SCENARIO ANALYSIS IN SPATIAL IMPACT ASSESSMENT: A METHODOLOGICAL APPROACH

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Abstract

This paper introduces the concept of Spatial or Territorial Impact Assessment as a new tool for balanced urban or regional planning from a long-term sustainability perspective. It then argues that modern scenario methods may be a useful complement to pro-active and future oriented urban or regional strategic thinking. A cognitive interactive model for scenario analysis is next presented and its advantages are outlined.

1. Introduction

Urban sustainability calls for a long-range perspective on an uncertain future. Policy analysis is a field fraught with many uncertainties of all kinds. In the past decades scenario analysis has been developed as a scientific tool for coping with and managing long-run uncertainties in the policy-making process. A scenario may be defined as a possible, often hypothetical sequence of events constructed in an internally consistent way for the purpose of focusing attention on casual processes and decision points (Kahn and Wiener, 1967). Consequently, a scenario consists normally of three parts: a description of the present situation; a description of future situations; a description of a number of events that may connect the present situation with future ones (the path) (see Nijkamp et al., 1997). The advantages of scenario methods over long-run forecasting tools are the following (see Table 1):

Table 1. Progressive advantages of scenario approaches in policy analysis

From:	To:
- Focus on quantified variables	- Focus on qualitative pictures
- More emphasis on details	- More emphasis on trends
- Results determined by status quo	- Results based on future images
- Deterministic analysis	- Creative thinking
- Closed future	- Open future
- Statistical-econometric tests	- Plausible reasoning
- From quantitative to qualitative	- From qualitative to quantitative
- Single track thinking	- Multi-track thinking
- Reactive problem driven	- Proactive vision driven
- Multiple implicit assumptions	- Transparent simple assumptions
- Limited set of options	- Open range of options
- Model-determined mind	- Alertness to signals of uncertainty

Source: Nijkamp et al. (1997)

In reality, there is a wide variety of scenario methods, such as: descriptive vs. normative scenarios, projective vs. prospective scenarios, commonsense-oriented vs. expert-based scenarios, or trend-based vs. opened-ended scenarios. Scenario studies are usually experimental in nature and have assumed a solid position in the field of planning and policy analysis (see also Ringland, 1998).

The present paper proposes a cognitive methodological approach for future scenario development belonging to the field of *Future Studies* that is by its very nature a useful tool in the context of a Spatial impact evaluation process. In the first part of the paper, we describe the spatial or Territorial Impact Assessment process which proposes an integrated methodological approach that draws on the theory of

'planning and control' (Bardach, 1977) (Figure 1). We begin with an analysis of a real-world spatial (territorial, land-use) phenomenon for supporting the elaboration of alternative future scenarios related to a set of strategic objectives. Such an approach is based on the assumption that the future is not something already predetermined, but rather the product of a causal chain of events determined over time from exogenous and endogenous elements of the spatial system. Planning actions aim to guide such events towards achieving the political objectives. According to the theory of 'planning and control', the implementation of planning action becomes an important task, so that scenario development must include an ongoing system of control and evaluation that can measure whether the development of the real world is proceeding in the direction that was envisaged. In this sense, scenarios are not an abstract and unchangeable path. They are in themselves an instrument which can help monitor and assess future development in order ultimately to propose new and creative actions.

The 'control' is very important to guarantee the satisfactory implementation of actions, moving away from a mere control of the extent to which the implementation conforms to the original plan to concrete prescriptions.

In the second part of the paper, a cognitive methodology for future scenario development will be introduced (scenario planning) belonging to the field of Future Studies, that is inherently consistent with the processing logic proposed.

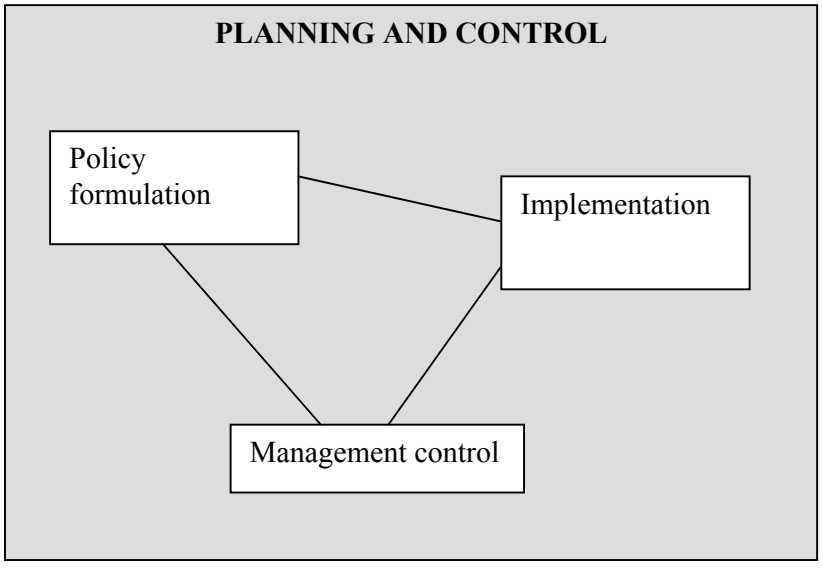

Figure 1. Relationship between policy and implementation
Source: Bardach (1977)

