ENERGY TRANSITION FOR RECREATIONAL BOATING IN EUROPE

A roadmap for alternative fuel infrastructure

EBI
European Boating Industry

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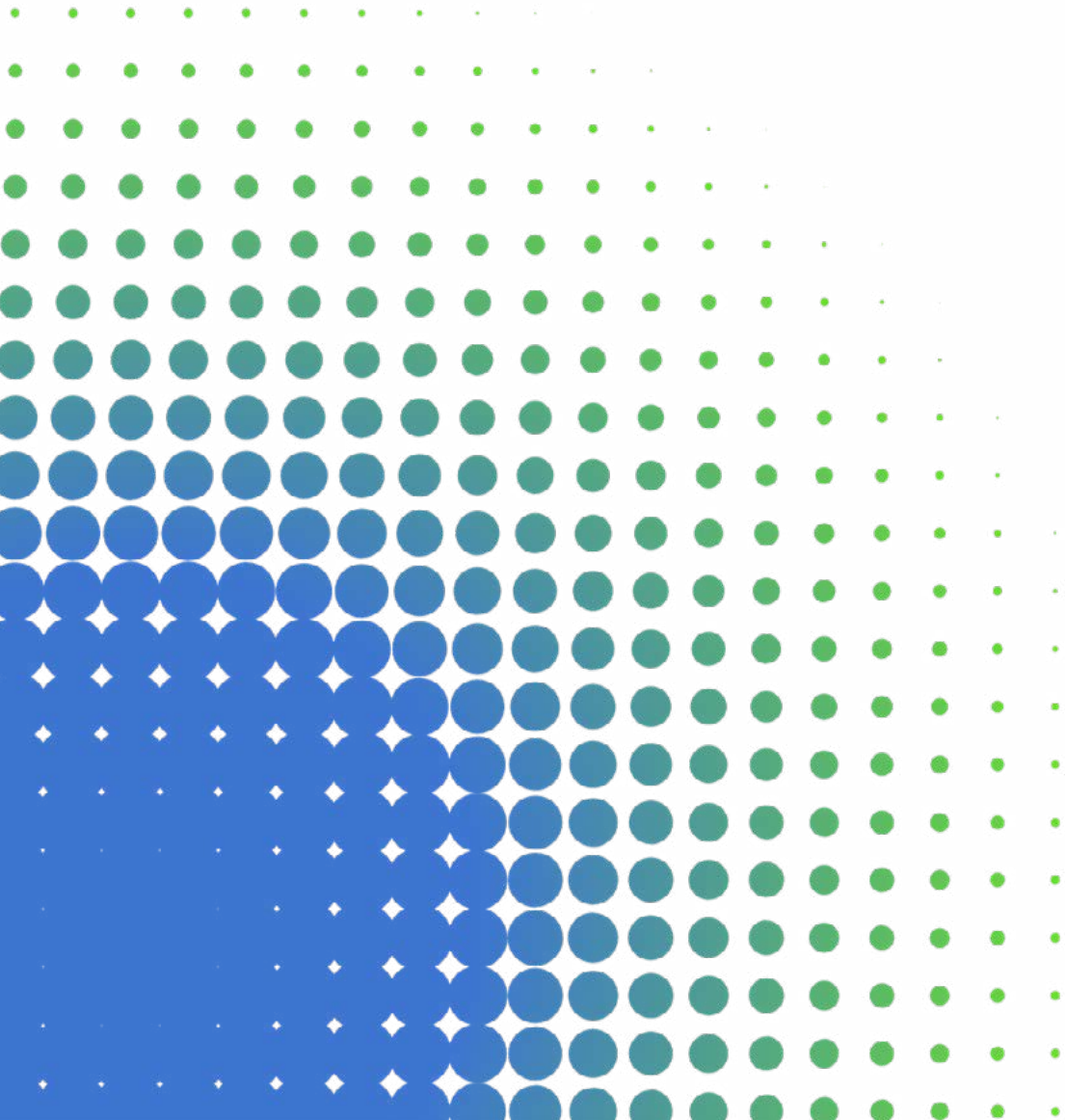
If you have any question regarding the document, feel free to reach out to our Brussels-based policy experts: **office@europeanboatingindustry.eu**



1. Introduction

Recreational boating is a hugely diverse sector, including sailing craft, large yachts, small motorboats and many different uses. The recreational craft sector accounts for around 0.4% of transportation emissions in Europe. Recreational boats have an average life span of over 40-50 years and engines are used on average between 35 to 48 hours per year.

To achieve the EU's decarbonisation targets a technology-neutral and multi-technology approach is needed in the shift toward sustainable propulsion and fuels for recreational boating. The transition to low- and zero-emission propulsion in recreational boating is no longer a distant objective - it is an immediate priority, driven by Europe's accelerating climate goals, including the 90% reduction target for 2040, the Industrial Maritime Strategy, and the Sustainable Transport Investment Plan (STIP).

