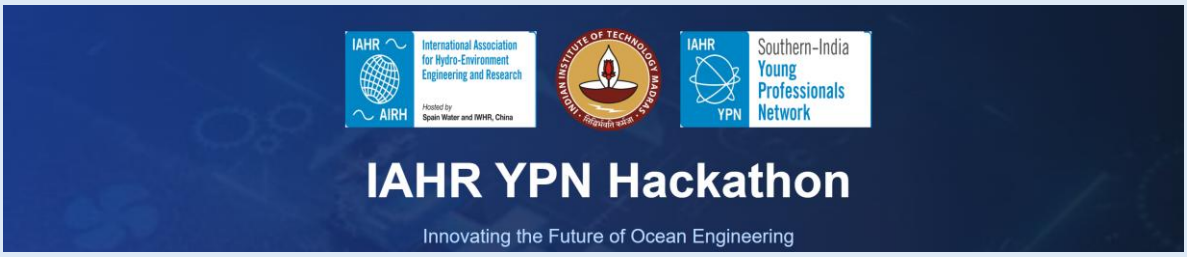


IAHR YPN Hackathon 2026 – Challenge Statements

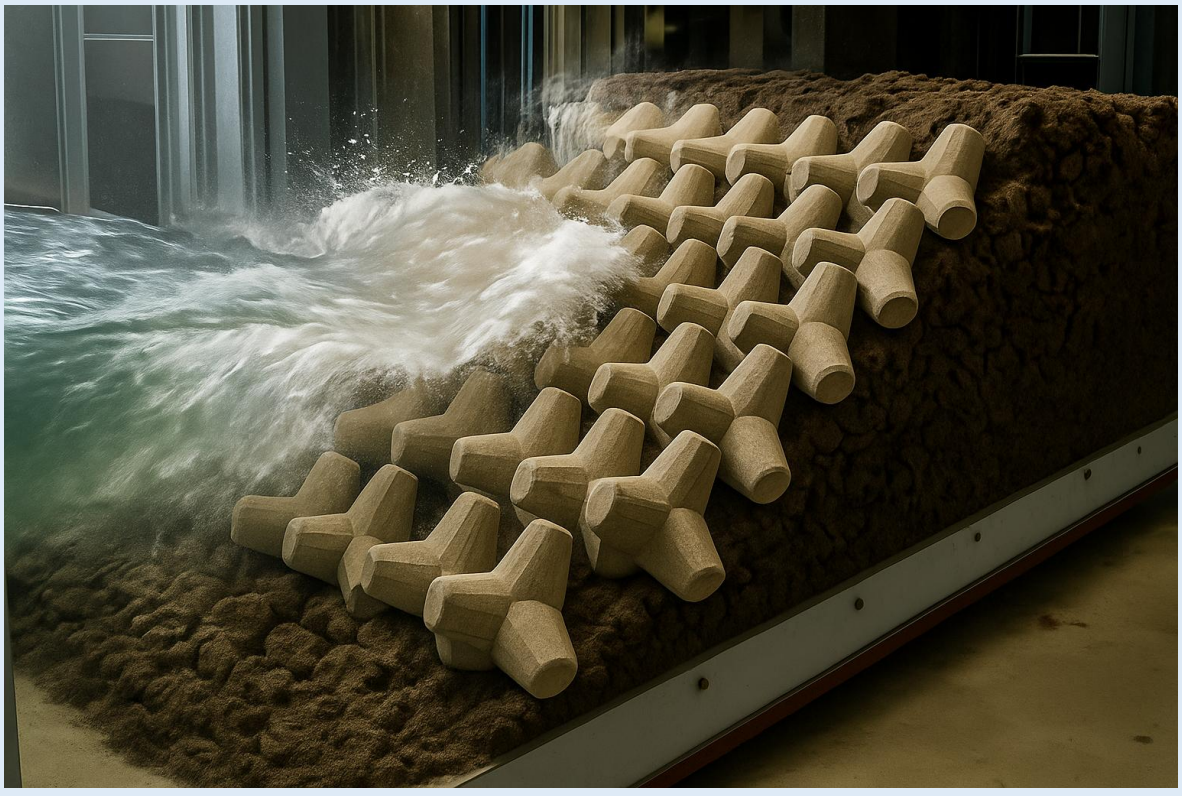
Challenge 1: Sustainable Armour Units for Cyclone Conditions

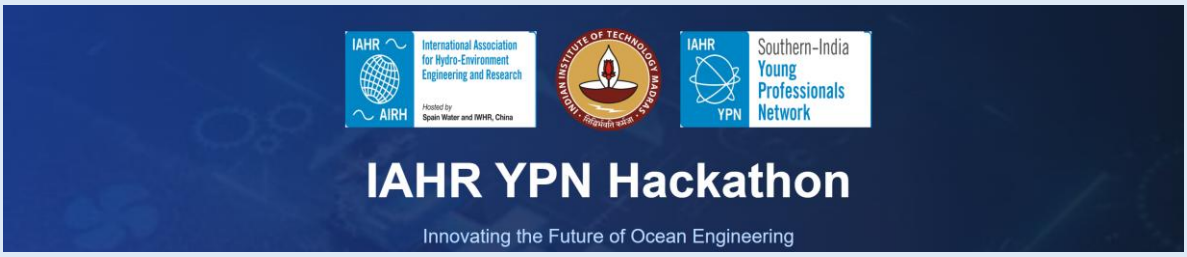
Background

Rising sea levels, accelerated coastal erosion, and increasingly intense cyclones are placing over 600 million people in coastal zones at risk. Traditional rubble-mound breakwaters and concrete armour units, while effective under moderate conditions, often fail under cyclone-induced extreme wave loads. The need of the hour is to **innovate sustainable, resilient, and eco-integrated armour units** that provide robust protection while also contributing positively to marine ecosystems.

