

Land Use Planning for Sustainable Development of Coastal Regions

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Abstract: The current paper will focus on the coastal zone of Georgioupoli and its vulnerability as a result of the lack of spatial planning. The case study is selected because it concentrates the characteristics of a typical coastal touristic zone, which faces rapid intense unplanned touristic expansion. The examined zone has been diachronically influenced by the liberalization of construction regulations, an unqualified private sector emerged, hastily developing construction mostly without government oversight and without building permits. We present a concept for planning sustainable development in coastal regions.

1 INTRODUCTION

Today's coastal regions face intense problems caused by the rapid urbanization, coastal erosion, sea level rise, global warming and climate change. These factors have a huge impact on coastal communities. Especially in Greece with a coastline length of 17400km and with many cities and residential areas at the coastal regions the above factors play an important role. The biggest island of Greece is Crete which is predominantly based on services on tourism and agriculture. Since 1970 Crete became a popular tourist attraction, it has more than 2.000.000 tourists every year and this number is increasing.

The massive influxes of tourists have pressed the coastal regions with nice beach to create big tourist developments. Hotels, marinas, roads, restaurants, facilities for recreation and sport activities are some of them. These results in great pressure mainly on resources and on the marine ecosystems. Natural habitats like of the seagrass meadow have been removed to create open beach, other tourist developments have been built directly next and on the beaches. Careless constructions and resorts have destroyed the beauty of the environment.

Tourism is a crucial aspect of the Greek economy given the pleasant climate and sea conditions which contribute to Greece's overall popularity as a tourist destination. In the Greek coastal zone, there are major conflicts between the demand for tourism on the one hand, and coastal

preservation on the other. The Greek coastal zones face problems with delineation and definition of public land cause significant uncertainties among land owners regarding where the public domain ends. For the protection of the coastal areas it is important for Greece to conduct an evaluation of planning and legislative tools in relation to these zones.

One of the most significant problems is the coastal erosion. It takes place through strong winds and high waves and storm conditions and results in loss of land and beach. One can observe at the satellite images Fig. 1 and Fig. 2 the coastal erosion at one coastal area in Crete, name Georgioupoli. The first image is taken in 2003 and the second one in 2016. The sandy coast almost disappeared in the second one. As one can see there are more buildings in the second image and a road is constructed between the residential part of the region and the coast. Using GIS technologies it is found that the length of the beach is 400m and the average width 40m which makes 16.000sqm loss of sandy beach. It is estimated a loss of economic value 10€ per sqm per day in Greek beaches that means 160.000€ per day for such a small village like Georgioupoli in Crete (Synolakis, 2013).

Human intervention is a major cause for coastal erosion (Hsu *et al.*, 2007). The construction of different types of hard structures including seawalls, breakwaters and roads are a major factor for coastal erosion and beach loss. A main method for protecting the coastline is beach nourishment which

is a soft engineering solution (Phillips and Jones 2006).



Figure 1: The coast of the satellite image in 2003.



Figure 2: The coast of the satellite image in 2016.

In our approach we discuss the land use planning and control laws for a sustainable development of coastal regions for tourists. The current paper will focus on the coastal zone of Georgioupoli and its vulnerability as a result of the lack of spatial planning. The case study is selected because it concentrates the characteristics of a typical coastal touristic zone, which faces rapid intense unplanned touristic expansion. The examined zone has been diachronically influenced by the liberalization of construction regulations, an unqualified private sector emerged, hastily developing construction

mostly without government oversight and without building permits.

There are some main laws for constructions at Greek beaches: a) The leasing of seashores and beaches is allowed for works related to trade, industry, land and sea transportation, or “other purposes serving the public good”, b) beach zone 50 m wide, c) Access roads to the beach of minimum width 10 m., means: expropriations of land properties, d) fences are prohibited in a zone of 500 m from the beach in areas not covered by urban plan. Exceptions: when agricultural fields have to be protected, and e) “Light”, non permanent constructions are allowed in the seashore zone, meant to serve public recreation (tents, open bars etc.) (Lalenis, 2014).

However there is a need for more detailed and strict regulations for building a construction. The current paper will propose ways for the problems of coastal erosion and beach loss. It will propose a concept for deepening the existing urban plan with the use of light structures and creating detailed constrains for the coastal areas.