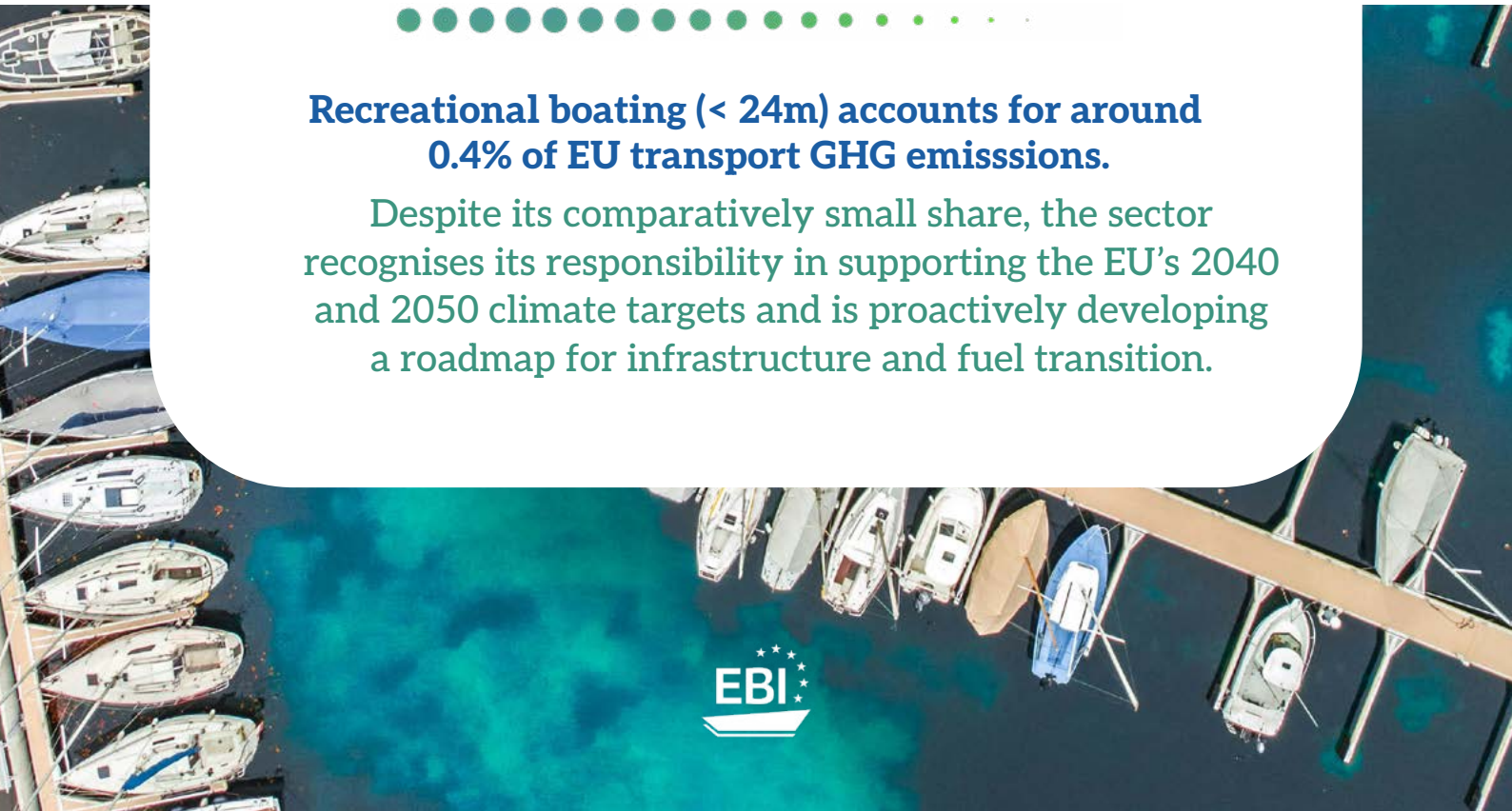
"Similarly to the maritime sector, a broad set of possible alternatives to fossil fuels are being considered for [...] recreational craft. [...] recreational craft experience a low pace of penetration of new vessels (only 15%-20% renewal of the fleet by 2050). With no mandatory targets in place, [current fuel will] progressively be replaced by renewable drop-in fuels."

Sustainable Industrial Maritime Strategy, European Commission, 2025

As these agendas expand to include all sectors, recreational boating must prepare for change, not only in technology but in supporting infrastructure.

Recreational boating (< 24m) accounts for around 0.4% of EU transport GHG emisssions.

Despite its comparatively small share, the sector recognises its responsibility in supporting the EU's 2040 and 2050 climate targets and is proactively developing a roadmap for infrastructure and fuel transition.



Marinas [1] are at the centre of this transformation. They are the gateway for vessels and the energy sources that power them, making them indispensable enablers of decarbonisation. Without marina infrastructure that is ready, safe, and equipped for alternative fuels and electric charging, even the most advanced technologies developed by boat and engine manufacturers will remain underused and consumers not willing to invest.

The recreational boating sector is highly diverse, comprising over 6.5 million vessels across Europe—both new builds and a vast existing fleet. No single solution can meet all operational, geographical, and user-specific needs. For this reason, EBI supports a broad mix of propulsion technologies—including electric, sustainable liquid fuels such as HVO, hybrid systems as well as future opportunities coming from research into methanol, hydrogen and other innovation—tailored to the realities of vessel type, usage pattern, and use area. To ensure this mix delivers genuine environmental progress, policy and investment, it must be informed by Life Cycle Assessment (LCA). These must consider not only emissions during operation but also upstream and downstream impacts across production, distribution, and end-of-life.

BLUE BOAT HORIZON PROJECT

The Blue Boat Horizon project developed the first LCA (Life Cycle Assessment) methodology specifically for recreational boats under 24 m. Led by EBI and supported by leading European associations and yards, the project will enable boatbuilders to measure environmental impact across the full life cycle—from materials to end-of-life. Unlike traditional tailpipe emissions metrics, this approach includes manufacturing and disposal, offering a clearer and comprehensive sustainability picture. The methodology aligns with EU Product Environmental Footprint (PEF) standards and aims to be accessible even to SMEs. It is a key step toward helping industry actors make informed decisions and preparing for future regulatory and consumer demands. The next phase of the project continues under the umbrella of the global association ICOMIA co-chaired by EBI and the North-American association NMMA.

[1] For the purpose of this roadmap and EBI work, "marinas" refers to all infrastructure dedicated primarily to recreational boating, including small local marinas, yacht harbours, and larger leisure harbours across coastal and inland waters.

