WHAT IS STRATEGY IN URBAN MOBILITY SYSTEMS?

Rosário Macário
CESUR, Instituto Superior Técnico, Universidade Técnica de Lisboa
TIS.PT, Consultores em Transportes Inovação e Sistemas

INTRODUCTION

The analysis of the evolution of the organizational and institutional framework of the urban mobility systems around the world provides the evidence that in the large majority of cities the division between decisions of strategic, tactical or operational character is quite blurred. Very often we see a considerable overlap between the decision levels and today we have the evidence that this is a major factor that hinders the evolution and good management of the urban mobility systems.

From our experience in observing and analysing urban mobility systems the main reason for this outcome is the absence of a defined strategy for these systems. This absence is confirmed in all types of urban configurations and dimensions – town, conurbation, city, metropolitan area, etc. From the survey undertaken in the different countries and continents, we have observed common difficulties presented by decision makers when confronted with this concept – strategy – in the context of the urban mobility systems.

The concept of "urban" involves a series of interrelated dimensions, among which: population size and density; spatial, economic and social organization; variety of functions and institutional interactions; social values of population or degree of "civility" (often also referred as "urbanism"), etc.

A review of existing definitions of "urban area" has been undertaken by the Network for Urban Research in the European Community (NUREC) (Paddinson R., 2001, pp 31) and it concluded that the level of comparability between urban areas is very low. This is mainly because the basic geographical units, and even the functional building blocks, are substantially different and also because of the importance given to economic and social functions existing in any urban area. As a consequence of this diversity other factors result as essential for urban management, such as the dimension of urban infrastructure and other supply systems.

In addition, the spread of inter-urban connectivity, that is the growing conurbation effect[1], in the last decades called for a redefinition of the concept, emphasizing interactions and functional relations instead of geo-morphological criteria. As reported by (Hall, 1969, pp 408-435) and (Hart, 2003, pp 102-123) much of the movement that some decades ago was considered as regional is now incorporated in urban agglomerations, sometimes even

[1] Here understood as an aggregation or continuous network of urban communities often using common supply services

producing a cut across national boundaries, such as the case of urban areas between Belgium and Netherlands or between France, Germany and Switzerland. Indeed, some authors have defined the city on basis of a functional community area, representing a self-contained labor and social market area characterized by high frequencies of interaction (Frey and Speare, 1995, pp 139-190)[2]and (Hawley, 1971, pp 149-150).

THE EVOLUTION OF THE URBAN AREAS AND ITS DYNAMICS

The concept of interaction and interrelation is present in the definition of systems applied to many different sciences, from biology to management science, but in urbanism and, consequently, in urban mobility these concepts gain an interdisciplinary character. A common argument around the systemic approach is that every system is part of another system, that is the existence of formal hierarchies of systems, with formal subordination of the lower level partition to the upper level partition of the more global system. In urban dynamics, and especially in urban mobility, this formal hierarchy is not so straightforward as it may be found in other disciplines. Moreover, the interpretation and definition of these formal and informal hierarchies is a key factor for how planning and control functions are designed and performed.

However, we leave this theoretical discussion out of this paper and define the urban mobility system, central object of this work, as an enabler of the urban system. That is, a subsystem with great autonomy of organization but also with strong symbiotic relations with the other sub-systems of urban life (i.e. land-use, environment, telecommunications, security, education, etc.) as well as with the main upper system, leading to cause-effect relationships between their performances and, consequently, influencing their evolutionary capacities.

As referred by (Simon, 1999, pp 195) , one of the sources of selectivity for systems evolution is their capacity to create building blocks, which will constitute basic stable configurations that will contribute to accelerate the evolutionary process[3]. Urban mobility, like all other referred sub-systems, acts as one building block of urban life and, contributes to its configuration through the interaction with land-use, environment and other subsystems.

Urban areas together with their stakeholders – members of urban societies - can be seen as complex[4] systems with a wide span of control of several sub-systems (themselves, also of considerable complexity). One of the main difficulties associated to this perspective is the identification of boundaries for interaction between these subassemblies, and the understanding of the extent to which the interaction between any two of these sub-systems will also affect the others, through the simple effect of contextual disturbance. We have thus three clear distinct dynamics within the uppermost urban system, as conceptually represented n figure 1: between upper and lower partitions within the same disciplinary dimension and across different ones, designated as vertically nested dynamics; between sub-systems, designated as transversal dynamics; and the one within each of the sub-systems, designated as inner dynamics. As referred in (Macário, 2005, pp 242) for the urban mobility to cope with

[2] These authors considered only the labor market and ignore the existence of a social market, where leisure activities occur, that is also fostering competition between cities and is one determinant factor of mobility needs.

[3] Speed of evolution was discussed by H. Jacobson in *"Information, Reproduction and the Origin of Life",* in American Scientist, 43 (January 1955) pp 119-127, where he applied information theory to estimate the time required for biological evolution. The essential idea of Jacobson's model is that the expected time required for the system to reach a particular state is inversely proportional to the probability of the state – hence it increases exponentially with the amount of information (negentropy) of the state, in Simon H. (1999), p189, footnote 4.

[4] At this stage we follow Simon's semantics and consider complex systems as the ones with a high number of components, interaction and interdependencies, woven together in a logical whole.

the these dynamics the following main properties of an urban mobility system have to be ensured:

- Robustness, meaning long term stability and sustainability;
- Adaptability, meaning the capacity to adapt services to evolutionary demands or new technological opportunities, often resulting from exogenous changes, which are typically initiated within the sub-systems where urban mobility requirements are generated, therefore not controlled by the mobility system)
- Efficiency, meaning high productivity, in the capacity to transform basic resources into service outcomes, and these into consumption units, providing the best results at the lowest possible cost;
- Diversity, capacity to respond to the different demands of different market segments in a dynamic match between supply and demand for urban mobility.

