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COGNITIVE MAPS AND SUSTAINABLE DEVELOPMENT IN THE MEDITERRANEAN REGION

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ABSTRACT

Sustainable development is a very broad, complex and ambiguous concept. It accounts for very different issues (i.e. economic, social and environmental issues), concerns and actions. Moreover, sustainable development projects involve many actors (stakeholders) both at global and local levels, such as local communities, companies, local administrators and governments.

In the Mediterranean area sustainable development is becoming a fundamental issue within the socio-economic development programs. This area is inhabited by communities that are characterized by very different cultures, knowledge, traditions, habits and levels of development. These communities may interpret differently the concept of sustainability, have different priorities and lines of actions and this can render the development of common projects difficult. Hence, a critical issue in making decisions related to sustainable development in the Mediterranean area is to identify methodologies and tools to better understand visions and perspectives of the different stakeholders involved so as to create mutual comprehension and a common background.

In this paper, cognitive maps are proposed as tools to investigate the different meanings sustainable development acquires in different regions of the Mediterranean area. In particular, the results of a pilot study aimed at assessing benefits and disadvantages associated to the use of cognitive maps are discussed. Cognitive maps of some representatives of the Mediterranean area have been developed and some initial considerations on the concept of sustainable development in this area have also been drawn.

1. SUSTAINABLE DEVELOPMENT AND ITS INTERPRETATION

The general definition of sustainable development provided by the Brundtland Commission report (WCED, 1987) is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs, with three key objectives for sustainable futures: a socially and environmentally innovative, resource-efficient economy that delivers quality of life in the developed world; an improvement of economic welfare and quality of life in developing countries; a healthy natural environment with resources used and conserved wisely worldwide". Thus, sustainability does not only refer to environmental protection, but it also embraces social and economic aspects.

Although the term sustainable development is now broadly used, there is, in general, no widely accepted operational framework through which to implement sustainability. The definition is rather ambiguous too: it has provoked many debates and several interpretations have been given to it. We are convinced that sustainable development does not mean no development. Rather, it means developing methods for resources management in the context of an increasing demand for resources. Sustainable development must facilitate economic development while fostering environmental protection so it is necessary to reconcile the three Es: Economic development, Energy security and Environmental protection.

The Earth Summit held in Rio in 1992 (UNCED, 1992) published the Agenda 21 recommendations for sustainable development to address governance issues at a local level and the 27 principles, where ethics, equity, regulations, and peace were considered, among others, as elements to be included in the picture to ensure true sustainability. So sustainable development should help to overcome the lack of equity between rich and poor, developed and developing countries. The concept of equity in the use of the Earth's resources cannot be overlooked. Equitable resource use requires that everyone gets a fair share of the planet's resource base. This principle must hold equally within a country, among countries, among genders and from generation to generation.

Satisfaction of basic needs (such as reduction of poverty), equity-enhancement, reduction in energy consumption and adoption of renewable energy sources, preservation of cultural diversities, institutional sustainability, social justice, and participation are some of the main goals of sustainable development politics. Within this framework there is scope for different communities to seek different balances among these elements. Some communities may place high value on obtaining high environmental quality, while others may prefer to improve their life standards. Income pro capita, education, social structure and ideology are, for example, factors that can determine the interpretation of sustainable development in a community. However, no community lives in isolation. The attitude towards the environment assumed by one community can for example affect all the others. Some rules need to be designed to guide people's behavior. Nevertheless, methods of development must be appropriate to the people and the environment in which they are applied. Decisions that are made, and the rationale underpinning these decisions, must be acceptable to these people and preferably should not be made by outside agencies, but by the people in the communities themselves. It is this involvement of people at all levels that is absolutely critical in making development sustainable.

In 1997 the Kyoto Protocol reinforced the importance of considering both the international dimension to implement policies for long-term sustainability, and also national and local levels to focus on specific priorities (Priddle, 1999). Global sustainability stems from local actions, and local economic development may be reached within the limits imposed by sustainability.

The policy objectives formulated so far have spawned considerable discussion about how to measure sustainability. Yet, actual measurements and indices are extremely rare and standardization is difficult to achieve and define.

The way communities develop will largely determine success or failure in overcoming environmental challenges and achieving sustainable development. Local governments are important actors in the local economies. They should assume the responsibility for marshalling the resources necessary to address the sustainability problems that are faced by their communities (Roseland, 2000). They build and maintain infrastructures that are essential for economic activity, set standards, regulations, and taxes, procure services and products, and can influence markets for goods and services. There are a variety of ways that local governments can adopt to address sustainable development and global environmental concerns. For example, Gilbert et alii (1996) have characterized eight styles of local government responses to potential climate change and global warming. Moreover, at the micro/local level of companies, a clear and fully integrated sustainable strategy should not only guide competency development, it should also shape the company's relationships to customers, suppliers, other companies, policy-makers and all stakeholders. Companies can change the way customers think by creating preferences for products and services that are coherent with sustainability (Hart, 1997).

