

Economic assessment of a Marine Protected Area's effects on the sustainable development in the Mediterranean



Case study on Zakynthos, in Greece

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I. Local development and MPA: Current situation and retrospective analysis of key interactions at Zakynthos Island

Zakynthos is a greek island within the archipelagos of Ionian Islands. It is located at the south part of homonymous sea, about 20 Km West of Peloponnesus and 14 km South of Kefallinia Island. It is, with the uninhabited islets of Strofades (about 50km at the south), a NUTS 3 area (department) of 406 km² (9th biggest greek island and 0,3% of the national territory) with a population of 40.650 (2011 – 6th most populated island and 0,4% of the greek population), having rather a high density 100,23 inh/km², higher than the greek average (81,75). It is composed by a significant (for a Mediterranean island) plane area in the south east part where most of the population and activities are located and a hilly one in its north west part (223 km² or 55% of its territory is classified as semi-mountainous areas and 178 km² or 44% as plains). The capital town of Zakynthos, which benefit of the same name, is located in the south east of the island and concentrates about 30% of its population. Since 2010 the whole island constitutes a single municipality.

Figure 1 : Map of Zakynthos



1. Local development at Zakynthos island: driving forces and socio-economic and ecological trends

The description of the sustainability situation has to be based on economic, social and environmental parameters describing not only the past trends and the actual situation but also the perspectives; so it is necessary to evaluate the economic performance of Zakynthos, its demographic trends but also the social equity performance as well as the environmental situation and precisely the capacity of the natural capital to sustain environmental functions and services.

1.1. Features of local development at Zakynthos Island: current situation and past trends

In this paragraph the situation of Zakynthos is going to be presented according to the 3 dimensions of sustainable development: economic performance, social equity and environmental preservation.

1.1.1. Economic performance

The rapid increase of the GDP of Zakynthos during the '90s, revealed by the increase in its GDP per capita that topped the national average (from 91% of national average in 1990 up to 114% in 2000), has continued during the last decade, and before the beginning of the economic crisis in 2008 it was 25.536€ per capita compared to 21.084€ for the national one (121% of the greek average), producing 0,4% of the greek GVA. This performance places Zakynthos at the 3rd rank of NUTS 3 areas behind Viotia (the industrial “suburb” of Athens with 31.353€) and Kyklades islands (with 27.210€) and just before the capital region of Attiki (25.359€) but far away from the other NUTS 3 of the region as Kerkyra (which is the biggest NUTS 3) having a GDP of 18.979€. The average of Ionian islands is 20.196€ (95,8% of the national average) (table 1.1).

Table 1.1: The evolution of GDP per capita

	2000	2001	2002	2003	2004*	2005*	2006*	2007*	2008*
Greece	12.483	13.372	14.254	15.642	16.748	17.545	18.953	20.287	21.084
Ionian islands	12.104	13.143	14.049	15.520	16.358	17.450	18.472	19.633	20.196
Zakynthos	14.204	15.660	16.611	17.531	20.083	21.449	22.320	25.542	25.536
Index for Zakynthos (Greece 100)	114	117	117	112	120	122	118	126	121

*provisional data

Source: ELStat (www.statistics.gr), 2010,

The composition of the Zakynthos GDP shows a net predominance of Tourism as only the HORECA¹ branch produces between 25 and 30 % of it in comparison to 8% of the national average. For the other competitive economic branches, the primary sector is in net regression (3,4% in 2008 in comparison to 9,5% in 2000) with the fisheries to have an official contribution low to 0,5% and the manufacturing sector around 2,5%. All the other economic activity that has significant part in the GDP formation support either the local population or tourism activity or both as public services with 17% of the GDP, financial intermediation, real estate, renting (rooms to let included) and business activities 13,9%, trade 15% and construction 7,5% (in comparison to more than 10% in the beginning of the decade). This is the image of a fragile and vulnerable economy very dependant for its growth only on an economic activity, namely tourism with a very specific product (3S) that it is actually in high competition at the global level (table 1.2).

¹ HORECA ; HOtels Restaurants, CAfes

Table 1.2. The composition of GDP per branch (total in million euros and %)

Branches	2000		2005		2008	
Primary sector	46,0	9,5	48,0	6,2	31	3,4
Secondary sector (except construction)	8,0	1,7	26,0	3,4	37	4,1
Construction	47,0	9,7	66,0	8,6	66	7,2
Trade, HORECA, Transport and Communications	235,0	48,6	406,0	52,8	496	54,4
Financial intermediation, Real estate, Business	74,0	15,3	106,0	13,8	127	13,9
Public service, Social Security, Education, Health, Other Services	74,0	15,3	117,0	15,2	155	17,0
Total	484,0	100,0	769,0	100,0	912	100,0

Source: ELStat, 2010

The distribution of the employment for 2001² gives different image of the composition of the local economy compared to production results: 27,8% were working in the primary sector (only 0,5 in fisheries), 18,1% in the secondary sector (12,8% in the construction branch), 33,7% in Trade, HORECA, Transport and Communications, 5,2% in Financial intermediation, Real estate, Business activities, and 12,0% in the rest of services. This can be explained by the fact that pluri-activity is a common practice mainly due to a phenomenon of family employment.

1.1.2. Social aspects

Social justice/equity records the diffusion of the benefits arising from economic growth to the overall society Social equity is evaluated on the basis of: (a) demographic trends and (b) social cohesion information.

a. Demographic trends

The population of Zakynthos is estimated to be 40650 inhabitants (provisional data from 2011 census³) in comparison to 38.883 in 2001 and 32.557 in 1991. It has increased by 4,5% during the last decade when in Ionian islands it is observed a decrease of 1,4% and in the whole country a decrease of 1,3%. This

² Census data concern only the employment of permanent residents

³ Until now the total population is the only information coming out from 2011 census. Consequently all the other information concerns 2001.

population has also to be compared with the population of 1951 (38062) and 1981 (30014) in order to have a better understanding of the population evolution since the 2nd world war.

Table : Population evolution

	1971	1981	1991	2001	2011*
Greece	8768641	9740417	10259000	10964020	10787690
Evolution %		11,1	5,3	6,8	-1,6
Ionian Islands	184430	182651	193734	212984	206470
Evolution %		1,0	6,1	9,9	-3,0
Zakynthos	30187	30014	32557	39015	40650
		0,6	8,5	19,9	4,2
MPA	4919	5117	6180	8521	na
		4,1	20,7	37,7	

Source: El Stat, Census data , *provisional data

This evolution is due to a vigorous out-migration movement that has swept the greek periphery during the three decades following World War II (1951-1981), mainly of the active population that has also provoked a negative natural movement till the beginning of '90s; since then the increase of births (around 450 per year during the first decade of the 21th century in comparison of about 360 the previous decade) has converted this trend to a positive one (+1,31% for the period 2000-7 when for the majority of regions is still negative). Nevertheless this change is not strong enough to explain the population increase; this increase is 90% due to the immigration of natives coming back to the island and of foreigners (mainly from ex-eastern European countries). In 2001, 13,2% of the population was composed of foreigners in comparison to 9,2% for the Ionian Islands and 7% for Greece. This evolution seems to have continued during the following years as data for the period 2000-7 (EU, 5th Cohesion Report, 2010) gives an annual increase of 4,03%.

This “ejection” of new and young population (due to foreigners) has highly influenced the age structure in the island with an ageing rate of 17, 7% that it is significantly lower than the regional one (22% - the higher in the country)- and the national average (18,56%). The active population rate is also very high 50% of the total population is active in comparison to 40% for the region and 43,8% for the whole country.

Population evolution since 1971 in Zakynthos and more specifically within the protected area was different from what happened at the national and regional level as the population is increasing more intensively; within the MPA the average population density was for 2001 112 inh/km² when the average of the island was less than 100 (it was 100,2 in 2011).

b. Social Equity⁴

Unemployment is quite high in Zakynthos: it was 8,7% for 2008 in comparison to 8,5% for the region and 7,7% for the country; 28,7%, 26,7% and 22,1% respectively for young people between 15-24 years old and

⁴ Data are coming either from the Greek Statistics (Statistics.gr) or from Eurostat.

12,1%, 12,1% and 11,4% for women. The unemployment rate has dramatically increased since then due to economic crisis and is currently around 18%.

The declared revenue per capita in Zakynthos was 12.489€ for 2008 (74,9% of the national average in the 46th place among 52 NUTS 2 zones), the per capita tax and the saving deposits for 2009 13418 (71,4%, in the 27th place). The number of car per 100 inhabitants is 39,9 (when the national average is 45,58 , in the 8th place and the number of new logging per 100 inhabitants 0,9 in the 10th place.

Other indicators concerning social equity are not available for NUTS 3 but only for NUTS 2 level (2008); so they have usefulness only as general information as there is significant intra-regional divergences:

- Long term unemployment rate: 1,73% of the labour force (Attiki: 2,82% and EU-25 = 2,6%)
- Life expectancy: 82,8 years for women and 78,7 for men (among the highest in Greece in comparison to 81,7 and 77 for Attiki and to 82,0 and 75,8 for EU-25)
- Infant mortality rate (2006-7) is 2,7 per 1000 live births (Attiki: 3,7 and EU-25: 4,7)
- Young people aged 15-24 not in work, education or training, average 2006-2008: 15,72% (Attiki: 9,33% and EU-25: 11%)
- Net adjusted disposable income of private households (PPCS), for 2007 is 57,6 (Attiki 112,7 and EU-25 100)
- EU Human Development Index⁵, for 2007 is 39,2 (Attiki: 69,3 and EU-25: 62)
- Human Poverty index⁶ 64,6 (Attiki: 27,8).

From the existing data at the regional level we can say that the objective of social equity is far from to being achieved. Zakynthos as its economic performance is better (mainly the GDP per capita) and a rather good evolution of the main demographic variables has probably achieved a much better level of social cohesion.

1.1.3. Environmental state

Environmental state has to do with the evaluation of the quality of natural capital and its capacity to sustain environmental functions and services. As direct and quantitative information is not always available, there is an effort to give estimation:

- Land cover: The distribution of Zakynthos' area into basic land cover / land use categories is 61,2% arable land, 36,2 forest and semi-natural areas, 0,1% of internal waters and only 2,5% of artificial

⁵ HDI is a composite index by UNDP. It is based on life expectancy in good health, net adjusted household income per capita, and education level (Source: Eurostat, DG REGIO). The education component of the HDI is now measured by mean of years of schooling for adults aged 25 years and expected years of schooling for children of school entering age. The HDI sets a minimum and a maximum for each dimension, called goalposts, and then shows where each country stands in relation to these goalposts (<http://hdr.undp.org/en/statistics/hdi/>).

⁶ This indicator is a composite index by UNDP to complete the HDI and better reflect poverty, especially in developing countries. The HPI is based on: share of population aged 25-64 with a low education attainment, long-term unemployed as share of the labour force, probability of not living to 65 at birth and % of population with an at-risk-of-poverty income relative to the national median (Source: Eurostat, DG REGIO). In 2010 it was supplanted by the UN's Multidimensional Poverty Index

surfaces (census 2000). This percentage is very low when compared to artificial areas of an urban region as Attiki (15,6%) but higher than the national average (1,9%). Artificial areas continue to grow since then mainly in the south and east part of the island where is concentrated the tourism activity and the major part of the population, in and around the MPA.

There are 3 protected areas (figure 2):

- The south part of the island and mainly the golf of Lagana, designated as a Site of Community Importance (SCI) and has great ecological importance as this is the main area of reproduction of the sea turtle *Caretta caretta* and where the biocoenosis of *Posidonia oceanica* is significant. It covers also the small islands of Marathonissi and Pelouzo located in the golf as well as the islands Strofades located about 50.km in the south of Zakynthos for the presence of marine seal *Monachus monachus*, the remnants of natural vegetation cedar and other plant species (*Quercus coccifera*, *Laurus nobilis*, etc) and as found in bird migration route in western Greece base station and a resting and breeding of these species. The protected area has 45,4km² of terrestrial zone (of which 14,2km² are the core zone) and 89,2km² of maritime zone. The borders of this SCI are almost the same as the delimitation of Zakynthos Marine National Park, which is the object of the study.
- The Natura 2000 area covering all the west and north coast of the island (covering 33 km² or the 9% of the total surface of the island). This rocky coast with very small, isolated bays and numerous caves is an important biotope for the marine seal *Monachus monachus*.
- The saltpan of Aliki that it was recently included in a network of small wetlands of islands.

These areas have been downgraded from the human activity; the situation is alarming in the dunes of Lagana and at the wetland of Keri.

Figure 2. Protected areas in Zakynthos



Source: NMPZ, 2007

In spite of their protection, these sites are currently facing serious environmental threats: Drinking water problems, for instance, are becoming more and more important as salinization and pollution of aquifers occur more and more, mainly at the southern, coast where the pressure is bigger due to the concentration of the population and the tourist installations; quantity is also a problem and during the summer period private mobile tanks are used to transport water from other areas of the island. The wetland of Keri at the western part of the golf of Laganas from where important sources of water are used in order to supply the southern area with drinking water is actually facing important problems from the intrusion of sea water but also from the pollution coming from different activities at its borders. High concentration of ammonia in the water is also observed due to uncontrolled disposal of waste water; concentration of nitrates is less important but it is a real problem as it has been localized in many areas⁷.

Sea water quality is within the EU norms for bathing water in all the 43 control stations in 2010; a problem appeared within a zone within the capital town as it was reported by the local authority during summer 2011. However, only 8 beaches had the award of Blue flag in 2010.

Landscape has been deteriorated by the unregulated construction due to (a) the legislation that allows to built in every piece of land that borders on the transport network as well as all pieces of land having a surface of more than 0,4 hectares and (b) the absence of any architectural pattern for new buildings. Construction activity is concentrated around the capital - mainly after the earthquake of 1953 that destroyed

⁷ NMPZ, 2007, p.13-23 and 79-80

the town - as the main activities and facilities are located there but also near the coastal area due to tourism development; Laganas, Kalamaki, Agios Sostis are the places within the protected area where the deregulated new construction due to tourism development is more obvious.

1.2. The forces driving the development in Zakynthos

Tourism and 2nd house (residential) activities are the main drivers of the development of Zakynthos; there is an important temporal correlation between tourism development and the inversion of economic and demographic trends. The other activities are becoming marginal and depend directly or indirectly from these ones.

1.2.1. Tourism as a driving force

Tourism development in Zakynthos has recorded a first development during the '80s. In the beginning of the decade, a very limited number of beds existed attracting very few tourists, mainly Greeks (the nights spent in hotels by Greeks were twice as much as the foreigners' ones). Since then, the growth rate of the whole activity was explosive, as a lot new investments in hotel and complementary accommodation were realized due to the economic incentives promoted by different development laws and EU funding supported by the creation of an international airport for charter flights; the number of foreigner tourists has been multiplied by 32(!) within 20 years, and Zakynthos became an important destination for organised tourism: the number of arrivals by charter flights has been increased from zero in 1980 to 151903 in 1990 and 437947 in 2000 and the number of nights spent in hotels has increased from 61.678 in 1980 , to 367.465 in 1990 up to 1.964.716 in 2000. In contrary the number of nationals in hotels in Zakynthos has raised only by 1,6 times (from 122.278 up to 199613). The profile of Zakynthos in the end of last century was totally different compared to 20 years ago (table ??).

