# Integrating mobility and urban development agendas: a manifesto

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# Integrating Mobility and Urban Development Agendas: a Manifesto

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Abstract: Contemporary urban lifestyles and business practices are increasingly dependent on mobility. At the same time, the negative impacts of mobility on natural and social environments are growing dramatically, as is the public outcry for their reversal. Urban planners are faced with a difficult dilemma: how to rejoin the essential role of mobility in enhancing cities' welfare and well-being with the lack of sustainability of present urban mobility practices? The paper argues that coping with this dilemma requires understanding and managing the deep intertwining of urban mobility, spatial developments, and broader socio-economic and cultural processes, but also coming to terms with the many, irreducible uncertainties of the challenge. It concludes that only a more intensive and critical interaction between different disciplines – at the very least fully integrating transport and spatial planning- and between planning science and planning practice can achieve this.

## *1 Setting the scene*

We live in a quintessentially mobile society. Contemporary lifestyles and business practices depend on mobility. In order to thrive, places seek ever better connections to other places. At the same time, the negative impacts of this 'hypermobility' (Jotin Khisty, Zeitler 2001) on natural and social environments are growing dramatically, as is the public outcry for their reversal. Policy-makers across the world are faced with a difficult but urgent dilemma: how to rejoin the essential role of mobility in enhancing society's welfare and well-being with the lack of sustainability of present mobility practices? This dilemma is especially manifest in cities, where both the positive role and the negative impacts of mobility are highest (May, Marsden 2010).

Mobility has thus become central to the very object of planning, cities, but the full implications seem not to have been drawn. Urban planning still seems to see mobility as just one among many particular concerns, rather than a central, structuring perspective on the development of cities. On the other end of the spectrum, transport planning, while focusing by definition on mobility issues, still seems to ignore the broader, long term implications for the quality of urban life. Furthermore, both urban and transport planning seem to lack awareness of the deeply contested and yet pressing nature of mobility issues, and thus the need to acknowledge the irreducible uncertainty surrounding planning goals and means, and yet to act in the face of it.

Planning mobility in the contemporary city requires on one side understanding and managing the deep intertwining of urban mobility, spatial developments, and broader socio-economic and cultural processes, and on the other side coming to terms with the many, irreducible uncertainties of this challenge. A much more intensive and critical interaction between different disciplines – at the very least fully integrating transport and urban planning – and between planning science and planning practice seem to be necessary to achieve this. This paper further develops this argument. In the next section, the notion of a mobile urban society will be articulated. Then, the core dilemma of urban mobility planning – 'dependency vs. lack of sustainability' – will be discussed. In the main body of the paper, conceptual tools to cope with this dilemma will be introduced. In the conclusions, implications for planning practice, education and research will be drawn.

## *2 A mobile urban society*

While mobility has been always part of human life, interaction between developments in transport and telecommunication technologies and developments in the economic, social and cultural sphere have made mobility a defining characteristics of modern societies (Castells 1996; Graham, Marvin 2001; Urry 2004; Laarsen et al. 2006; Sheller, Urry 2006). People's daily lives are made up of a growing diversity of activities and locations, and mobility holds all of this together. People live in one place, work in a second, and shop, care for another person, or seek entertainment in another. Thanks to mobility, there are a great number of options available when it comes to living, working, leisure or social contacts. These enable people to take advantage of the specific characteristics of dif-

ferent places, thereby fulfilling an increasing variety of wishes and needs.

Business processes are also becoming more and more spatially articulated. When we reconstruct the creation of a product or service, we often discover that the management, the administration, the production and the distribution departments are each at a different location. Although those different locations may be in the same region, they are often in different places, or even countries. Sometimes different firms are involved, with one company being a supplier or buyer of the other. However, the process can just as easily be organized within one and the same company, with the many-branched value chains of transnational corporations being perfect examples. This spatial articulation allows firms, just like households, to make use of the differences between locations to meet a growing variety of requirements. At one location it might be the concentrations of qualified employees or high-quality facilities while, at the other, it might be the cheap land or labor (Castells 1989, 1996)

Modern lifestyles and business processes are thus inextricably linked to mobility. But there is a paradox. While mobility brings freedom it also becomes a necessity. Without mobility, we cannot get access to basic services and take part in social and economic life. We *have* to move. Sheller and Urry (2000) speak in this respect of the 'coercive flexibility' of automobility. How true these statements are becomes clear if mobility options declines, for example as a consequence of worsening congestion, or more expensive fuel. The loss of mobility due to unexpected events (such as extreme weather conditions) heavily disrupts daily routines and forces painstaking adaptations. In cities around the world traffic jams on the roads and delays in public transport services are some of the most widely and heatedly debated issues, as they directly impinge on the quality of life.

