



PROJECT PERIODIC REPORT PUBLISHABLE SUMMARY

Grant Agreement number: 288192

Project Acronym: TROPOS

Project Title: “Modular Multi-use Deep Water Offshore Platform Harnessing and Servicing Mediterranean, Subtropical and Tropical Marine and Maritime Resources”

Date of latest version of Annex I against which the assessment will be made: 22-10-2014

Periodic report: 2nd

Period covered: From 19th month (August 2013) to 36th month (January 2015)

Name, title and organization of the scientific representative of the project coordinator:

Dr. Joaquín Hernández Brito, Plataforma Oceánica de Canarias

Carretera de Taliarte, s/n. 35214 Telde - Las Palmas - España

Tel: +34 928 134 414

Fax: +34 928 133 032

E-mail: joaquin.brito@plocan.eu

Project website address: <http://www.troposplatform.eu>



The TROPOS Project — Modular Multi-use Deep Water Offshore Platform Harnessing and Servicing Mediterranean, Subtropical and Tropical Marine and Maritime Resources, has received funding from the European Union's Seventh Framework programme for research, technological development and demonstration under grant agreement number 288192 (Call Ocean of Tomorrow).

1. SECOND REPORTING PERIOD - PUBLISHABLE SUMMARY

This section has been organised to be of suitable quality to enable direct publication by the European Commission.

1.1 Summary description of project context and objectives

The oceans are the largest and one of the most complex ecosystems on earth, which also accommodate the largest natural energy resources, both fossil and renewable. The oceans are also essential for the use of certain infrastructures to transport goods between continents and countries, facilitating global trading. The oceans move and feed the world, even if the largest part is still unexplored. This makes the oceans the source and the next frontier of opportunities. In this context, and given the over-exploitation of land resources, oceans will not only become an essential element for European citizens to ensure the provision of resources, health, food supply, as well as sustainable, efficient and clean energy, but also a key focus for a smart, green and integrated transport system, the conservation of the environment, and combating climate change.

At the same time, space for developing infrastructures to exploit marine renewable energy resources is limited in coastal regions. An integrated approach is required to prevent conflicts between novel maritime activities in offshore areas focusing on harvesting living as well as renewable resources. Funding the development of concepts for multi-use oceanic platforms has clearly become one of the EU's most interesting and ambitious initiatives to encourage such an integrated, sustainable use of our marine environment in the fields of renewable energy and living resources. Achieving these objectives requires a multidisciplinary and cross-sectoral team of specialists in areas such as offshore structures, wind, wave and other ocean energy sources, aquaculture and maritime transport.

TROPOS and its two sister "Oceans of Tomorrow" projects have developed unique concepts for the sustainable utilisation of our marine environment. They have studied options for multi-use platform systems to share sites, infrastructures, logistics and to reduce costs, all providing a large potential for economic blue growth. There is significant demand for developing and testing innovative concepts and methods for sustainable aquaculture, renewable energy and related transport service installations integrated in a compact way. At the same time, there is a strong need to reduce economic costs and ecological footprints of potentially large and/or logistically expensive offshore installations by exploiting synergies and minimising negative impacts to the largest extent possible.

The TROPOS project has considered options for location of floating modular Multi-Use Offshore Platforms (MUOPs), developed platform designs, integrating a broad range of specific activities from different sectors. The innovative platform concept has been designed primarily for deep waters, but can also be deployed in shallower waters. The TROPOS platform concept supports an integrated and sustainable production of renewable energy and aquaculture, and may also include leisure facilities and port services for the shipping sector.

TROPOS also contributes to the Maritime Spatial Planning, because environmental aspects and integrated planning are key features for the integration of a broad range of functions from diverse sectors. Specific objectives of TROPOS were:

- Determining suitable locations for the offshore platform system.
- Exploring the relations, potentials for synergies and integration of a broad range of functions including different marine renewable energy sources, fisheries, aquaculture and related maritime transport aspects.
- Developing innovative designs of MUOPs that allow for the integration of the different functions.

- Studying logistics, security, installation, and operational, decommissioning and maintenance requirements for MUOPs.
- Studying the economic viability, socio-economic acceptability and environmental impact of key combinations and addressing ways to minimise significant negative impacts of floating MUOPs.
- Configuring the MUOPs primarily for the Mediterranean, subtropical and tropical areas.

1.2 Description of the work performed since the beginning of the project and main results achieved so far

The multi-disciplinary nature of TROPOS represents a significant challenge for standardising approaches and methodologies. The following sectors are integrated into different conceptual modules and scenarios: Transport, Energy, Aquaculture and Leisure, short TEAL. In order to identify synergies within this diversity of sectors the project has developed a common decision methodology based on a GIS tool (Geographic Information System) and on a thorough analysis of the main constraints and synergies between platform components that both facilitated a quantitative evaluation of the specifications of each TEAL component.