"PROPELLING OUR FUTURE" PATHWAYS REPORT

In 2023, ICOMIA published a comprehensive international report analysing decarbonisation pathways for the recreational marine industry. It evaluated nine boat types using propulsion options like battery-electric, hydrogen, sustainable liquid fuels (e.g. HVO), and hybrid systems. The study's central finding is clear: a unique multi-path approach to decarbonising recreational boating is needed. This must match fuel or technology to boat size, usage, and location. Drop-in fuels like HVO emerge as the most viable option for many existing boats, offering up to 90% GHG emissions reduction while using current infrastructure. Electric, hybrid and hydrogen systems show promise, particularly for smaller or frequently used boats, but require significant infrastructure and are more suitable for new builds. Importantly, the report reinforces a key point for Europe: marina readiness must align with technological development, and a mix of fuels will be essential for the diverse European fleet.

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EBI's role is to support this complex transition by facilitating knowledge exchange, and ensuring that technological innovation is matched by practical implementation. Only through this coordinated effort can the sector contribute meaningfully to the EU's wider sustainability objectives—while preserving the unique benefits that recreational boating brings to European society, economy, and tourism.

2. Assessment of current infrastructure readiness

Europe has approximately 10-20,000 coastal and inland marinas. They are a vital part of the EU's recreational boating and nautical tourism ecosystem being the interface between land and water infrastructure. They are also largely composed of small and medium-sized enterprises (SMEs) or owned by local municipalities, making them financially constrained and often under-resourced to deal with large-scale infrastructure investment.

Across Europe's coastal and inland waters, marina infrastructure is primarily

designed for conventional refuelling – diesel and petrol– with only a very small number of locations beginning to install electric charging points. Facilities prepared to handle new fuels remain very limited and, in most cases, pilots.

Recent insights highlight the complexity of adapting marina infrastructure across Europe. In the Netherlands, a significant regulatory shift has occurred in Amsterdam where new boating permits are only granted to electric-powered vessels. Boats registered before 2025 are required to decarbonise within five years.

At the same time, propulsion technologies are moving forward quickly: manufacturers are bringing to market electric and hybrid solutions, engines compatible with HVO or synthetic fuels, and exploring future fuel systems. However, these advances are outpacing the readiness of marinas, creating a gap between what is technologically possible and what is practically available to boaters.

In parallel, manufacturers confirm that drop-in sustainable fuels—particularly HVO—can already be used in most existing diesel engines today, delivering immediate greenhouse gas (GHG) emissions reductions without requiring engine replacement. For large yachts (>24m) solutions such as hydrogen and methanol are being explored. These innovations show that technical solutions are becoming available across the full range of boat types. However, the gap between technological readiness and marina infrastructure—particularly for fuelling, charging, and safety standards—remains a barrier to full deployment.

The barriers to bridging this gap are clear: the absence of harmonised data, limited space within marinas to accommodate multiple new systems, high upfront investment costs, and uncertainty around regulatory and funding frameworks. In addition, supply constraints linked to market structure—such as limited availability from major fuel providers or high minimum order quantities—can hinder the uptake of sustainable fuels despite their technical readiness. Regulatory uncertainty regarding the placement of fuel infrastructure, including restrictions on locating fuel stations on floating docks versus fixed quays, creates further challenges in some Member States. These barriers are often not technological, but linked to market dynamics and fragmented regulatory approaches across regions.

3. Transition Pathways and Applications

The current fleet—representing over 6.5 million boats in European waters—has a very low renewal rate, with less than 1% of boats replaced annually. This means that most vessels operating in the mid and even long-term will be those already on the water today with low engine replacement rates. For these, drop-in sustainable fuels like HVO offer the most immediate and scalable solution to reduce emissions, particularly for diesel used on coastal and inland waters that can be deployed with minimal engine modification and without major changes to marina infrastructure, making them an essential tool for decarbonisation in the short to medium term.

