

Environmental compatibility of the coastal tourist installations: definition of a sustainable planning design tool

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ABSTRACT: This research deals with the general discussion about the *environmental impact of tourism* (a multidisciplinary issue concerning environment, society, culture and economics) focusing on the deterioration caused by the building activity within the coastal areas, in great environmental importance places. The research focuses on the coastal decay caused by tourist facilities development on the unprotected territories. In these areas the maintenance of the equilibriums between human and environment becomes a fundamental tool for the preservation of the tourist demand and for the correlated economic and social increase. These areas are subject to notable tourist flows which positively affect local economy in the short-time, these flows are attracted by the environmental qualities, but the consequent anthropic pressure causes the perishability of the delicate and fragile ecosystem.

A sustainable planning design tool of the coastal territory has been defined within this research. The application phase has been experimented on the territory of Porto Cesareo in the province of Lecce, situated in the South of Italy.

The design tool founds itself on methodologies already experimented and it can be used from the local authorities and the operators that realize sustainable planning interventions in the coastal territories at our latitudes, when the tourist demand is limited to a short-time. The tool can be used by the authorities in the evaluation phase of the projects, and by architects for the preliminary design as well.

Keywords: sustainable planning design tool, coastal tourism, sustainable planning

1. INTRODUCTION

Tourism is a worldwide phenomenon; it has impressive dimensions both considering the number of people and the aspects concerned by it. It cannot be regarded as an economical activity only: it is a possibility of contact [1], comparison, growth, an effective tool for local development from the cultural, social and economic point of view.

In many cases, the results of a policy aimed at a short-term and forced growth of the tourist activity, lacking a careful planning, have been the cause of environmental disasters. The growth of tourist coastal centres is following similar development processes: at the beginning, the tourist demand is attracted by the landscape quality, producing an increase in the tourist facilities (which, without an environmental control, starts deterioration processes of the environment) and a transformation of the tourist demand, from a naturalistic demand, into a recreational one. At the same time, the increase in the local economy produces a transformation of the economical activities typical of the territory into tourist activities. In the long run, these processes lead to the loss of the local identity of an area, and to the abandonment of the

urban centres during the period in which the off-demand.

1.1 Background

In 1978, in order to face the environmental impact of tourist activities, WTO (Worldwide Tourism Organization) established an environmental committee, which gathered for the first time in Madrid in 1981. However, the concept of sustainable tourism was coined only after the general definition of sustainable development; it is defined as:

"The sustainable development of tourism shall meet the need of tourists and of all the destinations, at the same time, improving and enhancing the future possibilities" [2]. Only in April 1995, at the end of the First Worldwide Summit on Sustainable tourism, in Lanzarote (Canary Islands), the *World Chart of Sustainable Tourism* were drawn up. So *Sustainable Tourism* [3] is not restricted to responsible tourism, eco-conscious visitors, eco-hotels etc. it also deals with environmental protection and sustainable planning for tourism development.

In many cases, for example, the deterioration and the consumption of the **soil** (one of the resources with the slowest re-formation rate) persists in the name of a

tourist demand, which by nature, is limited only to three/four months a year.

1.2 The goal

The main objective of this study is to define a sustainable planning design tool, specific for coastal tourist planning. It was adopted as a reference for the redevelopment project of some European urban districts: HQE²R (*Haute Qualité Environnementale et Economique pour la Rehabilitation*) [4].

2. METHODOLOGY

The present research has used the methodological structure of HQE²R [5], as described above; the *output result structure*, whose efficacy has been extensively tested, has been used as well. This research follows the development phases of HQE²R methodology, whose contents have been elaborated again.

The basic phases are: realization of the document related to the *inventories* and the diagnosis protocol; definition of the system of specific *indicators* for the existing conditions evaluation, and definition and evaluation of hypothetical development *scenarios*.

2.1 The indicators and their measurability- OBJECTIVE- the experimental phase

The definition of the specific objectives referring to this decision-making support tool, were originated by the analysis of the diagnosis protocol and of the development processes occurring in the coastal areas of the Mediterranean region. Subsequent to the completion of the diagnosis protocol, the following specific objectives have been established:

- **territory** preservation and enhancement:

every human settlement should aim at reaching a balance with the natural environment housing it. The need for reaching and protecting this balance between the natural environment and the "building" context is essential when the territory is the target of tourist flows attracted just by the environmental characteristics of the area.