Table 3: Main tourism data (1980-2009)

	1980	1985	1990	1995	2000	2005	2009	2010
Beds in hotels	2 578	4 063	6 428	11 269	16 642	25 994	27 167	29 303
Beds in rooms to let	2 211	5 282*	12 139	17 067			14 404	13 595
Arrivals by charter flight	na	39 402	151 903	281 603	437 947	474 081	459 676**	na
Nights spent in hotels (foreigners)	61 678	228 502	367 465	540 544	1 964 716	1 697 735	2 054 247	na
Nights spent in hotels (nationals)	122 278	112 160	76 238	115 299	199 613	242 403	209732	na

*1986; **2008; na: not available. Source: Epilogi, 2010

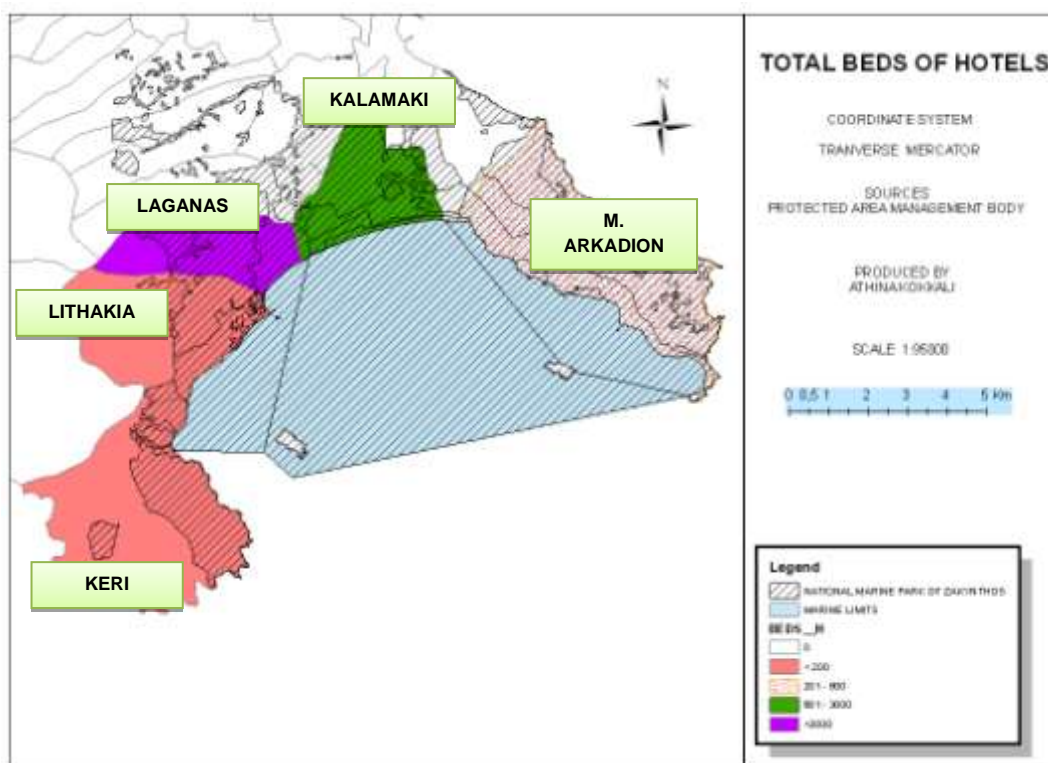
This trend has not continued during the beginning of the new century. Even if the number of hotel beds has continued to rise rather rapidly (29303 in 2009 or 3,8% of the national park of hotel beds – even 30772 beds for 2011 as reported the Union of Hoteliers of Zakynthos – compared to 16642 in 2000), it was not

the case with the number of tourists, that fluctuated during the same period: 2,05 million foreigner tourist nights spent in 2009 in hotels⁸ (4% of the total nights spent in Greece) compared to 1,99 million in 2000. Nevertheless, Zakynthos is the second department in Greece for the number of foreigners nights spent behind Dodecanissos (51,2 and 60,5 accordingly) when the national average is 4,3! National tourists that used to have the double number of nights spent in hotels during 1980, represent only 10% of them 30 years later. This evolution has led to a severe decrease in occupancy rate from around 100% in 2000 to around 68% at the end of the decade.

As commercial accommodation, we have to add also 5 camping sites with 1.200 places and particularly 13.595 (officially declared) beds in complementary tourist accommodation (rooms to let and apartments) that attract an important part of tourists, either international or national. The number of this category of accommodation that used to be dominant till the 90s, seems to be in decline during the 21th century. Despite this evolution, the quality of the accommodation remains extremely low as 80% of hotel beds are in 2 and 3* hotels and only 17,7% are belonging in the upper classes.

Concerning the location of the hotel accommodation more than 50% of the potential is situated within or around the protected area in the south of the island: 27% are in Lagana, 13,6% in Kalamaki, and 3,6% in Keri/Lithakia settlements that are around the golf of Lagana and 7% in Vassilikos, on the peninsula where most important of the nesting beaches as Sekania, Dafni and Gerakas are located. Argasi with about 13% and the capital town with 4,3% are also very close to the area but on the east coast of the island; the other two main tourist areas, Planos and Alykes, are a little bit further towards the north-east of the island.

Figure 3. Spatial Distribution of the number of beds in hotels within Lagans golf



⁸ Based on the arrivals by charter we have to estimate 1,2 millions of nights spent are effectuated by foreigners to rooms to let or other private accommodation.

Source: Kokkali, 2010

The pressure seems to be important as more than one official tourist bed corresponds to one permanent inhabitant (the population is doubled during the pick of the season) and the annual pressure from tourism is estimated to be around 10.000 of additional population. The number of tourism beds is over passing 100 beds per km² giving the highest environmental pressure in Greece; in fact this pressure is much more important as tourism (as well as all the activities of the island) is concentrated in less than the half of the territory. This pressure has provoked a very clear expansion of the built area of the island but also high water and energy consumption and waste production.

Concerning the tourism activity in terms of the number of tourism enterprises (bars, restaurants) operated in Zakynthos Island during the tourism season from May to October is found to be 1253 enterprises in total (2010). A quarter (25.1%) of the total tourism enterprises of Zakynthos, are operating in the ex-Municipality of Laganas. This is a significant percentage in comparison with the 4.4% of tourism enterprises in the ex-Municipality of Arkadion (Vassilikos area). Hence, it is evident that Laganas area contributes to the economy of Zakynthos in a great extent and especially during the tourism season.

Another crucial point for tourism is its high degree of dependence, as 85% of foreign arrivals are British coming by charter flights driven mainly by two Tour Operators. The recent involvement of low cost carriers after specific contracts with the local authority and the Association of hoteliers has not produced any significant modification till now.

1.2.2. Residential houses as a driving force

Housing and construction activity in general is an important pressure for the environment: on one hand it transforms in permanent way natural areas into artificial ones, thus influencing negatively the biodiversity of the area, and on the other hand the new activities developed in these areas are increasing the consumption of resources and the production of wastes.

The houses in Zakynthos were 19.845, as reported by the census of 2001 compared to 15.991 in 1991 (+3.854 or 24% increase), when the population increase during the same period was 6.265; 12.015 of them were permanently occupied (61%), 1.126 houses were declared as temporarily empty (26%), 5.031 as secondary houses and 1.361 for sale (7%)⁹. The percentage of houses declared as secondary is high (25,8%) compared with the average for the region of Ionian Islands (23,7%) and the national total (16,9%). The same trend has been continued during the last decade even if the population increase was much lower (+ 1.628).

More than a third of the constructions (38,5%) were built during the period 1980-2000. In the most touristik places the part of new buildings is even much higher: Pantokratoras 54,1%, Vassilikos 63,7%, Planos 71%, Kalamaki 69,4%, Argasi 70%.

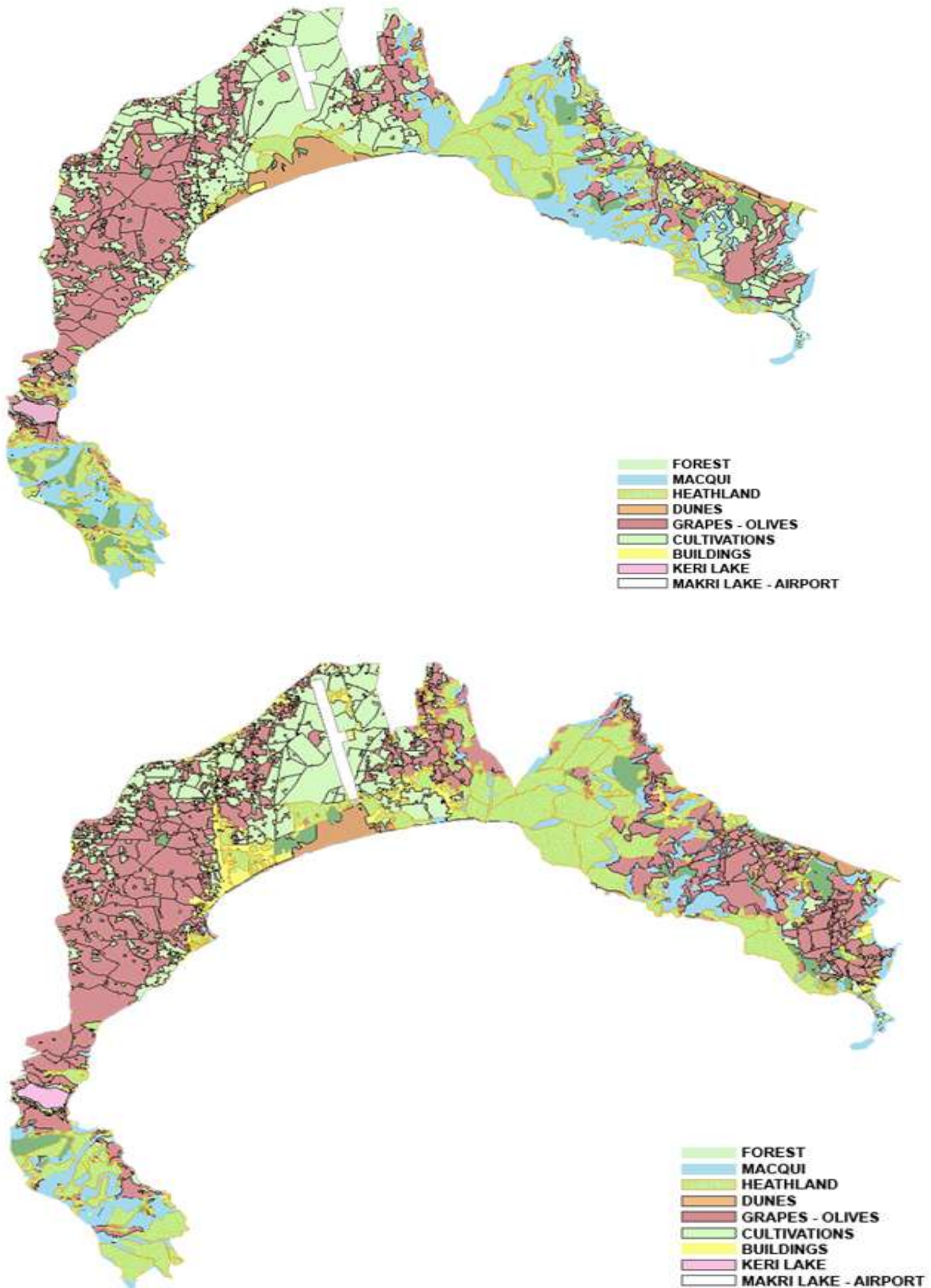
This rapid increase in housing and generally of new constructions illustrates the accrue pressure from this specific kind of tourism that has to be added to the previous analysis.

The overall pressure on land use changes from building activity is very important when a comparison is made between the period before the tourism development and the beginning of the 21st century. The built area has been expanded mainly at the plain area around the Lagana beach where dunes have been seriously

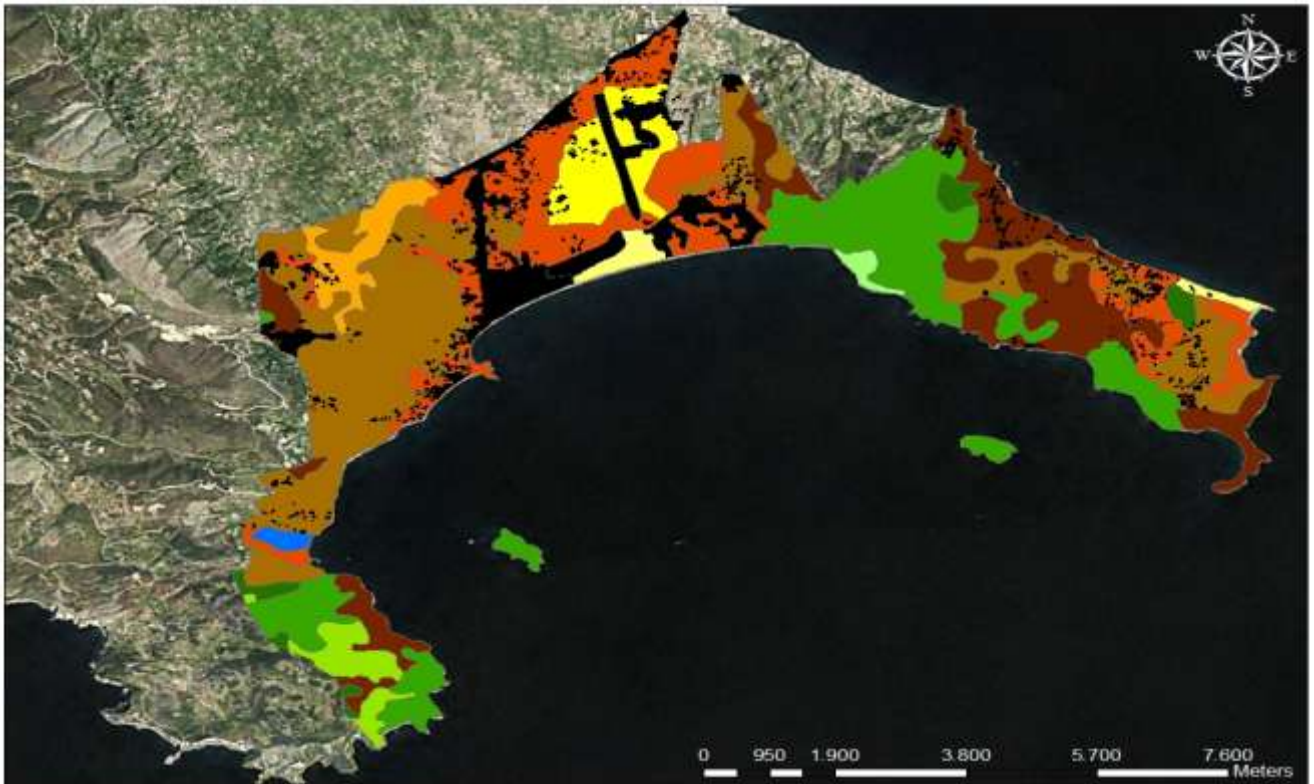
⁹ The rest is classified as collective dwellings that are without interest for this study

confined. The areas cultivated by olive trees and grapes have been extended against non permanent cultivations; heathland occupies now areas dominated previously by macqui. (Figure 4)

Figure 4. Land use changes within the protected area (1972, 2000 and 2012)



Source: Vardakastanis, 2007



Source: Laboratory of Island and Local Development, 2012

The built area (black polygons) is continuing to expand as shown by the above map made from Google Earth; nowadays using the Corine classification the artificial land within the above area is estimated to 10,0% of the total, the agricultural land 66,5% and the natural area 23,5% (including the wetland of Keri 0,1%) showing a high urban pressure.

1.2.3. The other activities

Agricultural activity has always been an important element in the economic life of the island during the same period of tourism development. Indeed, the geomorphology of the island favoured the traditional forms of agricultural exploitation by main axis agriculture; Animal husbandry and fishing has never showed a very significant contribution. The main crops of the island are now the olive and grape growing, with the most famous products of olive oil and currants, and the wine sector appears to make significant progress in recent years and a substantial critical mass of new vine and wine producers seem to send optimistic "wine renaissance" of the island. Historically, Zakynthos agriculture followed the traditional model of "self-sufficiency" in which each peasant family was trying to produce all kinds of food necessary for the family (cereals, olive oil, vine grapes and raisins, fruits and vegetables, dried feed for domesticated livestock and poultry, etc.) in an ecologically balanced environment with rich biodiversity, both in upland and lowland areas on the island.

