IMPLEMENTATION OF A PROPOSED INDICATOR SYSTEM FOR COASTAL AREAS IN KEFALONIA ISLAND

TZOUFI M.[1] and VAGIONA D.[2]

[1]PhD Candidate, School of Spatial Planning and Development, Aristotle University of Thessaloniki, [2]Assistant Professor, School of Spatial Planning and Development, Aristotle University of Thessaloniki
E-mail: mtzoufi@plandevel.auth.gr

ABSTRACT

In recent years coastal areas have been under serious pressure due to intense human presence and climate change. In view of severe threats on the European coast, the Recommendation 2002/413/CE was approved in 2002 and its content was about the implementation of the integrated management of coastal zones in Europe in order to protect their environment. A well – structured approach to Integrated Coastal Zone Management (ICZM) requires the use of indicators to evaluate the progress and effects of the current policies. According to existing references, indicators are used for three major purposes: i) to provide information on environmental problems, ii) to identify the main factors that cause pressure on the environment and iii) to monitor the impacts of the existing policies. In addition, indicators may be used as a strong tool to inform and motivate the public about environmental issues.

Numerous relevant studies and projects have taken place all over the world during the past years. Despite the ongoing developments, further research on this issue has to be considered aimed at finding a more suitable indicator system. The main objective of this paper is to draw up a comprehensive set of Sustainable Development Indicators (SDIs) for coastal areas, capable of providing an inclusive assessment of the current situation and identifying all the threats and weaknesses that coastal zones face, so the most suitable policy can be selected and applied. The concept of sustainable development in coastal areas and the definition of Sustainable Development Indicators in relevant reports are mentioned. The methodology followed for the creation of the proposed indicator system based on the SUSTAIN project is thoroughly analyzed and presented. Subsequently, this indicator system is applied to the coastal area of Kefalonia island and based on the results useful conclusions can be drawn and important considerations about coastal areas policies are displayed.

Keywords: sustainable development, coastal areas, indicator system, Integrated Coastal Zone Management, policies, SUSTAIN project.

1. Introduction

In Greece coastal zones constitute a quarter of the shoreline of the current European Union. They present great historical and cultural diversity thus they attract an extremely large number of tourists and visitors, which is both a source of income and opportunity for cultural exchange. Moreover, the Greek coastal zones host ecosystems characterized by high productivity and diversity, the survival of which is valuable. On the other hand, many human activities in the coastal areas impose a significant pressure on the environment, including physical alteration of habitats, over-exploitation of resources, and pollution. This pressure has increased steadily due to population growth and the development of economic activities. The uncontrolled and intensive residential and tourist development, the inadequate treatment of sewage and solid waste, the destruction of habitats and loss of biodiversity, the water pollution, the reducing of fishing capacity and the overexploitation of coastal aquifer are some of the most important problems that Greek coastal areas confront.

In 2006, the European Council adopted the EU Sustainable Development Strategy which defines a vision of sustainability in which economic growth, social cohesion and environmental protection are integrated and the needs of the present generation are met without compromising the ability of future generations to meet their own needs (European Council, 2006). Furthermore, the European Parliament and the European Council adopted the Recommendation on Integrated Coastal Zone Management (ICZM) in 2002 to solve the above-mentioned problems in coastal areas (CEC, 2002). Increasing problems have resulted in indicator-based efforts to measure the state of and progress towards sustainability in coastal zones. The term "indicator" is defined as a simple variable derived from the composition of individual parameters and provides information or describes a phenomenon. As a result of primary and processed data, indicators are used to simplify and qualify information on complex phenomena, contributing in this way to facilitate communication (Leka *et al.*, 2005).

Environmental indicators applicable to the coastal zone have been developed within the context of large-scale research programs at global level and are used in the framework of state of the environment reports at national level, eventually within regional initiatives. Environmental indicators tend to evaluate nature, rather than being oriented towards management processes. Many countries are now investigating the development of indicators that would allow an assessment of whether current or planned uses of the coastal zone are actually sustainable (UNESCO, 2003). However, there is no evidence that coastal management has reached a point where our natural resources are being used sustainably. There are two key reasons for this: firstly, there is no defined methodology by which the degree of sustainability can be measured by authorities. Secondly, there is no commonly agreed set of indicators that can be used to measure sustainability (SUSTAIN partnership, 2012b).

Within the project SUSTAIN, a set of indicators has been designed to measure sustainable development in coastal areas (SUSTAIN partnership, 2012a). The indicator set is linked to a scoring methodology, the DeCyDe tool developed by Isotech Ltd. Cyprus (SUSTAIN partnership, 2012b; Loizidou and Loizides, 2012). In this paper, the application of this methodology to Kefalonia Island is performed in order to assess its coastal area. Coastal municipalities, like Municipality of Kefalonia play an important role in sustainable development and measuring their current state of sustainability is a major task.

