

Zoppi, Corrado

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## Does landscape protection really matter? An assessment of a local community's attitude through multicriteria analysis

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# DOES LANDSCAPE PROTECTION REALLY MATTER? AN ASSESSMENT OF A LOCAL COMMUNITY'S ATTITUDE THROUGH MULTICRITERIA ANALYSIS

Corrado ZOPPI

Dipartimento di Ingegneria del Territorio, University of Cagliari, Via Marengo 2, 09123 Cagliari, Italy; tel.: Italy – (0)70 6755216, telefax: Italy - 070 6755215; e-mail: zoppi@unica.it

## ABSTRACT

Sardinian regional planning is characterized by a deep change that followed the approval of the Regional Landscape Plan (RLP). The RLP, which is ruled by the Italian National Code of Cultural Heritage and Landscape, establishes the directions for future Sardinian regional planning. The actual sectoral, province and coastal city plans, and plans for protected areas, have to be changed in order to follow these directions. The adjustment process could be conflictual, since coastal cities, provinces and the administrative offices of protected areas, may possibly disagree with the regional administration about the conservative rules established by the RLP. In this view, this paper evaluates and analyzes the degree of consensus of the people living in the city of Sinnai, a small coastal city of Southern Sardinia, on four planning proposals concerning a portion of the coastal strip. Two of these proposals are consistent with the directions of the (conservative) RLP, and two are not. These four proposals are defined independently from each other by four junior planners of the school of urban planning of the University of Cagliari (Italy), who also propose a set of criteria for making a decision on which of the four proposals is the most suitable. The paper is based on two steps. First, proposals and criteria are defined. Second, a questionnaire is delivered to a random sample of the citizens of Sinnai. Each respondent has to give her/his own ranking of the chosen criteria, being informed that the criteria ranking is going to be used to choose the best projects among the four proposals. An analytic hierarchy process multicriteria analysis procedure will be used to draw conclusions on the experiment.

**Keywords:** Landscape planning, Multicriteria analysis, Coastal zone management.

**JEL classification:** D81; O21; R52

## 1. INTRODUCTION<sup>1</sup>

The process of adjustment of the Masterplan of the city of Sinnai (MPS) to the RLP is quite complicated. The MPS has to conform itself to the descriptive, prescriptive and propositive contents of the RLP, to the general planning rules and directives established by the RLP for the coastal zones, and to the strategic policies for “conservation, protection maintenance, improvement or restoration of the landscape values identified in the landscape units.” (Planning Implementation Code [PIC] of the RLP, article 7, paragraph 1). The relationships between landscape values, characteristics of the zones and categories of strategic actions are described in the Annex 1 of the PIC.

In this paper, a significant and problematic issue concerning the change of the MPS in order to follow the RLP is put in evidence and discussed. This aspect is referred to the areas which belong to the “Coastal zone” according to the PIC. These zones roughly correspond to the “Coastal tourist zones” (labeled as “F” zones) of the MPS.

This question is extremely important, in the context of the adaptation process of the urban planning rules of cities and provinces to the RLP, for the city of Sinnai, whose territory is partly inside and partly outside the boundary of the coastal zone defined by the PIC. Outside the boundary is the consolidated urban fabric which roughly corresponds to the historic center, the most recent developments and the expansion zones, where the city development is planned by the MPS but has not taken place yet. The coastal zone, which is an administrative island of the city, has a consolidated small residential nucleus, and some areas where houses, c should be built in the near future, according to the Masterplan, which defines these zones as “F” (tourist) zones.

The question of the adaptation process of the actual plans to the RLP is of paramount importance for the effectiveness of the new planning policies of the Sardinian regional administration, and for the definition of a general model for the strategic assessment of city planning based on the analysis of perceived needs and expectations of the local communities, through sustainable-development-oriented governance processes.

Sinnai is an important urban center of the metropolitan area of Cagliari, the regional capital city of Sardinia, which shows a constant demographic increase in the period 1951-2001, with a resident population of around 16.000 in 2004. The city jurisdiction covers a territory of about 220 km<sup>2</sup>. Land uses are highly diversified, both in the urbanized and in the rural areas. An important coastal administrative area is almost entirely coincident with the village of Solanas, characterized by settlements for coastal and marine tourism. A diversified and complex structure characterizes the local community, its economic and social activities, and its relationships with its landscape and environment.

The city of Sinnai shows a significant local dynamics, as the Province of Cagliari Area Report (PRA) of the Regional Programming Center puts in evidence (Regione Autonoma della Sardegna, 2006), which grounds the choice of this context for the case study of this paper. Another interesting feature of this context is that it is circumscribed enough, and, as such, easy to be analyzed and understood, with reference to the economic and social processes which develop within it.

The PRA indicates that Sinnai has a demographic weight greater than the average amidst the cities of Southern Sardinia, with a comparatively high annual growth rate in the period 1991-2001, and a low old-age index. The percentage of cultivated land in the city jurisdiction is comparatively high, and construction industry is the most developed and attractive for the lo-

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<sup>1</sup> This paper is part of the project of relevant national interest on “Sustainable Development and E-Governance in Urban Planning,” funded by the Italian Ministry of Education, University and Research for the period 2006-2008.

cal labor force. There is a significant supply of rooms and beds in hotels, residences and camping sites. The level of education of the residents of Sinnai is above the average of Southern Sardinia, while youth unemployment rate is very high (above 20%).

Sinnai is a young, demographically-expanding city. It is an urban context with a lot of unemployed people and people looking for a job for the first time. Many of the young unemployed are investing in their professional education. The productive system of Sinnai is strongly dependent on agriculture and construction. Services and hi-tech are weakly developed. Marine and coastal tourism in the administrative island of Solanas is important and could be increasingly important in the future for local economic development. All these remarks are discussed in the PRA, which states the foundations of the economic and social programs of the Sardinian regional administration. These programs are based mainly on the availability of the Structural Funds of the European Union.

Sinnai has identified its economic and social development perspective with important residential developments, for tourism, in the coastal zone (an important share of the Eastern part of the Gulf of Cagliari), and for new residents, in some areas adjacent to the consolidated urban fabric of the city. Construction and tourism would fuel the local depressed economy, and in the long run a balanced and stable economic development would take place, based on the short- and medium-run impacts of the increase of income and employment.

This development perspective, which the city has expressed in its MPS and in its planning code, must be reconsidered with respect to the RLP, because the PIC is in contrast to the MPS. Since it is mandatory for the cities to redesign their Masterplans to fulfil the PIC, it is evident that a harsh dialectics may arise in the adaptation process. From this point view, the Sinnai case is certainly paradigmatic.