The element of monoculture that characterizes today Zakynthian agriculture as a whole, prevailed in the middle of last century (1950 onwards) when the olive spread rapidly, by reason of public policy incentives for its development, and were reduced or disappeared completely other traditional farming and agricultural activities (such as cereals and livestock).

The total number of farms in Zakynthos was according to the census of 2001 6.576. These holdings were managed agricultural land area of 178.812,90 acres or 43,8% of the territory. Only 2,6% of the above area is irrigated.

The agriculture exploitations have significantly high proportion of mixed farms. Across the Zakynthian agriculture-dominated by tree crops that participate in approximately 44%. The total area of olive cultivation in Zakynthos is 83,300 hectares and covers 42% of cultivated land and 98% of the area of tree crops; the production is around 10.000 tons or 2% of the national production. It is recognized as high quality product by the Product of Geographical Origin label of EU but only 40 tonnes are commercialized under this indication and other 100 tonnes as extra virgin. There is high use of fertilizers and pesticides that downgrades the quality of the product and the revenue of the producers but also the environment, so only 1,4% of the production is organic and a insignificant part is sold as such. The biggest part of the production is sold in bulk to other companies in order to be mixed and bottled; so an important part of the added value is not staying locally. Olive trees culture is the main agricultural activity of the protected area.

Particularly high, compared with national and regional level, is the percentage of vines in Zante (17% of the cultivated area). The vines, after the olive is also a traditional crop in Zakynthos. The vineyards spread over 33,500 acres (3% of the national cultivated area) and have two production lines: the production of wine and raisin production, recognized as the PDO product «Raisin Zante - Stafida Zakynthou» (10% of the cultures). With regard to the cultivation of wine grape is noted that new plantings made in recent years with selected, high-quality vine varieties, have begun to bear fruit as it has significantly improved the quality of wine produced. A big contribution to this qualitative improvement of wine did the new and modern wineries on the island.

Arable crops are largely oriented towards the needs of livestock that cannot be served only with the natural forage. Horticultural (which occupy only 3% of the total cultivated area) is remarkable culture of Zakynthos' "nerokremmydo" (water onion) an area of approximately 200 acres of Zakynthos and 4 acres of strawberries. Unfortunately, the great demand, especially during the tourist season, for large quantities of vegetables is satisfied only by imports from other regions of Greece or from abroad, mainly due to improper or rather non-existent organization of both production, especially the marketing of vegetables. Indeed, for this reason it seems that local remarkable varieties such as Zakynthos' melon and broccoli are lost forever. Some varieties of hard wheat are also endemic and have higher output than imported hybrids that are not adapted to the local conditions and low quality ground.

Husbandry has very low development in Zakynthos as the number of animals per category is lower than 1% of the total number in Greece except rabbits that represent 5% of the total (51.000 animals- 2007). The 9500 sheep, the 11.400 goats, the 2000 cattle, the 138.000 hens and chickens and the 856 pigs are producing about 1000 tons of meat, 4.000 tons of milk and 600 tons of cheese, mainly hard conserved in olive oil (Ladotyri). Within the protected area there are about one hundred of exploitations mainly of sheep and goats (3.200 animals). Given that there is no important meadow in the area, the pressure exerted by the animals can degrade the grasslands if no precaution is taken to feed them with fodder. It is important to notice that that sheep of Zakynthos is a native species under extinction.

Fishery is not an important activity: on the whole island there are 540 professional fishermen (3,1% of the active population) with 188 vessels (of which 10 trawlers – chalutiers) producing about 1% of the total added value and 3150 amateurs with 770 boats. The vast majority (98%) of the professional vessels has less than 12m length and they fishing close to the coast; 53 of them with 73 fishermen are located within the protected area (about 23% of small boats). The catches (which the volume has been reduced in the previous

years due to the degradation of the ecosystem) are coming mainly from the big fishing vessels and are sold at the local market and the restaurants. (NMPZ, 2007)

The manufacturing sector, having no company with more than 10 workers, is not at all important as underlines its contribution to the GDP. The main branches are food processing (10 olive presses are located in the protected area with a significant but seasonal environmental pressure as wastes are not treated, 1 creamery and 1 plant for raisin processing) and beverage (1 wine factory) but there are also different enterprises connected with the construction sector.

The service sector outside accommodation has companies working on wholesale and retail trade, restaurants and bars, transport companies, travel agencies, real estate companies, banking and other businesses serving either the tourism sector or/and the local population.

The evolution of the economic activity and the improvement of living standards are also reflected by the consumption of electric energy: it was below 30.000Kwh in the beginning of '80s, around 40.000kwh in 1990, 125.000 in 2000 and 200.000 at the end of the decade. At that time the service sector used about 55% of the total of energy consumed, housing 33% and industry only 2,5%.

As main infrastructures we can report the international airport, the main port used by the ships assuring the connexion with the mainland and other ports, for commercial purposes and for private yachts plus 8 smaller ones for fishing boats, 940 km of roads, an installation for treatment of waste water and the dump for waste disposal.

1.3. The policy performance

As analysed in the previous paragraph the pressures to the environment are coming quasi exclusively by the urban activity and sprawl: the local population was trying to cover its growing needs and tourism activity was recording a quite quick growth.

The pressures can be enumerated as follows:

- Permanent change to land use by the artificialization of non-urban areas due to different types of new constructions. The area of the MPA, protected by decree, has been better preserved even if illegal constructions have not been totally avoided. The regional land use plan adopted in 2002 has not changed the situation.
- Accrued use of resources as water and energy. There are no policies adopted in order to promote an efficient use of these resources and there is no application of the law concerning the illegal drillings till last year.
- Accrued production of waste. The creation of an installation for waste water treatment has seriously limited the quantity rejected without any treatment; in the contrary the situation of solid waste remains without a significant amelioration as their collection system is totally inefficient as anybody can see all around the island, recycling has not progressed and their disposal continuous to take place in a dump within the protected area, contrary to what the law provides.

2. The MPA of Zakynthos Island: effects on local development

Protected areas are described as “the areas of land and/or sea especially dedicated to the protection of biological diversity, and of natural and associated cultural resources and managed through legal or other effective means” (IUCN, 1994, p.9). The National Parks and the Protected Areas are aligned with the principles of sustainability, contributing in that way to the development of societies with many different ways such as (IUCN, 1994):

- Preserving the natural landscapes as they are, allowing a minimal human interference
- Preserving the tradition of different cultural patterns and promoting their development by keeping their own identity
- Providing nature education and ecological conservation
- Supporting the local welfare by providing job opportunities, scientific research and recreational opportunities.

These contributions have to be added to the general services “offered” by the ecosystems’ functioning as food provision, water and climate regulation, waste treatment etc.

More specifically a Marine Protected Area (MPAs) fulfils three key functions in conservation science: the conservation of the marine biodiversity, the preservation of the productivity, and the contribution to the economic and social welfare. It is also designed in order to support other traditional forms of marine resource management that were not effective enough to maintain ecosystem management at high levels. In the case of MPA of Zakynthos where terrestrial areas are indispensable for the preservation of the threatened species, the management of the land around the protected sea area is important for the success of the operation.

2.1. Portrait of Zakynthos’ MPA in 3 dimensions: social, economic and ecological

The National Marine Park of Zakynthos (NMPZ) was established on December 22, 1999 by Presidential Decree 906. The purpose of NMPZ is the preservation of vast natural heritage and ecological balance of marine and coastal area and islands of Laganas Bay and the islands Strofades, with the parallel development of activities consistent with the protection of nature and landscape in the region. The NMPZ includes the marine area and islands of the Gulf of Laganas, the nesting beaches of sea turtles and an area of island that surrounds them, the wetland of Keri and Strofades Islands, located about 40 miles south of Zakynthos (figure 1). Zakynthos is the most important nesting habitat of marine turtles in the Mediterranean and is also the only European country where nesting sea turtles *Caretta caretta*. Further, a permanent population of the species risking extinction seal *Monachus monachus*, is on the west coast of Zakynthos.

2.1.1. The ecosystem of the protected area

The area of the Zakynthos’ National Marine Park is characterized by various types of ecosystems, of national and European interest, such as dune systems, underwater seagrass meadows (mainly *Posidonia oceanica* but also *Cymodocea nodosa* and *Halophila stipulacea* – immigrant specie) and coastal ecosystems. In these are found many of species of flora and fauna that are different according the specific sub-areas as the beaches and the dunes (mainly the central beach of Lagana), the cliffs (all around the golf), the wetlands (the lake of Keri in the west part of the golf and the banks of the streams that flow in the golf) and the internal lands.

The western part of the Bay at the area of Keri is characterized by different species of the Mediterranean maquis including many uncommon and interesting species such as the *Hypericum aegypticum* and *Dianthus fruticosus*¹⁰. The coastal area of the centre of the protected area is almost unvegetated, since the wind-driven

¹⁰ NMPZ, 2004

wave re-suspension of bed sediments does not permit the establishment of the vegetation 20 m from the coastline. After this barren zone, the existence of the sand dunes has made the ground more fertile for the establishment of different species of plants, albeit the urbanization of the area is considered as a significant barrier for the sustainability of the ecosystem. A similar vegetation pattern is identified on the islet of Marathonisi with an unvegetated coastal zone of 20-30 m and the rest of the islet to be covered by maquis vegetation. The east side of the Park is covered by Genistas plantation while in this area the extremely rare species of *Pinus pinea* has also been found. Finally, the significant part of the Park is covered by permanent cultures (olive trees and vineyards) that generally are low input cultures; the organic patches are located inside the protected area mainly in the hilly zone near Vassilikos.

Concerning the fauna there are two emblematic and endangered species that are the sea turtle *Caretta Caretta* and Mediterranean seal *Monachus Monachus*. The former is reproduced mainly in the beaches within the golf of Laganas (Sekania and Dafni are the most important beaches for nesting) and the latter use as shelter the cliffs at the west coast of the island, where is the Natura zone¹¹.

The loggerhead turtles *Caretta caretta* belong to the one of the two families of the marine turtles, namely in the Cheloniidae family and more specifically in the tribe of Caretini, Genus: *Caretta*¹². In the Mediterranean Sea, the total number of turtle nests is 3.300 and the majority of them are found in Greece, Turkey and Cyprus¹³. However, *Caretta caretta* species mainly nests in Greece and specifically in the Laganas Bay of Zakynthos, in the Kyparrissia and Lakonikos Bays of Peloponnese and finally in the Bays of Chania and Messaras in Crete¹⁴.

The greater part of the Loggerhead turtles life occurs in the sea, while only the females emerge onto land to lay their eggs in the sand. The females return to the beach of their origin in order to breed every 2-3 years¹⁵. The loggerhead turtles take residency in coastal areas and establish “home ranges” (Frazier, 1999) The Laganas Bay in Zakynthos hosts one of the most important breeding populations of *Caretta caretta* (Margaritoulis, 2005). Every spring these species migrate to the Bay and from May to August they lay on the six beaches of Marathonisi, Kalamaki, East Laganas, Sekania, Daphni and Gerakas, three clutches of eggs (Schofield et al, 2010).

Laganas Bay is one of the most important ecotopes of the Mediterranean for marine mammals, in particular for the Mediterranean Monk Seal (*Monachus monachus*), one of the critically endangered species in Europe. The Mediterranean Monk Seals are including in the Red List of Threatened Species of IUCN. Internationally, 400 -500 individuals remain and the 50 % of them are living in the Greek Seas¹⁶. The largest population of these species is located mainly in the Aegean and Ionian Islands and more specifically, regarding Zanynthos Island in the areas of Keri, Marathonisi and Gerakas¹⁷. According to the last record of these species from the WWF Monk Seal project in Zakynthos from 1997-1999, the total population number

¹¹ Plessas, 1997

¹² Bowen et al, 1993

¹³ Nooa, 2006

¹⁴ Archelon, 1997

¹⁵ PNMZ, 2004

¹⁶ Reijnders et al, 1993

¹⁷ Papadopoulos et al, 2010

reaches up to 16 animals that inhabit in the area of Laganas Bay as well as in the north part of the island¹⁸. The entrapment of the Monk Seals in the fishing gear puts in jeopardy the number of species and contributes to the decline of the resource base of fishes¹⁹ and aggregates the antagonism between the fishermen and the seals for the same resources.

However, the ecological importance of the Park does not only concern the protection of these two emblematic species but also expands its fundamental implication to other species and ecotopes. Zakynthos Island offers a friendly environment of residence for a wide range of mammals; 32 out of 116 mammal species that are found in Greece, are found on this island (Gardelis, 1999). The weasel (*Mustela nivalis*), the ferret (*Martes foina*) and a few bat species are regarded as rare and are included in the IUCN Red Data Book for Greece (YPEXODE, 1995 cited in Gardelis, 1999). The coastal wetland of the lake of Keri hosts numerous species of reptiles and amphibians such as the water snakes (*Natrix natrix*) and the fresh water turtles (*Emys orbicularis*). Alongside the coastline of Laganas Bay, many of the reptiles *Coluber gemonensis*, and *Vipera ammodytes* have also been found (NMPZ, 2004).

The areas of Keri, Marathonisi and Vassilikos as well as the complex of Strofades Islands which are located within the boundaries of the NMPZ, are considered as important areas for the spring and fall migration of avifauna species (NMPZ, 2004). Although, birds in Zakynthos have not yet thoroughly studied, many of seabirds and raptors have been recorded in these areas. For example, some of the seabird species that have been found are the Cory's Shearwater (*Calonectris diomedea*), the rare Audouin's Gull (*Larus audouinii*), the Yelkouan Shearwater (*Puffinus yelkouan*) and the Mediterranean Shag (*Phalacrocorax aristotelis desmarestii*). Raptors species, such as the Eleonora's falcon (*Falco eleonora*), have been observed on Marathonisi Island (NMPZ, 2004).