2. THE CONCEPT OF SUSTAINABLE DEVELOPMENT IN THE MEDITERRANEAN REGION

One of the areas in the world where diversities in the interpretation of the concept of sustainable development may be more evident and crucial is the Mediterranean region, where very different cultural, economic and social conditions exist. The different Mediterranean countries often need to interact and co-operate for resource exchanges, but it is our belief that this interchange could be eased if common ground on important issues (such as sustainable development) and mutual comprehension of different perspectives were fostered.

The Mediterranean area has a clear environmental and geographical identity, but it presents enormous differences in prosperity, economic and social development and perspectives. Sustainable development in the area can be seen as an opportunity to make this region a good test-case of co-existence and co-operation among different people and cultures that can exchange resources and share a possible common future. To achieve sustainable development, good governance at all levels and in all parts of the region is required. At the same time environmental problems that affect the area should be alleviated. Economic growth coupled with environmental degradation (coastal zones, forests, soil, fisheries, water), for example, must be counteracted by comprehensive policies on sustainable production and consumption (NGO, 2002). Energy demand in the Mediterranean region is gradually increasing, especially in the South-East countries where in the last twenty years it has tripled. Electric energy demand in these countries will increase by 7% per year in the close future. Countries in the north Mediterranean region still use 80% of the total energy consumed in the region. Since 1950 the total population has grown at a rate of about 0 - 0.5 % in the North, and of about 1.5 - 3% in the South-East countries and from 220 million inhabitants it will reach the figure of about 700 million in 2025 (Biliardo

et alii, 1998). It has been estimated that by 2025 the 70% of the population will belong to the South-East area.

Natural resources have always played an important role in the Mediterranean region. Energy sources, in particular, are strategic elements. These sources (like oil, coal and gas) are available in the less developed and more unstable countries of the area. Water demand will become by and large a fundamental issue in the next future. Maghreb countries, for example, have recently started to experience a worrying deficit of water. In Israel the deficit for self-sufficiency drinkable water is about 25%, whereas in Egypt it is 60%. Today about 7% of the total population already lives with less than 500 m^3 of water pro capita, which is the amount considered critical by the experts. Water demand for industry and domestic needs is expected to grow in the close future (Negri, 1999).

Sustainable development represents a challenge to the Mediterranean countries given their background of fragmented legislation concerning environmental policy which represents a special problem for the adoption of measures on integrated pollution control. Fragmentation affects in fact implementation when it is delegated to lower levels, which can exercise considerable discretion in the way policies are interpreted and acted upon. This implies that alternative views of sustainable development may well emerge and determine a different policy outcome (Pridham et alii, 1997).

Sustainable development has systemic implications in the operation of environmental policy, for its consequences are not only administrative, political and economic, but also social and cultural (Pridham et alii, 1997).

The communities of the Mediterranean developing countries (southern countries) face distinctively different challenges than those faced by the communities of the developed ones (northern countries). From the perspective of sustainable development the basic problem with northern communities is that their development is unsustainable, whereas the southern countries are still developing. Because sustainable development strategies should favor bottom-up over top-down approaches, a local rather than international focus, small-scale projects rather than mega-projects, coordination and negotiation may become the main issues for suitable policies. Mobilizing citizens and their governments toward sustainability is then required (Roseland, 2000). To this aim it is useful to find a set of guiding ideas and metaphors shared or, at least, comprehensible to the different actors of development in the different countries. Since differences in the concept of sustainable development are rooted in the current economic and social conditions, resource availability and cultural heritage, this implies that different weights are given to different objectives associated to the concept of sustainable development by different communities. In any case it is important to enable communities to make their own decisions about sustainable development, by using the theoretical frameworks and tools that they themselves believe to be appropriate and can continue to use. Nevertheless, it is also fundamental to promote perceptions about sustainable development that lead to the mutual understanding.

Given that the market demand is not strong enough to force the governments to decisive actions (Hadjilambrinos, 1996), sustainable development policies need to be defined and acted upon both as strategic global policies, involving a deliberate movement towards it in national or super-national contexts, and local ones. On the one hand at a local level differences are due to the different stakeholders' interests, on the other hand at a global level these differences need to be objectively evaluated and communicated. Local and global stakeholders should co-operate as in super-national projects. Methodologies and tools to analyze the subjective point of view in an objective way become essential to reach this target.

In this paper we have tested the possibility to adopt cognitive maps for understanding and analyzing different perspectives on sustainable development that emerge in the Mediterranean area. Individuals that live in this area have been interviewed, their cognitive maps developed and analyzed. After a brief overview on cognitive maps (Section 3), in Section 4 and 5 we provide the results of these analyses, a discussion about benefits and disadvantages that derive from their adoption and an interpretation of the initial results.

3. CAUSAL COGNITIVE MAPS: AN OVERVIEW

Causal cognitive maps are graphic tools used to represent concepts and ideas that individuals associate with some specific issue (i.e. the topic of the map). A causal map is characterized by two ontologies, namely concepts and causal links among them (Pidd, 1996). Concepts represent ideas,

opinions and key issues an individual associates with the investigated issue. For example, in a map about sustainable development, concepts represent key issues, strategies and main options an individual associates with the idea of sustainable development. Concepts are usually graphically represented by nodes. To explain the meaning associated to them better, concepts are often expressed as couples of opposing ideas (opposing poles). The first pole of a couple represents the preference of the individual whose map is developed. Expressing an idea and its (psychological rather than logical) contrary can help in the comprehension of what a person really means. People can in fact use the same terms to mean very different ideas, so making the reciprocal comprehension hard. Concepts represented in a map are linked by causal relationships, which can be mainly distinguished by cause/effect or means/end relationships. The former does not imply intentionality whereas the latter does. Both of them are graphically represented by arrows. Concepts that represent the cause or the means to achieve a given goal are situated at the arrow's tail, concepts that represent the effect or the end at the arrow's head. Concepts can also be linked by negative relationships. This means that the first pole of the concept situated at the arrow's head is considered to be associated with the second pole of the concept situated at the arrow's tail.

