

Ecological Landscape Planning, with a Focus on the Coastal Zone

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1. Introduction

How people utilize the land and their socio-economic activity taking place are the principal causes of the changes occurring in land cover, and thus, affecting greatly environment at a global level. However, the land use and management decisions taken often fail to consider this influence on ecology.

Human activity reflected particularly in urban and agricultural land use alters the capacity of the Earth, through its impacts on the physical material and ecological systems. This in turn adversely influences the basic resources that humans need and together with the gradual population growth lead to significant changes in land use (Dale et al., 2001). Despite this significance, however, land use decisions often neglect these impacts. Land use and land management should seek to establish a balance between different and often-conflicting interests regarding the use of the land, such as resource extraction, agriculture, industry, urban development, and complex ecological systems (ESA Committee on Land Use, 2000).

As some species and resources need structural and functional integrity of landscapes, landscape conservation approaches should be present in decision-making processes. Moreover, the multi-faceted characteristics of environmental problems necessitate the incorporation of ecological, socio-cultural and economic approaches in planning and the cooperation of individuals from different disciplines. Ecological landscape plans present a significant opportunity for implementing landscape conservation approaches and for contributing to the sustainability of landscapes. Ecological landscape planning has five stages: division into landscapes, inventory of nature conservation value and socio-cultural factors, landscape analysis, landscape plan, regeneration of biotopes (SCA Skog, 2011). The following section presents an overview of landscape ecology and details its principles and their use in landscape planning. The third section discusses the integration of ecological planning approaches in landscape planning, the fourth section coastal zone planning.

2. Landscape ecology principles and landscape planning

What landscape planning signifies today used to be considered within the concept land use planning until three decades ago. Landscape planning, as a concept, emerged due to the growing awareness and concerns about problems and the developments that took place in the society (Marsh, 2005). Although similar at first sight with land use planning, as both of

them deal with the macro environment, landscape planning focuses on the resources and systems of landscape in the planning and management decisions.

Coined in the late 1930s and developed thanks to aerial photography, landscape ecology originally focused on the spatial patterns created by the environment and vegetation. Ecology studies the interactions of organisms with their environment, and a landscape is a mosaic with ecosystems and land uses. Landscape ecology focuses on heterogeneous land mosaics, where the distribution, movement and flow of living beings and materials could be easily observed and foreseen. The principles of landscape ecology, particularly taking the landscape as the unit of study, later gained prominence in landscape planning. Several authors, like McHarg (1969) and Steiner (1991), sought to bridge the gap between landscape ecology and planning and gave way to the development of ecological approaches of landscape planning. More recently, the concept 'ecological landscape planning' has gained prominence (Cook & Lier, 1994). Whereas it is commonplace in landscape planning to use administrative boundaries or watersheds (Cook & Lier, 1994), the methodology of ecological landscape planning is based on landscape ecology. In addition, landscape ecology is related to land evaluation. The focus of land evaluation has changed considerably since the 1960s, from classification and potentiality, to feasibility and lastly sustainable land use in the 1990s (Peng et al., 2006). As both concepts share a common emphasis on social, economic and ecological values, landscape ecology could be utilized in relation with sustainable land use evaluation (Peng et al., 2006; Turner, 1989).

Ecological approaches of landscape planning constitute guidelines that shed light on various steps of planning processes such as data collection and analysis, participation and eventual monitoring (Langevelde, 1994). Ecological principles are functional in maintaining the integrity of landscape by increasing connectivity and minimizing fragmentation and land degradation. Below, four landscape ecological principles are presented: patches, edges and boundaries, corridors and connectivity, and mosaics (Dramstad et al., 1996).

2.1 Patches

Patches can have both positive and negative impacts on landscape. While forest patches between agricultural areas may prove beneficial for the ecological health, a landfill next to a sensitive wetland may have an adverse effect (Dramstad et al., 1996). Below, patches are categorized according to size, number, and location (Table 1).