The process of spatial disintegration of activities and reintegration by means of mobility gradually unfolded during the industrial revolution. In the second half of the previous century it became a generalized condition in Western societies. It has now become a worldwide phenomenon. The progress in transport and telecommunication technologies means that, over the years, the effort and costs involved in mobility have decreased spectacularly while, correspondingly, the mobility options for households and firms have spectacularly increased. Transport and telecommunications are both responsible for this process. In spite of early speculations (Martin 1978; Toffler 1980), there has been no simple replacement of transport by telecommunications. Research rather documents a mix of partial replacement, the generation of new mobility and the creation of new physical and virtual combinations (Ascher 1995; Graham, Marvin 1996; Graham 1997; Mokhtarian 1998; Wheeler et al. 2000; Janelle 2004; Larsen et al. 2006; Schwanen et al. 2008). Social or business relationships which are digitally maintained need to be regularly reconfirmed by physical encounters. Mobile telephones are primarily used to arrange meetings or to coordinate matters while travelling from one place to another. Services and products are offered on the Internet which, when purchased, translate into considerable flows of goods and people. Remote coordination and the material circulation of freight seamlessly combine in the production and distribution of artifacts. The net result of all this, at least for the time being, is the continuing growth of physical mobility. Worldwide, km traveled per person per day have moved from 3,7 in 1950 to 13,1 in 1997 (from 12,3 to 45,6 in industrialized regions, from 1 to 7,2 in the rest of the world), resulting in a staggering total of 2,628 and 14,951 billion passenger-km per year in 1950 and 1997 respectively (WBCSD 2001). This trend is deemed to continue in the foreseeable future. WBCSD (2004) expects passenger-km to grow between 2000 and 2050 at an average of 1.7% per year worldwide, up to 74,036 billion, with China and Latin America experiencing the higher growth rates (3.0% and 2.9%) and several non OECD countries narrowing (the former Soviet Union), or even closing (Eastern Europe) their 'mobility opportunity gap' with the industrialized world.

In the wake of this exploding mobility, the human phenomenon that we call 'city' has changed profoundly. Before the industrial revolution most activities involving urban dwellers took place inside the city's walled limits. Back then there was an almost direct relationship between the city as a physical phenomenon (the buildings) which the Romans called *urbs* and the city as a social phenomenon (the people and the activities), referred to as the *civitas*. Today the situation is markedly different. *Urbs* and *civitas* actually appear to have become disconnected. Activities by the inhabitants of cities now take place at numerous locations and are linked in all kinds of ways, while households and firms inside the same city may scarcely have relationships with each other (Dematteis 1988; Graham, Marvin 2001). The contemporary city has no clear boundaries; it is a city

of dissipated activities and changeable links. It is a city where the traditional urban centers appear to be losing their dominant role and where new centers seem to be appearing. This is a phenomenon first observed in the United States (Webber 1964; Fishman 1989; Garreau 1991) but later also in Europe (Ascher 1995; Sieverts 1997) and in the rest of the world (Castells 1996; Hall 2009; Lang, Knox 2009)

### *3 A dilemma*

The deep-rooted link between mobility and urban development confronts policymakers with a fundamental dilemma. On the one hand, mobility has become an essential condition for social emancipation and economic development, as we have witnessed. However, on the other hand, the negative effects of mobility are also becoming more and more obvious, with energy consumption, greenhouse gas emissions, air pollution, noise pollution, accidents, the severing of landscapes and communities being just a few poignant examples. It is making it increasingly difficult to find a political basis by which to meet the growing need for mobility through the construction of new infrastructure and it is making transport projects substantially more expensive due to mitigation and compensation measures. There are also the negative effects within the mobility system itself, such as congestion for those who drive or ride and exclusion for those who do not. In the developed world technology is expected to help on some fronts, but on others (most notably including nonrenewable energy consumption and greenhouse gas emissions) progress will most likely not be enough to balance for the explosive growth in mobility. In the developing world, even the solution of basic issues as appropriate mobility infrastructure, equity in access, congestion, air pollution, noise, and accidents is not in sight (WBCSD 2001). Mobility appears to have become the victim of its own success.