2. Study area and methodology

2.1. Study area of Kefalonia Island

The island of Kefalonia is located in the Region of Ionian Islands in Greece and with 35.801 inhabitants (Hellenic Statistical Authority, 2011) covers an area of 788.3 km^2 and has about 254 km of coastline. It has abundant mineral and forest wealth, diversity of flora and fauna, numerous caves and rare natural phenomena and terrain. There are also many areas which are characterized as protected. The existence of areas of outstanding environment and the exceptional living conditions allow the development of alternative forms of tourism. Today, tourism is one of the major sources of income and in 2010 recorded 622.555 overnight stays. The annual degree of bed capacity utilization at the same year was only 43.7%, which reflects the dependency on summer bathing tourism and a relatively short season. Along the coastline there are numerous beaches, 12 of which have been awarded the Blue Flag (Blue Flag, 2014). In 2010, the largest pier of the island was built in Argostoli which hosts cruise ships every summer from all over the world (79 cruise arrivals and 88.032 visitors – 2014).

2.2. The indicator set

The methodology of the current study is based on the SUSTAIN project. It was funded through the INTERREG IVC program and it has been a 3-year project part-funded by the European Regional Development Fund. The objective of SUSTAIN was the creation of a fully implementable policy tool to help coastal authorities and communities throughout Europe to deliver sustainability on Europe's coast (SUSTAIN partnership, 2012b). It is based on a set of easily measurable sustainability indicators that were developed and assessed during the lifetime of the project to

enable Authorities to measure effectively the sustainability of their coasts. SUSTAIN offers two sets of indicators (SUSTAIN partnership, 2012b):

- CORE indicators which should be used at all times where relevant data is available. They are considered to cover essential aspects of coastal sustainability.
- OPTIONAL indicators which reflect local, regional specificities and which can be implemented and adjusted according to the local/ regional circumstances.

The indicators represent the four pillars of sustainability: governance, environmental quality, economics and social well-being. In order to show their relevance to sustainability the different indicators have been grouped into a number of issues. The first pillar broken down in 5 issues which are: policies/ strategies for sustainability (7), monitoring tools for sustainability (6), human resources/ capacity building (4), implementation of good management practices (4) and stakeholder involvement/ public participation (3). The environmental quality pillar has been structured into 8 groups of issues: air pollution (1), biodiversity and natural resources management (2), change at the coast (2), energy and climate change (3), land use (1), public health and safety (1), waste management (2) and water resources and pollution (5). About the pillar of economics 4 key issues have been identified: economic opportunity (3), land use (1), tourism (3) and transportation (2). Finally, the indicators for social well – being have been chosen in order to promote social unity and resilience and 5 issues have been selected: demography (1), equity (1), education and training (1), local and cultural identity (2) and public health and safety. In total, there are 22 core issues and 58 core indicators. Data for the relevant indicators are fed into a newly development policy tool, DeCyDe-for-Sustainability (SUSTAIN partnership, 2012b). This is a user-friendly spreadsheet tool that allows the Core Indicators to be scored numerically, to support the self-assessment and to determine, whether an Authority is moving towards a sustainable end-point. It has three self-contained and inter-related steps:

- To find the data relating to the indicators
- To score the indicators based upon the data
- To weight the Pillars and Issues

In this paper the emphasis is given on the first and second step of this methodology in order to keep the results comparable.

2.3. Indicator application process

The core indicators are mandatory and were used in the study area of Kefalonia Island. In this paper the stepwise approach described in SUSTAIN partnership (2012b) is followed:

1. The relevant data for each core indicator were collected
2. The data was attributed to one of six appropriate classes and converted into class values from 0 to 10 based on predefined ranges. The ranges of values are mainly defined by EU Directives and when these do not cover the specific parameters, limits provided by International Bodies are used. The Governance pillar consists of Yes (score = 10), No (score = 1) and No Data (score = 0) statements (SUSTAIN partnership, 2012).
3. The class values were averaged for each issue and summed to receive a total score for each pillar. If data was imprecise, it was approximated and if data was unavailable its score is zero. SUSTAIN provides EXCEL spread-sheets, which use entered scores to automatically calculate aggregated results for issues and pillars.
4. The results would be presented to and discussed with local and regional stakeholders during work-shops (this step has not been implemented in the context of this paper).

