



Environmental impacts of tourist development in Rhodes

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Abstract

The study of environmental impacts of tourist development has become a subject which attracts many researchers and scientists, especially during the last decade. It is well documented that when the limits of tourist development are surpassed, many adverse and complicated effects are manifested. The intensity and magnitude of these problems become more prominent at places with special natural beauty, many aspects of which, are seriously threatened by many human activities. Not underestimating the contribution of tourism and the economic activities associated to it, towards the development of local communities, it must be stressed that, in many cases, tourist development characterised by the lack of long term goals and prospects, has been the main cause of much environmental and natural deterioration of many Greek island communities. It is certain that if no measures are taken and no methodology applied in order to ensure rational tourist development, the impacts can become quite serious and grievous in a very short period of time. Methodologies taking into account the capabilities of the areas concerned, as well as interventions respecting local conditions and environmental characteristics, such as the use of alternative energy sources, the implementation programmes based on ecotourism and the promotion of alternative tourism development in general, have been proposed by many researchers and scientists. Our research examines both negative and positive environmental impacts of tourist development in Rhodes, concentrating on issues such as natural resources and ecosystem management, the effects of human activities on fauna, flora and the coastal zone, leading to environmental indices for the island.[1] Data presented were collected from, personal interviews and all the local municipalities, state and municipal water supply, sewerage and electricity enterprises, the Union of hotel owners of Rhodes, the Prefecture of Dodecanisa including departments of environment, industry, agriculture, the port authority of Rhodes tour operators and local bibliographical sources.

1 Tourist development of the island

Rhodes, with area of 1400 sq. km, is one of the largest Greek islands and tourist sites in Greece. The gross per capita income has risen to \$12962 per citizen, corresponding to an increase of over 60% compared to the average gross per capita income for European island areas.[2]

Tourist development of the island started in the early '60s.[3] in the Southern part of the island, "The Southern triangle"(figure9). By 1971, hotels and rooms to rent reached about 20,000 beds, whereas by 2000 the number is estimated at about 120,000 beds. Figures 2 and 3 give a graphical representation of the trend in hotel units and bed availability over the years.

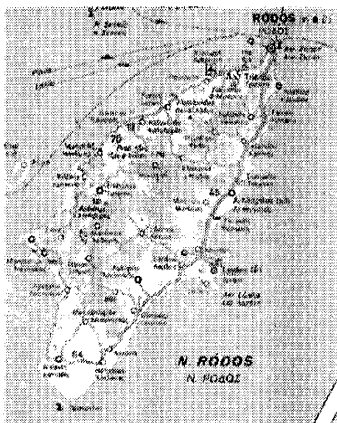


Figure 1: Map of Rhodes

Tourist arrivals and overnight stays in Rhodes since 1960 have increased considerably, as data presented in figures 4 and 5 indicate.

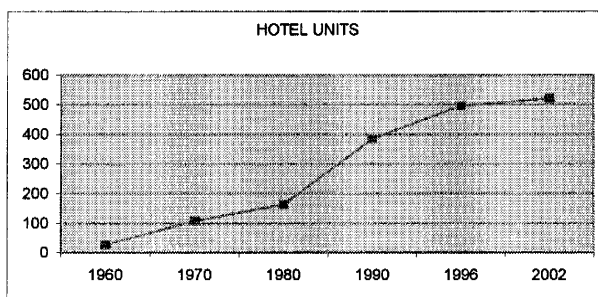


Figure 2: Hotels in Rhodes

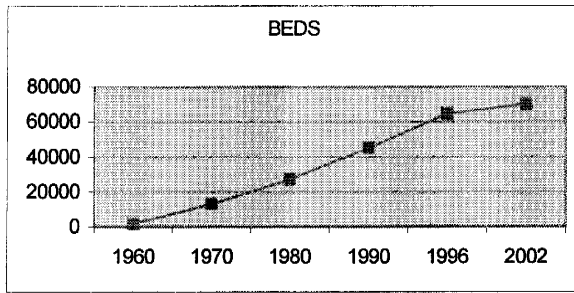


Figure 3: Bed availability in Rhodes

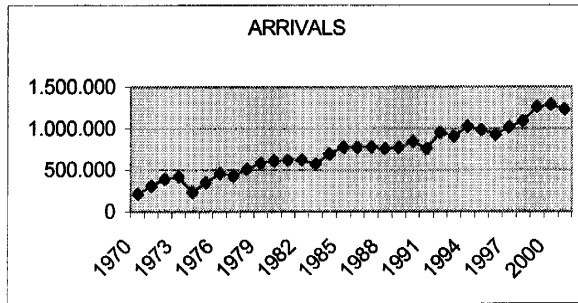


Figure 4: Tourist arrivals in Rhodes

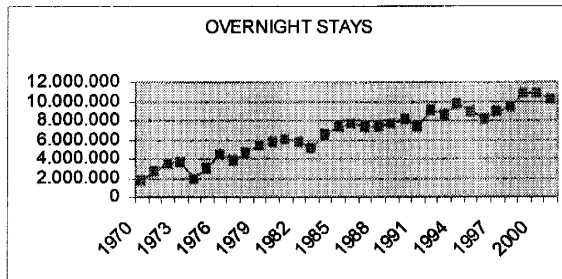


Figure 5: Overnight stays in Rhodes

Table 1: Hotel occupancy (% of full capacity)

