.

The new Marina of Rodi Garganico:

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2013 PIANC Marina Excellence Design Jack Nichol Award Winner

Marina di Rodi Garganico was ranked highest as a facility that best represents the functionality, aesthetics, and environmental sustainability criteria of the PIANC Marina Excellence Design Jack Nichol Award. Thus, the Recreational Navigation Commission awards the 2013 Marina Excellence Design Jack Nichol Award to Marina di Rodi Garganico

Introduction

The 330-berth Marina of Rodi Garganico in central Adriatic Sea, scheduled for opening in June 2009, demonstrates an interesting new case of "project financing", which is becoming more and more popular in Italy particularly in connection with the development of yacht harbours. The microtidal coastal site at Rodi Garganico is exposed to the prevailing NNW steep waves, which have reached a maximum recorded deepwater Hs of 6.3 m (fig.1).

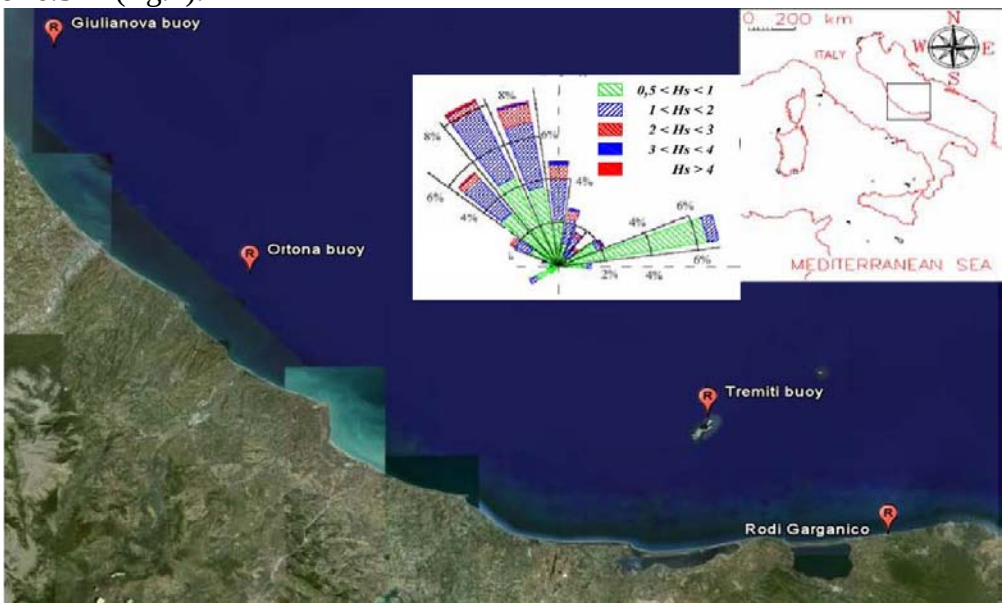

Figure 1 The geographical location of Rodi Garganico and near wave recorders, with deepwater wave climate at Tremiti (buoy records 2007-2008).

The picturesque whitewashed buildings of the tourist village stand on a high rocky promontory on the north coast of the green Gargano peninsula (Apulia Region). This area was once renowned for the export of locally produced citrus fruit(fig.2):: its long shallow golden sandy beaches and the nearshore spectacular limestone rock outcrops ("faraglioni") emerging from the clear, green seawater are separated by an exposed, old, solid jetty which is used in the busy summer season as a ferry terminal from which tourists can sail to the nearby, beautiful Tremiti archipelago.

Figure 2 : The harbour jetty of Rodi Garganico in 1914 and in 2007

The first port masterplan developed by the Apulia Region in 1999 is shown in fig.3: this proposed new port layout would have fully covered the natural rocky headland and outcrops. Following this, the municipality of Rodi commissioned a preliminary design (approved with prescriptions in 2005) and then the final design of the new port, concentrating the layout within a relatively narrow coastal area between the rock outcrops to the west and the existing jetty to the east. Following an EIA and public review by the various regional authorities ("*service conferences*"), as required by law, all approvals were obtained in Sept 2006.

Figure 3 First regional port masterplan of 1999 (existing jetty on the east side)

In early 2007 the municipality issued a "project financing" tender for the assignment to a private company to execute the design, construction and management of the project, only allowing for minor modifications to the approved final design. The 30-year concession tender was awarded to the specialized port-engineering contractor Impresa Pietro Cidonio SpA (with a budget of 12.5 M€) with the marine works design being finalised by MODIMAR Consultants in 2007 and the land based elements being developed by architects 3C+T Capolei-Cavalli associated architects.

