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Societal trends, mobility behaviour and sustainable transport in Europe and North America: the European Union network STELLA

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Abstract This contribution introduces the work of the European Union network Sustainable Transport in Europe and Links and Liaisons to America (STELLA) in the first section and examines especially social and behavioural aspects of sustainable transport from a transatlantic perspective in the second section. One of the most significant societal trends, the ageing of societies, is surveyed and its implications for mobility behaviour are shown. The sustainability of this behaviour is considered along with constraints and drivers of this behaviour in Europe and North America. The contribution takes up relevant policy issues and concludes with a discussion of a transatlantic research agenda on social and behavioural aspects of sustainable transport especially concerning the elderly.

Keywords Mobility · Traffic and transport · Ageing of societies · European-American comparative research

for a sound and sustainable development of the emerging European society. The new position of transport and communication in the European economy raises many intriguing policy and research questions. Transport in Europe is at the crossroads of strong but antagonistic interests, which can be summarised under the following headings: continued economic growth, fair geographical accessibility, and favourable quality of life. These research and policy issues in the transportation sector are certainly not unique for Europe but are also abundantly existent in many other countries, regions and cities in our world. North America (in particular, the United States and Canada) offers in this context a fascinating spectrum of new developments in the area of transportation, land use and communication systems. There are many common elements but also various contrasting characteristics compared to the emerging European situation.

Introduction

Transportation, mobility and communication are at the heart of current European research and policy interest. They present both great opportunities and severe threats

The STELLA network

Transportation research in both Europe and North America is widely recognised as a high-quality knowledge activity, with many spin-offs for both the public and private sector. However, so far research on transportation issues in both regions has been undertaken mainly in isolation and fragmentation, with the inevitable consequence of lack of synergy and of mutual learning mechanisms. Taking this into account the European Union has founded a transatlantic network programme called Sustainable Transport in Europe and Links and Liaisons with America (STELLA).

STELLA is a thematic network within the Growth Programme of the European Union's Fifth Framework Programme of research and development. It centres around common issues in transatlantic transport research. Its aim is to generate value added from knowledge exchange and to support a common research approach from both sides of the Atlantic, which will not only be to the benefit of the research community but also

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be of interest to policy-making bodies and industrial organisations. By bringing together research institutions, universities, industry and public authorities in the transportation field the following three objectives will be met: to create an institutionalised platform for exchange of scientific information, to foster a better understanding of the (common and different) causes and backgrounds of mobility behaviour in both Europe and North America, and to foster and create conditions for applied comparative research in both Europe and North America. The overriding goal of STELLA is to generate a clear added value from knowledge exchange and a common research perspective that is applicable at both sides of the Atlantic.

The STELLA network addresses five major focus areas which have been identified by both researchers and users in a series of recent meetings and publications as critical fields of interest for a transatlantic thematic network in the transportation field. These are: (a) globalisation, e-economy and trade 2, (b) information and communication technology (ICT), innovation and the transport system, (c) society, behaviour and private/public transport, (d) environment, safety, health, land use and congestion and (e) institutions, regulations and markets in transportation. The STELLA network covers a 3-year period and started in January 2002. The concrete actions and results of the STELLA network find their origin in the focus areas. They form the integrating core of the network. The STELLA network comprises mainly two key institutions: Network on European Communications and Transport Activity Research (NECTAR), initiated by and linked to the European Science Foundation (ESF) in Strasbourg, and the Sustainable Transportation Analysis and Research (STAR) network linked to the National Science Foundation in Washington, D.C. ESF acts as the intellectual base for the STELLA activities in relation to national European research councils. On the American side the Transportation Research Board (TRB) is one of the organisations to liaise with, while on the European side a close cooperation with the European Commission's Directorate-General for Energy and Transport is ensured (and also with various public and private bodies), so that both the public and the private sector are directly and indirectly linked to STELLA.

The focus groups

In the following the core goals of the five focus groups (FG) are briefly presented.

Focus group 1: globalisation, e-economy and trade

This FG addresses the transport and trade implications of the historical shift from a transportation economy (t-economy) to the electronic economy (e-economy). Some persons see a great opportunity for substitution between physical and non-material transport, but others claim the contrary in the era of globalisation.

