SUSTAINABILITY MEASUREMENT IN ISLANDS: THE CASE OF SOUTH AEGEAN ISLANDS, GREECE[1]

by

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Abstract:
Although sustainable development is usually defined in an abstract way, most researchers agree that it combines the so-called 'three dimensions': economic development, social equity and environmental conservation. These dimensions are not always compatible. This, as far as the spatial scale is concerned, creates developmental problems to localities. A first step towards sustainability, as far as a certain region is concerned, is identifying the problems that this region faces. Regions comprise areas representing a bundle of actors, which try to satisfy their needs: inhabitants act in order to achieve social wellbeing, while economic actors try to achieve economic competitiveness. When sustainability is not met then these activities are in essence the factors that cause the specific regional problems. Consequently, in order to achieve sustainability a reconciliation of both needs (area's and actors' needs) must be achieved by regional policies. This paper presents a method of sustainable development measurement based upon the aforementioned theoretical framework. This method is applied to the South Aegean Region-Greece, in an effort to identify the developmental problems of the South Aegean Region.

1. Introduction

The Program ISTOS (Innovation for sustainable tourism and services in the South Aegean) has as a strategic goal the achievement of sustainable development through innovative actions in the Region. In the framework of this Program the Action 1.1 (sustainable development, material flow and ecological footprint) of the Activity 7.1 (innovation – sustainable development and Local Agenda 21) was assigned to the Laboratory of Local and Insular Development of the Department of Environmental Studies – University of the Aegean. The aim of this Action is the *construction of a practical tool for the maintenance and improvement of sustainability at a local level*. This requires the fulfilment of two goals, namely:
1. The assessment of an area's present state according to the principles of sustainable development.
To achieve this goal:

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- An *operational definition* of sustainable development at a local level must be developed,
- A *method* to *monitor* the present state of the area according to sustainability must be formed,
- A *method* to *assess* sustainable development at a local level must be constructed.

2. The improvement of an area's sustainability.

To achieve the second goal:

- A *qualitative method* to *pinpoint* the area's *problems* and their *causes* must be developed,
- Appropriate *policy interventions* have to be *identified* in order to improve overall sustainability.

In the framework of Action 1.1 only the first goal is fulfilled.

2. Islands, mountains and insularity

Although islands are detached, self-contained entities whose boundaries are obvious (King 1993), a commonly accepted definition appears to be quite problematic. According to the International Convention of the Law of the Sea '*an island is a naturally formed area of land, surrounded by water, which is above water at high tide*' (UNCLOS 1982, Article 121). At a European level, Eurostat (Eurisles, 1997) defines an island as a geographical unit which:

- Has a surface of at least 1km^2,
- Has a statistically significant permanent population (at least 50 habitants),
- Is not connected to the mainland by permanent structures,
- Is situated at least 1km from the European mainland,
- Is not containing the capital of a Member State.

The characteristics of the island regions refer to:

- Their small size,
- Their insularity and remoteness,
- Their fragile ecosystems,
- The special cultural values and identity of their residents (Briguglio 1995, Spilanis 1996).

Mountains are also very hard to define. The notion 'mountain' refers to a visually or geomorphologically distinctive landform. Mountain characteristics according to Braudel (1972) are the archaism and insufficiency which characterize '*their culture, their economy, everything*'. Yet, Horden and Purcell (2000) claim that mountainous societies can no longer be characterized, as they were by Braudel, primarily in stark Malthusian terms. Instead they propose that what is important to understand better the mountains, but also the islands, '*is the ability to recognize, in places that are no literal islands, the insular quality of being 'in the swim' of communications*'.

According to the EU mountain areas are made up of three types of administrative units or sub-units:

1. Areas where altitude creates very difficult climatic conditions, shortening the growing season substantially. The minimum altitude is between 600 and 1,000 meters.
2. Areas at a lower altitude, in which the average slope is so steep (usually above 20%) to make the use of mechanical equipment impossible or very expensive.
3. Areas characterised both by altitude and slope and where, in comparison with the situation in the other two types of areas, each of these factors taken separately causes a less severe handicap, but their combination give rise to a handicap which is equal or greater.