2. Territorial Impact Evaluation : A New Approach for Sustainable Regional Development

Spatial impact evaluation refers to the territorial and land-use impact assessment of policy intervention. It aims to offer a systematic framework for consistent future-oriented policy action. The concept of Territorial Impact Assessment (TIA) was officially introduced for the first time in the 'ESDP Action Programme' by the Council of Ministers responsible for spatial planning in the Member State of European Union and the Member of European Commission Responsible for Regional Planning of Potsdam in the context of the European Space Development Scheme (1999). In this document, 'Territorial Impact Evaluation' was presented as an *ex ante* intersectorial evaluation tool or procedure to support a spatial development policy, plan or project for assessing the impact of territorial development in relation to the objectives and the perspectives of territorial strategies. It includes all the aspects typical of territorial planning with reference to the social, cultural, environmental and economic dimension (Committee of Spatial Development, 1999).

The main features that distinguish TIA from the existing evaluation tools (Environmental Impact Assessment and Strategic Environmental Impact Assessment) are the following:

- it is a new approach to *ex ante* evaluation in addition to classical cost-benefit analysis, environmental analysis, multicriteria analysis, etc;
- it is a large-scale approach consistent with the the predictable effects of the overall territorial plans and projects of regional development;
- it includes a broad range of impacts (social, cultural, environmental and economic) that a plan produces in a specific territory, thus offering an intersectorial and multidimensional perspective.

Due attention is given to the future dimension in sustainable regional planning: here, controlling the impacts produced by future spatial developments play a key role. The main problem of large-scale planning is, in fact, closely related to long-term planning. This activity is, in turn, strictly related to forward-looking thinking, because planners define and influence certain aspects of the future, often with long-term effects. Accordingly, looking forward and exploring possible different futures, and preparing to face them, become important activities.

Territorial Impact Evaluation attempts to be an *ex ante* evaluation operating within an ongoing process of construction of hypothetical future scenarios of territorial development related to a well-defined system of objectives. It sets the fundamental objectives for public action in order to attain the common good through strategic actions to be assessed over time in relation to different dimensions, all equally important.

Starting from an integrated approach to the control system (Figure 1), it is possible to identify five steps, which involve:

1. identifying the issues through the observation of real-world phenomena;
2. setting the strategic objectives that have to be reached;
3. formulating alternative hypotheses of possible future scenarios in relation to the strategic objectives;
4. assessing the scenarios by means of a system of social, economic, cultural and environmental indicators;
5. applying a continuous monitoring system (strategy of control) on the territory in order to assess whether the actions undertaken in connection with the envisaged scenarios are meeting the strategic objectives set.

Within the evaluation process, questions arise as to the techniques to be adopted in each step together with the need for a way of measurement that enables the initial scenario (*ex ante* evaluation) to be compared with those consequent to the progressive realization of plans, programmes or projects that are decided to be activated (i.e. the ongoing evaluation). It seems important to emphasize that the evaluation process is not only a supporting instrument to the final choice, but should also be accompanied by a process of observation on the territory to monitor and to assess actions undertaken over time, with the aim of correcting the course of events if this is not in line with the strategic objectives.

This paper addresses the issue of future scenario building. In particular, scenario analysis will be proposed as a technique for building scenarios for territorial development. It is a flexible, transparent, communicative decision-support tool that can favor the participation of the social action to the territorial strategic planning. In fact, to evaluate, means above all “to enhance the transparency of the public action, to feed the democratic debate at different levels, to facilitate the understanding of the complexity of politics, to help the obtainment of a consent on the politics themselves” (Camagni and Musolino, 2002).

In the following sections, scenario analysis will be introduced with the purpose of understanding how it can support the Territorial Impact Evaluation process, as outlined in Figure 2.

