Quantis
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Blue Boat Horizon

Make Life Cycle Assessment the building block to improve the environmental performance and transform the future of the boating industry

Life Cycle Assessment methodology V1

EBI
European
Boating Industry

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01. Foreword
Robert Marx (EBI President)

The recreational boating industry is stepping up to the challenge of advancing sustainability. We believe that **Life Cycle Assessment (LCA)** is the key to unlock improvements in environmental performance - helping our businesses navigate toward a cleaner, more responsible future based on a strong business case. The **external perception on our industry is often wrongly based on Greenhouse Gas Emissions** and tailpipe emissions in the use phase, which constrains us in implementing innovation and technology that improves environmental performance from raw materials, to manufacturing, use phase and end-of-life.

LCA opens up innovation across the industry and to turn this vision into reality. **17+ leading European boat manufacturers and 9+ national industry associations** joined forces in the **Blue Boat Horizon (BBH) project** – with the aim to create the first-ever standardised methodology to measure and reduce the environmental footprint of recreational boats under 24 meters. This groundbreaking initiative, built on thousands of hours of expertise from industry specialists, is designed to be both **practical and scalable**, ensuring it meets real-world needs while addressing upcoming environmental regulations and putting our industry ahead of the regulatory curve.

Photo credits: Unsplash

This report captures the key takeaways from this international collaboration, led by **European Boating Industry (EBI)**, alongside **Quantis** (a BCG company), as a technical partner providing environmental sustainability consultancy services, and the **International Council of Marine Industry Associations (ICOMIA)** as our strategic partner.

The project unfolds in two phases. First we are **laying the foundation** through a science-based, industry-specific LCA methodology that meets the strict EU requirements, with rigorous third-party review. This is laid out in this methodology guide. The next step will be to **drive real change** – Implementing the methodology with a **database** and an **easy-to-use calculation tool**, making it accessible for widespread industry adoption. We look forward to embarking on these next steps with our global partners NMMA (National Marine Manufacturers Association) and ICOMIA.

By working together, we are providing manufacturers the tools to drive change and engage the supply chain to ensure that boating remains an enjoyable and environmentally responsible pastime for generations to come. And as President of EBI, I would like to express our gratitude to the associations, manufacturers and partners for supporting this project!

Robert Marx, EBI President

Europe Boating Industry - key metrics

Sectors

Boatbuilding, equipment manufacturing, marinas & service providers.

32,000

companies, predominantly SMEs that employ over 280,000 people directly.

6 millions

boats and over 10,000 marinas.

Timeline

02. Background

Why Life Cycle Assessment?

To support the sustainable transition of the boating industry, the Life Cycle Assessment (LCA) process gives businesses the opportunity to follow a comprehensive approach to evaluating the environmental impact of recreational boats. The assessment offers a multicriteria analysis going beyond greenhouse gas and tailpipe emissions to include impacts like energy use, waste, material resources, land use, and both freshwater and marine pollution.

Examples of eco-design

Decisions improving environmental performance across lifecycle enabled by the methodology

- Sourcing of recycled materials – reducing raw material impact
- Use of renewable energy on-site – reducing manufacturing phase impact
- Deployment of less impactful logistics – decreasing distribution phase impact
- Installation of more efficient engines – reducing use phase impact

By identifying hotspots, LCAs enable manufacturers to target specific environmental improvements in design and production, driving sustainability and avoiding greenwashing. For small and large yards, adopting LCAs can reduce their environmental footprint, align with key regulations, and enhance competitiveness by identifying cost-efficient saving opportunities through eco-design, comparing one material or technology to another. Each

Photo credits: Adobe Stock

yard can then identify their solutions based on their specific business case to improve environmental performance across the entire lifecycle.

The methodology developed by the BBH project is **practical**, **scalable**, and **tailored** to be accessible for all industry stakeholders across the value chain, including SMEs. It provides data that enables smart investment decisions.

Why PEF, PEFCR, and what is it?

The methodology aligns with the EU's Product Environmental Footprint (PEF) guidelines, ensuring environmental assessments are standardised, robust, and comparable, seeking alignment with upcoming regulations such as the Green Claims Directive (GCD) and support the EU's sustainability goals. It provides a unified framework to measure and communicate environmental impacts transparently. The project aims at subsequently developing official **Product Environmental Footprint Category Rules (PEFCR)** in the future. This offers specific, tailored rules to make PEF studies more efficient and relevant for the boating sector. Seeking compliance with the upcoming GCD requires that LCA are based on a recognized methodology to allow marketing claims among other measures to stop greenwashing.