The result is that the dominant approaches to mobility policy of the past are no longer usable. This applies in the first instance to the so-called 'predict and provide' approach dominant in the Sixties and Seventies (Owens 1995; Marvin, Guy 1999). This was based on predicting the mobility growth, followed by the building of infrastructure to accommodate that growth. The resources for keeping up with the ever-growing mobility demand no longer exist. Moreover, recognition of the negative effects of mobility means it is undesirable simply to continue in this way. An alternative approach was in its heyday in the Eighties and Nineties, spurred on as it was by the energy crisis and growing environmental awareness. This was sometimes referred to as 'predict and prevent' (Owens 1995). The idea was that the predicted mobility demand in fact had to be avoided, primarily by discouraging car use and by promoting alternative means of transport or by replacing mobility with telecommunications. This approach too is no longer useable since it ignores the degree to which the well-being of households and the viability of firms have become dependent on rapid and cheap mobility. The fierce societal resistance to road pricing in many countries has made this all too clear. A new approach to mobility policy is now emerging which is trying to find a balance between the two. It is trying to identify forms of mobility which acknowledge the need and desirability of mobility and, at the same time, can reduce its negative effects. This is what is generally meant by 'sustainable mobility' and is supported by a growing array of actors spanning academia and the profession (e.g. Banister 2005), government (e.g. European Commission 2007) and business (e.g. WBCSD 2001). However, and in spite of the apparent consensus, progress on the ground shows limited and difficult (Banister 2005, 2008; May, Marsden 2010).

Planning urban mobility in the contemporary world must start from the acknowledgment of this core dilemma, and develop conceptual and practical tools of coping with it. With respect to the conceptual tools, there are three main challenges:

- The first challenge is coming to terms with the systemic nature of urban mobility. As discussed in section two above, mobility is deeply intertwined with the form of and the life in cities. Mobility in cities is a 'system' (Urry 2004). A well-founded and understandable representation of the system's components and relationships is therefore a useful, if not indispensable conceptual tool for the identification of problems and the search for solutions.
- The second challenge is finding ways of coping with the inherent, deep-seated uncertainty surrounding developments in the 'system of urban mobility'. Uncertainty stems from the complexity of the system. In planning terms, it implies that disagreement on goals and means will be the norm rather than the exception. Planning has always had to cope with uncertainty, and developed conceptual tools to reduce it (Christensen 1985). However, this paper will argue that we most importantly need tools to cope with uncertainty that *cannot* be reduced.

• The third challenge is developing effective linkages between planning science and planning practice. Planning is both a social science and a social practice. Each has a unique contribution to give. The former can contribute the rigorous assessment of problems and solutions, the second the art of navigating the ambiguities and ambivalences of the real world. A productive relationship between the two is needed in order to address the extraordinary challenges posed by the dilemma of urban mobility. This is today not typically the case, and planning science and practice seem often rather to drift apart (Balducci, Bertolini 2007).

In the remainder of the paper, conceptual building blocks to cope with each of the three challenges are proposed. In the conclusions, some implications for planning practice, research and education are discussed.

## *4 Conceptual building block I: the transport land use feedback cycle, and beyond*

In order to address the systemic nature of the urban mobility system, one first has to acquire an insight into the way in which the use of urban land, transport systems, and the activities of urban households and firms are related to each other. There are, of course, clear connections between urban form and transportation. Striking examples are the close links between suburban environments and the car, or the much greater role of public transport in compact urban centers. A fundamental, recurring question concerns the direction of causality: do spatial developments determine the development of transport systems or does the reverse apply? Is mass car use the result of suburbanization or has the growth in car use caused suburbanization? And what is the link between the development of public transport and high density urbanization? The answer that transport planners and geographers have provided for some time is that the influence is reciprocal. Suburbanization and the growth in car use have mutually reinforced each other, as have the development of public transport and compact urbanization. The essence of this relationship is caught in what is referred to as the transport land use feedback cycle (Wegener, Fürst 1999; Meyer, Miller 2001; Giuliano 2004). There is, however, the need to add a layer of complexity to this common interpretation.