Moreover, it must be noticed that the city of Sinnai had recently (2002) adapted its MPS to the previous RLP. Thus, the MPS is consistent with the planning implementation code which was in force before the new RLP. By doing so, Sinnai would deserve a mention, since very few coastal cities adapted their Masterplans.<sup>2</sup>

The MPS was established by the Deliberations of the City Council nn. 87/October 30, 2000, 41/July 17, 2001, and 63/October 30, 2002, and published on the Bulletin of the Autonomous Region of Sardinia n. 40/November 26, 2002. The MPS has a simple and linear structure, which favors a concentric development of the city residential areas. This concentric development allows future residential developments to take the same characteristics of the historic and recent developments of the urban fabric. The inner part of the fabric is the historic center of Sinnai. Residential completion and expansion zones are concentric and adjacent to the historic center. The planning rules of the MPS for the expansion zones have to be implemented through detailed plans. A few of these plans have already been designed and approved by the city, and are actually being implemented by groups of landlords. However, in most cases these plans have not been designed and approved yet, due to the relatively recent approval of the MPS (end of 2002), and to the safeguard rules established in September 2004 by the Regional Law n. 8, which stated that in the coastal areas the implementation of the Masterplans had to stop until the RLP was approved.<sup>3</sup> Thus, only one year and a half had passed from the MPS establishment when Law n. 8/2004 was approved.

The process of adjustment of the MPS of 2002 to the RLP is extremely problematic and conflictual. One important reason of the conflict is that the planning process concerning the

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<sup>2</sup> The previous RLP referred to the city of Sinnai was the RLP n. 13 (South-Eastern Sardinia), established by the Law enacted by decree of the President of the Autonomous Region of Sardinia n. 278/August 6, 1993, published on the Ordinary Supplement of the Official Journal of the Italian Republic n. 285/December 4, 1993. This Law was cancelled by the Regional Administrative Court of Sardinia with the Sentence n. 1207/2003.

<sup>3</sup> This law (named "The saving-coast law") identifies the coastal areas as those included in a 2-km belt from the coastal line. The safeguard rules expired in September 2006, after the RLP approval.

coastal tourist zones of the administrative island of Solanas cannot be implemented as planned by the MPS. This paper analyzes this conflictual issue by assessing if people living in Sinnai have a good attitude toward the PIC with reference to the F zones.

Four planning proposals for a not-yet-planned coastal tourist zone of the MPS were defined and assessed. The assessment is based on MCA. A questionnaire was delivered to a random sample of the residents. Through the responses to this questionnaire it is possible to evaluate how the Sinnai citizens evaluate and rank the criteria on which the MCA application is based. The desirability of the future scenarios is assessed through the criteria ranking .

This paper is organized as follows. In the second section, the potential conflict between the city of Sinnai and the Sardinian regional administration is discussed. In the following section, four planning proposals for a coastal tourist area of the MPS is presented.. In the fourth section, the MCA methodology is discussed within the context of the case study. The fifth section describes the sampling technique and the questionnaire used in this study, and the results of the MCA methodology for the planning proposals' ranking. Finally, the sixth section summarizes the findings and discusses the implications of the use of MCA methodologies as a way of dealing with the diverse local community views on complex spatial planning issues.

## 2. THE CONFLICT BETWEEN THE CITY AND THE REGIONAL ADMINISTRATION

The conflict concerning the costal tourist zones depends on the new rules that the adjusted MPS will establish for these areas in case no detailed plans were implemented by the time Law n. 8/2004 was approved. The PIC states that, before the approval of the new MPS, new developments can take place if they are allowed in the actual Masterplans and detailed plans for the areas of these developments are in force (PIC, art. 15, paragraph 2).

The PIC also states the planning rules for the tourist coastal zones without detailed plans in force. These are the following:

- i. the quality of the existing tourist supply (houses, hotels, camping sites) of urban centers, villages, rural and scattered settlements, and old mining villages, must be fostered (PIC, art. 90, paragraph 1, letter a);
- ii. tourist projects for the existing settlements and their public areas must be defined and implemented, eventually through a step-by-step approach, in order to promote the improvement of the quality of the tourist supply and to favor a longer tourist season (art. 90, paragraph 1, letter b, §1);
- iii. tourist projects must aim at increasing the supply of rooms in hotels rather than building vacation houses (art. 89, paragraph 1, letters a and b);
- iv. new projects should increase the tourist supply through the restoration of the existing residential buildings and the realization of rooms and suites available for tourists, rather than through the construction of new buildings; the transformation of houses into hotels can be stimulated by giving extra building permits in areas located outside the coastal zone (art. 90, paragraph 1, letter b, §2);
- v. the settlements in the coastal zone should be relocated outside it; this should take place possibly in sites adjacent to existing residential settlements in order to minimize the impacts on the landscape; the relocation of residential settlements can be stimulated by giving extra building permits in areas located outside the coastal zone, allowing for up to 100 percent residential volume increment (art. 90, paragraph 1, letter b, §3).

It is evident that the adjustment of the MPS to the RLP implies significant losses of residential volume and tourist houses in the coastal zone. These losses can be detected and quantified on a per-coastal-section basis.<sup>4</sup>

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<sup>4</sup> The MPS divides the tourist coastal zone of the administrative island of Solanas into several zoning sections.

Let us consider, for example, two sections of the tourist coastal zone adjacent to each other, identified as F2- and F4-type areas by the MPS, both in the territory of the administrative area of Solanas. The MPS allows to build houses up to 3.000 m<sup>3</sup> on a 29.000-m<sup>2</sup> area (F2) for a nominal population of 50 residents, and hotels, residences, bungalows and camping sites, up to 16.000 m<sup>3</sup> on a 125.000-m<sup>2</sup> area (F4) for a nominal population of 270 residents. With the exception of a 3 percent of the F4-type area, where, optimistically, a 485-m<sup>3</sup> very small new hotel could be built – which, by the way, could be only allowed if it is demonstrated that it is a functional improvement of an existing building – all the whole building capacity of the MPS would be lost, were it adjusted to the RLP. This loss amounts to about 20.000 m<sup>3</sup>.<sup>5</sup>

As a consequence of the adjustment process, the most part of the building capacity of the coastal tourist zones of Sinnai, and of the other Sardinian coastal cities, would be lost in the same way, which may possibly hinder the development of coastal tourism, and generate a stark institutional conflict between the cities and the regional administration.

It is evident that the city of Sinnai would be in big troubles, if it had to set up a new MPS which states that no new houses and hotels would be allowed in tourist areas where new developments could have taken place before the RLP.