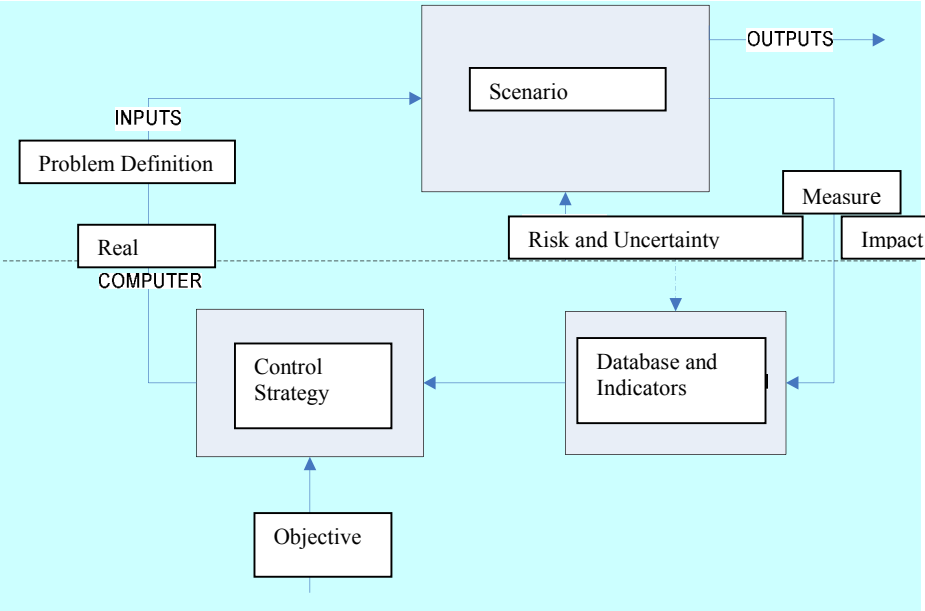

Figure 2. Territorial Impact Evaluation process

3. The Future Dimension in a Spatial Planning Process

The traditional approach to the planning of an unknown future attempts to foresee all its aspects, that is to foresee the future by extrapolating it from the existing trends. However, in the territorial planning field, forecasting is extremely complex since it is characterized by complex situations, whereby various groups of actors with conflicting objectives have the power to make decisions. The decision process is characterized by a high degree of uncertainty related to the future, especially in a dynamic and risky world (Beck, 1999). Uncertainty is, in fact, linked to the behavior of the actors involved and to the unexpected or undesired impacts of the decisions. Moreover, uncertainty is due to exogenous risk factors.

The above considerations present a number of interesting challenges, both from a procedural and substantive point of view. In that respect, the literature (Bell, 1997; May, 1996; Schwartz, 1991; Khakee, 1999) has proposed approaches and methodologies typical of *Future Studies*.

Furthermore, within complex systems (such as the spatial system), the indeterminateness of the information and the impossibility of always being able to

express the different and conflicting components through quantitative indicators makes the exclusive use of classical methodologies ineffective in future forecasting. Actually, in physical and socio-economic planning qualitative information is accompanied by the uncertainty contained in some or most of the information. Information, in ideal terms, should be precise, certain, exhaustive and unequivocal, but, in the real world it is very often necessary to use information that is compatible with the stochastic or fuzzy uncertainty of the data.

In approaches to *Future Studies*, normally an attempt is made to uncover the features and anticipate the characteristics of the future situation. This approach is based on the belief that the future is something already determined, unchangeable, and with clearly defined paths. The approach more often used to handle the uncertainty that intrinsically characterizes the future is to attempt to forecast with the purpose of defining a framework against which to set out objectives and programmes.

Within spatial planning, this approach based on the analysis of past trends has not always produced satisfactory results. Often, there is a complete reversal of past trends, due to exogenous factors that have overturned the normal forecasts (introduction of new technologies, changes in the macroeconomic context, climate change, environmental risk, etc.) and therefore it is possible, on this assumption, to develop a strategy that is not in conformity with the real future scenario.

Forecasts can be useful and accurate for measurable and comprehensible technical and physical systems (the movement of the planets, the load limit of a structure, etc.) that have a constant and informal character in everyday life, even if they also have a certain degree of space for indeterminateness. However, the territorial systems, strongly tied up with human dynamics with their values, beliefs or ideologies, are too complex and more difficult to forecast (Slaughter, 1995). Here, forecasting deals with systems for which complexity and uncertainty are strongly dependent on the influence of the external environment, at all levels, and on the unpredictable changes that characterize them.

In this perspective, the study of the future does not have the objective to try to investigate the unknown to determine its characteristics, but to understand the different possible alternatives that can be developed with the purpose of furnishing a decisional context characterized by a multiplicity of options and choices.

Future Studies includes an ample range of methods and techniques that can be used in many fields of investigation. The current literature offers classifications and

different indications of the principal methods and models of the art of *future study*[1]. In reality, it generally concerns methods imported by other disciplines, but always modified and suited for the particular environment being investigated and the objective for which the study is undertaken. Also important are the time of the research, the people involved, the decision methods, and the scale of reference.