The reasoning behind the transport land use feedback cycle is as follows (see the solid arrows in Figure 1). Patterns of land use determine the places at which people carry out activities, namely where they live, work, engage in leisure pursuits, etc. Movements between these different locations of activity have to be taken care of by the transport system and transport system developments are intended to be adapted accordingly. In turn, transport developments determine the accessibility of locations and, with that, their attractiveness as a location for certain land use developments.

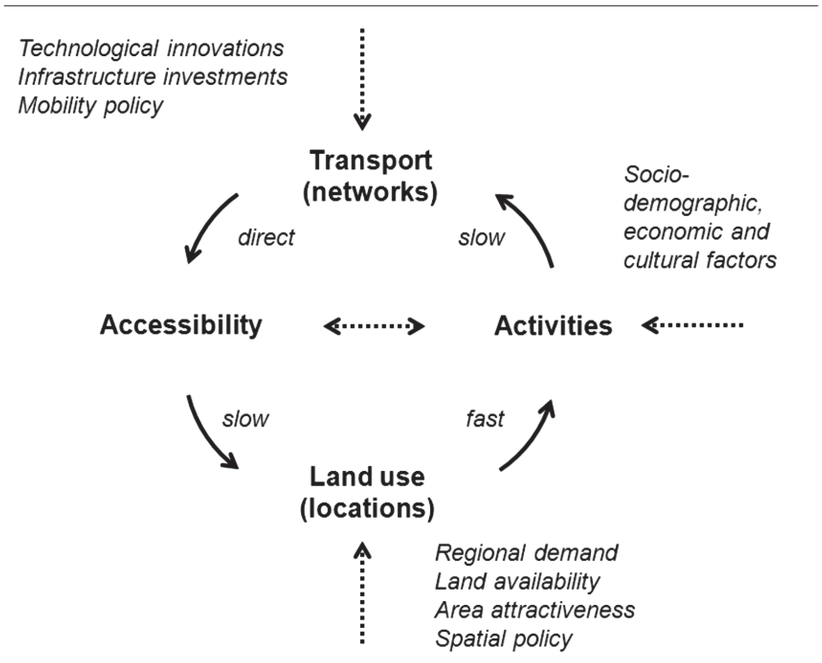


Fig. 1: Transport land use feedback cycle, and beyond.

The simplicity of the transport land use feedback cycle is both its strength and its weakness. It is easy to grasp, but developments in the real world are determined by many more factors (Hanson, Giuliano 2004). Furthermore, by focusing on a system view, there is a risk to overlook the role of individual agents (transport providers, land use developers, households and firms). The cycle should be thus seen as open and its development as co-determined by other factors. For instance (see the dashed arrows in Figure 1), land use developments depend not only on accessibility conditions but also on the availability of land, characteristics of the local environment, land use policy, or the economic dynamism in a region. Individual characteristics of households and firms and the characteristics of the wider socio-economic context play a major role in the emergence and adaptation of patterns of activities, a greater role in fact than that played by spatial factors. The development of transport systems is not only determined by the demand for movements but also by relatively autonomous developments on the supply side, such as technological innovation or mobility policy. The transport land use feedback cycle is also internally complex. Response times vary a great deal. While patterns of activities can be changed relatively quickly (within years, or even days), changes in land use and transport systems demand much greater amounts of time (in the order of decades). This leads to all manners of short circuits and contradictory movements. Variations in accessibility can, for example, lead to changes in patterns of activities without the land use changing first. Conversely, changes in activity patterns can determine changes in accessibility even in the absence of changes in the transport system, as through the impact of congestion.