The conflict comes from different reasons. First, the landowners of the areas located in the actual tourist coastal zones would experience an overnight dramatic decrease of the values of their properties, since they would lose their building rights. Second, the city would suffer from the decline of the building expansion rights since it could not rely on the financial resources for public services and infrastructure that would come from the impact fees paid by the developers anymore. Another problem for the budget of the city would come from the decrease of payments of the communal tax for real estate which includes land property, since the value of land would dramatically drop without development rights.

Since in many of the actual tourist coastal zones it would not be possible to build anymore, a crisis of the local construction industry would probably occur. This industry is the most important in terms of income and employment for the local economy, which is characterized by a high unemployment rate. Its crisis would worsen an already-difficult economic and social situation. (Regione Autonoma della Sardegna, *cit.*)

Moreover, in the short run most of the local firms of the construction industry would not be able to convert their constructive expertise from new buildings to renewal of the existing houses and hotels. A lot of them would be displaced and may possibly be pushed out of the market by competitors from outside Sinnai.

Finally, lack of competition between supply of newly-built houses and hotels in the tourist coastal zones and supply of houses and hotels elsewhere - since almost the entire supply of tourist houses and hotels would be the latter, in the medium and long run – would possibly impoverish the overall quality of the housing stock. A progressive decline of the quality of the housing stock would weaken the competitive position of Sinnai as an attractive city to spend a vacation, which would boost its economic and social problems.

Public subsidies for the infant construction industry of Sinnai would be necessary to support it during the adjustment period, in order to prevent a significant share of the firms of Sinnai to run out of business. These subsidies could hardly be available, since a lot of the coastal cities of Sardinia would need them at the same time, which may cause important financial problems to the regional administration.

For these reasons, it is very possible that a big resent would develop against the RLP, and, as a consequence, against the city and regional administration during the process of adjustment of the MPS to the RLP.

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<sup>5</sup> The detail of the calculations is omitted here. It is based on the information provided in the Main Report of the MPS.

### 3. PLANNING PROPOSALS FOR AN AREA WHICH THE ACTUAL MPS DEFINES A TOURIST COASTAL ZONE<sup>6</sup>

After the adjustment of the MPS to the RLP the tourist coastal zones could not maintain their status, thus building new houses and hotels would not be allowed in these areas anymore. New developments would be allowed in terms of publicly- or privately-owned public services, open space, recreation, public parking, sport facilities, etc..



*Figure 1.* Delimitation of the area for the planning proposals. The area is located in a tourist coastal zone of the actual Masterplan of Sinnai. The area is classified as “F4” (the largest share bounded by the red line) and “F2” in the MPS

This area is located in the administrative island of Solanas (see Figure 1). A part of the area is classified as a F2 tourist zone (about 4.3 hectares) and a part of it is classified as a F4 tourist zone (about 11.7 hectares). The latter is named “Comparto di Monte Mesu [Section of the Mountain located in the middle]. The F2 area is bounded on the north-west by Via delle Viole and Via delle Fresie [Violets Street and Freesias Street], on the south by the continuation of Via delle Rose [Roses Street], and on the east by Via delle Azalee [Azaleas Street]. The

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<sup>6</sup> The plan proposals are defined in the thesis of Manuela Arippa, Maria Grazia Lombardo, Daniele Marrocu and Roberto Sulis, in the Program of the First Degree in Building Engineering, at the Faculty of Engineering of the University of Cagliari, Italy. This thesis, titled “Definizione di un sistema di criteri per la pianificazione delle aree costiere in Sardegna nel quadro del Piano paesaggistico regionale: un caso di studio relativo a Solanas, nel comune di Sinnai” [Definition of a set of criteria for planning decisions concerning the coastal areas of Sardinia in the framework of the Regional Landscape Plan: a case-study referred to Solanas, in the city of Sinnai] was supervised by Corrado Zoppi. The thesis defense was held with the Graduation Committee of the First Degree Program in Building Engineering at the Faculty of Engineering, in 2010. The thesis is available for consultation at the Dipartimento di Ingegneria del Territorio dell’Università di Cagliari [Department of Territorial Engineering, University of Cagliari], Italy.

area is partially urbanized: a compact settlement is located to the south, and scattered houses to the south-east.

The four planning proposals for the area are described below.

### *3.1. The four planning proposals*

The first planning proposal (Plan1 from now on) follows the actual MPS and is not consistent with the PIC of the RLP, since it plans new tourist residential settlements. Plan 1 projects a tourist residence for the area classified as F4 and new residential buildings for the F2 area. The residence and its connected services and infrastructure exploit the whole building capacity of the area established by the MPS (Figure 1 shows a sketch of Plan1) for the F4 area, and the area F2 reaches its building capacity if we sum-up the volume of the new and existing settlements. The F4 area is endowed with parking lots, restaurants, pic-nic areas, sporting facilities, small children's play areas, and areas for the restoration of the Mediterranean scrub, a typical scrub of the Sardinian coastal landscape. Figure 2 shows a sketch of Plan1.

The second planning proposal (Plan2 from now on) is consistent with the RLP. The whole F4 area and the not-yet-urbanized share of the F2 are planned as an open space mainly dedicated to pedestrian walks. Areas for pic-nic, a children's playground, and a small botanic garden, are the only artificial spaces planned in this small park, which should allow tourists and residents to enjoy a small wild natural park very close to the seashore. The Sinnai road organization would be adapted to the new park. In this regard, priority would be given to maintenance, repair and improvement of the existing roads over the construction of new roads. This is consistent with the PIC. Figure 3 shows a sketch of Plan2.

The third planning proposal (Plan3 from now on) is partially consistent with the RLP, since it is based on the idea that the whole area F4 and the not-yet-urbanized share of the F2 should be exclusively devoted to public services and infrastructure. No new private developments would be allowed by a set of planning rules which would try to build a bridge between the RLP PIC code and the actual MPS. This proposal projects new services and infrastructure for tourists and residents which would improve the overall quality of life along the seashore. New services and infrastructure would imply a limited quantity of new buildings, which would not be in line with the extremely conservative rules of the RLP. However, new buildings would cover just one sixth of the building expansion that was allowed under the rules of the actual MPS. The conceptual approach of Plan3 to a new PIC for the MPS is based on the idea that new buildings should be allowed if, and only if, they will increase the endowment of the local public capital, and provided that they will not generate serious environmental damages, especially in the medium and long run. Figure 4 shows a sketch of Plan3.