Patch Size	Patch Number	Patch Location
Edge habitat and species		
Interior habitat and species	Habitat loss	
Local extinction probability	Metapopulation	Extinction
Extinction	dynamics	Recolonization
Habitat diversity	Number of large patches	Patch selection for
Barrier to disturbance	Grouped patches as	conservation
Large patch benefits	habitat	
Small patch benefits		

Table 1. Categorized of patch

2.2 Edges and boundaries

An edge is the outer section of a patch displaying different characteristics than the interior conditions of a patch, in terms of vertical and horizontal structure, width, and species composition and abundance. These differences constitute the edge effect and the edge acting as a transition zone between habitats presents opportunities for landscape planners to facilitate the achievement of an ecological goal. While the shapes of patches can be natural, i.e. due to their boundaries, they can as well be artificial, i.e. administrative, and thus, differ to a varying extent from natural edges (Dramstad et al., 1996). (Table 2).

Edge	Boundaries	Shapes of patches
<ul style="list-style-type: none"> • Edge structural diversity • Edge width • Administrative and natural ecological boundary • Edge as filter • Edge abruptness 	<ul style="list-style-type: none"> • Natural and human edges • Straight and curvilinear boundaries • Hard and soft boundaries • Edge curvilinearity and width • Coves and lobes 	<ul style="list-style-type: none"> • Edge and interior species • Interaction with surroundings • Ecologically "optimum" patch shape • Shape and orientation

Table 2. Edge, boundaries, and shapes of patches

2.3 Corridors and connectivity

Habitat loss and isolation, results of spatial processes such as fragmentation, dissection, perforation, shrinkage and attrition, necessitate the establishment of connections within the landscape. In the face of these challenges, it is ever more fundamental to preserve the integrity of landscape corridors, such as wildlife corridors and river systems can as well be thought as barriers to wildlife movement, as in the example of roadways, railroad and canals (Dramstad et al., 1996). Pattern and scale can be used to assess the integrity of a landscape (Table 3).

Corridors	Barriers	Stream and River Corridors
<p>For species movement</p> <p>Controls on corridors functions Corridor gap effectiveness Structural versus floristic similarity</p> <p>Stepping Stones</p> <p>Stepping stone connectivity Distance between stepping stones Loss of a stepping stone Cluster of stepping stones</p>	<p>Road and windbreak barriers</p> <p>Roads and other "trough" corridors Wind erosion and its control</p>	<p>Stream corridor and dissolved substances Corridor width for main stream Corridor width for a river Connectivity of a stream corridor</p>

Table 3. Categorize of corridors and connectivity

2.4 Mosaics

As abovementioned, the connectivity of the corridors within a landscape is an indicator of its ecological condition. These corridors often form networks of connectivity, circuitry, and mesh size and are useful for planners to assist movements across a land mosaic (Dramstad et al., 1996) (Table 4).

Networks	Fragmentation and Pattern	Scale
<ul style="list-style-type: none"> • Network connectivity and circuitry • Loops and alternatives • Corridor density and mesh size • Intersection effect • Species in a small connected patch • Dispersal and small connected patch 	<ul style="list-style-type: none"> • Loss of total versus interior habitat • Fractal patches • Suburbanization, exotics, and protected areas 	<ul style="list-style-type: none"> • Grain size of mosaics • Animal perceptions of scale of fragmentation • Specialists and generalists • Mosaic patterns for multihabitat species

Table 4. Networks, fragmentation and pattern, and scale

3. Ecological landscape planning

The conservation movement emerged in as early as the 19th century, as a response to the negative effects of development on the land. Despite its long history, it was not until the 1960s when landscape planner Ian L. McHarg started to advocate for an 'integrated landscape planning' approach indicating the application of the concept in planning to establish a balance between human activity on land cover and the environment (Marsh, 2005). The influence of McHarg was significant in the adoption of an ecological perspective in land use planning, which started to take into consideration the carrying capacity of the environment.

Ecological planning developed in the mid-19th century as part of landscape planning, which seeks to safeguard the land and looks for the optimum development of ecologic-biological diversity, structural and visual diversity of the landscape (Ayaşlıgil, 1997, as cited in Tozar & Ayaşlıgil, 2008). It creates and preserves an optimum landscape pattern in terms of ecology, structure and visual aspects by protecting natural resources and seeks to balance and reduce the adverse effects of different land uses by different sectors to a minimum level (Tozar & Ayaşlıgil, 2008). In doing so, ecological landscape planning prioritizes the complex biophysical and sociocultural relationships taking place within a bioregion (Smart Communities Network, 2004). Moreover, another aspect of ecology-based planning is the emphasis it places on not only natural factors but also social and cultural processes that should be involved in the decisions taken about the land use (Cengiz, 2009; Dale & Haeuber, 2001; Markhzoumi & Pungetti 1999).