Key project objectives

Transparent assessment 01

Harmonise Life Cycle Assessment calculations with a robust science-based and EU-PEF aligned methodology

Eco-design 02

Evaluate the environmental impact of recreational boats, aiming at encouraging and implementing eco-design practices

Environmental claims 03

Enable credible and trusworthy claims on the environmental performances to allow customers to make informed purchasing decisions based on equitable comparisons

Communicate 04

Inform the outside world of the Blue Boat Horizon project based upon existing EU regulation, including the Green Claim Directive to further influence the sector

Mobilise 05

Engage all actors from yards, engine manufacturers and the supply chain to transform the boating industry

03. Collaboration

Associations, large and small manufacturers, suppliers, yards of all sizes were involved in the project, representing some of the key countries in the industry; France, Italy, Germany, Spain, UK, Finland, Netherland, Poland, Croatia (see full table list at the end of the document)

Governance model

Quantis is part of the external service providers facilitating the interactions alongside EBI, providing directional recommendations spearheading the topics to develop and delivering technical support through its expertise

Blue Boat Horizon project in numbers

9+

associations, 17+ manufacturers, 8+ stakeholders, EBI and ICOMIA with growing participation

10

major workshops and dozens of other meetings providing technical input to the methodology

80-90%

market represented for sail and motorboats

2,000+

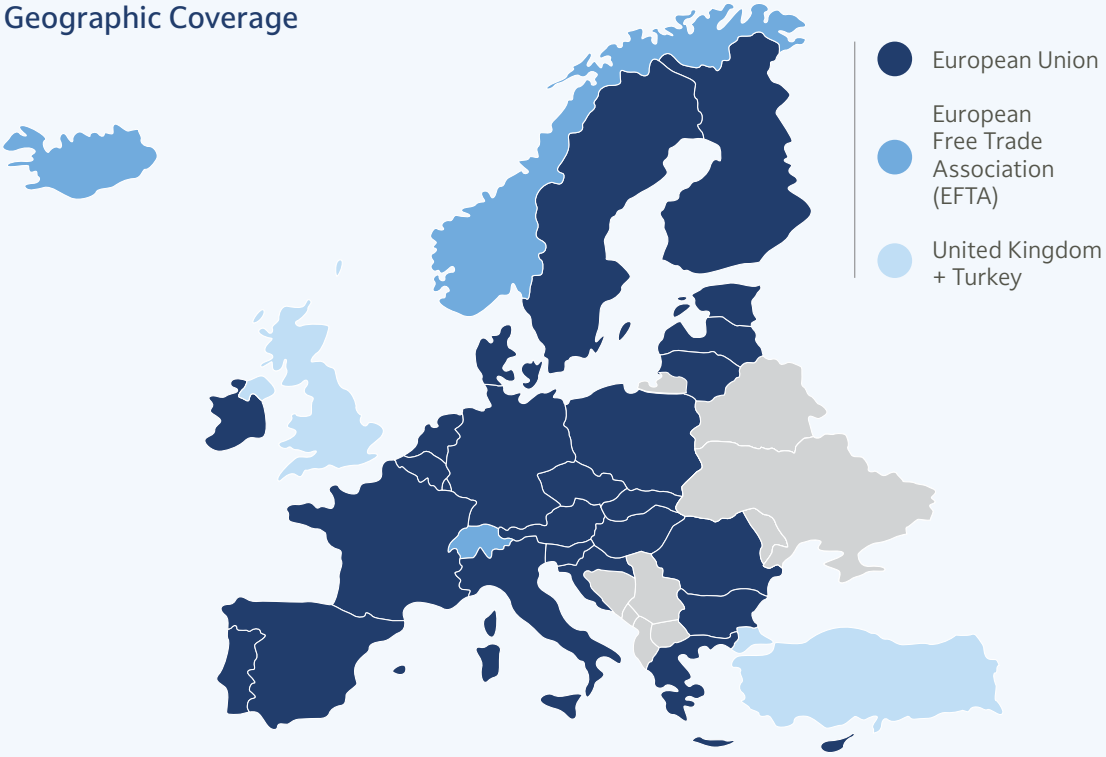
hours (250 working days) of involvement by technical experts of the industry in the project

1,000's

of datapoints from real usage, over 10,000 vessels, over 50,000 trips logged across Europe

The extent of coverage for Europe includes 33 countries:

Geographic Coverage



EU Countries

- Austria
- France
- Malta
- Belgium
- Germany
- Netherlands
- Bulgaria
- Greece
- Poland
- Croatia
- Hungary
- Portugal
- Cyprus
- Ireland
- Romania
- Czech Republic
- Italy
- Slovakia
- Denmark
- Latvia
- Slovenia
- Estonia
- Lithuania
- Spain
- Finland
- Luxembourg
- Sweden

EFTA Countries

- Iceland
- Liechtenstein
- Norway
- Switzerland

Pre-defined elements of the methodology

The following are the **key elements** integrated into the methodology that will be used for all LCAs and are pre-set.