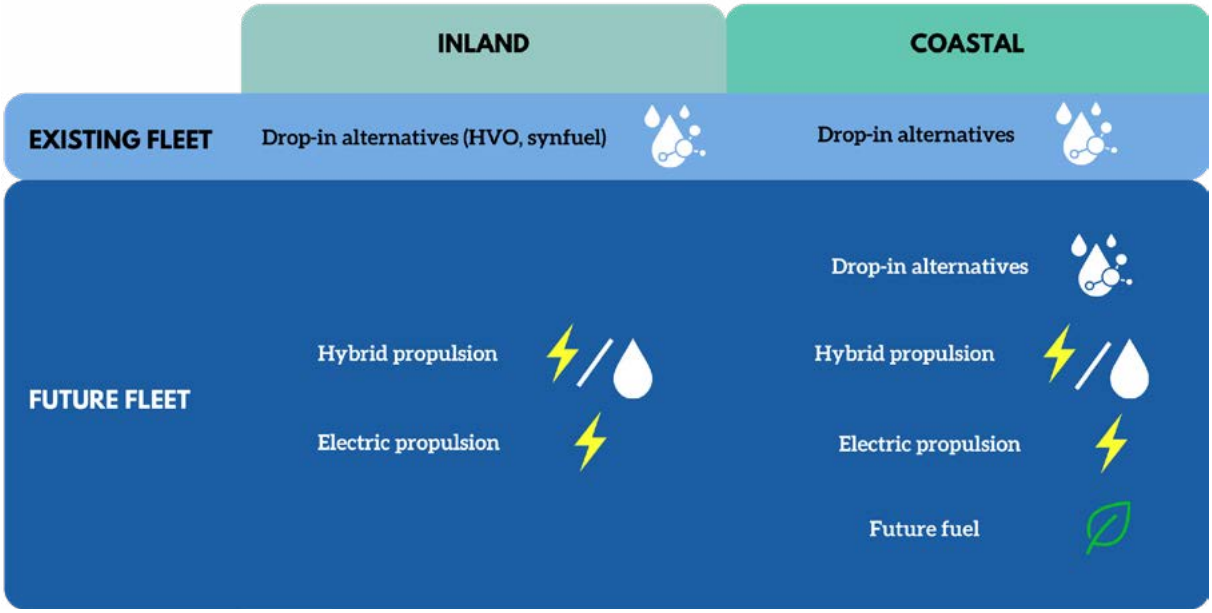


Figure 1: Outlook on fuels' usage in boating

In contrast, the new fleet opens the door for a broader range of technologies. Electric propulsion is rapidly expanding, especially for smaller boats, tenders, and Personal Watercraft (PWCs) and for inland or nearshore environments. Larger vessels may be equipped with hybrid systems, combining electric motors with combustion engines for extended cruising.

Therefore, no single technology can meet the needs of all boats, regions, and usage patterns. Importantly, marina infrastructure must evolve accordingly.

Fuel alternatives: HVO

HVO is a sustainable, paraffinic diesel alternative (EN15940) that can be used as a 100% drop-in fuel in most existing diesel engines, without requiring modifications or additional infrastructure.

Experience across Europe demonstrates its readiness for the recreational boating sector:

- The Irish leisure fleet is now in its third season of widespread HVO use, with positive operational results.
- In the Netherlands, HVO is already available at around 10% of fuel stations, with no reported technical barriers.

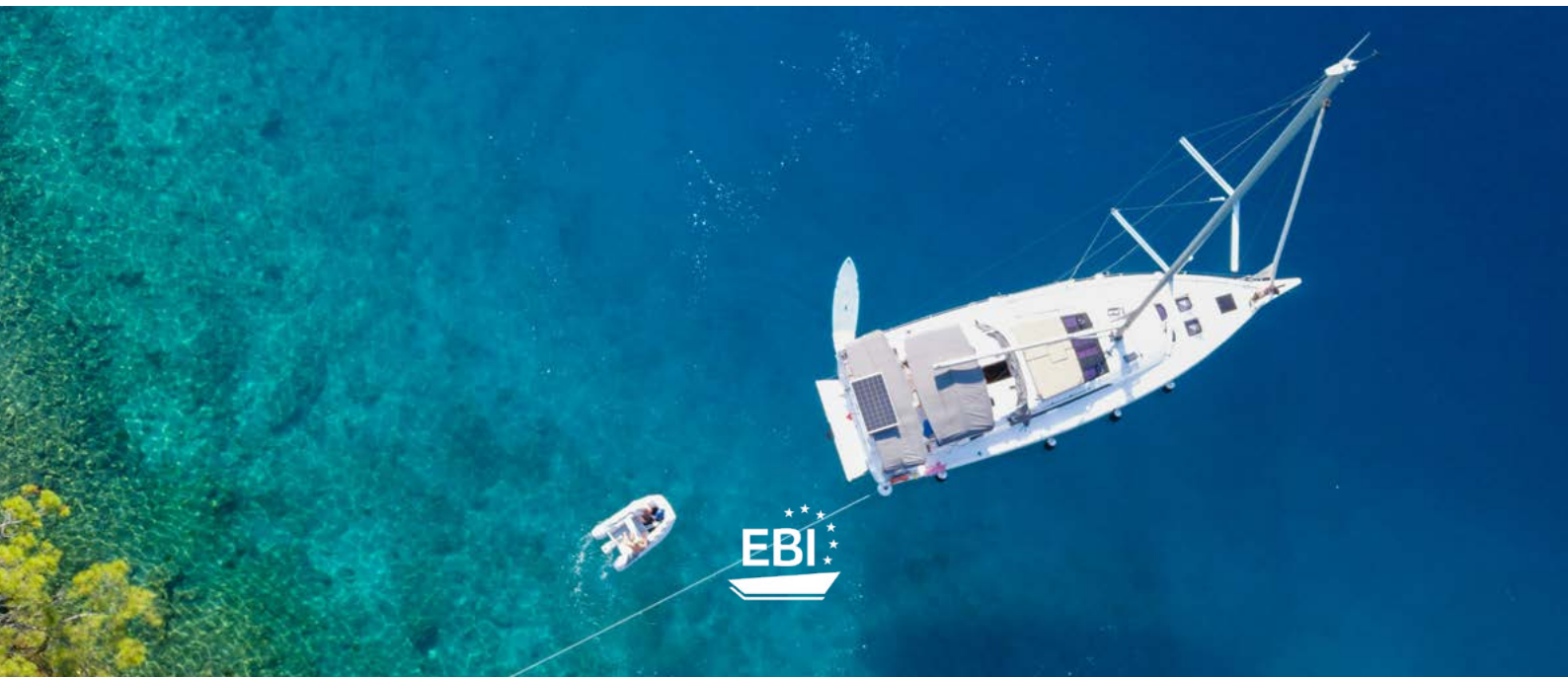
HVO delivers significant environmental benefits, including:

- Up to 90% reduction in lifecycle CO_2 emissions compared to fossil diesel
- Reduction of particulates up to 50% and NOx emissions up to 10%

It is already widely approved by engine manufacturers and compliant with international fuel standards, enabling immediate deployment across existing fleets.

In addition, certification schemes such as the Renewable Fuels Assurance Scheme (RFAS) ensure traceability and verified emissions reductions, supporting credible sustainability reporting.

As a “no-regret” solution, HVO provides a practical, scalable pathway for short- to medium-term emissions reductions in recreational boating while longer-term technologies (e.g. electrification, hydrogen) continue to develop.



