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Public Choices and Decision-Making Processes: a Case Study on Sustainable Mobility

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1 ABSTRACT

The definition of a decision process, which implies the capacity to implement and realize an action involving all the actors interested, is crucial not only for taking adequate political decisions but even mainly for getting a democratic control of the decisions themselves.

From a strategic planning point of view, decision process on public issues should be essentially considered as a process of participation, which involves political decision-makers as well as all the administrative organizations which have to realize the decisions taken and citizens and more generally all the stakeholders who will be impacted in a positive or negative way by such decisions. If this is the case, important issues arise: which is the methodology that should be followed to assess all the alternative solutions to adopt? How are analyzed the effects and the impacts of political decisions? How are evaluated the consequences of a set of actions?

To answer to all these questions, Decision Support Systems (DSSs) have been developed. They include measurement tools such as cost-benefit analysis as well as relational methods of "rational analysis" such as multicriteria analysis. DSSs' allow decision makers to implement the best choices and decisions with the aim of reaching a Pareto improvement for the territory considered. Though these tools may be implemented to any socio-political decisions, in these last years the democratic and, therefore, political pressure has led to adopt DSSs' mainly for two specific themes: the environment and the sustainable mobility.

Moreover, in the agenda of European institutions and local and national administrative governments, sustainable mobility is become a high priority. In this framework, the methodology[1] proposed combines two different approaches. On the one hand, the "classic" or top-down approach based on statistical data analysis is considered where the main target is the definition of some synthetic indicators, while on the other hand, the bottom-up approach is adopted, which is based on the Strategic Environment Assessment (SEA) framework and on citizens' participation. This decision process as defined, should be followed for implementing specific and appropriate solutions at local level and for taking into consideration the peculiarities of the territory considered. Finally, a case-study regarding the ex-13th District of the Municipality of Rome is presented.

Keywords: decision making process, sustainable mobility, participative approaches, public choices, decision support system

2 LITERATURE BACKGROUND

2.1 Policy cycle

In the post-World War II period, the ever-increasing gap between political prescriptive theory and the political practice of modern states prompted many scholars to research methods and approaches to achieve social, economic and political development, reconciling theory and practice that can be observed in the actual institutions.

Among these methods, it is worth to note what is based on the definition of public policy goals, called „policy science". From the seminal work of Harold Lasswell, the main topic of policy science regards government activities especially in describing their design and implementation, with a multidisciplinary, problem-solving and normative approach. Despite the criticism on the scientific feature of this approach, the principles developed are still valid and accurate, and continue to provide the basis for public policy study. Among them, one of the most generally known and widespread concept is the policy cycle theory, that is, the decomposition of the process of public policy formation in a number of distinct steps and phases. Among various advanced proposals (Lasswell, 1956; Brewer, 1974; Jones, 1984; Anderson, 1984) of particular

[1] The methodology has been developed within the Interreg III B Medocc project "Ville emission zero – Villemizero"

importance, it should be recall those of Howlett and Ramesh (1995). They define five phases (corresponding to the problem solving mechanism): Agenda Setting, Formulation, Decision making, Implementation, and Evaluation.

In this vein, a decision process starts when there is a need for a change or when an action should be implemented (Sutton, 1999): for example it could be an answer to a uneasiness situation or to the feeling that the current state is inadequate in respect to the new needs of a specific community. The initiative of starting a decision process may be related to the action of a person or of a group interested in changing, because new data or research results highlight the need of new policies.

The rising of changing needs leads to the formulation of a problem that requires a solution. Sometimes the problem will be well defined and will be easily subdivided in targets and constraints, but more often it will be confused with general and many targets (or even only aspirations) that is difficult to analyse.

Starting from these considerations, analysing the relative constraints, the active and passive involved actors, the relationship among interests, it will be possible to define more precisely the problem, to analyze a set of different actions (scenarios) to solve it and finally to realize the chosen solution.

Even if this approach facilitates the understanding of the decision-making process by subdividing it into various subprocesses, it should be taken into account that actually the process is not structured so sequentially or aimed at the goal but is influenced by several factors such as actors, institutions, prevailing ideologies, tools available (Hilgartner and Bosck, 1981; Holzner and Marx, 1979) according to non-linear schemes. This empirical evidence has led to the development of different models of decision-making, including the most well-known as: the rational model (Simon, 1955), the incremental model (Lindblom, 1959), the garbage can model (Cohen, March and Olsen, 1972). These models point out that, depending on different conditions (number of agents, environment in which decision is taken, completeness of information, time available) (Forester, 1984, Howlett and Ramesh, 1995) the decisional process can assume different styles, anyway oriented to the best possible result.

2.2 Decision making

In this framework the decision making, the process embracing the steps leading to a choice, assumes a central role and for this reason is studied in several academic disciplines: psicology, sociology, political theory, economy and managerial sciences. Among them, the one aiming more specifically at the study of the decision process and to the development of methodologies to reach rational (or optimal) choices, is known as Operations Research, Management Science[2] or Decision Theory. However, there is a large overlap, and the issue has been deepen from the variety of methods that researchers with different backgrounds have applied to the same or similar problems.