Focus group 2: ICT, innovation and the transport system

Drastic changes in modern technology, in particular in the ICT field, raise many research and policy questions in the transport sector. This FG seeks to perform compares North America and Europe in terms of the ways in which ICTs are intersecting with new ways of living and working in metropolitan regions, creating a complex mix of travel substituting, enhancing and generating effects.

Focus group 3: society, behaviour and private/public transport

It is increasingly recognised that modern life-styles in affluent societies do not lead to sustainable outcomes. This also applies to mobility behaviour. Social change affects transport and is affected by transport. In close interaction with social values and individual attitudes, mobility and transport patterns are linked in complex ways with significant social trends, such as the adoption of suburban life-styles, ageing populations, and the decline of the nuclear family. This FG will explore the inter-relationships between social change and transport in the very different spatial organisation and cultural contexts of Europe and North America.

Focus group 4: environment, safety, health, land use, and congestion

The transport sector is fraught with many external conditions. This FG will undertake a comparative study of environmental, safety, health, land use and congestion aspects of transport, and of policies directed at these issues in North America and Europe. The geographical scope of analysis extends from local effects to global phenomena. Policies to be studied include transport pricing and regulation, financing, and investment intended to increase economic growth and cohesion.

Focus group 5: institutions, regulations and markets in transportation

The transport sector enjoys a great interest from the public and from policy-making bodies. This FG aims to exchange and pool relevant knowledge, with a view to a comparative analysis of institutions and regulatory mechanisms in European and North-American countries that are relevant for travel behaviour in general and sustainable transport in particular.

STELLA propositions

The STELLA thematic network has prompted an intense debate in both Europe and North America on the future perspectives of transport research and the foundations of policy analysis in this field (including the

question on the formulation of policy lessons). Based on a series of three meetings in every FG (founding meeting with trend notes, consolidation and exploration meeting with positions papers, seminars with synthesis papers) and several cross-sectional meetings with all leaders and members of all FGs (Policy Issues Forum, Videoconference, Topical Users Meeting) it was possible to reconfirm the basis for reaching the three main STELLA objectives, in the light of a policy research agenda with a view to achieving sustainable transport. Some common propositions from all FGs can be extracted up to now in the light of a possible research synthesis. This is illustrated below with reference to relevant spatial, economic, environmental and policy frameworks.

Spatial framework

1. Compact cities and compact production locations replaced by lower density settlements (e.g. in relation to United States cities in FG3; in terms of a 'network model' of production in FG1, and in terms of space-time reorganisation processes in FG2; in relation to outsourcing practices in FG5; in relation to the requirement of unlimited access to activities and services whenever and wherever the customer wants in FG4).
2. Discrepancy between the layout of urban structure and the present-day requirements imposed by the volume of traffic (e.g. in FG3, but also present in FG1 with reference to ICT and logistics requirements; in FG5 in terms of the increasing independence of local administrations; in FG2 in terms of space-time reorganisation processes).

Economic framework

3. Quality of logistics services related both to the flows of goods and/or persons and to the flows of information (e.g. in relation to the requirements of flexible freight transportation in FG1; with respect to the changes in transport mode structure and corresponding infrastructure facilities in FG3; in relation to space adjusting technologies and information enhancement in FG2; considering the effects of technological change for sustainable transport and the effects of improved ICT for the control of complex organisations in FG5).
4. Increasing relevance of new segments of transport demand (e.g. social and economic changes in eastern Europe, and elderly/female mobility in FG3; mobility rights in FG5; ICT and logistics requirements in FG1 and in FG2; significance of life-style patterns on travelling in FG4).

Environmental framework

5. Relevance of transport externalities at the local-global level (particularly investigated by FG4, which

also emphasises the linkages, in various aspects, with the other position papers).

6. Relevance of sustainable mobility (implications of ICT and e-commerce for sustainable development in FG1 and FG2; in relation to production and consumption in FG5; mainly in relation to congestion in FG3, and in relation to the development of appropriate measurements and indicators in FG4).

Policy framework

7. Relevance of interest groups (e.g. the participation of actors representing various interest groups in the process of transport policy and spatial planning in FG3; with reference to the role of organisations in FG5; and in FG2 in terms of opportunistic collaboration).
8. Role of institutional conditions (e.g. the dual role of institutions, beneficial in some contexts and hampering others, in FG5; how ICTs are socially constructed and embedded in the distribution of authority, power, and opportunity in FG2; the role of institutions in regional policy and spatial planning in FG3; the role of institutions for the development of trade and logistics in FG1; the role of institutions for the practical (however complex) implementation of policies, such as decoupling, in FG4).
9. Analysis of barriers, bottlenecks and constraints in required policies (pointed out by all five FGs).