The fourth planning proposal is consistent with the MPS with the difference, with respect to Plan1, that newly-built (receptive) structures will only be allowed in the F4 area, while new settlements are not projected in the F2 residential area. The leading concept of Plan4 is that only receptive facilities should be allowed as newly-built structures, since local economic and social development is strictly connected to tourism. The coastal area and the beach of Solanas are particularly attractive, and their potential could possibly be increased by the quality of the coastal environment. So, Plan4 projects plenty of open spaces, green areas, pedestrian and bike paths, restoration of the Mediterranean scrub, and widespread tree planting and sustainable management of the environment. The qualitative improvement of the coastal environment is one of the leading concepts of the RLP, which, under this profile, is fairly more consistent with Plan4 than with Plan1, which allows the residential expansion planned by the MPS for the F2 areas. Figure 5 shows a sketch of Plan4.



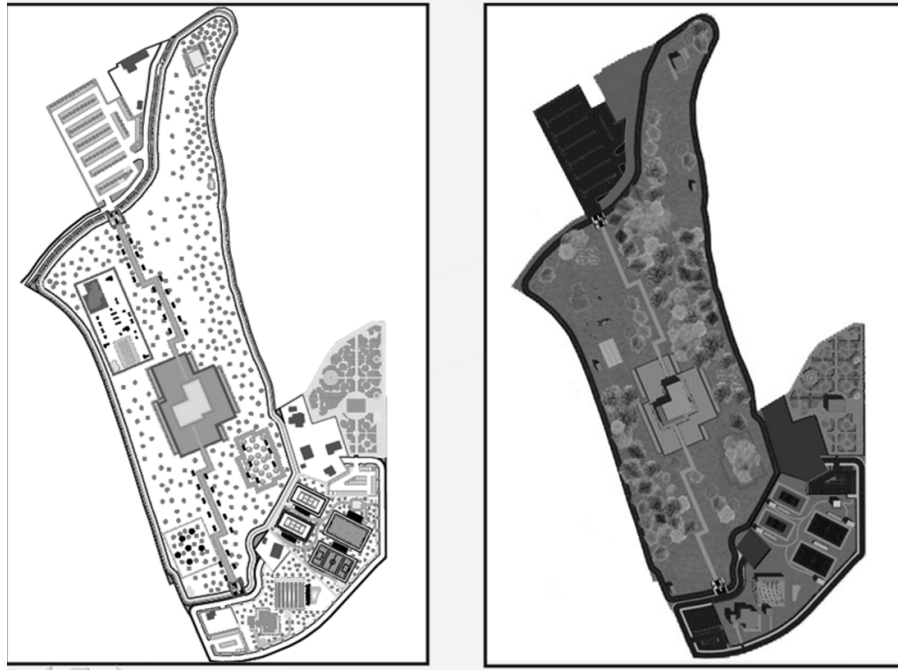


Figure 2. A sketch of Plan 1 (Elaborated by Arippa and Lombardo, *cit. in footnote 6*)

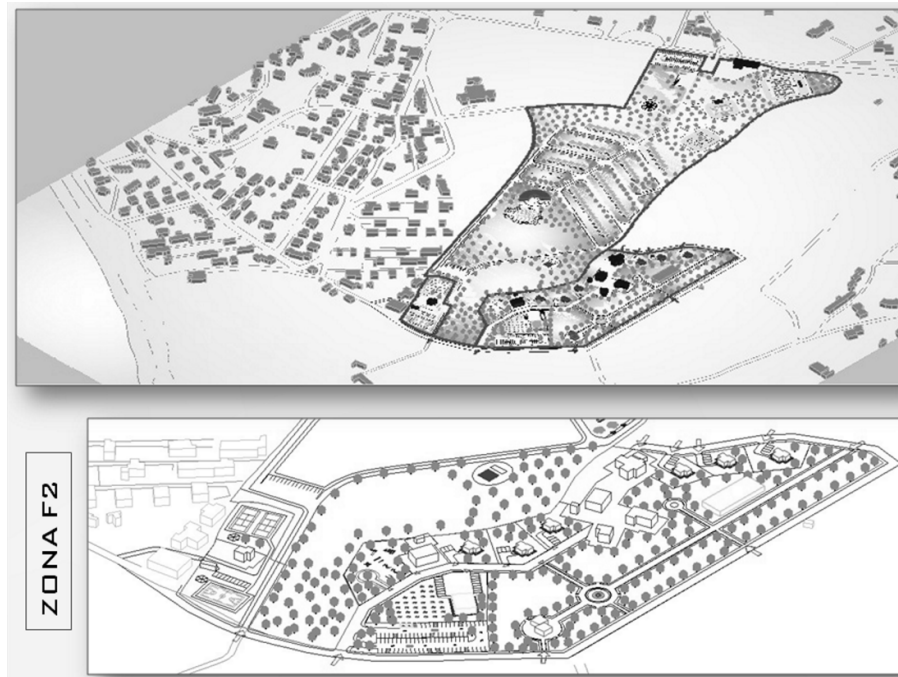


Figure 3. A sketch of Plan 2 (Elaborated by Arippa and Lombardo, *cit. in footnote 6*)



*Figure 4. A sketch of Plan 3 (Elaborated by Marrocu, cit. in footnote 6)*



*Figure 5. A sketch of Plan 4 (Elaborated by Sulis, cit. in footnote 6)*

#### 4. METHODOLOGY

We next describe the methodology used in the paper. We apply the AHP MCA, where scenarios and criteria hierarchies are defined through a survey results. A theoretical discussion of AHP MCA technique follows. Where appropriate, we discuss their applications to the case study at hand.

The MCA uses the AHP. AHP provides a taxonomy of the planning scenarios based on goals and criteria. For the case studied in this paper, the hierarchical structure of the decision process, that is the process which provides the ranking of the two planning scenarios, consists of three levels. The highest hierarchical level is the general goal (GG). The second hierarchical level is the criteria that give the GG content and meaning. The third level consists of four planning scenarios, which were described in the third section of this paper.

For this study, the GG is defined as: "Improvement of the quality of life of the city of Sinnai through the implementation of a set of planning policies that would strengthen the urban organization of tourist areas and public services." Ideally, before a GG is defined, it should be discussed and verified through a negotiation process involving public officials, politicians, practitioners, scientists, citizens, entrepreneurs and others. For this experiment, discussion and negotiation did not take place on account of limited financial resources.

The criteria associated with the 2<sup>nd</sup> hierarchical level and their measures are defined in Table 1.

The MCA provides a ranking based on global weights assigned to the four planning proposals. The global weights are determined by the local weights assigned to each level.<sup>7</sup> The local weights are based on a binary comparison of elements belonging to the hierarchical level and are done with respect to the elements of the preceding hierarchical level. Therefore, the four scenarios of level 3 are compared with each other along each of the criteria of the second level; the criteria of the second level are compared with respect to the GG of the first hierarchical level. The results of each binary comparison can be expressed quantitatively by means of *Saaty Semantic Scale* (SSS) shown in Table 2.