1. Bill of Materials (BOM)
2. Propulsion - Use phase data (matrice of hours)
3. Equipment - Use phase data (energy consumption)
4. Maintenance scenario (frequency of replacement of part & equipment)
5. End-of-life of materials (dismantling, recycling and disposal)

Representative Bill of Material

1 Hull
- Hull
- Structure
- Misc. structure
- Insulation

2 Deck
- Deck (on-deck) structure
- Misc. structure
- Insulation

3 Deck equipment
- Sail trim deck gear
- Furniture
- Windows
- Other deck equipment

4 Interior layout & amenities
- Bulkhead (partition)
- Furniture
- Appliances

5 Rigging
- Outriggers
- Running rigging
- Standing rigging

6 Sails
- Mainsails
- Headsail
- Boom
- Mast

7 Appendages
- Rudder
- Keel
- Foils

8 Electronics
- Navigation
- Gyroscopic stabilizer
- Other electronics

9 Circuit system
- Water circuit
- Gas circuit
- Other hydraulics

10 Plumbing system
- Tank
- Heater
- Toilets/shower/Sink
- Pipes/pump

11 Electrical system
- Battery set
- Charge/Inverter
- Control panel
- Wiring

12 Main propulsion / energy system
- Engine
- Fuel system
- Auxiliaries
- Batteries
- Generator/Genset
- Other system

13 Secondary propulsion / energy system
- Engine
- Fuel system
- Auxiliaries
- Batteries
- Generator/Genset
- Other system

14 Other elements

[1] Not exhaustive

The methodology was reviewed by a third-party panel to ensure its robustness and PEF alignment.

Expert panel composition:

- Luca Zampori, PEF Author: PRé Sustainability (PEF/LCA Expert)
- Amedeo Migali: MICAD, (Naval Architect)
- Gonzalo Huaroc: Pôle Eco-Conception, (LCA expert)

Review statement extract

"The review panel has completed three rounds of evaluations of the proposed LCA methodology and recognizes its significant relevance as a major initiative at the European level. The methodology demonstrates a strong effort to align with the Product Environmental Footprint (PEF) method, as outlined in Commission Recommendation (EU) 2021/2279".

"The methodology provides a solid foundation for conducting life cycle assessment studies in compliance with ISO 14040/ISO 14044."

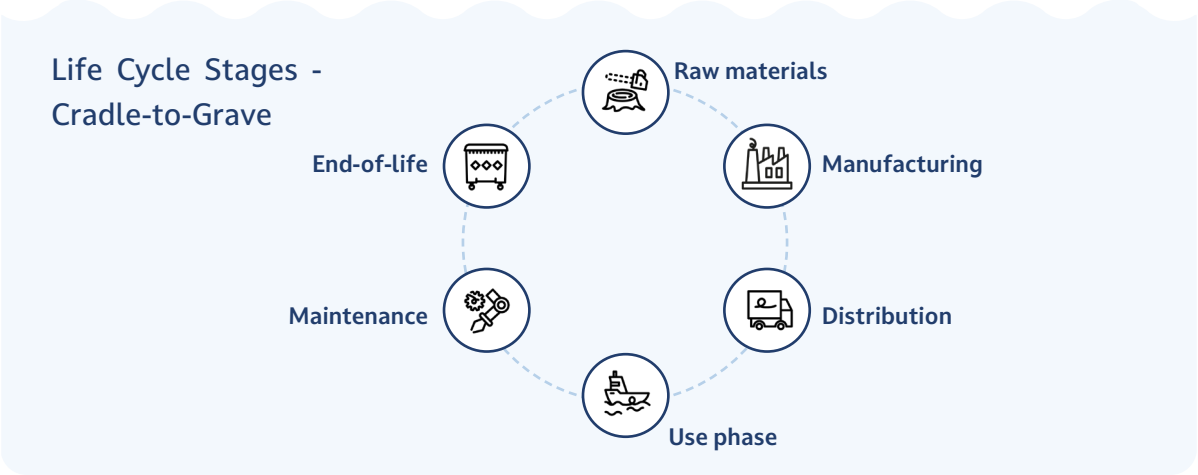
"Overall, the review panel is satisfied with the current state of the methodology and its readiness for practical application, while appreciating the consortium's forward-looking commitment to advancing its quality and relevance over time."