Society, behaviour and sustainable transport

In the following the main results of the third FG of the STELLA network ('Society, behaviour and private/public transport') are presented, since especially aspects concerning the ageing of societies and elderly persons are taken into account (European Conference of Ministers of Transport 2000). STELLA FG 3 is the FG the authors of this paper are responsible for.

The ageing of societies and implications for mobility behaviour

Modern societies are undergoing a major demographic transition. A larger proportion of the population is reaching old age. In nearly all countries of the western world the elderly already make up over 12% of the total population, and this percentage is projected to increase substantially by 2010. In the international comparison Italy is the leader with 18.3% of its population being aged 65 years or over while the United States has a comparatively young population, with only 12.6% of its citizens being older than 65 years. An increasing number of these individuals are licensed to drive, and they drive more than their age cohorts a decade ago. In view of the constantly increasing number of old and very old persons in our societies it is no surprise that their mobility behaviour has become an issue of public and scientific interest

(Mollenkopf et al. 2004). On the one hand, mobility (the ability to move about) and traffic (the transportation of people, goods, and news) have become an even more important precondition of ensuring the ability to lead one's everyday life, keep up social relations, take part in every kind of activity outside one's own four walls, and seek out places subjectively significant or objectively central to provide for daily material needs and health care. On the other, mobility is increasingly jeopardised as a person ages (e.g. Burkhardt 2000).

People are living longer and having fewer children, although the latter phenomenon is more pronounced in Europe ('Demography and the West', *The Economist*, 24 August 2004). Of those living longer, more are women. With the ageing and feminisation of the population has also come a shrinking of the middle class and an increased spatial concentration of low-income members of society (e.g. P. Krugman, 'For richer: how the permissive capitalism of the boom destroyed American equality', *New York Times Magazine*, 20 October 2003). Elderly, female, and socially excluded (principally low-income) users of public and private transport have different mobility needs which are met more or less well by existing systems, and we consider each in turn.

Mobility needs of elderly transport system users

For the elderly, mobility is a quality of life issue. It is essential for maintaining attributes of personal choice and independence, familiar habits, and life-style. Mobile elderly are able to reduce personal isolation, participate in recreational activities, obtain goods and services, maintain access to financial and personal consultants, remain active in a religious or spiritual community, and maintain intellectual stimulation (Schaie 2003). Although ageing is accompanied by waning strength (Fozard 2000), the needs of the elderly and those of the disabled are different.

Good physical mobility has been found to be the best predictor of elderly persons' satisfaction with mobility, while neither gender nor size of household significantly affects satisfaction. Walking is the most important mode for older persons (Gaffron 2002). A comprehensive notion of mobility should take into account the degree of mobility realised, the range of activities engaged in, the variety of transportation modes available to users, and satisfaction with mobility.

As women age, they tend to drive less or cease driving altogether more so than men. The growing difference between the numbers of elderly who survive and cease to drive (or do not drive), and those who survive and continue to drive indicates that there will be a growing demand for trips that are not automobile dependent (Tacken 2004). While the difference is greater for women than for men, the number of elderly men and women needing public transportation services will be increasing (Pitfield and Waldorf 2003). This potential development has a number of implications. In addition to a need for

greater provision of public transportation, especially if older persons should be convinced to quit driving, traffic management will need to be adapted to the changing driving population (Hakamies-Blomqvist 1993; Rosenbloom and Stahl 2002). Road markings and street signs will need to be made more visible, intersections simplified, and infrastructure and vehicles redesigned (Jovanis 2003). The relocation of residences and facilities for retirement communities will also need to be better planned. Public transportation will need to be adapted to the needs of elderly users and information technology used more widely. And if 'ageing in place' is to become a real option for more elderly men and women, more demand-responsive transit will need to be provided.

Regarding the subjective need it has been seen that many elderly persons consider outdoor mobility as very important for their quality of life and that a decrease in mobility with growing age does not always depend on a decrease in desired mobility or on health problems but on obstacles and hindrances in the environment and in the transport system. Elderly persons often have a bad relationship to the present-day chaotic traffic conditions and the behaviour of other persons in traffic. A new balance is necessary between demand and supply, through a reorganisation of the offer and transport policies in relation to current changes and to the needs expressed by the elderly.