Mental and formal models play a fundamental role in decision making. On the one hand it is through our mental models that we interpret the world and give a meaning to it (Forrester, 1975), while on the other hand, the formal models are the instruments to improve and strengthen our mental models but also they represent the way we communicate them to the others. The formalization can be more or less in depth, but a minimum level is necessary to face the complexity of many problems.

Particularly interesting are the models called policy narratives (Sutton, 1999). Such a narrative is a story with a beginning, a course and a conclusion, in which are represented a specific events sequence that reaches the status of “common sense” or “shared truth” within a community or a cultural, scientific or political circle.

In some cases they are stories deriving from specific experiences but interpreted as general meaning in all of the cases that reproduce similar circumstances. In other cases they are only artificial realities built in order to highlight or demonstrate the damages or the benefits that some behaviours or actions can imply. A typical example is the story called “The tragedy of the commons”.

These particular models aim to comparing and studying the effects of cooperative and competitive behaviours. In a decision making process, where there are actors with different targets, interests and preferences, the problem is how to choice among the possible alternatives.

[2] The two terms, used today as synonymous, have a different meaning: the first one underlines the operative decisions, the second one highlights the strategic and political choices.

Decision makers will seek to serve the "public good". But how are the decisions that serve the public good actually identified and distinguished from publicly the bad ones? Traditional planning theories propose that good public decisions are "rational" in the sense that social benefits will exceed social costs. The idea is that collective choice can and should mirror "rationality" as it applies to individual choice-making behaviour. Individuals do not freely make choices whose costs to them exceed the forecast benefits. By the same token, traditionalists argue that social groups in a democratic society should be presented with public choices whose collective benefits exceed the collective costs of achieving them.

In the same vein, traditional neo-classical economics teaches that good public choice requires decisions that yield "Pareto improvements" whereby change leaves some individuals better off without leaving others worse off.

There are theories of choice, however, that do not hold to the traditional model outlined above. James Buchanan, founder of the "public choice" school of economics, and other non-traditionalists such as political scientists David Braybrook and Charles Lindblom (1961), reject the fundamental premise that "rational" decision making, as it applies to individuals, can logically and reasonably be transferred to a collection of individuals (namely, the public) as a basis for public decision making. Buchanan puts it thus:

"Rationality or irrationality as an attribute of the social group implies the imputation to that group of an organic existence apart from that of its individual components. If the social group is so considered, questions may be raised relative to the wisdom or "unwisdom" of this organic being. But does not the very attempt to examine such rationality in terms of individual values introduce logical inconsistency at the outset? Can the rationality of the social organism be evaluated in accordance with any value ordering other than its own?" (Buchanan, 1954)

Each one of the decision makers will rank the alternatives on the base of his own preferences: how to get a common ranking? A typical way is to vote. Through the voting the preferred alternative should be chosen, if not from all at least from the majority of the decision makers.

Buchanan and others of the public choice school argue that it is simply majority decision making in the context of democratic institutions that yields sound social choices. They view majority decision and coalition formation as the key mechanisms through which a social group makes "correct" choices among alternatives.

Definitively the choices will be correct but not completely democratic. In fact, as proved from the impossibility theorem (Arrow, 1951), in trying to obtain an integrated social preference (a social welfare function) from diverse individual preferences, it is not in general possible to satisfy simultaneously even mild-looking conditions that would meet the most elementary standards of reasonableness for public choice in a democratic society while still preserving some basic axioms of rationality (transitivity, completeness, reflexivity). These conditions are:

- create a rank ordering of public priorities for every possible combination of individual preferences ("universal domain");
- ranking any pair of social states (alternatives) with no dependence on how others, unrelated alternatives, are ranked ("independence");
- permit no individual or group of individuals to prevail over the social ordering regardless of what others prefer ("nondictatorship");
- all the group of all individuals, taken together, to prevail over the social ordering (Pareto optimality).

Does this mean that group choices are inherently antidemocratic, or elitist, or irrational?

Buchanan argues that decisions reached through the approval of a majority has never been, and should never be, correctly interpreted as anything other than a provisional choice of the social group. As a tentative choice, the majority-determined policy is held to be preferred to inaction, but it is not to be considered irrevocable. In other words, if the result of a majority decision is ultimately seen by a majority to yield net negative outcomes, the decision will ultimately be reversed.

According with this point of view a decisional process cannot be reduced to a linear process aimed to choice the best alternative in a predefined set. On the contrary it can be represented as a "chaos of purposes and accidents" (Sutton, 1999) and if the target is to get choices related to the original needs, has to be characterized from three fundamental elements: learning, participation and assessment.

The analysis of a problem becomes a learning process where the reality (the system) in which the problem has born is understood gradually and where the knowledges of the various actors are shared. This process implies that the problem and the possible solutions are defined more than one time.

The study of decision processes, the capacity to analyze the mechanism and highlight the actors, is crucial not only to lead to good political decisions (in the meaning previously defined), but mainly to get to a democratic control of the decisions.

So the decision process has to be also a process of participation that has to involve, not only the decision-makers, but also all those who put into practice the decisions taken and those who will suffer in their lives (in a positive or negative) the effects of such decisions.