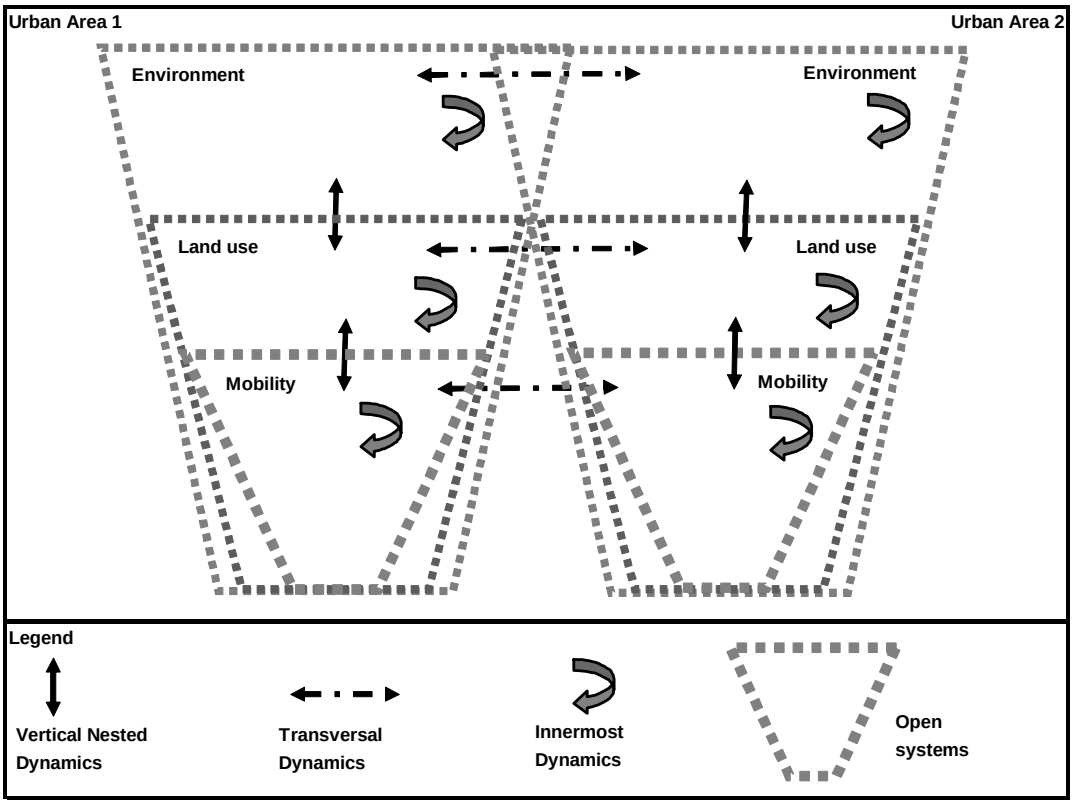

Figure 1: Urban Mobility Dynamics (Conceptual diagram)

(source: Macário R., 2005, pp 16)

The evolution of information and communication technologies substantially changed the configuration and processes of our societies. Business processes are becoming more and more spatially dispersed, costs of knowledge will foster co-operation between business and institutions and more and more people will work with information as their main productive resource, while workers of physical production are becoming a minority. The economy is not only global but it is also transforming into a network economy both at international, national and regional scales, challenging all former physical concepts associating space and time dimensions.

Business and social trends have consequences on the different spatial strata, the reverse being also true. Network societies are built over the emergence of urban networks where spaces are

conceived according to the new social paradigm of a highly differentiated and selective society. Some years ago cities used to be clearly recognized by their hard boundaries or the simple landscape discontinuity. Today, urban sprawl has multiplied centers, which compete to attract citizens, fostering motorized zigzagging across distanced centers as one of the most appealing weekend leisure activities for a good part of the population.

Current and future societies are characterized by high individualization and with most developed countries showing a trend to early social emancipation, where the individual becomes the basic reference unit, instead of the family or group of friends. Consequently, individual freedom of choice is expected to increase as well as social mobility, as transitional work increases and quick up and down turns in social circumstances are seen as a normal characteristic of individuals' evolutionary paths. Co-existence of different social groups and heterogeneous areas, from the social and spatial viewpoint, should thus be a consequence of the modern way of living and an attribute of new societal configurations. As Ascher (2001) so clearly points out:

> "Les individus apparaissent ainsi comme socialement multi-appartenants, socialement pluriels. Leur pratiques, leur systèmes de valeurs, leur choix individuels résultent de socialisations et de circonstances diversifiées. Par exemple, le sport pratiqué par un individu sera en corrélation plus forte avec son origine géographique, la musique qu'il écoute se rattachera plutôt à une classe d'âge, son travail dépendra pour une part significative des origines socio-professionnelles de ses parents , ses choix de vacances seront plus fortement déterminés par une négociation familiale, son vote politique dépendra du lieu où il habite, etc. La différenciation sociale semble ainsi peu à peu pulvériser une societé dans laquelle des individus plus différents et autonomes, ne partagent plus que momentanément des valeurs et des expériences sociales" (Ascher F., 2001, pp 34, emphasis is ours).

With this evolution, the use of urban spaces will be by and large dominated by a context that is changing from providing unique and monofunctional options, for each problem or need, to redundant multifunctional ones (Ascher, 2001, pp 82-83).

Enlargement of spatial implantation of cities, large conurbations in special, led to a more restrictive offer of goods, services and even social events within walking distance. Theoretically this possibility still exists for people living near commercial or business centers, but for the most part of the population access to those elements of social life is increasingly dependent on motorized transport, particularly private car. Moreover, concepts of quality of life and ways of living have changed substantially, one of the most significant changes being the valuation of urban places as a function of the diversity of multiple options that they may offer.

This concentration of diversity can be found mostly in commercial areas, where multiple functions can be performed at the cost of the same trip. Elsewhere it requires moving at a distance that usually requires motorized means. These cases, as referred by (Viegas, 2002, pp 36), lead us to the recognition that motorized mobility is an individual right and a fundamental citizenship factor for social integration, without which social exclusion might occur as it is largely confirmed in developing countries[5]

[5] In Brazil, the Federal Government estimates that around 40% of population is socially excluded due to lack of access to place of work.

As Ascher defines it, urban modernization is a process that has been developed quite ahead of its own public awareness. It results from the interaction between three socio-anthropologic dynamics, responsible for the current configuration of modern societies. These are individualism, rationalization and social differentiation (Ascher, 2001, pp 12-13).

Individualism can be considered as the self view of the world, filtered by the individual selfish interest, that is the "stakeholdership"[6] role each citizen has been taught to perform in his relation to community life. Rationalization relates with the process of choice between different options and consequent acts, based on accumulated information on empirical evidences, scientific knowledge and utilization of methods and techniques. Rationalization arose as opposed to tradition or beliefs and (in the framework of community life) raised the individual ability of contesting public decisions. Social differentiation in turn is a process of diversifying the roles of individuals and groups within the society. The most fundamental principle wrapping this triad is to accept change as a permanent process in the interaction between these dynamics. That is, in modern societies "stakeholdership" is a moving condition, with each individual playing different personalities in successive moments and varying his position along time and circumstances, according to his own capacities and conveniences. Serving this unstable client is without any doubt a challenging task.

The last decades observed a technological development that allowed interactions to occur at such a spatial and time distance that there is a clear competition between the physical urban area and the artificial one enabling the development of a new concept of "local area". Social and economic interaction tends to occur by way of networks, where each individual can simultaneously belong to several networks. As Castells concludes "*Networks constitute the new social morphology of our societies, and the diffusion of networking logic substantially modifies the operation and outcomes in processes of production, experience, power, and culture*" (Castells, 1996, pp 468-469).