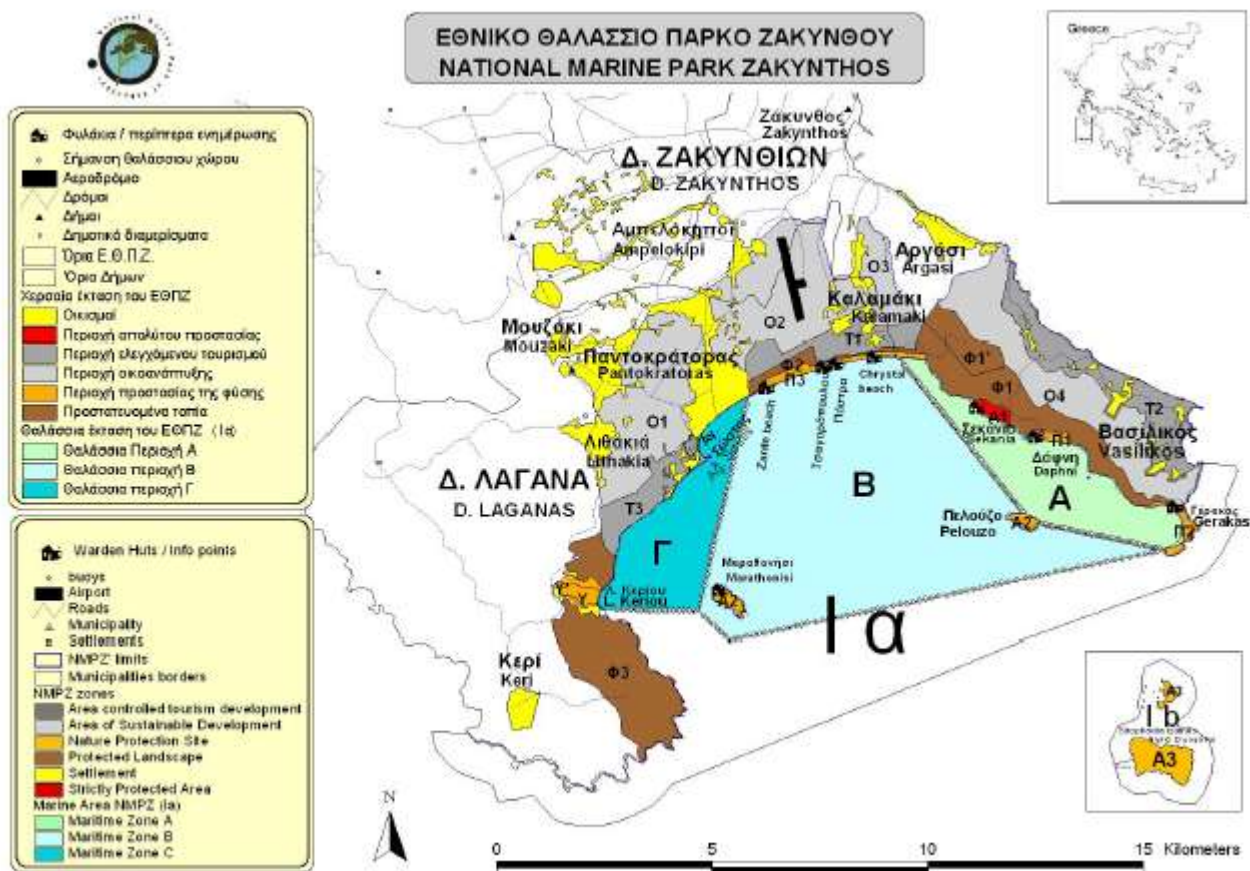
2.1.2. The zoning of the protected area

The National Marine Park of Zakynthos is divided into the marine protection zone Ia (the golf area) and Ib (Strofades islands) of 89,2ha and the terrestrial protection zone of 45,4ha (Fig 4); the core area is 14,2ha and the buffer zone is 31,2ha.

¹⁸ ESS, 2010

¹⁹ Kolliopoulos and Kolliopoulou, 2007

Figure 5 : Map of MPA of Zakynthos: zoning system of the NMPZ



Source : National Marine Park of Zakynthos

In general terms, within the boundaries of the Marine Area A and B, the regulations of the Park permit:

- navigation except from tankers ,
- fishing except from diving fishery during all year round and trawling gear and purse seines from May to October and finally,
- soft recreational activities such as swimming, wind surfing, scuba diving and canon.

The use of the protected sea and land area of the NMPZ is regulated by the management plan elaborated by the Protected Area Management Body (PAMB) based on the provisions of the Presidential Decree. A specific management plan is prepared every year based on the past experiences and on the existing means.

More specifically, between May the 1st and October the 31st, access, anchoring and mooring of vessels as well as fishing are prohibited for the area A of the zone Ia. For the same time period, although in the area B the access of vessels with a speed limit of 6 knots from May to October is permitted, anchoring and mooring of vessels are strictly prohibited. In the same area B, environmental friendly water sports such as sea bikes, canon and wind surfing are permitted, in a limited number regulated by the PAMB of the NMPZ and the local authorities. As far as the area C is concerned, the access of any vessel is also permitted with speed limit of 6 knots during the breeding period. The Zone Ib includes the marine area of the Strofades Islands (Fig.6) and navigation, fishing and soft recreational activities are permitted according to the above regulations. It is imperative to mention the strict prohibition of any type of aquaculture within the

boundaries of the marine protected area. Much of the Laganas Bay is quite shallow with an average depth less than 30 m. The lack of underwater mounds increases the rate of water exchanges between the Bay and the Ionian Sea (Euaggelatos, 2008).

The terrestrial area is also subdivided into the “Strictly Protected Area” of Sekania (A1), the areas of Marathonisi Island (A2), the Strofades Islands (A3), the beaches of Dafni (II1), Gerakas (II2) and Kalamaki (II3) which are concerned as “Nature Protection Site”, the area of Keri (Y and Y’) defined as “Nature Protected Site of Lake Keri” well as the areas (Φ1), (Φ2), (Φ3) which are referred as “Protected Landscape”. The “Strictly Protected Area” (A1) of Sekania is the core area of the Park and it is concerned as the top priority nesting beach of *Caretta caretta* in the Natural Marine Park; therefore, it is used only for scientific purposes and no other activity is permitted. The access to the area is only allowed for scientific research with the permission of the Management Body of the NMPZ. Further, it is worth to mention the fact that the WWF Organization of Greece has purchased the area of Sekania and its surrounding zone (372 m²) and in that way WWF made a useful contribution to the sustainable future of the most significant beach of the National Park. However, Nature Protection Site (A2) aims to preserve the number of the loggerhead turtles residing in Marathonisi Island, the sand dunes, the biodiversity of the endangered birds and the natural refuge of the monk seals *Monachus monachus*. In this area, daily organized visiting of the island is permitted by the management plan elaborated every year by the PAMB regulating the land and sea uses (MA of NMPZ, 2011); at that time, the park’s guards are providing information to visitors about the life and the characteristics of the loggerhead turtles as well as the regulations that visitors have to follow in this area. However, there are limitations in the number of tourists’ arrivals in the island as well as in the time period- approximately thirty minutes- they are allowed to swim and stay on the island²⁰. The mooring of vessels is permitted only for conservation operations but not during the reproductive period of the turtles. Scientific contribution of the volunteers is of high importance in this area, as every morning volunteers count the new nests of the loggerhead turtles that they have created during night.

The core consciousness about the Strofades Islands (A3) is the protection of the migratory birds as long as the complex of these islands is regarded as one of the most important stopover areas of the migration flow in the Eastern Mediterranean Sea. Concerning the tourism activity in this area, the measures that are applied are the same with those of the protected area (A2) albeit, until the recent days there is not any organized tourism planning for this area. The nesting beaches of Gerakas (II1), Dafni (II2) and Kalamaki (II3), which management is under the control of the Management Body of NMPZ, are open to visitors from 7.00 a.m. until sunset. The information kiosks along these beaches provide information about the characteristics of the protected area and the regulations that have to be followed in order to decrease the potential danger of the environmental destruction of the area.

In addition, the “Protected Landscape” zones, as well as the “Nature Protection Site of the Lake Keri” refer to the lake of Keri (Y) and its surrounding area (Y’) as well as the forestry areas (Φ1), (Φ2) and (Φ3). The appropriate managing of these protected landscapes is vital for the conservation of the migratory birds and their habitats. Within the boundaries of these zones, the human activities that are allowed are the environmental education of visitors – for example, the Sea Turtle Center is located in the zone (Φ1) - the designation of hiking and walking trails, the cultivation of the already existent agriculture areas and the beekeeping.

²⁰ The management rules established by the MA are not applied in the same way every year, as the number of guards hired every year depends on available funding. The same applies to the controls effectuated by the Port Authority’s guards.

The buffer zone of the Park includes also the Tourism Zone (T) where tourism development is permitted with buildings to cover an area of 2.000 m² and not to exceed the height limit of 7 m in 10,000 m². The Tourism Zone is subdivided into the sub-zones T1, T2 and T3 which concern the urban areas of Kalamaki, Vassilikos and Lithakia respectively. Finally, the Eco-development Zone is found as sub-zones O1, O2, O3, O4 distributed in many places around the Bay and allow for housing and development of high quality tourists accommodation such as villas and bungalows.

2.1.3. Purpose, objectives, management plan, means and activities of the NMPZ

The establishment of the National Marine Park (NMPZ, 2004) aimed to accomplish the following goals:

- Protection of biodiversity: as the protection and the conservation of the most important nesting beaches of the loggerhead turtles (*Caretta caretta*), the conservation of the monk seals population (*Monachus monachus*), the protection of the endangered species of birds - and more specifically the migratory ones, the conservation of the endemic flora as well as the coastal and marine ecosystems, the protection of the coastal and marine ecosystems giving more emphasis on the conservation of the seagrass *Posidonia oceanica*, the protection of marine resources
- Improve knowledge of environmental resources (monitoring and education, awareness) with the systematic monitoring of the environmental resources
- Development of compatible activities (traditional uses and sustainable activities) as ecotourism and traditional activities and land uses
- Provision of benefits to local community (attractiveness, income linked to any resources and cultural heritage)

The main source of funding for the Park is provided by the State and the European Union²¹). For the period 2004-2008 the budget for different investment as kiosks and information centers, boats, instruments, research programs, operational costs etc was 6,9M€. However, the Protected Area Management Body (PAMB) makes continual efforts to find alternative sources of funding, as the existent ones are insufficient for the operating needs of the Park²². The PAMB has developed collaboration relationships with the organizations of WWF and Archelon which is an NGO for the protection of the Sea Turtles in Greece²³. In summer, every morning the volunteers of ARCHELON count the new nests of the loggerhead turtles alongside the nesting beaches of the Marine Park.

Within the boundaries of the Park there are seven information kiosks where tourists have the chance to be informed about the role of the National Park as well as the regulations and the prohibitions imposed by the PAMB on tourists' behaviour in the beaches of high importance. There are several means of providing information about the Park such as the positioned signage along many central points of the island that show the way of access to the Park, the posters in every beach of the Park that provide information about the location and the special characteristics of each beach, the leaflets created by the Management Body of the Park and finally, the responsible guardians of the kiosks who are well-informed local people hired by the Management Body of the Park and being responsible for the face to face provision of information to

²¹ Togridou et al, 2006 - WTP

²² Bozos and Tzouanou-Tzakou, 2004 cited Togridou et al, 2006

²³ Fely, 2004

tourists. However, during the summer season of the year 2010, only four out of seven information kiosks were operated²⁴ due to budget constraints that prevented the hiring of more guardians this year. The budget of the PAMB for 2010 was 687.583€ in comparison to 772.921€ for 2009 (-12,4%). The situation has worsened in 2011 due to sever cuts concerning the national budget.

The Thematic Exhibition Center of the loggerhead sea turtle *Caretta caretta* is located in the area of Dafni within the protected area in the municipal department of Vassilikos. The landscaped area of the thematic center, the exhibition and information material, the use of multimedia and memorabilia given, gives to visitors the occasion for information and awareness about the sea turtle and its nesting in the beaches of Zakynthos. Its role is not restricted to the study and promotion of *Caretta caretta*, but extends to the acquaintance with other priority and endemic species of flora and fauna found in Zakynthos. The construction of the Center has been funded by the European Regional Development Fund (more than 80% of the budget) and national resources (Ministry of the Environment). It runs with the help of donations from the National Bank of Greece and “Alexandros Onassis” foundation.

The main activity of the PAMB of the NMPZ concerns the program of supervision and information on the park area. It includes: control and information of visitors about the uses that are authorized on the protected beaches, the surveillance and guarding of the marine area of NMPZ and provision of information to navigators and swimmers with the help of port authorities, the keeping of the forest area within the terrestrial area of the park and the operation of the information centers. The PAMB has also installed 3 floating platforms in order to facilitate the access of yachts and professional boats effectuating trips within the golf for visiting Marathonissi and for turtle observation. This action permits a better management of the visitors. There are several means of providing information about the Park such as the positioned signage along many central points of the island that show the way of access to the Park, the posters in every beach of the Park that provide information about the location and the special characteristics of each beach, the leaflets created by the Management Body of the Park and finally, the responsible guardians of the kiosks who are well-informed local people hired by the Management Body of the Park and being responsible for the face to face provision of information to tourists.

One of the most important actions of the Management Agency is the environmental information and education of Zakynthos' school population; the programs are adapted to age and learning level in order to achieve maximum awareness of new citizens. Within the framework of the program every year are organized educational tours in the protected area, visits to the Thematic Exhibition Center, working groups and event organization.

The annual organization of the volunteer program of NMPZ welcomes every year more and more individuals wishing to participate in its activities. The ultimate objective of the program, beyond the strengthening of the PAMB staff during the summer months, is the overall environmental public awareness and the detailed information on the actions of the Park. Volunteers learn about the environmental parameters affecting nesting, the management measures adopted to protect the ecosystem as well as the problems encountered in each area, along with measures that the PAMB has taken on in order to resolve them. The volunteers take part in the scientific work and have the opportunity to attend the nesting activity of *Caretta Caretta*, they are participating in nest excavations and they assume the role of eco-guides and of guardians on the protected beaches. Their vast majority are university students, mostly biologists, and able to offer quality services to the visitors of the Park.

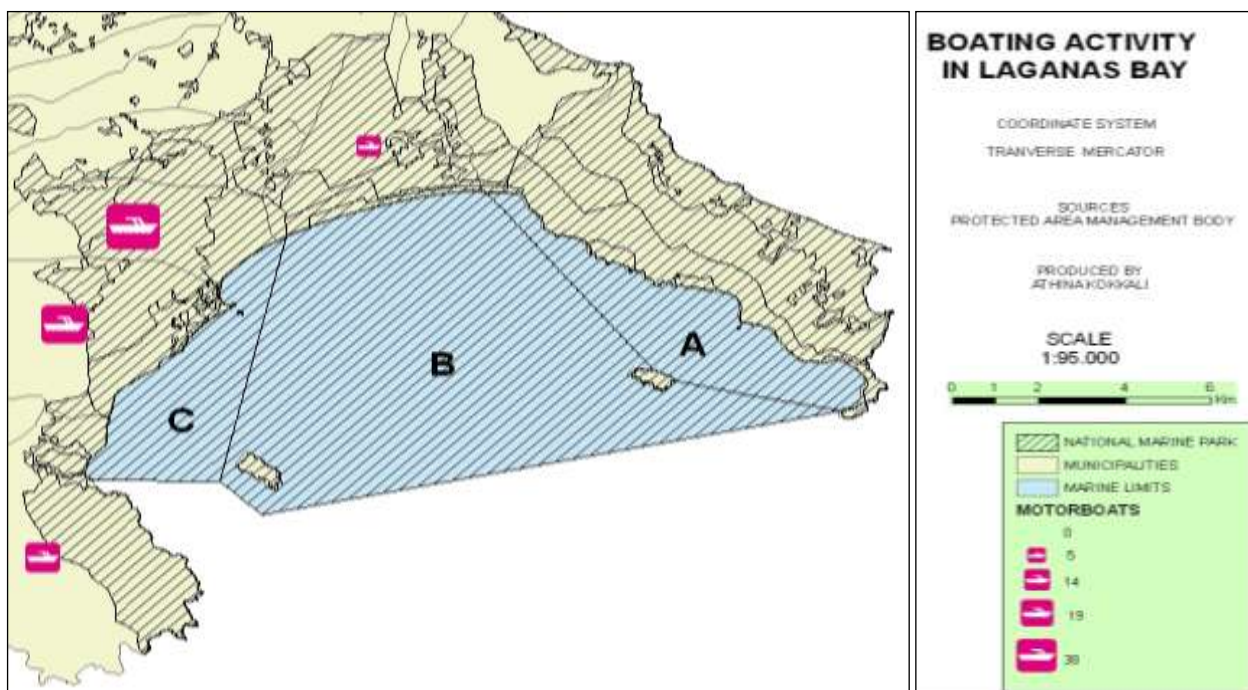
²⁴ Kiosks located in Gerakas beach, Kalamaki beach and in the Marathonisi Island were closed.

Monitoring the breeding activity is one of the main responsibilities of the PAMB. The purpose of this research field work is to record accurately the parameters affecting the nesting of the turtles in Laganas bay, in order to apply the right tools for increasing the effectiveness of the management system. Furthermore the impact of human activity on or adjacent to the nesting areas is also subject to regular assessment at the six beaches under supervision: Gerakas, Dafni, Sekania, Kalamaki East, Kalamaki west and Marathonissi.