The second level consists of the nine criteria defined in Table 1.

The procedures to calculate the local weights of the two planning scenarios of the 3rd level, the weights of the criteria, and the global weights of the two planning scenarios are described next.

##### Step 1: Normalization

The first step to calculate the local weights of the four plans, the performance measures of the plan with respect to each quantitative criterion have to be normalized.

##### Step 2: Thresholds

In order to utilize SSS for binary comparisons of the two scenarios, the following taxonomy of thresholds is defined:

lowest threshold  $\equiv$  twentieth percentile;

second threshold  $\equiv$  thirtieth percentile;

third threshold  $\equiv$  fortieth percentile;

fourth threshold  $\equiv$  fiftieth percentile;

fifth threshold  $\equiv$  sixtieth percentile;

sixth threshold  $\equiv$  seventieth percentile;

seventh threshold  $\equiv$  eightieth percentile;

eighth threshold  $\equiv$  ninetieth percentile.

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<sup>7</sup> See Scarelli (1997, pp. 91-100) for a more detailed discussion.

<b>Criterion</b>	<b>Definition</b>	<b>Measure</b>
<i>CRI1</i>	Availability of public parking areas	m <sup>2</sup> , area of the open spaces suitable for public parking lots
<i>CRI2</i>	Availability of areas for recreational uses	m <sup>2</sup> , area of the open spaces suitable for recreational uses
<i>CRI3</i>	Availability of bike and pedestrian paths	m, length of planned new bike and pedestrian paths
<i>CRI4</i>	Availability of hotels, residences and camping sites	m <sup>3</sup> , volume of planned new hotels, residences and camping sites
<i>CRI5</i>	Increased residential pressure	m <sup>3</sup> , volume of planned new residential buildings
<i>CRI6</i>	Accessibility of the areas for public services	m, distance of the entrance of a planned public service plot from the section of the closest external street suitable for vehicles; in case of multiple plots, this measure is identified by the weighted average of the distances; the weight is the capacity (the highest number of users) of the service located in a plot
<i>CRI7</i>	Access to the seashore	m, distance of the entrance of a planned public service or residential plot from the closest access to the seashore; in case of multiple plots, this measure is identified by the weighted average of the distances; the weight is either the capacity (the highest number of users) of the service located in a plot or 1/60 of the volume of the house located in a plot <sup>8</sup>
<i>CRI8</i>	Pressure of the residential and service settlements on the coastal area	m, weighted average of the distances of the planned new buildings (residences and services) from the water-line; the weight is the building volume
<i>CRI9</i>	Conservative attitude toward environmental geomorphology	m <sup>3</sup> , total volume of planned excavation and embankment

Table 1. Definition of the criteria

<sup>8</sup> This parameter is established by the Law enacted by decree n. 2266/U of December 22, 1983, of the Councillor for local administrations, finances and regional planning of the Autonomous Region of Sardinia to calculate the nominal number of residents in the F (tourist) zones.

<i>Intensity of Importance</i>	<i>Definition</i>	<i>Explanation</i>
1	Equal importance	Two elements contribute equally to the property
3	Moderate importance of one over another	Experience and judgment slightly favor one element over another
5	Essential or strong importance	Experience and judgment strongly favor one element over another
7	Very strong importance	An element is strongly favored and its dominance is demonstrated in practice
9	Extreme importance	The evidence favoring one element over another is one of the highest possible order of affirmation
2,4,6,8	Intermediate values between the two adjacent judgments	Compromise is needed between two judgments
Reciprocals	When activity i compared to j is assigned one of the above numbers, then activity j compared to i is assigned its reciprocal	

Table 2. Saaty semantic scale (Saaty, 1988, p. 78)

Scores from 1 to 9 are assigned to each interval starting from the interval corresponding to the lowest threshold. Each binary comparison, one for each criterion, results in a positive integer from 1 to 9, which identifies the value of “intensity of importance” of the binary comparisons of SSS.

The intensity of importance of the binary comparison for the four scenarios (Plan1, Plan2, Plan3 and Plan 4), for a given criterion j, is denoted by  $RAPP_{inj}$ ,  $i = 1, \dots, 4$ ,  $j = 1, \dots, 9$ .

### Step 3: Geometric average of intensity of importance

For Plan1, Plan2, Plan3 and Plan4, and  $CRI_j$ , the geometric average of the intensity of comparison,  $v_{ij}$ , is computed. Namely,

$$v_{ij} = \sqrt[4]{\prod_{n=1}^4 RAPP_{inj}} .$$

### Step 4: Scenario local weights

In Step 4 the local weights for the scenarios with respect to each criterion,  $P_{ij}$ , are calculated as follows:

$$P_{ij} = v_{ij} / \sum_{k=1,2,3,4} v_{kj} .$$

The vector  $P_j \equiv (P_{1j}, P_{2j}, P_{3j}$  and  $P_{4j})$  is the vector of local weights for the four scenarios with respect to criterion j.

The technique described by steps 1-4 is called the “principal eigenvector method” since the  $v_{ij}$ ’s are approximately the principal components of the eigenvector of the matrix  $RAPP_{inj}$  (Fusco Girard and Nijkamp, 1997).

### Step 5: Criteria weights and scenario global weights

The binary comparisons of the criteria with respect to the GG are based on the responses to a questionnaire where the criteria were listed, and the respondents were asked to classify them, from the most important to the least. Equal importance of two or more criteria was allowed. A growing score, from 1 to 9, is given to each criterion depending on its position in a respondent’s taxonomy. The sum of each criterion’s scores across the respondents determines the comprehensive score. There is of course a maximum (MAX) and a minimum (MIN) total score reachable by a criterion. The maximum score could be reached had a criterion deserved 9 in the taxonomies of all the respondents. The minimum score could be reached had a crite-

tion deserved just 1 for each of the respondents. . The binary comparison of two criteria i and j having scores  $X_i$  and  $X_j$ , assuming  $X_i \geq X_j$ , with reference to the SSS, can be calculated as follows:

$$RAPP_{ij}=(X_i-X_j)/x+1,$$

where x is:

$$x=(MAX-MIN)/9.$$

It is easy to see that: if  $X_i = 9$  and  $X_j = 1$ , then  $RAPP_{ij} = 9$ ; if  $X_i = X_j$ , then  $RAPP_{ij} = 1$ . Through the x factor binary comparisons between criteria can be normalized according to the SSS.