Areas above the 62th parallel and some adjacent areas, which are affected by very difficult climatic conditions, are treated as mountain areas too (Directive 75/268, Article 3, Paragraph 3).
Moreover, the EU acknowledges four key values of Europe's mountains:
1. They are 'water towers', intercepting water from air masses and storing it either as snow or in lakes and reservoirs,
2. They are centers of diversity and a significant proportion of them are conserved as national parks, nature reserves, and other types of protected areas,
3. They are tourism and recreation destinations.
4. They are sensitive to environmental changes (NORDREGIO 2004).
Apart from the different existing definitions of what constitutes an 'island', it seems more meaningful to refer to the more holistic notion of insularity. The concept of insularity goes beyond simple geographic boundaries and includes sociological, economic, and biogeographical concepts. Insularity can be defined, in the field of social sciences, as *being the result of a conjunction between a geographical condition and the reactions of political, social, economic and cultural peripheralisation* (Hache 1987). Baldacchino (2004) suggests the use of the word 'islandness' as insularity '*has unwittingly come along with a semantic baggage of separation and backwardness*'.
According to many researchers (Clark 2004, Braudel 1972, Baldacchino 2004) the sea is just one of a series of media which act as frontiers, as barriers, as obstacles to transfers. In other words, literal islands, surrounded by water, are only one sort of insular situation in the physical world. Horden and Purcell (2000) refer to virtual islands and quasi-insular regions, while Braudel (1972) refers to islands not surrounded by sea and stresses the notion of pen-insula. Mountain societies and the way they communicate with other mountain areas and plains form a curious analogue of the sea. Points where the mountains debouch into the coastlands can parallel the significance of great gathering ports (Horden and Purcell 2000).
Island and mountain regions are also characterized by similar *symbolic* features as they are perceived as:
- Safe 'harbours',
- 'Traditional' loci,
- 'Holy' / 'magic' places,
- Environmentally sensitive or protected areas (Nunn 2004, NORDREGIO 2004).
This analogue of mountain and island regions can also be traced at the *policy level*. The EC has recognized the existence of regions whose permanent natural handicaps limit their potential for development in specific ways. The three types of regions thus defined are mountain areas, territories with a low population density and island territories. It should also be recognized that many mountain areas occur on islands.
Moreover, the EC proposes similar measures of policy for both mountain and island territories. For instance, given that mountain/ island agriculture cannot generally compete with lowland farms, alternative solutions generally focus on the implementation of tailored models based on specific products or know-how, quality products and links with tourism activities (NORDREGIO 2004).

3. Sustainable development and methods of measurement

In 1987 the WCED defined sustainable development as '*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*'. Since then various definitions of sustainable development have been developed. The approach adopted by the EU is the so-called 'three pillars approach', which simultaneously aims at the achievement of economic prosperity, social equity

and cohesion and environmental protection (CEC 2005). This variety of theoretical definitions of sustainable development has resulted to the development of several methods for its measurement. These methods can be classified into three categories, namely:

- *Sectoral methods of measurement*

Several methods have been developed to measure sustainability at a sectoral level. The majority of these methods deal with issues regarding the development of enterprises such as the Dow Jones Sustainability Indexes, the Sustainability Assessment For Enterprises (SAFE) etc. (Dalal-Clayton and Sadler 2005, www.sustainability-indexes.com, www.ethibel.org, Kuhndt et al. 2002). Moreover, there are methods concerning sustainability and agriculture. Smith and McDonald (1998) have identified seven categories for assessing the sustainability of the agricultural sector and then developed a more integrated method.

- *Methods of measurement based on the different dimensions of sustainability*

- Economic dimension

The methods used for the measurement of the economic dimension of sustainability are based on traditional economic measurement methods such as the cost-benefit and cost-effectiveness analysis (DEAT 2004). Other methods include the econometric models used for developing sustainable economic strategies, such as CGE, macroeconomic and input-output models (Tambora 2003, Brettel 2003). A widely used index is the Index of Sustainable Economic Welfare (ISEW) developed by Daly and Cobb (1990).