Without these features it will be difficult the success of the decisional process, both for the lack of cooperation or little motivation of those who have to make the decisions, and for the resistance of those who, even suffering the effects of decisions, have not been involved (Healey, 1997).

2.3 Decision Support Systems and SEA

Whitin the decision making and consequently referring to the attempt to define the most efficient choices in order to catch up the policy targets, two questions assume a central role: which methods have to be used in order to assess alternative decisions, analyzing the effects and the impacts? How to evaluate effects that a set of actions will imply?

In order to answer to these questions the so called Decision Support Systems – DSSs have been developed: they include measurement tools as costs-benefit analysis and related methods of “rational analysis” (for instance based on multicriteria analysis), that have been devised in order to help decision makers to make good choices (Pareto improvements) and avoid bad ones.

Although this kind of analysis is known to be used for any problem, in the last years the democratic and, therefore, political pressure has led to develop decision support systems aimed at specific themes, notably the environment. A reference point, from this perspective, is the Strategic Environmental Assessment (SEA).

Conceptually born at the end of the 80s, the SEA is a systematic process to assess the environmental consequences of planning proposals, having as main goal to consider these at the same level of the economic and social impacts. The SEA concerns the elaboration process of the plan rather than the plan themselves. In that way the SEA has to be inserted from the very beginning of the decisional process and has to be applied along the path leading to the plan.

A central point of the SEA is the consideration of alternative choices, including the “zero option”. Often a planning process doesn’t include this option, i.e. to don’t act, that on the contrary sometimes can be more efficient compared with the other alternatives. The main steps of a SEA are:

- Screening (determining whether or not SEA is required);
- Scoping (determining the range of environmental issues to be covered by the SEA);
- The preparation of an Environmental Report;
- The carrying out of consultations;
- The integration of environmental considerations into the Plan or Programme;
- The publication of information on the decision (SEA Statement).
- In a operative way the SEA has to be based on:
- Simple methods oriented specifically on the strategic levels;
- Organized databases, without which it’s impossible any assessment.

Moreover since the 2004, with the adoption by UE Council of the directive 2001/42/CE, SEA has a compulsory character.

3 THE METHODOLOGICAL APPROACH

Starting from the framework depicted above, a decision making has been defined in order to identify a cohesive process able to assist the policy makers in finding solutions that best respond to local needs, in order to support, reinforce and best utilize the various territorial stakeholders.

In general terms this decision making has the following characteristics:

- interactive – various territorial actors work closely with the authorities responsible for planning, facilitating a continuous exchange of information;
- iterative – the choices, subjected to constant refining, are considered as alternative hypotheses;
- participatory – the request of the resident population affect the corpus of judgment criteria and project choices;
- systemic – the various components are analyzed according to their mutual interactions in relation to the established objectives;
- evaluative – the alternative scenarios are assessed in comparison with four different situations (ideal status, actual status, preferred status by institution, preferred status by local community).

The resulting conceptual framework has as core the concept of assessment that implies to define: the assessment target (the theme), the assessment object (the territorial context), the assessment criteria (the benchmark to be caught or the threshold not to be overcome) and the impacting actions (the alternative scenarios).

By applying this definition to the operational sphere, a logical outline of the process has been defined (Fig. 1) that foresees four main groups of action that operate according to a non-sequential dynamic and mutual relationship.