The design of the platforms was an iterative process which simultaneously considered numerous interrelated factors resulting in a dynamic process. Stages of the process can be defined as follows:

1. Identification of requirements and needs for defining platform design
2. Selection of structure type and conceptual design
3. Detailed design
4. Assessment and realisation of technical, economic and environmental requirements

The technological design and the selection of optimum sites for particular designs were essential steps in the development of different case scenarios. The design solution of the modular multi-use approach involved a floating central unit platform which is fixed to the seafloor by a catenary mooring. Depending on the requirements, modules with different functions can be directly attached to the central unit (patent pending), and/or satellite units (fixed with their own mooring) can be indirectly connected. Finally, three different concepts to be deployed at three different sites were chosen as case scenarios: (i) The Green & Blue scenario off Crete (Greece) combining fish and microalgae aquaculture with a floating offshore wind farm; (ii) The Leisure Island scenario off Gran Canaria Island (Spain) involves different leisure facilities, such as accommodation for tourists or a marine science and visitor center, a nautical activities center and a marina, and a photovoltaic plant to provide energy; (iii) The Sustainable Service Hub on the Dogger Bank (North Sea) focuses on transport and energy related needs of the offshore renewable energy sector, i.e. providing service for offshore wind farms. Additionally, two additional concepts were considered as “future scenarios” which could be developed once the will have technology matured; these “future scenarios” are: (iv) The Green & Blue scenario off Liuqiu Island (Taiwan) combining fish and macroalgae aquaculture with a floating OTEC (Ocean Thermal Energy Conversion) plant and (v) the Offshore Container Terminal in Panama combining transport activities with accommodation for personnel.

The design optimisation process involved modelling and simulations, experimental tests and validations, and even some pilot scale testing at sea.

The deployment strategy for the TROPOS scenarios was developed by building upon and combining the technical and viability strategy. The deployment strategy considered micro- and macro-economics, carbon life-cycle, infrastructure and logistics, technology and policy needs.

Since the start of the TROPOS conceptual design development, environmental and socio-economic aspects were studied and fully considered to ensure sustainability. As the first step, a thorough scoping of possible

positive and negative impacts including synergies and cumulative impacts was conducted. A comprehensive literature review of available Environmental Impact Assessments (EIA) was completed, while focusing on potentially significant impacts, mitigation and monitoring options that are beneficial to TROPOS. In a second step, environmental and socio-economic impacts (including mitigation strategies) were examined and assessed for the different TROPOS scenarios, and environmental monitoring programmes were adapted. Finally, the potential impacts of the TROPOS scenarios were compared to the impacts of single-use approaches to highlight the advantages of MUOPs.

1.3 Expected final results and their potential impact and use (including socio-economic impact and the wider societal implications of the project so far)

TROPOS has delivered full preliminary designs for three concepts: The Leisure Island platform, the Green & Blue platform and the Sustainable Service Hub platform. These designs can form the basis for future demonstration projects.

In addition, the TROPOS final outcomes contribute to:

1. Synergies between and integration of a broad range of sectoral interests including renewable energy, aquaculture, maritime transport and tourism aspects.
2. Increased knowledge on renewable and living marine resources available in different regions.
3. Diversification of the sustainable use of marine resources, including aquaculture; Improvement of technology related to the use of marine renewable energy resources, and food production, as well as for transport and recreational functions.
4. Advancement of knowledge and appropriate technology transfer for the integrated and sustainable use of these marine resources and functions with a particular focus on understudied but promising low latitudes

Operational outputs are:

1. Determination and description of suitable locations illustrating different combinations of functions of the TROPOS offshore platform system.
2. Innovative designs of Offshore Multi-Use Platforms allowing modular integration of diverse functions
3. Fully studied requirements in the areas of logistics, security, installation, operation, maintenance and decommissioning.
4. Guidance on economic viability, socio-economic acceptability and environmental impact including ways to minimise significant negative impacts and monitoring strategies.

Finally, the main impacts are:

1. Value for researchers: High potential knowledge outputs, tools, concepts, tested designs, developed methodologies, economic and environmental aspects.
2. Value for industry: Visibility and awareness of the industry, background information, available guidelines, huge detailed information about compatibility of uses in the platforms, IP (Intellectual Property).
3. Value for policy: recommendations, blue growth agenda, smart specialisation strategy or Atlantic Forum among others.
4. Value for society: numerous positive socio-economic impacts; quality of living, cultural, community or institutional aspects.
5. Value for clustering: opening multidisciplinary communities, networks, spaces of knowledge transfer among agents, multiple stakeholders and sectors.
6. Distribution and dissemination: As many sectors are involved in the MUOPs, there is a broad audience worldwide. Peer-reviewed publications help to reach even a wider scope.

7. Legacy of the H2OCEAN, MERMAID AND TROPOS projects: Opening a new gate for harnessing sustainable offshore resources, providing solid foundations and knowledge to prepare for a future innovative offshore economy.