2 LEGAL ASPECTS AND THEIR EFFECTS ON THE AREA

The Greek legislation for coastal areas began in 1837 when an early law dealing with the Greek public domain defined the “seashore” area as public property. Decades later, in 1940, the country’s first Coastal Law tried to protect the public domain status of the coastal zone. This law added definitions for “old seashore” and “beach” as additional elements of the Greek coastal zone and applied a setback zone of 30 meters from the seashore in which construction was prohibited outside of existing older settlements. A main characteristic of this was that there is no reference to the protection of coastal areas from an environmental perspective. In 1998, that the Greek Council of State has supported arguments that the coast is a vulnerable ecosystem and should be protected from intensive forms of development. The 1999 assessment report of the European Environment Agency indicated a continuing degradation of conditions in the coastal zones of Europe as regards both the coasts themselves and the quality of coastal water. In 2001, Greece’s enacted a new Coastal Law which prioritized the protection of the coastal zone as a public good, an environmental asset and an economic good.

This law defined the beach as a zone adjacent to the seashore, with a width of “up to 50metres”. This zone is a buffer zone between land and sea and, like the seashore, is included within the Greek public domain. It is usually defined in spatial plans of coastal settlements and rural areas as “open space”, but may be used for roads, pedestrian and bicycle routes. But there is no requirement that the beach is defined and in many cases, it is not.

This law restricts development on the coastal zone and beyond but it also provides many exceptions to these restrictions in order to encourage the tourism potential of the coast. Today the primary issue is extensive illegal development in restricted areas and a lack of political will to take action against such development. The most recent law (4178/2013) nullifies any previous laws which allowed for legalization, though still provides exceptions for types of development which may be legalized. As was the case in 1983, illegal development on public land, the beach, or seashore may not be legalized and must be demolished. In 2014, Greece adopted a new procedure for delineation of the coast based on the interpretation of aerial photographs. Today coastal zones are further threatened by the effects of climate change, in particular rising sea levels, changes in storm frequency and strength, and increased coastal erosion and flooding.

Only light construction associated with seasonal tourist and recreation facilities (open playgrounds, kiosks, mobile beach bars and refreshment areas) may be erected on the seashore and beach. The process for their establishment includes an application from business operators to the relevant Municipality. The municipalities set the cost and the revenue generated through the process is an important component of their budgets. Still many business owners violate these regulations. Access to the sea is obstructed in many areas often by approved private uses such as hotels and businesses.

The lack of controlling mechanisms combined with loose policies has today made Planning of the examined area ineffective. Although restrictions for uses and buildings permits exist these are rarely followed. The accessibility to the beach is mainly served by cars that causes traffic congestion during the summer period. The tourism infrastructures are closer than the allowed distance to the beach and the materials used for the creation of roads have degraded the environment. All the above have led to an area with a limited coast, with a limited access that is mainly covered by seasonal facilities accessible mainly to the clients of the area hotels.

3 REDISIGNING THE AREA WITH SUSTAINABLE PRINCIPLES

The design proposal of the present study for the coastal zone of Georgiupoli aims at re-designing the zoning of the beach, based on the legal framework described above, in order to protect it from anthropogenic and other impacts. We propose the following concept:

1. Human intervention must be prohibited at any case. There must be control using aerial or satellite images to keep up with all the changes.
2. Offshore beach nourishment can restore the beaches and protect them from erosion. There are different methods for beach nourishment (Dean, 2003) but for not so long beaches less than 1km length sand can be located without creating any problems.
3. Planted trees and natural vegetation will not only provide a beautiful image of the scene but provide a physical barrier against wind and coastal erosion.
4. It is essential to remove the cars from the coastal zone that means to avoid roads, even if they are not intensively used. Free public access towards the coastal zone is important by planning what encourages the best possible access to the beach.
5. Decongestion of the beach zone from traffic in particular form public transport, as well as encouraging and rewarding the use of alternative modes of transportation, such as bicycling and walking, is considered crucial. Thereupon, the preservation of an one-way, 3.5 meter wide traffic axis is recommended for bicycles, aiming to encourage safer, more responsible driving, and potentially reduce traffic flow (traffic calming).
6. Seawall constructions should not be allowed. It is already discussed that seawalls increase erosion and destroy the beach (Basco 1999)
7. The construction of the roads to the beach must be made by other material then asphalt. The removal of asphalt road and its replacement by sidewalks by paved floor allows the development of a variety of other uses such as the bicycle, pedestrians, playgrounds and staging areas. Therefore a well-designed coastal zone with public uses can attract not only tourism but also the area's residents.
8. Beach access with “vertical” or perpendicular lines. Public authorities have the right to

develop public access to the beach and we recommend a road infrastructure to the beach that along the beach. Moreover, access to the beach is intended to be made easier and more pleasant, so that more visitors are attracted and at the same time balance between ecological integrity with beach access is achieved.