At the tender stage, the approved final design was partly modified in order to improve the hydraulic and architectonic performance of the new marina. This mainly involved variations to the internal layout of the harbour thus avoiding changes to the already verified and approved coastal impacts. The most significant design modifications are the following (see comparison of schemes in fig. 4):

Figure 4 Comparison of marina layout final designs (left: approved initial scheme; right: modified scheme)

- the mooring basin is extended towards the existing shoreline to maintain the original contact position with the sea. This is to avoid an excessively wide paved yard and to improve the hydraulic efficiency of the Pincio stream by reducing its extension into the basin;
- an articulated distribution is given to the berths on water and to the service buildings on land, both concentrated along the secondary mole, which shows an unusual convex plan-shape along its inner, wet perimeter; the scattered small buildings facing the similarly fragmented old town on top of the headland and the green park southern area lead to a more harmonious urban connection;
- the enlargement of the mole allows a better access and separation between the public access for passengers using the ferry terminal and the private boaters;
- the outer ferry pier is extended from 20 to 50 m and its doubled berths are better located and oriented against the diffracted wave direction;
- the technical area for boat hauling and repair (some 4500 m^2) is better separated from the mooring areas and easily accessible from both land and sea;
- the berths along the rear side of the main rubble mound breakwater are removed together with the concrete crown wall, thus avoiding the wave overtopping risks and allowing a lower crest elevation and improved visual appearance;
- the internal wave agitation is further improved with antireflective quay walls and irregular basin plan-shape;
- the harbour water flushing and quality is enhanced by the introduction of two large pipes with pumps across the main breakwater;
- the provision for larger yachts has been increased in line with modern demand. Berths for 21 m and 25 m long boats have been included. Additional berths for transit boats and for small service and fishing vessels are also provided along the quay walls.

Execution design of the sea works

At the next “execution design” phase further minor modifications were made to the layout, particularly in terms of the distribution of berths, which even includes a 40 m long longitudinal berth. The main design characteristics of the sea works are described below. The harbour layout (fig.5) includes a 700 m long main breakwater with a soft streamlining curved plan-shape extending down to the –4 m contour (at a distance of 300 m offshore due to the local shallow sandy foreshore) to shelter the 6 Ha basin from the prevailing NW wind- waves .