Improvement in public transport could better meet the needs of the elderly, especially those with reduced mobility. Fully accessible public transport options must be considered. Even flexibility in transport is very important and can be carried out by adapting the existing system or with door-to-door solutions, which respond to the needs of the elderly persons with reduced capacity or who live in isolated areas. Housing and transport infrastructures must also be modified, improving security of traffic conditions and coordinated social, urban and traffic planning, especially for pedestrians. The car will be widely used by the older population, and car industries will therefore have to design cars that meet the real needs of the elderly and their gradually declining functions. In this direction the new technologies can give considerable support.

Elderly and sustainable transport

Against this background of information on trends in settlement patterns, mobility behaviour, and the habits and needs of specific user groups such as the elderly, we consider meanings of sustainable transport. Virtually all notions of sustainability must do not only with the persistence of systems but also the conveying of a healthy state of a system from one generation to the next. Since the Brundtland Report (World Commission on Environment and Development 1987) it has been recognised that sustainability must be viewed in a number of dimensions. Minimally these would include environmental, economic and social (Heal 1993). The

question of sustainability vis-à-vis transport systems concerns not only what level of personal mobility and flexibility is environmentally and economically sustainable (for living and future generations), but also what differences in transport service availability and effective access can be consistent with social cohesion. With this dimension in mind we might also ask what level of environmental quality is *socially* sustainable (World Business Council Sustainable Development 2001).

Different perspectives can be chosen to analyse the relationships between influencing factors and elderly people's outdoor mobility and traffic behaviour in general. One focuses on 'causal' factors. For example, what socio-demographic and psychological characteristics are associated with the driving behaviour of the elderly? This perspective is chosen frequently in traffic research studies. Another perspective might be called a segment-specific approach: Can the elderly as a group be subdivided into homogeneous subgroups? For example, are there variables that characterise those elderly persons who have a positive attitude toward public transport? It is important to bear this second perspective in mind, since 'the elderly'- and particularly the 'very old'-are a heterogeneous group (Schaie et al. 2003). This helps us to identify and understand their different mobility needs, their diverse driving behaviour, and the variety of their compensatory strategies (Rudinger and Jansen 2003). This perspective allows to determine the size of the different homogeneous subgroups of the elderly and to identify the characteristics of these subgroups as a basis for improving traffic safety and options for outdoor mobility (Schaie and Pietrucha 2000). Based on life-style differences (e.g. stimulation-seeking, intellectually curious, indifferent, passive, and negativistic) it is possible to isolate different types of mobility patterns of the elderly (Rudinger 2002). Typological approaches confirm the existence of groups of elderly deserving special attention with regard to intervention, rehabilitation and prevention (Willis 2003).

Thus improvements in the mobility situation of elderly must focus as much on transport policy and socio-political measures as on appropriate urban development planning. It is important to create flexible, user-centred options for mobility that offer a genuine alternative to both the private automobile and traditional local public transport services, and provide for neighbourhoods that also respond to the needs and wishes of an ageing population. For the elderly, whose life space contracts with advancing age because of their inability to overcome environmental obstacles, it is crucial that the areas near their homes have readily accessible stores, medical and care services, appropriate public transport and other facilities that will allow them to continue leading independent lives and being full members of society.

A transatlantic research agenda

The profound changes in the demographic structure due to the growth of ageing populations in developed

countries, especially in the European Union countries and the United States, will clearly require a profound reorganisation of society, both in public services and in private supply. The elderly users will be qualitatively different, as they will work longer, be more alone, and have a higher level of education. The majority of the elderly would probably require greater mobility than at present, regarding the need to work, travel and have interpersonal contacts. However, it can also be assumed that the current 'ageing of ageing' will increase the number of persons with reduced mobility performance or with cognitive and sensory disorders (e.g. sight, hearing), who today are often only potential users or excluded ones?

Therefore emphasis should be placed on the expected increase in the number of elderly persons with mobility impairment and the transportation challenges associated with this change. In order to keep older persons mobile and allow them to be independent it is important to know their mobility patterns, attitudes to transport and different needs, with special attention given to elderly persons with mobility impairment. Common surveys must be carried out in the United States and Europe and will provide useful comparative findings.