In fact, this network structure allows the same economic agent to be active in different countries and cities, while it enforces competition between cities, for the most prominent positions in the regions. Given the flexibility in the location of activities (labor and social) cities will compete with one another to attract individuals based on the quality of life they offer, which entails the level of accessibility to the most relevant markets. This increases the governance difficulties and also the complexity of all urban sub-system (including mobility system), which have to serve a much more differentiated set of clients, who are very often located out of the administrative boundary of jurisdiction. The new logic will inevitably cause a reordering of urban hierarchy and of economic and political links between places. (Fainstein and Campbell, 1996, pp 6-7)

The dynamics of the new societies, with network configuration and largely based on communication facilities, also developed a sense of potential ubiquity in performing part of our daily activities that contributes to changing our understanding of mobility, often seeing it as a potential corollary of that differentiation effect. In the last decades the situation evolved from understanding mobility as a vehicle related concept to a more recent, and only applied in a very reduced number of cities, wider concept of mobility where for all modes and means specific missions are attributed. The widening of the scope that forms the basis of the rationale behind decision making in these areas also widens the complexity of the problem regarding the number of entities to be coordinated, the number of nested spatial domains to be considered (EC, 1998, Cost 332, pp 23) and, consequently the potential for conflicts of interest and complexity of governance.

[6] That we define as the attitude of standing for specific social and economic interests as a result of self perception of events and respective advantages and disadvantages.

This change process between the new and old logic lying behind the rationale for land-use and transport planning was well understood in Cost 332 research, dedicated to transport and land-use policy, and is herewith reproduced in table 1.

Table 1: Logic elements behind the rational for transport and land-use

Old Logic	Feature	New logic
Expand	Networks	Manage and integrate
Predict and provide	Forecasts	Predict and manage
Hard-supply oriented	Technology	Soft-demand oriented
Engineers isolated	Professional culture	Managers open
Hermetic and sectoral	Policy making	Discourse and integration
Homogeneous	Space	Customised
Reduce travel time	Time	Niche, certainty
Dis-engaged	Users	Re-engaged
Site specific externality	Environment	Global emissions
Standardised, static	Knowledge and information	Tailored dynamic
Macro extrapolation	Modelling	Micro level responsive

(Source: EC, 1998,Cost 332, pp 47)

DECISION-MAKING AND LONG TERM SUSTAINABILITY OBJECTIVES

Cities and local authorities have their decision-making process made more complicated by the difficulty to accurately evaluate the effects of their policies or packages in the short, medium and long term. The lack of systematic information on these domains is even a limiting factor to develop mathematical simulation tools, as some cause-effect relationships are not understood in all its extension. Besides, while a single organization can evade goal controversy because it is only a part of the system, within government institutional frameworks the intergovernmental dynamics are representations of the whole systems and as such of the all polity (Christensen, 1999, pp 23 – 45).

Consequently, the need for innovative management tools is seriously felt by local administrations. Furthermore, some policy measures or packages need a considerable time gap to produce effects, sometimes conflicting with the time gap of policy cycles, which often hinders continuity of objectives as illustrated in figure 2. The goals accruing from the mandate of public organizations often result in multiple, conflicting and vague operational objectives.

European research[7] revealed that in most European cities the integration between transport and land use is one of the driving factors for long term sustainability. Surprisingly, the

[7] "TRANSPLUS – Transport Planning, Land-Use and Sustainability", EC supported project under the "City of Tomorrow and Cultural Heritage" key action, within the European Commission's Energy, Environment and Sustainable Development Research Programme, and CIVITAS - cleaner and better transport in cities – EC program stands for CIty-VITAlity-Sustainability, www.civitas-initiative.org, and surveys done by the author in South America, Australia, New Zealand on the strategic orientation of cities.

awareness gained so far points out, as first line target of public concern, to issues like land scarcity, traffic congestion and decreasing quality of life, instead of local emissions and other environmental concerns. Despite the implicit cause-effect relation, this evidence also raises the problem of defining sustainability and, with it, local quality of life, and consequently strategic options for the future of urban areas, as well as other concepts, which are up and downstream of this complex and rather subjective definition of sustainability.

In this context integration arises as a multidimensional task since its results is an attribute required at policy level (often the weakest link) but also between the supporting organizational models, monitoring indicators and institutional structures. It is the structural integration as a quality characteristic that imposes consistency in decoupling the sustainability concept from a universal concept[8], as Brundtland (1987) defined it "*the development that meets the needs of the present without compromising the ability of future generations to meet their own needs*", down to the large diversity of its national, regional and local interpretations.

The fine-tuning of sustainability concepts has been an essential contributor to strengthen planning processes while providing in-depth awareness on barriers to its operational interpretation, implementation, assessment, and possibly damage control of inherent risks of non-accomplishment. Evaluation and monitoring of progress achieved along time are fundamental tools for these assessment processes, although it must be evident that sustainability is a concept that should go far beyond the clean environment objective and corresponding traditional indicators as illustrated in the DPSIR framework[9] developed by the European Environment Agency (EEA) and illustrated in figure 3 below.

[8] Sustainable development concept first introduced in EU policy in 1987, with the Brundtland report, has been since then object of a wide diversity of operational interpretations and recommendations disseminated in a comprehensive set of literature references.
[9] DPSIR framework: **D**riving Forces, **P**ressures, **S**tate of the Environment, **I**mpact and societal **R**esponses