Photo credits: Adobe Stock

04. Methodology overview

System boundaries

The science-based BBH methodology is designed to comprehensively assess the environmental performance of recreational crafts, considering their entire life cycle. It emphasises on **practicality**, **scalability** and **alignments** with industry needs.



Boat classification

The use phase impact accounts for various operational activities (ie: slow cruise, medium speed, high speed, sailing, at anchor, at port, maneuvering, unused). Its determination relies on a series of typical use profiles for **4 types of craft classification** following the **RCD design criteria**[1] (ocean cruising, off-shore cruising, in-shore cruising, inland / sheltered). Each boat type is also associated with maintenance and replacement frequencies for on-board equipments, coatings, batteries, propulsion and sails.

Boat Classification

Description of design criteria[2]	**Ocean cruising** (Cat A)	**Offshore cruising** (Cat B)	**Inshore cruising** (Cat C)	**Inland / sheltered cruising** (Cat D)
Description of usage	Made for transoceanic voyage (Unrestricted range)	May include venturing several nautical miles from shore but not for long voyage (short range)	Boating that remain very close to the shore mainly for short trip of a day	Mainly day boating activity on calm water
Resistance to elements	Wind force 8; Wave>4m	Wind force 8; Wave 2m<>4m	Wind force 6; Wave 2m<	Wind force 4; Wave 0.5m<
Main propulsion	Sail (with aux. motor) 1a / Motor 1b	Sail (with aux. motor) 2a / Motor 2b	Sail (with aux. motor) 3a / Motor 3b	Sail 4a / Motor 4b

[1] The Recreational Craft Directive (RCD) regulates pleasure craft built and used with the European Economic Area (EEA). It applies to all recreational craft between 2.5 and 24 metres in hull length whatever the means of propulsion", classified under CPA code 30.12.1, including motorboats, sailboats (with and without auxiliary motors), and inflatable and non-inflatable leisure vessels.
[2] Refers to the categories crafts belong to, based on their ability to handle different sea and wind conditions from a safety and design standards standpoint, set by the RCD. (Cat. A – Ocean, Cat.B - Offshore, Cat.C - Inshore, Cat.D - Sheltered).

Functional unit

“1 hour of leisure for one person”

Type of craft, main propulsion and habitability have to be disclosed.

Impact categories (PEF - EF 3.1 Method)

- **Climate change**
- Human Toxicity, non cancer effects
- Particulate matter
- Photochemical ozone formation
- Ecotoxicity, freshwater
- **Resource use, minerals and metals**
- Ozone depletion
- Human toxicity, cancer effects
- Ionising radiation
- Acidification
- **Resource use, fossil**
- Terrestrial eutrophication
- Freshwater eutrophication
- **Marine eutrophication**
- **Land use**
- Water scarcity

Environmental impact indicators selected for the LCA case studies

LCA data inputs

The BBH methodology requires company specific data (e.g. BOM, engine fuel consumption) for accurate modelling of key phases and differentiation between alternatives. Default data ensure consistency where industry data is lacking (e.g., maintenance frequency, onboard energy calculation). The Ecoinvent database is the reference for background data, with other databases to be analysed in future.

Photo credits: Adobe Stock

[3] Eco-Invent database provider to support science-based environmental assessments (https://ecoinvent.org). Other databases can be used in alignment with the methodology

05. LCA example and results interpretation

LCA case studies with real-world data were used to **stress-test, question, and challenge** the outputs generated to further revise the modelling rules of the methodology and to identify points that needed to be reviewed or refined.