A planning methodology should consider the injuring activities in an area, their impact on ecology, and types of use affected by these activities (Bierhals et al., 1974, as cited in Altan, 1982). The Integrated Ecological Assessment (IEA) is a useful method in understanding factors related to ecosystems, factors related to human activity on land cover, and the synthesis of these factors (Bourgeron et al., 2001). Considering the scope of the IEA, its use

in an assessment study should follow three steps: integration of data (i.e. biophysical, biological, land use, and socio-economic data) (Fig. 1.), relationships between different analytical and planning activities, and depiction of spatial boundaries.

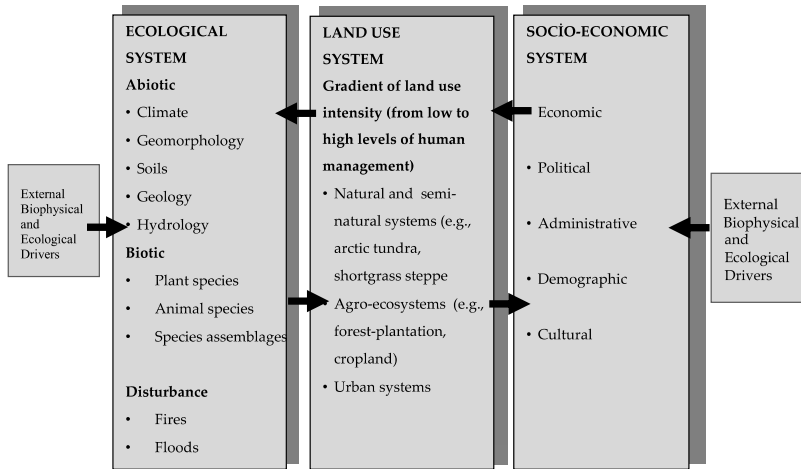


Fig. 1. A simple model of the relationships among regional biophysical, biological, land-use and socio-economic systems

Planning, particularly environmental planning, is a profession primarily related with the use of resources. Its prominence has increased within the last three decades due to the growing awareness about scarce natural resources and the ecological and cultural values at risk, in the face of wide-ranging problems, such as desertification, impacts of sectors such as industry and tourism, and filling wetlands (Marsh, 2005). Thus, key ecological principles are diversified, too, and they constitute a series of guidelines that demonstrate how these ecological principles are used in the decisions about land use and management (Dale et al., 2001) and consider various contexts in fulfilling multi-faceted goals (Table 5).

Examine the impacts of local decisions in a regional context,
Plan for long term change and unexpected events,
Preserve rare landscape elements, critical habitats, and associated species,
Avoid land uses that deplete natural resources over a broad area,
Retain large contiguous or connected areas that contain critical habitats,
Minimize the introduction and spread of nonnative species,
Avoid or compensate for effects of development on ecological processes,
Implement land use and land management practices that are compatible with the natural potential of the area.

Table 5. Checklist of factors to be considered in making a land-use decision.

Landscape planning is undergoing change due to new requirements. Its previous main task of controlling spatial uses and the development of nature and the landscape has extended. Implementation of the European requirements for the Natura 2000 network, for the Water Framework Directive (WFD), the Floods Directive as well as the Strategic Environmental Assessment (SEA) can be made considerably easier and can be coordinated with the help of landscape planning.

“As general, coordinating planning, within the scope of landscape planning, existing nature conservation concepts are merged and the nature conservation sub-objectives are coordinated with each other and possible alternative objectives and measures are named. The landscape planning plans are therefore also the suitable instrument for cross-sectionally oriented coordination of nature conservation and landscape management issues with other interests and claims “(Fig. 2) (Haaren et al., 2008).