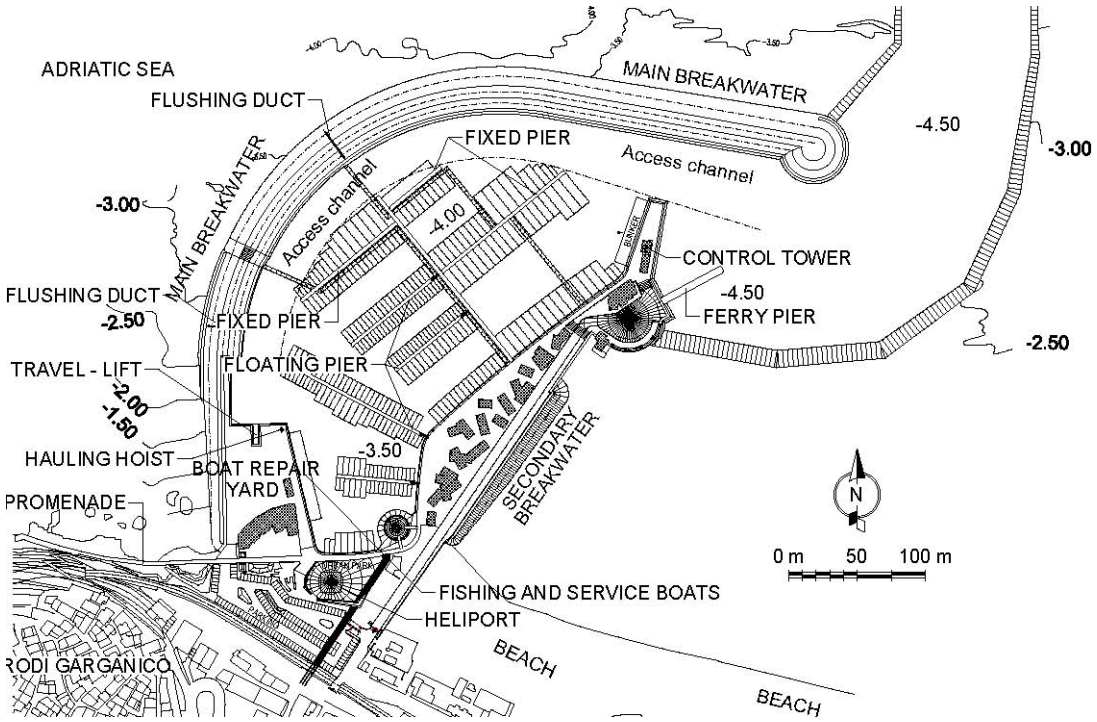

Figure 6 Execution design layout of the new Marina of Rodi Garganico

The existing straight jetty was widened and extended seawards by 150 m, resulting in a 50 m wide entrance and becoming the marina secondary breakwater: it also leads to a circular/ square expansion and a new 50 m external piled pier creating a double berth for the summer ferry link to the islands. The control tower and the fuelling dock are strategically located at the outer end of the new breakwater. The articulated wet perimeter borders a water basin dredged in successive areas to depths of –4.5/-4.0/-3.5 m MSL with ample manoeuvring space. The public access is confined to the eastern side of the jetty which maintains its historical straight alignment and position in relation to the adjacent beach. As with the marina buildings, the mooring piers and quays and the berth distribution exhibits quite an irregular pattern, thus avoiding the appearance of a dull, monotonous “boat garage”. A repair yard with a travel-lift basin is appropriately located in the western corner, suitably separated from the yacht berths and easily accessible by boats at the end of the curvilinear access channel. The depth-limited main breakwater has no crown wall (apart from the initial portion sheltering the repair yard and the final tip for pedestrian access to the head green light), thus improving the mooring safety and the visual impact of the structure. The rock armoured breakwater has a crest elevation of only +3.5 mMSL (fig.6). The placement pattern of the 3-7 t rock