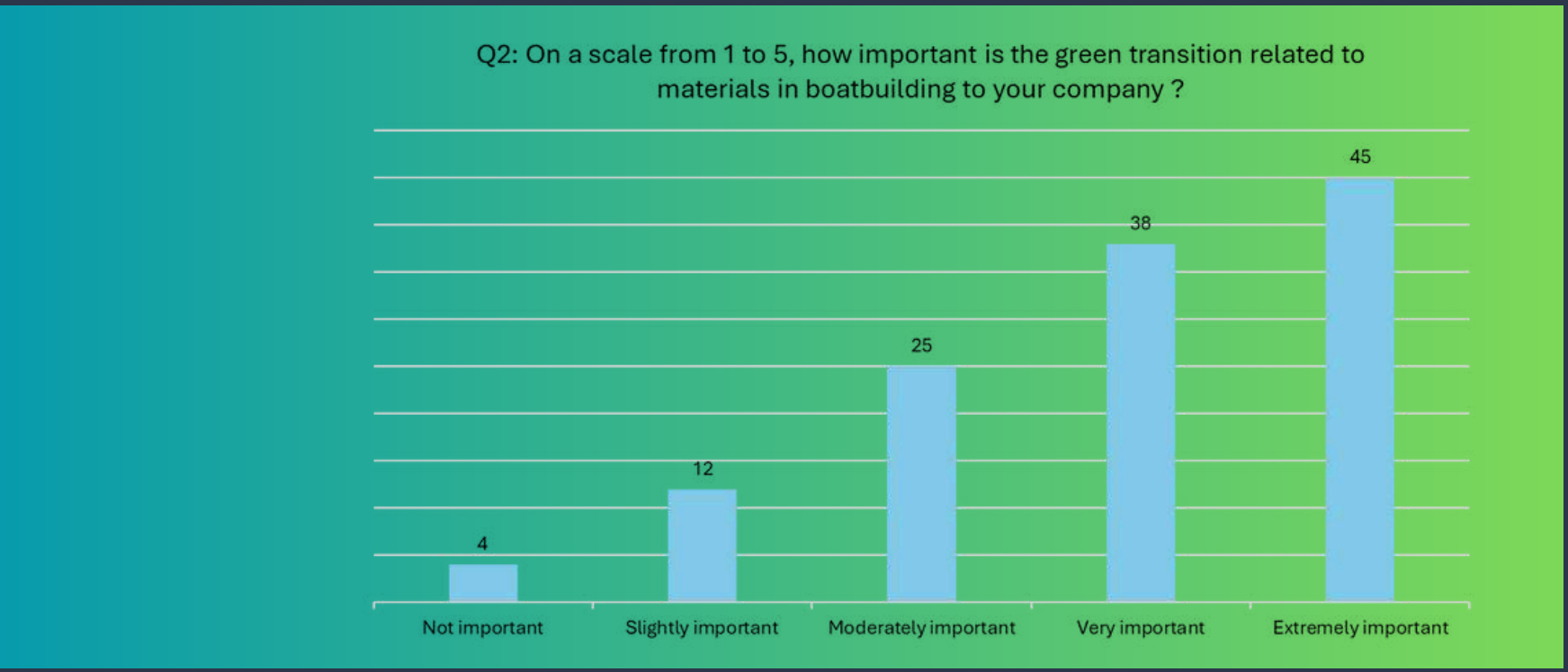
GREEN TRANSITION



Over 72% of companies consider the green transition as very or extremely important