More than 40 national and international institutions of highly relevant expertise have joined the TROPOS network of advisors and stakeholders. TROPOS has maintained close links with the MERMAID and H2OCEAN projects funded under the same 'Ocean of Tomorrow Joint Call' in order to further enhance complementarities and synergies.

1.4 Address of the project public website

<http://www.troposplatform.eu>

1.5 Figures



Figure 1.5-1. TROPOS Project Initial Platform Concepts and Locations



Figure 1.5-2. TROPOS Project Green & Blue Platform Initial Concept



Figure 1.5-3. TROPOS Project Sustainable Production Platform Concept

TROPOS Project Periodic Report

Second Reporting Period



Figure 1.5-4. TROPOS Project Leisure Island Platform Concept

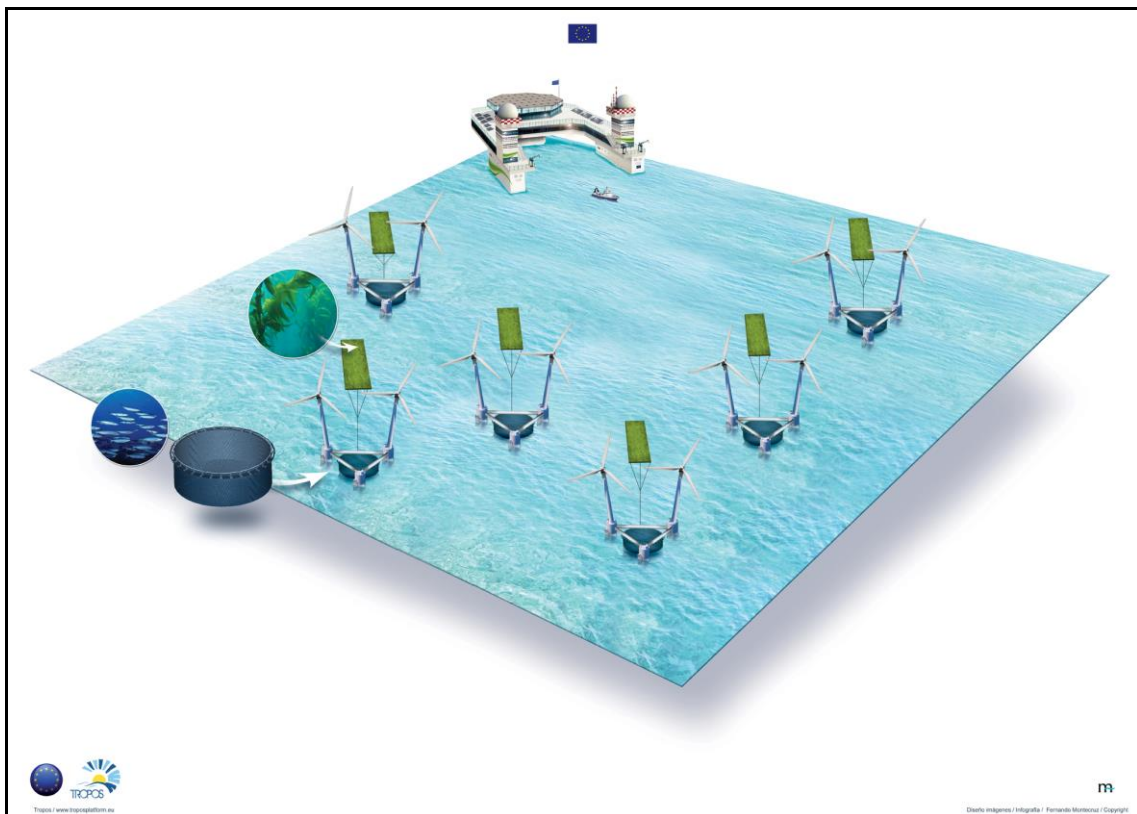


Figure 1.5-5. Green & Blue Crete concept considering initial Central Unit



Figure 1.5-6. Sustainable Service Hub concept considering initial Central Unit



Figure 1.5-7. Leisure Island concept considering initial Central Unit

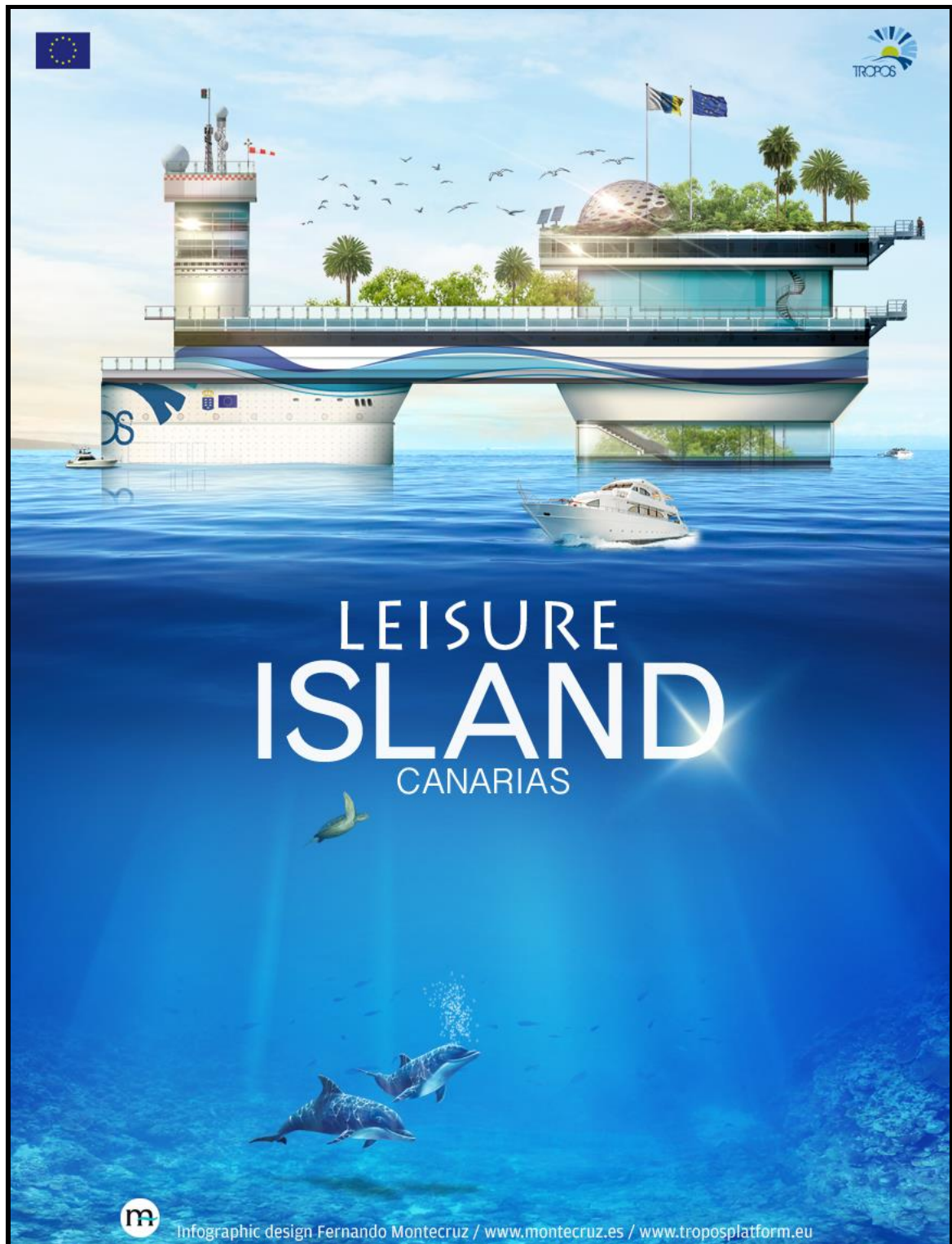


Figure 1.5-8. Leisure Island concept considering initial Central Unit - Advertising