2.1.4. The visitors within the MPA

Zakynthos tourism activity is not only measured by the number of accommodation units, of tourists and of the tourism enterprises (bars, restaurants): there are other facilities offered in the area which play an important role in the critical evaluation of tourism, but also for the evaluation of the pressure exercised in the protected area. In this case study, water sports centres operating in Laganas Bay offer a range of recreational activities such as boating, canoes, scuba-diving and sea-bikes. Concerning the boating activity (Fig.5) there are four points of departing, namely in Kalamaki, Laganas, Lithakia and Keri. The most intensive boating activity is found in Laganas area with 38 boats for rent. Tourists rent a boat from these sites and they are travelling in Laganas Bay. Usually, visitors stand in Marathonisi Island for experiencing this isolated and inhabited island. Boating activity is operating according to the regulations of the Park and it is permitted only for the zones B and C. As can be seen from the Fig. 6 Kalamaki has the less boating activity counted five boats, departing from this area. The high pressure exerted by this activity to the area and especially to Marathonissi (30.000 visitors and 3.900 vessels for 2007) has led the PAMB to establish a framework for cooperation with the consortium of vessels' owners regulating the activity in order to protect careta-careta and to ameliorate the tourists' satisfaction.

Figure 6. Boating activity in Laganas Bay



Source: Kokkali, 2010

In addition, the water sports facilities in Laganas Bay include canoes, pedalos and scuba diving. The data are illustrated in Fig.7 and concern the years 2009-2010 have been provided by the PAMB. Hence, it is obvious in Fig. 7 that most of the activity is happening in west part of the bay on the beach in front of Laganas'

settlement. (50 pedalos for rent, 16 canoes and three scuba diving centres) and in Kalamaki area (30 canoes and 15 pedalos). Finally Keri has 2 scuba diving centres

Following this, numerous tickets sellers offer turtle spotting opportunities in the Laganas Bay. As it can be seen in, the stands of the turtle spotting activities are found in two areas, namely the Laganas and the Keri areas. The owners of these stands are local people and offer sighting trips which length ranges from an hour in Laganas Bay to an afternoon excursion including a trip to Keri caves or a full day round the island tour. Some of the boats are glass bottomed boats in order to facilitate the process of turtle spotting and every tourist to get a good view from the turtles. The turtle spotting and day-trips activities, departing from the Laganas area is more intensive than in Keri. In Laganas area, the total number of boats for these activities is 19 whereas the correspondence proportion in Keri is almost the half (9).

Figure 7. Water sports in Laganas Bay



Source: Kokkali, 2010

In summary, from the existent analysis and evaluation of the tourism activity in the National Marine Park of Zakynthos in terms of accommodation units, enterprises and facilities, it can be determined the most intense area is Laganas. The vast majority of hotels, apartments, tourism enterprises, water sports facilities and recreational activities are found in Laganas area that holds the first position of tourism activity. Secondly, Kalamaki, at the east of Laganas, holds the second position in hotels and water sports activities. Lithakia, at the west of Laganas, does not play a central role in accommodation units, although it comes second in water sports and boating activities, possibly due to the port of Agios Sostis. The area of Keri and the ex-Municipality of Arkadion come second in the supply of apartments after Laganas, although they appear a moderate or negligible supply of water sports and recreational facilities. In the case of the Vassilikos area, the absence of such facilities is due to the interdictions that are imposed in the marine zone A.

An important question about the attractiveness of the MPA is linked to the motivation of tourists when they decide to visit Zakynthos. Two independent surveys conducted in 2010 and 2011 resulted to the same conclusion: the National Marine Park of Zakynthos, in itself, has a low attractive force on tourists.

In the first survey²⁵ the motivation for choosing Zakynthos for their vacations is firstly its beaches, its landscapes, the shipwreck, relatives and friends (for nationals), recommendation and low price, secondly the fact that it is an island with good weather and only in the third place (less than 10%) to visit the National Marine Park of Zakynthos. Beautiful landscape, holidays, beaches and friends and relatives are the main reasons of revisiting the island, while the NMPZ is only in the 5th place with 6,3%. The turtle spotting has the greatest demand as (34.9%) from the respondents who had practiced it while bird watching indicates the lowest preference (13.1%). Hiking is coming in a the second position of practicing and usually international tourists gave that answer, while the environmental friendly water sports as they have been recorded in the first part of the survey and include canoes, pedalos and scuba diving activities, are preferred by almost one fifth of visitors. These percentages are found due to some specific reasons. Firstly, turtle spotting is the most organized recreational activity in the Park and it is more attractive than the others, as it is related with the protected species *Caretta caretta* that the National Park is famous for and a percentage of tourists is coming only for this reason. Further, in principle, people seek for experiences associated with nature and therefore, turtle spotting is regarded as one of the most interested activities that provide the linkage between tourism and environment. Secondly, bird watching is only practiced by amateur birdwatchers, since there is no company that organizes this activity. As far as the environmental friendly water sports are concerned, the low responses rates of tourists are possibly due to the high prices of the water sports.

Interviewees were also asked about their willingness to experience more activities in the National Marine Park of Zakynthos. More than half of the sample has answered positively, providing some new ideas. the majority of visitors (24.1%) suggest guide walking and eco-festivals as the most important activities, followed by the provision of more information about the Park and the loggerhead sea turtles (17.1%). Other proposed recreational activities to be developed in the National Park are: environmental education centre, sports, night watching of turtles, construction of paths and horse riding.

An interesting finding from this survey has to do with the willingness of tourists to pay for the entrance of the Park. A large majority of the respondents (81.1%) indicated that they were willing to pay for the entrance of the Park, as they considered it as a major financial support for the current needs of the protected area. Looking next the amount of money that they proposed to pay for the Park, almost half of the respondents (52%) agree that the most appropriate amount is 5€. Many of the tourists were willing to pay for the entrance of the Park but when they were asked about the amount that they would propose, they mentioned that it depends on the facilities provided by the Park. However, 22.3% of the participants agree to pay 1€, as a symbolic amount for the natural park. In addition, a minority of respondents agreed to contribute to the financial support of the Park, proposing another way of payment that is to pay 5€ for the needs of the Park in the booking process of their holidays. On the other hand, there is minority that is not in accordance with this statement. They were reluctant to pay for the Park either because they were dissatisfied with the current picture of the marine park or because they are not in line with the concept to pay for a National Park, as it is “National” and everyone has the right to enjoy the nature free.

In the second survey, the visit to the NMPZ was the motivation of the travel for 4,7% of the 81 national tourists and for 2,7,% of 211 the foreigners. Concerning the attractions visited, the Castle of Zakynthos and the Shipwreck were the most popular; 39,5% of the 223 visits effectuated by the Greeks to different attractions (almost 3 visits per tourist) and 19,9% of the 261 visits effectuated by the foreigners (slightly

²⁵ Kokkali 2010: 175 questionnaires where completed from international (67,4%) and national (32,6%) tourists on the five beaches of the National Park.

more than 1 visit per tourist) have visited the Park and 24,7% and 5,2% respectively the Thematic Exhibition Center. Turtle watching have been practiced by 16,2% of the Greeks and 24,4% of the foreigners while 44,4% and 31,5 of them have practiced a sea cruise²⁶. The turtle impressed positively 2,9% of the Greeks and 5,5% of the foreigners while the beaches, the hospitality, the natural beauty and the night life had a much better score. The average daily expenditure was 67,5€ for national tourists (71€ for those who stayed in hotels and 63,5€ for those stayed in rooms to let) and 90,9€ for foreigner tourists (97€ in hotels and 69€ in rooms to let).

2.2. Links between the MPA and the island of Zakynthos

The main purpose of the MPA creation is to protect the habitat where the sea turtle uses for its reproduction; as secondary objective is the protection of the Mediterranean monk seal and its habitat. The protection of fishery resources, of the native flora habitats and of the habitats of the protected avifauna (especially migrant birds) is complementary objectives. In order to achieve these goals restrictions to land and sea uses have been established; these restrictions are absolute for the core area and differentiated in the other zones, marine and terrestrial, as described above. The most significant factor that affects the future of the *Caretta caretta* population is the degradation of the coastal environment. This degradation is caused by coastal development, especially for touristic purposes²⁷. The ecosystem of the gulf was not under an important pressure before the tourism development era as the surrounding land was not very productive and consequently not appropriate for agriculture activity. The permanent population was also limited to small settlement mainly on the surrounding hilly areas; it has to be noticed that the settlement of Laganas that is today the most important tourist location of Zakynthos was inexistent in the late 70s. Since then the development process has totally modified the habitats, the vegetation and the coast, mainly by the construction of tourism and general infrastructure as the airport, many roads, two small fishing and recreational ports, the extension of agricultural land mainly for the plantation of more olive trees, the intensive use of water resources and an intensive use of the beaches by tourists and permanent inhabitants. The secondary sector has limited activities on the island and in this area specifically; 6 manufactures for olive oil production, 2 quarries and the landfill of 9 hectares located at a slope within the protected area.

Turtles are also threatened by the accidental capture in various fishing gear, which leads to mortalities, sometimes intentional. In Greece, 80% of the wounded *Caretta caretta* that introduced in the Sea Turtle Rescue Centre of Archelon for their protection was due to their accidental by-catch from fishing vessels²⁸.

In contrast to what happens in many other MPAs, in Zakynthos most of the protected area is located in the centre of the area where a heavy tourist activity had begun some years before the proclamation of the National Park, and the imposition of restrictions both in the terrestrial and marine areas. Therefore it is difficult to talk about the relationship between the Marine Park and Zakynthos as if it were two separate areas; it is easier to understand why local people have perceived the limitations imposed firstly in 1980 (protection of Sekania, Gerakas and Marathonsi), then in 1987 (creation of zones where building restrictions were applied), in 1999 (creation of the NMPZ) and finally in 2000 with the establishment of the PAMB of the NMPZ as “hostile actions” against the development of their island and the opportunity to

²⁶ It has to be mentioned that every tourist (national and foreign had practiced 1,5 activity

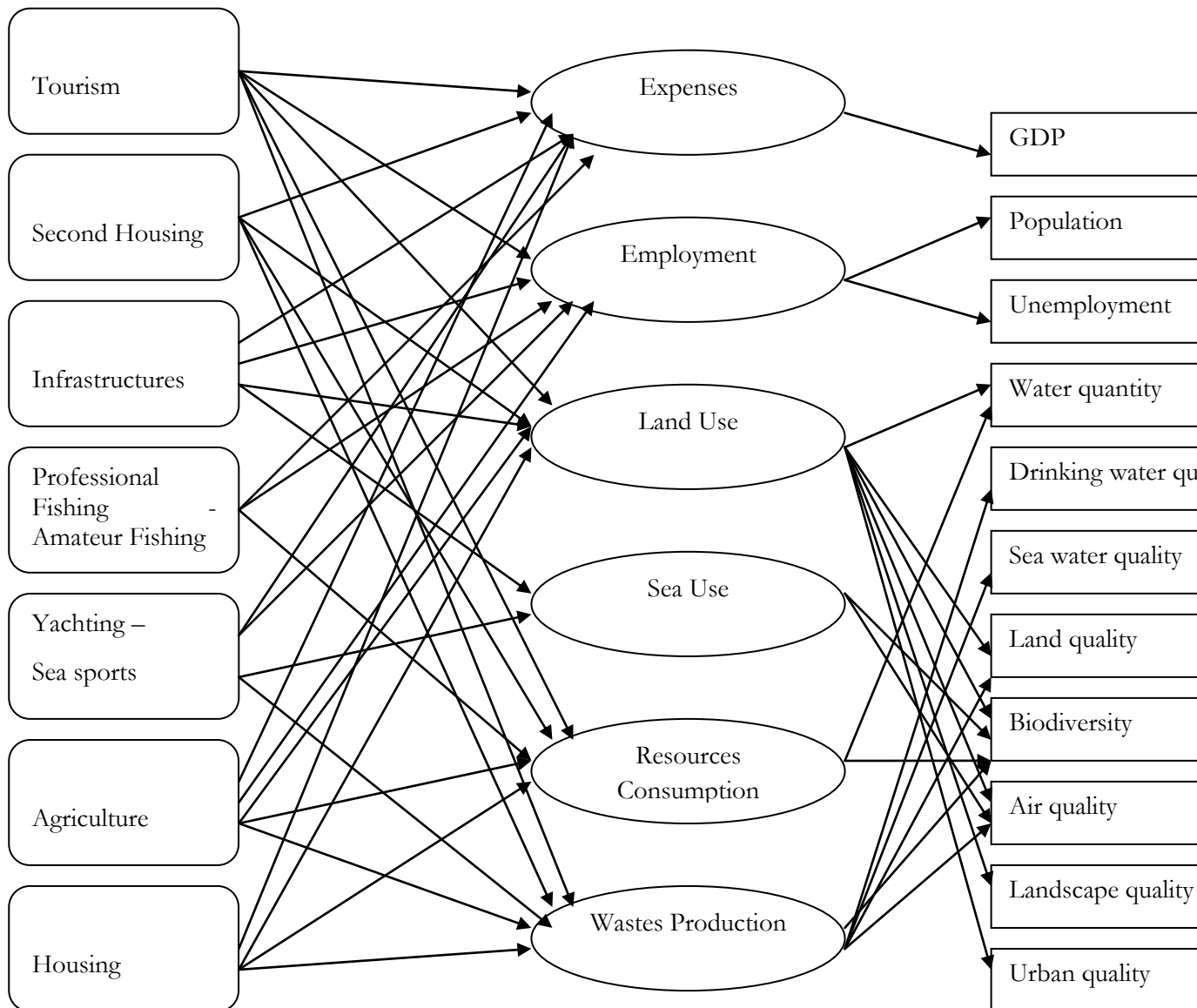
²⁷ NMPZ, 2004

²⁸ Panagopoulos, 2003 cited Margaritoulis, 2010

increase their income based directly on tourism and indirectly on the surplus value created from the appreciation of land prices.

In order to understand the interactions between MPA and the whole area we can map their links using an approach based on the extended DPSIR framework²⁹ in order to include socio-economic results and impacts beside the environmental ones as presented in the Figure 1 (Spilanis and ali 2011).

- Figure 1 : DPSR framework applied in Zakynthos



²⁹ The Driving Force, Pressure, State, Impact and Response is a causal framework for describing the interactions between society and the environment used by many organisms as United Nations (1996) EEA (1995). This framework is an extension of the pressure-state-response model developed by [OECD](#) (OECD 1991)

As it has already been presented, the Driving Forces (D) of the socio-economic and environmental changes are the economic activities (mainly tourism and construction in general as they are the activities in expansion plus infrastructure and secondarily agriculture, fishing, manufacture), creating important results (or pressures - P) as:

- land use changes (as presented in the figure 4),
- resources' consumption (mainly water, energy and fishery), and
- waste production.

Land use changes and mainly the intensification of the use in coastal zones had put a lot of pressure specially on the beaches, the turtle's habitat for nesting; in parallel, activities in the sea as fishing and sailing, have diminished the number of fishes, have put in danger turtles' life and have downgraded the seabed, causing loss of biodiversity, degradation of the natural capital and of the state of environment (S) of the area. Additionally, the intensification of the constructions has also affected the landscape mainly along the roads outside of the settlements.