Objective

Design and fabricate **sustainable armour units** that can withstand cyclone-scale hydrodynamic forces, minimise environmental impacts, and foster marine biodiversity.





Core Requirements

- **Wave Resistance:** Units must withstand prototype cyclone conditions (wave height 5–7 m, wave period 12–14 s, water depth ~10 m; tested at 1:33 Froude scale in a flume of 20 m × 0.6 m × 1 m).
- **Sustainability:** Use recycled, low-carbon, or bio-based construction materials (e.g., geopolymer, bio-concrete, fibre-reinforced concrete).
- **Eco-Integration:** Include design features that enable eco-colonisation (habitat niches, porous surfaces, biodiversity enhancement).
- **Innovative Geometry:** Develop modular, interlocking shapes that dissipate wave energy, prevent displacement, and allow scalable deployment.

Development Stages

1. **Conceptual Design:** Generate innovative geometries, perform stability calculations, and select sustainable materials.
2. **Model Fabrication:** Construct at least 3 scaled armour units using recycled/eco-materials with proper dimensional accuracy and interlocking ability.
3. **Performance Testing:** Units will be tested in a flume under scaled cyclone wave conditions for stability, energy dissipation, and eco-functionality.
4. **Refinement & Presentation:** Analyse test results, optimise design, and prepare a final presentation.

IAHR YPN Hackathon

Innovating the Future of Ocean Engineering

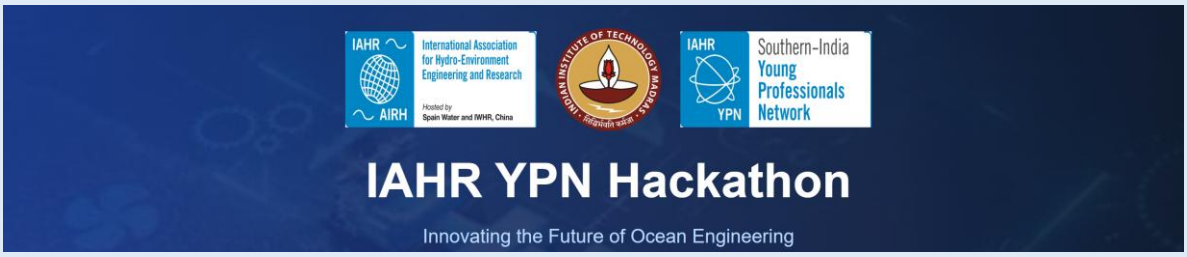
Challenge 2: Flexi-Float — Wave-Ready Floating Solar PV Raft

Background

As land availability for solar farms declines, **floating solar PV systems** are emerging as a scalable alternative. While freshwater floating PVs are gaining momentum, **ocean-based floating solar farms** face unique challenges — extreme wave loading, corrosion, mooring stability, and biofouling. Developing a **wave-adaptive, flexible floating PV structure** is essential for future large-scale offshore renewable energy integration.

Objective

Design and fabricate a **flexible floating solar raft (Flexi-Float)** capable of maintaining stability and solar panel orientation under unidirectional wave conditions.

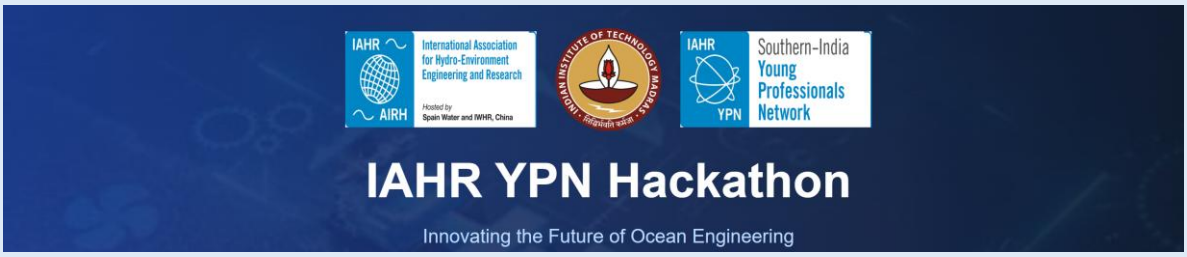


Core Requirements

- **Structure Dimensions:** 0.6 m width × 2.4 m length (scaled model).
- **Design:** Flexible membrane structure supported by buoyant elements (foam, rubber sheets, plastic films, or similar low-cost accessible materials).
- **Solar Mount:** Lightweight mock solar panel with fixed/passive tilt.
- **Wave Conditions:** Must perform in laboratory wave tank with:
    - Minimum wavelength (L/4) = 0.6 m
    - Maximum wavelength (L) = 2.4 m
    - Maximum wave height (L/10) = 0.24 m
- **Fabrication:** Safe, easy to transport, and built from accessible low-cost materials.

Development Stages

1. **Raft Design:** Develop a flexible structure capable of following wave contours while ensuring stability and alignment of solar panels.
2. **Model Fabrication:** Build the raft using specified materials and dimensions.
3. **Testing:** Submit raft for wave tank testing with laboratory-installed sensors.
4. **Iteration & Presentation:** Refine design based on performance outcomes and present final solution.



IAHR YPN Hackathon 2026 –Evaluation Criteria

Teams will be evaluated based on the following key aspects:

1. Problem Understanding – Clarity in addressing the challenge and real-world relevance.
2. Design Innovation – Creativity, originality, and effectiveness of the concept.
3. Sustainability – Use of eco-friendly materials and environmental integration.
4. Performance – Stability, resilience, and functionality under test conditions.
5. Execution & Presentation – Build quality, cost-effectiveness, and clarity in communication.