In the methods of future investigation an important distinction can be made between qualitative and quantitative methods, although this differentiation is intended more as a continuum than as a clean separation; most of the methods allow a certain quantification at least (Bell, 1997). Another important distinction is between normative studies and exploratory studies. Exploratory studies look at the future beginning from the present, while normative studies consider what needs to happen, so that a specific envisaged future state can come true. Normative forecasts establish objectives and introduce a series of alternative action to reach them; they define the desirable future and then study the formalities with which to achieve those objectives that remain in the sphere of the possible future. Exploratory forecasts look instead at the driving forces to see where this can lead us; they study the reasonable future. Starting from this distinction, May (1996) suggests an accurate classification of methods, by organizing them on a continuous scale that goes from forecast methods to those methods that aspire to actively shape the future. The principal methodologies of *Future Studies* include both models of Problem setting and models of Problem solving. In particular, we will make reference to them as tools to support decisions in the spatial planning process.

In the next section, a methodological approach to scenario analysis is introduced and its principal characteristics are highlighted.

4. Scenario Planning

4.1 Origin and development

The concept of scenarios is an old one. Since earliest recorded time, people have been interested in the future and have used scenarios as a tool for indirectly exploring the future of society and its institutions. In this context, scenarios have usually taken

[1] Trend Extrapolation, Dynamic Systems Analysis and Computer Modelling, Simulations and Games, Cross Impact Analysis, Technological Forecasting, Technological Impact Assessment, Environmental Impact Assessment, Social Impact Assessment: Delphi Polls of Experts, Futures Wheels, Scenarios, Science Fiction, Intuition & Intuitive Forecasting, Experiments in Alternative Lifestyles, Social Action to Change the Future, Short, Medium, and Long Range Planning: Relevance Trees, CERT/CPM Analysis.

the form of treatises on utopias and dystopias and, as such, have a long history which can be traced back to the writings of the early philosophers, such as Plato who described his ideal Republic (von Reibnitz, 1985; Wilson, 1978), and visionaries from Thomas More to George Orwell. However, as a strategic planning tool, scenario techniques are firmly rooted in the military and have been employed by military strategists throughout history, generally in the form of war-game simulations. Despite their long history in the military, the first documented outlines of what today might be regarded as scenarios do not appear until the 19th century in the writings of von Clausewitz and von Moltke, two Prussian military strategists also credited with having "first formulated the principles of strategic planning" (von Reibnitz, 1988). Modern-day scenario techniques, however, only developed in the post-war period, and the 1960s saw the growth of two geographical centers in the development of scenario techniques, the USA and France.

In the USA the most meaningful studies were those of Kahn and Wiener (1967) who within the RAND[2] Coorporation undertook numerous military commissions for the US armed forces. Founders of the Huston Institute developed their use in the 1960s, coining the phrase "to think the unthinkable" in relation to a forecast of the threat of a thermo-nuclear war. Other important studies were conducted by Royal Dutch/Shell in the 1970s; the main exponents were, Wack (1985), De Geus (1988) and Van der Heijden (1996).

During the 1970s the Research Institute of Stanford proposed an innovative structured approach for scenario building under the guidance of the illustrious luminaries Willis Barman, Harnold Mitchell, Oliver Markley and Marie Spengler. Particularly important was the contribution made by the consultancy organizations societies that operated in this field: the Batelle Institute, the Global Business Network (Schwartz, 1991), the Northeast Consulting, and the Future Group.

Within the French school, the Centre d' Etudes Prospectives conducted fundamental studies in scenario approaches to long-term planning called 'prospective thinking' or 'You Prospective' (Berger, 1967). This approach reportedly emerged as a consequence of the repeated failure of 'classical' forecasting approaches. In this context, an extremely important contribution is that of Godet (1986), whose interest was mainly in morphological analysis and in existing relationships among different actors in the process of scenario building.

The main differentiating feature between the US and the French centres of scenario development is that, whereas the early scenario work in the US tended to be

[2] RAND is an acronym from 'Research and Development'.

of a global nature, scenario development in France was more narrowly focused on the partner-political foundations of the future of France itself (van Vught, 1987). There has since been a diffusion of scenarios into the business community, but scenario work in France still continues to play an important role in public sector planning.

4.2 Some definitions

Nowadays, the scientific literature on scenario analysis embraces a wide array of scientific disciplines, and the technique of scenario development is used above all in the choice processes to face the uncertainty that characterizes future areas of action. Despite all the discussion on scenarios, no clear definition or model has as yet been developed. It has proved to be a very broad and complex concept which defies attempts to capture it in a universally applicable definition.

Scenarios essentially represent coherent and feasible 'maps' of the future. So scenario analysis can be seen as the study of the strategic behavior of actors in relation to true actions or events. Kahn and Wiener (1967) define a scenario as "a hypothetical sequence of events built in order to focus the attention on casual knots of decision processes."