Figure 1.5-9. Green & Blue Taiwan future concept

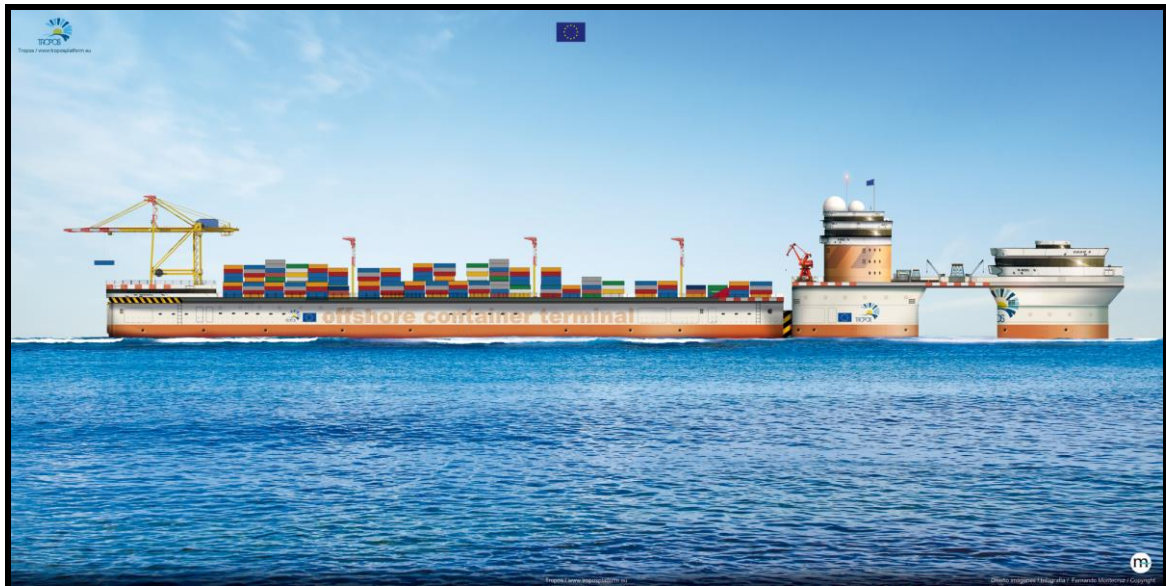


Figure 1.5-10. Offshore Container Terminal future concept

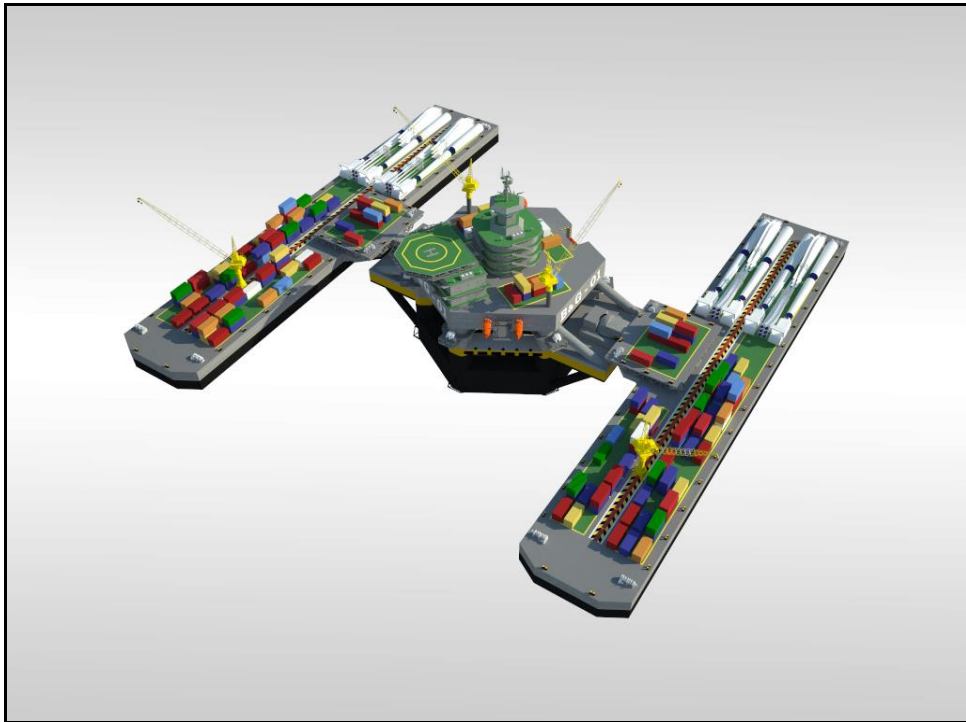


Figure 1.5-11. Green & Blue Crete Engineering Design –Platform

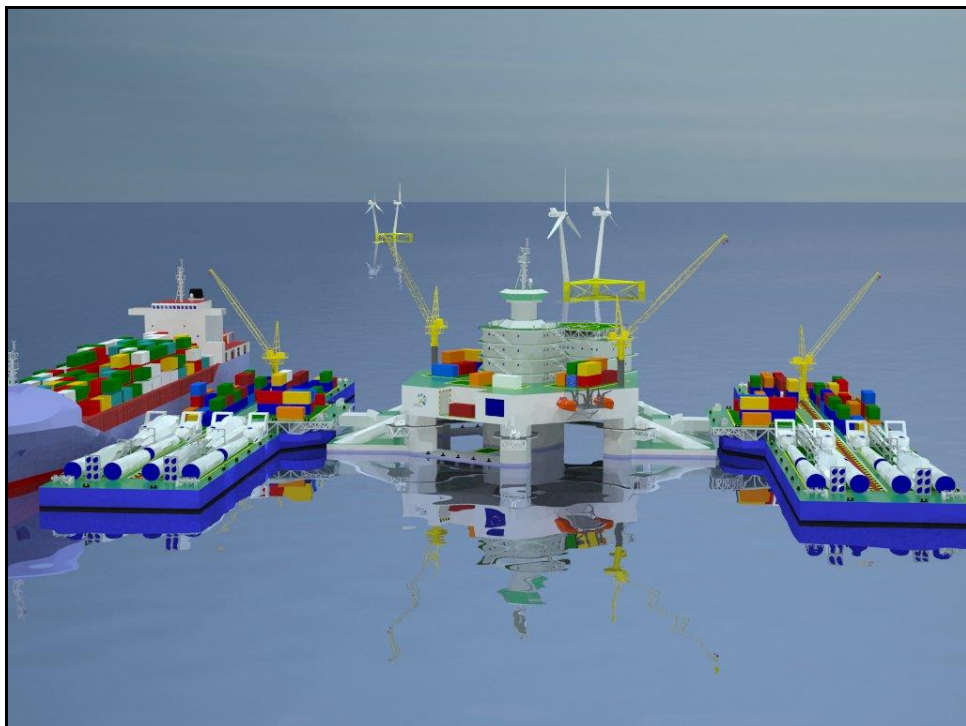