Only 4% consider the green transition as not important

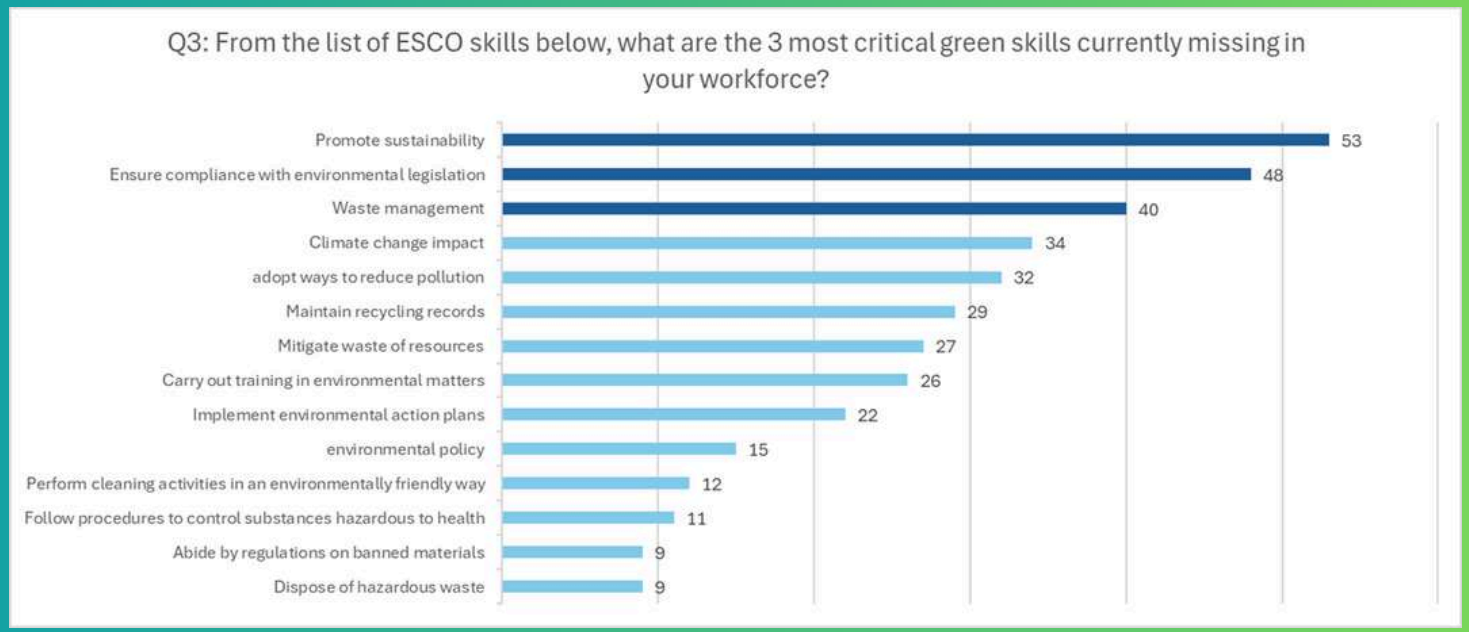
...RELATED TO MATERIALS



On average 70% of boatbuilders consider the green transition related to materials very important or extremely important

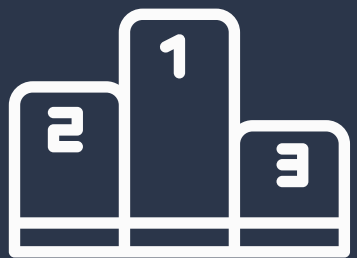
Only 3% of them consider it not important

CRITICAL SKILLS



Promotion of sustainability

Ensure compliance with environmental legislation



Waste management

ARE THERE OTHER SKILLS OR AREAS YOU WOULD LIKE TO MENTION?

Sustainable materials & eco-desgin

- Advanced application of bio-based resins and natural fibers in boatbuilding
- Development of industry standards for composite recyclability including teacking
- LCA implementation for product sustainability

Circular economy & waste management

- Development of recycling strategies for composites and hazardous waste
- Water filtration techniques and microplastic reduction in boatyards
- Efficient material use and waste minimisation during production

Skills development & workforce training

- Training of apprentecies and existing workforce in green technologies
- Awareness of funding opportunities and grants for sustainability projects
- Customer education on eco-friendly materials and practices

