

EcoShipYard Partner Updates & Technical Highlights

Welcome to Volume 6 of the EcoShipYard (ESY) newsletter!

EcoShipYard continues to develop practical solutions to reduce the environmental impact of shipyards and support circularity across the vessel lifecycle. This sixth edition highlights progress on the Ship Digital Passport, environmental assessment methods and digital tools connecting shipyard operations with sustainability data. We also share findings from shipyard monitoring activities and updates on the project's publications and outreach.

Included in this issue:

- **Circularity and environmental assessment**
  The Ship Digital Passport and Shipyard Environmental Performance Index (SEPI).
- **Digital tools and pilot activities**
  ESY platform developments, production data integration and

occupational health and safety monitoring.

- **Knowledge sharing and project visibility**
  The Green Book of Shipyards, industry and policy engagement, and the upcoming SSGS 2026 conference.

Work Package Highlights & Technical Progress

WP2 – Non-operational environmental impacts from shipping

Within the ESY project and WP2, ABS and project partners Azimut Benetti, ISQ, and Danaos completed Task 2.5 of the EcoShipYard project, advancing circular economy principles in shipping. The task developed a Ship Digital Passport (SDP) concept and identified circularity metrics applicable throughout a vessel's lifecycle. Adapted from the Digital Product Passport concept emerging under EU policy, the SDP provides a structured framework for vessel data. It covers four categories: Vessel Information, Sustainability and Circularity, Health and Safety Records, and Value Chain Actors (Figure 1)

This framework aims to improve traceability, transparency, and lifecycle data management, supporting more circular vessel design, operation, maintenance, retrofit, and end-of-life decisions. The SDP could also link vessel-level information with future passports for subsystems, equipment, and components. The task reviewed circularity metrics covering material origin, waste generation, recyclability, reuse, recovery, durability, and material retention.
However, standardized maritime circularity metrics are not yet established, and the data required for robust assessment remains limited. Two real-world case studies, involving a cargo/steel vessel and a recreational/composite vessel, assessed practical applicability with shipyard and shipowner input. Findings confirmed the SDP's usefulness and the relevance of the metrics, while highlighting gaps in data availability, quality, and industry readiness.

Confidentiality and intellectual property restrictions also presented

challenges, particularly regarding access to design information while differences between vessel types demonstrated the need for a flexible and modular SDP structure.

Successful implementation will depend on improved data practices, clearer stakeholder responsibilities, broader industry engagement, and further development of maritime-specific assessment methods. The final results are presented in Deliverable D2.3, “Material Passport Blueprint & CRL Index,” submitted in August 2026.

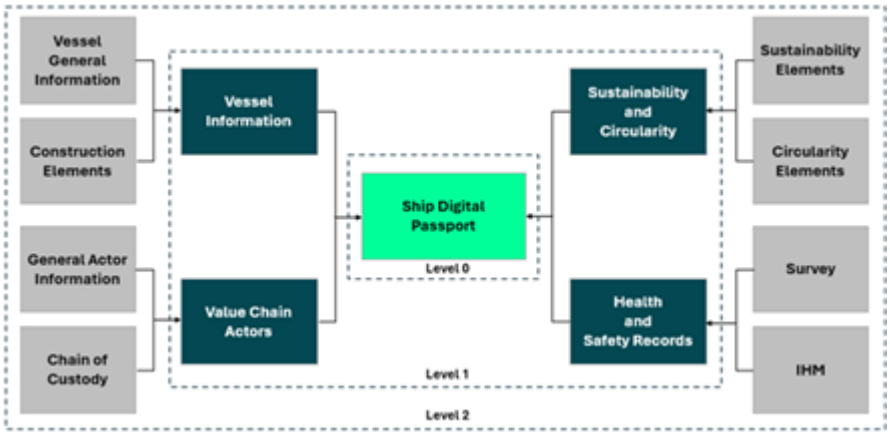


Figure 1: Schematic representation of the Ship Digital Passport



Figure 2: The lifecycle stages of a vessel

WP3 – Assessment of Ship Lifecycle Processes

Shipyard Emissions and Environmental Evaluation

WP3 has reached an important milestone with the submission of Deliverable D3.3, “KPIs and SEPI for Environmental Assessment Standards and for Sustainable Shipyard Processes.” Building on the process inventory (D3.1) and quantification methodology (D3.2), the work package has delivered the Shipyard Environmental Performance Index (SEPI), a composite indicator that measures the environmental footprint of shipyard activities beyond carbon

alone. SEPI draws on eleven internationally recognized environmental indicators, including climate change, resource depletion, acidification, smog formation, and toxicity. It is reported as two complementary scores: SEPI Processes, covering on-site operations such as cutting, welding, blasting and coating, and SEPI Materials, covering the footprint of the materials entering the yard. Keeping the two separate ensures that improvements on the shipyard floor stay visible alongside the much larger impact of materials. The team also developed a common process taxonomy for newbuilding, repair/retrofit and dismantling, reusable "process patterns" for consistent data collection, and the requirements for integrating SEPI into the ESY platform and its dashboard.