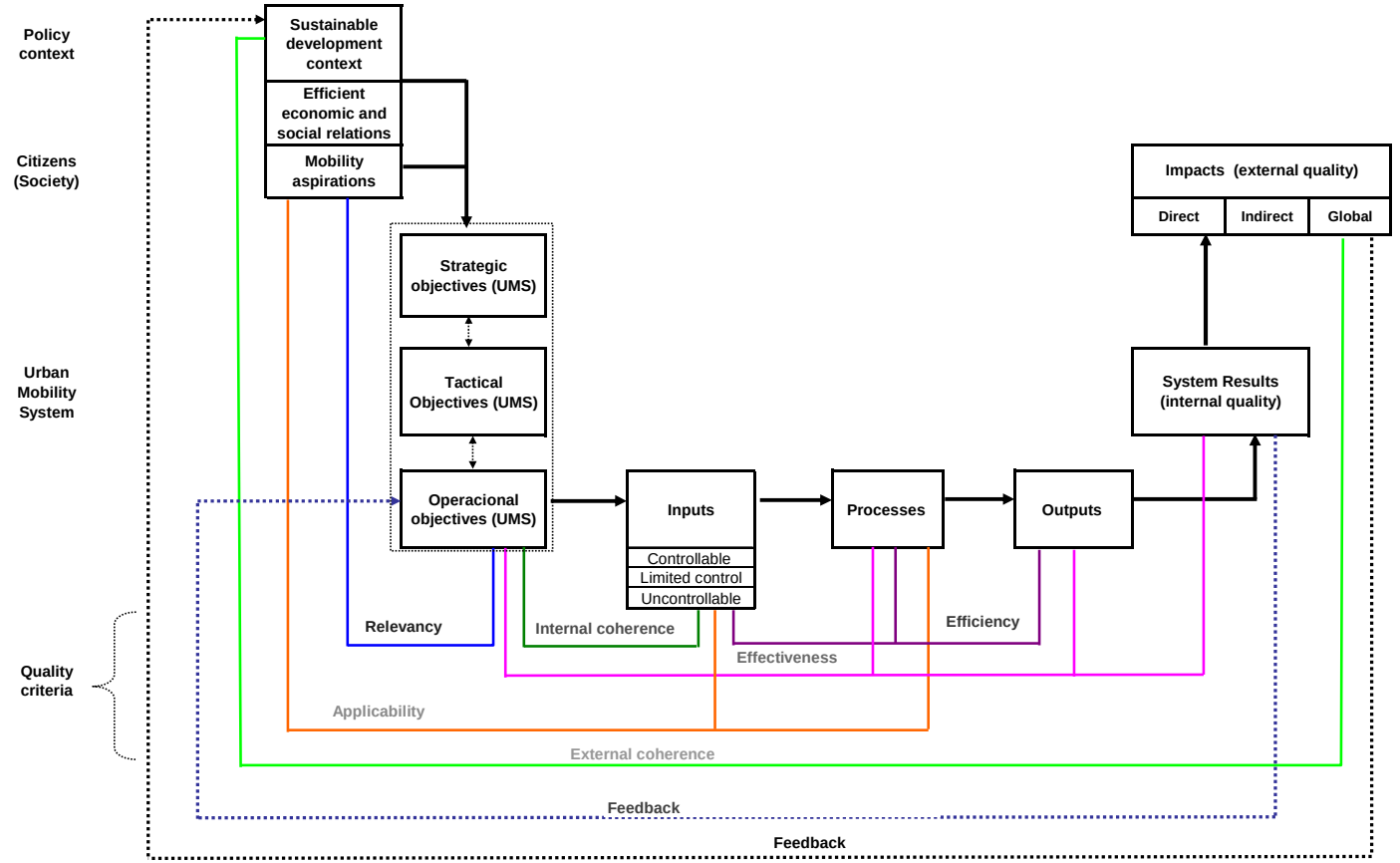

Figure 2: Effects of policies and strategies as quality drivers for Urban Mobility Systems

(Macário, 2005, pg 238)

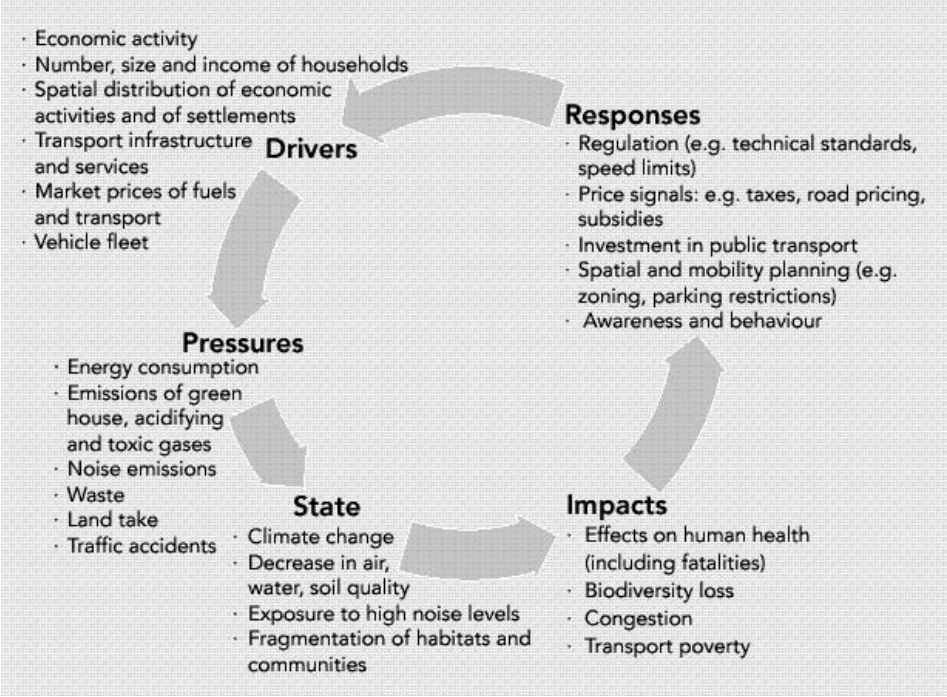

Figure 3: DPSIR framework.

Source: TERM research project (EEA, TERM, pp 12)

Furthermore, sustainability aims induce urban planners and managers to cease the traditional fragmented disciplinary thinking, by breaking down artificial barriers, which constitute infirmities to our contextual knowledge of factors influencing the dynamics of urban systems and even our ability to predict long-term evolution. The prominence of this fragmented thinking has often hindered our capacity of establishing relations between parts and wholes of sub-systems and components interacting in urban areas. This rationale limited our ability to understand and deal with chance and uncertainty often caused by asymmetric information between agents.

Dealing with the unexpected is a common requirement in open systems, where the absorption of new flows of information is continuous and where we have not only a considerable diversity of stakeholders but also each individual plays several (sometimes, conflicting) personalities in different moments, according to the specific interests at stake[10].

THE NEED FOR STRATEGY

As highlighted by (Morin, 2001, pp 29), "*The universal problem for every citizen of the new millennium is how to get access to information about the world and how to acquire skills to articulate and organise that information, how to perceive and conceive the context, the global (the whole/parts relation), the multidimensional, the complex*".

Consequently, as the citizen uses the urban system and its sub-systems at is own interest and hopefully benefit, this is also one main challenge in managing urban mobility systems, which have their structural support on three main processes and respective feed-back knowledge: strategic definition, configuration and delivery of supply and steering system performance according to society needs. However, as the urban mobility system is meant to be a facilitator

[10] at least as an individual with its own moving interests, a member of society and a member of human beings species. (Morin, 2001)

of urban objectives and strategies, its strategic definition is largely dependent on the identical definition done at the level of the urban system.

Inevitably, the awareness of complexity of sustainability goals leads to a more strategic thinking of urban planning, where the multidimensional character of society is emphasized providing evidence on the interaction, cross feedback, and interdependence between the different components that form the urban system.

Although this work has no objective of undertaking an in-depth discussion on the dynamics of urban systems, it seems to be unavoidable that in particular urban planning has to be addressed as a relevant contextual background for the management of urban mobility systems. Land use and transport planning are key factors in this process for spatial distribution of activities and as such potential originators of mobility flows and ultimately of environmental externalities. As Fainstein and Campbell (1996) so well observed "*Urban space gains its meaning as a consequence of the activities carried on within it, the characteristics of the people who occupy it, the form given to its physical structures, and the perception with which people regard it. Consequently such space does not simply exist; it is instead a social creation*. (Fainstein and Campbell, 1996, pp 10-11)

Land use and transport policies have been the two main streams of action to influence the spatial distribution of activities, often seen as alternatives to each other. Direct intervention on land use policy or indirect influence on land use patterns through intervention on transport policy are common actions, reason why these instruments should rather be seen as complementary to each other in the developing and shaping of sustainable urban areas.