To develop cognitive maps different methodologies are proposed in literature[1] (Codara, 1998; Moretti, 1997). The main approach for data collection consists of the administration of semi-structured interviews (Eden, 1988; Laukkanen, 1998). Some scholars have also developed more structured schemes (Cossette, 1994) or models to make people self-interview (e.g. Self-Q technique by Bougon, 1983). In some studies documents rather than interviews are used to develop maps (Bonham et alii, 1976). Different methodologies to analyze and compare maps also exist. In most studies quali-quantitative metrics (e.g. number of heads, tails, domain and centrality) contained in existing software packages (e.g. Decision Explorer or CMAP2) are used (Cossette et alii, 1992; Moretti, 1997). However, some scholars have defined ad hoc metrics to compare maps. The most well-known have been developed by Markoczy et alii (1995).

Three main functions can be pointed out for cognitive maps, namely an explicative, a predictive, and a reflexive one (Codara, 1998). Cognitive maps can help highlight the context in which a decision-making process occurs and the perspectives different organizational actors or groups of people have with respect to that decision (explicative function). They can also be used to make predictions about a person's behavior once his/her cognitive map about a given issue or situation has been developed (predictive function). Finally, they can help a person reflect on his/her ideas and assumptions about a given situation (reflexive function). The graphic representation of concepts and ideas can help individuals make their reasoning explicit and support decision-making. Maps can also be used to solve conflicts, structure brainstorming sessions and facilitate negotiation (Langfield-Smith, 1992; Pidd, 1996). The explicative function can, for instance, be adopted to facilitate the comprehension of different perspectives and the creation of a common one. Based on the analysis of the maps of single participants to a decision-making group, a collective map can also be created. Different kinds of collective maps and methodologies to develop them have been proposed in literature (Codara, 1998; Langfield-Smith, 1992; Moretti, 1997; Pidd, 1996). Collective maps usually represent perspectives that are common to all the members of a group. The shared perspectives derive from the comprehension of mutual positions and discussions about them. Hence, single participant maps can be used as means to start debates and facilitate negotiation whereas collective maps represent the result of the negotiation process, the common view generated as the result of the achieved agreement. Ability to facilitate the achievement of a consensus and agreements among different parties (thus supporting organizational action) is peculiar to cognitive maps and makes them different from other qualitative methodologies. Initially proposed to reproduce the way of thinking of human beings (Eden, 1992; Kelly, 1955; Tolman, 1948), during the 70s, cognitive maps were mainly used to analyze political decisions within international policy issues. In particular they were adopted for their explicative function (to represent a given political situation better) (Axelrod, 1976) and for their predictive function (maps were used to simulate the behavior of some politicians once their view about particular situations was mapped) (Bonham et alii, 1976). Starting from the 80s, cognitive maps were widely used as research tools in the field of management and organization science (Eden et alii, 1992). In this field cognitive maps have been adopted, for instance, to support strategy development or business process reengineering, for mapping distinctive competencies and for the creation of corporate memories (Bougon et alii, 1977; Eden et alii, 2000; Fiol et alii, 1992; Jenkins and Johnson, 1997; Kee-Young et alii, 1999). Here maps have been used both for their explicative, predictive and reflexive function.

To our knowledge a very few studies about sustainable development use cognitive maps as a research/support tool (Daniels et alii, 1996; www.johnsonfdn.org/library/journal/ v19n2/learning.html).

[1] A detailed reference list on causal mapping is available at: http://www/banxia.com/dexplore/debiblio.html.

However, increasing interest towards this technique is being observed in the field of sustainable development.

4. COGNITIVE MAPS FOR SUSTAINABLE DEVELOPMENT: A PILOT STUDY

In this section we investigate the possibility to use cognitive maps for depicting different perspectives of the concept of sustainable development in the Mediterranean area. As mentioned in Sections 1 and 2, sustainable development is a very broad and complex topic and people use the term giving different relevance to social, economic or environmental aspects. Cognitive maps can thus help the representation of the different perspectives and the analysis of the main differences (explicative function).

A pilot study has been carried out: cognitive maps for eleven post-graduate students (master and doctoral students) that live in the Mediterranean area have been developed and their differences have been analyzed. They were separately asked to talk about their idea of sustainable development, their opinions about key issues, strategies and main options. Each interview lasted about an hour. After the interviews, collected data was codified by using the Documentary Coding Method (Wrightson, 1976) and the attendant cognitive maps were developed. In the rest of the paper, maps are referred to by identification numbers. As an example, in Figure 1 and 2 two very different and significant maps are reported (Map 1 and 5, respectively).

