Transatlantic Transport Research: Strategy and Scope

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The field of transportation research is in full motion. The need to address sustainability aspects of transportation prompts both intriguing policy questions and fascinating research challenges. On both sides of the Atlantic a great variety of research strategies and projects have been developed to cope with relevant research questions. The STELLA Transatlantic network aims to focus the attention on these issues with a view to the exchange of information, the execution of comparative research and the establishment of relevant network activities in order to design a future research agenda. The paper introduces the nature of these research questions from a transatlantic perspective and presents the contours of a realistic policy research agenda for transportation in a sustainability context.

1. Transportation on New Roads

The benefits of transportation today are often countered by a series of disbenefits. This is not just a problem of the modern world. At the time of the Roman Empire and later during the Middle Ages the use of vehicles (chariots, wagons and carts) created problems of congestion and excessive noise for cities. Policies were enacted during these early times in an attempt to alleviate the problems created. In modern times, transportation is still the source of numerous

problems for most nations of the world and their cities. However, the order of magnitude and the intensity of transport problems have risen to an unprecedented degree. It is therefore of little wonder that notions such as sustainable mobility or sustainable transport have gained much popularity, even though their direct meaning is not unambiguous or precisely measurable. It has become clear that transportation is a double-edged sword, which divides the societal impact into favourable outcomes (such as prosperity, accessibility and communication) and unfavourable outcomes (such as fatalities, environmental decay and congestion). The major challenge today is to find a balance between these two sets of outcomes (Freire and Stern, 2001).

Transportation in our modern society has followed a dynamic pathway and experienced an unprecedented evolution, as witnessed by the changes in life-styles, technologies, and globalization trends it has stimulated. A solid strategic analysis and a sophisticated applied modelling approach to this complex force field are an enormous challenge for the transportation research community. There is a clear need for systematic fact-finding, leading to consistent and harmonized empirical databases, which constitute a necessary requirement for a mature comparative study program on mobility and transportation patterns in Europe and North America, as well as elsewhere in the world.

Modern societies exhibit a high level of mobility in the form of intensive flows of people and goods. This mobility generates many benefits for individuals, firms and society at large, but leads also to many negative externalities in the form of pollution, accidents, congestion, and land use deterioration. In particular, motorized forms of transport are a source of many environmental externalities, especially in densely populated urban areas. In the EU-15 countries motor vehicles used in road transport are responsible for 57% of the carbon monoxide emissions, 46% of the emissions of nitrogen oxides and 31% of the hydrocarbons (volatile organic compounds) emissions. Comparable figures for the US are 66%, 37%, and 27%, respectively. However, the decreases in emissions in Europe and America during the last decade have substantially improved air quality. Nevertheless, the air quality situation in many European and some American cities is still alarming with inhabitants experiencing pollutants in excess of established air quality standards. The advantages and disadvantages of our transport-intensive economy call for a thorough analysis of the driving forces, the impacts and the policy responses of highly mobile societies. It is noteworthy that all developed countries of Europe, Asia and North America seem to move towards similar patterns of mobility intensity.

Over the past decade in various countries, a broad portfolio of policy strategies has been designed to deal with the sustainability aspects of transport (see Button and Verhoef, 1998). These policies have varied across countries in terms of their nature, intensity, acceptance and enforcement. A particular on-going motivation for addressing sustainability issues from a transportation perspective stems not only from the wide range of externalities associated with this sector, but also from the fact that, in contrast to most other sectors such as manufacturing or agriculture, transport has not managed in either relative or absolute terms to reduce its fossil fuel consumption, so that many forms of air pollution and particulate levels remain high. The cumbersome research and policy issues in the transportation sector are certainly not unique for either Europe or North America, but exist also in many other countries, regions and cities in the world. Consequently, comparative and combined policy research on common

themes involving North-American and European perspectives and expertise promises to offer 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 in the emerging situations on either side of the Atlantic. In the next section we will offer a panorama of issues and research challenges in the field of transport, communications and mobility.