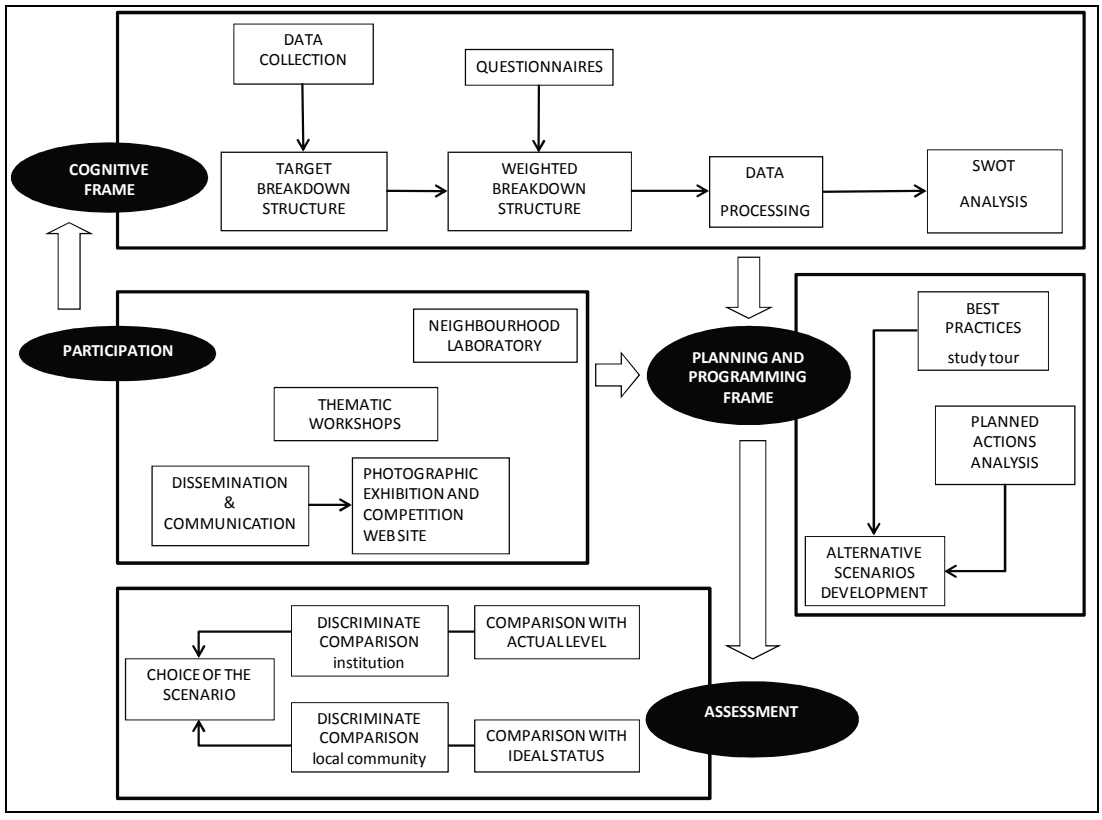

Fig. 1 – Logical outline of the methodology (our elaboration)

The components of this logical outline have been then recomposed into five steps to assure its operability: building the Target Breakdown Structure; measuring the Status quo, defining the alternative scenarios, assessment and choice. In the following table (Tab. 1), the correspondence among these lasts and the ones of SEA and of Policy cycle has shown.

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Decision making (our proposal)	Policy cycle	SEA
Target Breakdown Structure	Ageda setting	Screening
Measuring the status quo	Formulation	Scoping
Defining the alternative scenarios	Decision	Environmental report
	Implementation	Consultations
Assessment	Assessment	

Tab. 1: correspondence between Decision Making proposed, SEA and Policy Cycle

4 DECISION MAKING ON SUSTAINABLE MOBILITY

Due to the fact that sustainable mobility is today a focus point in the agenda of development policies, the procedure above mentioned has been concretized in a model which allows for the adoption of common strategies to reduce emissions caused by traffic, such as the development of intermodality, improvement of infrastructure and existent transportation services, also through improved relations among the various institutional levels.

The conclusions of the Johannesburg Earth Summit (2002) and the Aalborg "Charter of European Cities & Towns Towards Sustainability" (June 2004) highlight on the commitments that have to be assumed by the local authorities to develop their territories according to the principles of the sustainability. One of the themes is that one of the mobility:

"We, cities & towns, shall strive to improve accessibility and sustain social welfare and urban lifestyles with less transport. We know that it is imperative for a sustainable city to reduce en-forced mobility and stop promoting and supporting the unnecessary use of motorised vehicles. We shall give priority to ecologically sound means of transport (in particular walking, cycling, public transport) and make a combination of these means the centre of our planning efforts. Motorised individual means of urban transport ought to have the subsidiary function of facilitating access to local services and maintaining the economic activity of the city."

The concept of mobility therefore covers more than merely transportation or traffic (Mataix González 2010).

The European Commission establishes different guidelines in this regard: alternatives to private car, the increase efficient travel through the links between the different modes of transport and the smart control management to reduce traffic congestion. The objective of European sustainable transportation policy is to provide a transport system that addresses economic, social and environmental needs of a society trough an efficient transport systems that account for the strong impact that transportation has on economic growth on social development and on the environment.

The importance of mobility reflects even on the so called Smart City paradigm and on its different axes make this a vital issue for residents and local governments. The difference between mobility and smart mobility is public accessibility to real-time information; this improves services by saving time, enhancing the journey, saving money and reducing CO_2 emissions (Manville et al. 2014). Smart mobility is key to the smart transformation of cities (Van Audenhove et al. 2014).

Even if the target is clear, there is no shared definition of sustainable and smart mobility. So among the different definitions, it has been chosen the one advanced by the Sustainable Mobility Working Group of the World Business Council for Sustainable Development (http://www.wbcsd.org/): Sustainable Mobility is the ability to meet the needs of society to move freely, gain access, communicate, trade, and establish relationships without sacrificing other essential human or ecological values today or in the future.

According with this definition four major challenges have been identified:

- reduce carbon emission (CO, CO_2);
- build institutional capacity;
- address the problem of traffic congestion;
- reinvent current processes of planning, development and management of mobility infrastructures.

Coherently with these issues the subsequent phase has been the definition of an indicator set in order to describe the phenomenon and able to give a quantitative measure of its value.

4.1 Building the Target Breakdown Structure

To define the indicator set we have choosen to use a hierarchical framework typical of the Project Management theory (usually known as Work Breakdown Structure - WBS) recalling it Target Breakdown Structure (TBS). It's articulated in themes, subthemes and indicators describing the phenomenon with a „tree structure".

The starting point for choosing the indicators was the "scorecards" in Mobility 2001 by WBCSD. We modified the items listed in the scorecards through a combination of studies of existing literature, availability of data and consultations with stakeholders.

The result was a set of 25 indicators grouped in 16 themes and 4 main policies that in our view constitutes the most important dimensions of sustainable mobility.

