

>> Introduction

SETTING A NEW RESEARCH AGENDA FOR A MORE SUSTAINABLE MOBILITY AND LOGISTICS IN FLANDERS

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>> Flanders is a densely populated region in the northern, Dutch-speaking part of Belgium, Europe. The region has a population of approximately 6.4 million inhabitants (not counting Brussels) in an area of 13,597 km² and is divided in 308 municipalities. There are three major cities with a high employment attraction: Brussels (1,160,000 inhabitants in the Brussels-Capital-Region, which has its own government, legislation and administration) is the center of service and government jobs; Antwerp (512,000 inhabitants) is characterized by its port activities (e.g. chemical industry and petrochemicals); and Ghent (248,000 inhabitants) mainly offers jobs in industry, research, education, and development. Additionally, there are 11 other large cities with a central function in their region with regard to employment, health care, education, culture, and entertainment (Dewulf et al. 2015).

Developing a sustainable urban mobility and logistics policy implies that governments have to focus on creating high-quality, livable cities with acceptable standards of access to goods and activities. Such sustainable urban development aims to shorten distances between locations of activities so that more sustainable transport modes other than the car and/or truck will be used resulting in a reduced use of energy and other resources and a reduction of emissions including carbon dioxide (Banister, 2008, 2010). The core common feature of such sustainability in European cities thus primarily depends on a reduction of motorized vehicles (whether cars or trucks) use. This involves a change in people's way of life, a shift in their mindset, and looking for a shift in governance and policy-making towards more sustainable mobility and logistics solutions (Van Acker et al. 2015). This policy shift is also closely related to such topics of smart architecture, green built-up land use and environment, climate change, safety issues, and health issues.

The need for a psychological and institutional turn

As such, the quest for sustainable and resilient mobility remains one of the most important issues within the Flemish administration, media and public domain. Not a day passes when sustainable mobility is not questioned in the media. Examples are abundant: the criticism about the new Flanders Mobility Plan, the Oosterweel-link (completion of the Antwerp 'ring road', attracting more traffic to the urban highways in this city), Brussels ring road (separating international and urban highway traffic but also extending the road capacity), extensions of public transport lines (such as GEN-Brussels), Uplace (large shopping centre planned in the fringe of the Brussels agglomeration close to an already congested Brussels highway interchange), Mobility planning of Antwerp and Ghent (discussion if a more or a less car oriented accessibility should be planned for). For the one part this media coverage and therefore ongoing discussion within Flemish public planning is not remarkable. For Flanders is one of the car-densest regions in Europe, as it is characterised as a region with one

of the most diffuse infrastructure ever (UU/TNO 2012, Boelens 2013, Lauwers and De Mol, 2013). Unlike its neighbouring countries and regions (the Netherlands or the North-Rhine-Westphalia in Germany), Flemish civil engineers upgraded existing roads and planned new infrastructures next to the existing ones, instead of creating a stand-alone new and consistent network. Although in the 1980s an infrastructure programme called 'Doortochten' started with projects aiming at downgrading the function of local and regional roads and since the approval of the 'Ruimtelijk Structuurplan Vlaanderen' (the Flemish spatial policy plan) a binding categorisation system aiming at rebalancing accessibility and liveability has been introduced, the dense road network is still very permeable for car traffic. As a result, the whole of Flanders appears to be well accessible by car, and consequently its environmental impact is felt everywhere.

Moreover, this infrastructural feature was flanked by a rebuilding policy soon after the Second World War, to subsidize individual family housing together with a liberal spatial planning policy, instead of taking those issues as state-affairs in their own hands (Boelens and Taverne, 2012). The result is suburban sprawl, characterized as a horizontal metropolis or 'citta diffusa' ('nevelstad' in Dutch, Vigano 2012). In this respect mobility and especially car-mobility has turned out to become a love-hate affair for the majority of the Flemish people. On the one hand, they love their car and the dispersed infrastructure network, while it serves the accessibility of the citta diffusa. On the other hand, they hate it, not only due to the daily traffic jams, but also since the environmental impact of ongoing and dispersed mobility has in the meantime generated major consequences in most urbanised areas, where the car traffic – but also its harmful emissions – accumulate. Thus, at the one side there is a quest for additional infrastructure, in order to guarantee accessibility and diminish traffic jams; on the other hand it is highly contested while it further affects health and well-being. Therefore, there is a growing and ongoing policy focus on minimizing the (social-environmental) impact of the expanding mobility, by covering up main highways, public transport or parking places, or by inducing new technologies in the transport and traffic market, in order to make these more sufficient and/or sustainable. Upgrading of biking infrastructures and public transport services since the beginning of 21st century have led to an absolute growth of these modes, but only at the same pace as car traffic. So the relative position of biking, public transport and car travel in the modal split in the Flanders region has been quite stable for some decades.