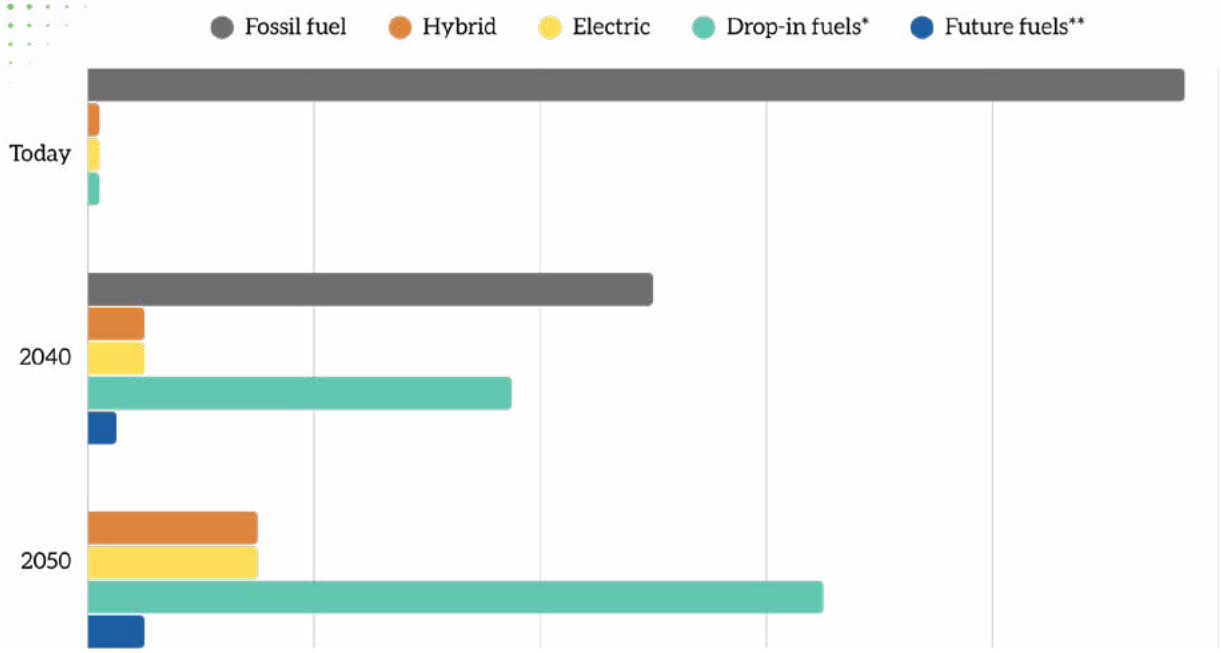


Figure 2: Energy transition

*HVO, synthetic e-fuels and other sustainable liquid fuels

** Hydrogen, methanol, ammonia and other emerging technologies

4. Coordinated roadmap for implementation by 2030 and beyond

To ensure a smooth and well-coordinated shift towards sustainable propulsion and fuel infrastructure, EBI sets out a series of practical recommendations and steps for each key stakeholder. These are designed to align marina infrastructure development with EU and national decarbonisation objectives, bridging the gap between technological advancements and implementation. The recommendations focus on enabling marinas, industry actors, and policy-makers to work in parallel to ensure infrastructure readiness, regulatory support, and access to funding.

Industry (marine propulsion providers, boat manufacturers, equipment)

- Design and deliver cost-efficient infrastructure solutions —infrastructure needs to work together with current and future propulsion alternatives, and infrastructure deployment needs to be on par with the introduction of sustainable propulsion technologies.
- Establish regular communication with the marina sector to clarify technical

specifications, grid requirements, expected timeframes, and investment priorities.

- Work together on unified life cycle assessment approaches, ensuring all propulsion and fuel technologies are evaluated consistently and transparently across the sector following the collaboration between EBI, NMMA and ICOMIA.
- Identify R&I and upscaling gaps for support by EU R&I funding.

Marinas

- Carry out detailed technical and financial reviews to determine the most suitable upgrade paths for each specific site, whether focused on electric infrastructure, alternative fuel infrastructure, or other adaptations.
- Take part in pilot projects at national and EU level to trial new solutions and build experience with alternative fuel infrastructure in regional clusters.

Policy-Makers (EU Level)

- Prioritising availability of access to recreational boating sector for sustainable liquid fuels in relevant regulatory frameworks.
- Facilitate a diversified propulsion and fuel mix, rather than a single technology.
- Base decarbonisation objectives on Life Cycle Assessment (LCA) and move away tailpipe emissions.
- Align regulation at international level to support globally exporting boating industry, ensuring a level playing field and achieve economies of scale.
- Revision of EU Recreational Craft Directive based on the principles leading to a wide fuel mix for recreational boating and Life Cycle Assessment [2].
- Revision of the EU Concession Directive to create a more investment-friendly regime for alternative fuel infrastructure.
- Include recreational boating explicitly within the scope of the Alternative Fuels Infrastructure Regulation (AFIR [3]), ensuring eligibility for funding and regulatory support at national level.
- Develop targeted EU grants or dedicated funding allocations within programmes—such as a future EU Competitiveness Fund —to support marina decarbonisation efforts.
- Define technical standards and safety rules to enable the rapid and consistent rollout of various new fuel infrastructure options across Member States.