Despite these important nuances, the transport land use feedback cycle can provide a useful framework for exploring the relationship between developments in cities and mobility. It places the focus on the dynamic nature of the relationship, on the mutually strengthening or indeed weakening developments in both domains. It also reveals where the challenges are. One example is the need of reconciling the low flexibility of public transport with the increasing fickleness of urban households and firms movement patterns (as for example addressed by regional light rail developments). Another example is the need of reconciling the low capacity of the car with the lack of space in historic urban centers (as for example addressed by parking regimes or congestion pricing). Successful policy acknowledges these dependencies and dynamism and seeks ways of strengthening or indeed weakening them. For instance, it is policy that combines the development of the public transport system with compact urbanization around that system's stops, and vice-versa, as in Transit Oriented Development (Dunphy et al. 2005). But it is also policy that acknowledges that, in the case of developments in low density areas, public transport cannot easily play a leading role and that the use of cars – or of transport means with comparable door-to-door qualities – might in fact have to be facilitated, as already stressed by Webber (1986) and more recently advocated by Bruegmann (2008 – see, however, for a nuance Mees 2010). Furthermore, successful policy is also aware of the complexities of the transport land use relationship, and thus of the often decisive role of developments outside the cycle (such as socio-demographic, economic, or cultural trends or technological innovations), and of the possibility of unexpected short circuits inside the cycle (the dashed arrows in Figure 1). It is policy, therefore, that acknowledges the existence of factors that fall outside the policy control and also takes account of the unpredictability of its own continued effects. This brings to the second conceptual building block, namely insight into how to deal with this deep-rooted uncertainties.

## *5 Conceptual building block II: coping with irreducible uncertainty*

In essence, planning is about linking goals and means. Which goals should we be pursuing? Which means can we employ to achieve them? Conventional planning approaches assume that both a consensus on goals and an insight into the effectiveness of means are both desirable and feasible, meaning that uncertainty must and can be reduced so that a balanced choice can be made (Christensen 1985). This was most explicitly the case in the ideal, rational approach to planning (Simon 1957) but it is still implicit in many current approaches, most notably in transport planning (Wilsson 2001). However, the debates spurred by the dilemma of urban mobility appear to be characterized by lasting, irreducible uncertainty regarding planning goals and means. For instance, although there might be agreement on the broad necessity of sustainable urban mobility, each attempt to develop and apply it in practice reignites the discussion. Should we give the economy or rather the environment priority? And how can we most ef-

fectively stimulate the economy or protect the environment? Will we ever agree on this? Those who follow debates like the one relating to the expansion of airports, new motorway links, or other major infrastructure projects, or to parking regimes, road pricing and other limitations of car use, have to answer the latter question with a resounding 'no'. Uncertainty about goals and means will persist. The situation is, therefore, such that planning approaches which focus only on reducing uncertainty will not come up to the mark, meaning that a more radical approach is required. I call this an evolutionary approach, by analogy with adaptive processes in the natural domain and conceptualization in other social sciences.

The argument is represented in Figure 2. The point of departure for the argument is that, in a situation in which the uncertainty regarding goals and means cannot be reduced, the focus of planning has to shift from searching for certainty to searching for robustness and flexibility. As represented in Figure 2, goals and means are always and by definition to an important degree uncertain. However, a distinction can be made between more and less robust goals and means. Robust goals are goals which, even if uncertain, are relevant in a number of possible future contexts. For instance, even if we might never agree whether the economy should come first, we could agree that the maintenance of favorable transport and land use conditions for innovation of the urban economy is a more robust goal than assuming the long-term prevalence of a presently leading economic sector, and gearing transport and land use policy to support that sector. Robust means are means which, even if uncertain, can serve a number of goals simultaneously. For instance, even if we might never agree which transportation system is the most effective, we could agree that the maintenance of sufficient diversity as regards mobility options in cities (as with the development of *both* public *and* private, *both* motorized *and* non-motorized transport modes) is a more robust means than devoting everything to the development of one type of mobility. Goals and means which appear to be robust have to be experimented and bargained over in order to explore their desirability and feasibility in addressing practical problems (the upper left quadrant in Figure 1). After all, they will continue to be uncertain and only their application will reveal whether their potential is more than a hollow promise. Goals and means which are not robust, or turn out not to be robust after application, need to be reconsidered. Until then, options need to be kept open, and flexibility be preserved (the lower right quadrant in Figure 1). It is a continual process which does not stop when policy is implemented and with regard to which it is important to keep involving various views on what should and can be done. The world and our understanding of it will continue to change and in order to cope with this we should continually seek and not avoid refutations and contradictions.