Figure 1.5-12. Green & Blue Crete Engineering Design – Platform & Context

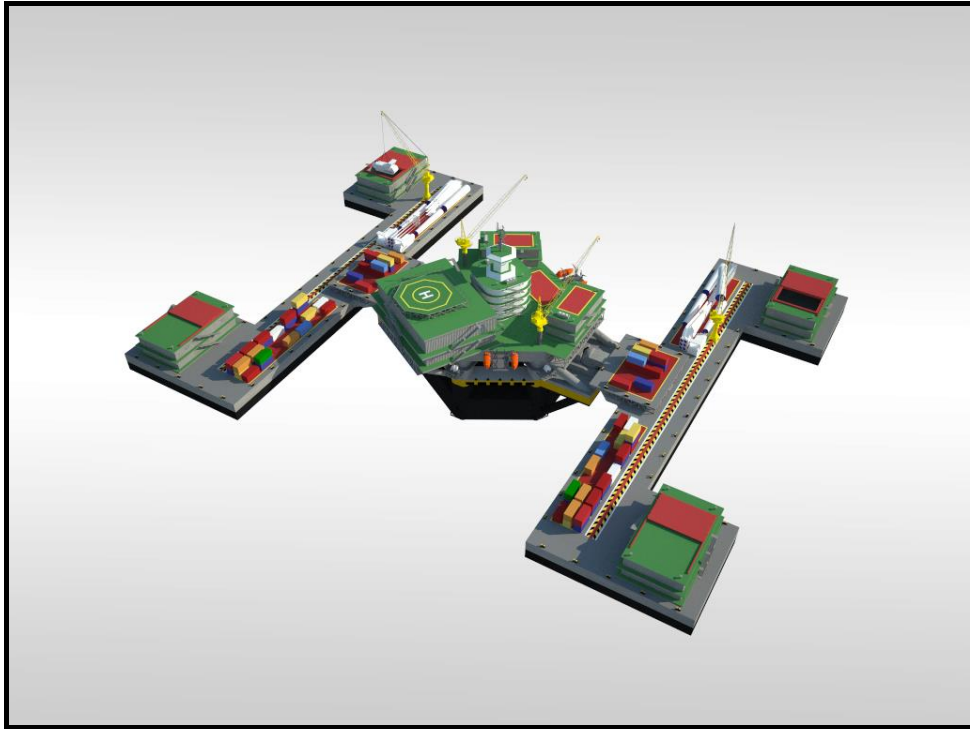


Figure 1.5-13. Sustainable Service Hub Engineering Design –Platform

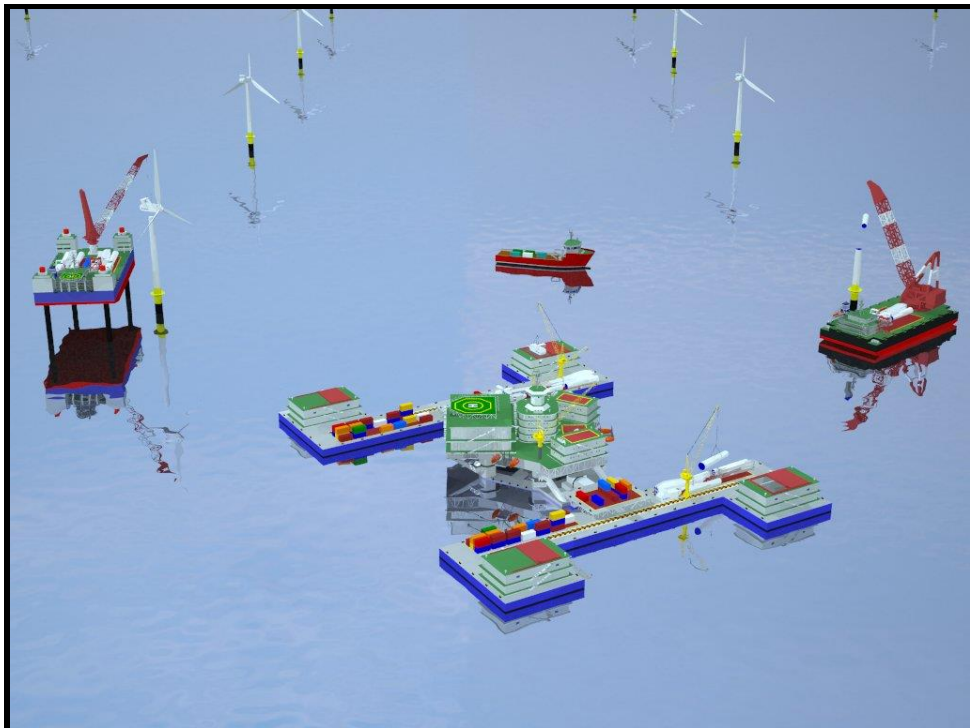


Figure 1.5-14. Sustainable Service Hub Engineering Design – Platform & Context