The methodology was tested on two industrial use cases: a steel scrubber tank retrofit at Astander and GRP yacht hull construction at Azimut Benetti. Coating emerged as the main process hotspot in the retrofit case, while VOC emissions from open moulding and gelcoat application dominated the composite case. Scenario tests showed how SEPI can support decisions. Switching the coating method cut process-related emissions by around 40%, recycled steel sharply reduced the materials footprint, and on-site solar power lowered electricity-related impacts. Industry partners welcomed the approach. They also stressed that SEPI is most meaningful when comparing similar shipyards or tracking the same process over time, and that it should align with existing reporting frameworks such as the GHG Protocol. Next steps include integrating SEPI into the ESY platform, cross-checking the platform results against the use-cases, and refining the methodology with further site-specific data.

Suggested Visuals from D3.3:

See figures 3,4,5.

This WP has made substantial progress in developing an integrated **Life Cycle Assessment (LCA) methodology** for evaluating the environmental footprint of shipyards and shipbuilding processes. DLR, NTUA and Epsilon have focused on lifecycle inventories, emission factors, mathematical models and environmental assessments of key shipyard activities, including cutting, welding,

surface preparation, coating and energy consumption. A major achievement is the **Shipyard Environmental Performance Index (SEPI)**, enabling systematic environmental assessment and benchmarking. Supporting digital tools, including the LC emissions assessment model, facilitate emissions estimation and identification of environmental hotspots. These developments establish a technological foundation for integrating LCA into shipyard Digital Twins and decision-support systems, extending environmental assessment across construction, maintenance, retrofitting and end-of-life activities.