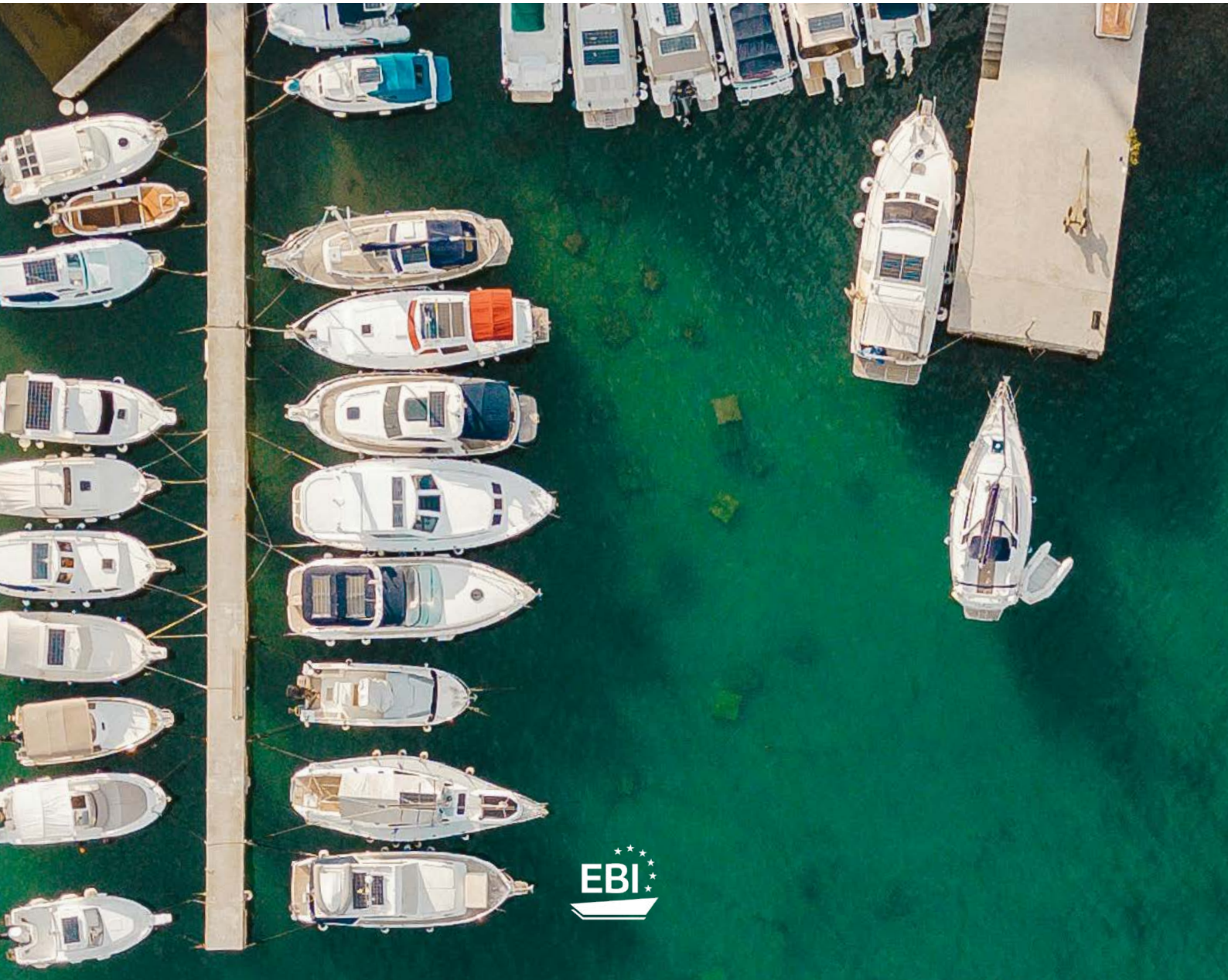
[2] https://www.europeanboatingindustry.eu/eu-affairs/ebi-s-positions
[3] Currently under revision (April 2026): https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/16672-Review-of-EU-rules-on-alternative-fuels-infrastructure_en.

Policy-Makers (National Level):

- Integrate marinas into national investment plans, recognising their role as essential tourism hubs and support infrastructure need for decarbonisation.
- Streamline permitting and licensing process for installing alternative fuel facilities, including permitting for additional tanks.

Policy-Makers (Regional/Local Level):

- Encourage closer cooperation between marina operators and municipal authorities to coordinate energy provision and tourism development plans, enabling the development of infrastructure across a region.
- Support access to regional and tourism-related funding, with a particular focus on small and medium-sized marinas.



5. EBI's role in implementation

Acting as coordinator, EBI will bring together industry, marina operators, policy-makers, and other relevant stakeholders to maintain cohesive and aligned progress.

- EBI will work with the EU institutions on implementing the regulatory and policy priorities, as well as on R&I and upscaling funding, infrastructure support , including through the Waterborne Technology Platform.
- To track progress and highlight shifting priorities, EBI will arrange stakeholder reviews every 1-2 years. These will help measure achievements, pinpoint ongoing challenges, and adjust strategies as needed.
- EBI will work with its members and partners, notably ICOMIA/IMEC and EUROMOT, and marina certification schemes to expand the focus on alternative fuel infrastructure.
- EBI calls for a coordinated initiative at EU and national level to gather and share data, assess infrastructure capacity, and create the conditions for marinas to adapt to the green transition.
- Understanding the value of knowledge exchange and mutual learning, EBI will also organise technical webinars and knowledge-sharing events at its platforms in collaboration with key boat shows.
- EBI will try to develop a coordinated mapping of fuel use and alternative fuels by collecting information from all its network.
- To help marinas make informed investment choices, EBI will develop a flexible decision-making matrix. This tool allows marina managers to assess infrastructure options tailored to their local context—factoring in location, vessel types, usage habits, environmental regulations, and grid capacity.

CASE STUDY: ADVANCING SUSTAINABLE FUEL INFRASTRUCTURE IN THE U.S. RECREATIONAL BOATING SECTOR

CONTEXT AND DRIVERS

The U.S. recreational boating industry, represented by the National Marine Manufacturers Association (NMMA), has taken significant steps toward supporting the transition to sustainable propulsion, particularly through the development of fuel infrastructure and industry-led alignment. The approach is characterised by strong coordination between manufacturers, associations, and regulators, combined with a pragmatic understanding of marina needs. The U.S. sector recognises that a successful transition to sustainable fuels requires readiness not just from boat and engine manufacturers, but also from the fuel infrastructure that supports boaters in marinas and ports. To address this, NMMA has actively engaged in fuel testing, education campaigns, and policy dialogue aimed at facilitating the rollout of drop-in fuels like HVO and e-fuels.