Although these incentives contribute to sustainable mobility on the short run, the impression is that each of these policies start at the wrong end of the story. They just minimize the (social-environmental) impact of growing mobility, rather than represent a real endeavour for socio-spatial resilient transport-travel-traffic planning (Vanoutrive and Boussauw, 2014). It is focussed on the hardware of the issue (infrastructure, vehicles, public transport means etc.) and hardly on the software (preventing or inducing a more sustainable use, preventing inefficient or avoidable travel, diminished energy-use and thus its environmental impact) or the orgware of

¹ in Dutch 'wet van Behoud van REistijd en VERplaatsingen', meaning 'law of constant travel time and trips' stating that through recent history and in different economic and cultural conditions daily travel time budgets are constant, regardless of the transport modes available or the average speed of these modes

infrastructure and mobility planning (organization of space and mobility, efficient situational and adaptive shared mobility, focussed on the specific demand at hand etc.). There is a real need to refocus more on these last two domains, instead of an ongoing expansion planning, serving the needs of a growing mobility. According to the BREVER-law (Hupkes 1977)¹ this is in fact a self-reinforcing development, – in Anglo-Saxon literature often referred to as 'the fundamental law of road congestion' (Downs 1962) – for which more and more empirical evidence has been documented (Cervero, 2003; Duranton and Turner, 2011). Scholars are increasingly convinced that it would be more resilient on the long run to refocus on the existing requirements and means of mobility (Dijst and Gimmler, 2016). In fact, that would need a change on the internal drives, specific motives, interests etc. of the mobility users and actors themselves; in fact a radical turn from a pure civil engineering approach, towards an integrated approach of sustainable mobility, including also psychological, sociological and/or institutional aspects. Despite the fact that we have an increasing number of telematics and technological resources at our disposal (e.g. smart phones, automatic vehicle control, satellites, computerized flow control, etc.), this endeavour is however not so easy to implement. Since our network society has become much more complex, volatile and contingent and since new actors, organizations and technological means have appeared on the scene, the future mobility flows will become much more non-linear, criss-cross, fuzzy, and thus unpredictable and hardly controllable top-down (Allen 1997, Boelens and De Roo, 2014). We have to become smarter than smart, and dig into this complexity ourselves, in order to come up with new tactics and strategies enhancing sustainable or resilient mobility in fuzzy, changing circumstances.

Three lines of thought

With this in mind, the current book sketches a new, future research and policy agenda. It departs from existing, preliminary attempts of research in this direction; and tries to further materialize this into a resilient agenda for the future. These preliminary attempt starts from a different view about the interaction between society, space and mobility; driven by radical transitions (disruptions) from the traditional to more complex, a-linear approaches. This transition is characterized by three major challenges (or lines of thought):

- From generic towards situational approaches of the demand side of the travel market;
- From hard and stable to smart adaptive approaches within the transport and traffic market;
- From top-down strategies towards structural couplings and coevolution in the mobility market.

The first line of thought (SOCIETY AND SPACE) deals with situational travel behaviour in respect to changing settings of accessibility, lifestyles, and their interaction with society, health and space.

The second line of thought (TECHNOLOGY AND INDIVIDUAL TRAVEL) deals with the ongoing use of new technological means, including shared mobility and interactive design to facilitate these increasing individual demands;

The third line of thought (GOVERNANCE AND COLLECTIVITY) deals with adaptive, actor-relational approaches of mobility, in changing settings of formal and informal initiatives in mobility planning.

This book is structured along the three above-mentioned lines of thought.