Vakgroep defined a scenario as "a story that describes the present situation of a society, with the changes and the developments that is hoped it can have in the future, and it individualizes the series of events that ties the present condition with the auspicious future state." (Vleugel, 2000)

According to Chermack and Lynham (2002) "Scenario planning is a process of positing several informed, plausible, and imagined alternative future environments in which decisions about the future may be played out for the purpose of changing current thinking, improving decision making, enhancing human and organization learning, and improving performance"

The Batelle Institute in 1996 furnishes the following interpretation of the term scenario: "A scenario is a narrative description of a possible state of affairs or development over time. It can be very useful to communicate speculative thoughts about future developments to elicit discussion and feedback, and to stimulate the imagination. Scenarios generally are based on quantitative expert information, but may include qualitative information as well."

Therefore, a scenario does not represent a forecast or a preferred development of an actual situation; it is instead a set of coherent and believable descriptions, that represent different visions of alternative futures, described according to a chain of

events (Figure 2). In other words, scenario development can be seen as a tool to explore the future rather than to foresee it, to build contexts to support the decision, thus lowering the level of uncertainty and raising the level of knowledge. A scenario provides a context to think and reason about factors, relationships among actors and situations that answer the question "What would happen… if?". Scenario elaboration is the task of an interdisciplinary team and helps to understand the points of strength and weakness of a project.

According to the cyclical development process proposed by Kolb (1984), starting with the concrete experience, we can build models of possible futures (see Figure 2) achieved via different chains of events that then have to be valued and verified against different contextual conditions. Systematic information helps us to ensure that the future vision is built on the basis of the knowledge acquired during the process, in relation to the expectations, values, needs and events that can take place over time. The process is a cyclical-learning process in which new information is continually being turned into knowledge and verified on the base of the hypotheses formulated. Such an approach appears to be very much in line with the processes of Territorial Impact Evaluation, as described in Section 2 above.

The indeterminateness of the events that shape the possible future, causes the planners, the policymakers and all the subjects involved in the process of scenario building to react in different ways in relation to an uncertain and not deterministically predictable situation; in fact, it is possible to identify different ways to face uncertainty: to ignore the uncertainty; to identify and to specify the degree of uncertainty; not to do anything and wait until the uncertainty naturally reduces; to accept the idea that a condition of uncertainty exists and to act in conscious way to manage it; or to face the uncertainty not as a threat, but as an opportunity to model the future in a creative way. This last attitude is sometimes defined in the literature referred to as the 'no-regret strategy' (see Nijkamp, 1994), in the sense that defined strategies may also effective, even if the conditions are substantially modified over time. Therefore, scenarios do not claim to foresee the future, but are a toolset for describing possible chains of events that can determine alternative spatial transformations. This appears to be very useful within a Territorial Impact Evaluation process, because they can support the definition of the lines of action, thus reducing the degree of uncertainty set by future dimensions. Furthermore, the construction of chains of events can help to monitor the course of events (see also Figure 3).

In the next section, our methodological approach of scenario building will be further described.