-protection of the **resources** through the reduction of the open cycle consumption [energy, water resources, urban waste]

The reduction of the open cycle resources is one of the most important objectives for any redevelopment work aiming at optimizing global sustainability. With respect to tourist areas, it is important to remember that the consumption of open cycle resources, for tourist activities, is remarkably higher than the consumption connected to daily life activities.

-improving the **services** (quality of life and quality of the visit)

The quality and quantity of the *urban services* available for users can be considered as an indicator of the quality level of the offer concerning both "tourism" and "daily life", in a specific place. The services available help a correct evaluation of the qualitative/quantitative possibilities offered by an area.

Beyond specific threshold levels, the ratio among the services referring to the two categories shifts from

reciprocal proportionality (if one increases also the services referring to the other category will increase too) to inverse proportionality (if one increases the quantity and the quality of the services offered to the other category will decrease).

-Improving the "tourist pressure" ratio: **residents/visitors** ratio (the ratio among users typologies)

This objective defined as $\delta_T \text{ visitor}/(\text{resident} + \text{visitor})$ will help to understand and control the "threshold level" of the balance to be pursued. The chance to control the effects that possible interventions on the territory may have on this fragile balance is essential.

2.2 Description of the calculation OBJECTIVE

This methodology has been scientifically implemented, in order to be easily used in the environmental evaluation of other areas, facing the same problems.

Being a flexible tool, partly editable, all the applications and the calculation table have been elaborated in order to optimize the individuation of the data to be inserted and of the modifiable values, according to the needs and the local characteristics.

The other aspects of this evaluation and calculation method, such as the **objectives** - both their definition and their importance-, the **structure** of the cards and their **calculation method**, as well as the structure of the **final** results, remained fixed and unchanged.

OBJECTIVE 1:

EVALUATION OF THE TERRITORY

1. Rare urban areas, for second housing (tourist areas), corresponding to the areas having gone through a urbanization process, to meet the tourist demand by the "owner visitors". The "soil imperviousness" caused by the demand, which develops during a definite and brief period of the year, for a maximum duration of four months.

2. Rare urban areas, to highlight the unsustainability of a model producing an unsustainable mobility system and causing the imperviousness of notable amounts of land.

3. Dense urban areas, although the soil is completely impervious these refer to historical anthropization processes, implemented by the local offer addressed to resident users, who live in the area throughout the year. Residents, in general, are responsible for the transformation and conservation processes of a territory[6], intended as their habitat, and it is necessary to refer to them for the development and implementation of actions aimed at the protection of an area.

4. Generic cultivation areas, in such a case, although the soil is not impervious, it is the object of intensive exploitation.

5. Traditional cultivation areas, can preserve the typical natural environment, although not at its virgin state. "Traditional cultivation" refers to all the form of "Cultivo Madre".

6. The object of this research is principally the evaluation of the environmental sustainability; for this we have been elaborated a specific evaluation system (following explained) for the Natural vegetation areas.

A zone of analysis was selected, with a dimension of 1 hectare, in order to facilitate the evaluation; the category referring as "natural vegetation" was further divided in 4 sub-classes and analyzed according to defined well-known characteristics. The hectares under optimal conservation conditions obtained the maximum value. This condition refers to specific characteristics such as the *existence of connections among the green areas, the presence of important naturalistic elements and a good integrity*. This evaluation is based on the definition and identification of *ecological corridors* in the analyzed area, referring also to other basic characteristics, such as *shape, density and compactness* which complete the information gathered through the morphologic analysis carried out on satellite data.

Compactness: $K=(2\sqrt{\square} A)/p$; border development: $D=p/(2\sqrt{\square} A)$; Circularity: $C=4A/p^2$; Mean radius: $R=(\Sigma R)/n$, form ratio: $FR=A/l^2$; shape factor: $SF=pc/p$. Where A = Patch area; l = length of the longitudinal axis; n =number of sides considered; p = Patch perimeter; R = Patch radius[7]. The schematization of the different interaction typologies is reported below – corridors among the green areas. This schematization is the basis of the evaluation process and the basis of the value assignment process in this research.