armour is random and porous on the seaward slope to increase wave energy dissipation, while it is regular and compact on the emerging part of the steeper slope on the rear face. This is to improve the visual appearance and the stability of the structure against overtopping water jets.

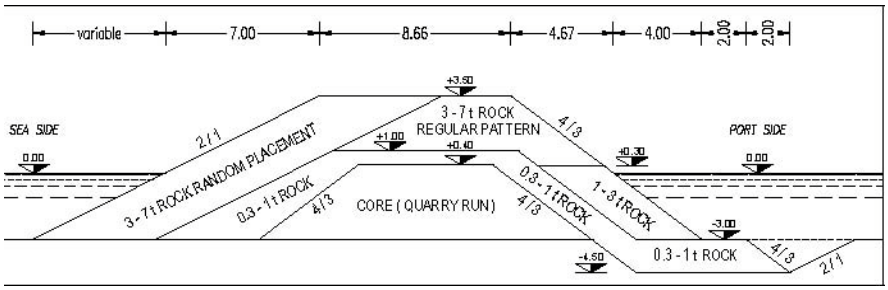

Figure 7 Typical section of the main breakwater

The quay walls are formed using perforated precast reinforced concrete caissons (3.4H x 3.0L x 2.5B m^3), which offer excellent performance in terms of monolithicity, durability and hydraulics (fig.7). In comparison to traditional blockwork quay walls, the caissons can be manufactured quicker and more accurately and are easier to place, with fewer joints. The mooring piers are either fixed (on piles) or floating, depending on boat size, in order to allow some flexibility in the users’ demand and final berth layout. Most berths are well aligned with the prevailing winds. The mooring system is a traditional simple

“anchor and chain”.

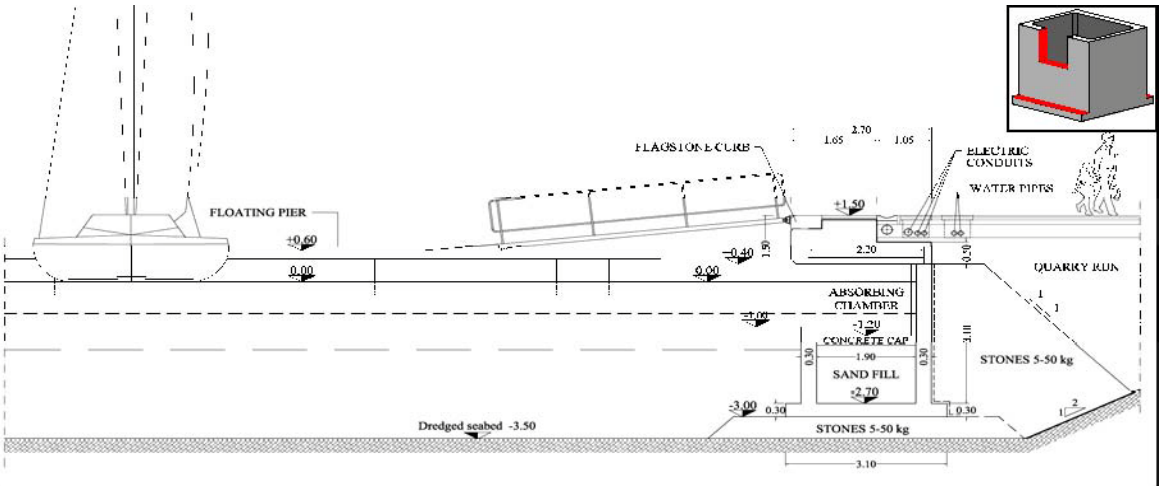

Figure 8 Typical section of the perforated caisson quay wall and floating pier

The pile design considered an embedded length of around 10 m (just 2 m above the bedrock level) and a top elevation of +0.1 m (inside piers) and +0.4 m MSL (outside ferry pier) (see sections in fig.8). The 5 boreholes executed along the breakwaters during the design phase showed a rather homogeneous soil stratigraphy: sand with gravel for the upper 2.5 m; black silty sand for the next 9-10 m and finally the hard clay marne and limestone.