Contributions

The first contribution, in the first line of thought, of *Koos Franssen, Greet Deruyter and Philippe De Maeyer* is focused on the complex matter of accessibility. Although accessibility is regularly related to the socio-economic opportunities to access important destinations beyond their immediate surroundings, they show that the current debates often fall short to the question of how the complexities of the existing and evolving society's travel behaviour are incorporated into the decision process of actions that lead to a gain in mobility. Social disadvantages, related to these particular mobility-needs, have a strong link with the transport disadvantages, because of the specific transport system's characteristics. If both aspects are not fine-tuned to each other, transport poverty originates, which in turn results in the inability to access social networks, services and vital commodities. Therefore they conclude that in order to combat social exclusion, there is a growing policy attention needed to define where and when transport poverty materializes.

In the same way, also *Veronique Van Acker* pleads for a growing policy attention towards a more life-style adaptive approach of mobility planning. Nevertheless she shows that what are regularly called lifestyles in mobility research rather refers to stage-of-life or household composition, which refers only to general objective socio-economic characteristics. She therefore tries to provide a more sophisticated overview of the 'lifestyle' concept in terms of definitions and measurement methods towards a so-called sociographic lifestyle approach focussing on a behavioural orientation – values, attitudes and preferences – and a latent factor motivating behaviour patterns. In addition, she tries to add some evidence on this issue using data on attitudes and leisure activities from a sample of highly educated respondents in Flanders, Belgium. Here she concludes that the influence of lifestyles becomes more interesting when considering the interaction with residential location choices and car ownership decisions in a path analysis. This path analysis gives more profound insights into which type of people (in terms of lifestyles) is associated with urban residential choices (i.e., residing in high density neighbourhoods close by a regional city center) and car ownership decisions.

In that respect the third contribution of *Jonas De Vos, Ben Derudder and Frank Witlox* focuses on the reciprocal interaction of travel patterns in their surroundings. Since

existing literature predominately focusses on the one-dimensional impact of the built environment (as for instance the distinction between compact or suburban environments) on daily travel patterns, they suggest that this interaction is more complex and reciprocal adaptive. The link between residential location and travel behaviour is also affected by travel-related attitudes. As land use preferences are partly shaped by these attitudes, people self-select themselves in a neighbourhood where they can easily travel with their preferred travel mode. This could be called a path dependency of the respective lifestyles, in Van Acker's idea of thought. But additionally De Vos, Derudder and Witlox also stipulate that these preferences are subject to how people perceive their travel; travel mode choice plays an important role in how satisfied we are with our trips. People using public transport – especially the bus – are least satisfied with their trips while walking and cycling results in the experience of positive feelings during the trip and a positive evaluation of the trip. Since travel satisfaction is affected by travel mode choice and is also related with travel-related attitudes and the residential location, it is important to include these adaptive approaches and travel satisfaction within policies with regard to the interaction between residential location and mobility.

Here the contribution of *Veerle Van Holle* and *Lieze Mertens* comes in. They discuss those ideas of travel behaviour and travel satisfaction from a Public Health Perspective (PHP). After introducing health benefits and measurement methods, and the influencing factors of active transport, they make a distinction between macro-incentives (i.e. accessibility of destinations) and micro-incentives (i.e. specific street characteristics such as quality of infrastructure). For four different age groups they show how these macro- and micro-incentives could influence travel behaviour and travel satisfaction in reference to public health results in specific Flemish cases. And although it is difficult to provide 'one fits all' advice on how the physical environment should be designed to promote active transport, they suggest that accessibility of destinations are key factors in this respect. As such the circle is round again, and we have to turn back to the first contribution, stipulating that we need a multifaceted policy from various (lifestyle) perspectives to induce sustainable transport for tomorrow.

The second part of this book is focussed on how new technological measures and/or telematic means could help in this respect.

In a first contribution *Sidbarta Gautama*, *Nico Van de Wegbe* and *Philippe De Maeyer* show how movement of people can be observed and organized using modern ICT tools in a smart city environment. Current technological advances allow within certain limits to observe aspects of multimodal mobility behaviour. Camera networks, city sensors and smartphone applications all deliver different insights in the complex interplay of transport modes in a city. However, and although more and more advances are made in this domain they stress that we have to move beyond simply collecting mobility data into big data repositories, and explore how ICT can be used to set up the dialogue between citizen and policy maker. It helps in bringing forward purpose of travel and

the preferences and dislikes of the mobility consumer with respect to current and future policy.