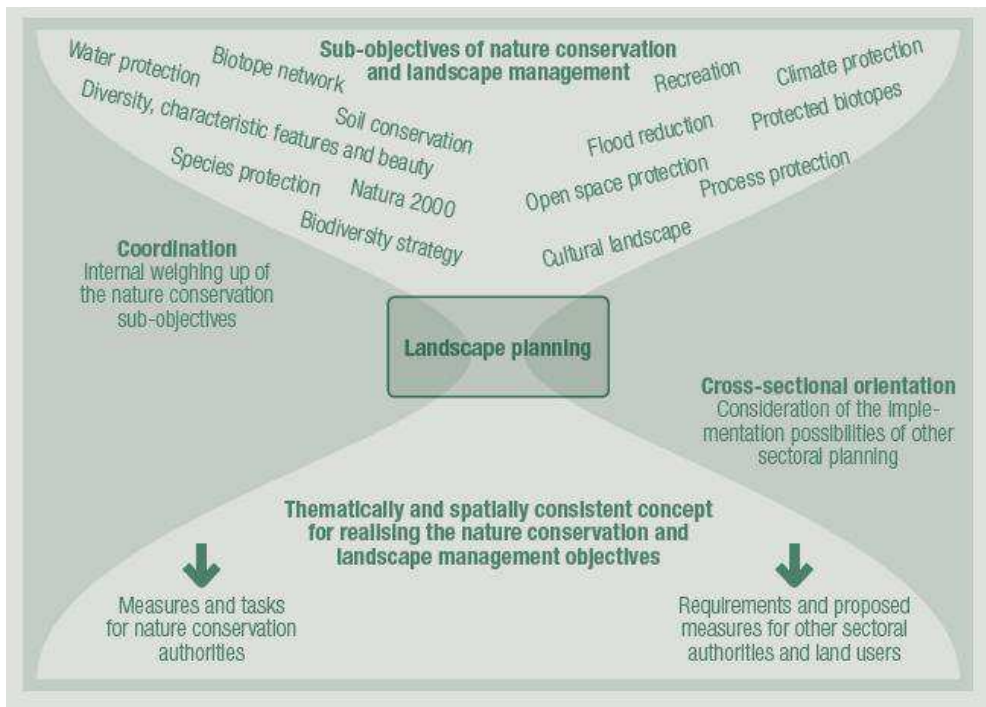


Fig. 2. Coordination and cross-sectional orientation in landscape planning in Germany (Haaren et al., 2008).

3.1 Ecological landscape planning methods

Ecological planning methods are examined under two main headings: Landscape Suitability Approach I (LSA I) and Landscape Suitability Approach II (LSA II). The five methods of the LSA-I that uses natural landscape characteristics in determining the suitability of a piece of land for a certain land use are as follows: the Gestalt method, the Natural Resources

Conservation Service capability system, the physiographic-unit method, the resource-pattern method, and the suitability method. Landscape suitability approach II brought about some refinements and new approaches in both theory and method. The suitability of the landscape is determined by the dialectical balance between the economic, social and biophysical factors. The methods of LSA II are landscape classification method, landscape-resource survey method, allocation-evaluation method, strategic suitability method, Australian approach to regional land use planning, Steiner method and Golany method (Tozar & Ayaşlıgil, 2008).

In the last three decades, the growing social consciousness about the negative effects of human activity on the nature and the increasing number of environmental laws worldwide necessitated the development of nature protection methods. Consequently, significant theoretical developments took place in LSA. The variations of LSA are among the most common methods used in ecologic planning. The LSA methods are applied in two basic stages (Tozar & Ayaşlıgil, 2008). In these stages,

- The area is divided into identical cells (similar features and same dimensions), and
- The suitability of each cell could be analysed according to different criteria and techniques for each type of land use.

3.2 GIS and remote sensing usage in planning

Lenz & Stary (1995) point out the need to use clear concepts in planning processes. The Geographic Information System (GIS) techniques are useful in this respect as they allow for multi-disciplinary approaches and complex data to be used in landscape planning in a comprehensible way (Cengiz, 2009; Cengiz et al., 2011; Ozyavuz & Yazgan, 2010; Tixerant et al., 2010). While generic classifications that lacked in depth and detail were used widely in forming landscape typologies (Antrop, 2000, as cited in Van Eetvelde & Antrop, 2007), recent practices make it possible to obtain detailed landscape typologies, such as zoning which demonstrates different uses in the selected areas (Clark, 1996) and the typologies based on GIS techniques like overlay and spatial analysis. A landscape classification depends on aspects such as the aim of classification, the way of defining the landscape through typology or chorology, the method chosen between holistic and parametric methods, the data quality and the hierarchical scales (Van Eetvelde & Antrop, 2007).