- Social dimension

The social dimension of sustainability has been interpreted in terms of welfare of people and societies, including issues such as quality of life, social cohesion, human development etc (Duhaime et al. 2004, Royuela et al. 2003, Zhu 2001). The majority of these measurements are conducted at the international level (Sirgy et al. 2004), although more recent studies focus on national or sub-national levels (Berger-Schmitt and Noll 2000). In some studies, social sustainability also includes issues of institutional ability (GTZ 2003a, GTZ 2003b, GTZ 2003c, Mizrahi 2004).

- Environmental dimension

Methods for measuring the environmental dimension of sustainable development include the Environmental Sustainability Index (ESI) (Yale Center for Environmental Law and Policy and Center for International Earth Science Information Network 2005) and the Environmental Performance Index (EPI) (Hoti et al. 2004) among others. A special category of measurement methods is the resource efficiency measures (Moffat et al. 2001), such as the ecological footprint (Wackernagel and Rees 1996). The PSR, DSR, DPSIR frameworks were developed by the OECD (1993), the UNCSD (2001) and the European Commission (1999). Although these frameworks were originally developed to measure environmental issues concerning sustainability, they have been adapted to reflect also economic and social issues.

- *Integrated methods for measuring sustainability*

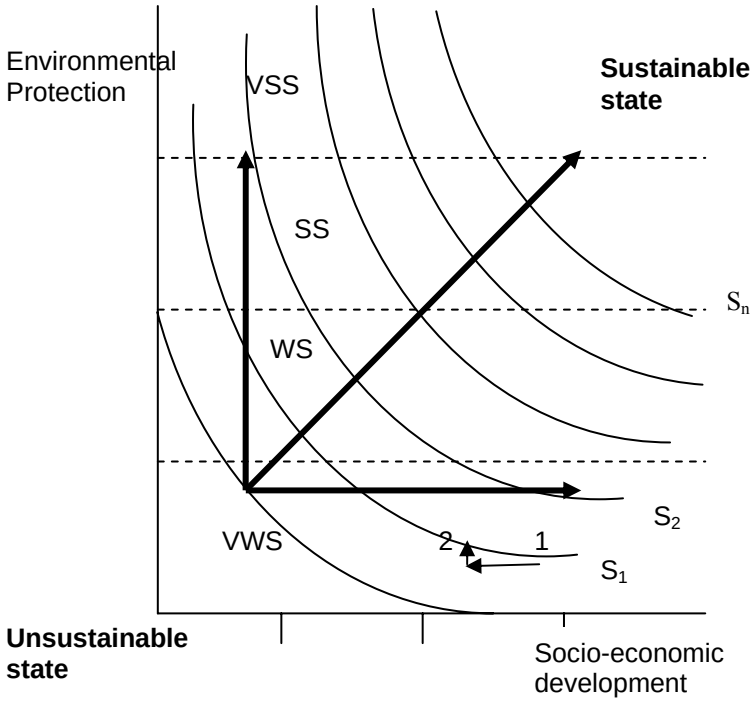
Some of these methods develop a theoretical framework for the analysis and/ or assessment of sustainable development (UNEP's framework, Integrated Sustainable Cities Assessment Method (ISCAM), Sustainable Quality Management (SQM),

Systemic Sustainability Analysis (SSA) and Systemic and Prospective Sustainability Analysis (SPSA), Environmental Alliance's matrix approach) (UNEP 2004, Ravetz 2000, Schleicher-Tappeser 2002, Bell and Morse 1999, 2004, Buselich 2002). Other methods provide frameworks for the development and/ or selection of sustainability indicators. Some of these frameworks develop single sustainability indicators (sustainability index of Western Australia, Zoeteman's integrated evaluation framework, dashboard of sustainability) and others use a variety of indicators to assess sustainability (well-being assessment, flag model, Juanda and Wasrin's model, the 4 capitals model, framework of 'sustainable wealth', Giaoutzi and Nijkamp's DSS model) (Anderson et al. 2004, Zoeteman 2001, http://esl.jrc.it/envind/dashbrds.htm, Nijkamp and Ouwersloot 1997, Juanda and Wasrin 2002, GHK 2002, http://www.iucn.org/places/canada/Word/Backgrounder%20Final.doc, Schafer and Illge 2003, Giaoutzi and Nijkamp 1993).