In that respect also *Sabine Wittevrongel* and *Joris Walraevens* stress that those new means have to be applied in the shared-vehicle paradigm in order to enhance its performance as a good alternative for ‘vehicles as property’. The main performance measure of those shared systems is the availability of vehicles when and where users need them. To get good performance, fleet-size should be large enough and operation management such as relocation of vehicles could be necessary. This obviously comes at a cost. In this chapter *Wittevrongel* and *Walraevens* therefore review queuing models for different types of shared mobility systems. These queuing models are essential to improve the performance of shared-mobility systems, to capture the influence of different parameters and of operational choices on this performance and, on a more strategic level, to compare different forms of shared mobility.

Additionally the third contribution of *Rodrigo Rezende Amaral*, *El-Houssaine Agbezaf*, *Birger Raa* and *Ehsan Yadollahi* in this line of thought focuses on how these new technological means could also help to improve urban logistics and mobility. The challenge here is how to optimize logistics and transport activities in urban areas, while taking traffic congestion and air pollution into account, with a view of reducing the number of vehicles on the city’s road network through the rationalization of their operations. The logistical activities and mobility aspects involved in this process include, in addition to transport, handling and storage of goods, the management of inventory and related pickup and delivery operations. They show how this could be done and how smart city logistics could be viewed as a first step towards a clean, safe, mobile and economically and environmentally sustainable city.

Nevertheless, and although these new technological means are a necessary prerequisite for a smarter and possibly more sustainable mobility in and around cities, the third line of thought in this book stresses that these new means are not sufficient. Additional institutional, organizational measures are necessary in order to make these new technologies work efficiently and adaptive situational in an ongoing and ever more complex networked society.

In their contribution *Enrica Papa* and *Dirk Lauwers* therefore stress that we have to become smarter than smart. In order to enhance sustainable mobility planning, we should move beyond technology, and integrate technologies, systems, infrastructures, and capabilities, with the real interests and ambitions of the customers and actors involved. The new technology means should evolve toward a means and an end. Here there is a need to commit ‘citizens’ and not just ‘users’ to a *smarter* mobility paradigm. The open and active involvement of people and stakeholders would be far more effective. Thus, broad coalitions should be formed to include specialists, researchers, academics, practitioners, policy makers entrepreneurs and activists in the related

areas of technology, transport, land use, urban affairs, environment, public health, ecology, engineering, green modes and public transport. Accordingly, we should start with the situational human capital itself, and facilitate a willingness to change and an acceptance of collective responsibility with regard to sustainable mobility. Papa and Lauwers stress that a central aspect over here is a bottom up approach, with active involvement from every sector of the community: civic, public business, and knowledge institutions. Main actions over here include for instance:

- creating the conditions of a continuous process of learning and innovation;
- broad coalitions: specialists, researchers, academics, practitioners, businesses, policy makers and activists in the related areas of technology, transport, land use, urban affairs, environment, public health, ecology, engineering, green modes and public transport;
- integrating smartness, local context, citizens, sustainability in real-life testing and experiential environments (Mobility Living Labs);
- developing prospective areas for Public-Private-People (PPP) Partnership for innovative sustainable transport and mobility solutions in urban areas;
- interactive and participatory processes to commit people in their role as “citizens” and not just as “mobility users” within the development and implementation of innovative technology products and services in the city