Use of GIS in landscape planning brings substantial advantages. Content and technical requirements and standards are necessary which enable reciprocal data exchange so that the data of other sectoral administrations can be used for landscape planning and so that the results of landscape planning can be incorporated in the information systems and planning of other technical disciplines. Consideration of the relevant existing standards (e.g. ISO standard 19115 for documentation using metadata) in GIS-assisted landscape planning makes it easier, or indeed makes it possible in the first place, to forward and make use of the data and information acquired within the scope of landscape planning in a relatively uncomplicated way. In addition, it would be important to increase the use of standard methods, classifications and structuring in order to merge information from different landscape planning, e.g. within the scope of an SEA or Environmental Impact Assessment (EIA). The use of GIS supports the integration of landscape planning content during the planning process is made easier (Haaren et al., 2008):

- The plan produced is no longer a comprehensive data packet which remains unchanged until it is updated. The use of GIS enables the plans to be updated as needed with little effort. Independent of this, the nature conservation concept must be evaluated at suitable intervals and changed if necessary.
- The data on which landscape planning is based can be directly evaluated for pending planning tasks and if necessary linked with other information. This makes it easier to use landscape planning for other planning, because the planning authorities can specifically retrieve the contents of landscape planning according to their requirements.

“Remote sensing – by satellites such as LANDSAT (USA) and SPOT (France) – is very helpful in planning process. The high spatial resolution of multiband radiometers on LANDSAT and SPOT, well proved for land survey, also works moderately well for shallow-water survey (where waters are clear and cloud cover is low). Remote data have their best use in coastal zone planning and management when coupled to digital mapping and GIS technology (Salm, et al, 2000).”

“Remote Sensing Platforms: Light reflectance-based remote sensing technologies can generally be grouped according to the resolution (pixel size) of the resulting data. This resolution is affected by both the altitude of the platform from which data are collected and the design of the instrument or camera. Low-resolution satellite platforms such as NASA's SeaWiFS (Sea Viewing Wide Field-of-View Sensor) and NOAA's AVHRR (Advanced Very High Resolution Radiometer) produce images where each pixel represents an area of 1 to 10 sq. km. Moderate-resolution satellite platforms such as LandSat, SPOT, and human-occupied spacecraft (e.g., the Space Shuttle or International Space Station) produce images where each pixel represents an area of 10 - 30 sq. meters. Instruments mounted on fixed wing aircraft and helicopter platforms produce images where each pixel represents an area of 1 - 5 sq. meters. Classified remote sensing platforms from the National Technical Means (NTM) Programme produce images where each pixel represents an area of less than 1 sq. meter (Salm, et al, 2000).”

4. Coastal zone planning

4.1 Coastal zone

Unlike lakesides and river sides, sea coasts enjoy a special status due to being a zone of transition between the land and sea, two great compositions in the world. This status has turned sea coasts into a resource that should be utilized in terms of certain uses and functions. These uses or functions include (Arslan, 1988):

- Providing industrial or urban settlement in ports through a connection between sea transport and land transport,
- Providing settlement areas to make use of marine products,
- Discharging urban and industrial waste in a cost-effective way,
- Providing as many ideal settlement areas as possible in order to benefit from the positive influences of the sea and beach on climate,
- Establishing favorable environments for agricultural uses,
- Providing favorable areas for tourism activities with their visual features and natural resources.

Ecological features and natural resources found in coastal zones, which penetrate from the coastline into the land to a certain degree, have an influence on human life and make it possible for them to benefit from coastal zones in different ways. Among the natural resources in coastal zones are (Arslan, 1988):

- Wetted areas and outfall bays,
- Alluvial pools, which resemble lagoons in shape, formed in coastal areas following tidal currents,
- Natural resources that must be protected for future scientific research, and educational, instructional and social activities,
- Arable areas and those areas that are suitable for forestry,
- Reserve areas,
- Mineral deposits,
- Beaches and dunes,
- Areas and waters that can be used for recreation,
- Visual features.