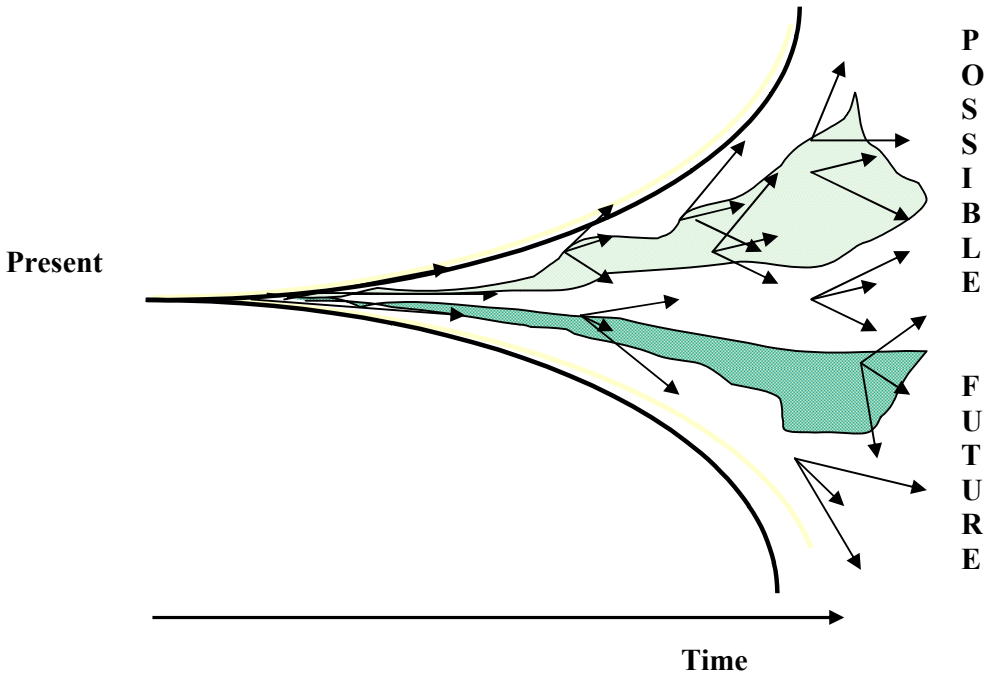

Figure 2. Cognitive process of scenario building

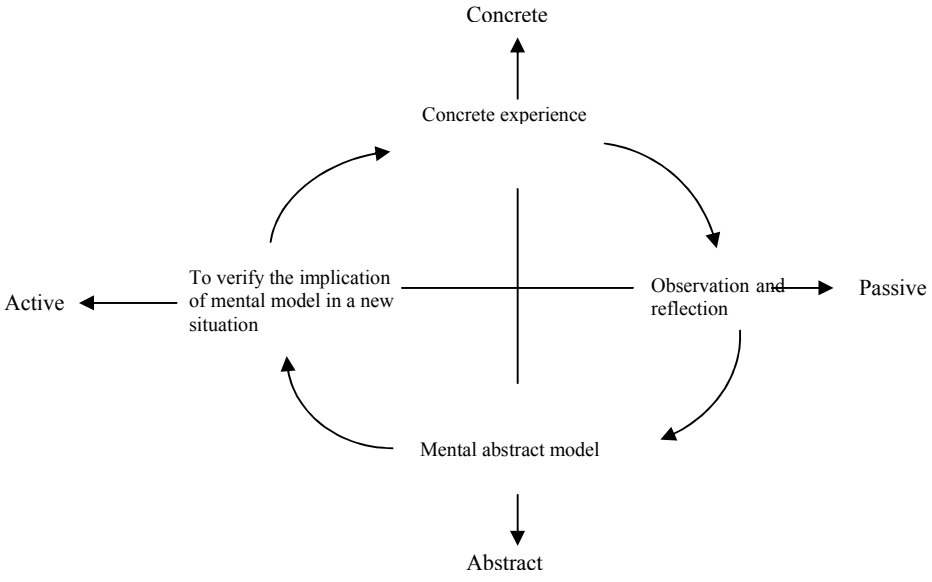

Figure 3. The learning process
Source: Adapted from Kolb (1984)

4.3 The methodological process of scenario development

4.3.1 Introduction

The design of a cognitive, interactive methodological approach for the construction and evaluation of scenarios draws on different fields of decision theory and particularly on those of descriptive theory (Descriptive Decision Theory) and of prescriptive theory (Prescriptive Decision Theory).

The field of the Descriptive Decision Theory, directed to the study of psychological models in the decision process, even if not directly furnishing any formal support tool, guides the analysis of the various types of behaviour allowing suitable interventions during this process. This field of the decision theory, with reference to multi-actor decision processes, focuses on the individual or group mechanisms that can be activated, underlining that elements, both behavioural or psychological that are able to influence, even strongly, the results. Within an interactive process we hardly make reference to information and knowledge acquired during the ongoing decision process, while more easily and frequently we look at information and knowledge assimilated in preceding times (Volkema, 1997).

This phenomenon seems to substantially depend on the necessary time for the processing of the acquired information. The information that every individual acquires during an interactive process is 'processed' to shape the concepts (descriptions of general categories): the use of concepts makes possible the reference to the information that contributes, together with other contemporary or past information, to produce these concepts (Wierzbicki, 1999). This means that the activated process must foresee the times of processing in order to allow an effective exchange of information.

The field of the Prescriptive Decision Theory foresees many methods to drive the decision maker toward choices that, according to the approaches used, can be judged, efficient, rational, excellent, satisfactory, etc. This field also uses descriptive analysis to drive the decision-maker in the evaluation of the decision process and its results.

In a concise and simple way, two approaches of Prescriptive Decision Theory can be distinguished:

- Problem Structuring (PS); and
- Decision Analysis (DA).

In the first case, strongly directed to problem structuring, alternatives/solutions are built within the decision process in a dynamic way; the process finishes when an alternative/solution is recognized as satisfactory, either unanimously or by the vast

majority of the stakeholders involved. In contrast, in the second approach, the alternatives/solutions are defined in advance and then ordered during the decision process in a ranking based on efficiency or optimality criteria, with the aim to support the final choice. The alternative can be both continuous and discrete.

Each of these two approaches has a different role in the decision process The first one, in fact, is well suited to an interactive process with the purpose of collecting knowledge, facilitating interaction, creating a group spirit, deeply analysing the problem by making its characteristics formally explicit and therefore producing ideas and solutions. The second, vice versa, represents a strongly formalized support of the evaluation phases of an interactive decision process.

4.3.2 Methods and approaches

During the last decade different methods have been used for shaping scenario development, in terms of approach and vision of the planner; today we can speak of intuitive scenarios, idealistic scenarios, qualitative or quantitative scenarios, and participative ones. In each of these cases, the scenarios are always considered as mental, analytical or visionary constructions, not necessarily valid, that aim to offer a context to think in a rational way to the future.