Even for the decision makers who seem to have understood the importance of the concept and respective practice, doubts remain still on how to build and implement it in a multi-agent context without hierarchical relations between them. The fact that the urban mobility system builds on a chain of principal-agent relationships leads to a strategic definition for the systems that is made by the principal who induces the agents to develop tactics that will enable the achievement of that strategy. This inducement game is of course better said than done and very often conflict of interests hinders the achievement of the final goals, but we must not forget that in this complex system the principal is the city.

The current work lies on the following surveys: undertaken in Europe between 1995 and 2005, on regulatory and institutional aspects as well as on the transferability of good practices in urban mobility, the later under the framework of the CIVITAS program; in Brazil, between 2003 and 2005, for the definition of the framework law for the reform of urban mobility systems; in Portugal, in 2002, in the process of setting up the organisational and regulatory framework for the Metropolitan Areas of Lisbon and Oporto; and finally, in 2004 and 2005, in EUA, Australia, New Zealand and South Africa, as a complement to the previous for the definition of a management model for urban mobility systems (Macário, 2005)[11].

However, our survey made evident another even more complicated reality. Most cities that reveal some sensitiveness to the concept of strategy understand it in a very curtailed perspective, that is simply as the capacity to forecast with demand studies, and control, with productive monitoring studies. In some other cities the understanding is even more restricted, that is a wrap-up concept for whatever is important. This misperceptions led these cities to an overall state of "institutional myopia" since causal relations have never been observed and understood and, consequently, have never been articulated in a consistent way with the

[11] Three type of surveys were done: desktop, interviews to key informants, fact finding questionnaires

planning process. This work provided the evidence that one of the main causes for underperformance of Urban Mobility Systems is the lack of knowledge about what is strategy and how to implement it.

Today, a number of studies[12] provide in-depth knowledge, based on empirical evidence, on the difficulties and barriers to the implementation of effectively integrated sustainable policy strategies in urban areas. Although the type and number of obstacles differ between any two communities, thorough observation leads to conclude that some of the most common stumbling blocks are:

- unclear and unfit legal and regulatory frameworks;
- land-use and environment; counterproductive institutional designs and allocation of roles;
- unclear financing and investment streamlines with inadequate pricing and fiscal structures;
- poor integration between transport and land-use;
- low quality or even non existent information systems;
- unclear and/or unfit application of subsidiarity and proportionality principles within the governance mechanisms;
- lack of experience and knowledge in the adoption of community participation in policy building processes and problem awareness.

Indeed, defining and implementing integrated policies also entails bringing together national, regional and local levels of government, and also public and private entities, business developers and citizens. Policy and institutional interaction between all these types of stakeholders, where some of them have no obvious authority rights over the others, requires an adequate managerial structure and mechanisms encompassing all the mobility system and supporting the clarification of roles and missions of the different agents.

Sustainability should have a definition of objectives in the economic, social and environmental dimensions, which needs to reflect short term actions to accomplish long term goals. That is, finding an adequate balance between the different vectors of the problem, in such a way that assurance can be given to citizens for access to the services and activities required for their daily lives, while minimizing negative environmental, equity, economic and health impacts of mobility. This means applying strategic thinking in the local operationalization of the sustainability concept, having the structure and growth of urban areas as crucial considerations to develop alternative strategic options. In this work sustainability is understood as a quality characteristic of urban systems, strategically defined at the local (micro) level, despite the need of consistency with macro and meso[13] objectives.

Objectives and policies from urban mobility authorities also reveal a high degree of variation. Worldwide we can find many urban areas where the urban mobility concept is not yet perceived and many others where, despite evidence of the understanding of the concept this has not been assumed in an integrated organizational and management structure covering all

[12] Such as: PROGRESS and the accompanying measure CUPID; projects within the European Commission CIVITAS' initiative, such as MIRACLES, TELLUS, VIVALDI, TRENDSETTER and the accompanying measure METEOR and several ECMT and World Bank studies. The author was directly involved in both CUPID and METEOR accompanying measures, with responsibilities for evaluation and corresponding methodological developments.

[13] In this paper we follow the concepts of micro, meso and macro levels as defined in TRANSPLUS research (Deliverable 1.2, p.7), where micro level relates to the immediate surroundings of a specific infrastructure, meso relates to the city under the management of one municipal authority, and macro a metropolitan region including a core city and surrounding suburbs or satellite towns, under the rule of a County or Metropolitan Authority

the decision levels. In fact, even in the latter cases the most common situation is a scattered distribution of responsibilities to several entities, sometimes backed up by an integrated policy document. This situation results from the fact that even where the urban mobility concept is assumed there is often a misfit between the existing institutional design and the organizational requirements for the management of such a complex system, which results in inconsistencies that influence the overall performance of the mobility system.

The framework for urban mobility differs substantially from one country to another and even between cities of the same country but, whatever the choices made, in practical terms cities are major sources of output, of productivity, of growth and of wealth, and this characteristic is very likely strengthened by the city size. Although reported as not completely proven, some authors (e.g. Prud'homme, 1996, pp 174, Alonso, 1971, pp 75) advance the hypothesis that the synergetic effect comes from the fact that the bigger the city the larger is the effective labor market[14].

Despite this recognized potential, Prud'homme also alerts for a common pitfall (1996, pp 176) that is, if jobs and homes are poorly located, and/or if the transportation system breaks down, then the city will be formed only by several independent small markets without appropriate scale to induce higher productivity. So, the good interaction between land-use and transport is by itself a factor that influences the potential of a city as major source of productivity (i.e. output or growth) and, consequently, its long term sustainability will result from a good city management.

As the city develops the growth of some urban nucleus together with a more intense interaction between the pre-existing nucleus transform the city into a bigger structure, like a metropolitan area, requiring then additional mechanisms to ensure horizontal concertation between the various local governments that compose the metropolitan area or region. This involves the creation of adequate organizational structures – metropolitan institutions – either with very wide responsibilities (e.g. Metropolitan Planning Organizations at USA) or very specific functions (e.g. Transportation Authorities that can be found in several European countries).

When this dimension develops, some additional ad hoc groups arise and tend to evolve into a "syndicate" type like for example the Brazilian Fora of Secretaries of Transport that is a specialized forum, or still the Brazilian Council of Cities and the Irish Transport Forum which represents the civil society organized in stakeholders groups. These multiple examples of organisms of varying composition are only a reflex of the complexity of the metropolitan systems, and of the inadequacy of the traditional democratic hierarchic system (where only citizens as individual persons are represented, and then only at their place of residence) to provide adequate representation of all the interwoven interests.

In general terms we can say that the quality of the outputs of the urban mobility system depends not only of the quality of its inputs but also on the overall quality of management of that city which thus becomes an input of the system in the sense that it is part of the potential to produce outputs. Besides, the interplay between the different policies and institutions that steer the relevant urban processes, such as land-use, socio-economic development and environment, are also considered as an input of the urban mobility system.