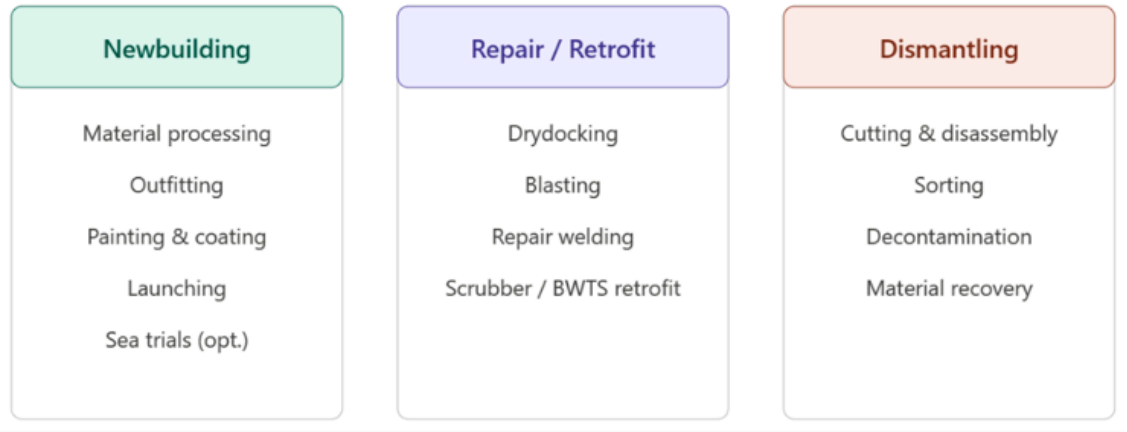


Figure 3: process categories across newbuilding, repair and dismantling

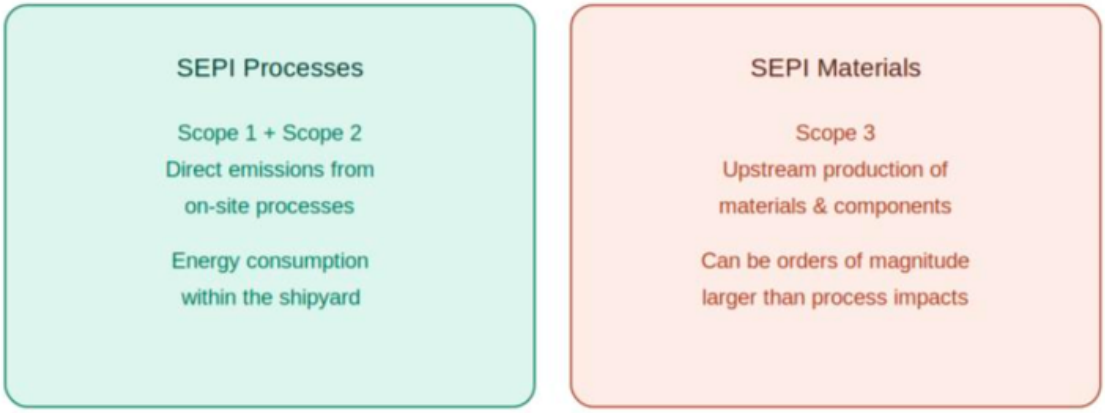


Figure 4: the two complementary SEPI indicators

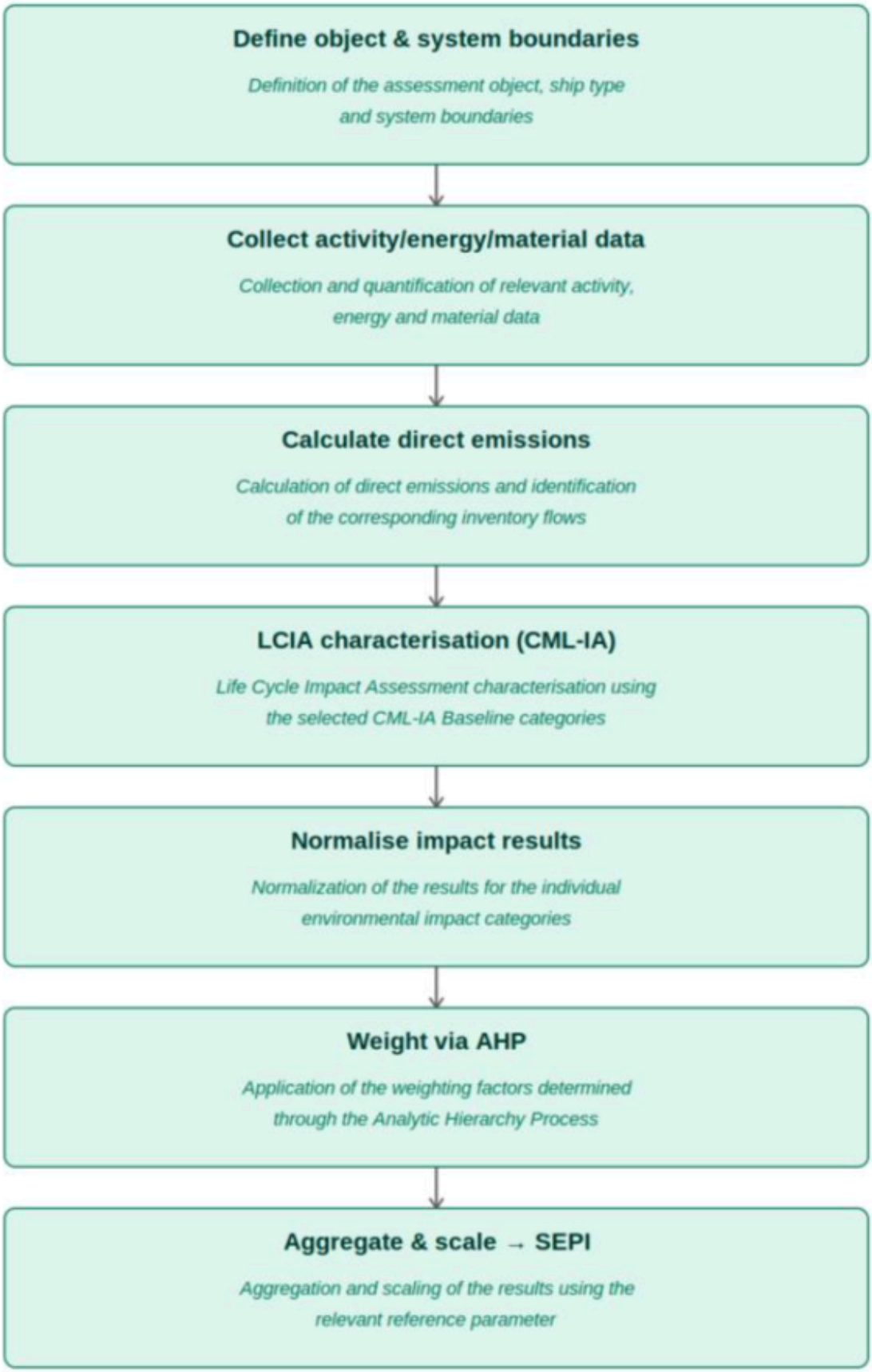


Figure 5: the step-by-step SEPI calculation sequence

WP4 – ESY Platform

Digital Decision Support, Material Passport & Circular Readiness

Reliable data acquisition and analytics constitute essential prerequisites for data-driven process monitoring and sustainability-oriented optimization in industrial environments. In this context, an AI-powered, non-intrusive Edge Observer has been developed to capture, process, and analyse operational data directly at the shop-floor level. The approach is specifically designed to overcome limitations associated with conventional data acquisition infrastructures, particularly in existing production facilities where modifications to machinery or production processes may be difficult, costly, or subject to extensive certification and approval procedures.