Recent developments clearly reveal the dangers of planning goals and means which are insufficiently robust. North American cities which are very much car-oriented have on the whole functioned satisfactorily for decades but have turned out to be quite vulnerable when confronted with unexpected changes in the context. Unexpected and substantial increases in

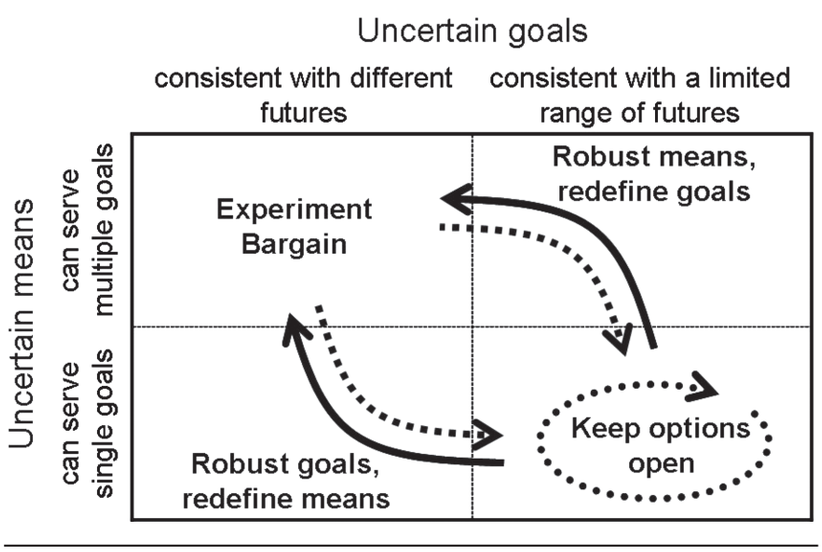


Fig. 2: Evolutionary planning.

fuel prices caused entire lifestyles and industrial complexes to wobble. The turnover of hypermarkets plummeted, the real estate value of remote houses dropped, and the car industry was unconcerned with people who wanted to and had to drive more economically. Now fuel is somewhat cheaper again but it is very uncertain how the price is going to develop in the future. In any event, new and substantial price raises cannot be ruled out. The more diverse mobility systems of European and prosperous Asian cities, where more fuel efficient cars, public transport and non-motorized means of transport also play a role seem to have proven to be more durable in this respect. However, the final word has by no means been spoken on this issue. Historically, North American society has shown itself to be very adaptable and whether the mobility systems of Europe and Asia will remain robust and flexible in the long term still remains to be seen. It is a challenging quest which also demands a change in the relationship between planning practice and planning science, as represented by the third and final conceptual building block.

### *6 Conceptual building block III: experiential learning between science and practice*

Understanding and managing the relationships between urban development and mobility is a major challenge, as is the identification and implementation of robust and flexible planning goals and means. Such challenges demand intellectual enquiries but also practical experiments, a science which can inspire a change in practice and a practice which is open to insights from science. The complex interactions sketched in Figure 1 can to a certain degree be mapped by researchers, but can never be entirely captured by them, and must therefore be also explored in actual, real world 'policy experiments' (Szejnwald Brown 2004). The same applies to the search for robust and flexible combinations of planning goals and means evocated by Figure 2. More cross-pollination between planning science and practice is thus needed. This brings to the third and last diagram (Figure 3). It elaborates on what is known as the 'experiential learning cycle' (Kolb, Fry 1975) developed in the theory of education context during the Seventies and inspired in turn by the views of North American pragmatists.

The underlying idea is that learning is a process which closely combines action and thought, experience and conceptualization. Learning takes place by observing and reflecting on concrete experiences, by conceptualizing observations and reflections, experimenting with the acquired insights into new situations, and by applying the outcomes in concrete experiences. The experiential learning cycle provides a useful framework by which to structure the relationship between planning science and practice. Practice is the world of concrete experiences, science that of abstract concepts. Learning takes place when the two domains are linked together. This occurs primarily in the intermediary activities, that is, by observing and reflecting on practice, and by experimenting with the insights from science. The link between practice and science is essential in order to maintain sufficient contact with developments in the world of experiences on the one hand and those of ideas on the other. At the same time, there has to be clarity regarding the differences in roles and activities in order to maintain a critical attitude on both sides.