[14] (Remy Prud'homme et al., 2004, pp 7) report a study conducted in 23 French cities and 3 Korean cities dedicated to the determination of factors governing the productivity of cities, where the effective size of the employment market is defined as the average number of workers who have access to enterprises in less than a given period of time (e.g. 60 minutes).

THE PROCESS: FROM STRATEGY TO RESULTS AND IMPACTS

We define urban mobility as the aggregated result of the multiple decisions (and factors conditioning those decisions) taken by individuals and economic agents as an answer to their requirements of displacement of people and goods. Conditioning factors are: the location of social and economic activities in the urban defined spaces; the working hours of the different activities; intensity of opportunities for social interaction; other cultural elements that contribute to define the pattern of social relations in a city. The urban mobility system in then a structured and organized system that tries to provide fluidity in those displacements and access to the relevant urban activities, making use of the possibilities offered by the various transport modes envisaging an adequate balance between the several modal resources, with the ultimate aim of contributing to the preservation of a sustainable city.

The urban mobility system is formed by infrastructure (including superstructure and intermodal links), networks, services and agents, each of them by itself a complex whole that requires further decoupling, namely:

- the main infrastructures of the urban mobility systems are: roads, rails, parking areas, pedestrian areas and corridors, cycling areas and corridors, unimodal and multimodal stations. Some of these are only made functional by association to services provided by professional entities, while others can be explored on self-service basis, namely road and pedestrian and cycling infrastructures, although they can also support professional services;
- the main services are: motorized transport services, services related with vehicle, infrastructure (and superstructure) availability and use, information services[15], citizens training and education for self-service modes. Professional services can be provided in all networks even in the ones used on self-service basis;
- the main agents are; authorities, service operators, users of the various transport modes and other citizens;
- Finally, the main networks which are formed by the interlinkage of individual elements (infrastructure or services) are: the public transport network, that can encompass several modal networks like, road, rail and inland navigation; the network of individual private motorized transport; the network of non-motorized individual transport, each of them with potential for subdivision of modes and services.

In all sectors and dimensions the main responsibility of management is to create value that in rather generic terms means to give an effective and sustainable contribution to the improvement of the appraisal of the object of management. In an Urban Mobility System creating value means to act in such a way to bring the system closer to the desired configuration and performance and improve the satisfaction of a target population in face of the new state of the system. In practical terms this principle means steering the system along its value chain, that is the sequence of activities and information flows that a set of agents with different missions and characteristics must perform to conceive, design, produce, market, deliver and monitor mobility services of a pre-defined quality of live for the city in question.

In this simplified perspective each activity, developed by each agent, constitutes a step that should increment value to the end service. This value chain concept applied to the urban mobility system forces us to see the entire economic and functional process as a whole, regardless of who performs each activity, confirming this way the need to consider the three

[15] Information services also require a specific infrastructure

quality levels that have been referred along this work: quality at the service level, at the agents level and, finally, at the system level.

However, the demands falling over an urban mobility system are very diverse and require the system to continuously adjust to the urban changes. Besides, clients are divided in segments that represent different preferences, sometimes in conflict. This means that the activities that add value to a specific segment of clients might well subtract value to other segments. Consequently part of the steering mission has to be dedicated to the management of these conflicts that are reflected since the design of the configuration of the urban mobility system where equity concerns among these groups have to be considered.

In a city the definition of strategic objectives starts with the decision-makers' interpretation of several elements, namely:

- the importance of the needs (or aspirations) of the citizens; and
- the importance of the problems to be solved, measured through their impacts on social and economic live of the city; and
- the assessment of the probability of success of each of the actions and policies envisaged as potential solutions for those needs and problems, as well as to the superior objectives of sustainable development of the urban environment.

Therefore objectives are defined upstream of the prioritization of actions and policies. Indeed, whatever the context, the formulation of a strategy always requires the establishment of a hierarchy of objectives and the setting of the level of their ambition. Cities differ substantially in their vocation and in their development strategies. Besides, even if we are dealing with similar problems, in any given moment each city is conditioned by the choices made in the past that configure a different departure point for the problem under analysis and, consequently different perceptions are derived on which are the main problems and which are the best solutions to mitigate them.

Achievability and relevance are major concerns when defining an objective. The degree of achievement of an objective is easier to recognize when it is verifiable and associated with a measurable indicator. Relevance of the specified objective, in turn, implies: attainability with the means made available for that specific purpose; and coherence with the different levels of intervention of the encompassing policy, which is achieved by aligning the decoupled objectives ensuring that the objectives set at the strategic level are correctly declined in the tactical and operational goals.

Under the already referred CIVITAS program of the European Commission, a number of projects were assembled having a leader city and a number of followers cities in each research project, with the aim of gaining deeper knowledge on how to transfer measures and policies in order to import a successful resolution of a given problem from city X to city Y, as referred in figure 5.

These cities provided the evidence that generic strategic objectives (e.g. good accessibility, fluidity, low environmental aggression, etc) are easy to transfer, but their operational translation is not directly transferable from one city to another, because the weights allocated to each operational objective differ, as a consequence of the representation of stakeholders interests, as well as the intervention strategy that depends not only on those weights but also on the degrees of freedom each system has. Through these research projects[16] we could

[16] The author developed a methodology for transferability of transport policies and measures between cities, which is currently being tested in those cities. The work was done under an EC "accompanying measure" (of several CIVITAS research projects) designated as

confirm that no universal solution exists for the different urban mobility problems, instead we can find types of measures and instruments that are more likely to have a better match towards the solution of certain type of problems.

The rationale underlying our proposed model lies on the assumption that a key input for the Urban Mobility System is the interaction between policies, namely between land-use, environment and socio-economic development of the urban area, since these aspects are upstream the generation of mobility requirements (through land-use) and the choices made by the citizens (through the pricing system, regulation on environmental protection, fiscal incentives, etc). The structure supporting this rationale is composed of four entities: inputs, outputs, results and impacts.

Inputs are the resources that are mobilized by processes to move the system towards the prescribed objectives. In this sense the concept of system' inputs encompasses all usable resources, which can be human, material, financial, organizational, regulatory, political, etc.

However, inputs are not all equally controllable. Some inputs are under the control of the transport (or mobility) authorities, and thus seen from the perspective of authorities as fully controllable, others are controlled by the service suppliers within the mobility system (e.g. productive factors for vehicle.kilometres), and consequently authorities can only develop indirect control, through contract and monitoring, others are totally external to the mobility system and, as such, no control is possible.

There is a considerable correlation between the degree of access to information regarding these inputs, the commercial value of that information and the degree of control exercised by the authorities managing the urban mobility system, which is not necessarily equivalent to the degree of importance of the input for the management of an urban mobility system. So we can have situations where we have no control on inputs although there is good information available, as well as situations where the agent is under control of the authorities but frequently withholding information that she considers commercially sensitive. In short, we can not establish a stable relation between availability of information and capacity to control the agent who holds it.