3. Results and discussion

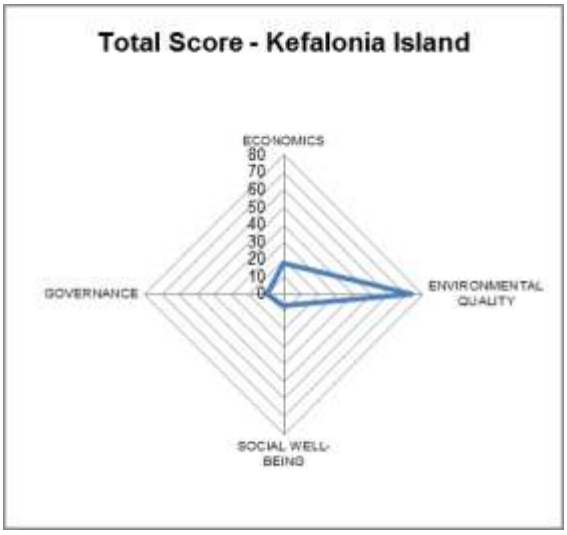
The SUSTAIN indicators have been selected using three criteria: a) relevance to sustainability, b) data availability, c) ability to be scored. As for the availability of data it should be mentioned that they are not often available from one year, so data from different years have to be used. In this case study a recent and full data set from only one year was not accessible, and it is chosen a period of several years (2006-2014). Another problem encountered at this case study was the selection of the study area. The reason why the Municipality of Kefalonia is chosen and not only

one section of it was the availability of data specific to the assessed spatial unit. To carry out an indicator application for the Municipality of Kefalonia helps to overcome this problem because the data often is already aggregated with respect to this unit. However, all sections of Kefalonia municipality consist of coastal zones. According to SUSTAIN project, "the approach to score through ranges instead of using precise values, provides the method with flexibility: even data which could not be specifically identified or might be considered imprecise or give just an approximation can be used if identified within a range" (SUSTAIN partnership, 2012b). Moreover, the approach has a mathematical weakness, as if there is no data for one or more indicators, the score for them is zero, so this value is included in the average calculation and reduces the final score and result.

According to the SUSTAIN project, the methodology gives the opportunity to users to repeat the process at different time intervals in future, in order to determine whether or not they are moving towards greater sustainability. On the other hand, the indicator set does not allow a reliable comparison of different decades at one study site. Systematic changes might become visible, over a long period of several decades and only if the quality of data remains stable.

Table 1: Self – assessment and scoring for sustainability results for Kefalonia Island

SELF -ASSESSMENT AND SCORING FOR SUSTAINABILITY RESULTS		
PILLARS	INDICATORS	Indicators Score
ECONOMICS	Economic Opportunity	4,67
	Land Use	10,00
	Tourism	2,67
	Transportation	0,50
		17,83
ENVIRONMENTAL QUALITY	Air Pollution	10,00
	Biodiversity and Natural Resources Management	5,50
	Change at the coast	10,00
	Energy & Climate Change	5,33
	Land use	10,00
	Public Health and safety	10,00
	Waste Management	0,00
	Water resources and Pollution	24,40
		73,23
SOCIAL WELL-BEING	Demography	1,00
	Equity	0,00
	Education and Training	0,00
	Local and cultural identity	0,00
	Public Health and Safety	5,00
		6,00
GOVERNANCE	Policies/ strategies for sustainability	2,29
	Monitoring tools for sustainability	2,50
	Human resources capacity building	5,23
	Implementation of good management practices	0,75
	Stakeholder involvement/ public participation	1,00
		5,79
TOTAL	106,85	



With regard to Kefalonia case study, the final table (Table 1) shows that the best score notes the environmental quality pillar, as the air pollution levels are too low, a large percentage of the total area of the island is protected, significant changes in the coastal area have not been observed, greenhouse gas emissions are low, minimum technical infrastructure threatens the coastal area and the percentage of the built environment is very small compared with the total area of the island. Also, the chemical and ecological status of coastal waters is considered to be in good or very good condition. Finally, the lack of data on waste management issue reduces the final score. Second in rating comes the economy pillar, where employment by sector is rated with moderate values, as well as the unemployment rate and the rate of Gross Value Added per sector focusing on coastal dependent activities like fishing and tourism. The proportion of people living in coastal areas to be in danger is zero. The tourism sector gets moderate score because of its low intensity related to the size of the island. The transportation sector also scored low due to lack of data reducing the final score. The score for the pillar of governance is also low since the policies related to the specific area of coastal zone protection is nonexistent. Finally, the social well-being pillar has a very low indicator score, the main cause is the lack of data on half indicators of this pillar and secondly the indicator of demographic dependency ratio for the island of Kefalonia is very large and is rated with only one grade. The results are presented below in a table and graphical.

4. Conclusion

The SUSTAIN project provides sets of core and optional indicators in order to measure and assess sustainable development in coastal areas on local and regional levels. The study

undertaken in this paper was intended to implement the SUSTAIN project and collect data for all core indicators, so as to give them the corresponding scores and produce a result. This result could help in a future comparison with new data. Reliable spatial comparisons of the state of sustainability in different regions and countries are highly impractical, as are time series applications for singe sites. This is a result of the availability, the quality and spatial resolution of data and the factor of human subjectivity. For this reason, a thorough revision of the indicator set and the methodology is proposed. However, the final score is not as important as the application process itself, which can initiate a discussion about sustainability in coastal areas at local level.

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