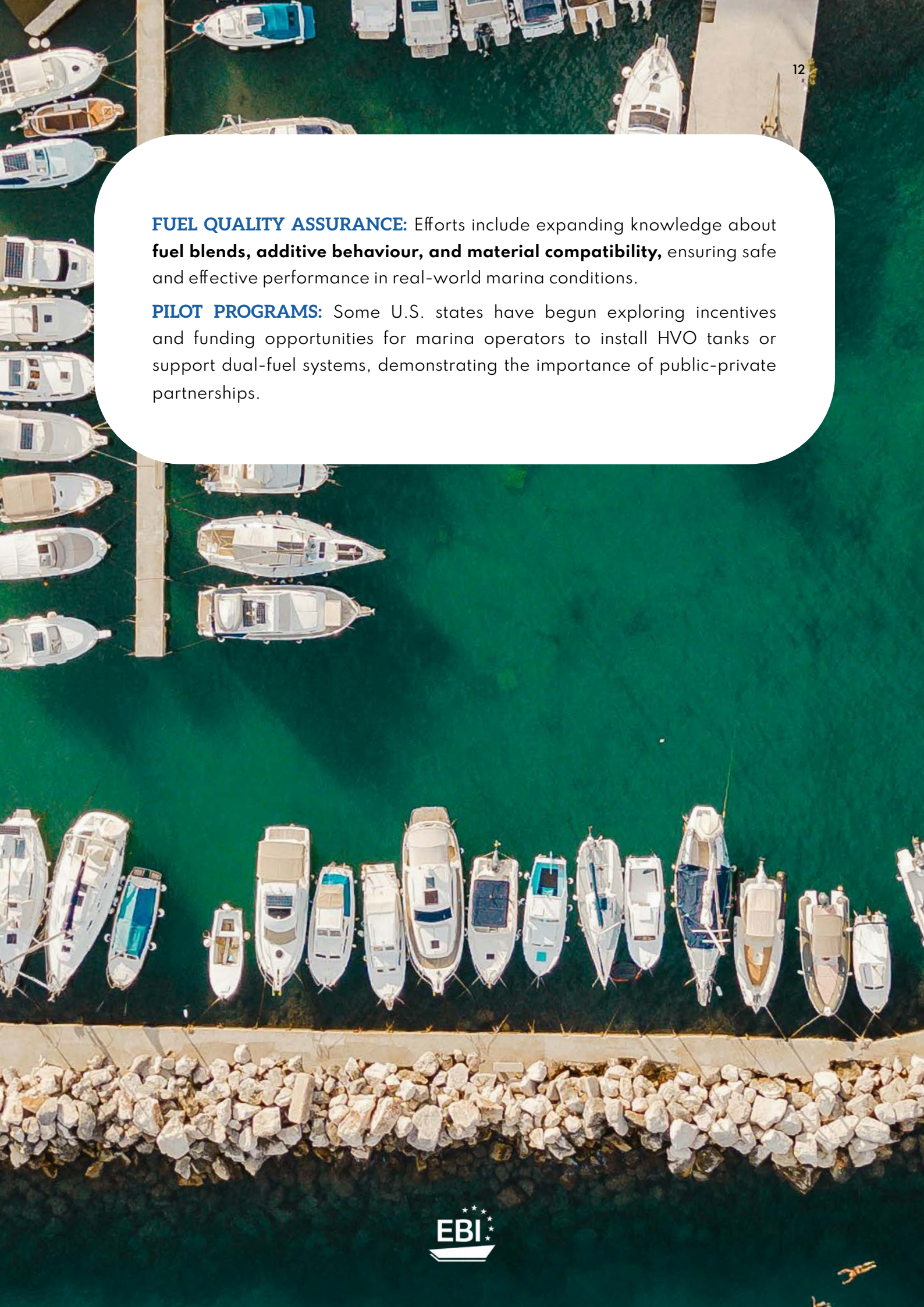
At the same time, clear national guidance, combined with robust partnerships at state level, has allowed U.S. stakeholders to experiment with implementation frameworks that may offer lessons for Europe.

KEY ACTIVITIES AND INSIGHTS

TECHNICAL READINESS: NMMA-led testing has demonstrated that **HVO and e-fuels are compatible** with current marine engines and systems, making them a realistic short- and mid-term solution for reducing emissions, especially for the existing fleet.

CONSUMER COMMUNICATION: Emphasis is placed on clear labelling, safety assurance, and consumer education, ensuring a smoother adoption of alternative fuels by boaters.

POLICY ENGAGEMENT: NMMA collaborates closely with regulators to ensure that recreational boating is considered in broader fuel policy, and that fuel formulations remain compatible with marine engines.



FUEL QUALITY ASSURANCE: Efforts include expanding knowledge about **fuel blends, additive behaviour, and material compatibility,** ensuring safe and effective performance in real-world marina conditions.

PILOT PROGRAMS: Some U.S. states have begun exploring incentives and funding opportunities for marina operators to install HVO tanks or support dual-fuel systems, demonstrating the importance of public-private partnerships.

CASE STUDY: MAPPING THE FUTURE OF MARINA INFRASTRUCTURE IN GERMANY

To understand the readiness of German marinas to support alternative propulsion systems, the German Maritime Industry Association (VMWD), in cooperation with the Fraunhofer Institute, conducted a comprehensive study focused on the infrastructure needs and future trajectories of marinas in Germany.

