



**PIANC**  
The World Association for  
Waterborne Navigation Infrastructure

**Recreational Navigation Commission  
RecCom**

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**PIANC RECCOM WG 217**

## **THE IMPACTS OF ALTERNATIVE FUEL PROPULSION SYSTEMS FOR RECREATIONAL VESSELS ON MARINA DESIGN AND MANAGEMENT**

### **TERMS OF REFERENCE**

#### **1. Historical background - Definition of the problem**

Typically, recreational vessels use combustion engines as either their primary or, in the case of sail boats, secondary method of propulsion. These engines may use either diesel or petrol and can also be used for heating or the charging of batteries.

Globally there is an increased awareness of the environmental impacts of using combustion engines which not only generate significant volumes of carbon dioxide but also reduce air quality. This environmental impact is further magnified in the marine environment due to the risk of fuel spills which cause ecological harm.

Ports around the world are under increased pressure improve air quality which is negatively affected by large diesel engines found on large container ships and cruise ships. It is likely that this pressure and possible legislation will impact the recreational marina market.

The shipping industry has, for some time, been exploring and introducing alternative fuels in a bid to reduce the impacts of goods and people transport via water. Such alternative fuels must still provide propulsion over long distances where little opportunity to refuel exists. The fuels most commonly considered today are Liquefied Natural Gas (LNG), Electricity, Biodiesel, and Methanol. Other fuels that could play a role in the future are Liquefied Petroleum Gas (LPG), Ethanol, Dimethyl Ether (DME), Biogas, Synthetic Fuels, Hydrogen (particularly for use in fuel cells), and Nuclear fuel.

The recreational market differs in that most use cases require small volumes and a shorter distance between refuelling. The energy infrastructure is unlikely to be easily advanced for many types of alternative fuel, with the key exception being electricity.

Electric cars are increasingly being adopted as domestic motor vehicles and there is signs of increased usage and desire to adopt the same philosophy for recreational boats. Battery technology is undergoing a period of rapid development and will soon be reflected in the charging infrastructure requirements

New propulsions systems are starting to be used in recreational vessels, instead of internal combustion engines. Up to now, all marina planning provisions and design guidelines assume that all vessels will use gasoline (petrol) or diesel engines.

Many boat manufacturers already offer hybrid and full-electric engines. While marinas already provide a power supply for low voltage applications, the requirements for electric propulsion is likely to be different. Even slow-charge of plug-in electric boats would require more capacity, and fast-charging will require new systems.

There is some potential for hydrogen fuel cells and other systems evolving in commercial vessels for cargo or passengers to be implemented in the future for recreational boating.

## **2. Objectives**

This working group report will identify the new requirements for marinas to serve recreational vessels with new propulsion systems. The main focus is on electric propulsion, but other systems may be considered.

## **3. Earlier reports to be reviewed**

PIANC reports on marina utilities and work on non-fossil fuel propulsion systems in inland navigation and maritime navigation should be reviewed.

## **4. Scope**

The proposed scope of work is to:

- Review case studies of alternative fuel systems on recreational craft.
- Assess the potential uses and likely take-up of alternative fuel systems.

- Identify the infrastructure and equipment needs given a significant market take-up.
- provide recommendations on how to provide for these needs in design guidelines for new and existing marinas.

## **5. Intended product**

The working group report is intended to serve as a guideline for the design of marinas to accommodate new propulsion recreational vessels.

Additional products may include: comparison of the impacts in marina development cost due to different new propulsion systems; estimations of energy consumption by marinas with mixed propulsion fleets; potential impacts on reduced fossil fuel consumption; environmental and risk benefits of alternative fuels.

## **6. Working Group Membership**

Membership includes:

- Marina designers and engineers.
- Manufacturers and designers of electric and hybrid recreational boats and yachts. It is expected that ICOMIA, through its membership of boat manufacturers and designers, will be an important partner.
- Manufacturers and designers of electric supply equipment for marinas.
- Experts with experience with installations for fast-charging of electric vehicle batteries will need to be invited.
- Port and inland navigation facility designers and engineers with specific experience in electric propulsion systems can be incorporated.

## **7. Target Audience**

The primary target audience of this working group report will be marina designers, and operators.

The report should also serve as a reference for the implementation of recommendations to reduce carbon emissions by the recreational navigation industry.

## **8. Relevance**

### **8.1. Relevance to countries in transition**

This report can assist countries in transition to implement strategies for growth of recreational navigation that reduce carbon emissions.

The potential use of small electric boats for tour operators and charters can expand the business opportunities for countries in transition. This can have a positive impact by removing from the system older engines that are typically poorly maintained and polluting.

### **8.2. Climate Change and Adaptation Implications**

This report will support the implementation of low-carbon solutions for the recreational navigation industry. It can be a key element to achieve effective carbon emissions mitigation, thus ensuring long-term sustainability of boating industries.

### **8.3. Reference to WwN**

Supporting infrastructure for electric boats can be part of a strategy to reduce potential environmental impacts. This technological solution is part of the “WwN tool box”.

### **8.4. Reference to UN Sustainable Development Goals**

This report is intended to directly contribute to the following SDG's:

- Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
- Goal 13: Climate Action
- Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable