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INCENTIVES FOR THE CONSERVATION OF THE NESTING GROUNDS OF THE SEA TURTLE CARETTA CARETTA IN LAGANAS BAY, ZAKYNTHOS, GREECE

by Stavroula Spyropoulou and Dimitrios Dimopoulos

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FOREWORD

This paper is one of a series of 22 case studies that describe practical experiences in OECD Member countries with the use of incentive measures for the conservation of biodiversity and the sustainable use of its components. These case studies were submitted by OECD Member countries to the OECD Working Group on Economic Aspects of Biodiversity as a contribution to the OECD study of the design and implementation of appropriate incentive measures for biodiversity conservation and sustainable use. In order to ensure maximum comparability between the case studies, all were developed under the common methodology described in "Incentive Measures to Promote the Conservation and the Sustainable Use of Biodiversity: Framework for Case Studies" [OECD/GD(97)125].

The practical experiences described in the 22 case studies were used as the basis for the policy advice developed in the *Handbook of Incentive Measures for Biodiversity: Design and Implementation* (OECD, 1999). This *Handbook* combines the lessons learned through the various experiences described in the case studies – covering a wide range of ecosystems, economic pressures on biodiversity, and utilising various incentive measures – with sound economic theory to develop a practical, step-by-step guide for policy-makers on the design and implementation of successful incentive measures for the conservation and sustainable use of biodiversity.

This paper was written by Stavroula Spyropoulou and Dimitrios Dimopoulos (Sea Turtle Protection Society of Greece). It is released as an unclassified document under the responsibility of the Secretary-General of the OECD with the aim of bringing information on this subject to the attention of a wider audience.

This study, and the other 21 case studies submitted by Member countries, are available on the world wide web at http://www.oecd.org/env.

ACKNOWLEDGMENTS

The elaboration of the present report proved much more difficult than anticipated. The guidelines provided in the 1997 OECD document "Incentive Measures to Promote the Conservation and Sustainable Use of Biodiversity: Framework for Case Studies" (OCDE/GD(97)125) forced the authors to repeatedly look for the essence of issues, but it is uncertain to what degree this effort was successful.

This case study presents an evaluation of 15 years of continuous efforts aimed at reconciling tourism development with coastal biodiversity conservation in Laganas Bay, Zakynthos Island. Many of the social and economic issues discussed in the report ought to be supported by relevant research conclusions, but these are lacking at the moment. The fact that the Laganas case has been in the process of being discussed in the Standing Committee of the Bern Convention (for the Conservation of European Fauna, Flora and Habitats) for at least the last 10 years should give an indication of the importance of the site, and of the efforts invested in overcoming the existing constraints.

Sincere thanks are due to Dimitris Margaritoulis of the Sea Turtle Protection Society of Greece for scientific contributions and valuable comments on the text; also to Eleni Tryfon and Sofia Markopoulo, of the Nature Management Section of the Hellenic Ministry of Environment, Physical Planning and Public Works, for their support. Thanks are also due to the Administration of the Prefecture of Zakynthos for the provision of information.

This report would not have existed if quite a number of people in the Public Administration of Greece had not engaged themselves in an effort to safeguard the coastal biodiversity in Laganas Bay and a great number of volunteers had not insisted on this aim since 1979.

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by

Stavroula Spyropoulou and Dimitrios Dimopoulos [1]

EXECUTIVE SUMMARY

This case study describes the range of incentive measures developed between 1980 and 1997 for the conservation of the nesting grounds of the endangered sea turtle *Caretta caretta* in Laganas Bay, Zakynthos, Greece. The incentives used included regulations and access restrictions (the creation of a Nature Reserve and a planned National Marine Park, as well as restrictions on beach activities, building, fishing, marine traffic and airport operations), the grant-aided purchase of some of the land by the World Wildlife Fund with EU support, information and awareness campaigns (including the employment of local wardens for safe-guarding the turtle nests and providing information), and the provision of physical infrastructure (cages) for the protection of the nests. In addition, adverse incentives were identified such as a provision in the 1982 Development Law which encourages the almost unconditional development of new hotels; the lack of verification and enforcement for the payment of the tax on tourism; and property rights uncertainties and disputes that arose as a result of the loss of all ownership records in the 1953 earthquake.

Ecosystem studied: coastal zones

Incentive measures used: regulations, access restrictions, definition of property rights, removal of adverse incentives, positive subsidies, information provision, capacity building, stakeholder involvement, planned visitor fees

Main lessons learned: Land use regulations and restrictions have been fairly effective in safeguarding the most sensitive lands, but they are insufficient alone and should be combined with other economic and informational incentives; incentive measures need to be compatible with each other; stakeholder involvement is essential for raising local awareness about biodiversity issues and working towards sustainable use of resources.

[1] Stavroula Spyropoulou is Biologist Oceanographer M.Sc. at the Environmental Planning Division of the Hellenic Ministry of Environment, Physical Planning and Public Works, and Dimitrios Dimopoulos is Biologist at the Sea Turtle Protection Society (STPS), a Greek NGO. The views of the authors do not necessarily reflect the official views of these organisations.

1. GENERAL DESCRIPTION

This report described the incentive measures developed between 1980-1997 (see Table 1) with the aim of conserving the coastal biodiversity of Laganas Bay of Zakynthos island, especially in relation to the nesting habitats of the endangered species of the loggerhead sea turtle *Caretta caretta*, that is of Mediterranean importance (Groombridge, 1987). As a result of the implementation of these measures, *Caretta caretta* has become a flag-species for coastal biodiversity conservation in Greece.

The coastal site of Laganas Bay lies at the southern part of Zakynthos island in the Ionian Sea off Western Greece. The broader terrestrial area of the site occupies approximately 10 000 hectares – one fourth of Zakynthos – a significant part of which, located in the west and in the east, is mountainous with intensive relief. The important natural habitats comprise app. 419.21 ha of land on Zakynthos and the two islets of Marathonissi and Pelouzo, and a marine area of 8 918.47 ha adjacent to them.

In addition to sea turtle nesting, the site is important as a terrestrial habitat of endemic plants and migrating birds, as well as a marine habitat of the monk seal *Monachus monachus* threatened with extinction, and the Mediterranean endemic sea grasses *Posidonia Oceanica*.

There are 6 sandy beaches where within the site where sea turtle nesting occurs: East Laganas beach (2.4 km long), Kalamaki beach (400 m), Sekania beach (650m), Dafni beach (800 m), Gerakas beach (590 m), and Marathonissi islet beach (370 m). In the coastal strip of Laganas Bay and on Marathonissi and Pelouzo islets, one can find Mediterranean sand dunes, rocky cliff vegetation, and a small wetland of Keri, all of which host endemic plants. The islet of Marathonissi, as well as other parts of the coast, provide some fine samples of Mediterranean hard-leafed forest vegetation (maquis); the site in combination with the Strofades islets which are located further south, is an important station on the migration route of the turtle dove, *Streptopelia turtur*.

The site has mainly been exposed to pressures from tourism. Tourism development rapidly expanded in new destinations throughout coastal Greece and the islands during the 1970s and 1980s. The natural beauty of the coast in Laganas Bay – and especially of the extensive beaches and dunes of Laganas-Kalamaki, the dunes on Marathonissi and the spectacular Gerakas peninsula – drew attention to the interesting fact that sea turtles were established on these beaches (Margaritoulis, 1977) and this inevitably led to considerations of the possible impacts that tourism development might have on the nesting sea turtles.

Tourism development presents several threats to this particular coastal ecosystem: direct habitat loss caused by disturbance from increasing numbers of visitors and the related amenities provided on the beach and at sea, constructions near the beach front or on slopes behind the beaches, artificial lights and noise around the beach during the night. All of these have had negative impacts on the sea turtle nesting. Other biodiversity threats include the destruction and loss of the sand dune ecosystem and the endemic plants present, seasonal incidents of marine pollution from untreated wastes, land use conversion from agricultural land to human settlement, and loss of the aesthetic landscape value.

Table 1. Classification of incentives for the conservation of the nesting grounds of the sea turtle Caretta caretta in Laganas Bay, Zakynthos, Greece

MEASURES IMPOSING RESTRICTIONS ON PUBLIC INTEREST

Measure 1 : *Building and land use restrictions*

Measure 3 : Establishment of a Nature Reserve

Measure 4: Fishing and marine traffic regulations

Measure 5 : Airport operation regulations

TOURISM DEVELOPMENT INCENTIVES

Measure 2 : Establishment of a Zone of Urban Control

SMALL SCALE POSITIVE INCENTIVES

Measure 6 : Grant- aided land purchase

Measure 7 : Species enhancement schemes

Measure 8 : Local employment schemes

REMOVAL OF PERVERSE INCENTIVES

Measure 9 : Establishment of a National Marine Park

Positive incentives:

- land acquisition by the Park through use of *inter alia* the building coefficient transfer,
- cost-sharing management agreements,
- benefit sharing by introduction of special fees on airfares,

and/or

Mitigation of problems arising from incentives already in place:

- establishment of the Park Management Institution,
- active conservation and sustainable tourism policies,
- infrastructure works aimed at upgrading the tourist services offered in the area.

The main incentive in use at the site has been land use regulations (1984-1987), which have set building restrictions in the ecologically sensitive area (1984) and building advantages in parts of the broader area (1987). These were complemented at a later stage with fishing and marine traffic restrictions, airport operation restrictions, the creation of a Nature Reserve, and visitor access and beach activity restrictions (1987-1992).

Information and awareness campaigns, grant-aided land purchase, sea turtle enhancement techniques, and local employment schemes have been used as means to mitigate the economic effects of the main restrictions imposed and support the enforcement of the regulatory measures taken.

As a result of these incentive measures, most of the important natural coastal features have been preserved and the nesting population of *Caretta caretta* has not shown a decreasing trend. The conservation costs and the related benefits, however, have not been equally shared by land owners as tourism has developed in parts of Laganas Bay without compensating most land owners whose land falls within the Nature Reserve.

In order to mitigate this imbalance and further organise the management of the area, new incentives are planned (1997). These include the establishment of a National Marine Park, with the consequent establishment of its Management Institution, the introduction of property and building rights exchange and transfer mechanisms, local management agreements in the context of the Park management, and environmental fee for visitors. These new incentives constitute active conservation and sustainable tourism policies and are combined with infrastructure works aimed at upgrading the tourist services offered in the area.

2. IDENTIFICATION OF CAUSES AND SOURCES OF PRESSURES

2.1 Identification of sectoral activities and resulting pressures

The development of tourism

Zakynthos island occupies an area of 40 500 ha, 44 per cent of which is lowlands and 56 per cent is mountainous zone. Despite the development of tourism, the agricultural land (41 per cent of the island) has not suffered a significant decrease during the last 20 years. The forests (17.2 per cent of the island) have suffered major fire incidents over the same period, but it seems they are recovering through natural regeneration

The total area occupied by settlements, roads and infrastructure comprises about 5 per cent of the island. Settlements have been extended only in the coastal and lowland parts of the island during the last 20 years. The main areas developed for tourism are those in proximity to the most attractive beaches in the southern and eastern part of the island.

With regard to tourist accommodations, there are 9 000 hotel beds (1994) on the island and there was a 40 per cent increase in the number of hotel beds between 1990 and 1994. In addition, there are a further 12 000 beds (1994) available in ‘Rooms to let' complexes on the island according to official registrations.

In terms of tourism demand, the data of the Civil Aviation authority of Zakynthos show that there were 231 739 arrivals to Zakynthos by Charter flights in 1994, a number indicating a tenfold increase compared to 1983.

The wider terrestrial area of Laganas Bay has 5 000 inhabitants (1991), organised in 5 Communities. This area includes 45 per cent of the tourist accommodations of Zakynthos and had a 42.3 per cent increase in the number of overnight visitors between 1990 and 1994**.**

Pressures

The most important tourism pressures that are affecting the sea turtles and their habitats, and which have been identified at the site, are given below.

- Building permit requests on the narrow coastal strip, on sand dunes and slopes adjacent to the beaches, and on land outside the legally defined boundaries of the settlements in the area (identified in 1980).

- Pressures for extension of the legal limits of settlements due to the favourable building regulations in these areas (identified in 1984).

- Noise and artificial lights on the beach at night, sand compaction, beach occupation by sun beds and umbrellas, sand dune destruction and building at the sea front within the limits of the coastal settlement of Laganas; noise and artificial lights at night from the settlement of Kalamaki; and noise and lights from the operation of the airport of the island, which is situated behind the settlement of Kalamaki (identified in 1986-1990).

- Sand compacting by vehicles driving on the long beach of Laganas-Kalamaki; occupation of the beach by sun beds and umbrellas, refreshment kiosks on the beaches, planting of tamarisk trees for shade, construction of sea walls against erosion, garbage left by tourists on the beaches, visitors attempting to watch nesting turtles, and new roads leading to all beaches (identified in 1984-86).

- Beach litter is dumped behind the sand dunes of Laganas and Kalamaki at the beginning of each tourist season and the same dunes are also used as a dirt-bike racing area (identified in 1987-90).

- Marine ecosystem degradation due to sport fishing (fish stock depletion) and untreated sewage disposal of Kalamaki and Laganas settlements, together with marine sports development with speedboats and sea-bikes (identified in 1988).

There has also been a source of pressure from outside the tourism industry, in the form of requests for the establishment of aquaculture units within Laganas Bay.

2.2 Identification of underlying causes of biodiversity loss

Missing markets for ecotourism

In the 1980s, the local development needs in the area of Laganas Bay had no alternative except through tourism, due to the extremely favourable tourism incentives at that time for the whole of the country (see Section 2.3). All coastal plots in the area, regardless of their size, were considered as potential tourism development sites and their price in the market increased each year. In light of this, at quite an early stage, the Planning and Environmental authorities tried to identify ways in which environmental considerations, including the conservation of the sea turtle breeding habitat, could be part of a sustainable plan for tourism in the area (see Section 4).

At that time (1984) special ecotourism markets were being developed in Europe and elsewhere in the world. With some publicity given to Zakynthos and its sea turtles on a European scale in 1986-87, it was expected that a special type of high quality, ecologically oriented tourism could be developed in Laganas Bay. Unfortunately, this effort was not endorsed by most investors on the island, who did not

have access to these new markets and were satisfied with the demand and the quality of tourism they already had.

Furthermore, the assistance and the guaranteed clientele that these new markets could provide to the small scale hotel owner was limited compared to that of the big tourism industry. Consequently, the local rooms-to-let and hotel owners were collaborating with the big European Tour Operators, who, even though they held a positive view towards conservation, did not require high environmental and infrastructure standards. As a result, most of the areas that were given an advantage for tourism development by the building regulations developed facilities for mass tourism and found quick economic returns, but could not satisfy both types of markets at the same time.

Finally, there was also a matter of personal pride of several local hotel owners , who denied collaboration with the "ecologists" and the ecotourism market of Germany and the United Kingdom, as a reaction to the regulatory measures taken by the State.

Lack of awareness

Another underlying cause of the environmental damage was the lack of awareness (locally and nation-wide) about several issues. First, there was a lack of awareness about nature conservation issues and especially threatened species. Second, there was a lack of awareness of the environmental standards that high quality tourism destinations need to maintain, along with the preservation of traditional aesthetic values and forms. Third, there was a lack of awareness on the potential contribution conservation could make to sustainable tourism.

The need for a short term investment was expressed by local landowners and the local administration, who were not aware of the life-cycle of tourism and the future needs of their clients and usually lacked any formal training in the tourism business. This fact was recognised much later by the local communities.

Lack of property rights

Property rights on Zakynthos are also an underlying cause of biodiversity loss, as the Cadastre and the ownership records were destroyed during the big earthquake of 1953. As a result, people could claim as private property the sand dunes, the wetlands, and the forests, which usually comprise public or Community owned land. Even now there is a great number of pending ownership issues related to the conservation measures that are planned for the area.

2.3 Identification of adverse incentives

National policies for tourism development

Development Law 1261 of 1982 was the landmark case for the tourist boom in Greece in the years to come. This Law gave very high incentives for the almost unconditional development of new hotels. Policies in the 1980s especially favoured small and medium sized investors, resulting in the establishment of a large number of small tourist units, the environmental standards of which were almost impossible to control.

As a result of this policy, small-scale family investments in a number of rooms-to-let complexes, built on small plots of private land, were very common in comparison to the establishment of high class hotel complexes, which required a higher investment, trained personnel, and larger plots of land. Particularly in island communities, this policy was combined with prevailing local attitudes, whereby non-local investors are considered "outsiders" for a long time. In 1994, most of the 133 hotel units operated on Zakynthos island belonged to the third and second classes, with a notable absence of luxury and first class hotel units. This composition is reflected in the Laganas Bay area.

Loose taxation

An adverse incentive that operated against the development of high quality tourism, and a corresponding biodiversity conservation attitude, was the fact that, until 1996, taxes on tourism income were based on individual declarations, which could not be easily checked. Thus, data of arrivals kept by the Civil Aviation Authority on Zakynthos in 1994 suggest that the declared income from accommodation enterprises corresponds to only one-third of the visitors recorded as arriving by charter flights.

The fact that local tourism businesses did not declare their full income had two major consequences. The first is that local accommodation taxes (2 per cent of income) were not paid to the local authorities, resulting in a lack of local funds for infrastructure such as sewage collection pipes, waste treatment, road maintenance, etc. The second is that national taxes (approximately 30 per cent of income) were not paid, and these gains could instead be readily reinvested in other similar businesses. This situation has been mitigated by the taxation system established in the last two years and the frequent controls.

International tourism market

Market prices for mass tourism accommodation are fully dependent on — and controlled by — the international tourism industry, they cannot be negotiated by locals. 70 per cent of the tourist demand on Zakynthos derives from one market, that of the United Kingdom, and this dependency makes the economy vulnerable to such things as recession periods or periods of social and political unrest in the country of tourist origin. In the Laganas Bay area, prices of accommodation offered by tour operators for the season showed a steady increase until 1987, they remained fixed during 1988-89, and have decreased since 1990, regardless of inflation, due to international competition. Another adverse incentive was that, until 1994, night charter flights to Zakynthos were much cheaper, despite the disturbance they caused to visitors.

3. IMPACTS ON SPECIES AND ECOSYSTEMS

3.1 Background information on the loggerhead sea turtle

The loggerhead sea turtle *Caretta caretta* is considered the key-stone species of the coastal ecosystem in Laganas Bay because it utilises both the marine and the terrestrial components of the ecosystem for its survival. In addition, it is listed as ‘globally endangered’ according to IUCN and it is protected by national and European Union legislation as well as International Treaties.

The loggerhead turtles are a migratory species and spend the major part of their lives in the sea. Mating occurs in early spring and each female comes ashore for some hours at night every 2-3 years to use particular sandy beaches to lay their eggs. Egg laying in the Northern hemisphere starts at the end of May or beginning of June, and lasts until the end of August. During this period, female turtles lay, during the night, 2-3 clutches of about 120 eggs, at 15 day intervals. Incubation lasts about two months, after which hatchlings run to the sea during the night or early dawn.

Laganas Bay is the most important breeding site of *Caretta caretta* in the Mediterranean (Groombridge, 1987), with 900-2 000 nests per year identified between 1984 and1996 on the six nesting beaches, comprising a total length of 5 km (Margaritoulis *et al*., 1997). Usually about 65-80 per cent of the eggs hatch, a fact that has been observed in other sites in the world as well. Results from 15 years of tagging show a strong fidelity of sea turtles to the beaches of Laganas Bay for nesting (Margaritoulis *et al*., 1997). It is widely suggested that they nest on the same beach they were born on, some 30 years before their first reproductive cycle (Frazer, 1985). Genetic research techniques have shown that the Mediterranean populations of loggerhead turtles are independent and do not mix each other. Further research is planned to assess whether each distinct nesting population in the Mediterranean, including the one at Laganas Bay, comprises a genetically discernible population, which does not mix with others in the Mediterranean, as has been found in other parts of the world (Bowen *et al*., 1993).

3.2 Impacts on the nesting beaches of Laganas Bay

The reproductive cycle of *Caretta caretta* on Zakynthos coincides with the high season of tourism activities. Due to the fact that the settlement of Laganas was enlarged in 1987, the nesting habitat has decreased by 1.5 km of beach in areas which are now compacted from the excessive numbers of visitors, backed by hotels, bars, or restaurants, and exposed to noise, artificial lights, and vehicles. Controlled development was also allowed here caused by visitors during the day and noise and lights during the night. As there is an uneven distribution of the number of nests in the beaches of Zakynthos (see Table 2), the higher nesting percentages may be attributed partly to the development restrictions of the isolated and protected smaller beaches of Sekania, Daphni, Marathons, and Gerakas.

Table 2. Average distribution of numbers of nests in the beaches of Laganas Bay (1984-1994)

Sekania	52.7 %	Daphni	12 %
East Laganas	11.2 %	Kalamaki	8.9 %
Marathonissi	8.4 %	Gerakas	6.8 %

Documentation of such an impact was the relative drop in the numbers of nests in 1993-94, when illegal buildings operated behind Daphni beach, and the increase in the number of nests during the two years of regulation compliance in Daphni beach (1995-96).

Several impacts of human activities on sea turtle breeding have been identified by researchers such as Dean (1975), Dodd (1988), Hosier (1981), Mann (1978), Ridgway (1969), Witherington (1991), and Worth (1976). Many of these impacts have also been identified and observed in Laganas Bay (Arianoutsou, 1986) and are related to the terrestrial component of the coastal ecosystem and particularly

to the nesting beaches. These are: (a) the direct natural habitat loss from building on the sand dunes and erosion of high slopes behind the beaches due to building, resulting alterations in the sand quality for sea turtle nesting and the destruction of populations of sand dune vegetation, endemic plants and fauna; (b) the day time disturbance of the beach environment from trash, trampling on nests, sticking umbrellas in the sand which may cause damage and infections to sea turtle nests, and alterations to the sex ratio of hatchlings due to shading; and (c) night time disturbance of nesting and hatching turtles caused by noise, traffic and lights from hotels, bars, discos and the airport which result in the abandonment of nesting and the disorientation of hatchlings towards artificial lights.

As a result of the incentive measures taken, and despite a relative degradation of the coastal ecosystem outside of the Nature Reserve established in 1990, monitoring of sea turtle reproduction activity carried out by the Sea Turtle Protection Society over the last 15 years shows a more or less stable nesting population, with annual fluctuations similar to those observed in other parts of the world (Dodd, 1988).

3.3 Impacts on other species and the coastal ecosystem

Impacts of tourism on the marine component of the ecosystem have been observed in Laganas Bay, but no monitoring data exist. It can be safely estimated, however, that these impacts affect all marine life. The main impacts include:

(a) seasonal degradation of the sea water quality of Laganas Bay due to hotel sewage and lack of treatment facilities, which may cause alteration in the food chains and infections of the marine animals, and regression of the underwater prairies of *Posidonia oceanica*, which is the main oxygen producer in the Mediterranean Sea; and

(b) stress, wounds and incidental deaths of marine animals due to the high number of speedboats used for recreation. A number of dead sea turtles (2-5 annually) has been recorded for several years in Laganas Bay. Most of the time these animals were adult females, which had come to lay their eggs. The number of wounded sea turtles is also high, and was calculated at about 20 per cent of the nesting population in 1991.