Functioning of a Life Cycle Assessment

Step 1
Provision of detailed Bill of Material

- Materials used, production processes, electricity consumption
- Standardised data quality requirements

Step 2
Calculation in tool based on methodology

- Same use phase assumptions for similar boats
- Assumptions on end-of-life treatment
- Use of database for emission factors

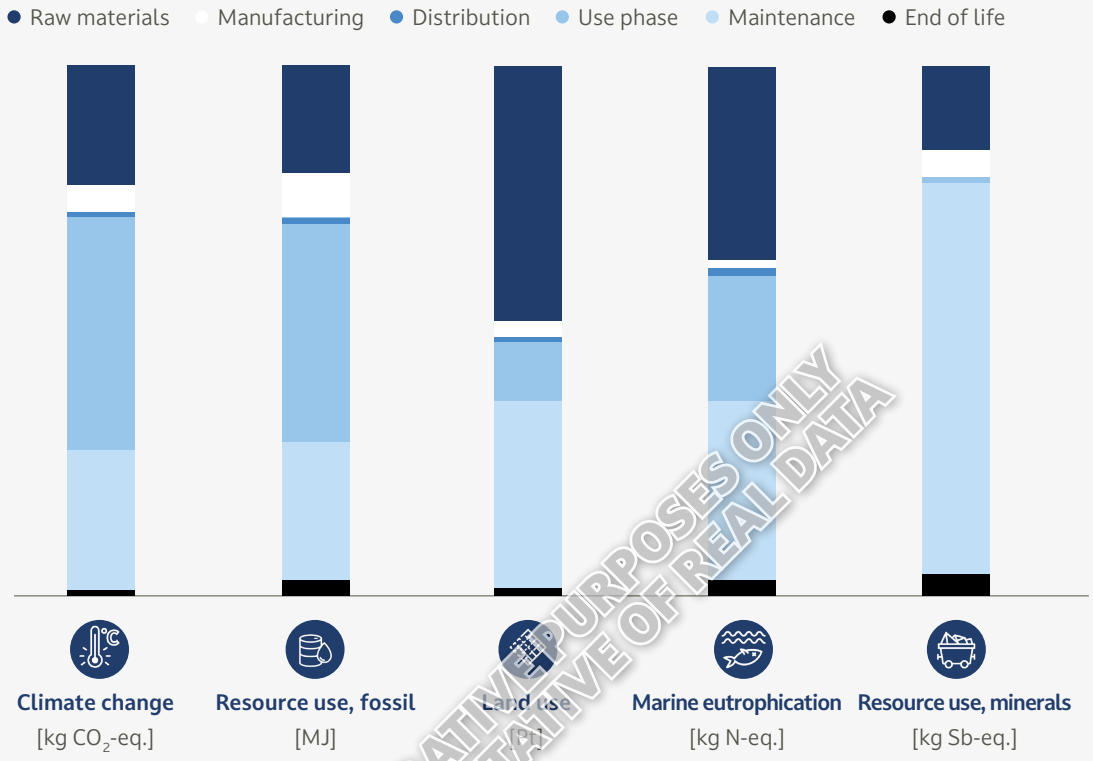
Step 3
Outcome of life cycle assessment

- Environmental indicators impact (eg. Climate Change)
- Hotspot and contribution analysis
- Sensitivity analysis

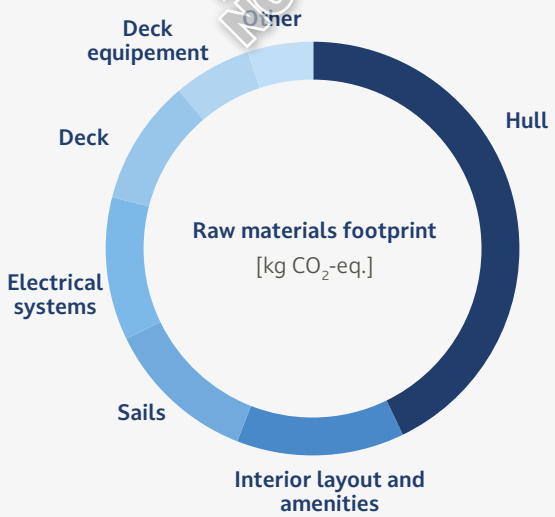
Step 4
Internal and external uses

- Eco-design
- Products comparison
- Communication (claims)

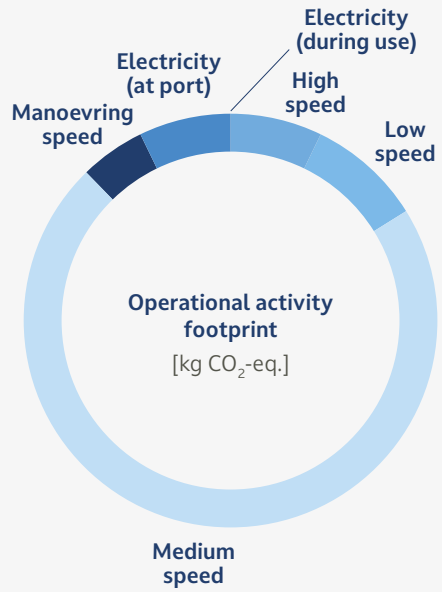
LCA Results - Environmental Impact Breakdown Contribution per Indicators



Raw Materials Contribution



Use Phase Contribution



06. Use of the methodology

Use of the methodology

- **Eco-design:** assessing and improving environmental performance
- **Data:** Testing and feeding data back to project for further development
- **Third party review:** Further review by external experts
- **Communication:** Use of data for marketing, sales in public (to be permitted after testing, improvement phase)

Current project stakeholders will be able to use the methodology, and additional project stakeholders are be invited to test methodology and be involved in further development.