The geometric average of intensity of importance for a given criterion j is

$$v_j = \sqrt[9]{\prod_{n=1}^9 RAPP_{nj}} .$$

The vector of intensity of importance for the eight criteria is  $V \equiv (v_1, \dots, v_9)$ .

The final step is to calculate the local weights of the criteria with respect to the GG. The local weights of each criterion with respect to the GG,  $\Gamma_j$ , is calculated as

$$\Gamma_j = v_j / (v_1 + \dots + v_9) .$$

The last part of the procedure is to determine the global weights of the four planning proposals with respect to the GG, denoted by  $PG_i$ . The global weights use the vector of the local weights for CRI j with respect to four scenarios  $P_j \equiv (P_{1j}, P_{2j}, P_{3j}, P_{4j})$  and the vector of local weights of CRI j with respect to the GG  $\Gamma \equiv (\Gamma_1, \dots, \Gamma_9)$ . More specifically,

$$PG_i = \sum_{j=1, \dots, 9} P_{ij} \Gamma_j .$$

## 5. SAMPLING METHOD AND RESULTS

A random sample of residents of the town of Sinnai was chosen by associating a random number to each name listed in the phone directory. 400 people were randomly selected. These households were contacted by telephone and asked if they were willing to participate in the survey. Out of these 400 people, 160 people agreed to participate, implying a 40 percent rate of participation. The phone calls were made at different times of the day. One third were made between 7.30 and 9.00 a.m.; one third between 1.30 and 3.00 p.m.; and the last third between 7.00 and 8.30 p.m. The rate of participation was almost constant in the three periods. If the randomly selected person answered that he was willing to participate, then he or she was asked to rank the nine criteria reported in Table 1. The social characteristics of the sample are not significantly different from the social characteristics of the population of Sinnai, as described in the 2001 Census data.

The interview allowed a person to clarify his doubts and misunderstandings that he may possibly have had on the meaning and scope of each criterion before expressing his ranking.

The taxonomy of the criteria for the MCA is defined through the technique described in the fourth section. Table 3 reports the criteria scores.

Criterion	Score	Normalized value
<i>CRI9</i>	1416	2.31
<i>CRI2</i>	1273	1.54
<i>CRI1</i>	1254	1.43
<i>CRI3</i>	1211	1.21
<i>CRI6</i>	1202	1.17
<i>CRI4</i>	1056	0.79
<i>CRI7</i>	1048	0.68
<i>CRI8</i>	1039	0.64
<i>CRI5</i>	948	0.47

Table 3. Criteria scores

The results of the implementation method described in the fourth section are reported in Tables 6 and 7. The ranking of the nine criteria is based on the responses to the questionnaire, that is it is based on the preferences expressed by the respondents.

On average, these responses express the priorities of the residents of Sinnai on the city planning policies for tourist coastal areas – defined as such by the actual MPS -, with reference to the criteria. The RLP states that these areas may not be urbanized for tourist residential uses anymore. New urbanization can be distributed only between public services and recreational uses.

The ranking of the criteria implied by the classification defined through the responses of the interviewed people, and their normalized values for their binary comparisons through the SSS are reported in Table 3. Table 4 shows the criteria measures for Plan1, Plan2, Plan3 and Plan4. The binary comparisons of the four planning proposals with respect to each criterion are reported in Table 5.

The four plans' implied absolute weights are the following: 0.157 (Plan1), 0.328 (Plan2), 0.319 (Plan3), and 0.196 (Plan4).

It is evident that if applied to rank the plans through MCA, the criteria weights based on respondents' classifications would reveal a large preference of the planning proposals based on the classification changes which the adjustment of the MPS to the RLP would imply, that is Plan2 and Plan3. The AHP MCA results depend on the fact that these scenarios prevail over the Plan1 and Plan4 for Criteria 9, 2 (only Plan3), 1 (only Plan2), 3 and 6 (only Plan3), which are the highest-score criteria (see Table 4), according to the vast majority of the respondents.

Had the respondents given more importance to the availability of new hotels, residences and camping sites (Criterion 4), and possibly less to the conservation of the landscape morphology and aesthetics (Criterion 9), the MCA results would have changed accordingly.

Criterion Definition		Measure	Plan1	Plan2	Plan3	Plan4
<i>CRI1</i>	Availability of public parking areas	m <sup>2</sup> , area of the open spaces suitable for public parking lots	5,672	126,924	7,936	11,708
<i>CRI2</i>	Availability of areas for recreational uses	m <sup>2</sup> , open-space area suitable for recreational uses	129,764	128,659	142,170	47,015
<i>CRI3</i>	Availability of bike and pedestrian paths	m, length of planned new bike and pedestrian paths	1,384	3,256	2,844	1,773
<i>CRI4</i>	Availability of hotels, residences and camping sites	m <sup>3</sup> , volume of planned new hotels, residences and camping sites	11,182	0	0	13,814
<i>CRI5</i>	Increased residential pressure	m <sup>3</sup> , volume of planned new residential buildings	1,072	0	0	0
<i>CRI6</i>	Accessibility of the areas for public services	m, distance of the entrance of a planned public service plot from the section of the closest external street suitable for vehicles; in case of multiple plots, this measure is identified by the weighted average of the distances; the weight is the capacity (the highest number of users) of the service located in a plot	149	170	97	130
<i>CRI7</i>	Access to the seashore	m, distance of the entrance of a planned public service or residential plot from the closest access to the seashore; in case of multiple plots, this measure is identified by the weighted average of the distances; the weight is either the capacity (the highest number of users) of the service located in a plot or 1/60 of the volume of the house located in a plot <sup>9</sup>	469	510	449	789
<i>CRI8</i>	Pressure of the residential and service settlements on the coastal area	m, weighted average of the distances of the planned new buildings (residences and services) from the water-line; the weight is the building volume	664	543	672	502
<i>CRI9</i>	Conservative attitude toward environmental geomorphology	m <sup>3</sup> , total volume of planned excavation and embankment	33,545	6,945	1,311	41,441

Table 4. Measures of the criteria indicators

<sup>9</sup> This parameter is established by the Law enacted by decree n. 2266/U of December 22, 1983, of the Councilor for local administrations, finances and regional planning of the Autonomous Region of Sardinia to calculate the nominal number of residents in the F (tourist) zones.