Even though trawlers are not fishing in the Bay, coastal fisheries also pose threats to the sea turtles because a number of animals are caught in the fishermen's nets each year. The Monk seal population is also threatened because of its competition with fishermen for the decreasing quantities of fish in Laganas Bay, and 7 dead seals have been counted between 1987-1991 according to Cebrian and Vlachoutsikou (1993), as a result of damages they cause to the fishing gear (Karavellas, 1995).

4. IMPACTS ON ECONOMY AND WELFARE

4.1 Positive effects of tourism

It is clear that tourism has had a positive effect on the economy and welfare of the island of Zakynthos, including the Laganas Bay area. The island has about 32 700 inhabitants (1991). There was a 7.78 per cent decrease in the population over the period 1961-1991 attributed to internal immigration, and a 9.1 per cent population increase in the period 1981-1991 attributed mainly to the development of the tourism industry.

Tourism and agriculture are the main economic activities, and Zakynthos has contributed 15 per cent of the income for the Region of the Ionian islands, marking an increase in its declared income of about 74 per cent over the years 1987-1990.

During the last 20 years, there has been a steady increase of 13-14 per cent in the number of days of visitor accommodation on Zakynthos. In 1970, the number of accommodation days for the whole island was 53 641, in 1975 it was 96 000, in 1980 it was 184 000, in 1985 it was 340 000 and in 1991 it increased to 480 000. About 56 per cent of the overnight stays in 1990 were accommodations in Laganas Bay. Tourist accommodation facilities on the island increased by 40 per cent between the years 1990-1994.

4.2 Negative effects of tourism

Studies have concluded that sooner or later the busy tourist destinations become less attractive to the visitors unless measures are taken that will succeed in maintaining the desired maximum carrying capacity of visitors and a qualitative change in investments (Martin and Uysal, 1990). Some indications of this phenomenon in Laganas Bay are apparent, as indicated below.

- *Low quality of services and lack of proper technical infrastructure*

The tourist period primarily covers the months from May to October, and this seasonality of visitors is a source of problems for the infrastructure (roads, ditches, etc.) and the natural resources (water, energy). There is an obvious lack of proper infrastructure in the transportation network, the sewage collection system, the solid waste management system, and the operation of marinas. Due to the rapid development of tourism, there is a significant number of services that do not keep the proper safety and sanitary standards. This lack of infrastructure, in combination with the increased number of visitors, causes serious problems to the proper operation of the whole community, leads to the degradation of the environment, and decreases the tourism value of the area.

- *Loss of aesthetic value*

Since the standards set at a national level were not very high, most of the constructions allowed in the development zones in Laganas Bay reflect a short-term investment in tourism, with a lack of communal planning. A striking example is the development of the settlements of Laganas and Kalamaki, which have had a tenfold extension of the area they legally occupied 20 years ago. Within these settlements there is a noted lack of spatial planning and technical infrastructure, a high concentration of low quality tourism accommodation, a lack of architectural identity in the forms of constructions, and a lack of good quality services for tourists.

- *Decrease in revenue*

Despite the increasing number of visitors, the low quality of services provided attracts tourists of medium or low income, and the respective total income increase from tourism for the local community is lower than anticipated by the increase in the number of visitors.

An example of the adverse impacts that the kind of tourism developed on Zakynthos can have on economy and welfare is the fact that there were 657 913 overnight stays declared in 1994, showing an increase of 42 per cent compared to 1990, but in 84.1 per cent of the units were declared fully occupied in 1990, in contrast with 65 per cent in 1994. This fact can be combined with the decrease in the market prices for accommodation, and the lack of environmental and aesthetic quality in most of the developed parts as discussed in Section 2.3. However it is not possible to calculate any direct economic losses prior to the implementation of the incentive measures, nor any negative impact on employment as the measures were initiated at an early stage of tourism development of the area.

- *Damage to public goods*

A degree of damage to public goods in Laganas Bay has taken place. This can be further explored in relation to the carrying capacity of the beaches, where relative studies have used the concepts of 'psychological capacity' and 'ecological capacity' and reached the conclusion that the total number of people visiting the sandy beaches of Laganas Bay exceeds the desired capacity (ENVECO,1995). This is especially true for the beaches of Laganas-Kalamaki, Daphni, and Gerakas.