A key characteristic of the Edge Observer is its non-intrusive mode of operation. It does not require modifications to existing equipment and does not interfere with ongoing production processes. Consequently, the need for additional certification or approval procedures can be minimized, facilitating its deployment in operational environments. The solution is based on self-contained edge computing devices equipped with a variety of sensors and sufficient computational capabilities to perform data pre-processing and post-processing directly on the device.

The Edge Observer uses artificial intelligence (AI) and machine learning (ML) methods to identify characteristic data patterns, referred to as signatures, based on previously collected and labelled training data. By learning the characteristic signatures of different machine states and operating conditions, the integrated ML model enables the automatic detection and classification of ongoing activities without requiring direct access to the machine control system. This allows relevant operational information to be extracted from sensor signals and translated into meaningful information about the current state and behavior of production equipment.



Figure 6

Significant progress is being made towards integrating the **ESY Life Cycle Assessment (LCA) methodology and Shipyard Environmental Performance Index (SEPI)** into the EcoShipYard digital platform. The integration focuses on connecting environmental inventories, emission factors, mathematical assessment models and shipyard operational data with cloud-based calculation engines, dashboards and decision-support functionalities. The integrated system is designed to enable users to **calculate environmental footprints, assess Scope 1, 2 and 3 impacts, identify environmental hotspots, benchmark shipyard performance through SEPI, and evaluate alternative improvement scenarios**. The development roadmap targets **30 December 2026** for delivery of a **fully functional, cloud-based ESY-LCA/SEPI system**, providing an operational foundation for continuous environmental assessment, performance monitoring and future Digital Twin integration. This will represent a major step towards transforming ESY research results into practical digital services for European shipyards.

By the end of WP4, the project aims to demonstrate the connection between Floor2Plan and the EcoShipYard platform, bringing together shipyard production and operational information with environmental data collected directly from the shop floor. During this period, we have extended Floor2Plan’s capabilities to capture

and use this information end-to-end, including sensor data such as temperature and energy consumption, as well as project and consumption data received through REST API interfaces. Building on this data flow, we have also developed calculation logic that can use imported project properties to generate planning and cost estimates, for example estimating labour hours from block dimensions or expected energy consumption from welding information. Together with reusable process templates, scalable planning structures and improved data imports, these developments create a more connected workflow while reducing manual data preparation and re-entry.

To extend this connectivity beyond Floor2Plan, we have also implemented interfaces that allow external systems to access relevant Floor2Plan data and developed a reference **MES Bridge** demonstrating how another Manufacturing Execution System can retrieve and interpret this information. This approach supports the interoperability required within the EcoShipYard ecosystem, connecting sensor data, production information and external systems through documented interfaces rather than individual bespoke integrations. The next steps will focus on expanding the information available through these connections and refining the calculation models using representative production data, with the final WP4 demonstration showing how operational and environmental information can work together to provide a more integrated view of shipyard activities, planning and environmental performance.

Screenshot: Figure 7.

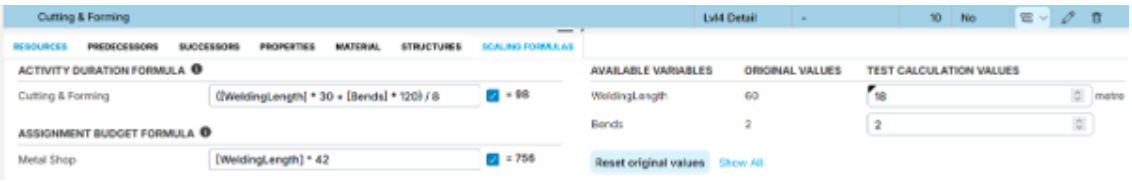


Figure 7: Scaling formulas

WP5 – Pilot Deployment and Testing

In WP5 an occupational health and safety monitoring campaign was conducted in a shipyard environment during representative carbon-steel fabrication activities. The monitored processes were MIG (Metal Inert Gas) welding, grinding using an electrical angle

grinder fitted with a 125 mm grinding disc, and cutting using an electric angle grinder fitted with a 125 mm cutting disc. The objective was to generate a baseline screening assessment of airborne particulate and gaseous emissions associated with these activities and to identify potential worker exposure concerns.

The monitoring campaign used a real-time particulate analyser measuring particle concentration across size channels from 0.3 µm to 10 µm, and a gas analyser measuring SO_2, HCHO, NO, CO_2, CO and TVOC over approximately 160 minutes.

The particulate results show that active work cycles generated measurable increases above background conditions across several particle-size fractions. This confirms that MIG welding, 125 mm angle-grinder grinding and 125 mm angle-grinder cutting are airborne particle-generating processes. The gas-monitoring results show generally low levels of SO_2, HCHO and NO, while CO_2 and TVOC fluctuated during the measurement period. A distinct short-duration CO peak and simultaneous disturbance in SO_2, CO_2 and TVOC were observed around 100 minutes, indicating a task-related emission episode.