<i>Binary comparisons of Plan1, Plan2, Plan3 and Plan4</i>														
CRI1	Plan1	Plan2	Plan3	Plan4	CRI2	Plan1	Plan2	Plan3	Plan4	CRI3	Plan1	Plan2	Plan3	Plan4
Plan1	1	1/4	1	1/2	Plan1	1	1	1/2	3	Plan1	1	1/3	1/2	1/2
Plan2	4	1	4	3	Plan2	1	1	1/2	3	Plan2	3	1	2	2
Plan3	1	1/4	1	1/2	Plan3	2	2	1	4	Plan3	2	1/2	1	1
Plan4	2	1/3	2	1	Plan4	1/3	1/3	1/4	1	Plan4	2	1/2	1	1
CRI4	Plan1	Plan2	Plan3	Plan4	CRI5	Plan1	Plan2	Plan3	Plan4	CRI6	Plan1	Plan2	Plan3	Plan4
Plan1	1	3	3	1/3	Plan1	1	1/3	1/3	1/3	Plan1	1	1	1/4	1/3
Plan2	1/3	1	1	1/5	Plan2	3	1	1	1	Plan2	1	1	1/4	1/3
Plan3	1/3	1	1	1/5	Plan3	3	1	1		Plan3	4	4	1	2
Plan4	3	5	5	1	Plan4	3	1	1	1	Plan4	3	3	1/2	1
CRI7	Plan1	Plan2	Plan3	Plan4	CRI8	Plan1	Plan2	Plan3	Plan4	CRI9	Plan1	Plan2	Plan3	Plan4
Plan1	1	1	1	2	Plan1	1	1	1	2	Plan1	1	1/6	1/6	1
Plan2	1	1	1	2	Plan2	1	1	1	2	Plan2	6	1	1	6
Plan3	1	1	1	2	Plan3	1	1	1	2	Plan3	6	1	1	6
Plan4	1/2	1/2	1/2	1	Plan4	1/2	1/2	1/2	1	Plan4	1	1/6	1/6	1

<i>Local weights of Plan1, Plan2, Plan3 and Plan4</i>																			
Criterion 1				Criterion 2				Criterion 3				Criterion 4							
Plan1	Plan2	Plan3	Plan4	Plan1	Plan2	Plan3	Plan4	Plan1	Plan2	Plan3	Plan4	Plan1	Plan2	Plan3	Plan4				
0.12	0.54	0.12	0.22	0.24	0.24	0.43	0.09	0.12	0.42	0.23	0.23	0.25	0.10	0.10	0.56				
Criterion 5				Criterion 6				Criterion 7				Criterion 8				Criterion 9			
Plan1	Plan2	Plan3	Plan4	Plan1	Plan2	Plan3	Plan4	Plan1	Plan2	Plan3	Plan4	Plan1	Plan2	Plan3	Plan4	Plan1	Plan2	Plan3	Plan4
0.10	0.30	0.30	0.30	0.11	0.11	0.48	0.30	0.29	0.29	0.29	0.14	0.29	0.29	0.29	0.14	0.07	0.43	0.43	0.07

Table 5. Binary comparisons of the Plans and local weights

## 6. DISCUSSION AND CONCLUSIONS

We discuss the results of the AHP MCA presented in section 5 through a comparison with those obtained in two preceding experiments (Zoppi 2008; 2010).

In those experiments, planning proposals consistent with the RLP (open space for recreational uses) for not-yet-planned residential expansion and coastal tourist zones of the MPS were defined and proposed to the local community. The assessments were based on contingent valua-

tion (CV). Questionnaires were delivered to random samples of the residents. Through the responses to these questionnaires it was possible to evaluate the desirability of the future scenarios which would be generated in the former residential expansion and tourist coastal residential and hotel zones by the implementation of the PIC.<sup>10</sup> The CV results show that the residents of Sinnai would disagree with the classification change which the adjustment of the MPS to the RLP would imply. Definitely, the residents seem to prefer the MPS rules over the PIC, that is new tourist and residential settlements over recreational parks and open spaces.

However, the conclusion we can draw from the results of the AHP MCA case study described in this study reveal a very different attitude toward new tourist settlements and new parks. The ranking of the nine criteria to assess future city planning scenarios implied by the respondents' classifications would reveal a clear preference of Plan2 and Plan3 over Plan1 and Plan4, that is a fairly conservative attitude towards future planning scenarios concerning the coastal zone. This conservative attitude is certainly in line with the RLP rules.

From this point of view, this paper demonstrates how the objectivity and accuracy of MCA can benefit from the intermix with CV method. Moreover, the comparison of the results of the CV method and the MCA can be used by the economist or planners to determine if the criteria were appropriately defined. In this respect, this paper makes an important methodological contribution, since economists and planners can better ensure that the policies they advocate are the ones actually desired by local communities.

As we put in evidence, in the context of this case study, the CV and MCA results are not consistent. The AHP MCA results depend on the fact that Plan 2 and Plan3 prevail over Plan1 and Plan4 for the highest-score criteria, according to the vast majority of the respondents. The deep differences between the MCA and CV results indicate that the MCA evaluation problem is possibly not well-defined. The chosen criteria (see Table 1) should possibly be integrated within a larger set which should take account of the negative short- and medium-run social and economic impacts which may come from the adjustment process of the MPS to the RLP, that is dramatic decrease of land values, decline of the financial resources for public services and infrastructure that would come from the impact fees paid by the developers, decrease of payments of the communal tax for real estate which includes land property, crisis of the local construction industry, and lack of competition between supply of newly-built houses and hotels in the tourist coastal zones and supply of restored houses and hotels in the consolidated urban fabric of the city.

It is evident that the choice of the criteria is decisive for the ranking of the scenarios, since the inclusion/exclusion of a criterion can potentially reverse the results of the classification procedures. Criteria need to be identified by experts on urban, regional and environmental planning, economists, geologists and others. This is a precondition for the evaluation process to begin. On the other hand, the criteria choice need to be open to public discussion and participation, which would make it possible to implement decision processes on public policies where experts and the local community would share and possibly build common expectations on the future of their city environment, as the experience of Sustainable Seattle (1998) has shown.