2. Transportation in a Complex World

Mobility is a complex phenomenon, whose future is fraught with many unpredictable consequences since the transport system is influenced by a multitude of variables, including technology, spatial behaviour, the configuration of networks, the emergence of policy organizations and institutions, or regulatory systems (including road pricing, advocated more than 80 years ago by the Cambridge economist Pigou). Spatial mobility is a function of transport modes and networks, economic activity, urban development and environmental factors. The relationship with spatial modes of living (urbanization, e.g.) also plays a role; for example, Newman and Kenworthy (1989) have shown that European cities are more compact than American cities, with a corresponding higher use of public transport and a lower energy consumption per capita. Therefore, it is not surprising that average petrol consumption in American cities is four times higher than that in European cities. The balance between compact ways of living and car density (and use) in suburban areas is a delicate one. Several experts point at an uneasy relationship, as it seems as though cities all over the world are moving away from sustainable patterns rather than towards them.

Clearly, transportation takes place in dynamic force field where land use (e.g., high density land use, residential neighbourhoods, spatial concentration of facilities, different transport modes, zoning principles etc.), and transport policies (e.g., congestion measures, environmental strategies, infrastructure design, access and safety) are integrated in a rather complicated ramification. This often calls for more integrated strategies, but these are often facing many hurdles due to the vested interests of various parties involved with mobility.

Spatial sustainable development is a policy concept with a high degree of popularity in the past years. Against this background, sustainable transport has also become an important policy idea that is very much 'en vogue' nowadays. It refers to an acceptable level of social costs associated with the physical movement of people or commodities (Banister et al., 2000). Sustainable transport – as a policy orientation for the transport sector – has prompted a debate on various fronts, such as the relationship between economic growth and transport volumes, the relationship between transport and environmental externalities, and the relationship between new technologies and the development of transport systems (see Black and Nijkamp, 2002; Crane and Chatman, 2003; Cropper and Gordon, 1991).

Transport in a modern society appears to generate conflicting views of the socio-economic and environmental aspects of mobility. From an economic perspective, transport may be seen as an input factor in a societal goal to favour individual welfare and progress in which case containment could be motivated on the basis of transport cost minimization arguments (see also Rietveld and Bruinsma, 1998). But one may also conceive of transportation as an

opportunity, or even a necessity for growth, spatial accessibility and competitiveness (cf. also Chandra and Thompson, 2000; Conrad and Seitz, 1994; Rephann and Isserman, 1994). In the latter case transport development has to be encouraged. These two viewpoints not only hold in a narrow context, but also in combination with ecological or safety constraints. It is evident that in all cases, economizing on energy consumption is a wise strategy, so that the adoption of a 'no-regret' policy is always a meaningful and smart approach to be supported. Against this background, technological improvements in transportation systems are always warranted, in particular if they aim to improve the performance at a lower energy cost.

It is no doubt true that technology plays a major role in any sustainable transport policy. Examples are advanced logistics, transport automation (for both passengers and freight) and new energy sources (e.g., biomass, hydrogen). With rising fuel prices one may expect more drastic changes in current transport systems.

Technology is thus a critical factor for improving the performance of transport systems. Clearly, if transportation system improvements following upon technological advances would lead to a velocity increase, then the question will emerge whether the rise in discretionary time will be used up immediately for more trips or whether it will be spent otherwise. Travel time budget studies appear to indicate that the total daily travel time budget is on average fairly constant within and between metropolitan areas. In that case, the costs and benefits of additional trips would have to be evaluated from a sustainability perspective. This question calls for a clear behavioural perspective in studies of spatial and transport sustainability.

The spatial constellation of transport systems is also an important factor. Whether or not a compact city is an efficient geographic configuration from a transportation perspective is an open question (see Hall, 1994). Much uncertainty arises from the steep rent gradients in dense urban areas, and these spatial-economic implications would have to be traded-off against possible environmental benefits. Actual developments in many countries seem to move towards more diffuse patterns of living and working, so that it will be hard for urban and transport policy to change the current tide. In any case, we believe a more integrated land use and transportation perspective at local levels is a *sine qua non* for sustainable mobility policy. Such a policy is increasingly leading to a complex portfolio of initiatives in which issues like public facility location, public transport, hubs and spokes, value of time, multifunctional land use, intermodal transport, ICT and e-commerce, mobility management, car sharing, road pricing and many other elements play a role (see Banister, 1998). There is a wide array of goals involved in sustainable mobility policy, and there are several policy strategies that could be pursued. Consequently, an open but intriguing research challenge lies in the identification of an optimal policy mix that is supported by sound scientific evidence, on both the European and North-American side. This task calls for effective and open research collaboration.