4.1. Map analysis results

Map analysis has been carried out by using the quali-quantitative indicators provided in Decision Explorer (www.banxia.com), a software package developed by the University of Strathclyde and largely adopted for map design and analysis. Number of concepts and links, number and typology of heads and tails, clusters, loops, domain, centrality and set analysis have been considered.

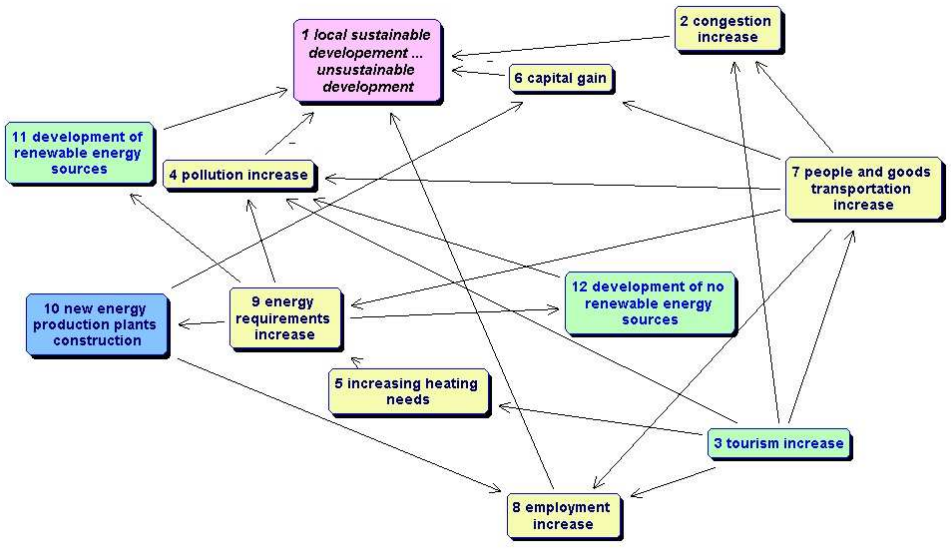

Fig. 1. Map 1.

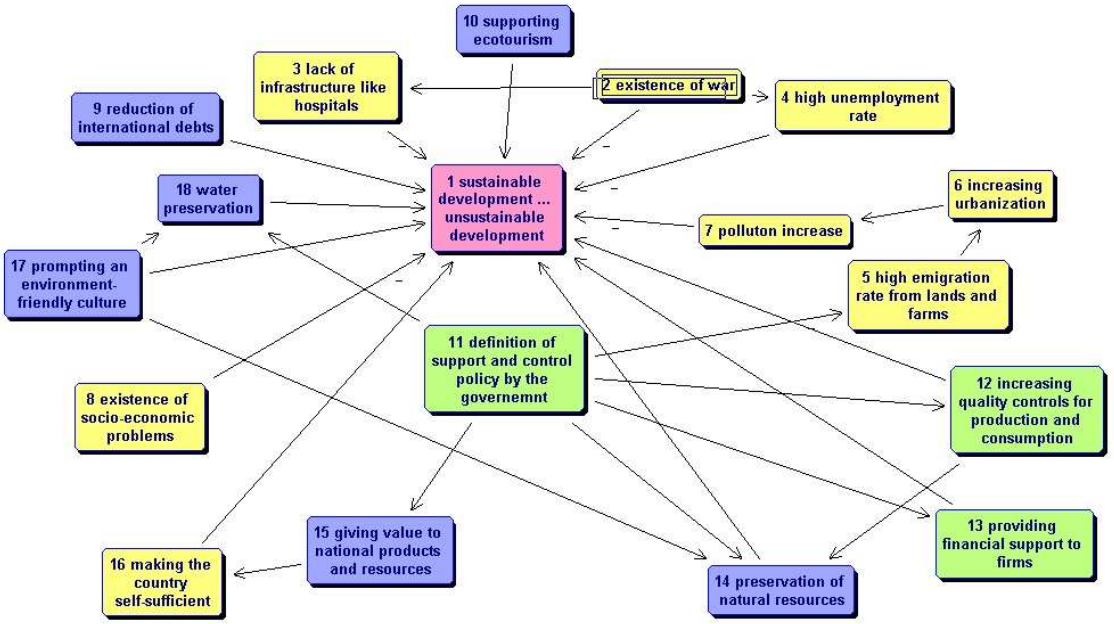

Fig. 2. Map 5.

Number of concepts and links. The list of all the concepts (159 concepts) represented in the maps is reported in the Appendix. The maps have an average number of 17 concepts (ranging from nine to 30) and average link/concept ratios of about 1.4 (ranging from one to 1.9).

The number of concepts is quite low, but the link/concept ratio is slightly superior to the values proposed in literature (Eden et alii, 1992).

To evaluate the complexity of the maps (that mirrors the complexity of the individuals' cognitive schemes) both the number of concepts and the link/concept ratio have to be taken into account.

Heads and Tails. The heads of a map are those concepts that are represented by nodes that have only arrows going inside (no arrows go outside). They are the goals expressed in terms of final ends or effects. On the contrary tails are those concepts that are represented by nodes that have only arrows going outside (no arrows go inside). They are concepts that explain/describe the causes of current situations or means to be adopted to solve some problems.