The findings of this study can be effectively read in the light of the lesson read from Bertolini's view about uncertainty in planning (Bertolini, 2010). Bertolini proposes a taxonomy of four possible situations concerning planning in the public domain, that is planning with a high level of public awareness and participation. These situations entail four different levels of uncertainty. The lowest level of uncertainty is referred to situations characterized by a gener-

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<sup>10</sup> The CV method is a favorite tool of regional and urban economists. CV case studies, which are based on people's expressed thoughts and convictions, quantitatively assess the degree of consensus in terms of people's willingness to pay (perceived opportunity cost) for some public good. It is commonly used in the context of environmental goods.

al agreement on planning goals and technology, where “the term «technology» is used here in the broad sense of «means to achieve goals»” (*ibid.*, p. 413). If there is agreement on goals and means, there will be plenty of room for planning, and, assuming goals are properly defined and means effectively used, it is very possible that planning cycles will start, develop and end-up following linear paths, and their outcomes be assessed accordingly. Medium-level uncertainty is characterized by either disagreement on goals or lack of consensus on technology. According to Bertolini, in order to address, i. uncertainty on goals, it is worth developing bargaining processes where the public sector acts as a proactive mediator between the stakeholders involved; ii. uncertainty on means, the public sector should propose planning experiments which aim at building single parts of a not-yet defined planning plot. The most difficult-to-deal-with condition is one of uncertainty on both technology and goals. This is chaos. The way Bertolini indicates to effectively address chaotic planning situations is derived from Cross (2007). Cross’ viewpoint is described as follows (*ibid.*, p. 78, cited in Bertolini, *cit.*, p. 415):

During the design [planning] process, partial models of the problem and solution are constructed side-by side as it were. But the crucial factor, the ‘creative leap’, is the bridging of these two partial models by the articulation of a concept ... which enables the partial models to be mapped onto each other.

As a consequence, the question of irreducible uncertainty in planning should be dealt with by managing and supporting complex incremental, evolutionary and open-ended processes, where goals are not agreed and technologies are unknown.

The conflict between the regional administration and the city and local community of Sinnai, which characterizes the adjustment process of the MPS to the RLP, could be interpreted in the light of Bertolini’s view of chaos in the planning processes: the conflict is caused by a chaotic situation generated by misunderstandings of goals and means, since the general objective of environmental protection is agreed by the local community, as the AHP MCA results show. These are mainly due to the fact that the Sardinian regional administration maintains an overturned concept of subsidiarity (Zoppi and Lai, 2010). This passage of the regional-law proposal titled “New rules for the use of the regional territory” enlightens this point:

The goals of the preceding paragraph [The goals of the planning activity of the cities, provinces, and the regional administration] are pursued, on the basis of the principles of subsidiarity, adequacy and efficiency, by means of: a) the attribution to the cities of all the functions concerning territorial government which are not expressly attributed by this or other laws to the region and the provinces; [...].<sup>11</sup>

This overturns the concept of subsidiarity of the Italian legislation, which states that:

[The attributions of functions] have to observe the principle of subsidiarity. The majority of tasks and administrative functions should be attributed to the cities, provinces and mountain communities, on the basis of their territorial size, and community and organizational complexity, with the only exclusion of the functions inconsistent with these size and complexity. Public responsibilities are also attributed to the part of the public administration closest to the citizens in order to help families, organized groups and communities to take on social tasks and functions; [...].<sup>12</sup>

This overturned concept of subsidiarity puts in evidence how far from an effective cooperative approach is the adjustment process of the masterplans of the coastal cities of Sardinia to the RLP. The role of the cities is very ancillary, since they only have to provide to the regional administration with geographic, economic and social information so that the regional administration may govern and manage regional, province and city planning activity in the most efficient way. The only role of the cities is to support the regional administration.

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<sup>11</sup> Law proposal no. 204 of January 3, 2006; not discussed by the Sardinian Regional Parliament.

<sup>12</sup> Italian Law no. 59/97 titled “Law which delegates the Italian government to establish the procedures to attribute administrative tasks and functions to the regional and local administrations, in order to reform the public administration and to simplify the administrative procedures”, article 4, paragraph 3, letter a.

A Foresterian narrative<sup>13</sup> shows that everything could change, if each participant changed the way he sees the role he has to play, and if each participant changed the way he sees the role the other should play. In particular, the fundamental point is that the regional administration should change its attitude towards subsidiarity. It is worth quoting the definition of subsidiarity given by the European Union's Glossary:

The principle of subsidiarity is defined in Article 5 of the Treaty establishing the European Community. It is intended to ensure that decisions are taken as closely as possible to the citizen and that constant checks are made as to whether action at Community level is justified in the light of the possibilities available at national, regional or local level.[...]

The Edinburgh European Council of December 1992 issued a declaration on the principle of subsidiarity, which lays down the rules for its application. The Treaty of Amsterdam took up the approach that follows from this declaration in a Protocol on the application of the principles of subsidiarity and proportionality annexed to the EC Treaty. Two of the things this Protocol introduces are the systematic analysis of the impact of legislative proposals on the principle of subsidiarity and the use, where possible, of less binding Community measures.<sup>14</sup>

In other words, the principle of subsidiarity indicates that the regional and national (and of the European Union) authorities should not interfere with the administrative autonomy of the local communities as long as the local communities are willing and able to deal with and successfully govern certain matters. Urban and city planning are certainly among these matters. The contribution of this essay to define an on-going strategic assessment of the RLP identifies two main normative points. First, the right concept of subsidiarity has to be restored in the RLP planning implementation code. Second, the regional planning activity has to be based on a true cooperative-planning approach so that the relations between the regional administration and the cities may lose their conflict-derived inefficiency.

Dissemination of information and fairness of the decision processes, which are most likely to be ensured by awareness and participation of the local community in defining and implementing public policies, are certainly important in generating the most socially desirable outcome. The role of the city administration of Sinnai and of the regional administration of Sardinia would be instrumental in developing a process of this kind for the futures of the tourist coastal zones of Sinnai. Moreover, the ranking of the scenarios cannot be the end of the story. The ranking must be presented back to the local community and a public discussion on the outcomes and implications must be held. This is necessary as the rankings are merely a representation of the average preferences. What criterion has proven decisive in determining the ranking has to be made as clear as possible, and further consideration and discussion on the main issues must be encouraged, even though they possibly may delay the implementation of the final plan.

Thus, the methodology developed and applied in this paper should be viewed not only as a decision support tool, but as a procedure to favor and improve information, awareness and participation. Goals, criteria and scenarios are sure to be defined first by the public administration. The MCA methods then can be used to start the decision process where the participants (public officials and executives, politicians, practitioners, scientists, citizens, entrepreneurs and so on) cooperate and build the future of their city recursively and incrementally.

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<sup>13</sup> An analysis is developed in the light of the lesson learned from Forester (1999). One of the main points of Forester's approach is that the practitioner should try to understand and solve conflicts concerning decision-making in the public domain by favoring empathetic dialogue between the fighting parties. Forester's narrative is that conflictual processes can succeed (that is, can be deliberative) if the parties start esteeming each other, and, by doing so, try to understand and possibly appreciate the other's point of view.

<sup>14</sup> The Glossary is available at the following Internet address: [http:// europa.eu/ scadplus/ glossary/ subsidiarity\\_en.htm](http://europa.eu/scadplus/glossary/subsidiarity_en.htm) [accessed 07.01.2011].

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