Figure 1.5-15. Leisure Island Engineering Design – Platform

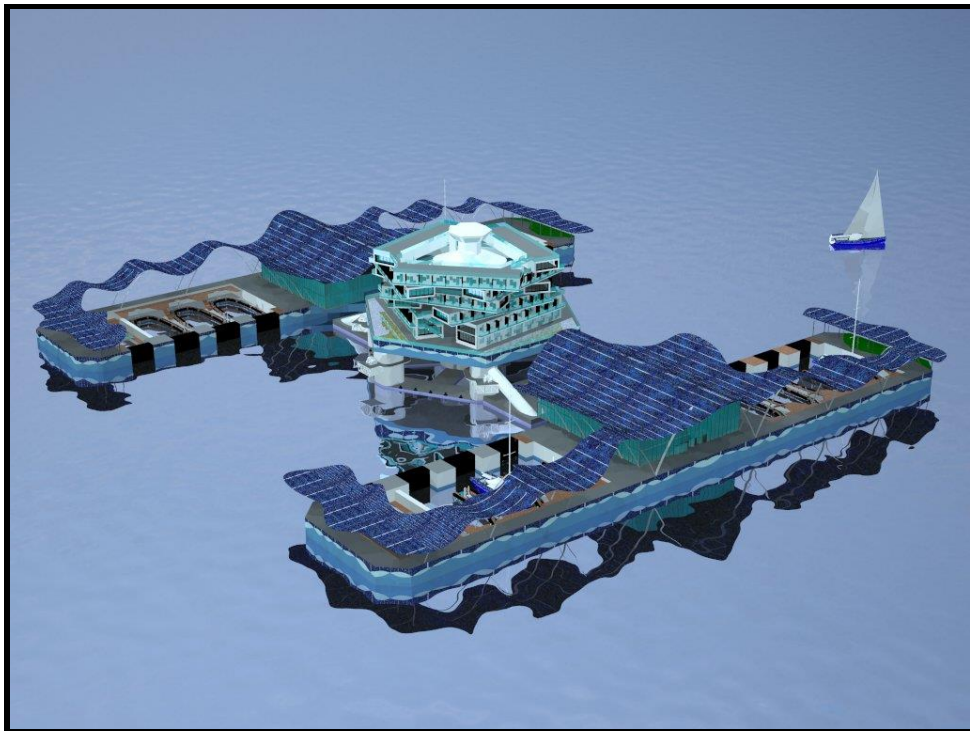


Figure 1.5-16. Leisure Island Engineering Design – Platform & Context

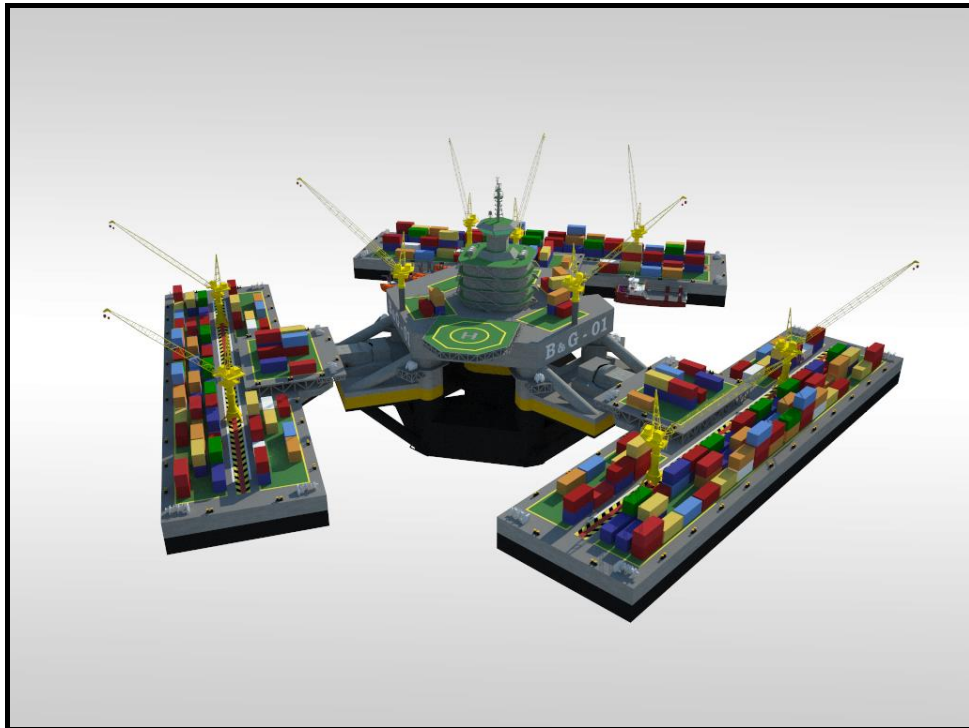


Figure 1.5-17. Offshore Container Terminal Engineering Design –Platform