The society response (R), i.e. the policy measures adopted by the Greek government, has to do with the restrictions imposed to land and sea use in order to maintain the sea turtle, the monk seals, the migratory birds and their habitats, had affected economic activity in short term. Main results of the policy adopted are:

- The fishing activity (both professional and recreational) has been restricted within the protected area despite the problems for an effective control; the recreational fishing is totally prohibited within the protected area and the professional fishing is prohibited in the area A during the summer period. The control is quite impossible at Strofades islands where the prohibitions of zone A are applied.
- the construction activity mainly of second houses and tourism installations has been prohibited within the core zone (Sekania beach, Marathonisi island and Strofades islands), the nesting beaches and the protected landscape areas and limited in the buffer zone comprising the tourist zone (by establishing limitations of the size of the new buildings) and the eco-development zone where housing and development of high quality accommodation is permitted. Even if the law establishing the restrictions has also provided compensations (as indemnifications, transfer of building coefficient) when limitations and restrictions were too burdensome for the proprietors of land or expropriation, these provisions have not been applied creating a lot of conflicts; some of them have been put in court.
- On the one hand, the limitations for the construction of new tourism beds don't allow the expansion of tourism activity within the protected area. On the other hand the changes outside the protected zone are too important; so many local stakeholders have argued that the control of land use changes had to be more extensive, covering perhaps the whole island.
- An economic activity concerning water sports is developed within the NMPZ area; even if part of it has been developed before the creation of the Park, the fact that a specific activity around turtle watching has been developed, we can argue that there is more economic activity despite the restrictions mentioned above.
- The economic activity on and around the under supervision beaches has been limited during the day as different activities and practices have been totally prohibited and other put under a strict management plan elaborated yearly by the PAMB and supervised either by the PAMB's guards or by the Port authority guards. The results concerning the preservation of the beach when somebody compares the part of the beach of Laganas where the restrictions are applied and the adjacent part of the same beach

where there is no restriction: on the first one the economic activities are limited to some “light” and mobile structure servicing tourists, keeping away from the nesting places during the day and total prohibition of the use of the beach during the night have conserved the quality of the sand; on the second one, the permanent hard structures (tavernas, bars, sport and other recreational activities) and all-day (and all night) use is allowed even by cars and motorbikes has led to the degradation of the sand quality.

- The activity is also limited within the sea protected area as the construction of permanent structures as ports for yachting (i.e in Keri) is submitted to much more severe standards in order to limit the disturbance of the habitat and the use of the area is prohibited within the zone A and severely regulated for sailing and fishing in the zones B and Γ (figure 5).
 - Within the direct results from the creation of the AMP we have to include:
- The creation of PAMB, as a new economic structure with a budget coming either from national or from European financing and the employment of permanent and seasonal staff. For 2012 there are 32 permanent employees either in scientific tasks or as guards and more 23 guards are going to be employed for 5 months (9,6 annual jobs)³⁰ Concerning permanent staff, its level of knowledge and competencies is much higher compared to the average qualification of the employees in Zakynthos as one third of the permanent employees have a University degree³¹ . Its presence has engaged a number of scientific activities as congresses and field research and generally has attracted in Zakynthos people which never would have visited the island under other circumstances.
- The presence of the NGOs Archelon and WWF is not without direct economic benefices as their activities are supported by money injected in the local economy from abroad; additionally the presence of at least one hundred of volunteers each summer for the supervision of nesting activity of the sea turtles creates an extra economic activity.
- The acknowledgement of *Caretta caretta* as the “symbol” of Zakynthos (it is obvious concerning the promotion material and the opinion of many tourism entrepreneurs, hoteliers and travel agents) has some direct positive results through an enrichment of the activity of the conventional 3S tourism through i.e turtle watching cruises, scuba diving activities, turtle souvenirs etc. Despite this existing “symbol”, it has not been used sufficiently in order to change the “tourism product” and the profile of Zakynthos as tourism destination.
- The development of quality accommodation combined or not with alternative activities as riding, hiking, painting, pottery-making, agro-tourism ones within the areas of eco-development (mainly in the area of Vassilikos close to the beaches of Dafni and Gerakas – O4 in figure 5) has slightly affect the tourism supply. It has to be mentioned that these accommodations have resisted better to the tourism crisis of the recent period concerning the prices that can obtain from their clients (these enterprises are less or not at all dependent on TOs) as well as their seasonality and their occupancy rate.
- A “new” agricultural activity is emerging in the same area (O4) with mainly organic olive-oil production and in the plain (zone O1) with vineyards.

³⁰ In previous years, before the economic crisis, the number of seasonal staff used as guards for the application of the management plan was higher

³¹ In comparison, only 7% of the total population of Zakynthos had a University degree at 2001 census.

The restrictions imposed by policy measures to land use changes and to sea use, if strictly implemented, are going to protect ecosystem functions and services that are directly linked to people well-being³², such as:

– (a) *Production function*

- Fish stocks and other food of marine origin actually being in decline; this evolution can support a sustainable use of these resources in medium and long term. Even if there is no quantitative data, the president of the fishermen association has admitted unofficially that nowadays the quantity of fishes caught is higher than some years ago even if it is known that the prohibitions concerning fishing are not strictly applied.
- Other food production and firewood (renewable energies) on the terrestrial protected area as the urban expansion is limited within the protected area and a supporting framework for quality products was established by the PAMB (label from the NMPZ) plus financing for the production and commercialization of traditional products respecting quality rules using EU funds from the regional operational program.
- Fresh drinking water as the protection of natural ecosystems, mainly of the wetlands at the plane but also of the forest and maquis areas on the surrounding hills around the golf. If the protection of terrestrial area of the Park and mainly of Keri wetland as well as the application of the legislation about waste disposal were more effective, the effects on the quantity and the quality of fresh water would be less aggravating.

– (b) *Cultural and informational function*

- Provision of good quality supports for recreational activities such as preserved landscapes (terrestrial and marine), water transparency and the presence of a riche(er) biodiversity and rare species to be watched. Tourists have reported that they are satisfied by the quality of the landscape and of the recreational activities in the golf; this satisfaction can be assigned –even partly- to the protection measures and the management plan of the beach (limitation of the number of tourists and of activities) and the sea use (limitation of the sea traffic, restriction of yacht berthing, control of pollution etc).
- Scientific knowledge is improved inside the NMPZ for instance by the observation of natural processes as the scientific groups are monitoring every day the nesting areas in order to record information about the places where the turtles are nesting, the nesting failures, the incubation of the new turtles, the pit-tagging of the female turtles in order to study their behaviour, the assessment of light pollution in order to evaluate the disturbance provoked to the turtles, the assessment of the quality of the beach etc. All this information is important in order to ameliorate the conditions of reproduction and of survival of the turtles.
- Preservation and dissemination of information concerning cultural and natural heritage (environmental education, public information...). The main receiver of this information is the local population as well as the entrepreneurs and the employees of the area as a lot of information activities are organized by the NMPZ. The Information Centre is created in order to give more accurate information about caretta-caretta through different communication tools and to aware the visitors, mainly the young ones. The guards have to organise visitors' information and management and to control the professionals who are working within the protected area if they are respecting the management rules.

³² These are the Impacts of the DPSIR framework

- (c) *Regulatory function*
- Regulation of local climate and mitigation of extreme events (land and beach erosion included) that benefits to agriculture activity but also to residents and visitors. Better climate conditions could decrease the use of cooling and heating equipment.
- Organic waste treatment when grey water exceeds treatment capacity avoiding generation of pollution especially in shallow waters affecting tourism activity.
- Contribution to global climate regulation through CO₂ sequestration in Posidonia meadows and rizohmes and also forest cover affecting general impacts as sea level rising.

What is the valuation of the applied policy focusing to protect *Caretta caretta* on the sustainability of local development? We will try to have a qualitative approach about the effects of the measures adopted for the protection of the area in two periods: the first (1990-2000) concerns the period after the implementation of the restrictions in land and sea use and the second (2000-2010) after the establishment of the NMPZ (Table 4).

Table 4: Economic and environmental evolutions due to the establishment of the Park

		Evolution with the presence of the park	
		1990-2000	2000-2010
Driving forces	tourism investments	+++*	+
	tourism activity	++	-
	residential houses	++	+
	construction	++	+
	agriculture	-	-
	husbandry	-	-
	fishing	-	+
	manufactures	=	=
Pressure	land use - urban sprawl versus natural habitats	++	+
	water consumption	++	++
	energy consumption	++	++
	waste water production	++	++
	solid waste production	++	+
State	beach - dunes	-	+
	turtles	-	+
	fish	-	+
	posedonia	-	=
	birds	-	=
	water quantity	-	-

water quality	-	-
sea water quality	-	=
land quality	-	-
landscape quality	--	-
climate change - air quality	--	-

*A + sign means growth, - sign means decrease and = sign means no evolution

We can argue that since the creation of the Zakynthos MPA a deceleration in activity of the main driving forces tourism and second home construction within the protected area is observed mainly due to a stricter application of land and sea use restriction fact that has provoked an amelioration of different environmental capital and consequently of its ecosystem services. Tourism crisis, which coincides with the establishment of the PAMB in 2000, can be a complementary (?) explanation.

II. Prospective analysis and measurement of the effect generated by Zakynthos MPA on the local development

1. Potential development futures in Zakynthos and effects on the Zakynthos MPA

- The fact that the tourism activity, the main driving force of the economy of Zakynthos, has entered within a long term crisis since the beginning of the 21st century is more than obvious from the data presented in the 1st part. It is not an isolated phenomenon as it is recorded at many destinations and at the national level and it reflects the problem of the competitiveness of mass 3S greek tourism product. This crisis has not been reflected on the local GDP evolution until 2009 due to national parameters: a very important grey economy in conjunction with a galloping private and public borrowing has maintained a high rate of private consumption and of public expenditure leading to an unbearable debt; this was the only way to counterbalance the continuous increase of the deficit of the foreign balance due to a loss of competitiveness of greek economy (tourism and primary sector included) and the diminution of investment into productive sectors (except housing). Since 2009 the greek economy has entered within a very vigorous recession (-13,6% of the GDP in three years) due to the net decrease of investments, public and private consumption combined to a quasi interruption of money lending by the banks.
- The greek crisis is not a single and isolated phenomenon but a part of a general (global) economic and financial crisis emerged in 2008 that has lead many of the most powerful economies to a recession or in the best case to a stagnation. This evolution has provoked an increase of unemployment (in EU it has recently overpass for the first time 10%) and a diminution of the private incomes and consequently of their expenditures. As any forecast for these economies, principal clients of the greek products and services (tourism included), remain uncertain, it is rather difficult to see how the recession trend can change in Greece and how fast it could happen.
- Given this situation, actually it is very hazardous to speak about the development futures in Zakynthos as for every other island economy; a restructure of the local socio-economic and environmental system would be a more reasonable term as the regain of competitiveness of the tourism product and of the attractiveness of Zakynthos as destination is the first priority.
- Even if there is a higher level of acceptance of the NMPZ and of the MPA's activities from local bodies and population, there is no till now an integration of the Park to local development policy in

order to take full advantage of its presence and at the same time to take under consideration the limits set by its presence. It has to be underlined here that local population can apprehend mainly direct and short term economic benefits and costs affecting him personally, less the collective (public) and long term results and hardly the non monetary effects and impacts. During the crisis period, it is very probable that short term approaches take advantage on the others.

1.1. Proposed prospective scenarios

As developed earlier the main drivers of changes in Zakynthos during the last 30-40 years have been tourism (HORECA) and secondary house development; the construction sector is closely linked to the above sectors, as well as the trade sector. These branches have led to the increase of employment and of incomes locally, inverting the migration trend recorded till the 80s, also creating a secondary / multiplier effect to branches serving the local demand (administration, education and health sector, banking, transport and communication, electricity and water production and waste services as well as trade and construction sector). Agriculture and fisheries, even if they are declining activities, as they have not been linked to tourism development, are also going to be part of the prospective scenarios.

Given the above analysis, the scenarios about the potential development of Zakynthos have to take into account the general socio-economic crisis and the recent trends regarding the tourism sector in parallel with the shift of the expectations and the goals of the population, mainly in Europe, for more sustainable strategies. It has to be mentioned here that the current EU strategy EUROPE 2020 guiding the development policies for the coming years has three axes: smart, green and inclusive growth (EU, 2010); the competitiveness of the European economy has to be based on knowledge and innovation, to be more resource efficient and greener, fostering high employment delivering social and territorial cohesion

Three scenarios are going to be explored to highlight the effect of the preservation of natural assets on the local sustainable development, through potential evolutions of the NMPZ:

- The “Tendency scenario”: Zakynthos in the greek crisis after 30 years of growth.
- The “Quality scenario”: Creating competitiveness based on the production of quality products and services by using the park’s natural resources
- The “Preservation scenario”: The reinforcement of the protection status for an alternative development.

1.1.1. The “Tendency scenario”: Zakynthos in the greek crisis after 30 years of growth

This scenario is based on the Very Weak Sustainability (VWS) approach where the main objective is to find again the growth trend based mainly on the existing drivers of tourism and secondary houses. The growth strategy is based on traditional “cost-benefit” analysis meaning that every activity that can increase GDP is welcome and the preservation of the environment has to be achieved if possible through the use of environmental friendly products and techniques combined with the amelioration of the financial results of the companies (increase of revenues and/or diminution of the production cost).

The competitiveness of the insular tourism 3S mass product and of the economy in general can be reached mainly through the diminution of production cost (i.e. salaries, social security expenditures, national and local direct and indirect taxes, cost of water and electricity, cost of waste treatment, cost of other provisions as equipment, food, cleaning materials etc), through the adoption of innovations and new technologies (i.e. technologies of information and communication, e-commerce, renewable energies etc) but also through the

externalisation of production costs to community. The diversification of the product (i.e. development of specific tourism products as golf, marine tourism, congress tourism etc) can be a strategy whether the inputs used for its production are local or not, if the carrying capacity of the area is respected or not³³. The development of transport infrastructures for bigger airplanes and ships, for ship-cruises and for yachts, new investment for new, big and luxury hotels, for villas, for desalinisation of water, for waste treatment etc are welcome in this scenario as they add on GDP creation. The development of any other activity can be possible if they respect the same rules without hampering the development of the activities considered as more competitive and efficient; nevertheless there will be less space for agriculture activity and husbandry and less fish resources for fishing activity. Imports will continue to accrue in order to satisfy local demand and the creation of an aquaculture farm could be foreseen.

The preservation of the MPA is rather an obstacle towards the achievement of the growth goals than a priority even if the maintenance of the scenery has been considered by tourists as a positive output. As the regulations imposed by the European and the national law and implemented by the PAMB are limiting the expansion of different activities related directly or indirectly to tourism and to holiday activities, these restrictions have to be limited to the strict necessary. The land and sea use prohibitions have to be re-examined; otherwise the owners of land that has been excluded from building or where limitations are imposed, have to be indemnified.

The regulation of the number of permits for different activities concerning the land and the sea use within the Park given by the Port Authority based on the management plan of the PAMB is under reconsideration after the new legislation for the liberalization of economic activities voted by the Greek Parliament in 2011.

In this scenario it would be expected that the pressure on the resources will be aggravated and the stock of natural capital will diminish; consequently the different kind of services described above is going to be affected negatively.

A qualitative estimation of the evolution concerning driving forces, results and impacts is presented in Table 5.

1.1.2. The “Quality scenario”: Creating competitiveness based on the production of quality products and services

This scenario is based mainly on the Weak Sustainability (WS) approach where the main objective is a long term diversified development based on the preservation and the exploitation of local cultural and environmental resources that are the comparative advantages of Zakynthos within a green economy. The production of quality products and services based on new knowledge, innovation and skilled human resources are prerequisite for the success of such a strategy.

This means that growth through tourism and secondary houses is not any more the main option as it is considered that the carrying capacity of the island is reached if not over passed. Tourism has to be “transformed” in order to increase its quality³⁴ and to diversify its supply with new activities in order to satisfy the different motivations of tourists seeking to live particular experiences and to discover the place

³³ The preservation of ecological functions and ecosystem services is not a goal per se in this approach, as priority is given to GDP maximisation.