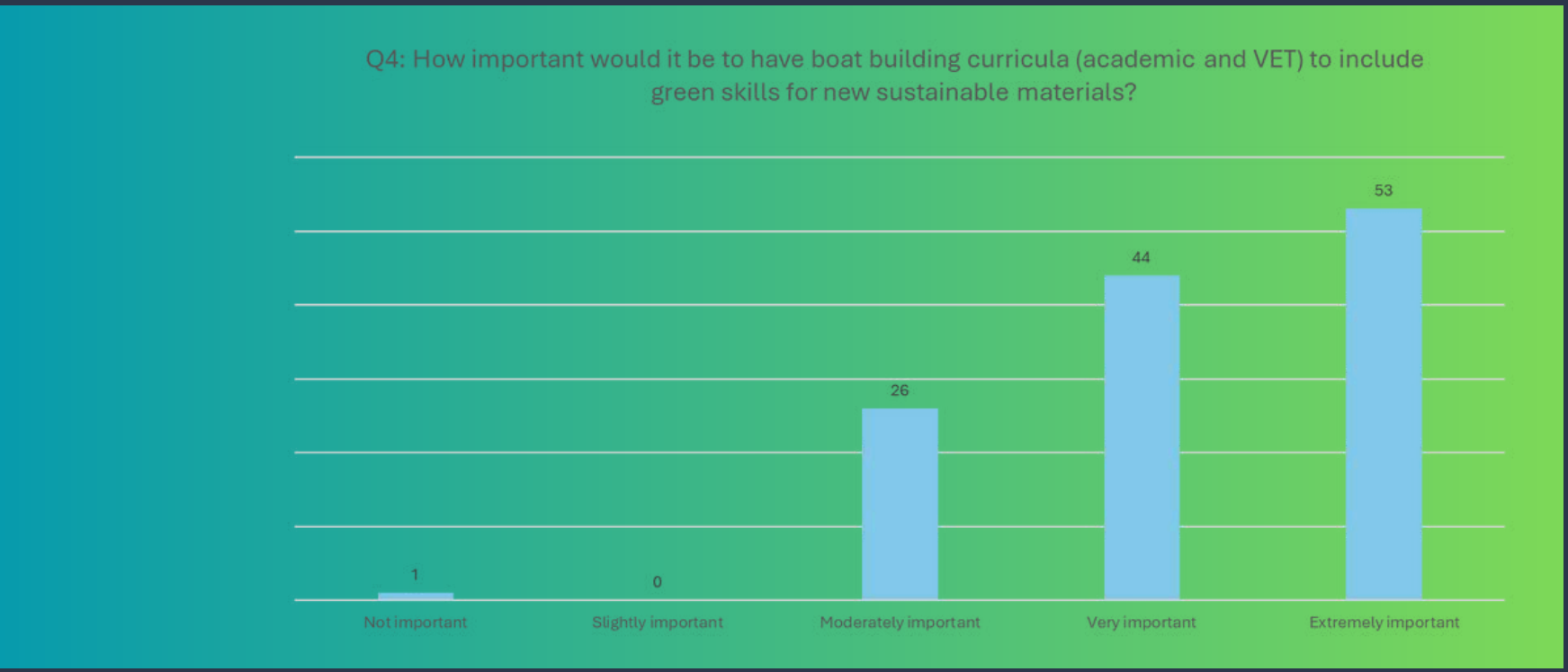
Regulations, Compliance & workforce training

- In-depth knowledge of ISO, ESCO skills, and environmental certifications
- Monitoring and auditing environmental impact supplier
- End-of-life boat dismantling and sustainable disposal strategies

Global Value Chain & Industry Collaboration

- Understanding and addressing supply chain sustainability challenges
- Knowledge-sharing and benchmarking with global best practices
- Integration of eco-conscious purchasing and sustainable transport strategies