The diagram provides a framework for the development of research programs in which to make optimal use of the unique potential of practice as a laboratory of new scientific insights. It also provides a framework to stimulate practice so that insights from science can be used immediately. Lastly it offers points of departure for educational programs aimed at producing, on the one hand, practitioners who are able to continue innovating and, on the other hand, scientists who are able to stimulate social innovation. The dilemma of urban mobility discussed above can provide a focus and rationale for the exercise (how to cope with it?). Even more than that, it can only be coped with if,

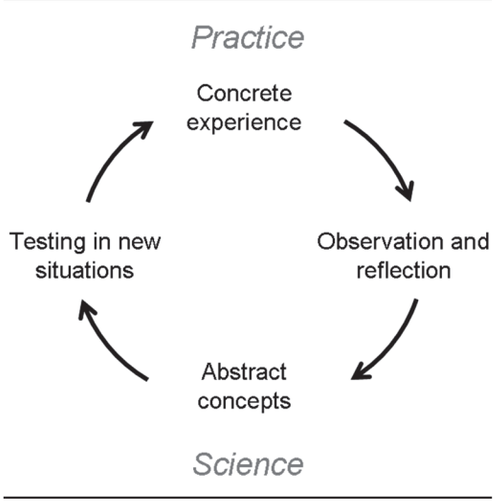


Fig. 3: Experiential learning cycle as a link between science and practice (based on Kolb, Fry 1975).

when and where such ability to learn from experience is in place, as research is increasingly showing (Cervero 1998; Curtis et al. 2009; May, Marsden 2010). However, at the moment, this cross fertilization is by no means being used to its full potential in the world of planning practice, education and research.

Institutional spaces for this interaction are often not present and need to be created and, where these are already present, consolidation needs to take place. Research programs developed in recent years have reflected this change in direction, but the procedures have by no means been definitively formulated, let alone institutionally anchored. In education, possibilities need to be expanded to enable students to reflect systematically on practice and, conversely, to enable practice to benefit from students' fresh interpretations and perspectives.

Contradictory signals are being received from the wider context. On the one hand, the call for the social valorization of scientific knowledge is getting louder all the time (Nowotny et al. 2001); on the other hand, the dominant accountability mechanisms in both planning science and practice seem to be becoming increasingly inward looking (Balducci, Bertolini 2007). In the present context academic research is geared increasingly at obtaining the recognition of peers (that is, other academics, and particularly academics abroad), rather than recognition of those who are supposed to use it (planners at home). A main reason for this is that funding, but also individual and organizational prestige, are increasingly linked to that recognition, as expressed in international publications, invitations to lecture at universities abroad, and research assessments by fellow scientists. At the other end of the research-practice spectrum, room for reflection by practitioners is becoming more difficult to find within increasingly short-term output-oriented professional planning practices. This represents a crucial challenge for planning. Due to the dual nature as science and practice the field is well positioned to perform on both interfaces but, relatively speaking, less well when it comes to performing on just one of the two fronts. If they stay in their separate worlds planning scientists and practitioners are doomed to substandard achievements. By contrast, progress can be made if the worlds are linked (Straatemeier et al. 2010).

## *7 Implications for planning practice, education, research*

In the above I have discussed how society has become an intrinsically mobile one and how this faces planners with a difficult but urgent dilemma: how to balance our dependency on mobility with the lack of sustainability of present mobility patterns? Next, I have proposed some conceptual anchors to cope with this dilemma: the transport land use feedback cycle (and beyond); an evolutionary approach to planning; and experiential learning between science and practice. As a way of concluding I will discuss below some implications for planning practice, education and research.

The first conceptual building block pointed at the need to integrate transport and land use planning and to cultivate the links with other relevant disciplines. Transport and land use planning are in practice still largely separated professions, as are the public and private institutions to which they cater (e.g. government agencies, transportation companies, property developers). Efforts to integrate the two professions and institutions are being made, and, when successful, appear a key factor in effective urban and transport planning (Cervero 1998; Curtis et al. 2009). However, the divide is still wide and improving understanding between the two perspectives seems a necessary and challenging first step towards integration (Straatemeier, Bertolini 2008). Education can help, if students are systematically taught to think at land use and transport issues, urban development and mobility issues as one and the same. Traditionally, urban and regional planners have focused on the former and transport planners on the latter. In many curricula courses are offered that provide a stepping stone towards the other side, but truly integrated programs are rare (Krizek, Levinson 2005). The task is that of educating professionals and academics who are able to span and link both fields, and have at least a working comprehension of the dominant paradigms in each of them. Finally, research should help us understanding transport and land use dynamics in its complex relationship with economic, social and cultural processes. Of course, there is already a strong tradition of studies focusing on questions such as the impact of urban form on mobility behavior, or – conversely – the impact of transport infrastructure on urban (and particularly economic) development (see e.g. Hanson, Giuliano 2004). However the deep intertwining of mobility and contemporary urban life requires that the field