Item	Confirmed technical description
Welding	MIG (Metal Inert Gas) welding performed on carbon steel.
Grinding	Electrical angle grinder equipped with a 125 mm grinding disc, used on carbon steel.
Cutting	Electrical angle grinder equipped with a 125 mm cutting disc, used on carbon steel.
Material	Carbon steel for all monitored processes.

Figure 8: occupational health and safety monitoring campaign

Key EcoShipYard Events and Outreach Activities

Over the past months, **EcoShipYard** strengthened its visibility across major European maritime and transport platforms, engaging with researchers, shipyards, policymakers, technology providers and the wider innovation community. The following highlights capture the key moments that supported dialogue, knowledge exchange and the promotion of sustainable, circular and energy-efficient shipyard operations.

EcoShipYard Showcased the Future of Sustainable Shipyards at SMM Hamburg 2026

1- 4 September 2026 at Hamburg Messe und Congress, Germany

EcoShipYard (ESY) was proudly represented at **SMM Hamburg 2026**, held from **1–4 September 2026 at Hamburg Messe und Congress, Germany**, bringing the project closer to the international maritime and shipbuilding community. As one of the leading global meeting points for the maritime industry, SMM provided an excellent opportunity to raise awareness of EcoShipYard and its work towards **more sustainable, efficient and circular shipyard operations**. Throughout the four-day event, EcoShipYard was represented at the booths of three project partners: **Atlantec Enterprise Solutions GmbH** in Hall B4, Booth 207; **LTH-Baas** in Hall B2, Booth 215; and **Floorganise** in Hall B7, Booth 436.Through this joint presence, visitors had the opportunity to meet members of the EcoShipYard consortium, learn more about the project and exchange ideas on the challenges and opportunities surrounding the transition towards greener and more resource-efficient shipbuilding and shipyard practices.



ESY at SMM 2026

EcoShipYard Showcases Sustainable Shipyard Innovation at Green Shipping Day 2026 in Nice

23 September 2026 | Nice, France| Green Shipping Day 2026

EcoShipYard (ESY) participated in Green Shipping Day 2026, organised by Green Marine Europe and held in Nice on 23 September 2026. The event brought together shipowners, shipyards, ports, industry representatives, researchers and policymakers to discuss maritime decarbonisation, circularity, biodiversity and environmental performance.

EcoShipYard (ESY), presented by **Prof. Marc Bonazountas (EPSILON Group)**, demonstrated how shipyards can evolve into cleaner, digitally enabled and environmentally accountable industrial ecosystems. ESY advances Life Cycle Assessment (LCA), the Shipyard Environmental Performance Index (SEPI), emissions assessment, digital decision-support tools and sustainable shipbuilding and repair practices.

The event also featured a complementary presentation of ESY's Horizon Europe sister project, **Circles of Life**, by **Rosanne van Houwelingen (Maritime & Offshore NL)**. Her presentation addressed maritime circularity throughout the vessel lifecycle, including material traceability, component reuse and the emerging Ship Lifecycle Passport.

Together, the two projects highlighted complementary approaches to maritime sustainability: EcoShipYard measures and improves shipyard environmental performance, while Circles of Life strengthens lifecycle information and circular material management.



ESY at Green Shipping Day 2026

Sharing EcoShipYard's Environmental Assessment Approach Across Sectors

EcoShipYard partners shared the project's Life Cycle Assessment (LCA) methodologies and Shipyard Environmental Performance Index (SEPI) through industry events and academic engagement, exploring their application within and beyond shipbuilding.

ECMAR General Assembly | 7–9 October 2026, Varna, Bulgaria
Marc Bonazountas (EPSILON) presented EcoShipYard and discussed future European research and innovation proposals for next-generation shipyards, highlighting the potential contribution of ESY technologies and SEPI.

MARE MED IV Conference | 13–15 October 2026, Tel Aviv
Marc Bonazountas promoted the ESY-LCA approach in discussions on sustainable shipyards.

Academic knowledge exchange | Paris, France
During a university lecture, Christianna Karadimiriou (EPSILON) presented the value of ESY's LCA methodologies and SEPI, including their potential application to the SUNPEROM perovskite photovoltaic energy system for lifecycle environmental assessment and sustainability benchmarking.

These activities expanded awareness of EcoShipYard's results and explored opportunities to apply its environmental assessment methods across different industries.



ESY-LCA and SEPI

EcoShipYard and CirclesOfLife Cooperate on "The Green Book of Shipyards"

This book offers a timely and comprehensive overview of how modern shipbuilding is evolving in response to sustainability imperatives, circular economy principles, and digital innovation. As the maritime industry accelerates its transition toward climate neutrality, shipyards stand at the forefront of this transformation.