In addition to their natural structures and biological diversities, coasts are an ecosystem in which nature is connected to cultural texture and different types of flora/fauna communities with different characteristics are enabled to live, reproduce and grow. Establishing a strong link between land and sea resources, coastal ecosystems play a key role in regulating the life quality of living creatures. The circle in coastal ecosystems is closely intertwined with and depends heavily on the natural structure of coastal zones, their geological features, their micro-climatic impacts, their hydrologic features, their flora and fauna, their soil structure, human activities, cultural structures and the way human beings use water. Coastal zones are dynamic compositions that can be different depending on the quality and intensity of human activities on them. One of the most significant factors in landscape, population growth has rapidly caused human beings to diversify their demands on coastal resources, which, in turn, has led to an increase in use pressure on unit area.

Three fundamental living environments (water, air and land) today are irreversibly polluted and destroyed as a result of rapid structuring and industrialization, population growth, insufficient awareness of environment, uncontrolled human activities and poor land use planning decisions. Ecological balance is becoming more and more upset, which leads to environmental pressure on natural ecosystems about the continuance of biological environments and sustainability of resources. Their distinctive ecological properties and cultural values make coastal areas delicate landscapes (Lindgren, 2010; Scialabba, 1998; Cicin-Sain & Knetch, 1998). Besides, their high landscape value enables multi-faceted spatial solutions to be developed. An example of these solutions would be cultural use for touristic and recreational purposes (Marin et al., 2009; Scialabba, 1998). Coastal destruction is the most common form of natural deterioration. Fill areas that are formed in these regions cause destruction of the fauna through filling of the sea. Therefore, after the construction of fortifications, designs should be developed to be reestablish the balance between the sea and the flora, considering the natural species of that region (Cengiz et al., 2012). It is essential that ecological planning approaches based on the balance between protection and use should be developed in order to minimize environmental pressures on coastal zones and to sustain these delicate areas.

Accordingly, the guidelines to be considered in coastal planning should focus on (Clark, 1996):

- A high-quality protection of coastal zones,
- Defining high-quality zones to be protected,
- Defining and protecting delicate coastal habitats,
- Defining special areas and habitats that are suitable for development,
- Determining and controlling the level of pollution from point sources through surface flows,
- Determining the economic structure and environmental pressures that have an influence on the protection and development of coastal zones,
- Raising public awareness.

4.2 Boundaries and zoning in coastal zone

“One of the major problems in attempts to conserve coastal and marine ecosystems is determining their boundaries to use them in the protected area design. Protected area boundaries used to be dependent mainly on three variables, namely geological features, political districts or costs. If ecological boundaries cannot be identified in an appropriate manner, the result will be inappropriate boundaries and zoning of the protected area. There is no consensus on the ideal size and design of Marine Protected Area (MPA), some being in favor of “disaggregation” whereas others favoring “aggregation”. Although the method of disaggregation is suitable for terrestrial protected areas, they are not equally effective when it comes to underwater areas. The best approach to the latter group of areas seems to be “aggregation” coupled with an effective use zoning scheme (Salm et al., 2000).”

“The requirements of local residents, tourism development and the conservation values and needs within an MPA often conflict with each other. It is possible to make tourism in MPAs harmonious with conservation of most areas. Even so, the construction of tourist facilities around places bordering the MPA might lead to certain damage. MPAs are often designed so that they allow for controlled and sustainable uses within their boundaries. However, the MPA should have certain zones allocated for certain appropriate uses. The method of zoning is commonly used to make sure that the most sensitive and ecologically valuable areas are free of people and the impact of visitors is limited (Salm et al., 2000).”

“One activity might be more suitable for a habitat than others. Therefore, areas should be zoned in a way that i) damaging activities are kept out of sensitive habitats, ii) intensive use is permitted only in certain sites, and iii) conflicts are prevented through a separation of incompatible activities (Salm et al., 2000).”

Zoning methodology

Activities in management zones are designed in reference to the objectives of the reserve. The intensity of management changes from one zone to another.