In questionnaire surveys that have been conducted (Cape, 1991), a high percentage of tourists were favourable to the conservation of the coastal environment, they were willing to contribute directly to conservation projects, and they noted the poor environmental and tourist quality of some areas in Laganas Bay, indicating that they would not come back there for their next holidays. A reaction of some of the large tour operating companies to the unwillingness of the locals to meet the standards was noted in the early 1990s, and TUI pulled out of the island as a demonstration against the lack of local compliance with conservation measures.

5. IMPLEMENTATION OF INCENTIVE MEASURES AND CONTEXT

5.1 Land use planning (building and land use restrictions, establishment of a Zone of Urban Control, creation of a Nature Reserve)

Identification

Of these three incentive measures, **building and land use restrictions** fits best into the category of measures that aim at reducing the degree of uncertainty in order to avoid short-term exploitation of resources. The **establishment of the Zone of Urban Control** (a physical plan of the area) is mainly a measure that allows the private use of the value of coastal biodiversity in the broader area. The **creation of a Nature Reserve** with restrictions on beach use and management, together with the marine traffic and airport operation restrictions, realises the value of biodiversity as a public good through the creation of a protected area.

Measure 1: *Building and Land Use Restrictions*

The first building and land use regulation was issued in 1984. It defined three zones in the coastal area adjacent to the see turtle breeding beaches where restrictions varied from practically non-intervention areas to areas of controlled development.

The objective of this regulation was to prevent tourism development in the adjacent land behind the beaches (zones I and II), and to set higher environmental standards in tourism development in the broader area around them (zone III).

The measure was chosen as a result of a recognition that tourism development was the major threat to the coastal ecosystem.

Measure 2: Establishment of a Zone of Urban Control

The 1984 regulation was replaced by a broader building and land use plan, issued in 1987. The previous zoning system was modified, without significantly relaxing the existing restrictions, but the total area of the Zone of Urban Control was much larger and encompassed adjacent locations where the introduced building regulations were particularly favourable to tourism development. In addition, specific restrictions and management measures for the protection of the nesting beaches were included in the legal text.

The objective was to provide a rational frame for balanced development in the wider area of Southern Zakynthos in order to meet the increasing development pressures, and also to secure the nesting beaches from newly introduced threats such as the expanding sun bed and umbrella businesses, light and noise disturbance at night, vehicle driving, etc.

The reason for choosing the measure was the need to respond to the local development pressures and the local argument that "the 1984 regulation had condemned the southern part of Zakynthos to underdevelopment" on the one hand, and on the other hand to respond to pressure from "green" activists from Greece and abroad who highlighted a need to better secure the future of nesting beaches.

Measure 3: Establishment of a Nature Reserve

The Nature Reserve was established in 1990 as part of the revision of the 1987 Zone of Urban Control. There was no modification of the existing restrictions, but provision was made for a Management Plan of the Reserve.

The objective was to give a distinct protection status to the already protected sensitive zones of the area and to therefore allow for the implementation of the legal provisions for land acquisition and rent within protected areas, as well as the establishment of a Management Institution.

Implementation

All three measures were taken by the competent national Planning and Environment authorities in the form of Presidential Decrees and Ministerial Decisions, after consultation with the administration of Zakynthos and the public. They were based on the concept of biodiversity being a public good and the Constitutional responsibility of the State to preserve the environment by taking measures both on public and private land.

The most important distributional feature of these measures was the unequal sharing of costs and benefits for the biodiversity conservation. Under the building restrictions and the consequent establishment of the Nature Reserve, some landowners were deprived of almost all their building rights (and so were the main bearers of the costs of implementation), while others were obliged to comply with less strict restrictions. In the addition, the establishment of other parts of Laganas Bay as tourism development sites by the Zone of Urban Control favoured many landowners in the wider area, and they too did not bear any of the costs of the conservation measures. It also particularly favoured development within the settlements of Laganas and Kalamaki, except for the inconvenience and economic loss it imposed on the local authorities with respect to the beach management.