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COASTAL DEFENCES: A STUDY ON ENVIRONMENTAL MANAGEMENT

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ABSTRACT

Coastal areas play an essential role in social, political and economic growth of several countries they assist productive and different coastal ecosystems that offer valuable services and goods. Universally coastal erosion and flooding indicate severe threats along numerous coastlines and will become much severe as a consequence of alterations induced by human and developed rise of sea level. The structures of coastal defence have become ubiquitous coastal landscapes characteristics as a response to these threats. The defence works proliferation can influence over half of natural shoreline in certain areas and outcomes in dramatic alterations to coastal surroundings. Small attention has been paid to ecological coastal defence consequences. The outcomes from DELOS project represent that the coastal defence structures construction will influence coastal ecosystems. The results can be viewed on a local scale as interference of enclosing soft bottom surroundings and implementation of new artificial bottom habitants of hand with consequent alterations to native areas assemblages. Coastal defence structures proliferations can have essential influences on diversity of regional species, eliminating separated obstacles, favouring the non-native species spread and developing heterogeneity of habitat. The environmental context knowledge in which structures of coastal defence are placed is basis to an efficient structures management as whilst there are certain usual results of such building numerous impacts are site specific. Advice is offered to offer particular goals of management which involve mitigating particular influences on surroundings such as reducing alterations to enclosing sediments, developing natural resources and/or exotic species spread or nuisance species growth. The DELOS project identifies that the defence structures downstream influences on regional scale influences and coastal methods on biodiversity requires management and planning at regional scale. To handle and efficiently understand coastal defences, the goals of environmental management must be incorporated and stated clearly into the construction, planning and supervision steps.

Keywords: Coastal management, Ecological perspective, DELOS Project, Sea defence,

Introduction:

Erosion of dunes and shoreline from currents of ocean, wind and wave action and tidal movements is a similar natural event along coastlines all over the globe. Coastal erosion has often occurred and has shaped coastal landscapes throughout history in Europe. A coastal evolution inventory in European Union carried out within programme of EC CORINE revealed 55% of coastline to be steady, 19% to be facing from erosion issues and 8% to be depositional (European Environmental Agency, 1995). Universally the issue of flooding and erosion will become

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much severe because of developing levels of sea and a developed frequency of storm as an outcome of worldwide change in climate (Bray and Hooke, 1997; National institute of Coastal and Marine Management of Netherlands, 2004). The coastlines recession is anticipated to last even in new human activities absence (Bondesan et al, 1995). Similarly coastal regions plays an essential role in social, political and economical growth of several countries and their economic significance is set to develop substantially due to focus of recreational activities, populations and industries. The pressure of human is specifically severe on the coast in tourist regions (Cencini, 1998) where recreational growth affect upon beaches despite erosion. Hard substrate defence structures have become similar characteristics of coastal landscapes in shallow sub-tidal and inter-tidal surroundings (National institute of Coastal and Marine Management of Netherlands, 2004). The defence structures main purpose are to reduce or hinder flooding and erosion of greater value coastlines to retain and stabilize reclaimed land and beaches and to develop the coast amenity value. The size, spatial arrangement and quality of habitats are leading determinants of abundance and diversity of species existing in an area (Hanski and Gilpin, 1997). These regional or landscape scale factors have acquired huge attention in terrestrial systems management for findings the urban development consequences for nature reserves design and to inform plans of restoration (Simberoff, 1988). In this study DELOS the European scale project was evolved and the purpose of the study was to motivate efficient configuration of LCS (low crested structures to defend shores of Europe while similarly meeting particular goals associated to surroundings by reducing influences on existing habitats or when desirable developing particular natural resources in a sustainable way. In the present study the author explains the ecological influences that emerge from hard defence structures deployment and provide advice on processes for meeting goals of environmental management on coastline. These prospects

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are based on outcomes of DELOS project and other issued works. The DELOS project focused particularly on low crested structures and several points are applicable broadly to any kind of rock or hard armored artificial structures.

Biological difference: processes of ecology differ in space and time:

This difference is an outcome of communication between physical and biological methods (Pickett and White, 1985). The usual methods that set the distribution and abundance of species are survival, recruitment, dispersal and reproduction of individuals of species pool in specific area. Huge number of interactions and factors among them will create complex patterns in patterns variation as well as organism's distribution in space and time (Martin et al, 1993; Aberg and Pavia, 1997; Airoldi, 2000). A general knowledge of how interactions and natural processes produce species variability in time and space is important to find how defence structures deployment will impact coastal assemblages and to recognize sustainable design choices. Broad qualitative predict of species kinds and the sequences of alteration on or around a defence structure can be made with certain confidence. Quantitative predictions of impact on individual assemblages and species at any specific location are much difficult. Furthermore systems alter over time naturally and in response to human communications. A sustainable defence structures design required to regard the local environmental features and essential temporal alterations.

Scale Importance: Communication between broad and local scale processes:

The factors of environment influencing the abundance and distribution of species and maintaining biodiversity perform on varied temporal and spatial scales. On a wide geographic scale the pool of species in a specific region is decided by past evolutionary and geological processes coupled with the impact of leading physical factors such as major currents, climate, tidal excursion, salinity and upwelling (UNEP,

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1995). Important physical communications involve competition for resources such as nutrients, space and light, food, predation and grazing (Southward, 1964; Hawkins and Hartnoll, 1983). Lastly on a little scale certain species abundance may be decided by accessibility of biologically and physically offered microhabitats. Microhabitats are produced by alterations in grain texture and size on soft bottoms. The assemblages and coastal habitats attributes also differ over an extent of temporal scales with complex communications between temporal and spatial scales. Thus the species abundance may fluctuate substantially when viewing at a little spatial scale but be steady when contrasting average abundance on a bigger scale. Similar processes perform when handling desired natural resources on defence structures of coast which may need actions at a regional scale to hinder local difference due to fragmentation of habitat.