	1994	1999
APRIL	47%	30%
MAY	69%	60%
JUNE	86%	80%
JULY	96%	95%
AUGUST	100%	98%
SEPTEMBER	86.5%	80%
OCTOBER	64.4%	55%

It is noteworthy that the population of Rhodes has increased considerably during the period of 1950-1990 representing a rise of 67%. This increase is considerably higher than the national average and has been associated to the increase in tourism especially after the 1970's in the northern part of the island. In contrast the southern part of the island has retained its rural character and has not participated in the development of mass tourism in the way the north eastern and north western regions of the island have. This is shown in Table 2.

Table 2: Hotels per municipality in Rhodes

	Hotels	Rooms	Beds	beds/hotel
KALLITHEA	84	8947	16828	106,5
IALYSOS	94	8609	16606	91,6
CITY OF RHODES	148	8881	16575	60,0
AFANDOU	49	3510	6673	71,6
LINDOS	53	2859	5516	53,9
S.RHODES	27	1678	3411	62,1
PETALOUDES	43	1759	3357	40,9
ARHAGELOS	19	560	1044	29,5
ATTAVIROS	4	41	79	10,3
KAMIROS	1	68	127	68,0
	522	36912	70216	52,2

It must be noted that within the last 10 years, there is an increase in the number of beds: 317 in 1991 to 3411 in 2001 (an increase of 1076% for the municipality of southern Rhodes. In Lindos the increase is estimated to be 1470 beds in 1990 to 5410 in 2001. In the municipality of Attaviros the first hotels come into operation in 1998 with 51 beds.

2 Primary, secondary and tertiary production

It is clear from the data presented in Table 3, as well as other data not presented here, that employment in the primary and secondary production level has dropped whereas there is an increase in the tertiary level, confirming both the national trend as well as the increase in the tourist trade for the area, during the 1980s.[4]

Table 3: Employment in different production levels for Greece, the Dodecanese and Rhodes during the years 1981 and 1991, as a percentage of total employment in the specified area.

area	year	production level		
		primary	secondary	tertiary
GREECE	1981	29,2%	30,5%	40,4%
GREECE	1991	19,6%	25,4%	55,0%
DODECANESE	1981	13,9%	27,4%	58,7%
DODECANESE	1991	7,9%	23,6%	68,5%
RHODES	1981	10,2%	25,6%	64,3%
RHODES	1991	6,0%	22,7%	71,3%

Agricultural land has, on the whole, remained unchanged (330,000 sq. Km.), whereas small manufacturing units are mainly oriented towards agricultural products, juices-soft drinks-drinks, olive oil presses, ceramics, pottery, furniture and goldsmiths. A detailed description of basic secondary production units is presented in Tables 4 and 5. Finally as far as tertiary production is concerned, Rhodes is the administrative centre for all the Dodecanese islands, and people employed in this section of economy were estimated to be 27,171 in 1991, 14,660 of which, were employed in the hotel and restaurant business.

Tables 4 & 5: Factories in Rhodes

municipality	quarries	used oil storage	oil terminals	distilleries
ARHAGELOS				
ATAVIROS	1			1
AFANDOU				
IALYSSOS				
KALLITHEA	2		1	2
KAMIROS			2	
LINDOS	1			
SOUTH RHODES				1
PETALOUDES		1		
CITY OF RHODES	1			

municipality	ship repairs	concrete mixing	dairy units	olive oil press
ARHAGELOS				6
ATAVIROS				4
AFANDOU				3
IALYSSOS		2		
KALLITHEA		1	2	4
KAMIROS				3
LINDOS				1
SOUTH RHODES				1
PETALOUDES				5
CITY OF RHODES	1			

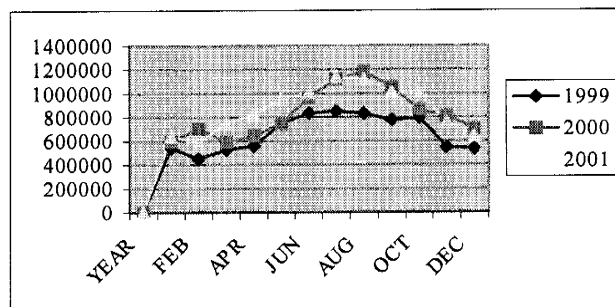
3 Energy sources and environment

3.1 Water sources

Increased demand during the summer months has been a serious problem for the island, rates and quantities shown in Figure7 .The need to provide satisfactory water quality remains a pressing issue both to local citizens as well as visitors during summer. Agriculture is also an area that is in need during the same period.[5-6]

Table 6: Overpumping at sea water, Municipality of Lindos

Year	Ovepumping at sea water
1998	1
1999	-
2000	-
2001	1
2002	-


Figure 7: Water consumption in the city of Rhodes

3.2 Urban waste and solid waste management

Urban waste management (solid and liquid) is characterized by the lack of efficiency and environmental protection. Only the large urban centers fulfill the basic requirements of modern waste management installations. Other settlements do not even have a complete urban waste collection network. The situation is best described in Table 9 and 10.[7]