Two issues have influenced the choice of indicators. One regards the need for indicators that reflect all three pillars (environmental, social, and economic) commonly thought necessary for sustainability. The other regards the importance of "people-centered" factors. In this perspective the four main policies identified are:

- accessibility, meaning a transport system that protects and guarantees the right of movement, its accessibility and safety;
- economic development, meaning a transport system mainly oriented to the economic development in respect for environmental laws;
- territory, meaning a transport system that favours "soft" mobility;
- innovation, meaning a transport system oriented towards new research findings and opportunities.

To characterize each element of the TBS in a clear and unambiguous manner have been defined the related metadata (Fig. 3).

The TBS has to be thus specified according to the available statistical data concerning the specific context object of evaluation. Whereas elementary data are not available (what especially happened when the study is conducted at local or sub-local level) specific estimation models could be used to find the value of the indicator (in particular for air pollution and noise pollution) or, alternatively, appropriate proxies have to be found.

To add a dynamic dimension to the TBS, finally mutual relationships (i.e. vertical relations) among all the indicators in order to capture the complexity of the phenomenon have to be defined. Such evaluation, performed with classical criteria or with statistical independence tests, allows for the creation of a correlation matrix.

4.2 Measuring the "status quo"

In order to get a not purely quantitative measure of the phenomenon the TBS has to be more specified in terms of relative performance.

In fact if the process would stop at the previous step, it would be a simple top-down analysis. Considering that different territorial contexts have different priorities, the methodology, coherently with a bottom-up approach, foresees to use a Weighted Model Evaluation, introducing a weight to each indicator depending on the impact to the citizens or the experts' opinion (Delphi method) by means of questionnaires on the relevance perceived of the indicators above defined. That adds a subjective and qualitative component to the previous objective and quantitative measure.

It must be underlined that to capture better the perceptions of the different stakeholders, the weighting process can consider separately the answers of differente stakeholders (for instance politicians and citizens).

Another point that helps to get relative results, concerns the data collection process that has not to be restricted to the target area, but it has to be extended to a set of close local administrative units, standardizing the results of the data collection.

This process leads to the definition of a spatial matrix Xnpr, with n indicators and p territories and r weight vectors representing the priorities of the interviewed subjects (r is the number of the stakeholder groups choosen).

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This step ends with a SWOT analysis (Strengths, Weakness, Opportunities and Threats) in order to summarize the main issues of the target area in order to be presented in an interactive and iterative way to the main territorial stakeholders enriching thus their informative background.

4.3 Definition of the alternative scenarios

An impact assessment requires two fundamental elements: the object of impact and the impacting agent. The first element are the indicators of the TBS.

The second element are the several actions that could be implemented in the focus area, the so called „alternatives", which definition starts from the SWOT analysis previously defined. Main actors in this activity are local governance authorities, as well as citizens who can express their priorities in several way: neighbourhood laboratories, forum, working group and all the possible means of participations. To better inform the citizens it is possible to support the participation activities with workshops of experts, reports of specific literature and of similiar experiences in other contexts (benchmark analysis), and the visiting of other contexts (study tours).

The different scenarios, as subset of hypotized actions, are created by using a quali-quantitative logic. Firstly, the impact of a determined action, when implemented, can impact on one or more indicators (and consequently on more determinants) of the TBS, so as many impact matrices (n x m, where n is the number of the indicators and m is the number of impacting actions) derive as many weighting vectors has been defined.

Each scenario, impacting the indicators that define the initial state of the sustainable mobility system, transforms them into receptors, altering their status and defining a new status of the system. (Eq. 1):

(1) $R_i = f(A_{j\ (j=\ 1\ to\ m)}; W_{i,k\ (k=\ 1\ to\ n)} * I_i)$

where

R= receptor, value of the indicators after the impact of the action

A= action

I= value of the indicator before the impact

W = weight attributed by the stakeholders (for instance politicians k=1, citizens k=2, etc.) to the i-indicator

i = number of indicator/receptor

j = number of impacting action

k = number of stakeholder groups

The specification of function (1) depends on the impacting action and has to be defined for each case.

The impact of the scenarios on the entire system depends finally on the correlations (vertical relations) among the indicators, as previously defined. To have the syntetic value of the sustainable mobility, hypotizing that stakeholders are two (politicians and citizens), the decision making process produces four different scenarios of the focus area:

- status quo (zero hypothesis or status quo);
- ideal scenario (where the receptors assume their maximum value);
- planned scenario (top-down hypothesis or scenario imagined by local administrators);
- wished scenario (bottom-up hypothesis or scenario imagined by citizens).

4.4 The assessment

Comparing the four scenarios, concise quantitative judgment could be elaborated with regard to:

- Citizens' perceptions of the current states of their district in comparison with several other areas;
- policy makers' perceptions on the current state of their territory of competency in comparison with several other territories;
- effective performance of the sustainable mobility system related to its maximum potential;
- potential improvements and new states of the sustainable mobility system.

We choose to aggregate the indicators so that the maximum value for the sinthetic index is 4, representing the benchmark of the ideal situation.

Moreover the model allows for a focus on each component of the TBS, so that the local/regional authorities could acquire the information for making, as much as possible, an informed choice about the actions to be implemented.