Communication

- **Provide transparent verified claims** about the environmental performance of crafts, enhancing trust and market competitiveness
- **Third type of claims:**
    - **Declarative** (report environmental performance),
    - **Eco-design** (improve environmental performance across iterations),
    - **Comparative claims** (comparison of products)[1]

Photo credits: Adobe Stock

[1] ISO Standards 14020 & 14040

07. Next steps

The debates, data, technical expertise and cooperation brought to the Blue Boat Horizon project has shown the importance of consolidating and harmonising LCA methodologies. EBI is excited to be continuing this for the global phase of the project in cooperation with our partners **NMMA** and **ICOMIA**.

The aim continues to be bringing together a database and tool that players in the market from small businesses to larger serial production yards can make us of and be their key tool to improve environmental performance based on a strong business case.

The Version 1 methodology provides a strong foundation and framework that will be further developed to transition from a PEF-aligned framework to full PEFCR compliant framework recognised by the EU. Continuing testing and development is planned to further improve and optimise the methodology over the next period.

We invite all stakeholders to join and shape LCA as the building block of the industry's transformation!

Photo credits: Unsplash

08. Project participants

The **Blue Boat Horizon project** involved a wide range of stakeholders, with critical roles and contributions. Each stakeholder played an important role, from providing technical data and manufacturing insights to ensuring regulatory compliance and promoting eco-design innovation.

Stakeholder Type	Project participants
Industry associations	EBI, ICOMIA & National Associations: FIN,BVWW, ANEN, Confindustria Nautica, Polboat, HISWA-RECRON, Finnboat, British Marine, CEA Nautical Sector
Manufacturers/yards	Beneteau, Fontaine-Pajot, Catana, GLY, Amel Yacht, Ihna Works, Sanlorenzo, Bavaria Yachts, Ferretti Group, Sasga, Greenline, Sunreef, Azimut Benetti, Amer Yachts, Ferretti Groups, Sunseeker, Laisai
Stakeholders	IMCI, EuCIA, European Boating Association, Brunswick, Torqeedo, Oceanvolt, ICOMIA Marine Engines Committee, Euromot, Epropulsion, Brunswick Corporation
LCA expert reviewers	Quantis, Independent Reviewers (PRé Sustainability, Micad, Pôle Eco-Conception)
Technical partner	Quantis

Figure: Stakeholders type example roles

Classification	Propulsion	Source of data	Sampling size
Ocean cruising	Motor	• British yard • Italian yard • Italian yard	• 750 vessels • 65 vessels + engine data • 4,600 vessels + engine data
	Sail	• French yard • Quantis • Sailties	• 59 boats • Data provided to and analysed by Quantis • 386 vessels, 63 models, 2,324 trips
Offshore cruising	Motor	• French yard • Quantis • British yard	• 55 boats • Data provided to and analysed by Quantis • 750 vessels + Engine data for over 70 boats
	Sail	• Quantis • Sailties	• Data provided to and analysed by Quantis • 86 boats (15 models)
Inshore cruising	Motor	• French yard • Finnish yard	• 251 boats • 3,500+ boats and around 66,000 individual trips
	Sail	• Quantis • Sailties	• Data provided to and analysed by Quantis • 86 boats (15 models)
Inland cruising	Motor	• Quantis • Finnish yard • UK study on inland boating sector • KPMG study for Ireland inland boating sector	• Data provided to and analysed by Quantis • 3,500+ boats and around 66,000 individual trips • N/A • 220 boats
	Sail	• Sailties	N/A

Figure: Source of data to elaborate the profiles

To request access to the full methodology, please contact EBI.

EBI represents the recreational boating industry in Europe. It encompasses all related sectors, such as boatbuilding, equipment manufacturing, marinas and service providers. The mission of EBI is to advance and represent a sustainable boating and nautical tourism industry **#MadeInEurope**.

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