4. Research method

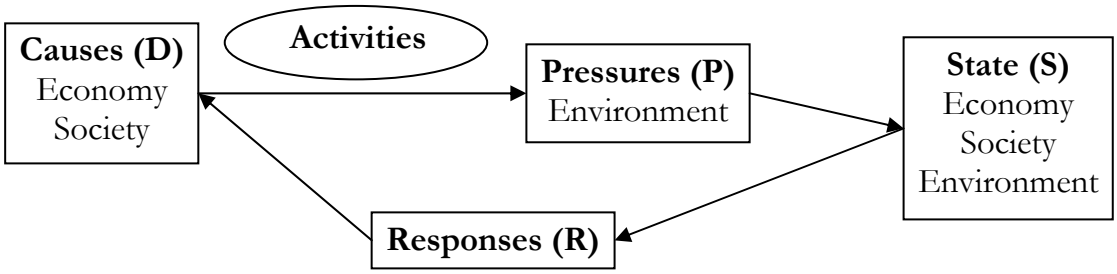
In this program, sustainable development is not envisaged as an 'end in itself' target, but as a *continuous process* of development, which leads simultaneously to the improvement of economic, social and environmental goals adopted by *each society*. This approach is shown in Figure 1. The horizontal axe represents the socio-economic development while the vertical axe the environmental protection. The curves S_1, S_2, Sn are indifference curves which represent different levels of sustainability. The dotted horizontal lines indicate the different levels of environmental protection: Very Weak Sustainability (VWS), Weak Sustainability (WS), Strong Sustainability (SS), Very Strong Sustainability (VSS). While on curve S_1, moving from point 1 to point 2 indicates a lowering of socio-economic development and an increase of environmental protection.

Figure 1: Sustainable development as a continuous process of development



The adoption of the DPSR framework helps to separate *causes* (driving forces) from *pressures* and factors that characterise the *state* of an area. The focus of the DPSR framework was broadened to include not only environmental but also economic and social issues. This exercise assisted in the classification of factors – used in the international literature – into the four categories[2] of the DPSR framework.

Figure 2: Framework of analysis



Thus, it was clarified that 14 factors must be monitored when measuring the *state* of an area. These factors, in order to become measurable are 'articulated' into several indicators. 9 indicators reflect the state of the economy, 11 the state of the society and 19 the state of the environment (Table 1).

Table 1: State Factors, State Indicators and measurement units

	Factors	Indicators	Measurement unit
ECONOMY	Employment	Total persons employed	Number of persons
		Employment in the most important sector / total employment	%

[2] D: driving force (cause), P: pressure, S: state, R: response

		Employment in the 2nd most important sector / total employment	%
		Employment in the 3rd most important sector / total employment	%
		New enterprises	Number of enterprises
	Exports	Employment in the exports' sector / total employment	%
	Enterprises' performance	Total VAT	Euros
	Production	GDP	Euros
		GPD per capita	Euros
SOCIETY	Active population	Active population / total population or dependency ratio	% or ratio value
		Active female population / total female population	%
	Unemployment	Unemployed female population / active female population	%
		Unemployment	%
		Youth unemployment	%
	Job position	Executives / total number of employed (specialisation index)	%
		Number of seasonal employed / total number of employed	%
	Income & income distribution	Income per capita	Euros
		Direct taxes per capita	Euros
	Population	Population	Number of persons
		Ageing Index	Indicator value
ENVIRONMENT	Biodiversity	Natural protected area / total area	%
		Natural protected area / total area (per type of ecosystem)	%
	Land use change	Land use area / total area (per land use)	%
		Burnt area / total area (per land use)	%
		Sparse built-up area / total area	%
		Built-up coastal area/ coastal area	%
		Diversity of land use (Shannon's index)	Indicator value
	Water quality and quantity	Freshwater resources quantity	m3
		Quality of drinking water and irrigation water (chemical elements' or compounds' concentration)	ppm, ppb
		Available water in storage reservoirs	m3
		Desalinated or imported water	m3
		Bathing water quality (Concentration of total & excremental bacteria)	ppm, ppb
	Soil quality and quantity	Desertified area / total area	%
		Cultivated area / total area (per category of cultivation intensity)	%
		Organic farming area / total cultivated area	%
		Solid waste landfill area	Hectares
	Urban environment	Non built-up urban areas / total urban area	%
		Number of cars per km (traffic)	Indicator value
		Renewable energy produced / conventional energy produced	%