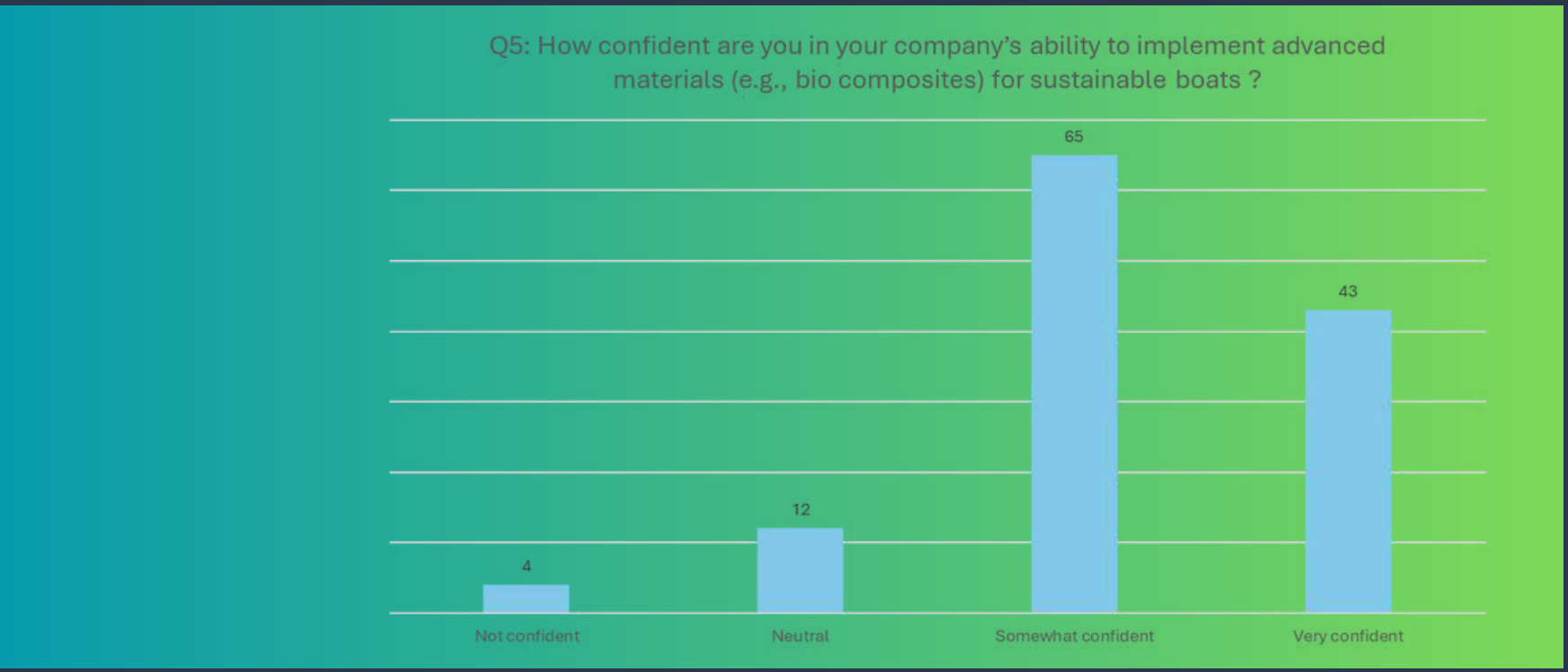
BOAT BUILDING CURRICULA



Almost 80% of the boat building companies believe in the importance of academic and VET curricula

Only 1% disagrees (due to it is dictated by the internal organisation of the company, they already have a research center that trains workers)

COMPANY`S ABILITY



Almost 90% of the boat building companies feels somewhat confident or very confident

Only the 3% feel not confident

Less than 10% neutral

WHAT DO ALL OF THEM HAVE IN COMMON?

Need for Industry Collaboration & Legislative Support

Companies recognize the need for change but feel policy and supply chain improvements are necessary.

- Call for **stronger regulation** to support material transition.
- Need for **cross-industry collaboration** (e.g., learning from the automotive sector).
- Expect material suppliers to **take more initiative** in offering solutions.

WHAT ARE THE CHALLENGES OF ADOPTING ECO-FRIENDLY MATERIALS OR PRACTICES?