Policy	Definition	Themes	Definition	Variables/Indicators	Definition
Accessibility	A transport system that protects and guarantees the right of movement, its accessibility and safety	Security	Safety level of the passengers	Street accidents deaths	Number of road accidents deaths per year
				Street accidents woundeds	Number of road accidents injuries per year
				Infraction to the street code	Number of Code violations per year
		Capacity	Capital stock of the public transport means	Passengers	Average of passengers per years/ resident population at 31-12
		Capillarity	Territorial distribution of the access points to the public transports	Public transport stops	Number of local public transport/ total area in square Km
				Taxi stock	Number of taxi/resident population at 31-12
		Quali-quantity	Total efficency of the qualitative and quantitative stock of the public and private vehicles	Circulant vehicles stock (Npc)	(n. of private vehicles+ n. of taxi + n. of bus+n. of tram and metro)/resident population at 31-12
				Age of circulant vehicles	Average of the age for the Npc variables/ years of useful life for the Npc variables
				Energetic consuption of the circulant vehicles	Average consumption per Kwh for the Npc variables
				Use of Public Transport	Average Km travelled from the public transport means
Economic Development	A transport system mainly oriented to the economic development in respect for environmental laws	National level of wealth	Specialization level of the mobility sector with regard to the entire economy	Sectoral specialization in the field of transport	Year added value of the transport system / Year added value of the entire economy
		Worker competitiveness	Addedd value produced from a worker in a year in the traansport sector compared with the added value of the entire economy per worker	Average productivity employer	Year added value of the transport system for worker unit / Year added value of the entire economy for worker unit
		National level of occupation	Contribution of the transport system to the employment level	Transport occupation sectoral specialization	Number of employers in the transport sector / Number of employers in the entire economy
		Pollution	Negative exttemalities cased by pollution	Air pollution	Yearly average in mg per cube meter of Pm10
				Acustic pollution	Yearly average of the noise pollution in decibel in the night hours
Territory	A transport system that favours "soft" mobility	Green areas	Capital stock intensity for the urban green areas	Urban green stock	Urban green areas (mq)/ total area (mq)
				Urban green closed stock	Urban green closed (mq)/total area (mq)
				Garden stock	Garden area (mq)/total area (mq)
		Urban area with "zero" traffic	Capital stock intensity for the urban areas with zero traffic	Walkways areas	Walkways areas (mq)/total area (mq)
		Urban area with controlled traffic	Capital stock intensity for the urban area eith controlled traffic	ZTL	ZTL (mq)/total area (mq)
		Protected routes for alternative mobility	Capital stock intensity for the alternative mobility	Cycling routes	Cycling routes (Km)/total area (mq)
Innovation	A transport system oriented towards new research findings and opportunities	Management systems	Research and Development expenditure	Research and development	R&d expenditure for the public firms in the transport sector / totale budget
		Means of transport	Public capital stock intensity eco-sustainable	Eco-friendly transport	Transport means with zero emissions/ total number of public transport means
		Information on the street	Virtual accessibility on the streeet to the informations on the mobility system	External hot spot	number of hot spot points/total area (mq)
		Information by home	Virtual accessibility by home to the informations on the mobility system	Internet access	Number of internet contacts to the public transport sites/ number of inhabitants

Fig. 3: The target breakdown structure (our elaboration)

5 EVIDENCES FROM A STUDY CASE: THE XIII DISTRICT OF ROME MUNICIPALITY

The decision making process described above has been tested on the territory of the XIII District of Rome. To evaluate the citizen opinions on sustainable mobility as previously defined, a questionnaire was submitted to a sample of 400 individuals: 200 of them were interviewed face to face at stops along the Roma-Lido train line, while the other 200 were interviewed by phone. Sample quotas for gender and age group were calculated on the basis of census data for the 13th Municipal district. Moreover, a questionnaire was designed for and submitted to a chosen panel of decision makers and technical experts, to assess the gap between the institutional wishes and the citizens' perspectives. Given the importance of evaluating the mobility desiderata and opinions on challenges land potential solutions to sustainable mobility, has been used

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a categorization of the citizens interviewed (unsustainable, intermodal, sustainable) on the basis of their mobility orientation choosing as criterion (specifically stated during the interview) the main means of transport utilized. The results highlight the guarantee of accessibility as the main priority, followed by the implementation of innovative systems. The right to movement (accessibility) is interpreted essentially as greater frequency of public transportation, followed by request for greater security, as it pertains to cleanliness, decorum and public order. In the use of innovative systems, the preferred choice is the investment in eco-sustainable means of transportation and the management of traffic to avoid delays; third is the option of investing in informative panels on the streets and on train and metro platforms; and far behind there was the possibility of receiving information through the most advanced systems. As far as foot and bicycle traffic, the first priority for citizens of the 13th district was the construction of green areas, then the construction of foot paths and finally there was the construction of bicycle paths. The organization of traffic in ZTL - Limited Traffic Zones, was the least preferred option in the sample interviewed, as it was seen as a mere limitation rather than a solution.

Among the many other findings of the study, it's interesting to note that the satisfaction about the transport system in the 13th District is considerably higher in those with sustainable behaviors, probably because them tend to use mostly public transportation and non-polluting vehicles and therefore they make their evaluation on the basis of their own life experience.