The average number of heads per map is three (ranging from one to six). Apart from the concept “sustainable development” that is common to all of the considered maps, heads are the “improving the quality of life” in three out of eleven maps (Map 11, Map 4 and Map 6), “reduction of international debts” in two maps (Map 3 and Map 4), “necessity to eliminate the embargo”, “solving problems in large cities that are over-crowded” (Map 3), “improvement of the country's image” (Map 2), “solution of the acid rain problem” (Map 6), “improving the education system”, “supporting private companies”, “solving problems associated with desertification” (Map 8) “corruption reduction”, “solving fishing problems by international relationships”, “resource consumption”, “environmental impact assessment” (Map 10), and “tourism increase” (Map 11) in one map. Heads are usually goals, but in three maps they also represent the effects of some situations (such as “scarce interest in alternative energy sources and environmental problems”). This is the case of Map 2, Map 3 and Map 10.

The average number of tails per map is six (ranging from one to 11). In the considered maps, the tails are concepts that mainly represent means to solve problems or achieve goals such as “providing financial incentives” and “promoting an environment-friendly culture”, “improving the socio-economic situation”, “using alternative energy sources”, “improve the education system”, “need to preserve and sustain local knowledge and culture” rather then concepts that express facts or causes.

Clusters. Clusters represent groups of concepts closely connected among each other, but weakly linked to the rest of the map.

Most of the considered maps present no clusters, i.e. concepts result strongly linked among each others, except for Map 4 (that has three clusters associated to income/debts, increase of the population/need for more input and investments/education, respectively), Map 6 (that has one cluster associated to education, health, agriculture and urbanization), Map 9 (that has one cluster associated to research/solving problems associated to desertification).

Loops. Loops are groups of concepts that form closed paths (the last concept coincides with the first one in the path). They are self-reinforcing (positive loops) if they are connected by positive relationships or an even number of negative relationships.

In the considered maps no loops exist except for Map 3, where the following concepts "the country is very poor", "existence of many debts towards the international community", "existence of very high interest rate on national debts" form a positive loop.

Domain and Centrality. Domain and centrality provide information about the importance of concepts. Domain measures the importance of concepts by assessing their potency, i.e. the number of direct links (both as input and output). Centrality measures the importance by considering both direct and indirect links. In particular, in this analysis, the number of concepts that are indirectly linked up to the third level of connections have been considered. By considering both direct and indirect links, the centrality provides information about relationships that are not necessarily consciously known to the respondents.

Concepts with the first two highest domain and centrality scores have been reported in Tables 1 and 2, respectively. As the concept "sustainable development" has the highest score in all the maps, it has not been reported in the Tables. Also, the Tables show more than two concepts per map where different concepts have the same highest domain or centrality score. In the considered maps most of the concepts characterized by the highest domain score have also the highest centrality score. Concepts with the highest centrality score usually strengthen the ideas expressed by concepts with the highest domain score. Yet, in some cases the centrality analysis shows the interest of the respondents towards some concepts (i.e. concepts whose importance is not necessarily known by the respondents) that are not listed among those that have the highest domain scores.

Table 1. Domain scores: The first two concepts per map.

Map #	Concepts (domain scores)
1	People and good transportation increase (6), Energy need increase (6), Tourism increase (5), Pollution increase (5)
2	Good economic situation (4), Low levels of criminality (3), Military governments (3), Scarce information freedom (3), Existence of prejudices (3) Improvement of the country's image (3)
3	The country is very poor (9), Reducing poverty (6), Improving the education level (6), Preserving water resources (6)
4	Supporting the preservation/rational use of natural resources (5), Promoting investments in new technology and research (4)
5	Definition of support and control policies by the government (6), Preservation of natural resources (4)
6	Addressing health problems (5), Teaching farmers the correct use of natural resources (4)
7	Supporting eco-tourism (3), Infrastructure improvement (3), Absence of market economy (2), Preservation of the environment (2), Improving the education level (2)
8	Need for government or NGO support (4), Lack of water (2), To support research for water preserving and for using sea water (2), Reduce water consumption (2), Unemployment decrease (2), Supporting the exportation of national products (2), Developing action plans (2)
9	Effective public policy (5), Environment protection law definition (2), Facilitate communication (2), Supporting agriculture (2), Dam construction (2), Pollution reduction (2)
10	Sustaining development by public efforts (5), Environmental protection (2), Communication and high analphabetism (2), Law definition (2), Association (2), Rural area development (2), Population increase (2)
11	Biomass diffusion (5), Renewable energy sources diffusion (5), Increase alternative transportation (4), Pollution Increase (4), Citizens persuasion (4)

For example, the "existence of war" in Map 5 and in Map 7 or the "need for more and more input" in Map 4 are very central concepts, even though they have not the highest domain score.

Table 2. Centrality scores: The first two concepts per map.