Exchange of relevant insights into complex transport systems may lead to more effective policies for sustainable transportation, provided we know what the theory tells us, what statistics tell us, what analysis and modelling tells us, and what policy analysis tells us (see also Reggiani and Schintler, 2005). These insights cover a wide array of issues, such as economic principles (e.g., efficient cost strategies), social principles (e.g., access to transport), environmental principles (e.g., ecological bases of sustainability) and

technological principles (e.g., smart design or smart management). These issues have in recent years extensively been discussed in a transatlantic network of transport researchers and will now be highlighted.

The STELLA (Sustainable Transport in Europe and Links and Liaisons with America) Thematic Network has been one of the pioneering initiatives to address sustainable transportation issues from the perspective of creating a Transatlantic (policy) research agenda. A thematic network serves to facilitate communication and collaboration between existing or new (policy) research organizations, appropriately organized working groups and leading researchers, and to exchange and disseminate the knowledge acquired in this network constellation. Through such networks research efforts can be optimized, a critical mass of interested experts can be reached and a sufficient impact on policy-making bodies or the private sector can be achieved.

The structure of the STELLA operation comprising five focal areas of research on sustainable transport and transport policy is mapped out in figure 1. STELLA has started with a sound, high ambition and has managed to realize its goals thanks to the dedicated efforts of its scientific members on both sides of the Atlantic. It has not only prompted a lot of enthusiasm among its members, but it has also created a platform for effective joint cooperation between researchers from both North America and Europe that is unique. It has proven its viability and vitality in many ways, through a large series of workshops, through numerous joint publications, through the involvement of public and private bodies, and through the creation of the broad common awareness that the test to reach a process of sustainable transport is both necessary and difficult. It has gained many new insights which will turn out to have a great impact on both the research agenda and on policy-making in this field. The complex force field and spatial mobility in the context of five STELLA focus groups can be mapped out as follows:
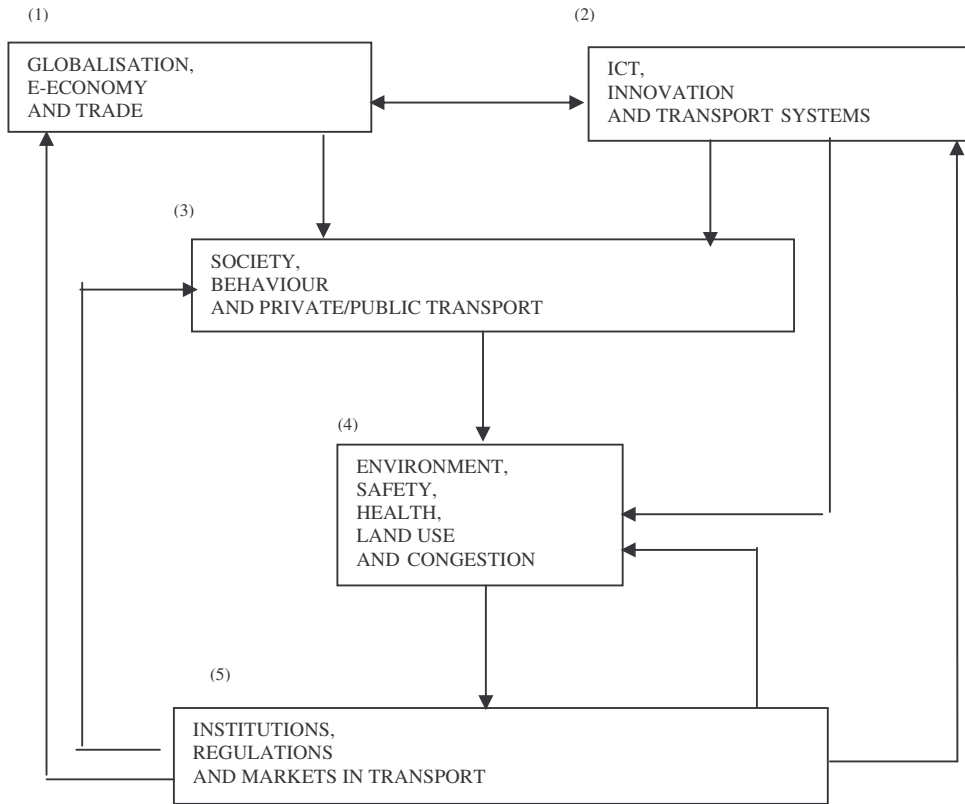
(1)

(2)

| GLOBALISATION, E-ECONOMY AND TRADE | ICT, INNOVATION AND TRANSPORT SYSTEMS |

(3)