A good illustration of this type of difficulty is provided by the interaction between land-use and mobility, where the first is a major remote cause of mobility needs with information largely disclosed, but absolutely no control is possible by the mobility management entities. Due to the high complexity of these two sub-systems of the urban system (mobility and land-use) there are good arguments to keep them administratively separate, which then implies that joint management control can only be achieved through concerted decision-making between mobility and land-use authorities.

METEOR, dedicated to monitor the progress of experiences and demonstrations in CIVITAS Cities (i.e. cities participating in the CIVITAS research project), as well as providing technical support to the cities and the European Commission with policy recommendations based on those experiences. This work started in Jan 2001 and it will last until May 2006.

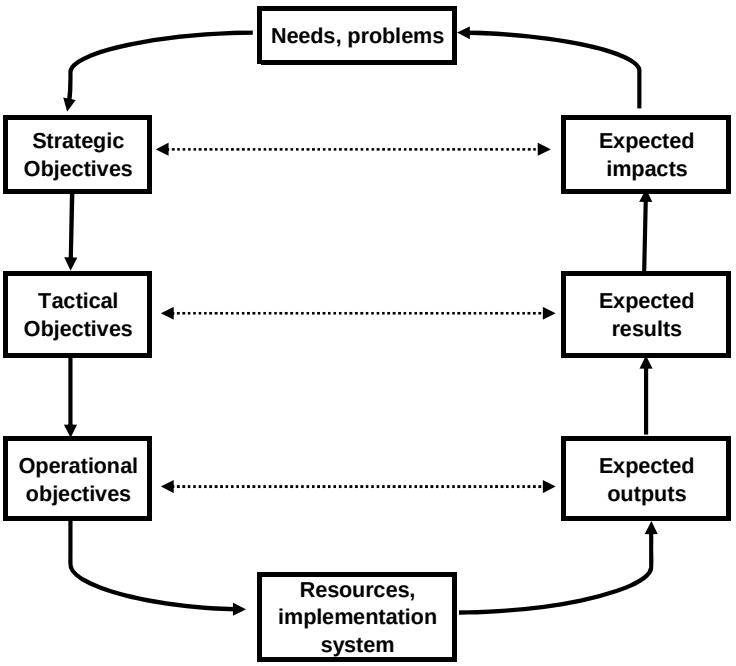

Figure 4: Implementation cycle[17]

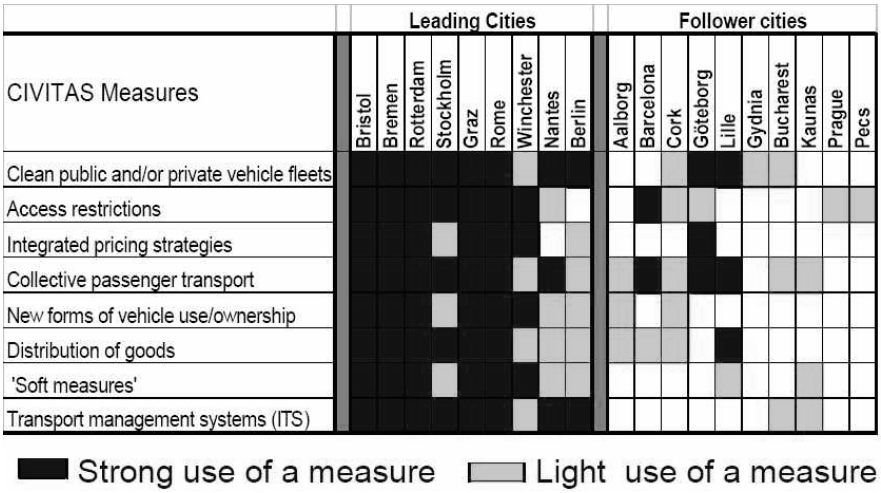

Figure 5: Cities and measures included in CIVITAS/METEOR projects

These resource inputs are then build into processes. System process is the logical organization of agents, information and resources into activities designed to produce a specified result under integrated decision-making. The complexity of urban mobility systems causes the existence of a number of several nested processes over which the strategically defined objectives are deployed. This deployment of objectives is made in two simultaneous ways, through the activities (activity by activity) and through the process priority (or criticality) in terms of improvement of the overall system, with the ones with highest potential for the improvement of effectiveness of the overall system going first. Process quality, in turn, is measured along the following four principal dimensions:

- Clarity – enable an easy understanding of what is to be done and why and how much of a process has been accomplished in a given moment. Clarity is a major

[17] Adapted from EC (Means Collection, 1999,vol I, pp 89)

element of stimulation to maintain willingness and intensity of effort for long periods;
- Effectiveness –meeting the objective for which it has been designed;
- Efficiency –being effective at the least cost;
- Adaptability – maintaining effectiveness and efficiency under a changing environment and/or under change of requirements;

Following the rationale and principles that support quality management theories (Riley, 1998, pp 6.1-6.21), process quality management implies:

- Conscious orientation towards the customers and their needs;
- Specific focus on managing key cross-functional processes which affect customer needs
- A clear pattern of accountability for each key process;
- A cross functional team responsible for operating the process;
- Application of quality management principles to process management (quality control, improvement and planning)

Outputs in turn are the realization obtained through the transformation of inputs supported by organized productive processes. Typically operators of services and infrastructure are responsible for outputs that can be divided in two main categories, namely:

- Material outputs, such as the construction of a road, rehabilitation of an old urban area as a consequence of traffic restraint, a walking path, etc.;
- Immaterial outputs, can be the displacement of a person or good from point X to point Y, information, training and coaching, etc.

Results are the benefits (or disbenefits) that the recipients of the services delivered by the system obtain from their utilization. It is an end state dimension, an immediate outcome, centered in the system user and internal to the urban mobility system. Results should be subject to regular monitoring and it is through the evaluation process that they provide the first information feed-back for any possible adjustment required in the implementation of an action or measure. A good illustration of a result is the improvement of accessibility with the extension of an underground line, i.e. an enlargement of the territorial area that can be reached within a certain time threshold.

Impacts are consequences that can either affect the recipients of any process, action, measure or policy package, or any third parties. Impacts are spread along time, and can be any socio-economic change that accrues directly or indirectly from any implemented action or measure. Following the methodological guide for evaluation used by the European Commission (Tavistock Institute, 2003, Glossary, pp 10, former MEANS project) impacts can be of three kinds:

- Direct impacts, that is specific impacts observed among direct beneficiaries of the system which can be reflected either in short term or in long term. These can be further disaggregated in the effect they produce on the relations between the beneficiaries and the systems:
- First, only by changing perceptions, that can be seen as a direct effect over potential users and so influencing their choices;
- Second, by introducing behavioral adjustments, as a consequence of the change in perceptions, that represents a secondary effect since they will progressively spread throughout society; and,

- Indirect impacts, which affect indirect beneficiaries;
- Global impacts, which are the ones that can be observed at macro-economic and macro-social levels.