Map #	Concepts (centrality score)
1	Energy need increase (8), People and goods transportation increase (8), Pollution increase (8), Employment increase (7), Tourism increase (7)
2	Low levels of criminality (8), Solidarity (7), Military government (7), Good economic situation (7), Scarce information freedom (7), Difficulty in relationship with foreign countries (7), Existence of prejudices (7), Promotion of post-graduation courses abroad (7)
3	Reducing poverty (16), The country is very poor (16), Improving the education system (14), Preserving water resources (14)
4	Supporting the preservation/rational use of natural resources (11), Enhancing political planning and management (10), Promoting investments in new technology and research (10), Need for more and more input (10, Supporting rural development (10), Increasing people involvement in political decisions (10)
5	Preservation of natural resources (10), Definition of support and control policies by the government (10), Water preservation (9), Promoting an environment-friendly culture (9), Existence of war (9), Increasing quality controls for production (9), Providing financial incentives to firms (9)
6	Addressing health problems (11), Addressing problems associated to urbanization (9), Supporting agriculture (9)
7	Infrastructure improvement (5), Supporting eco-tourism (5), Absence of market economy (5), Improving the education system (4), Preservation of the environment (4), Social and economic problems (4), Existence of the war (4)
8	Need for government or NGO support (6), Reduce water consumption (6), To support research for preserving and for using sea water (6), Developing action plans (5), Soil degradation (5), Supporting the exportation of national products (5), Unemployment decrease (5), Environment preservation (5), Existence of social and economic problems (5)
9	Effective public policy (8), Pollution reduction (6), Dam construction (6), Supporting agriculture (6), Facilitate communication (6), Environment protection law definition (6)
10	Rural area development (7), Environmental protection (7), Sustaining development by public efforts (6)
11	Biomass diffusion (8), Renewable energy sources diffusion (8), Citizens persuasion (7), Increase alternative transportation (7), Pollution increase (7)

Tables 1 and 2 also show a diverse distribution of the respondents' interests. In most of the maps more attention is devoted towards politics issues (e.g. need for government support or “Increase people involvement in political decisions”), social issues (e.g. poverty) and to issues associated to the correct and effective management of natural resources (water and soil, in particular) rather than to energy or transportation problems (cited in Map 1 and Map 11), that were mentioned in Section 2 as relevant issues.

Sets. Sets are groups of concepts that deal with a specific issue or topic. By examining the concepts presented in the maps, sixteen sets have been defined (Table 3). For example, the set “agriculture” comprises all the concepts that deal with agricultural issues (e.g. “teaching farmers the correct use of natural resources” or “supporting agriculture”). Each concept can belong to different sets and a set can be subset of another set. For example, “water management” is a subset of the set “natural resource management” just as “debt/poverty” is a subset of the set “social issues”.

The relevance of each set (i.e. the number of concepts per set) is a further measure of the importance that different issues have for different individuals.

By counting the number of concepts mentioned in all maps for each set (last column in Table 3) it is possible to state that respondents are more interested in issues related to the following sets: “social issues”, “natural resource management”, “agriculture”, “education/culture” and “energy”.

Styles. Style provides information about the typology of concepts (e.g. concepts can represent goals to achieve, lines of action to pursue or they can simply express opinions or facts). In these maps, concepts have been coded by using for the following styles: goal, strategy, option, and standard. Goal is the style that denotes those concepts that represent the final ends; strategy is the style that denotes those concepts that are key issues or long-term lines of action; option denotes those concepts that represent the different ways strategies can be implemented. Standard is the style that involves all the concepts that do not belong to the other styles.

Table 3. Number of concepts for each set per map.

	Map #											
Set	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**# of concepts mentioned per Set**
Agriculture	0	1	2	3	0	5	0	2	4	2	0	19
Alternative sources	1	1	1	1	0	2	0	0	0	1	5	12
Actions involving citizens	0	0	0	3	0	2	0	0	1	1	3	10
Country relations	0	3	1	0	0	1	0	0	0	1	0	6
Debt/poverty	0	1	6	2	2	2	1	0	0	0	0	14
Education/culture	0	1	2	3	2	3	1	1	2	2	0	17
Employment	1	1	0	0	1	1	0	1	1	1	0	7
Energy	5	2	2	0	0	2	0	0	1	0	5	17
Health	0	1	0	0	1	1	0	0	0	0	0	3
Individual and national income	1	0	1	1	3	1	3	2	1	0	0	13
Natural resources management	0	1	2	1	3	3	1	5	2	1	2	21
Pollution	1	1	1	0	1	2	0	0	3	0	1	10
Social issues	0	5	10	7	5	5	3	2	6	5	0	48
Tourism	1	1	1	0	1	0	1	0	1	0	1	7
Transportation	1	0	0	0	0	0	1	0	0	0	2	4
Water management	0	1	3	0	1	2	0	3	1	1	0	12

The maps considered denote more interest toward the definition of strategies and options to achieve sustainable development rather than to the definition of goals. In fact, the unique goal in most maps is the achievement of sustainable development. Yet, in some “improving the quality of life” is considered as the very final end.

4.2. Discussion

The broadness and complexity of the concept of sustainable development are confirmed by the results of this pilot study. The considered maps present (in total) more than 155 concepts and point out the interest of the respondents towards several different issues.