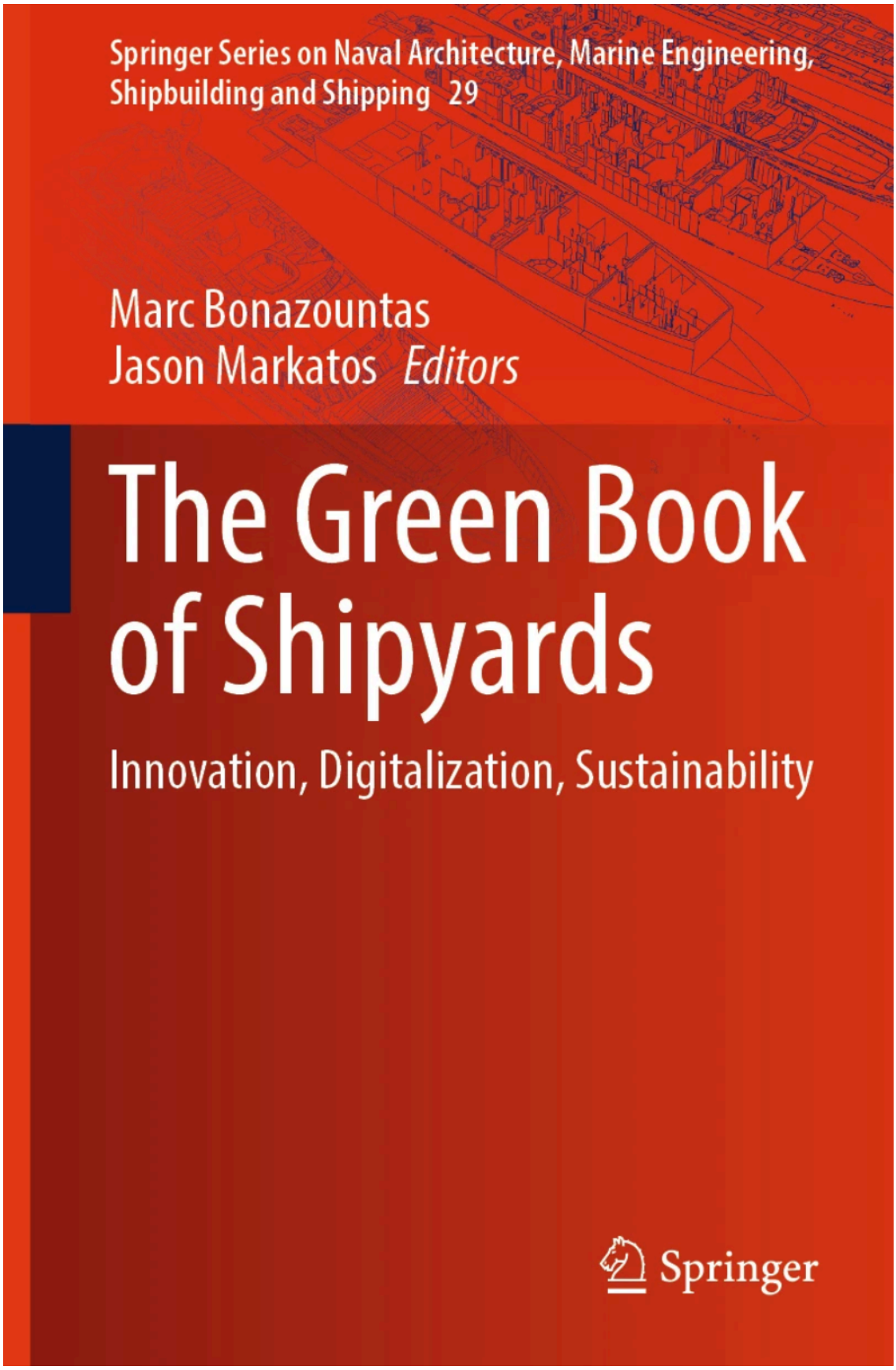
Drawing from the outcomes of two major European Commission-funded projects, EcoShipYard and Circles of Life, this book presents contributions from over 32 leading organizations, including maritime research institutions, technology developers, shipyards, and the Green Marine Europe initiative. Readers will find practical insights, illustrated case studies, and technology applications covering a range of topics: from low-emission materials and lifecycle assessment (LCA) to digital twins, emissions monitoring, and compliance with EU and IMO regulatory frameworks.

The book is organized into four thematic sections: Shipbuilding Engineering, Digitalization and ICT, Environmental and Social Governance (ESG), and Legal and Regulatory Developments,

making it accessible to readers from both technical and non-technical backgrounds. Ideal for engineers, researchers, policy professionals, and maritime business leaders, this book is both a reference and a roadmap—offering a rich overview of how sustainability and innovation are shaping the future of shipbuilding.