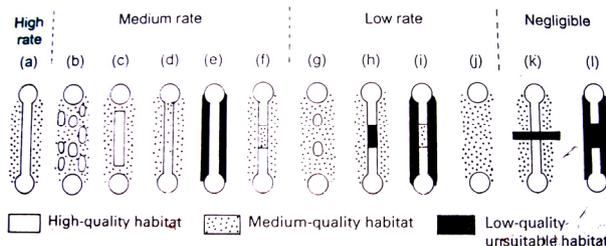


Figure 1: typologies of green areas

Representation of the percentage related to the movement of the biodiversities among the different patches represented:

I group HR - (a) connected corridors [optimal evaluation: there is a connection among the areas with a high quality habitat; they are surrounded by medium quality habitats];

II group MR - (b-c) cluster of patches, not fully connected, (d) gradient: the corridor is composed of areas with variable quality (e) the connection is composed of high quality areas, but surrounded by low quality habitats (f) patchy corridor, but surrounded by medium quality habitats/settlements;

III group LR - (g) row of advancement patches, with high quality habitats, (h) small intersections with completely impervious soil, (i) the corridor is surrounded by low-quality habitats, such as completely impervious land, but the corridor is intersected by medium quality habitats, therefore improvements are possible, (j) the corridor does not exist, but the area around the green patches is medium-quality, thus the areas are possibly connectable;

IV group N- (k) barrier intersection (l) the intersection has small dimensions, but the green patches are

surrounded by low quality habitats, therefore unlikely to be connected.

Besides, we assigned a full value to a hectare of land belonging, for example, to **HR** group (High Rate), and surrounded for its whole perimeter by a hectare of the same category, and a value decreased of one point for a hectare of the same group but surrounded by interrupted portions of lands, belonging then to lower categories, for more than 50% of its perimeter.

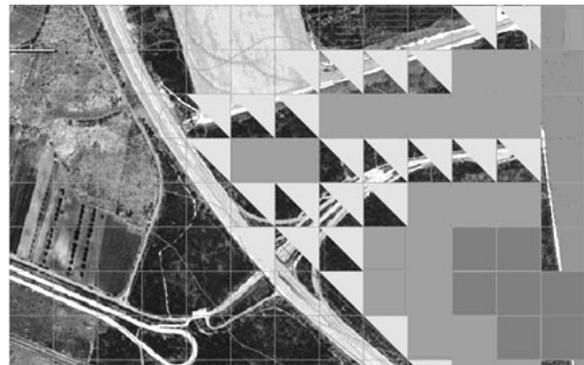


Figure 2: To facilitate the visualization and the rating of the area and the comprehension of the methodology adopted, all the modules of the area presenting completely impervious portions of land (according to Forman's scheme they belong to *Negligible N*) are represented by triangles.

OBJECTIVE 2:

EVALUATION OF THE RESOURCES

The evaluation of the resources can be made with the measurement of their consumption; the indicators enable the evaluation of the use of open-cycle resources, an element which automatically gives information on the unsustainability of a system, without considering the amount of recycled material.

This objective especially measures the impact that building has on the available resources within a region. The consumption is divided in three main classes (these classes have been measured for every type of consumer):

1. **energy** consumption -unit of measurement: $KgCO_2/m^2$
2. **water** consumption -unit of measurement: *litres/person per day*
3. production of **waste** -unit of measurement: *Kg/person per day*.

OBJECTIVE 3:

EVALUATION OF THE URBAN SERVICES

A series of specific indicators have been added to each class of services. The values assigned to each specific indicator is based on the following function $\Sigma(fx)=f(X)+f(Y)+f(J)$ where

X = **frequency** number

Y = **accessibility**

J = **functionality**.

Specific attention is paid to the evaluation of service accessibility, with respect to the distance that the user must cover to benefit the service under consideration. For this reason the chart classifies different kinds of services, according to the frequency of use for each family of users. The final result is the product of the

frequency number, multiplied by the distance (**accessibility**) that the user has to cover and by the **functionality** value (the quality).

OBJECTIVE 4:

EVALUATION "RESIDENTS/VISITORS"

This ratio, defined as $\delta_T \text{ visitor}/(\text{resident} + \text{visitor})$ and originated from the variable "time", corresponds to the pressure ratio, acting between a visitor and a resident.

This indicator comes from a survey by Lega Ambiente Italia during which 128 specific indicators referring to 15 classes of indicators, or main indicators, were defined. Main indicator 4 (pressure ratio) is calculated also with respect to the ratio between *second houses and residents, percentage of existing holiday villages*. The ration between the residents and the different classes of visitors is specifically analyzed; the following functions are analysed:

- $\delta_T \text{ owner visitor}/(\text{resident} + \text{owner visitor}-1)$,
- $\delta_T \text{ lodging visitor}/(\text{resident} + \text{lodging visitor}-2)$,
- $\delta_T \text{ weekly visitor}/(\text{resident} + \text{weekly visitor}-3)$,
- $\delta_T \text{ daily visitor}/(\text{resident} + \text{daily visitor}-4)$.