9. Aesthetic parameters provide an added value to the coastal regions especially when they are used for swimming and touristic purposes. There must be some criteria for the color used for the buildings and other constructions, for construction's material or roof types.
10. An important principle in our concept of sustainable development of the coastal regions is the idea try to 'build with nature material'. Standards for the restoration of older structures could serve as a supplementary means of improving the appearance of existing structures.

Laws, policies and regulations should focus on coastal management issues, with a view to improve the integration of a full range of problems. It is important for regional and urban planning to add specific reference for the protection the coastline to their respective constitutions. Such strategies provide integrated policies for coastal zone management, which can complement the relevant existing legislation.

It is also important to limit the use of the coastal uses that are inherently linked to the sea and to limit uses that provide economic or social benefit. Policies should focus on procedures that include time limits for temporary structures and rules for renewal. Rules should be also geared towards reducing expectations of temporary structures becoming permanent.

3.1 Case Study

To demonstrate the realization of our concept we use the coastal region at the village of Georgiupoli at North Part of Crete.

First of all the possible solution of the erosion problem would be beach nourishment. This is a soft engineering solution to protect both the beach and tourism infrastructure (Fig. 3).

Then we propose the existing road will be replaced of natural stone, such as sandstone slabs, a material that does not pollute the environment, and additionally has the required strength. We abolish one lane and the final width of the road will be 3.5 meters. On the side of the street to the sea a bicycle lane is designed, with a total width of 1.2 meters, while on the opposite site, in front of the facades of

the existing buildings, an oblate pavement, with a total width of 2 meters is constructed. The pavement will be at the same level with the street and will be separated using short stanchions (Fig. 4). Today in the existing situation, a two-way, 7 meter wide (on average) street existed parallel to the beach.



Figure 3: The coast with the beach nourishment and the green area at the end of the beach.

Continually a wooden deck will be designed next to the road 1 meter above the level of the sand which is a light construction protecting the sand from other material from the road. It can be enhanced with vegetation such as trees both to protect the coast and for shading (Fig. 5). Moreover, for practical and aesthetic reasons benches will be placed as stopping areas, as well as ramps for smooth ascent and descent to, and from the road and to the beach.

At the end of the construction, a green area will be designed, together with the construction of an outdoor gym and a playground (Fig. 3). In this case more buildings are not suggested. The green area is a natural continuation of the trees along the pavement and the combination of blue and green creates a peaceful and satisfied atmosphere.

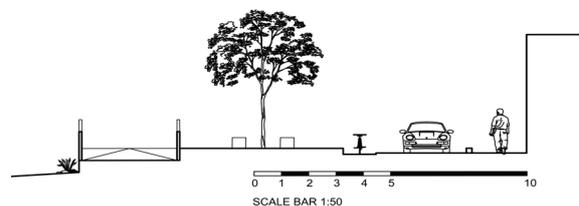


Figure 4: Section part of the coast with vegetation and roads.



Figure 5: The new lanes according to the proposal.

4 CONCLUSIONS

Greece should undertake a comprehensive assessment of not only current, but also projected, urban areas to determine the desired urban form and its interactions with the coastal zone. Such an assessment will allow for development of specific policies which match the desired outcomes.

It is essential for planning to encourage coastal regions development according to the principles of sustainable development.

A small scale design such as the one described above can be proved beneficial both for the human and for the environment. The re-design proposal focused not only on sustainable but also in touristic development. Equally important to the above is the use of natural materials that do not harm the environment, as in this case the replacement of asphalt with natural stone and wood. Especially when the delineation process of the coast is not necessary the design of light structures with the use of materials which do not harm the environment and the creation of natural vegetation filters is required.

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