SOCIETY, BEHAVIOUR AND PRIVATE/PUBLIC TRANSPORT

(4)

ENVIRONMENT, SAFETY, HEALTH, LAND USE AND CONGESTION

(5)

INSTITUTIONS, REGULATIONS AND MARKETS IN TRANSPORT

Figure 1. The complex force field of spatial mobility

Globalization certainly plays a key role in this dynamic network framework. Globalization in this context refers to the broad area of increasing internationalisation of markets, changing consumption patterns and the shifting of industrial activities all over the world, with clear consequences for (international) transport and the environment. The increasing awareness of globalization phenomena has, in fact, not only demonstrated the complexity of the transport phenomenon, but also the fragility of networks and their links (e.g., the recent events in the year 2001, SARS, and the War in Iraq). Globalization appears to be the underlying driving force in the emerging pattern of new consumer/user activities, with an immediate impact on related transport activities.

The above-mentioned trends call for a thorough exploration of contrasts and similarities in both Europe and the United States and Canada. These issues are also related to the need for a 'methodological' transatlantic synthesis of the various research approaches adopted so far in transport analysis and its applications. The present paper attempts to offer a novel and realistic perspective in this respect, together with newly emerging reflections on the desirable future evolution of research in this area.

3. STELLA as a Transatlantic Research Network

The objective of the STELLA Thematic Network centers on common issues in transatlantic transport research. In particular, it aims to:

- create an institutionalized platform for exchange of scientific information (in particular, research in progress), for the pooling of (partly common, partly contrasting) experience and for facilitating research cooperation among European and North-American transportation researchers and experts;
- foster a better understanding of the common and different causes and backgrounds of mobility behavior in both Europe and North America, particularly with a view to the impacts of policy (transportation policy, land-use policy environmental policy, economic policy);
- shape feasible conditions for applied comparative research in both Europe and North America regarding behavioral motives, innovative strategies and policy assessment in the transportation sector with a view to the achievement of sustainable transport.

The STELLA network addresses five major focus areas that were identified by researchers and users in a series of preliminary meetings as critical fields of interest for a transatlantic thematic network in the transportation field:

- Globalization, E-economy and trade
- Information and communication technology, innovation and the transport system
- Society, behavior and private/public transport
- Environment, safety, health, land use and congestion
- Institutions, regulations and markets in transportation.

Over a period of more than three years, STELLA has operated along a decentralized system with five rather independent nuclei (coined Focus Groups) which were nevertheless coordinated through a central management system. A great many Focus Group meetings in both Europe and North America were organized so as to generate new ideas for a (policy) research agenda on sustainable transport from a transatlantic perspective. These meetings have been extremely useful and led to the emergence of various common strategic propositions, in particular:

- the need for developing new conceptual and methodological frameworks;
- the need for deepening the sustainability concept, by offering more operational indicator systems;
- the need for reaching practical science-based support in order to implement policies aimed at sustainable development.

As a result of the various meetings attended by North-American and European transportation science experts, various common broad research questions were formulated, that centered in particular around the following issues:

- relevance and necessity to clarify transport sustainability, including its scope, concept and measurement;
- impact and feedback (space-time) effects among transport, growth of e-commerce, ICT, travel behavior, policy decisions and implementation.

In addition, various common policy concerns also emerged, notably:

- space-time scale of transport policy implementation in a broad spatial setting (including land-use context);
- equity, efficiency and environmental issues of the implementation of transport policies;
- barriers to implementation of transport policies emerging from different background factors at various scales.

The various scientific ambitions of the STELLA network emerged not only from the wish to generate new pathways for innovative policy research, but also to disseminate the findings on the intricate relationships between institutions, regulations and markets in transportation to a wider international audience comprising both the research community and policy-making bodies as well as users of transport systems.

There is certainly the need for a thorough transatlantic comparative analysis in the transportation sector. Despite different research traditions, different policy constellations, different lifestyles and mobility patterns and different socio-economic conditions, it is of the utmost relevance to identify commonalities and contrasts in research findings.

The following lessons can be drawn from the STELLA operation over a period of more than three years:

- Focus Groups formed the core of the network and have clearly demonstrated their viability and vitality and may be seen as kernels of future activities, even though the precise mission and number of the Focus Groups in the future may need reconsideration and revision. Also supporting mechanisms such as the Policy Issues Forum may be regarded as important tools of future cooperation. Clearly, a prominent emphasis on sustainable development in a broad sense would be needed in order to create sufficient focus for an appealing policy research agenda.