Table 7: Urban Waste treatment Plants in Rhodes

municipality	populati on	urban waste treatment plant	percentage of covering	availability
ARHAGELOS	7758	N.R..T.P	0	
ATAVIROS	3214	1	30%	3000
AFANDU	6557	N.R..T.P	0	
IALYSOS	10275	N.R..T.P	0	
KALLITHEA	9979	N.R..T.P	30%	
KAMIROS	5315	1	50%	
LINDOS	3719	1	30%	
SOUTH RHODES	4315	NO		
PETALOUEDES	11858	YES		8000
CITY OF RHODES	54802	N.R..T.P	90%	144000
RHODES TOTAL			70% of all the island	

NRTP: North Rhodes Urban Waste Treatment Plant, Vodi Place

Table 8: Garbage Handling

	garbage handling	overpumpnig ending at seawater
ARHAGELOS	dump place	no
ATAVIROS	dump place	no
AFANDU	scrap heap	yes
IALYSOS	place of sanitary burial	yes
KALLITHEA	place of sanitary burial	yes
KAMIROS	place of sanitary burial	no
LINDOS	scrap heap	last time in 2001
SOUTHERN RHODES	scrap heap	yes
PETALOUDES	place of sanitary burial	?
CITY OF RHODES	place of sanitary burial	last time 1982

3.3. Electricity production

As seen in Figure 8 electrical consumption has increase over recent years. The surge in consumption during the summer months is also highlighted. Taking into account that the power generation plant at Soroni is powered by heavy duty oil, it is not surprising that both costs and environmental impacts are high for the island.

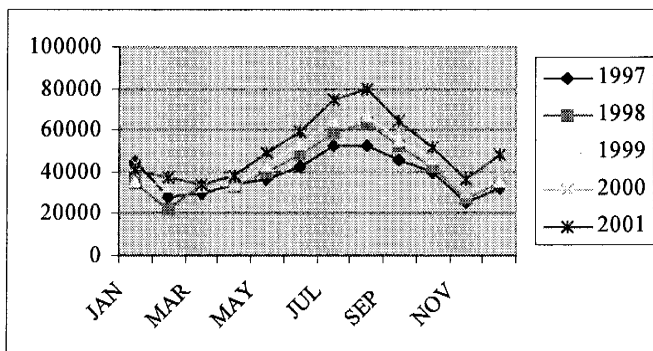


Figure 8 : Electricity energy production in Rhodes

3.4 Built environment.

Rhodes represents a good sample of gang planning lack. The first areas to have been developed on basis at plan were Ixia and Faliraki (journal of government 40 d 1972). In those regions there is a high structural factor and, as a result, large hotel units were built, in certain distance from coasts. During the 70's, houses and other buildings have been constructed in the west axis of the island despite the lack of land and environmental planning.[8] These regions are characterized as aesthetically deteriorated. The new building method in tourist areas and villages has brought alteration in traditional architectural models.[9] Illegally built constructions in tourist areas exist in the island focused in three categories:

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1) Illegally constructed hotels, 2) Illegally used buildings as hotels and 3) other Illegally buildings in the seashore. City of Rhodes has serious problem parking. Medieval town dwellers have abandoned it because of its unsatisfactory rendering of services.[10]

Table 9: Illegal buildings, shore and marine pollution.

year	illegally built buildings	pollution due to hotels	marine pollution
1995	2		2
1996	2		1
1997	2	1	
1998	2		2
1999	1		4
2000	12		1
2001	18	1	2
2002	2	2	5

3.5 Protected areas and ecosystems

The following activities can be identified as important pressures on coastal ecosystems:

1. Permanent exploitation of tourist industry
2. Garbage is dumped at sea
3. The oil spills that are dumped at sea
4. The cleaning and flattening of coasts carried out with the use of machines
5. The traffic of 4x4 jeeps
6. The coastal cereals and vegetables cultivations
7. The sand exploitation and
8. Soil erosion [11]

3.6 Noise

The model of tourism used in practice imposes the existence of night clubs, the operation of which takes place after formation providing in certain areas. The policy of specific working hours aims to the particularization of every single region without, however, always protecting the citizens from noise.

3.7 Environmental indexes

An important index concerning the impact of human activities on the natural environment is the beach impact factor presented in Table 10.

regional planning study of Rhodes suggests an increase of available beds in the southern region from 2,5-3 % of Rhodes capacity to 13,4 %.An example of this anorthodox development is that this study suggests that on Genadi beach the bed availability should reach 10000 beds imposing serious impact on the natural environment.

•**Support for employment in Southern Rhodes – Ecotourism** New employment opportunities in southern and mountainous area of Rhodes. .Ecotourism and support of alternative (biological agriculture) and normal rural production.

•**Increase of tourist demand during the months of low season** by developing and marketing novel tourist activities particular for the island.(mountaining, cultural events, conferences etc.

•**Completion of the urban waste treatment plants and network, appropriate garbage handling** (urban garbage treatment - olive oil press residuals management)

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