³⁴ The application of volunteer environmental quality schemes as ISO 14001 and EMAS to tourism enterprises is a prerequisite; a more broader and demanding scheme as a label of local responsibility and quality has to be developed.

visited. They have to following specific rules described in the MPA's Charter and management practices applied by the MPA in order to protect the environment and improve tourists' satisfaction. The discovery of a place has to do with its natural resources (the MPA is the most important but not the only one as there are more resources to be explored in the sea but also on Zakynthos), local food (so the development of agriculture products is necessary in order to substitute imports), local traditions (embroideries, handicrafts, plastic arts, music etc), monuments and museums, settlements etc; the development of activities can increase the length of stay and the tourist per day spent that seems to be low nowadays, to decrease seasonality, but also to create more stable and better paid jobs in modern sectors using educated labour force. The additional activity will not create more pressure as investors, locals and tourists will be more aware about protection goals, the development of new activities is going to be more regulated than previously and the application of environmental quality schemes from enterprises will diminish the per capita resource use and waste production. This strategy is also linked to a "green" approach as the limited natural resources of the island have to be managed in a better way and the carrying capacity of the island respected. The goal is to reduce the use of resources such as water, land, energy and recycle the waste produced both by enterprises (mainly in the tourism sector) and the local population. It is plausible that less infrastructure for transport, for water and energy production, for waste treatment, for beach recovery etc as well as for mitigation of climate change would be necessary.

Tourism has to be better incorporated to an integrated local development plan that has to be inspired by the principles of a Local Agenda 21. In order to diminish the dependence on tourism mono-culture, the development of other activities is possible always based on the principle of quality as the only possibility to find niche markets ready to pay a higher price. This will be the case also of organic agriculture and husbandry which products awarded by a special MPA's label that has to be developed at least within the limits of the protected area. The demand for traditional local products could be accrued as well as their prices.

In this context the preservation of the MPA is a particular asset as it can become the symbol of the island and the centre of the interest of visitors. Many of the activities already organized by the PAMB or its partners have to be re-evaluated in order to be easily accessible from well informed tourists. Maintaining the current restrictions of land and sea uses is crucial for the appeal of the area and more measures have to been taken in order to ameliorate the built environment, not only in the surrounding area but within the whole island. The current activities as well as the new ones can be developed further by the PAMB in cooperation with public and private actors in order to reduce seasonality.

In this scenario it could be expected that the pressure on the resources will be diminished and the stock of natural capital be maintained or accrued; consequently the different kind of services described above is going to be affected rather positively.

1.1.3. The "Preservation scenario": The reinforcement of the protection status for an alternative development

This scenario is based on the Strong Sustainability (SS) approach where the preservation of the natural capital and of the ecosystem functions is the priority regardless its impact to the socio-economic development; population and economy has to be maintained either at their actual level or to be decreased if the preservation of the natural capital is not achieved by the actual level of the use of the resources.

In this context the tourism activity has to change its features in order to "fit" in the new development model; mass 3S tourism has to be transformed into ecotourism by reorganizing establishments, fluxes and

practices in order to become totally environmental friendly. The extension of organic agriculture and husbandry which products receiving the special MPA's label has to be expanded to the whole island.

The MPA will be the centre of broader protected area including the west-northwest coast of the island in order to protect also the monk seal and its habitat. Land and sea uses have to be stricter and the application of the rules more systematic. The activities to be developed have to be in totally accordance to the purpose of the creation of the MPA as quoted in the paragraph 2.1.3.

In this scenario it could be expected that the pressure on the resources will be diminished significantly and the stock of natural capital be accrued; consequently the different kind of services described above is going to be affected positively.

Table 5: Estimation of evolutions from the three scenarios

		Scenario 1		Scenario 2		Scenario 3	
		inside MPA	outside MPA	inside MPA	outside MPA	inside MPA	outside MPA
Driving forces	tourism investments	+	++	+	+	-	=
	tourism activity	-	=	++	++	-	+
	residential houses	++	+++	=	+	--	+
	construction	++	+++	+	+	--	-
	agriculture	--	---	+	+	=	-
	husbandry	--	---	+	+	=	-
	fishing	--	---	+	+	=	-
	manufactures	-	---	+	+	=	=
Pressure	land use - urban sprawl versus natural habitats	++	+++	+	+	=	+
	water consumption	++	+++	=	-	-	+
	energy consumption	++	+++	=	-	-	+
	waste water production	++	+++	=	-	-	+
	solid waste production	++	+++	=	-	-	+
State	beach - dunes	--	---	+	=	++	+
	turtles	--	--	+	=	++	+
	fish	--	---	+	=	++	+

posedonia	--	--	=	=	++	+
birds	--	--	=	=	++	+
water quantity	--	---	=	=	++	+
water quality	--	---	=	=	++	+
sea water quality	--	---	=	=	++	+
land quality	--	---	=	=	++	+
landscape quality	--	---	+	=	++	+
climate change - air quality	--	---	+	+	++	+

1.2. Assess the effects of Zakynthos MPA on development in the local area: variations in costs and benefits³⁵

It is rather unlikely to see for the future evolutions on the MPA's future in disconnection to the socio-economic context and from scenarios related to Zakynthos evolution. Over and above, as it is presented in the previous paragraph, there is no possibility for an "as usual" scenario, as the context has changed dramatically in Greece but also in the other countries of Europe as well as within the whole globe; so actually it is impossible to predict evolutions on the socio-economic parameters and their impact on the Zakynthos MPA. It is not unlikely that economic crisis pushes public and private decision makers and the population in general for short term economic solutions that will undermine a (long term) sustainable development.

The new situation has actually a negative impact to population evolution as part of the immigrants arrived in Greece and in Zakynthos in order to find a job has already been obliged to leave the country as unemployment is high and increasing; a similar situation is already observed concerning Greeks, mainly the youngest and the most educated ones. So it is possible that for the actual decennia (2010-20) the population is going to decrease during the first years and equilibrate in the total with an increase unto the end of the period if GDP growth rates will turn into positive after 2013, as it is projected at the national level.

The most plausible scenario based on the actual crisis has to do with less means for the protection of the NMPZ as it happens since 2009 due to loss of budget that has already diminished the capacity of MA to apply its own management measures resulting for the legal framework and the general capacity of the local and national authorities to finance action for environmental protection (controls for illegal land use changes, for illegal actions within the protected sea area and for illegal pollution of different activities in and around the protected area); this situation is going to worsen as it is expected a diminution of funds allocation of around 10% per year till the re-equilibration of public finances and an possible augmentation of 3-5% for each of the following years if growth rate and taxes collection allow it. Simultaneously the pressure for the different social groups (fishermen, tourist entrepreneurs and employees, entrepreneurs and employees in the construction sector, land owners) for less environmental protection through the modification of the legal framework protecting the area.

In **this first scenario** (*degradation scenario*) an extreme evolution could be the complete abolishment of the MPA and its complete degradation. If the restrictions concerning land and sea uses are not applied, we

³⁵ This effort for quantification of the contextual variables and of the variables of the three prospective scenarios has to be taken in consideration with a lot of precaution as it is based on many assumptions and not on a simulation model; additionally the actual socio-economic crisis don't allow simple projections even for variables as the population and the GDP.

could argue reasonably that the evolution concerning the main Driving Forces could have evolved as follows:

- The growth rate of tourism beds supply in “conventional” infrastructures for mass tourism (HORECA and related infrastructures) would be higher as well as the construction of new private houses within the protected area and mainly close to the beaches as happened in Kalamaki, Laganas and ex-municipality of Arkadion that are not protected. A more intensive tourism supply (higher production capacity by 2% per year) which would perhaps accrue the number of visitors and nights spent on the island but it would further reduce the occupancy rate of the accommodation. The “quality” of tourists – that is very low actually due to the main motivation that attracts tourists in Zakynthos (drinking and nightlife) – would be even worse. AV and profits decline ~~40~~by 2% between 2011 and ~~until~~ 2015 and by -23% per year until 2020. This decrease is mainly due to degradation of infrastructure, quality of services and general increase in costs.
- Growth of 3-5% per year for diving activities (with an increase of +3% of produced VA) until 2015 and 10-15% after 2015 because of lack of control. Degradation of landscapes and underwater fewer dives after 2020;
- Increase of yachting because of the expansion of port facilities and the diminution of prohibition at the circulation of yachts in the interior of the MPA, (5-10%) until 2015 and 10-15% afterwards due to the lack of control and management. The marina and harbour boatmen ties to the city of Zakynthos move and settle in the Marine Park. Increased degradation of Posidonia meadows and increased harassing the sea turtle *Caretta caretta* in the marine area of NMPZ
- The construction and the real estate sectors are supposed to grow from 2013 (is decreasing since 2009 due to the crisis) with a decreasing rate as they are going to be affected by the degradation of the landscape and the environment in general (between 2 and 1%).
- The lands dedicated today in agriculture would be under real-estate pressure and an additional reduction in activity would be recorded even if the crisis will guide local population to accrue production by exploiting abandoned lands.
- The number of fishermen is going to stay stable because of the crisis as there will be a return to primary activities; a rejuvenation of the fishermen is expected. In short term, an increased of catches can be expected because of the effect of reserve due to the MPA. The amount of fish caught will declined (-5% per year) after 2015 because there will be an increased of the catch in short term from professional and amateurs; so the fishing activity would be marginalized in midterm because of more rapid diminution of fish stocks. A change the law for less protection of fish stocks and the abolishment of protection measures is possible due to the negative interpretation of the effects of the existing one and the pressures exerted by associations of professional and recreational (semi-professional) fishermen.
- The sector of commerce is influenced from both the tourism activity (directly from tourists purchase) and the general economic activity (indirectly from local population purchase); so it is normal that it is going to be influenced negatively (it is projected to be between 2 and 3% per year)
- The additional economic activity provoked from the operation of the PAMB (direct and indirect), of the Sponsors and of the NGO's would not exist.

The results could be as follows:

- Additional production and revenues would be created in short term from the additional investment mainly for the construction sector, tourism activity and the related occupations. But this oversupply would drag per bed prices and general the per day expenditure of tourists even lower creating greater business viability problems than they have today.
- Additional employment would have concentrated to seasonal and low qualified jobs.
- Additional problems from tourism activity and tourist behaviour (noise during the night, fights between gangs of drunken people etc)
- Additional pressure would be created for the environment as besides the pressure from urbanization (as the demand for more water and energy consumption would have increased) more waste and noise would have been produced, and higher frequenting on fragile ecosystems would undermine its wealth.

The Impact on Zakynthos' state could be summarized as follows:

- The dependence of Zakynthos economy on “sun-seeking” heliotropic mass tourism would be even higher and its economic viability more fragile. The lack of innovation incorporated within these activities would worsen even more the structure and the future of the local economy as economic leakages will continue to increase.
- The cost for the local authority in order to manage the increased demand for supporting services to tourism activity would have increased.
- The social pressure from the increased number of tourists visiting the island would worsen the quality of life level of residents. Already the tourism pressure is very high as the ratio between official accommodation beds (residential houses not included) and the number of residents has overcome the critical level of 1:1 (42.900 : 40650).
- As land uses will change under the pressure for more construction and the pressure on marine ecosystems will be higher as a consequence of increased activities in the marine protected area (-1%), the sequestration of CO₂ will be in diminution.
- As an augmentation of wastes will happen, the pressure on terrestrial and maritime ecosystem will accrue and its currying capacity over passed.

The environmental pressure of “commercial” tourism³⁶ that in combination with pressure from residential tourism and from resident population mainly during the high season (august) is very high (more than 250inh/ km²). The damages to the different components of the environmental capital as drinking water quality and quantity, biodiversity, landscape, quality of sea water and to the ecosystems services provided would undermine the sustainability of the island.

The **second scenario** (*trend scenario*) is based on the hypothesis that the tourism crisis reordered since 2000 and the general socio-economic crisis are going to lead to a change of the development pattern where the MPA is going to be an integrated part of. Without changing the legal framework and the management plan of the NMPZ, the different actors will be not only more cooperative to apply the provisions within the park's area, but it is supposed to be more “environmental friendly” also for activities out of the parks' limits.

³⁶ It concerns tourists using commercial accommodation

This evolution is going at least to maintain the current situation within the park and to diminish the exerted pressures on the different components of the environment of the island.

The budget of MA will be maintained till 2013 at the same level as 2011 and increased afterwards as local actors will complete the financing from the central government as they will consider the central role of the AMP for the “renovation” and the diversification of the tourist product and the sustainable development of the island; so all activities will be strengthened within the next few years.

In this scenario, we could argue reasonably that the evolution concerning the main Driving Forces could have evolved as follows:

- Joint decrease in the number of tourists and overnights per year until 2015. Resumption of joint nights spent and visitors’ arrivals after 2015 when the new quality product will be established. Recovery of profits can be projected from 2015.
- As the preservation of the MPA continuous, a growth of 3-5% of the diving activities per year until 2015 and 5-10% per year between 2015 and 2020 is expected.
- Increase of yachting because of the renovation of port facility the interior of the MPA until 2015 (5-10%) and stabilization afterwards due to a limited carrying capacity.
- The construction and the real estate sectors are supposed to continue decreasing from 2013 (is decreasing since 2009 due to the crisis) as restrictions for building are not going to change.
- The lands dedicated today in agriculture would be maintained and activity will be increased as the demand for local quality products will be strengthened. In parallel the crisis will increase the number of farmers, giving increased revenue.
- The number of fishermen will remain stable because of the crisis because there will be a return to primary activities; a rejuvenation of the fishermen is expected. The amount of fish caught can be maintained or slightly increased due to the protection effect. Revenues will be increased.
- The commerce activity will increase as the demand from tourists and locals will increase.
- The additional economic activity provoked from the operation of the PAMB (direct and indirect), of the Sponsors and of the NGO’s will continue and will increase after the economic recovery.

The results could be as follows:

- Additional production and revenues would be created in mid- and long term from the upgrading and the diversification of the tourism product. Additional employment would be created; it is going to be less seasonal and more qualified.
- Progressive diminution of problems from tourism activity and tourists’ behavior.
- Augmentation of the employment and the revenues within the primary sector.
- Stabilization of the pressure would be observed for the environment as besides the diminution pressure from urbanization, the demand for more water and energy consumption would have decreased, less waste and noise would have been produced, and a better protection of fragile ecosystems would maintain its wealth.

The Impact on Zakynthos’ state could be summarized as follows:

- The dependence of Zakynthos economy on “sun-seeking” heliotropic mass tourism would progressively lower and its economic viability will be less fragile. The increase of innovation incorporated within these activities would ameliorate even more the structure and the future of the local economy as economic leakages will start to decrease. So, less GDP and GDP per capita, perhaps will mean more income per capita and welfare.
- The cost for the local authority in order to manage the increased demand for supporting services to tourism activity would have also decreased.
- The social pressure from the number of tourists visiting the island would ameliorate the quality of life level of residents, as an increasing number of visitors will be respectful of local society and environment.
- As land uses will be stabilized and the pressure on marine ecosystems also, the sequestration of CO₂ will be stabilized too.
- As an augmentation of waste treatment will be happened the pressure on terrestrial and maritime ecosystem will be diminished and its currying capacity respected.

The environmental pressure of “commercial” tourism, combination with pressure from residential tourism and from resident population mainly during the high season (august), will stay rather high (more than 250inh/ km²). But the damages to the different components of the environmental capital as drinking water quality and quantity, biodiversity, landscape, quality of sea water and to the ecosystems services provided would be limited as a better management of the island resources will be organized.

The **third scenario** (*protection scenario*) of the reinforcement of the MPA provides more protection not only within the NMPZ but to the Natura 2000 area covering the West – North West part of the island for the protection of the monk seal. This scenario is the less plausible within the actual economic and financial context.

The budget of MA will be maintained till 2013 at the same level as 2011 and increased afterwards as national and local will contribute in order to fulfil a broader role for the PAMB within a process of sustainable development of the island; so all activities will be strengthened within the next few years.