The goals of the sustainable development politics mentioned by the persons interviewed resemble those that are cited in Section 1. By analyzing the heads of the maps social justice, equity-enhancement and the solution to environmental problems indeed emerge as the main goals of such politics. Preservation of cultural diversities and the adoption of alternative energy sources are mentioned as some of the means to achieve these goals (tails of some maps).

Two main attitudes towards sustainable development can be derived from the map analysis. In some maps more attention is devoted to economic and environmental aspects (such as “energy need increase”, “alternative energy sources” and “pollution increase”). This is, for example, the case of Map 1 and Map 11. Other maps show more interest towards social and environmental aspects (aspects associated to health problems, war, poverty, effective management of natural resources, etc.). This is the case, for example, of Map 3 and Map 5. Apart from Map 1, some maps also stress a need for the satisfaction of basic needs (e.g. water or human rights). In these maps problems associated with development rather than to sustainable development are often considered. In fact, in some cases (Map 2 and Map 3), the respondents state that the contrary of sustainable development is “no development at all” rather than “unsustainable development”. They probably consider sustainable development as a synonymous for development.

The interest showed towards problems associated with environment varies in the considered maps. Pollution and environmental problems are not taken into account in several maps, probably because the

respondents live in areas that are not particularly industrialized and are not polluted. However, in the same maps, an interest towards the environment, and, in particular, towards the need to effectively manage natural resources (e.g. soil and water) clearly emerges.

Maps of individuals coming from areas that produce traditional energy sources (such as oil and gas) are not very sensitive towards research or projects related to alternative sources (sun, wind, biomass). On the contrary, other maps show a great interest in these issues (Map 11). These considerations are confirmed by the results of domain, centrality and set analysis (see Tables 1, 2 and 3).

Finally, some interest is shown towards politics issues and the need for an increasing involvement of people in decision related to sustainability (see Tables 1 and 2), thus confirming what was mentioned in Section 1.

This analysis shows the existence of different perspectives on the concept of sustainable development in the Mediterranean area. As mentioned above, the very initial impression deriving from the analysis of the maps is the existence of two main attitudes towards the concept of sustainable development: some maps focus on economic and environmental problems, others are more oriented towards social and environmental problems. In particular, these two perspectives seem to be associated to more developed and less developed countries, respectively. This is a hypothesis that has to be tested in further research.

Some considerations can also be drawn about the possibility to effectively adopt maps to depict the different perspectives, which is the aim of the paper. The main benefit that derives from adoption of the maps is the easiness of the analysis of different perspectives. Graphical representation enables clearly identifying key issues and easily stressing the differences among different positions. Moreover, the adopted indicators facilitate the understanding of concepts or relationships which are not perfectly clear or conscious to individuals. These relationships can be more easily stressed than in the case of other qualitative tools (such as case studies or simple interviews). Yet, the methodology shows also some drawbacks. In particular, the stage of the creation/development of cognitive maps (interviews and codification of collected data) is the most critical. This observation is based on the difficulties we encountered during the application of the methodology, but it is also widely discussed in literature. As most qualitative research methodologies, the knowledge schemes of the interviewer (i.e. the researcher) can strongly influence the findings. By knowledge scheme we mean the culture, interests and experiences of an individual. The researcher's knowledge scheme can influence the way questions are asked (thus influencing the answers) and, above all, the way data are analyzed. There exist some techniques that try to reduce subjectivity, but they introduce other kinds of error (Markoczy et alii, 1995). For example, by providing an ex-ante defined list of possible constructs and concepts (though in some cases they can be extended by respondents) the answer possibility of the respondents is limited and can be biased. As this pilot study was also aimed at investigating all the possible concepts associated with sustainable development in the Mediterranean area, we used an eliciting methodology as little structured as possible to avoid influencing the answers.

Cognitive maps are aimed at representing the perspective of the respondents. However, if the map must represent the perspective of a class of persons (such as the members of a country), particular attention must be devoted to the selection of the sample (in terms of number and knowledge schemes of the individuals of the sample) and to the development of the collective map.

5. CONCLUSIONS

In this paper a pilot study aimed at assessing the opportunity to use cognitive maps to represent and analyze different perspectives on sustainable development that exist in the Mediterranean area has been proposed. This is part of a larger research project aimed at investigating key issues, strategies and lines of action associated to the concept of sustainable development.

A sample of individuals that live in the Mediterranean area has been selected and interviewed about the concept of sustainable development. Based on the information collected during the interviews, different cognitive maps have been designed and analyzed. The analysis results have been reported and discussed. Benefits and disadvantages associated with the use (both during the design and analysis stages) of cognitive maps have also been discussed. Some difficulties in adopting cognitive maps arise during interviews and map development. In particular, the researcher should assume a neutral position both during the interview and the analysis of collected data. However, as in all the qualitative

methodologies, the risk that the subjectivity of the researcher may modify obtained maps can be high. Despite these difficulties, that are well stressed in literature, cognitive maps are a powerful tool for the representation and analysis of different perspectives on a given issue. Graphical representation allows in fact clear identification of the main concepts and ideas whereas the analysis supporting tools (such as the centrality, domain, or set analysis) facilitate comparisons among maps and the analysis of their differences.