To strenght the implementation of the decision making two other activities has been performed to broaden. the knowledge of the issues and help the definition of the solutions. Firstly, study tours was carried out in the European cities partener of the project with the aim to inspirations and potentially adopt successful solutions to local contexts. Secondly, neighbourhood laboratories (in this case called Villemizero Lab) was created, to discuss and define policies and activities to be implemented. The main results of decision making implemented in the 13th district of Rome can be summarized in the following points:

(1) The overall evaluation of the status quo, as perceived by its residents (Fig. 4) and determined by algorithms of the model, is 2.14, in seventh place among the 19 other Rome districts, where values range from 2.28 in the 19th district and 1.57 in the 9th district;

(2) The evaluation of the status quo, as perceived by political actors (Fig. 5), varies only slightly from the evaluation made by the citizens. The overall evaluation of the state of the sustainable mobility system is equal to 2.04, just below the citizens' evaluation, which puts the 13th district in eighth position among the 19 Rome districts;

(3) The evaluation of the scenario related to the impact of the activities desired by the citizens (the wished scenario) earns a value of 2.46. This value moves the 13th district from seventh to first place in the ideal scale of the positions among all Rome districts (Fig. 6);

(4) The evaluation of the scenario relative to the impacts of the activities planned by local policy makers (the planned scenario) shows a value of 2.11. This value takes the 13th district from eighth to seventh place on the ideal scale of the positions of all Roman Municipal districts, representing only a relative unitary increment greatly inferior, in absolute value and in relative comparison, with residents' perceptions of the new state of the system in relation to their specific requests (Fig. 7).

The last evaluation has been performed about the value of each determinant (accessibility, territory, innovation, economic development) and of each indicator of the TBS, thus allowing to better understand on what elements to focus on the activities to maximize the final result.

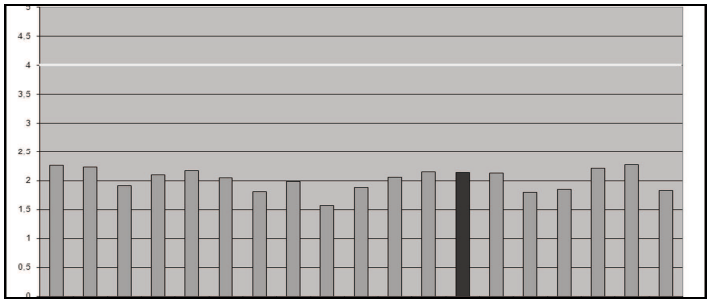

Fig. 4: Status quo of the mobility system in the citizen perception (our elaboration)

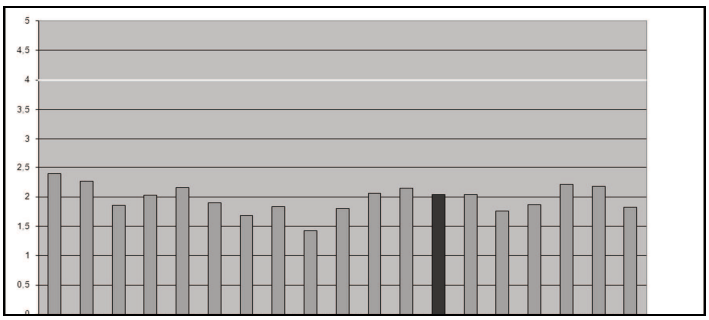

Fig. 5: Status quo of the mobility system in the policy makers perception (our elaboration)

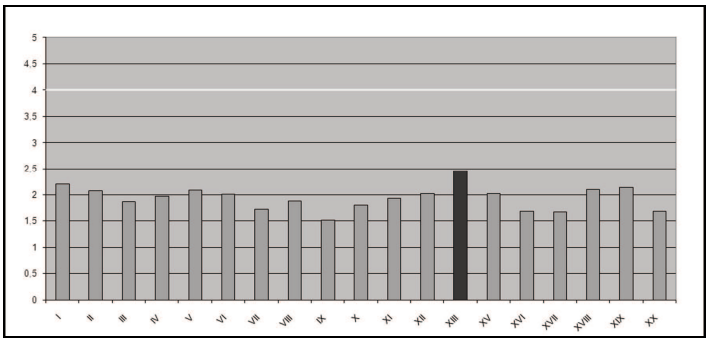

Fig. 6: Effects of the wished scenario on the Rome districts performance (our elaboration)

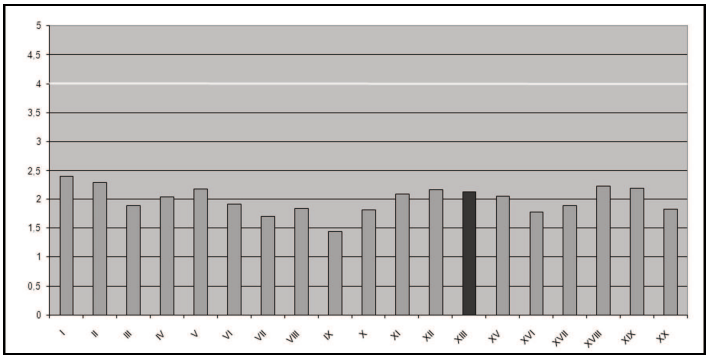

Fig. 7: Effects of the planned scenario on the Rome districts performance (our elaboration)

6 CONCLUSION

The proposed decision making does not provide a set of predefined actions in order to solve the sustainable mobility issue and to be used indifferently in various contexts, but rather it defines a general procedure, applicable to different cases, that, recognizing the particularities of different territorial contexts, allows yielding specific (thus each time different) solutions.