is broadened and links are made with other perspectives, as for instance the emergent 'mobilities' paradigm in the social sciences (Sheller, Urry 2006). Key to this emergent paradigm is the observation that social sciences have tended to ignore mobility, while transport planning and modeling has tended to ignore the social dimensions of travel. However, an integration of the two is essential if we are to understand contemporary 'mobile societies' (Larsen et al. 2006). From a planning perspective a crucial question is how to achieve change (e.g. towards more sustainable mobility) in the face of such a complex, 'locked-in' intertwining of the technical and the social, as captured by the notion of a 'system of automobility' (Urry 2004). Inspiration can be sought in other fields facing similar challenges in 'long term transformative change' (Grin et al. 2010).

The second conceptual building block introduced an approach to coping with irreducible uncertainty in planning. In practice, how to cope with uncertainty is increasingly recognized as key to addressing upcoming societal challenges that go well beyond those discussed in this paper (think for instance at issues related to climate change or nuclear energy). There seems to be a paradox here. The more the complexity of issues grows, the more the public arena seems to long for straightforward answers that, however, because of increased complexity become less adequate. Accordingly, finding ways of accepting uncertainty and learning to live with it is a difficult and yet key challenge to which this paper has just proposed a way of thinking about. It should, again, start in education. There is a need to train students in, recognizing that values and thus planning goals are contested and that the same applies to knowledge and thus planning means. Both urban and transport planning have moved some way in this direction, even if in different ways. Urban planning seems more at ease with uncertainty about planning goals (and the ensuing need to intersubjectively define problems and thus mediate and negotiate), as in collaborative planning approaches (Healey 1997; Innes, Booher 1999). Transport planning seems to have been rather exploring uncertainty about means (or the need to incrementally identify solutions and thus experiment), as for instance in 'adaptive planning' approaches (Marchau et al. 2010). However, the task seems rather that of dealing with both uncertainties at the same time, to negotiate, mediate and experiment, identify problems and explore solutions simultaneously, as sketched in section five above. Research has a crucial role, as it should help identify and articulate planning approaches to deal with irreducible uncertainty. Two directions seem promising. The first is that of retrospectively analyzing and conceptualizing how in complex planning issues irreducible uncertainty has come to the fore and be dealt with. The second is to explore the potential of new approaches being proposed in planning or other fields to deal with irreducible uncertainty of goals and means (e.g. Lempert et al. 2003) in mobility planning practice.

The third conceptual building block proposed a framework to more effectively link planning science and planning practice. The challenge for planning practice here seems to be that of finding ways to 'make room for reflection' in practices that, both in the public and private sector, seem increasingly under pressure to deliver on narrow, short term targets. It implies a more experimental attitude towards policy and more reflective attitude towards knowledge. Interaction between planning science and practice should be central to the education philosophy, and reflection in action be acknowledged as the main way professionals learn. Of course, this is something that has long been contended since Schön's seminal contribution (Schön 1983). However, what we still often see is courses concentrating on *either* practical skills (planning practice) *or* on fundamental questions (planning theory). Recent developments in academia seem even to exacerbate the dichotomy (Balducci, Bertolini 2007). The challenge seems rather to have *both* being developed, iteratively in the same curriculum and course. Interaction with real practice seems a prerequisite. A possible reference here could be the deliberately 'transdisciplinary' approach to education propagated by institutions as Harvard and ETH Zürich (Steiner, Laws 2006). The implication for research is that if proposed planning approaches are to be more than promising concepts and are also to improve actual planning practice, they need to be tested and further developed in 'the context of their intended use', as is common in other sciences aiming at changing, not just understanding the world (van Aken 2004).

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