Finally, system evolution is the structuring effect that results from all these impacts. Therefore sustainable changes act as drivers of system evolution. The feed-back cycles entail an evaluation process that enables to decide whether the system needs correction of its path and where the improvement process should be focused.

Feed-back cycles assess strategic objectives against impacts and operational objectives against results, making this evaluation complementary to the one, previously referred, that is made to each inner process of the urban mobility system. This evaluation should be based on the following set of six quality perspectives, and respective meanings, in order to ensure the structural coherence of the model:

- Relevance - appropriateness of the operational objectives of the Urban Mobility System taking into account the context and the needs, problems and aspirations over the system;
- Effectiveness - capacity to achieve the expected outputs, results and impacts;
- Efficiency – capacity to be effective at a reasonable cost;
- Applicability – adequacy of means to the achievement of objectives;
- Internal coherence – correspondence between the different objectives within the different levels of the system. This implies the existence of an hierarchy of objectives within the system, with those at the lowest levels contributing to the accomplishment of the ones at a higher level, as illustrated in figure 4;
- External coherence – correspondence between the objectives of the urban mobility system and the ones of other sub-systems of the urban system. That is for every objective of the urban mobility system there is a functional relation with an objective of the urban system and its sub-systems. This correspondence will in fact contribute to ensure the vertical and horizontal consistency of the urban system.

CONCLUSIONS

From the observed cities we conclude that despite the wide variety of literature concerning decision-making and strategy setting processes there are four main practical approaches in urban mobility systems:

- Vision led, when the decision-maker has (or so believes) a clear vision on the policies and measures needed to solve the current problems, and improve system performance, in which case she focus all attention and required resources in its implementation;
- Plan oriented, where problems are identified, objectives are set and the measures and policies that best meet those objectives are specified by analysis leading to the implementation of the plans;
- Consensus building, where stakeholders are consulted and impact on these groups assessed. At the end measures and policies implemented are the ones gathering the greatest support through referendum or public consultation formal process.
- Mixed approaches, that involve leadership, planning and stakeholders consultation as proposed in (Viegas and Macário, 2003a, pp 213-225) and applied in the cases

of Lisbon and Brazil. Mixed approaches, that involve leadership, planning and stakeholders consultation as proposed in (Viegas and Macário, 2003a, pp 213-225) and applied in the cases of Lisbon and Brazil. The original problem is explained to groups of stakeholders, alternative solutions are presented and choices are explained and done after assessing and presenting the pros and cons of each option. After this phase of gaining acquaintance with the problem and possible solutions, implementation plans are done and again presented to stakeholders for a better transparency of the process. Feed-back process is also implemented and made public. Mixed approaches can also be organized with different intensities of any of the previous three more radical approaches.

Land-use configurations are instrumental for the subsequent definition of strategic objectives of the city and also of the degree of interaction needed between the other components of the urban system. There is no best universal approach to decision making in Urban Mobility Systems, each city has its own characteristics that influence the options taken.

However there are some useful references from existing experiences that can serve as indications, for example the obvious pitfall of a vision led approach, which is critically dependent on the individual developing the vision, or the plan oriented approach that can led to an excess dependency on technical planners expertise without sensibility for the political component, or the consensus-building approach that can lead to strong delays and inaction, unless consensus is rapidly obtained. All these pitfalls contribute to favor the mixed approach.

Finally, from the cities observed it is clear that contrary to what has been the conclusions of previous research, the main existing gap is in the definition of clear strategies for the development of the city. Consequently there is no bridging between the upper system and the sub-systems entailed in urban system and consistency between the strategic option taking at both level fails.

Strategy in urban mobility systems is thus a rather eclectic definition since it is always subordinated to the strategic planning of the urban area served by that mobility system. In this context, and following the rational proposed by Mintzberg (1999, pp 13), strategy in urban mobility system corresponds simultaneously to:

- An intended course of action, i.e. a plan, in the development of the urban mobility system. That is, the existence of a long term planning aligned with the objectives of the respective urban area for the equivalent period;
- Actions taken in a consistent pattern of behavior;
- A position taken by the city towards the surrounding competitive environment
- A perspective of evolution for the system, largely dependent on commitments to ways of acting and reacting
- To the resulting effect of the individual strategies undertaken by the many individual agents engaged in the urban mobility system.

BIBLIOGRAPHY

CASTELLS M. (1996), “The information age: Economy, Society and Culture”, Vol. I, “The Rise of the Network Society”, Blackwell.

CHRISTENSEN K. S. (1999), “Cities and Complexity: Making Intergovernmental Decisions, Cities & Planning”, Sage Publications

European Commission, EC, Directorate General Transport (1998), “Transport and Land-Use Policies – Resistance and Hopes for Co-ordination”, Transport Research – Cost 332, “Cost Transport”.

FAINSTEIN S., CAMPBELL S. (1996), “Readings in Urban Theory”, Blackwell.

FREY W. H., SPEAR A. Jr. (1995), “Metropolitan areas as functional communities” in Donald C. Dahamann and James D. Fitzimmons (Eds.), “Metropolitan and Non Metropolitan Areas: New approaches to Geographical definition”, Working paper No. 12, Washington, DC: US Bureau of the Census, Population Division.

HALL P. (1969), “Transportation”, Urban Studies 6 (3).

HART O. (2003), “Incomplete Contracts and Public Ownership: remarks, and an application to public-private partnerships”, The Economic Journal, 113 (March), C69-C76, Royal Economic Society, Backwell Publishing

HAWLEY A. H. (1971), “Urban Society: An Ecological Approach”, The Ronald Press, New York.

MACÁRIO R., 2005, “Quality Management in Urban Mobility Systems: an integrated approach”, Instituto Superior Técnico, Universidade Técnica de Lisboa, Lisboa, Portugal (available in http://cesur.civil.ist.utl.pt/nispt, dissertations)

PADDISON R. (Ed.) (2001), “Handbook of Urban Studies”, Sage Publications.

PRUD’HOMME R. (1996), “Managing Megacities”, Le Courier du CNRS, No. 82, pp 174 – 176.

RILEY Jr. J. F. (2000) “Process Management” in JURAN J., GODFREY A. B. (2000), “Juran’s Quality Handbook”, McGraw-Hill International, ISBN 0-07-116539-8, pp 6.1-6.21.

SIMON H. A. (1996), “The Sciences of the Artificial”, MIT.

VIEGAS J. M. (2002b), “Mobilidade” in “Gestão Urbana, Passado, Presente e Futuro”, Cap. II, Gestão da Mobilidade Urbana, Parque Expo, Lisboa, pp 216-235.

VIEGAS J. M., MACÁRIO R. (2003a), "Involving Stakeholders in the Evaluation of Transport Pricing" in PEARMAN A. et al. (2003), "Transport Projects, Programmes and Policies: Evaluation Needs and Capabilities", Ashgate Publishing Company, ISBN: 0-7546-3032-3, pp 213-225.