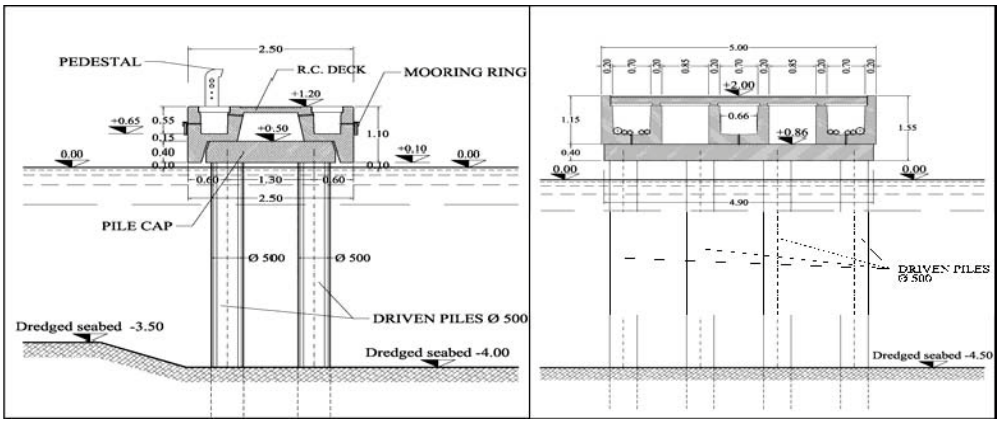

Figure 9 Typical sections of the fixed piled piers

Architectonical aspects

The design of the works on land was based on the modern concepts of bio-architecture, with the general aim to create a new urban link between the old village and the sea. Further design objectives were the following:

- prevailing use of local healthy raw materials;
- construction flexibility for potential future changes of functional destination;
- energetic efficiency (thermic isolation, natural lighting, etc.) and innovative technologies (solar panels, natural conditioning, etc.);
- maximum structural durability;
- recovering and recycling of construction materials;
- search for beauty and natural comfort, with extensive green areas.

Attention initially focussed on the shape of the external spaces, the interconnections between the new buildings, the pedestrian path network to suit the people, views and sensations. The individual building design becomes an integrated consequence of the overall scheme composed by small low blocks made with traditional materials. Starting from an isolated house surrounded by natural elements (sun, wind, sounds, etc.) the concept developed to a group of buildings well integrated within the territory to provide a comfortable place. This is particularly relevant for the vernacular architecture in Mediterranean climates, where outdoor activities can be performed for a long period of the year.

The urban structure reflects that of the historical town with narrow streets and frequent small squares, akin to ‘simple open-air rooms’. The fragmented distribution and variable orientation of the small isolated buildings reproduce the meandering sense of curiosity and surprise for the pedestrians, while the articulated inter-building corridors ensure useful ventilation and shade. The main land area of the marina develops on the secondary breakwater. A nice round square expansion is created near the seaward head for waiting passengers and public amenity.

Figure 10 Perspective view of the commercial and recreational area , sketche and realization

Another small circular “sea square” is created at the innermost basin corner as a focal point of the urban park, to be used for public shows, concerts and events (figs.10-11). The eastern peninsula hosts 16 buildings with the following destinations: commercial and administrative, restaurants and toilets. On the opposite western technical area two buildings are located, one for boat repair and sale of nautical accessories, the other for the coastal authority offices.

Figure 11 Perspective view of the commercial and recreational area , sketches and realization

The building design also reflects the old sea village style, with small, white constructions covered with a tile roof slightly overhanging the masonry walls whilst at the same time introducing a modern note in the composition of the openings. The buildings are mostly used as shops. They typically consist of a single storey, except for the yacht club (2-floors) to offer a panoramic view of the sea and the town, and for the control tower (3-floors) for obvious functional requirements. Each one has three free edges with an internal subdivision in three zones: exhibition and sale, toilets and warehouse. The total building surface is 3158 m2, with an overall volume of 10105 m3 (assuming an average floor height of 3.2 m).