“Defining the core zones, or sanctuaries. “Core zones” are defined as habitats with high conservation values vulnerable to disturbances. Such areas can be used by humans only at a

minimum level and managed for a high level of protection. In accordance with both conservation objectives and replenishing depleted stocks, areas should be allocated for a breeding population of the key species and their support systems. Core zones should be designed so that they will contain as many diverse habitats as possible (Salm et al., 2000)."

"Defining the use zones. Dedicated zones in a protected area are sites with special conservation value and can tolerate different types of uses by human beings. It is useful to map different neighboring habitats and to ensure that the protected area boundary has as many of these as possible. There should be harmony between the types and locations of required zones and the range of activities. Areas among and around these zones can be considered as general conservation zones (Salm et al., 2000)."

"Defining buffer zones. It is sometimes necessary to have a buffer zone which allows for a more liberal but still controlled range of uses. Such zones are set up in order to protect the area from encroachment and other activities that might have an impact on ecosystems. Buffer zones are a significant way of keeping external influences out of MPAs, for currents can carry nutrients, pollutants and sediments over great distances. The way an external buffer and the MPA is managed is different, the latter requiring cooperation of authorities outside of the MPA (Salm et al., 2000)."

4.3 Emergence of coastal zone planning in the U.S.A and Europe

Ecological planning in European countries today is supported by laws and regulations and integrated into the hierarchy of planning. In The Federal Republic of Germany between 1950 and 1970, for instance, attempts to rapid industrialization for developmental purposes led to irreversible damage to natural environment. In response to this, the Nature Conservation Act and relevant regulations were accepted in 1970s so that natural resources would be enabled to continue their ecological and biological functions. These laws and regulations included such precautions as (Kiemstedt, 1998):

- Ensuring functionality of current natural resources,
- Protecting natural resources and making them usable,
- Ensuring the continuance of landscapes formed by natural creatures.

Those who are responsible for making and implementing decisions with physical plans are governed by these laws and regulations. These plans consist of such stages as:

- Landscape framework plan,
- Landscape program,
- Land use plan.

The United Nations Conference on Environment and Development (1992) discussed, among other things, the protection and rational use of coastal zones and emphasized the importance of holistic coastal management. Similarly, it was emphasized, in the 787th meeting of the Organization for Economic Cooperation and Development in July 23, 1992, that strategic planning and holistic approach to coastal issues should be developed and a reasonable balance should be established between carrying capacity and tourism development in coastal zones (Anonymous, 1993).

In the U.S.A, where coastal areas were dominated by certain land uses such as business, industry, housing, tourism and recreation, coastal protection and planning attempts started in California in 1967. In 1972, the government accepted the Coastal Zone Management Act in order to protect, develop and utilize resources in coastal zones. According to popular opinion in the U.S.A, the state where the coastal zone project was first put into effect was California. The coastal zone of California is 1770 km in length, from the Mexican boundary to the southern-western boundary of Oregon. The propositions included in the project were (Arslan, 1988):

- **Coastal Waters:** With the aim of maintaining the quality of coastal waters, to launch a fund for refining all dangerous pollutants and effluent water before the discharge, to compensate for the damage caused by oil spills in a quick manner and to clean the waters as soon as possible,
- **Soil:** With the aim of protecting the flora in coastal zones, to conduct meticulous studies, to monitor sandpits and stone pits, to protect areas where salmons and whitefish lay their eggs, to open fertile plains and valleys only to agricultural activities,
- **Coastal View:** To ensure that such large facilities as industry centers and shopping malls are founded into the land and that urban development is in consistent with natural structure,
- **Development:** To ensure that new developments are concentrated on places where infrastructure is favorable, that rural area planning does not change natural character, that no power plant is included unless they are really necessary and that special precautions are taken for protecting coastal features in all respects,
- **Energy:** To ensure that a policy of energy conservation is adopted in coastal zones and that there are incentives to undertake projects on obtaining energy from the sun, wind, geothermal resources and methane gases,
- **Transportation:** To use air and sea transportation services at full capacity,
- **Coastal Accessibility:** To ensure that the public can access to the coast,
- **Recreation:** To identify the zones that are used for recreational purposes (intensive, medium, low), to determine the carrying capacity of the zone and to compose management plans,
- **Educational and Scientific Use:** To ensure that special precautions are taken in order to protect areas of historical, archeological, educational or scientific value,
- **Restoration of Coastal Resources:** To develop landscape restoration techniques in order to protect and rehabilitate the coasts whose ecological features have been disrupted,
- **Expenditures:** To launch a fund for long-term expenditures of the project.