- The STELLA network has greatly benefited from accessible and appealing communication channels favoring intensive exchange of views. In the future, the network scope can be widened by incorporating also methodological challenges, data assessment and comparative results in the platform debates, supported by advanced website facilities. And finally, more creative tools such as 3-D imaging, remote sensing data, vehicle infrastructure integration tools, new GIS modeling experiments and so forth can be included as well as new appealing elements of a transatlantic network.

- In addition to a research-driven network an interest group of experts in education and training in sustainable transport analysis and policy might be formed in order to exchange best practices (including E-training) in both Europe and North America, while also Asian and Latin-American countries may be envisaged.

4. The Future of STELLA

4.1 Shifting horizons

Transportation, communication and mobility shape the face of a modern economy. STELLA has taken as its point of departure the need for sustainable transport as a major orientation for transport policy in a modern and open society. A sustainable transport policy orientation has in recent years gained much support in public and research circles. But the sustainability orientation in transport research and policy is not without critics. The relevance of this central signpost for policy has in the course of the STELLA Network's existence clearly been questioned by several STELLA participants. They argued that in the past decade neither behavioral motives nor policy directions have given a firm impetus to a measurable achievement of this objective. Many scientists and policy-makers believe that, if sustainable transport is to become a major policy focus, then more (or probably most) emphasis has to be placed on innovative transport technology. Such a new paradigm might be phrased as a search for an ecologically sustainable, economically efficient and technologically sophisticated transport system. It ought to be noted however, that the clear impact of new transport and car technology and of new logistic systems is also induced by societal concerns for the environment, climate, health and fatalities, leading to specific goals, for example, strict pollution norms and safety standards. Thus, the interface of technology and the social sciences calls for a recurrent critical consideration of mutual interactions. The question is of course: does such a new paradigm make scientific sense and would that lead to different policy frameworks? What is gained by such a change in focus and what is lost? Are technological solutions equally relevant to the North-American and European situations, and could a common worldwide view be developed for such a paradigm shift?

To put such questions in perspective, it must also be recognized that transportation is normally not a goal in itself. Transport is usually taking place in a broader context of reaching socio-economic goals, respecting safety and security, protecting the environment, taking into consideration land use changes, enjoying free life styles and so forth. Very often, transport derives its meaning from the desire to achieve other goals (such as going out for shopping, traveling to a work place, visiting a theatre, and so forth). Does sustainable transport or sustainable mobility still have a meaning in such a broad setting? Is it possible to focus on measurable criteria that would be able to demonstrate which country or region has a better performance in terms of sustainable mobility, either over time or in comparison to others? Would it be possible to identify such a set of indicators for both Europe and North America, or would such a framework have to be country-specific? The policy and research questions are numerous. Clearly, sustainability may be a commonly accepted objective, but its appearance and policy priorities may differ over time and space. Consequently, the policy research agenda would have to be multi-faceted and evolutionary in nature. It would have to be appealing and realistic, to meet the needs of society and policy-making and deserve the attention of all stakeholders involved.

We will now present the foundation of the future research agenda, based on four pillars of promising research. These four pillars – largely disjoint, but inevitably with some overlap - will be concisely summarized here.

4.2 Life style, spatial mobility and transport externalities

This first component of the future research agenda calls for a social-science based approach to transportation analysis with due emphasis on socio-psychological determinants of spatial mobility, on economic-geographical implications of the 'flying carpet' phenomenon and on welfare-economic analyses of unpaid consequences of transport behaviors (such as environmental decay, congestion and travel fatalities). It has been convincingly demonstrated in previous sections how important a broad societal and behavioral perspective is for increasing our understanding of the fundamental drivers and the sustainability consequences of transportation, communication and mobility in a modern society.

4.3 Open markets, technological change and (inter)modal logistics in transport systems

The second pillar of a future research agenda takes for granted the move towards open markets, as a result of globalization and free trade, economic integration (such as in Europe), nomadic behavior of people, and virtual openness in our world due in large part to the internet. Technological change (not only in the ICT sector, but also in the new materials sector and soon in the nanotechnology sector) is a powerful driver that reinforces various mega trends in the transportation, communication and mobility field. A particularly important role is played by new logistics developments in order to increase efficiency and reliability of existing transport modes (air, rail, road, and water) as well to create a higher value added through a synergy between different transport modes. This second pillar covers transport systems at both local and global levels, for both passenger and freight transport systems.