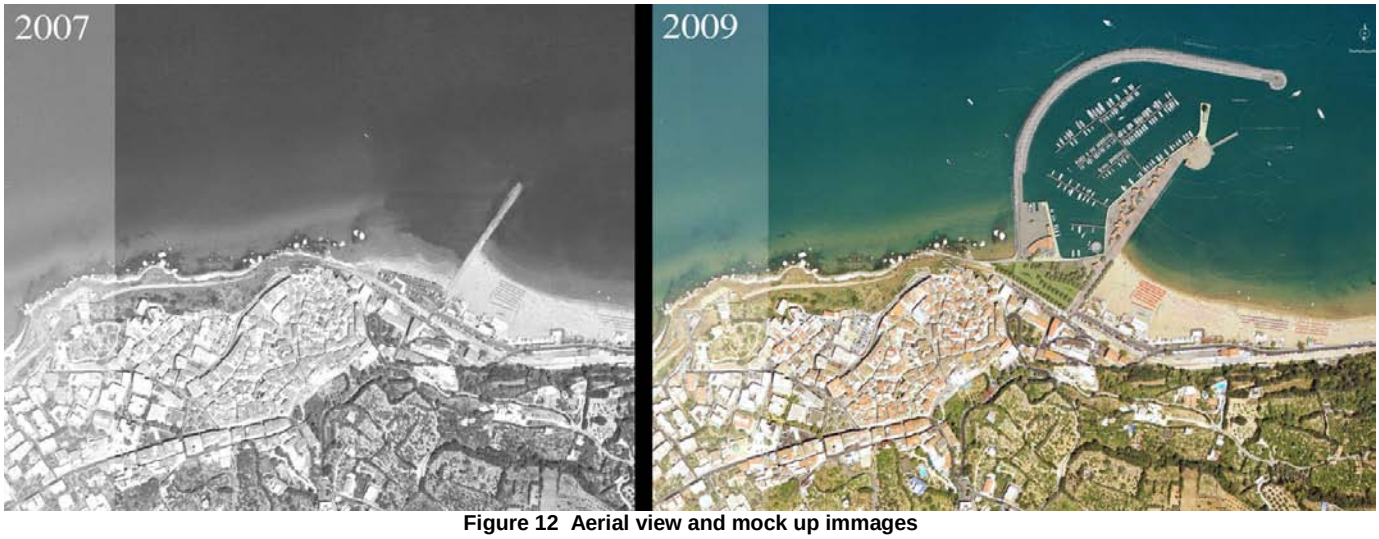

Figure 12 Aerial view and mock up immages

Figure 13 The Marina site in 1914 and 2009


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Figure 14 Marina under construction in winter time

Figure 15 Construction progress

Figure 16 Construction progress


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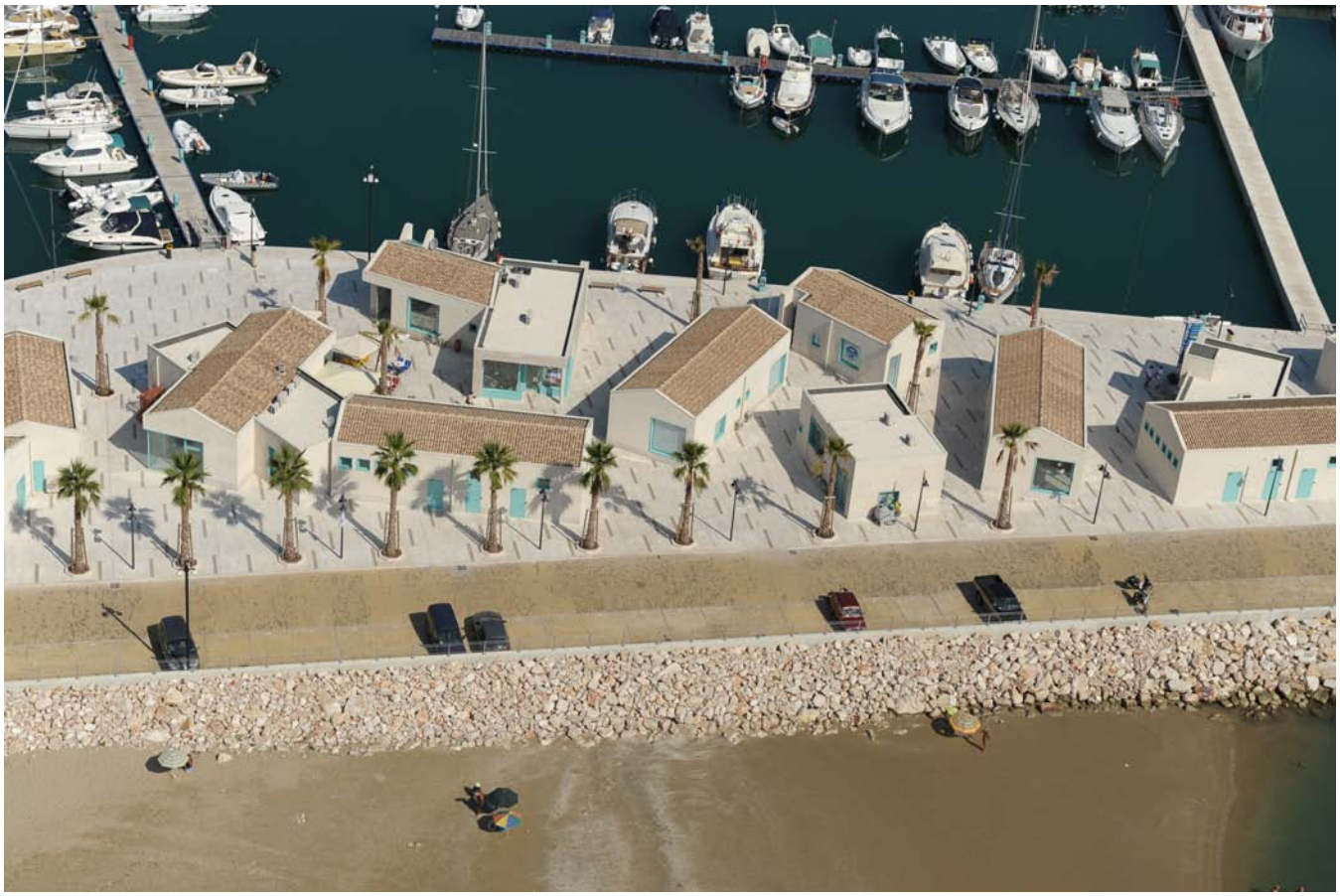