Deriving the pressure value from the variable "time", it is possible to define a standard cycle and analyze its characteristics.

2.3 The final output chart.

The configuration of the final chart, according to the **four objectives** established, is represented by the following figure:

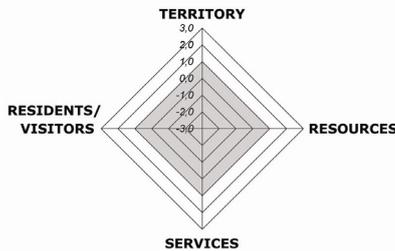


Figure 3: output chart

3. THE CASE STUDY- THE APPLICATION PHASE

The application phase was focused on the case-study of an Italian municipality, in the region Apulia (Porto Cesareo in the province of Lecce).

Porto Cesareo is characterized by peculiar environmental elements, subject to seasonal tourist flows; in the last decade the tourist demand had an exponential growth, therefore the setting up of tourist facilities is increasing. The expansion of the built areas generally takes place with low attention to the techniques for environmental protection.



Figure 4: Porto Cesareo

Half of the borders of the municipal area of Porto Cesareo [about 40° paralle], are in the coastline of the Mediterranean Sea. It is a tongue of land extending for about 3500 Ha, which in the narrowest points is only 900mt long. There are small hills: in the inland the maximum height, sloping gently down to the sea, is 50m. The area has more than 20km of coastline and it is in the coastline of the Ionian Sea (Sea of the Gulf of Taranto).



Figure 5: Municipal area

3.1 Results of the evaluation of the existing condition.

From the evaluation of the four objectives it is possible to deduce the result of the existing conditions, which becomes the essential starting point for the definition of the development scenarios.



territory services r/v resources

Existing condition	-1.00	-0.25	0.08	-0.7
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Figure 6: evaluation final existing conditions (output result structure)

From the conclusive evaluation of the existing conditions, it emerges that both the value referring to the consumption of the resources and those concerning the state of the area and the quality and quantity of the services offered, are rated **below zero**. These results points out a critical condition, representing the most urgent issue to face. The development scenarios shall act mainly on the critical condition established by the analysis of the existing condition.

3.2 Scenario 1, 2 and 3.

After the evaluation existing conditions we have defined of the development scenarios, in accord with the local authorities.

Following we bring the synthesis work.

Scenario 1:

Building of two new constructions for tourist accommodation, located along strategic road junctions. Creation of a urban free zone, near the beach, set up as a traffic restraint area.



Figure 7: valuation final scenario1

Observing the final output result obtained by the evaluation of this scenario, it is evident that the objective concerning general quantity/quality of the **services** has notably improved. This scenario acts only on the **lodging visitor** and **weekly visitor**.

In regard to the results concerning the evaluation of the area and of the consumption of the resources, it is possible to note that in both cases there is a slight improvement with respect to existing conditions, to the detriment of the ratio between **residents and visitors**. Since two tourist units have been designed to accommodate the flow of visitors flocking to the area, the pressure level will remain unchanged. It is necessary to note, however, that from a social and cultural point of view, such a scenario does not stimulate the interactions between residents and visitors, so the social and cultural benefits that a resident may have from such exchanges will be inhibited.

Scenario 2:

Renovation of the existing houses and demolition of the areas in the most critical conditions; controlled creation of new urban spaces and connection of green areas, keeping and renovating the local urban structure in order to optimize the use of the resources. Creation of a urban free zone, near the beach, as a traffic restraint area.



Figure 8: valuation final scenario2

Observing the final output result, it is possible to note a general improvement, especially concerning **resources** consumption and services evaluation. This scenario acts on all users.

Scenario 3:

Complete renovation of all the existing buildings and redevelopment of selected areas. Creation of a urban free zone, near the beach, as a traffic restraint area.



Figure 9: valuation final scenario3

This scenario is of difficult application, but the improvement reported by the values concerning resources and services conservation is good.

