

## CONTRIBUTION OF A NEW-DESIGN MULTIFUNCTIONAL ARTIFICIAL REEFS TO THE SUSTAINABLE MANAGEMENT OF COASTAL AREAS

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### ABSTRACT

Coastal territories are the focus of constant antagonism and conflict. The lack of integrated management of maritime and terrestrial resources causes serious tension among various sectors of activity (fisheries, agriculture and services). Consequently, the sustainable development of the coastal areas is put on hold. So, how to find a sustainable solution that balances the need to preserve the shoreline and economic development (local or regional)? Scientific knowledge about climatic changes, theoretical background in shorelines infrastructures construction, coastal engineers' awareness, controlling, monitoring and managing of coastal related operations could not avoid a relevant impact on coastal sustainability. Coastal resources are under increasing pressure and specific management programs strive to protect coastal resources for future generations while balancing today's competing economic, cultural and environmental interests. This management programs are determined to balance all the dimensions of the coastline importance (Tourism, Resource Extraction, Wildlife Habitat, Settlements and Industry). These interventions are socially important: they are concerned with the fair allocation/use of coastal resources while sustainably managing these areas so that they can be used by future generations. Sustainable coastal management should involve all parties in the decision-making process so that resources are used fairly without permanent damage. Without sustainable coastal management, there could be a loss in a country's economy and, even, no economic growth. The problem of coastal erosion has been sharpening in Europe. Several publications discuss pressure situations and erosion processes across the entire coastline, pointing to critical situations together with the densification of coastal urban areas partly due to successive waves of human migration towards coastal areas and estuaries. Portugal owns 2830 km of coast, islands included, and is one of the European countries where the growth of coastal urban areas was faster, the growth of population along the shoreline was higher, the most agricultural area along the coast was lost to other uses, and evident loss of dunes is due to construction/exploitation. So, how to find a sustainable solution that balances the need to preserve the shoreline and economic development, either local or regional? Rock walls, breakwaters or groynes usually serve the purpose of protecting land from erosion and/or enabling safe navigation into harbours and marinas, but other commercial value and multi-purpose recreational and amenity enhancement objectives can also be incorporated into coastal protection and coastal development projects. Submerged breakwaters (also called multifunctional artificial reefs (MFARs)), made partially from sludge muds resulting from dimensional stone cutting process, could be an interesting and efficient strategy, not only to protect a coastal system but because recycling and incorporating such wastes into building materials is a practical solution for pollution problems from stone industry. Moreover, MFARs will improve the bathing conditions of some coastal zones and cope to enlarge sea biodiversity. This research main objective is to find a sustainable solution that balances the need to preserve the shoreline in a sustainable way by enhancing the use of stone cutting sludge waste in the production of MFARs, reducing both the environmental impact and the production costs.