Developing effective transport policies responsive to ageing in Europe and the United States requires recognition of the needs of the older population, with special attention to those who are impaired. Persons with reduced capacities, which hampers their life-style, often desire to participate in outdoor activities, but their transportation possibilities are dramatically reduced, entailing many new needs in transportation supply. Data from European and United States surveys indicate substantial barriers to outdoor mobility for the elderly population, particularly those with mobility impairment (Marcellini and Allen 2004). As the populations of Europe and the United States continue to age, transnational collaboration is essential to create environments that meets the needs of the elderly so that they can live their later years as active and valuable citizens of our communities.

Research questions and directions

In parallel, all five FGs have emphasised the growing diversity, complex dynamics, and multiple feedback effects between transport, land-use, socio-economic systems and demographic changes in relation to: (a) globalisation and demand/supply in both passenger and freight transport (FG2, FG1), (b) ICT and intermodality in both passenger and freight transport (FG1, FG2), (c) socio-political changes (FG3, FG5), (d) the interlinked system of land use, transport and life-styles (FG4, FG3) and (e) institutions, regulations and border effects (FG5, FG4). In addition, the impact of these dynamic frameworks on sustainability has been highlighted. Particularly, the study on the communalities/differentiations of these effects in different spatial-economic and social

contexts has been identified as necessary area of research.

Cross-cultural research is then envisaged in the design of a comparative analysis between Europe and North American. Hence different spatial levels—from theoretical, methodological and empirical viewpoints—might be analysed, by investigating concepts, data, and particularly the different speeds of ICT and transport dynamics and behavioural responses.

In this framework, there is a need to deepen, in both the European and North American contexts: (a) theoretical perspectives (such as the possible change of paradigms or modelling, e.g. in the sustainability concept, decay functions, behavioural models, forecast methods, and in general, in transport theory), (b) methodological issues (such as the exploration of new research methods, e.g. structural equations, multilevel models, self-organised criticality issues), (c) empirical evidence on the ongoing (un)sustainable transport-economic and social scenarios and (d) a strategy for inferring meaningful policy lessons in the context transport policy research. These ingredients appear to be a common focus, with a view to the related policy analysis and the future elaboration of a policy research agenda. Therefore, at the final STELLA meeting, the Topical Users Meeting, STELLA findings will be presented to the EU, the Policy Issues Forum, representatives of public bodies in the transport field, city councils, industrial organisations. This is part of the dissemination strategy of STELLA, with an orientation towards the demand side of transportation research.

Policy research directions

In general policy must take into account that sustainable transport and mobility systems require the co-existence of several different mobility modes. Moreover concepts of mobility management must be fostered and tax policies should not unsuitably favour a singular mobility mode (e.g. taxes on car fuel, but not on aircraft fuel).

We need a policy that avoids discrimination and social exclusion (mobility as a 'basic right', e.g. access to mobility for everyone, reasonable tax policies), especially concerning the elderly. On a transport dimension a balance between modes and means of transport is necessary, so that those who give up the use of a private car have available alternatives of good quality, without any discrimination. On a social dimension it must be assured that citizens are provided with a mobility system adequate for their needs and that no exclusion through price, or any other criteria, will be imposed on the base of economic or financial grounds.

Social, urban and traffic planning must be coordinated on micro-, 'meso-' and macro-levels (e.g. implementation of advisory boards of elderly in local/city councils). The accessibility, safety and security of different mobility systems (from an objective and a subjective attitudinal perspective) must be improved.

Finally, social barriers to implement sustainable mobility systems must be taken into account, in particular, when interest groups mobilise effective opposition.

Research infrastructure and research policy issues to encourage international comparative studies

To facilitate international cooperation in the transatlantic study of social aspects of sustainable transport there is a need for the development and sharing of data sets. There is also a need for benchmark assessments of how well common models capture stylised facts of travel behaviour in Europe and North America. Furthermore conditions for applied comparative research in both Europe and North America regarding behavioural motives, innovative strategies and policy assessment in the transportation sector with a view to sustainable transport must be fostered and created. New evaluation tools for transport policies based on an integration of the three pillars of sustainability—economic, ecological and social—must be designed. An international effort to develop evaluation methodologies may be very beneficial for transport policy. Researchers and politicians must deal with data barriers: To what degree does lack of data represent a policy barrier? Finally, there is a need for meta-analyses to assess the transferability of policy and practice (based on worst and best case examples).

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