We sincerely thank Prof. Marc Bonazountas (Epsilon) and Ms. Rosanne van Houwelingen (Maritime & Offshore NL) for fostering this cooperation, and all contributors for sharing their expertise. This joint effort highlights the importance of cooperation between European projects in bringing together complementary knowledge, strengthening the impact of research, and advancing a more sustainable maritime industry.

Find out more about the book on Springer.



The Green Book of Shipyards

Looking Ahead: SSGS 2026 in Glasgow



SSGS 2026 Announcement

Horizon Magazine Feature: Europe's Shipyards Navigate from Sunset Industry to Green Revival

7-8 December 2026 | University of Strathclyde, Glasgow | SSGS

How can shipyards become smarter, greener and more sustainable? The **International Conference on Smart, Sustainable & Green Shipbuilding (SSGS 2026)** will bring together researchers, industry professionals, policymakers and technology providers on **7–8 December 2026 at the University of Strathclyde in Glasgow** to explore this question.

Organised in collaboration with **EcoShipYard, Circles of Life and the University of Strathclyde**, the conference will focus on digitalisation, advanced manufacturing, environmental impact reduction, lifecycle assessment and circularity. Participants will have the opportunity to exchange knowledge and discuss solutions for a more sustainable and competitive shipbuilding sector.

Attendance is free of charge, and registration is open. The detailed programme will be announced soon.