Although many times it is common practice to develop a single indicator of sustainable development, this logic has not been adopted in this program. There are a couple of reasons for this. First, the adopted definition of sustainable development indicates that we must have a clear picture of the progress in each one of the three dimensions separately. Second, when a single index is developed, one cannot make

clear policy suggestions. To do this the overall number of factors must be taken into consideration.
This doesn't mean of course that the different factors of each of the three dimensions of sustainability must be appointed the same weight. It is not advisable either. In this case, all the area's stakeholders must *commonly agree* upon the weight of the different factors. Participatory processes constitute appropriate practices for this purpose.
Having reached such an agreement the monitoring and evaluation processes become more suitable and effective. The sustainability goals exist and are predetermined and quantitative. Monitoring practices will ensure that in the course of the programs implemented, activities will not lead to the deviation from the targets. At the end of the policy period, evaluation practices will determine whether the overall state of an area has improved.

5. Case study selection

Since the South Aegean Region is comprised of two Prefectures (Cyclades and Dodekanissa) it was decided that one island from each Prefecture should be included in the case study. Moreover, those islands had to be representative of their Prefectures in terms of size, tourism 'type' and intensity. The final selection of pairs of islands was based on the carrying capacity study of the South Aegean Region (Greek National Tourism Organization 2003). This study used a multicriteria method based on several islands' characteristics (e.g. demographic and economic data, tourism demand and supply). Three pairs of islands were selected: Kos – Paros, Karpathos – Ios, Patmos – Serifos. Finally, the application of the following criteria was used to select one pair of islands:

- The importance of tourism,
- The 'medium' size of islands,
- The willingness of local actors (institutions, citizens, NGOs etc.) to adopt Local Agenda 21.

The pair of islands that was selected is Kos – Paros. Both islands are of 'medium' size, exhibit a significant tourism sector and their local actors have shown an interest in the implementation of Local Agenda 21. Furthermore, the 'type' of tourism in each island is different as in Kos hotels are prominent while in Paros rented rooms comprise the majority of the accommodation.

6. Monitoring data and assessment

The system of measurement has to be a simple one, relying on published or easily accessible data. Three sources of data are used:
-The National Statistical Service of Greece (demographic, employment, income & income distribution data etc.),
- Data from Public Services (data at an island/local level, not collected by the NSSG) and Private Enterprises (i.e. data from the Public Power Corporation),
-Maps from the Ministry of Agriculture and the Greek Geological Institute (all indicators of land use change and soil quality).
Each indicator will be evaluated separately.
As far as the assessment is concerned, three indexes, one for each dimension of sustainability, will be formed. The exact method of aggregation *has not been determined yet*. This will be done after the completion of the collection of data.

7. Future steps to conclude the research

In progress:

1. Elaboration of measurement methods for certain complex indicators (e.g. land use change, soil quality, water quality),
2. Completion of the collection of data (many problems encountered: inadequate local cooperation; dispersion of data sources on different islands; no data in some cases)

*Next steps***:**

1. Evaluation of the quality of the existing data,
2. Calculation and aggregation of indicators,
3. Assessment of the sustainability level,
4. Training of Local Authorities in order to use the 'tool'.

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