3.3 Final consideration

The first critical point detected by the comparative analysis of the existing conditions, based on different development scenarios, is the difficulty to increase the hectares of HR (high rate) rural land; these high quality areas with natural vegetation could support the development of an abundant biodiversity and have been assigned maximum rate. Therefore, although both scenarios one and two envisage local changes, they can be assigned a value above zero. This is due to the general difficulty to regenerate the degraded green areas, since the regeneration of HR green areas requires continual care and time. The natural soil is a resource with the slowest re-formation rate. The third scenario does not envisage any demolition and the evaluation of the area is thus unchanged, with respect to the existing conditions.

The comparison of the final charts related to the existing conditions and the development scenarios, clarifies that the area defined by these diagrams is wider than that considered in the existing conditions (this is especially evident in scenario Two and Three) Following there are the comparison graphs of the most important annual consumptions. We can read as changing the consumptions in the different scenarios.

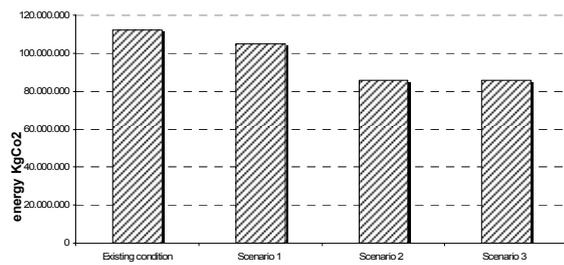


Figure 10: energy

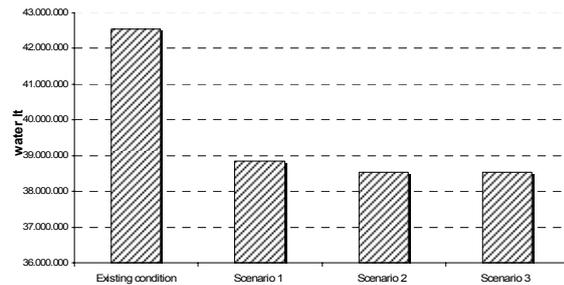


Figure 11: water

In the following graph we see the comparison of the quality public services

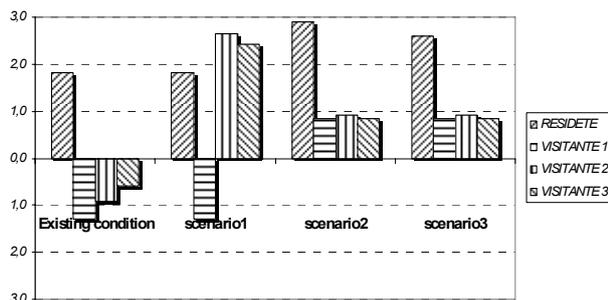


Figure 12: services comparison

Also in this case the different quality and quantity levels of the services depend on the targets of each scenario and especially on the different users categories they refer to.

4. CONCLUSIONS

Being aware that the environmental evaluations and the sustainability development analysis are only “flashes” of a dynamic system continuously evolving, this study intends to offer a methodology for the evaluation of the environmental impacts on the coastal territory, with special attention to the Mediterranean regions.

In this research basic step has been the definition of the indicators useful for the measurability of the scientific problem. The processes of definition of the indicators and of their method of calculation have been fundamentals. The clarity of the data of start is essential, because from these data we can start for the processes of measurability. The reading of the same data of start can be essential for the understanding of the active dynamics.

In this type of tools, the legibility of the final result is fundamental, in this case, represents a synthesis of the processes applied for the environmental evaluation. Such synthesis represents the balance of the territorial development, but it allows a examination on the partial results that reveal the true state of analysis. One of the potentialities of this type of tools of evaluation, are really in the possibility to read the partial results, therefore they are transformed in values referred to the global staircase of reference. These are often meaningful and they clarify particular dynamics in progress.

5. FUTURE WORKING OUT OF THE TOOL

Aware of the fact that the application to only one case study is not enough, we propose a future application of this tool on other case studies. The applicability offers the possibility to sharpen the systems of measurability and calculation so far to improve the level of reliability of the final result.

Particularly we remember that the tool is adaptable to the environmental evaluation of coastal tourist installations to our latitudes, that has natural characteristics of merit and that, particularly, is living a growth of the tourist demand in the summer period. The essential data for the application of this process of evaluation are shortly summarised in the following list:

- good definition of GIS drawing of the territory,
- statistic registry data,
- statistic data about the presence and typology of visitors,
- statistic data about the reported consumptions to the resident and visitor consumer,
- data about the presence of first and second houses,
- a territorial drawing of the quality and quantity of the urban services.

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