CHALLENGE	KEY ISSUES
High costs	Sustainable materials & process cost more, limiting affordability
Permormance concerns	Sustainable /green materials must be durable, resistant, and meet marine standards
Supply chain Gaps	Lack of suppliers, especially local ones, increases difficulty
Lack of training & Knowledge	Need for workforce education, VET programs and upskilling
Regulatory Uncertainty	Compliance with certifications & unclear legal framework
Low Customer Demand	Market is not ready to pay extra for green solutions
Innovation	New materials require modifications and investments in manufacturing

EXAMPLE OF ADOPTION	KEY INITIATIVES
Companies using bio-materials	Flax fibers, PET foam, bio-resins, recycled composites
Circular economy efforts	Reusing production waste, reducing material consumption
Electric propulsion	Companies focusing on greener energy solutions
Waiting for market push	Interested in sustainability but need regulation or demand

COMPARATIVE INSIGHTS

BOAT-BUILDING COMPANY	SUSTAINABILITY APPROACH	KEY CHALLENGES	SUSTAINABLE INNOVATIONS
	Circular economy, recycled composites	Energy costs, market demand	Recycled materials, R&D partnerships
	Mass production, cost-focused	High costs, market demand	Solar panels, wood waste repurposing
	Serial production leader	Scaling green materials (to avoid high costs)	Flax fiber, Elium resin, training programs
	Performance yachts, sustainable materials	Balancing speed and weight while using new materials	Flax composites, cork decks, hydrogen propulsion

CONCLUSION & NEXT STEP: A TRAINING COURSE

The three most **commonly identified challenges** to implement sustainable practices and materials:

SKILL GAPS, LACK OF KNOWLEDGE & TRAINING OPPORTUNITIES

RUDIMENTARY COLLABORATION BETWEEN INDUSTRY AND EDUCATION

GAP BETWEEN SECTOR NEEDS & SUSTAINABILITY GOALS

The three **most critical skills missing:**

PROMOTION OF SUSTAINABILITY

ASSURANCE OF COMPLIANCE WITH ENVIRONMENTAL LEGISLATION

WASTE MANAGEMENT

The interviews conducted and their evaluation serve as a

great entry point to:

BUILD ON THE INTEREST & CONFIDENCE IN THE SECTOR TOWARDS GREEN MATERIALS AND PROCESSES

ALIGN SOME OF THE IDENTIFIED SKILLS WTIH ESCO SKILLS SETS:

WASTE MANAGEMENT &
DISPOSE OF
HAZARDOUS WASTE

COMPLIANCE

ENVIRONMENTAL POLICY

PROMOTION OF
SUSTAINABILITY

EXPAND AND PROVIDE MORE DETAILS ON SKILLS AND KNOWLEDGE NEEDS

TEcoNaut will carry on
with two actions:

1

ENRICHING THE ALREADY-EXISTING ESCO SKILL SETS AND ADD THE IDENTIFIED SKILLS,

to holistically represent crucial competences needed for green transition in the boating sector

2

DEVELOPING A TRAINING COURSE FOR VET STUDENTS BASED ON IDENTIFIED SKILLS

to learn about different aspects of sustainable materials, practices along with practical exercises to fill the identified skills & knowledge gaps.

Sustainable materials & eco-desgin

Circular economy & waste management

Skills development & workforce training

Regulations, Compliance & workforce training

Global Value Chain & Industry Collaboration

From the identified skills that are needed to bridge the knowledge gaps, the following ones will be included in the Teconaut training program:

- Advanced application of bio-based resins and natural fibers in boatbuilding
- Development of industry standards for composite recyclability and including teacking
- LCA implementation for product sustainability

- Development of recycling strategies for composites and hazardous waste
- Efficient material use and waste minimasation during production

- Training of apprentices and existing workforce in green technologies
- Awareness of funding opportunities and grants for sustainability projects

- In-depth knowledge of ISO, ESCO skills, and environmental certifications
- Monitoring and auditing environmental impact supplier
- End-of-life boat dismantling and sustainable disposal strategies

- Understanding and addressing supply chain sustainability challenges
- Knowledge-sharing and benchmarking with global best practices
- Integration of eco-conscious purchasing and sustainable transport strategies

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Would you like to learn more about the training?
Are you curious how can you implement the curricula in your teaching?
Are you interested in our work?

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