From the analysis considered two main perspectives on sustainable development seem to emerge. Some maps are more focused on economic and environmental aspects whereas others devote more attention to social and environmental problems and express a need for the satisfaction of basic needs. Though not generalizable and testable at this stage of the research, we argue that these two positions reflect the perspectives of developed and developing countries, respectively. Further research will be carried out to verify the validity of this hypothesis. In particular we intend to extend the analysis to a larger sample of people living in the Mediterranean region.

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APPENDIX

All the concepts mentioned in the considered maps are listed herein. Concepts have been reported by using the same terms utilized by the respondents.

Absence of market economy
Addressing health problems
Addressing problems associated with urbanization
Association
Availability of traditional energy source
Bad government
Biofuel production
Biomass diffusion
Capital gain
Citizens' persuasion
Communication and high illiteracy
Congestion increase
Corruption reduction
Creating communication campaign
Dam construction
Decentralizing central power to facilitate local development
Definition of support and control policy by governments
Developing action plans
Development of renewable energy sources
Development of not renewable energy sources
Development of strategies to increase the individual and national income
Difficulty of investments in production activity especially if investments don't come from French companies
Difficulty in relationships with foreign countries
Diffusion of corruption (strong lobbies, French- related lobbies exist)
Eco-tourism can economically support rural people
Effective management/protection natural resources (air, soil, water and health)
Effective public policy
Elimination of terrorism
Employment increase
Energy need increase
Enhancing political planning and management
Environment preservation
Environment protection
Environment protection law definition
Environmental impact assessment for all projects
Europe buys only organic products
Existence of good laws to protect the environment
Existence of many debts towards the international community
Existence of many economic problems
Existence of prejudices
Existence of social and economic problems
Existence of socialism
Existence of very high interest rate on national debts (about 70% of the nation income)

Existence of war
Extremist (religious) movements that try to obstruct the disappearing of traditional life model
Facilitate communication
Facilitate the birth of associations
Facilitating investments by foreign countries without passing through the central government
Fighting for human rights
Focus attention on the issue of preserving water sources ... Focus on pollution/energy needs
Giving value to national products and resources
Good economic situation
High emigration rate from lands and farms
High employment rate
High unemployment rate
Improvement of the country's image
Improving service level in hospitals
Improving the education level (creation of curricula for the environment protection)
Improving the education system
Improving the quality of life
Incorrect management of soil destroyed cotton plants
Increase tourism
Increasing alternative transportation ... Increase traditional transportation
Increasing congestion
Increasing employment
Increasing heating needs
Increasing incomes
Increasing international tourism
Increasing international tourism (but no mass tourism)
Increasing people's involvement in political decisions (associated with good planning)
Increasing quality controls for production and consumption
Increasing the designing and building of plants using biomass
Increasing the use of nuclear energy
Increasing tourism
Increasing urbanization
Infrastructure improvement
Lack of infrastructure like hospitals
Lack of interest in studying/investing in technologies (only few studies deal with photovoltaic energy)
Lack of plants to treat water
Lack of human rights
Lack of water
Large availability of energy
Law definition
Life in towns is chaotic
Low level of education
Low levels of criminality
Making an income available for everyone
Making people sensitive to sustainable development
Making the country self-sufficient
Military governments
More controls on chemicals used in agriculture

Necessity to eliminate the embargo towards Algerian products in Europe
Need for good politicians
Need for government or NGO support
Need for more and more input
Need for the country to become self-sufficient
Need to preserve and sustain local knowledge and culture (such as rural culture)
New energy production plant construction
People and goods transportation increase
People decide to move to towns and they abandon fields
Political choices are often wrong
Pollution increase
Pollution reduction
Population increase
Population is increasing
Preservation of natural resources
Preservation of the environment
Preservation of water resources
Promoting an environment- friendly culture
Promoting investments in new technologies and research
Promotion of post-graduation courses abroad
Providing financial incentives to firms
Reduce water consumption
Reducing corruption levels
Reducing pollution
Reducing poverty
Reducing unemployment
Reduction of international debts
Renewable energy resources: sun wind projects, definition of large projects
Renewable energy sources diffusion ... Traditional sources diffusion
Resource (water, soil, air) consumption
Riches are concentrated in the hands of few people
Rural area development
Little information freedom
Little interest in alternative energy source, environmental, social and economic problems
Soil degradation
Solidarity
Solving fishing problems by international relationships
Solving problems associated with desertification
Solving problems associated with the lack of water
Solving problems in large cities that are overcrowded and have lots of problems
Solving problems with irrigation and drainage
Solving the problem with acid rain
Supporting agriculture
Supporting eco-tourism
Supporting organic farming
Supporting private companies with incentives
Supporting rural development
Supporting the agriculture sector

Supporting the exportation of national products
Supporting the preservation and rational use of local resources (water, soil)
Sustainable development
Sustaining development by public efforts
Teaching farmers the correct use of water, resources (and reducing the use of pesticides)
Technological innovation rate is so fast that people are not able to understand it
Terrorism is a serious threat especially in the countryside
The country is very poor
To do research
To support research for water preserving and for using sea water
Tourism increase
Traditional life model is disappearing
Twenty percent of the income used to pay for energy
Unemployment decrease
Urbanization is increasing
Use of alternative energy sources
Water is a critical resource that cannot be (re)created
Water preservation