In order to schematize the problem, though running the risk of simplifying it, scenario development can be divided in two basic approaches:

- *Future Backward*: we depart from the individualization of possible alternative futures and investigate the models and the choices that could bring about such scenarios;
- *Future Forward*: we depart from the analysis of the existing conditions and, on the basis of the evolution of present situation, possible futures are examined.

Departing from such generalizations, scenarios usually have four dimensions (Inayatullah, 1996):

- *Status Quo:* it is assumed that the future will be a continuation of the present;
- *Collapse*: this appears when the system cannot keep on growing anymore, or when existing conditions bring it to a state of irreversible breakdown;
- *Steady State*: this is based on a return to a past condition, imagined or real;
- *Transformation:* fundamental changes are hypothesized that can be in both values or technological innovation, or they may be political and economic changes.

In terms of a methodological approach, we can identify three fundamental approaches:

- *Intuitive logic*: Global Business Network and Shell;
- *Trend Impact analysis:* Future Group;
- *Cross-Impact analysis*: Batelle Institute.

The recent developments towards interesting methodological approaches are those proposed by Schwartz (1991) and described as 'Strategic Conversations'; here the process of scenario development is seen as a 'building block' to plan strategic conversations that bring in the organizations to collect the knowledge on the key decisions and the priorities. The principal role of scenarios, in such a context, is that of 'laboratories' in which different models of the future can be tested.

Therefore, scenario development can be considered as a process that consists of a series of phases that are able, at least in theory, to be developed according to a circular sequence (Figure 4). It is possible to recognize four main steps, as described below. Some points of a general character can be underlined as well:

- the scenarios should focus on clear matters, decisions, strategies or plans;
- the scenarios should logically present themselves as structured and internally consistent;
- the process should be flexible and able to be easily adapted to the requirements of different contexts;

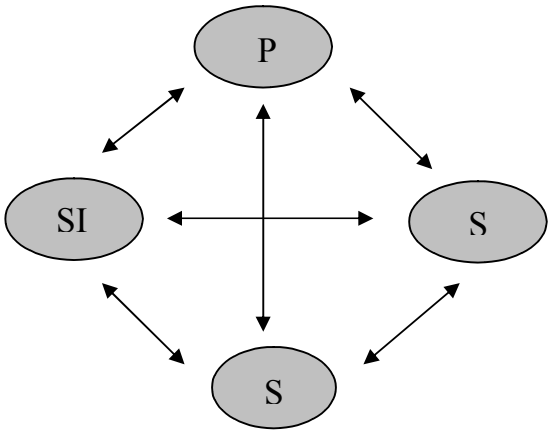

Figure 4. The cyclical process of scenario development and evaluation

Legend:
PS Problem Setting
SD Scenario development
SE Scenario evaluation
SI Scenario interpretation

In practice, such a process appears to be an interactive activity that aims to direct political strategies towards the action, through a series of phases that can vary according to the specific cases, although the main elements of the process stay unchanged.

The phase of *problem setting* has the objective of collecting and elaborating the information essential for the decision.

The construction of a framework for the collection of the information can be structured on three levels (Figure 5):

- the analysis and the collection of quantitative data and objective information with primary or secondary sources (official or unofficial) on the actual situation and the forecasts of variation in the variables and the elements of interest;
- the collection of information and ideas of decision-makers with respect to the future development through specific meetings. It is, in fact, possible that they provide different information from that described in the preceding point;
- the individualization of the possible dynamics of change, the discontinuities and the opportunities. The investigation of these aspects should happen through forum group and strategic conversations among the main actors involved in the decision process.

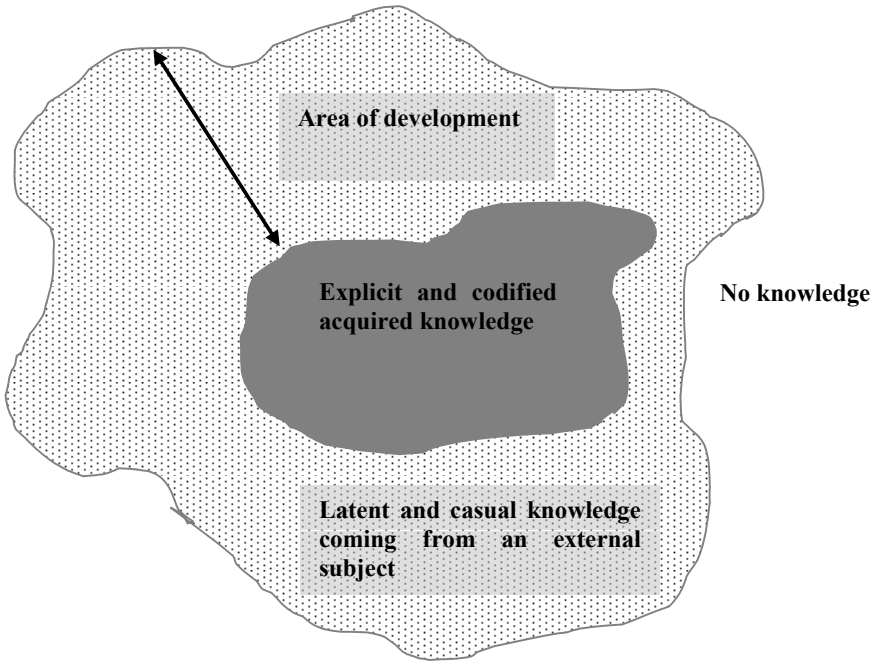

Figure 5. Example of information structure
Source: Faggiani (2003)