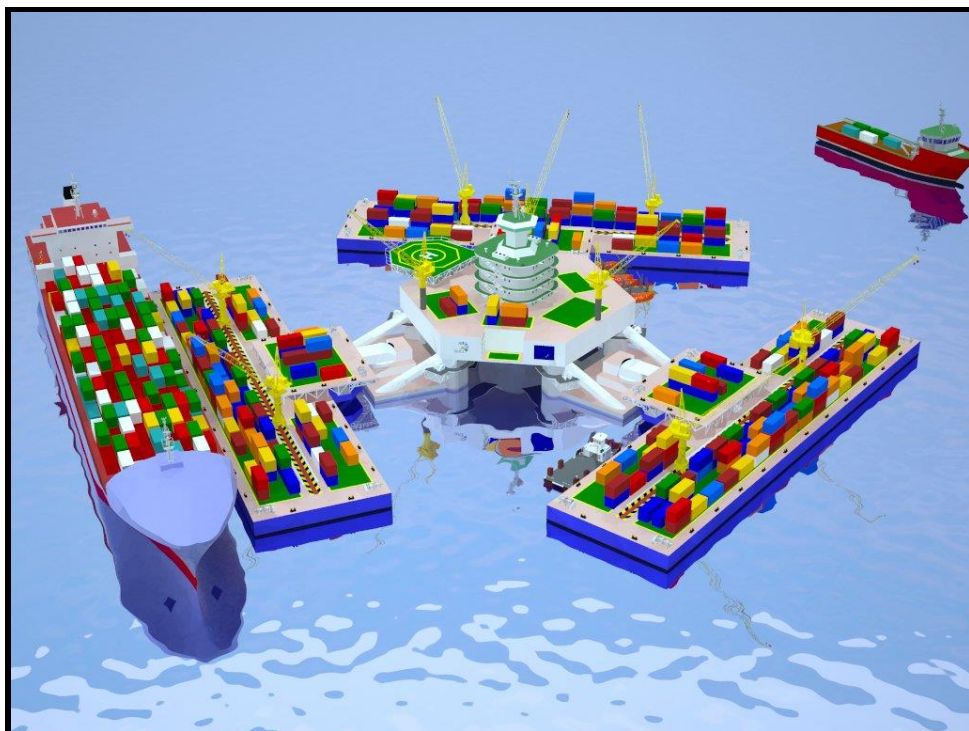


Figure 1.5-18. Offshore Container Terminal Engineering Design – Platform & Context

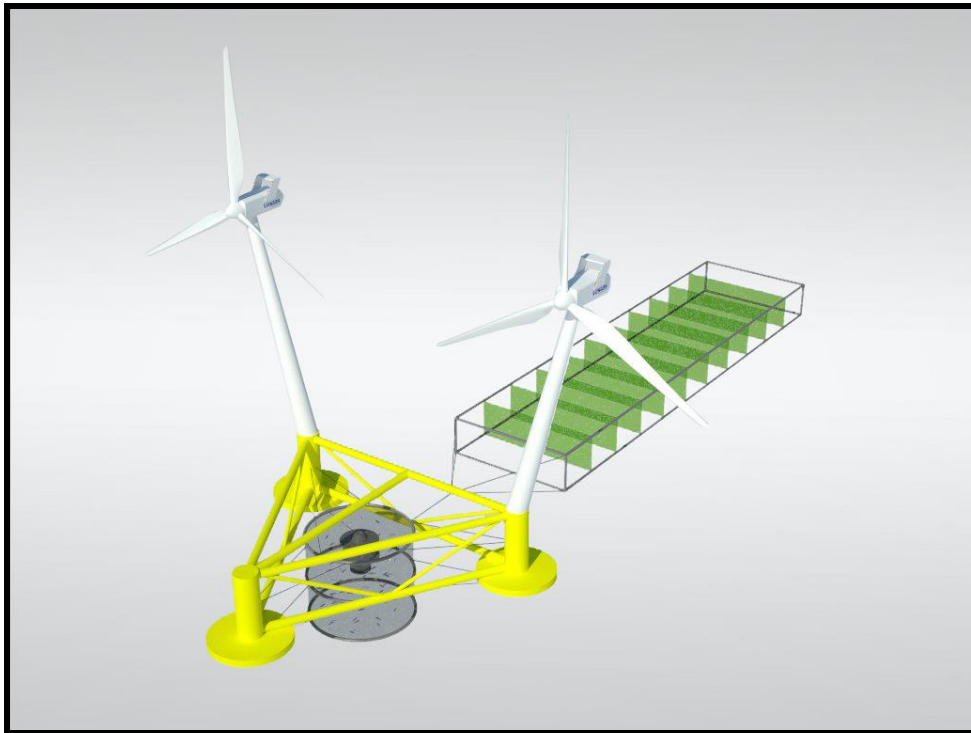


Figure 1.5-19. Satellite Unit, based on patented W2Power Design



Figure 1.5-20. TROPOS Project TEAL Components