Environmental influence:

Humans rely on coastal surroundings for energy, food, recreation, construction and several other services and resources. The resources usage has an impact on coastal surroundings and related life of marine inevitably. Alterations emerge as an outcome of numerous activities that exist within coastal zone most frequently (French, 1997). Certain alterations are caused intentionally by coastal managers or engineers. An alterations to surroundings and/or related biological resources as human activities consequences are usually known as environmental influences. Sustainability must be considered as a guiding principle for growth where sustainability may be referred as the utilization of environment components in a way and at a rate that do not injure natural biodiversity, ability to offer services of ecosystem and functioning of ecosystem irreversibly (UNEP, 1995). Nowadays few coastal surroundings can be considered as natural in the way that non human tools are independent from anthropogenic impacts (Jackson and Sala, 2001). Even a coast without development of human is influenced by regional methods on the sea or land such as inflow of freshwater, upstream nutrients

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excess input, sedimentation and threats such as pollutants and spills of oil. Thus it is feasible to recognize individual major baseline state of environment that can be defined in an objective way.

When a desired state of environment can be referred it is important that natural methods liable for handling that state are identified or known. Influences may alter ecosystems from desirable to undesirable states at bad situations influencing system sustainability. When ecosystems are driven through undesirable states thresholds losses can be permanent or long lasting (Scheffer, 2001; Hawkins et al, 2002). Several surroundings nowadays are understood as natural are relied and shaped on intervention of human. The rationale may be for wild life or ecosystem conservation, research or recreational use. Still the nature reserve may depend on a strategy of management to manage the surroundings at a specific state. In coastal management varied choices such as defence structures or deployment of low crest structures, nourishment of beach or to leave unprotected coast are estimated better in desired environment state and what strategy of management is needed by different stakeholders.

Influences of hard structures for coastal defence:

Low crest structures are any other hard defence structures which have results for landscape of coast and for the functioning and structure of coastal ecosystems. These results can exist locally but increase proportionally to enclosing regions and mainly influence coastal ecosystems on a regional scale. The ecological systems variability makes it critical to find the influences of low crest structures quantitatively in a particular area. Nevertheless the DELOS project outcomes recommend certain qualitative usual influences and recognize concern areas. The magnitude and type of alterations induced by low crest structures can differ substantially relying on setting of environment where the breakwaters are built. However the building of low crest structures and other kinds of hard

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defence structures often outcomes in a local loss of natural soft bottom habitats and related assemblages of plants and animals. Deploying numerous low crest structures or hard defence structures in an area has an influence on distribution and abundance of species on a regional scale. Such influences are not the cumulative outcome of numerous little scale influences and there can be emergent impacts. The artificial structures system can also offer new dispersal routes that allow the invasion of non indigenous species involving pests (Lambert and Lambert, 2003; Bulleri et al, 2005). The author learned the large scale impacts of hard defence structures using an integration of spatial population and field examination models with the limpet Pattella caerulea in the DELOS project. Simulation models of the survival and dispersal of Pattella caerulea in north Adriatic sea revealed that maximum species dispersal distance is far reduced than distance between natural reefs of rock in the areas. Thus before low crest structures deployment and other artificial structures the flow of gene between natural number of people in Ancona and Trieste was restricted likely. On the whole the outcomes reveal that coastal defence proliferation and other kinds of structures made by human can have essential influences on diversity of regional species.

Advice for a sustainable big term low crest structures management:

Once it has been determined to construct a structure on rational grounds to secure a coastline area there will be results for surroundings inevitably. The site ecological situations will be altered from its previous semi natural or natural state in several cases although on certain heavily changed coastlines the alteration will be from one group of artificial conditions to another. In several countries it is a nee that design choices are regarded that reduce influences of human actions on existing conditions of environment. While it may be feasible to reduce certain influences on low crest structures on soft bottom biota certain influences are unavoidable and must be used into the decision of whether or not to utilize

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this management process. It may be feasible to recognize design choices that expand certain structures byproducts to meet particular end points of secondary management. The efficient use and design of coastal defence structure needs: 1) expected results clear identification; 2) sound supervision to assess their efficiency at attaining objectives of management; and 3) estimation of economical and ecological consequences in light of regional social and environmental context.

Major Lessons from DELOS:

A natural process in naturally dynamic regions is known as erosion. Several issues of coastal erosion are made bad by the influence of humans on coast and there is developing concern about predicted future trends of developed storminess and developing level of sea due to change in climate (EUCC, 2004). The dilemma facing coastal managers is whether to protect the coast and at what socio-economic cost (French, 1997). There is a developing concern about the ecological suggestions of long term sustainability and coastal hardening of sea defence. The project of DELOS clearly mentions that coastal erosion differs among varied areas which need varied solutions with varied consequences of environment. Successful management can be accomplished by handling the complete coast as a combined unit where ecological consequences are estimated in societal and regional environmental framework. The DELOS project outcomes point out that to notify sustainable defence estimates ecological knowledge is essential about large scale and local scale influences of coastal defence structures. It is feasible to optimize certain unavoidable results of hard defence structures to attain particular goals of secondary management. Present study both from research and DELOS (Glasby and Connell, 1999; Davis et al, 2002; Lambert and Lambert, 2003) clearly reveals that certain ecological influences existing as a result of hardening of complete coastal regions can be much severe than have been valued usually and could lead to considerable changes of coastal habitats. Proper

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consideration of whether or not coastal defence structures must be constructed needs a clear goals statement and a consideration of environmental results at regional and local scales. If structures are deemed appropriate and essential then sound supervision after and before construction is needed to assess their efficiency at meeting the goals of management.

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