Cancún (Mexico) is a good example of threats brought about by coastal tourism and precautions taken. Cancún is located on the Yucatan peninsula, eastern Mexico, and a worldwide famous holiday spot. In 1970, the city was defined as a significant tourist attraction because of its climatic conditions, a 19 km-length white beach, population of coconut palms, clean water, rich water products, a 50 km²-length well-protected lagoon system, being the second largest coral reef barrier of the world that starts 30 m off the coast, having rich underground water resources and being an important archeological area. The distinguishing natural feature of Cancún is the Nichupte Lagoon System (Clark, 1996).

The basic problem here was the increase in the number of holiday resorts established in the city, which had been developing as a holiday spot. The increases in the areas of employment, the number of annual tourists and the number of accommodations were regarded as an accomplishment; however, environmental quality was neglected. Among the indicators of the change in environmental quality were (Clark, 1996):

- Disruptions in the Nichupte Lagoon System,
- Impacts on underground water resources,
- Openings in the flora along the highways,
- Decreases in the number of beaches and dunes,
- Problems associated with accessing or using beaches and dunes, and
- Visual pollution. The economy was based on tourism, which led to increases in the amount of pressure.

Planning and rehabilitation activities for the City of Cancún were focused on:

- Urban development based on protecting the nature,
- Protecting the environment, ways of using natural resources,
- Revision of nature-human relationship,
- Aesthetic and functional regulations in the area of tourism. The scope of the planning was mainly defined as the harmony between the natural environment and urban components and the integration of homogenous, dynamic and proper complexes. The areas of tourism were reorganized through precautions that imposed a limit on the use of natural resources with a consideration into aesthetics and functionality.

5. Conclusion

“A major problem in land use and management is achieving a reconciliation among such conflicting goals as resource-extractive activities, infrastructure of human settlement, recreational activities, services provided by ecological systems, support of aesthetic, cultural and religious values and maintaining the compositional and structural complexity of ecological systems. The more different goals stakeholders have, the more difficult land use decisions can be. The process of planning and decision-making should consider the ecological, socio-cultural and economic values of the landscape so as to achieve a new spirit of reconciliation between landscape conversation and changing demands (Dale et al., 2001).”

“It seems that the problems in ecological planning are brought about by disagreements between land use and environment. These disagreements are usually of five origins: i) initially poor land use decisions ii) environmental change iii) social change as well as technological change iv) violations of human values about the mistreatment of the environment v) geographic or spatial scale (Marsh, 2005).”

The leading reasons for disruptions in the natural structure of the land in coastal zones are irrational settlement processes, irregular and unplanned recreational and touristic facilities, industrial uses, agricultural activities, fill areas and highways that are too near to coasts. The increase in the number of ecosystems ruined by planning decisions in planning attempts of several scales without a consideration into natural resources makes ecological planning obligatory. Ecological planning approaches are defined as reflections of practices on environmental values within the framework of principles of sensitive area use in the

relationship between human beings and the nature (Langevelde, 1994). Ecology-based planning should take natural and social processes into account (Markhozoumi & Pungetti, 1999). Instead of short-term gains, coastal zones should be used sustainably and consciously with a balance between protection and use and they should be maintained as natural heritages. They have the potential to make contributions to the economy of a country or region for long years. Therefore, it is evident that the main objective in future practices in coastal zones should be using them in a planned way and handing them down to future generations without disruptions in their current ecological values.

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Landscape architecture is the design of outdoor and public spaces to achieve environmental, socio-behavioral, and/or aesthetic outcomes. It involves the systematic investigation of existing social, ecological, and geological conditions and processes in the landscape, and the design of interventions that will produce the desired outcome. The scope of the profession includes: urban design; site planning; town or urban planning; environmental restoration; parks and recreation planning; visual resource management; green infrastructure planning and provision; and private estate and residence landscape master planning and design - all at varying scales of design, planning and management. This book contains chapters on recent developments in studies of landscape architecture. For this reason I believe the book would be useful to the relevant professional disciplines.

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