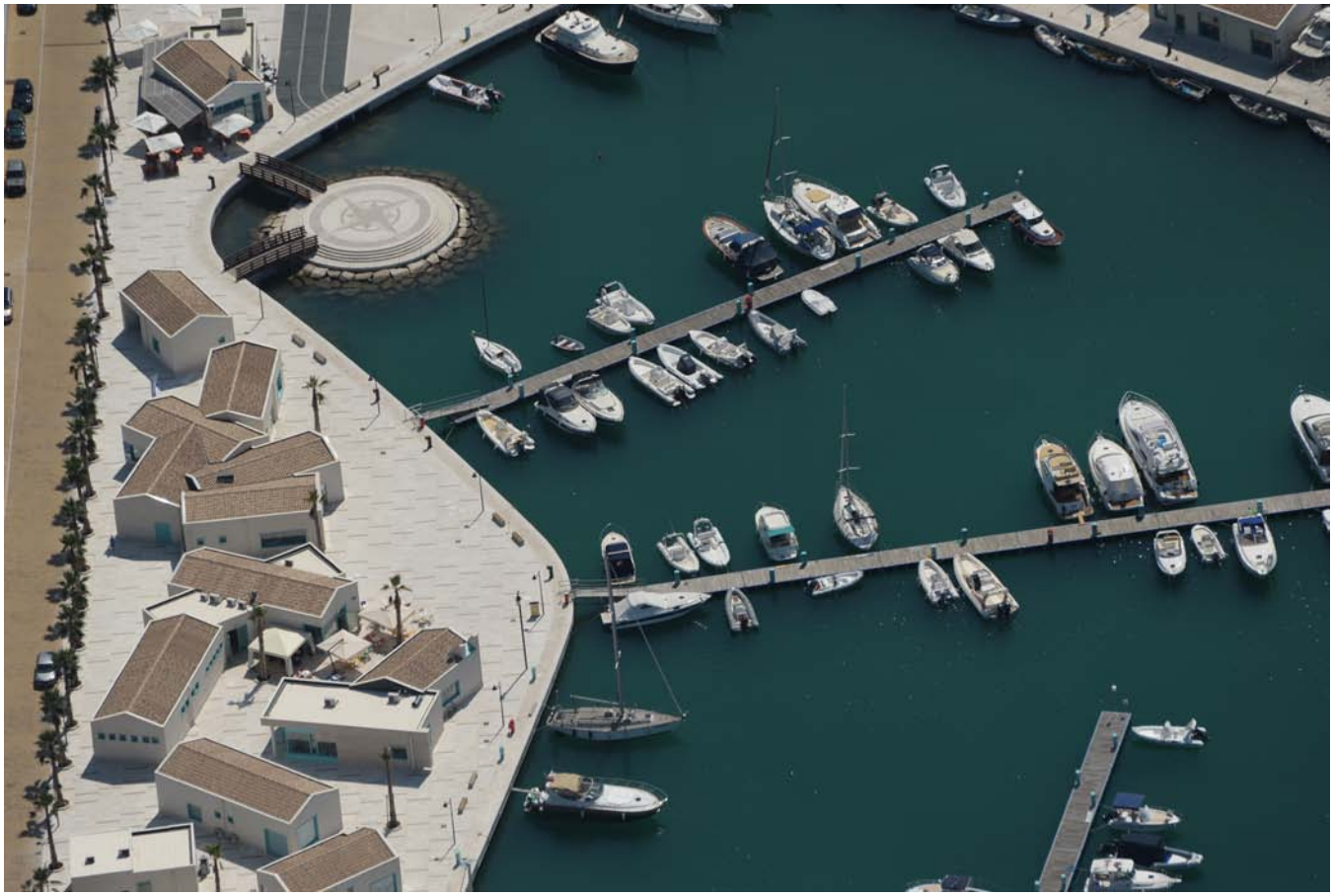

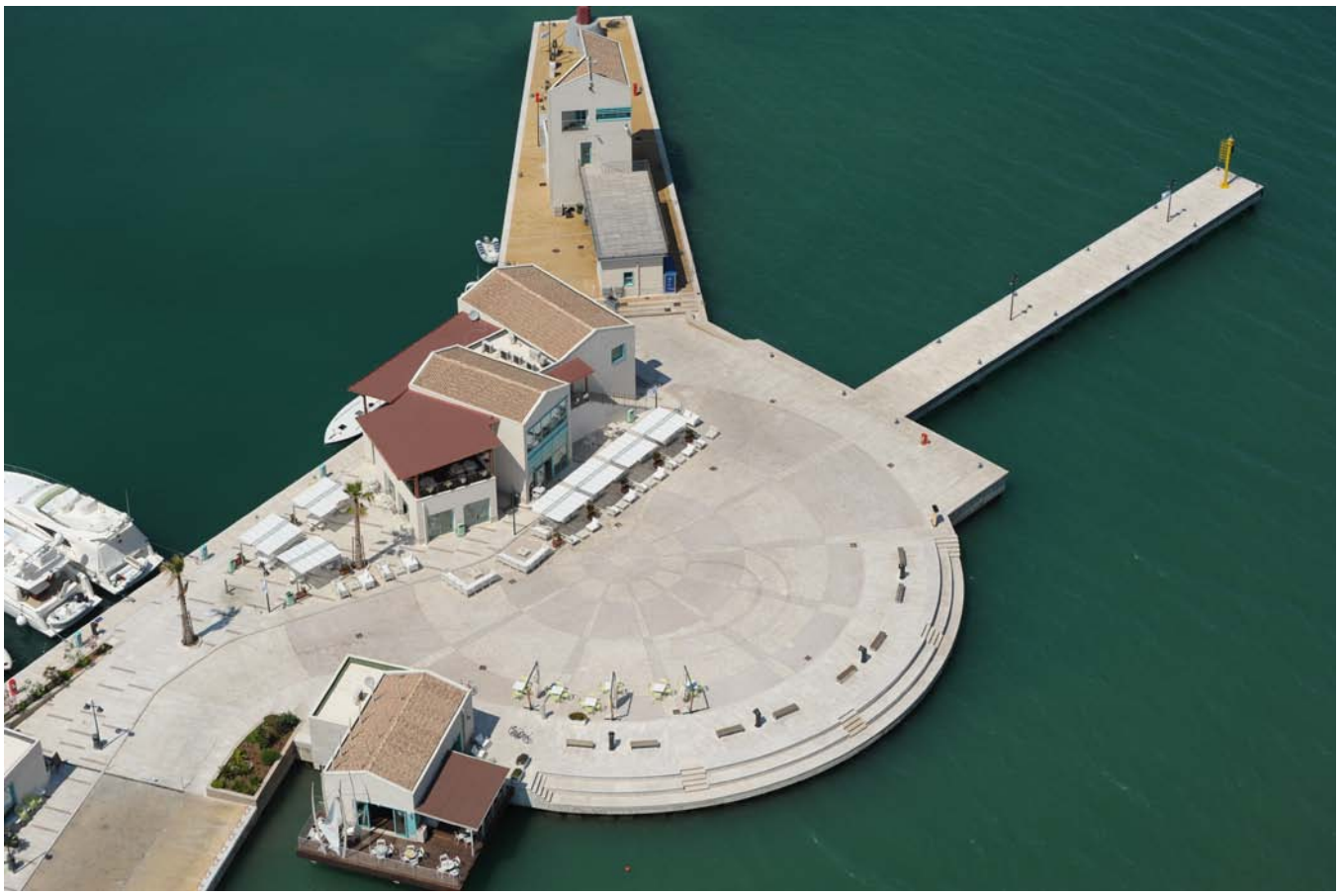

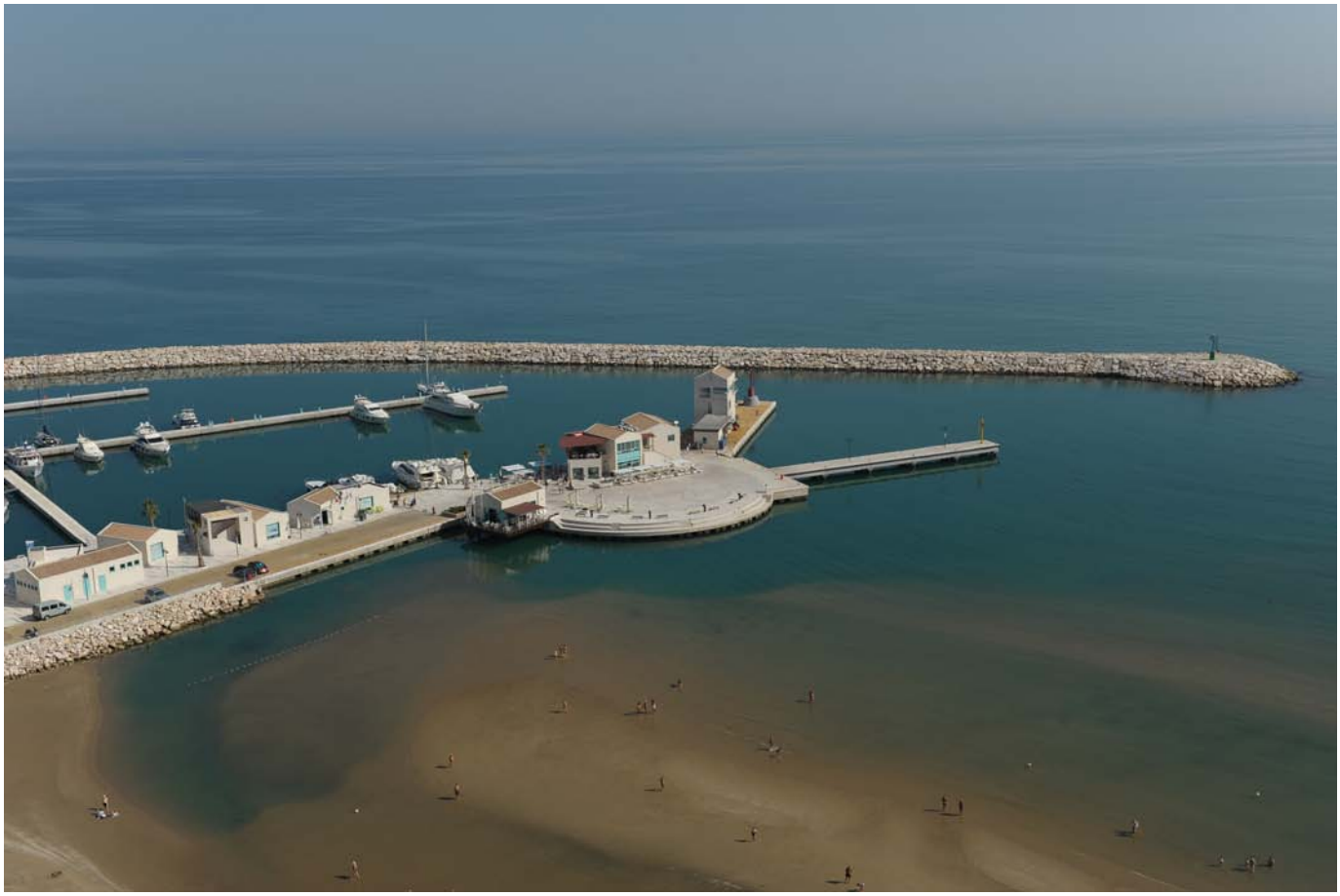

Figure 17 Aerial views

Figure 18 Sea side picture

The construction materials used for the buildings are: reinforced concrete for the inner structure, masonry blockwork covered with white plaster and bordered by limestone stones (also used for paving); aquamarine coloured aluminium is used for the fixtures. Public car parks (n.140) are located near the coastal railway to avoid car traffic inside the marina, while some 90 parking spaces are located along the eastern peninsula exclusively for boat owners.

Conclusions

This new marina project is a good example of the rapid design and construction of an infrastructure project in the marine environment where due consideration has been given to the various important hydraulic, aesthetic and coastal-morphological aspects of the scheme. The excellent cooperation between the architects and the engineers, as well as good communication between designers and the contractor, has been a key factor in the success.

Acknowledgements

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All photographs are by the authors (except the aerial views and photo n 18).