In the final contribution *Luuk Boelens* confronts these challenges with the recent decree of the Flemish government with regard to complex infrastructure planning. Also based on international literature with regard to complex decision making, he shows that this decree doesn't deal so much with the ongoing complexity of real life settings itself, but rather tries to reduce that kind complexity in a layered, linear system of decision making and a one-government-fits-all-concept. Therefore this decree only serves the streamlining of the internal affairs of the Flemish Administration – which is for all that matter even disputed in itself (see Beyers 2014, SERV 2014) – and not the adaptation of mobility planning to the changing and infinitely complex decision circumstances in real life itself. Next to the fact that this legislation starts at the wrong end of the problem (fixing the impact and avoiding complexity whatsoever), he therefore expects no real contributions of this decree to a more efficient and smarter mobility planning, let alone a more resilient or sustainable one. Instead he stresses that mobility planning has to become more situational in order to develop focussed mobility measures with regard to specific life styles, healthy accessibilities, reciprocal interaction between environment and travel modes, the introduction of new technological means over here, within for instance participatory living mobility labs as mentioned before, etc. Here he distinguishes several degrees of complexity, depending on the object of mobility planning and the actors involved: fixed, dynamic, open and fuzzy. In fact each of these situations asks for a specific governance of these challenges of sustainable mobility: smart, procedural, adaptive, collaborative, co-evolutionary. Although each of these planning approaches is still in their infant phase, there is an ongoing need to further elaborate them. Only in this way mobility planning could become more involved with the major challenges mentioned before, as that it could induce a more overall conditional vision in this respect.

Towards a more sustainable policy and research agenda

What would this all mean for a future policy and research agenda on sustainable mobility?

The first line of thought (SOCIETY AND SPACE) seems to drive towards an urgent need for a better understanding of 'soft' factors such as personal attitudes and lifestyles. Such soft factors must be questioned in relation to transport and mobility in the first place (e.g., how do people perceive car versus public transport, do people prefer multimodality or not). But also other themes that are related with transport and mobility such as residential and workplace location, health, climate awareness, subjective well-being and happiness? Without this, the attention for the software of transport can never reach a comparable level as the dominant hardware of transport. Future research should therefore focus on how attitudes and lifestyles are formed and change throughout the life course of individuals and households. This refers to the impact of past and future life events on current attitudes and behaviors, but also to the extent to which attitudes and behaviors are shared across different generations, peer groups, places and cultures.

The second line of thought (TECHNOLOGY AND INDIVIDUAL TRAVEL) drives towards a better understanding and policy processing of the ongoing use of new technological means that pervades daily life and allows us to construct connected mobility and interactive design to facilitate increasing individual demands. The availability of smart city sensors, internet of things and big data processing are not a technological goal as such, but have increasingly become a supporting means to better understand the individual and collective mobility needs and to set up a dialogue between mobility stakeholders and the consumer. Design of this technology transcends pure engineering and requires a multidisciplinary approach that combines among others information processing, user-centric design and participatory governance.

The third line of thought (GOVERNANCE AND COLLECTIVITY) drives towards a better understanding of the complexity of decision making and the adaptive, collaborative or co-evolutionary 'governance' of complex mobility situations. The coming decades will bring disruptive changes in the mobility system, based on the introduction of new technologies (making vehicles, infrastructure as well as users more connected), but also based on the emergence of new business models and actors (especially of new types of providers and brokers). Combined with the new mobility cultures following broader megatrends in society, this will bring new challenges to the mobility governance in different situations. There is no one-size-fits-all solution anymore, but there is a need for specific and situational approaches. Further research on possible mobility scenarios (from 'mobility as a service' to 'individual mobility luxury') and how they relate to mobility paradigms (sustainable mobility, place-making) will have to clarify adequate policy and governance approaches to meet the challenges for the mobility as well as for the spatial disruptions they might cause.

However, one could also question the ‘sustainable’ adjective of mobility itself: would in fact ‘no-mobility’ become the best sustainable, safe and robust mobility whatsoever? Therefore, this book also includes a fictive dialogue between two ‘ironic’ mobility experts. That dialogue starts with a discussion on the dialogue as a genre of scientific writing itself. It subsequently reflects on the concept of sustainable mobility and illustrates that there is no such thing as a homogeneous sustainable mobility discourse. The ‘ironic experts’ argue that sustainable mobility primarily deals with questions of justice and goodness and establishes a link to social justice-inspired work. Nevertheless, and after some thoughts on irony, they also conclude with a twofold role of transport studies. Firstly, researchers are in the position to make the normative nature of discussions on mobility more visible, and to reflect on the principles underlying transport policy. Secondly, they are able to make a profound analysis of the current transport system and its genesis. It puts our work as mobile experts and planners profoundly into perspective, although there evolves also a growing need to analyse and study mobility to its very psychological, technological and spatial core.

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