From this point of view the main characteristics of the process developed are:

- the capacity to integrate the desk informations with field investigation. Past experience demonstrates the importance of analyses founded on informal inputs from several entities (for instance interviews with local agencies and "field experts");
- a cohesive approach able to assist policy makers in finding solutions responding to local needs through the involvement of the various territorial stakeholders;
- the creation of a framework of qualitative and quantitative indicators to ensure the maximum coverage of the several aspects of mobility (indicators of stock, use, negative externalities and measures of the innovative character of the initiatives);
- the collection of data on contiguous territories that allows for a relative measure of the scenarios and thus it highlights more clearly the potential strengths and weaknesses in the focus area;
- the involvement of the stakeholders in the different step of the process that highlights not only the planned activities by the politicians, but also of the desiderata of the citizens;

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- a composite evaluation based on different sources of information (statistical data, questionnaires, etc.) and on the horizontal and vertical correlation among the indicators, that reflects the complexity of a decisional process;
- the dynamic character of the procedure, that allows for continuos monitoring and adaptation of the strategies, provided that info points (or neighbourhood laboratories) remain operational; these facilities thus become vital points of encounter between territorial actors, of information updating and territorial observation.

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8 REFERENCES

ANDERSON J.E., Public policy making: an introduction, Boston, MA, Houghton Mifflin 1984.
ARROW, K. J., Individual Values and Social Choice, Wiley, New York, 1951 (2d ed., 1963).
BRAYBROOKE, DAVID AND LINDBLOM, CHARLES E., A Strategy of Decision, Free Press, New York, 1961.
BREWER G.D., The policy sciences emerge: tonurture and structure a discipline, in Policy Science, 5, pp. 239-244, 1974.
BUCHANAN J., "Social Choice, Democracy, and Free Markets", Journal of Political Economy, University of Chicago Press, vol. 62, 1954.
COHEN M., MARCH J. AND OLSEN J., A garbage can model of organizational choice, in Administrative Science Quarterly, 17, pp. 1-25, 1972.
EUROPEAN COMMISSION, Aalborg Charter "Charter of European Cities & Towns Towards Sustainability", 2004, (http://ec.europa.eu/environment/urban/pdf/aalborg_charter.pdf).
FORESTER J., Bounded rationality and the politics of muddling trough, in Public Administration Review, 44, pp. 22-30, 1984.
FORRESTER J. W., Collected Papers of Jay W. Forrester. Waltham, MA: Pegasus Communications, 1975.
HEALEY P., Collaborative Planning: Shaping Places in Fragmented Societies, Vancouver: University of British Columbia Press. John Forester, 1997.
HILGARTNER S., BOSCK C.L., The rise and fall of social problems: a public arenas model, in American Journal of Sociology, 94, pp. 53-78, 1981.
HOLZNER B., MARX J.H., Knowledge application: the knowledge system in society, Boston, MA, Allyn and Bacon, 1979.
HOWLETT M., RAMESH M., Studying public policy: policy cycles and policy subsystems, Oxford, Oxford University press, 1995.
http://www.wbcsd.org/Projects/smp2/Resources/world-mobility-at-the-end-of-the-twentieth-century-and-its-sustainability
JONES C. O, An introduction to the study of public policy, Monterey, CA, Brooks/Cole, 1984.
LASSWELL H.D., The decision process, seven categories of functional analysis, College Park, Md, Bureau of Governmental research, 1956.
LINDBLOM C., The science of muddling trough, in Public Administration Review, 19, pp. 79-88 1959.
MANVILLE, C., COCHRANE G., CAVE J., MILLARD J., PDERSON J. K., THAARUP R. K., LIEBE A., WISSNER M., MASSINK R., KOTTERINK B., "Mapping Smart Cities in the EU." Industry, Research and Energy, European Parliament, 2014.
MATAIX GONZÁLEZ, C. Movilidad Urbana Sostenible: Un Reto Energético Y Ambiental, in Argumentos Para La Cultura, Obra Social Caja Madrid, 2010.
SIMON H.A. A behaviorhal model of rational choice, in Quarterly Journal of Economics, 69 pp. 99-118, 1955.
SIMON H.A., The Sciences of the Artificial (2nd ed.), MIT Press, 1981.
SUTTON R., The policy process: an overview, Overseas Development Institute, Working Paper 118, Chameleon Press Ltd, London, 1999.
Van Audenhove, F-J., Oleksii Korniichuk, L. D., Pourbai J., The Future of Urban Mobility 2.0, Arthur D. Little and UITP. 2014.
WBCSM, Mobility 2001: world mobility at the end of the twentieth century and its sustainability,
WBCSM, Mobility 2030: Meeting the Challenges to Sustainability, The Sustainable Mobility Project, World Business Council for Sustainable Mobility, 2004 (www.wbcsd.org).