CONTEXT AND OBJECTIVES

With increasing political and industry pressure to reduce emissions, the study aimed to identify the current state of marina infrastructure, evaluate the potential for adaptation to new fuels (HVO, methanol, hydrogen) and charging, and provide a foundation for national-level strategic planning. Recognising marinas as a critical enabler of the green transition, the study sought to fill the data gap on their operational realities, economic constraints, and spatial limitations.

KEY FINDINGS

The analysis of over 120 marinas—spanning coastal and inland areas—revealed several important insights:

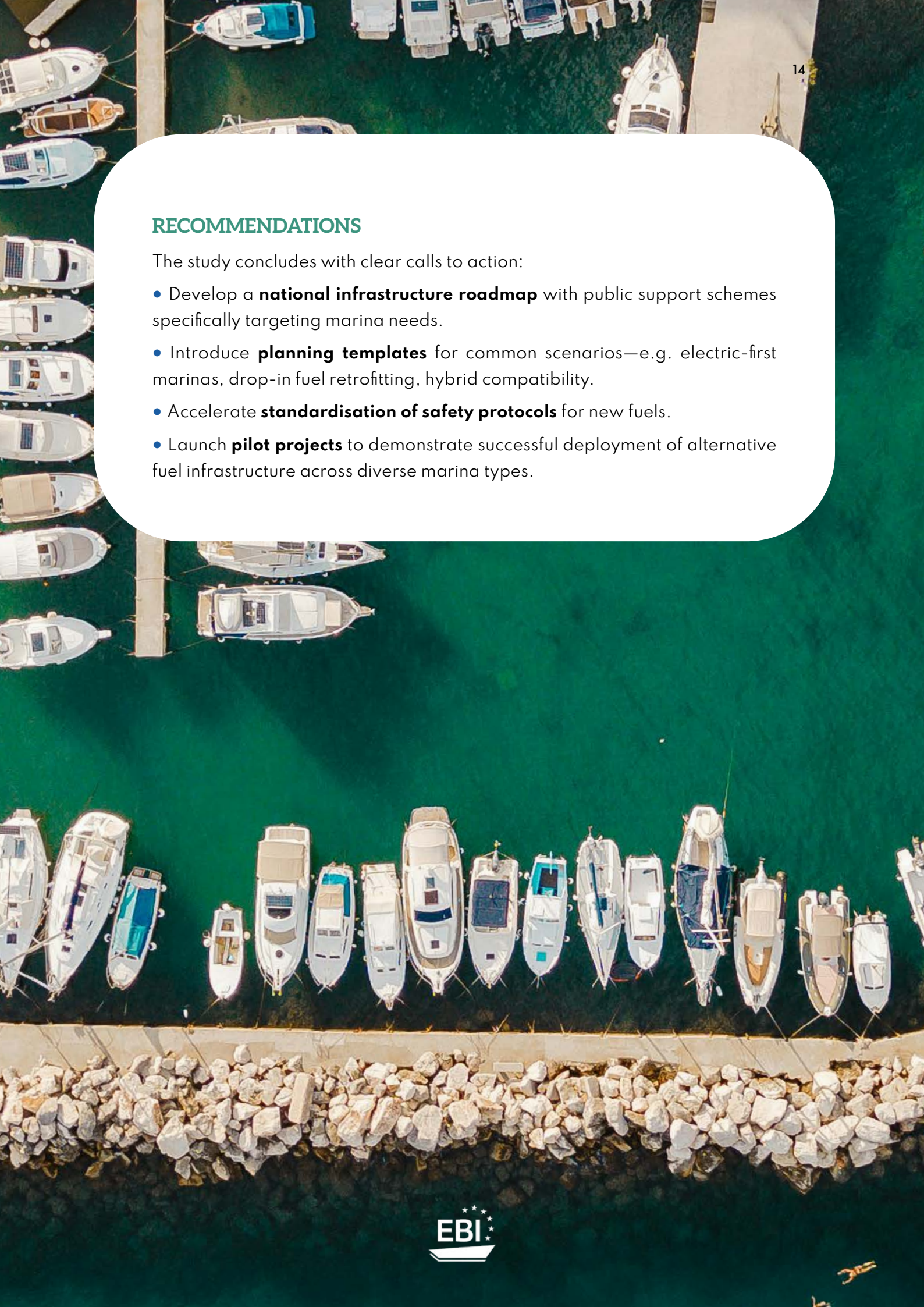
1. FUEL SUPPLY TODAY: Most marinas are equipped with petrol and diesel tanks, with **no standardised layout** or consistent safety requirements.

2. ELECTRIC CHARGING: Existing electricity infrastructure is generally limited to low-capacity shore power for hotel loads. Only a small number of marinas are preparing for boat propulsion charging, and grid capacity is often insufficient.

3. SPACE CONSTRAINTS: A major barrier is **lack of physical space** to add new fueling points or charging infrastructure, particularly in older, densely developed marinas.

4. REGULATORY GAPS: There is a lack of **clear national guidelines** for the integration of alternative fuels, particularly hydrogen, into leisure ports.

5. COST SENSITIVITY: As the majority of marinas are small and medium-sized enterprises (SMEs), they report **limited ability to self-finance** upgrades without external support.



RECOMMENDATIONS

The study concludes with clear calls to action:

- Develop a **national infrastructure roadmap** with public support schemes specifically targeting marina needs.
- Introduce **planning templates** for common scenarios—e.g. electric-first marinas, drop-in fuel retrofitting, hybrid compatibility.
- Accelerate **standardisation of safety protocols** for new fuels.
- Launch **pilot projects** to demonstrate successful deployment of alternative fuel infrastructure across diverse marina types.

https://www.europeanboatingindustry.eu