The acquisition of the core information has as a result the definition of an informative framework that involves:

- identifying driving forces, taking into consideration future spheres: the politisphere, econosphere, sociosphere, technosphere and biosphere;
- identifying predetermined factors - assessing what is inevitable about the future;
- identifying critical uncertainties — assessing those areas where the future is uncertain, which can be prioritized according to importance and the degree of uncertainty;
- developing scenario plots, i.e. a series of plausible alternative futures;
- assessing the implications of different scenarios for the organization(s), community(ies), sector(s) of concern;
- identifying and monitoring indicators to enable continual reassessment and adaptation.

The whole available information must be put into a system in order to enable the critical elements to be managed, e.g., by using Delphi studies. Some authors suggest matrixes to synthesize the cognitive learning process. Once the information is collected and the key factors are individualized, the next step is to order the acquired elements according to a scale of priority and level of uncertainty.

The results obtained through the exercise of ranking are the basis for the scenario development. At this level, the imaginative process, the creativity and the intuition play a key role. The importance and the objective of this phase have been underlined by Schwartz (1991): *"The objective is to individualize a limited number of scenarios whose differences are perceived by the decision makers. The built scenarios represent tools of knowledge for strategic decisions and the fundamental differences or 'scenario drivers' should be limited to reduce the elements of uncertainty. A lot of things, in fact, can happen, but so as not to lose the fundamental points of view. It will be necessary to elaborate only a few scenarios."*

The fundamental challenge in this phase is therefore to develop a limited number of logical scenarios that better capture the dynamics in action, not less than two, but no more than four. This has been defined as the rule (Wilson, 1978) and the following criteria have been suggested with the aim of making a choice:

- Plausibility - the selected scenarios have to be feasible;
- Differentiation - they must be structured in different ways, not with simple variations on the same theme;
- Consistency - it is necessary that the internal logical process is consistent;

- Utility of the decision making - every scenario has to contribute to build the decision process;
- Challenge - they have to propose innovative challenges in comparison with the existing conditions.

Once the preferred scenarios have been selected, then follows the phase of scenario development, building the chains of events that characterize them.

In relation to such a process structured in different steps, the methodological base that can support every step is ample and diversified and embraces a vast range of techniques and approaches. In fact, one of the problems connected with scenario development is to choose the most appropriate method for the phase of the process under analysis and for the context under examination. The classical *Handbook of Futures Research* (Fowles, 1978) dedicates around 30 pages to the description of the existing methodologies: for example, Delphi techniques, game theory, brainstorming, check lists, morphological analysis, the cross-impact matrix, analyses and extrapolations of trends, regression analyses, etc. Moreover, since the publication of this book, over the years many other connected techniques have been developed, above all in the field the strategic planning and management. One of the principal challenges in this field today is not so much to develop new technologies, but rather to test a process that can integrate in an efficient and effective way those already existing "… *the right tool for the right job*..." (Ratcliffe, 2002).

6. Conclusion

In conclusion, the proposed approach may be of great interest for territorial planning processes, because it is structured as a decision support system that can help decision makers to make sustainable choices for the future. Numerous questions arise concerning which techniques to adopt and on the control system to set that can support the monitoring of territorial transformations over time.

Assuming, in fact, that it is difficult to prefigure *ex ante* a future scenario, planning practice becomes the governance and management of territorial transformations in a strategic optics of possible futures produced by a chain of events, monitored continuously. The system appears flexible and modifiable, foreseeing adjustments over time: "*Defining a management control system is not useful to understand if the subject x or the organization y are doing well, but to clarify what we can do tomorrow*" (Dente, 1989).

Further research efforts must be addressed in order to test the existing methodologies with the aim of guaranteeing a process that can be transparent, manageable and controllable in its development. The single phases of the process leave open issues with respect to the capability to evaluate actions that condition the chain of events and the relative impacts, to measure such impacts, to build a strategy of control (direct observation of real phenomenon) that can guarantee the sustainability of the actions undertaken in relation to a system of strategic objectives. In conclusion, TIA in relation to scenario design and use may offer a new perspective that is appropriate for broadly supported planning actions in cities and regions.

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