- Decrease of number of beds as a part of old establishments will close; same of them that are close to the protected areas will be demolished. Regular decrease in the number of tourists per year until 2015 with average nights spent per tourist in increase. Resumption of joint count nights and visitors after 2015 with a better seasonality and a higher occupation rate for the different establishments. Recovery of total added value (AV) is not expected, but profits can be attended from 2015 as the per tourist revenue will increase.
- the number of dives in the MPA will increase of 3-5% per year until 2015 and will be stable after 2015 due to the strengthening of legislation to curb the uncontrolled increase in: a +3 to 5% of produced VA can be expected.
- Increased of yachting because of the renovation of port facility the interior of the MPA until 2015 (5-10%) and stabilization afterwards due to a limited carrying capacity.
- The construction and the real estate sectors are supposed to continue decreasing from 2013 (is decreasing since 2009 due to the crisis) as restrictions for building are going to be more severe.
- The lands dedicated today in agriculture would be maintained and abandoned lands will be used for primary activity; the crisis but also the accruing demand for safe, organic and quality local products will be the driving forces.

- The number of fishermen will be stable because of the crisis as there will be a return to primary activities. The volumes of catch will increase (+5%) because there will be an increase in marine resources. [Spillover effect](#) which has benefited the professional and recreational fishing outside the boundaries of the protected area
- The additional economic activity provoked from the operation of the PAMB (direct and indirect), of the sponsors and of the NGO's would increase again.

The results could be as follows:

- Production and revenues would be decline in short term from the diminution of tourist numbers and of the additional investment mainly for the construction sector, tourism activity and the related occupations. The change of the tourism product would drag per bed prices and general the per day expenditure of tourists higher creating greater business viability.
- Employment will be diversified to less seasonal and more qualified jobs.
- Problems from tourism activity and tourist behaviour (noise during the night, fights between gangs of drunken people etc) will be progressively disappeared as the type (the motivation) of tourists visiting the island will change.
- Diminution of pressures for the environment are expected in short, mid and long term; less pressure from urbanization, less demand for more water and energy consumption, less waste and noise would have been produced, and less frequenting on fragile ecosystems.

The Impact on Zakynthos' state could be summarized as follows:

- The dependence of Zakynthos economy on "sun-seeking" heliotropic mass tourism would decrease and its economy will be based less on the triptych "tourism-commerce and construction". The increase of innovation incorporated within "green" activities and activities related to the valorization of the environmental capital would ameliorate the structure and the future of the local economy as economic leakages will decrease. So, less GDP and GDP per capita, perhaps will mean more income per capita and welfare.
- The cost for the local authority in order to manage the increased demand for supporting services to tourism activity would have also to decrease.
- The social pressure from the number of tourists visiting the island would ameliorate the quality of life level of residents, as an increasing number of visitors will be respectful of local society and environment.
- As land uses will be stabilized and the pressure on marine ecosystems also, the sequestration of CO₂ will be in increase.
- As an augmentation of waste treatment will be happened the pressure on terrestrial and maritime ecosystem will be diminished and its currying capacity respected.

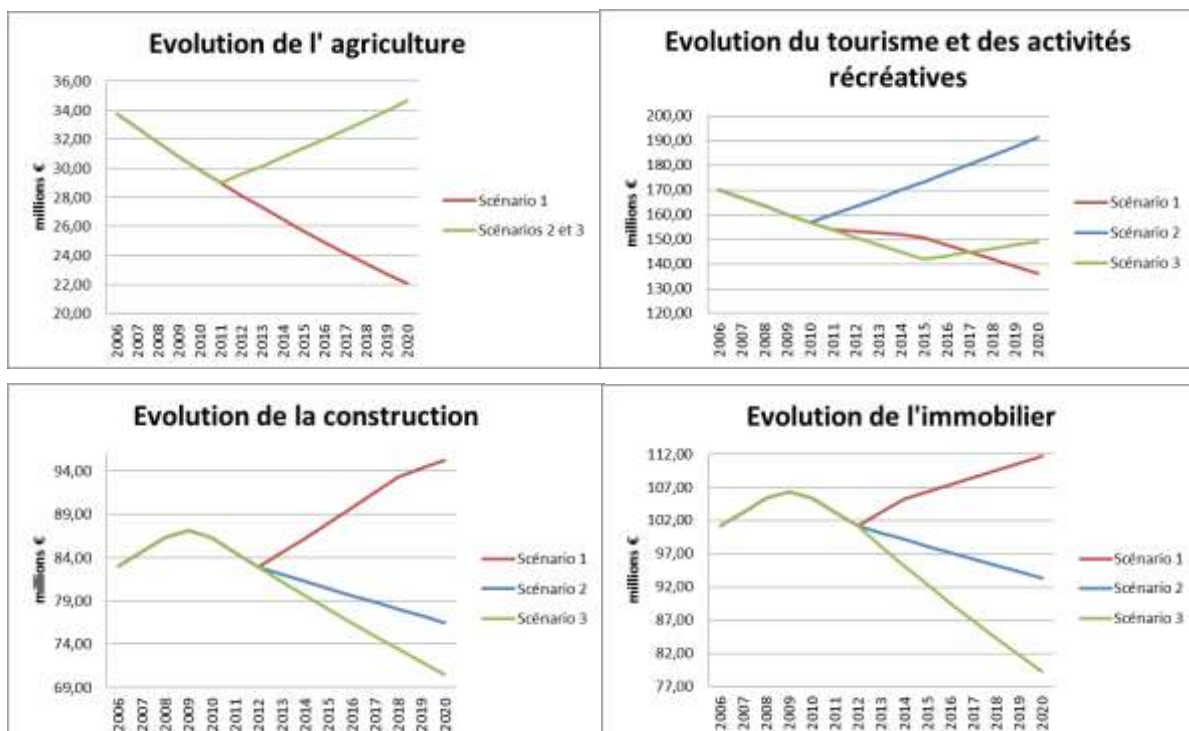
The environmental pressure of "commercial" tourism that in combination with pressure from residential tourism and from resident population mainly during the high season (august) will diminish (less than 250inh/ km²) as well as the per capita consumption of resources and production of waste due to the fact that the "new" tourists are better aware; consequently the damages to the different components of the environmental capital as drinking water quality and quantity, biodiversity, landscape, quality of sea water and

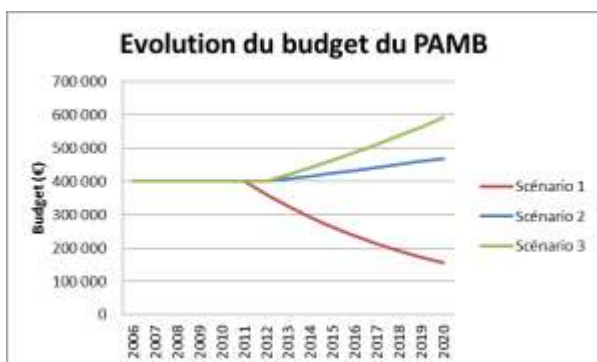
to the ecosystems services provided would be limited. At the same time a better management of the island will be organized.

A monetary evaluation of costs and benefits at the local level has to take into account:

- The expenditures for investment and functioning of the AMP as this money is injected in the local economy from different bodies such as the greek government and EU. Within the first scenario a loss of about 10M € per year is expected if AMP is totally abandoned, in the second no important change is expected, while in the third the budget has to increase consequently within the next years as the protected area will redouble.
- The expenditure related directly to the NMPZ (i.e. NGO activities, expenditure of volunteers). It has to be influenced as the budget of the AMP: it has to decrease dramatically in the first scenario, to be maintained in the second, and to accrue in the third.
- The marginal variation (positive or negative) of production for the main activities influenced by the presence of the MPA as tourism (diving and other water sports included), renting houses, construction, agriculture, and fishing has to be considered as directly affected as well as commerce. The added value for the above sectors was for 2006 (last year for which analytical data per branch exists) was respectively: 170,21M€, 101,26M, 82,96M, 33,77M, 1,45M and 82,67M€, id est a total of 472,3M€. An evaluation of their evolution based on the scenarios described previously gives for 2015 for the degradation scenario a total of 477,79M€, for the trend scenario 512,48M and for the protection scenario 399,24M. That means a significant positive variation of 40,1M for the second scenario, a very low but positive variation of 5,4M for the degradation scenario and a negative variation of 73,0M for the conservation scenario.
- The benefits from environmental protection due to the presence of the AMP can be distinguished as local (i.e beach erosion, preservation of the landscape, preservation of the land uses, sea uses), or global (i.e. CO₂ sequestration). Only the first category of them influences directly the local development but as they have already included in the evaluation of the different sectors. For the second ones, as they have global impacts, it's rather impossible to evaluate their impact locally.

The evolutions in the selected sectors for the 3 scenarios can be presented as following:





The activity that generates the largest benefits is by far tourism, with between 130 and 200 million euros depending on the scenarios, followed by real estate, construction and trade, then agriculture, and lastly by fishing.

The first Scenario – Status Quo, generates the largest benefits regarding real estate and construction, while the Quality scenario maximizes the benefits linked to tourism, trade and agriculture (ex aequo for agriculture with the Preservation scenario, that also generates the largest profits linked to fishing.)

According to the chosen option, the different local user categories will be more or less favoured, which might cause interest conflicts and require compensatory measures.

The following table displays gains and losses of Quality and Protection Scenarios compared to the Status Quo Scenario: a positive figure reveals a gain compared to the Status Quo Scenario, and a negative figure reveals a loss.

Table: Comparison of the Quality and Protection scenarios with the Status Quo Scenario

Années	Total des bénéfices liés à la pêche (en millions €)		Total des bénéfices liés à l'agriculture (en millions €)		Total des bénéfices liés au tourisme et activités récréatives (en millions €)		Total des bénéfices liés à la construction (en millions €)		Reste des bénéfices liés au commerce (en millions €)		Total des bénéfices liés à l'immobilier (en millions €)		Total (en millions €)	
	Sc. Qualité	Sc. Protection	Sc. Qualité	Sc. Protection	Sc. Qualité	Sc. Protection	Sc. Qualité	Sc. Protection	Sc. Qualité	Sc. Protection	Sc. Qualité	Sc. Protection	Sc. Qualité	Sc. Protection
2011	-0,07	-0,07	0,00	0,00	6,28	0,00	0,00	0,00	0,76	0,76	0,00	0,00	6,97	0,69
2012	-0,07	-0,05	1,45	1,45	10,10	-2,46	0,00	0,00	4,48	1,49	0,00	0,00	15,95	0,43
2013	-0,07	-0,03	2,89	2,89	13,98	-4,86	-2,49	-3,32	8,15	2,17	-3,04	-5,06	19,42	-8,20
2014	-0,07	0,00	4,31	4,31	17,93	-7,20	-5,00	-6,63	11,80	2,83	-6,10	-10,07	22,86	-16,77
2015	-0,07	0,02	5,72	5,72	22,56	-8,87	-7,54	-9,95	15,41	3,45	-8,14	-13,97	27,93	-23,61
2016	0,00	0,15	7,11	7,11	29,04	-4,43	-10,10	-13,27	18,99	4,03	-10,19	-17,81	34,86	-24,21
2017	0,07	0,27	8,50	8,50	35,53	-0,04	-12,69	-16,59	22,54	4,59	-12,23	-21,57	41,72	-24,84
2018	0,14	0,40	9,88	9,88	42,03	4,30	-15,31	-19,92	25,46	4,49	-14,28	-25,26	47,92	-26,11
2019	0,20	0,52	11,25	11,25	48,55	8,60	-17,02	-22,32	28,38	4,40	-16,33	-28,88	55,04	-26,43
2020	0,27	0,65	12,61	12,61	55,09	12,86	-18,74	-24,70	31,32	4,32	-18,38	-32,44	62,17	-26,71
Total	0,32	1,86	63,72	63,71735225	281,08	-2,11	-88,87	-116,69378	167,29	32,53	-88,69	-155,0579149	334,84	-175,75

As shown by this balance, the Quality Scenario might represent a gain of more than 300 million € compared to the Status Quo Scenario, while the Preservation Scenario would imply a loss of about 175 million € compared to this scenario, between the years 2011 and 2020.

The Quality scenario implies the largest overall benefits (amongst the activities that are taken into account), which is coherent with a vision of the NMPZ as a tool for sustainable resources management. On the contrary, the scenario that implies a strict preservation of the environment without any economic and social consideration implies the smallest benefits and the largest costs. As for the scenario of Status Quo, it implies a gradual decrease in the costs linked to the NMPZ that are partially reverberated in local economy, and only allows a short term return to growth before stagnation at the current level.

If we try to do a global evaluation for each scenario only the second scenario has positive sign as to the positive evolution of the GDP we have to add the impact of expenses from the AMP's budget as well the expenditure of other NGO's. The degradation scenario has negative results as the shutdown of the AMP has negative economic impact locally. Finally, GDP is decreasing in the third scenario, as the diminution of production is a prerequisite of the third scenario.

Conclusion

The economic assessment of a Marine Protected Area effects to the sustainability of the local development of an area is a complicated exercise with many domains where the scientific knowledge is till now incomplete and the methodologies under construction; when it is still difficult to estimate the impact of a MPA in an area it is rather impossible to produce reliable quantified prospective scenarios in absence of simulation models.

In this study it has been proposed:

- a system based on an extended DPSIR approach that tries to include all the parameters that are important when we analyze the sustainability of local development of an area.
- an approach in order to estimate the results and the impacts of a given policy (as the creation of an MPA) to the sustainability of the local development of an area.
- ideas how a qualitative estimation of the results and impacts of different scenarios without the use of simulation models.

Concerning the study on the MPA of Zakynthos:

- An effort was undertaken in order to describe the sustainability of local development of Zakynthos and how it was influenced by the creation of the AMP and of the MA of the NMPZ. As it is underlined the creation of AMP in the middle of the tourism development zone has provoked very important frictions between the “fans” of short term economic development and the “fans” of an alternative (sustainable?) mode for local development including the preservation of the nature and more specifically of careta-careta.
- The strong mass 3S tourism growth of Zakynthos has produced since '80s a very strong socio-economic development as GDP, employment and population evolutions shows, and provoking important pressures on the environment. The limitations imposed by the creation of AMP and the operation of the MA of NMPZ have put some limitations to these pressures within the protected area. These limitations in land and sea uses and the management scheme applied within the protected area have halted the degradation of the habitat and the biotic resources of the protected

area and have provoked eventually an improvement of the tourism product (new activities, better environment). A more complete investigation for the impact of the AMP to the sustainability of the local development of Zakynthos till now has to be done.

- This development model has shown its limits since early 2000's with a stabilization (or decline) of tourists nights spent and a diminution of tourism receipts. The need for changes in the tourism model have been considered as crucial from many of the stakeholders and the "use" of the caretacareta for this purpose it has been mentioned during the interviews with local authorities and tourism actors.
- The future of the AMP is closely related to the different development paths that Zakynthos can adopt:
 - The first scenario is based on the fact that the crisis will enforce the "business as usual" perception of local actors that means the continuation of the existing development model based on the 3S mass tourism. This evolution in combination that there is a continuous pressure on the action of the MA of NMPZ through the limitation of the means we imagine that it will provoke the degradation of the AMP. The results of such an evolution as well as the impacts to the sustainability of the local development are evaluated.
 - The second scenario is based on the fact that the local actors, as they have understood that the actual development model leads to an socio-economic and environmental impasse, they propose a shift to a "quality" development. This scenario includes at least a "tendency scenario" for the AMP as its actual protection is going to be maintained and an effort for evaluation of possible results and impacts.
 - The third scenario is based on an extension of environmental protection with the inclusion of a broader zone, the zone of monahus-monahus. This scenario considers that a stricter protection is necessary and consequently the development of Zakynthos has to be radically reconsidered. An evaluation of results and impacts to the local development of Zakynthos is attempted.

From the three above scenarios, only the second one gives positive results.

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