Explore the conference website and programme updates

FIND OUT MORE ON OUR WEBSITE

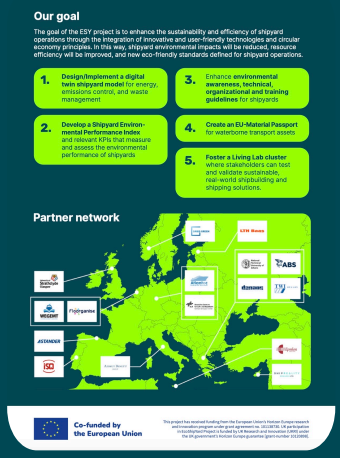
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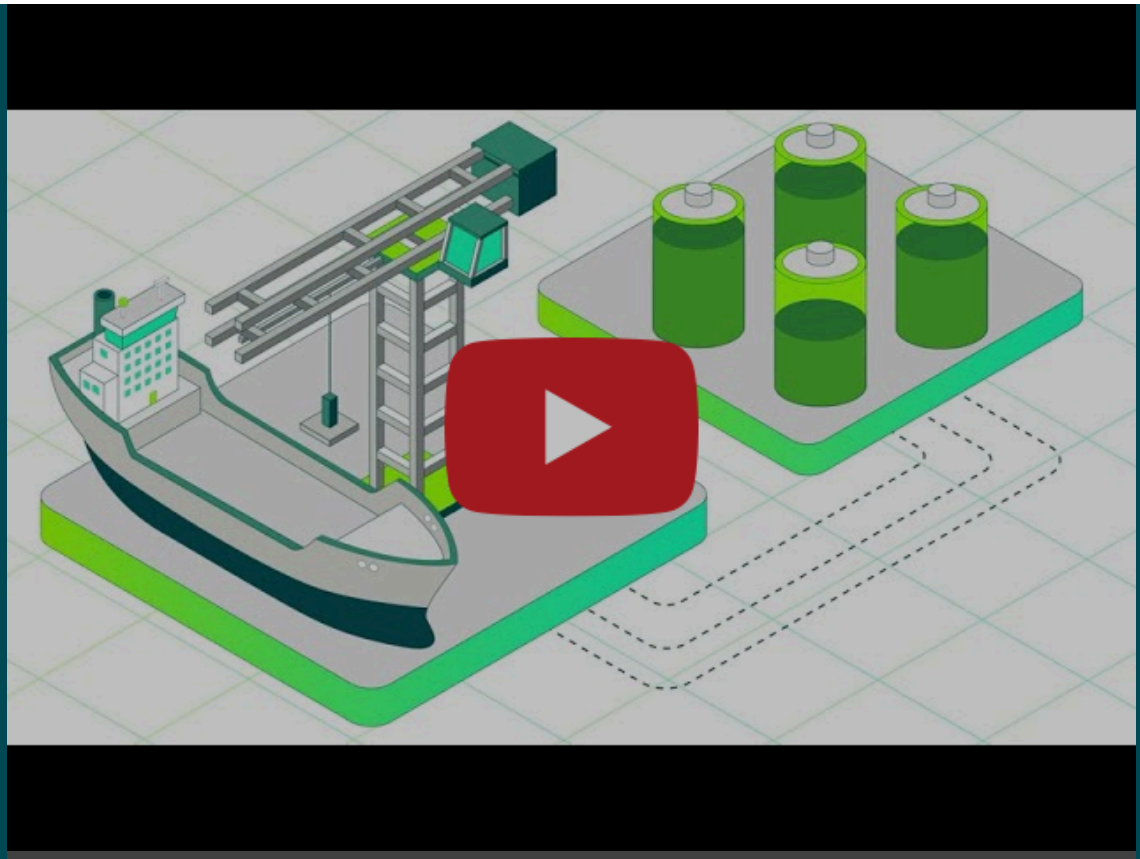
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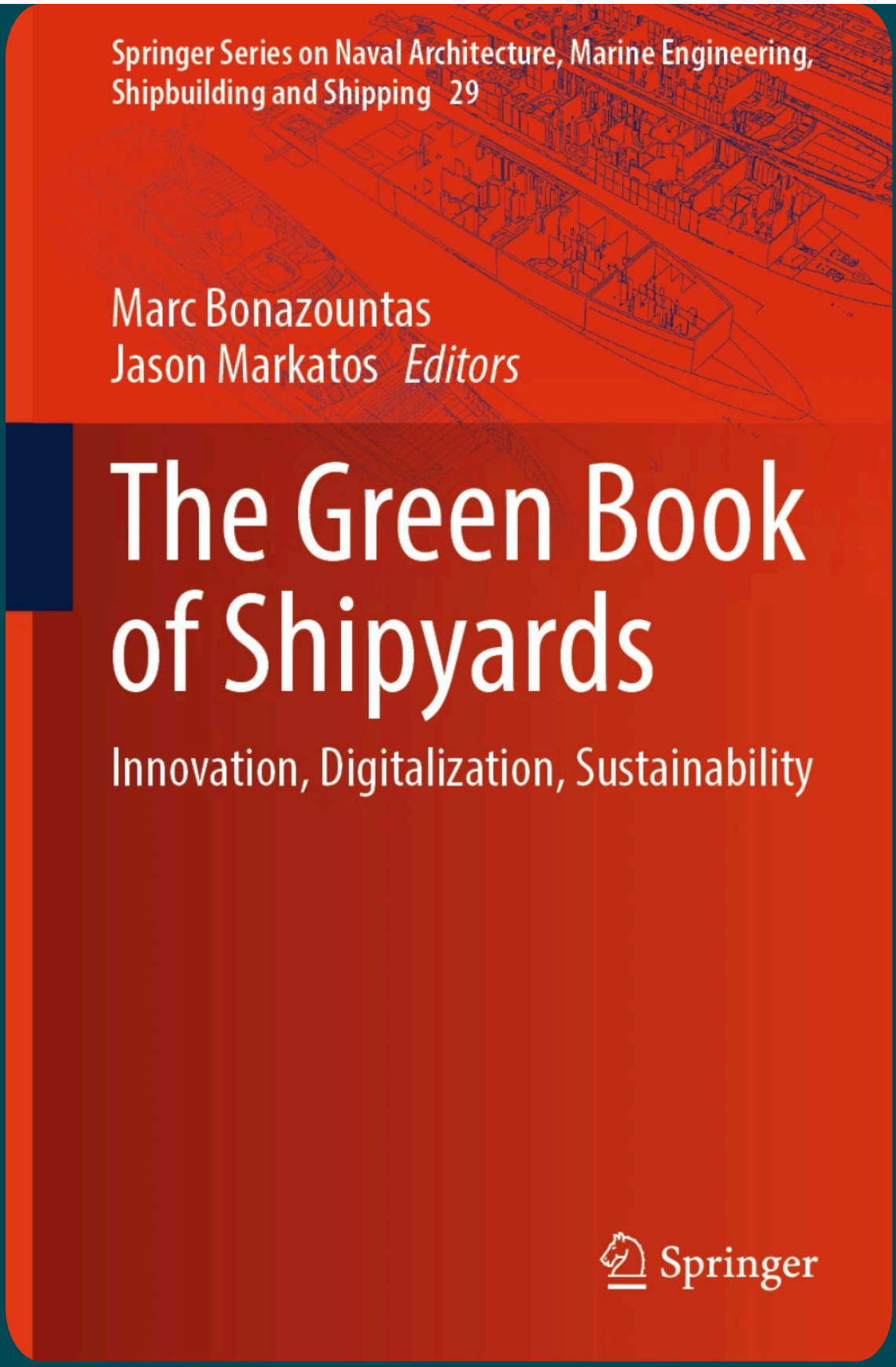
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Project updates



EcoShipYard and CirclesOfLife Cooperate on “The Green Book of Shipyards”

The Green Book of Shipyards: Innovation, Digitalization, and Sustainability is the result of cooperation between the EcoShipYard and CirclesOfLife Horizon projects, a cooperation fostered by Prof. Marc Bonazountas (Epsilon) and Ms. Rosanne van Houwelingen (Maritime & Offshore NL).

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EcoShipYard

EcoShipYard is a research and innovation project that promotes sustainable shipbuilding practices and material circularity in the European Union.

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