4.4 Performance and barriers in transport systems

Transportation serves to enhance efficiency in trade and mobility, a strategy that is important in the light of many under-performing transport systems. It also provides access to many opportunities. Consequently, the performance of transport systems is a major policy issue which deserves much attention. Therefore, the search for performance indicators (e.g., system-wide revenues, speed, reliability, safety, social access, coverage of the needs of mobility-deprived, and so forth) is an important research challenge. This research task is once more important due to the malfunctioning of most current systems. Delays in air transport, congestion on motorways, lack of parking space in cities, low speed of cargo transport, poor connectivity in railway transit, high fatality rates on secondary roads are only a few examples of the dilapidated state of modern transport systems; they all reflect the need for a proper performance measurement system with a view to timely design and implementation of effective policy measures. The number and variety of transportation barriers and impediments are indeed formidable and coping with such obstacles forms an important part of the future agenda of transport policy research.

4.5 Policies, institutions and regulatory systems in the transport market

The pervasive and strategic nature of transport systems has led to a strong and world-wide tendency for government intervention. The belief in market principles has in the past decades prompted a reconsideration of the role of the public sector in transport systems. Deregulation has become a leading principle, accompanied in recent years by a plea for re-regulation on

the basis of a redefinition of the role of governments in the transportation, communication and mobility field. It is foreseeable that in the years to come the role of transport policy-making, emergent public and private institutions in the transport market and the effectiveness and efficiency of regulations will become a subject of intensive debate in the policy literature.

4.6 A North-American Perspective

It is noteworthy that – parallel to the design of the above mentioned future STELLA research agenda – a tentative set of possible research directions has been suggested by the (US/Canadian) STAR (Sustainable Transport and Analysis Research) thematic network. These ideas were instigated by their anticipated relevance for sustainable development objectives (including transportation) and for application in transatlantic collaborative and/or comparative research. These directions are as follows:

1. *The Role of the Transport System in the Competitiveness of Firms, Industries, and Regions*. This would concern the importance of physical transport infrastructure investments and institutional resources in economic development. The research would help regions and countries to establish competitiveness in the world economy.

2. *Global Supply Chains and Sustainability – Developing a Dynamic Input-output Framework*. Relevant ideas include the monitoring, modeling, and controlling of logistical processes (including reverse logistics) to minimize bottlenecks and senseless transnational transport flows, the linking of input-output models with network models in a dynamic framework, and the consideration of the pollution and transport/environmental footprints of different industries.

3. *Evolution of the Service Sector Economy and the Growth in Transportation*. Transportation for the service sector of the economy generates increasingly large demands on the transport system that are not captured by freight and passengers studies or statistics. Understanding this role of the service economy is critical to identifying the sources of congestion and its mitigation.

4. *Emergent Temporal and Spatial Behaviors – and use of ICT in travel*. Basic understanding is required of emergent human activity patterns (e.g., work, leisure, social behavior), notably how they are influenced by new information and communication technologies. This is essential for improving the behavioral parameters in simulation modeling, and for a better assessment of policy levers, such as TDM, that are directed at travel behavior. Technologies for tracking individuals/vehicles may permit new approaches to transportation research – for example, dynamic real-time synoptic mapping of patterns of behavior across space and time.

5. *Integrated Land Use and Transport Simulation*. Agent-based models for simulating land use and transportation interactions over multiple time horizons and for different environments and institutional settings are needed to explore the dynamics of complex systems and to evaluate policy options. The agents include actors in public and private agencies as well as in households.

6. *Public Acceptance of Sustainable Transport and the Role of Education in Changing Attitudes to Environment and Transportation*. Standardized but culture-sensitive cross-national surveys would explore public attitudes to various aspects of the transportation (e.g., options for user pricing within a broad multi-national framework of environmental, economic, and social circumstances). Additional comparative analyses are needed to understand what children learn in the schools about transportation and its impact on the environment (e.g., compare textbooks and web resources used in different countries).

7. *Transport Substitutability*. The objective would be to investigate a variety of tradeoff responses in the transport sector. An evidence-base would be built on the specification and estimation of flexible demand systems.

8. *Handling Uncertainty in Transportation*. How is uncertainty incorporated into considerations of security and safety under different transatlantic institutional settings? Does research on robust systems and control theory offer insights on appropriate policy responses to meeting security and safety objectives?

9. *Indicators of Transportation*. There is significant interest in Europe and in North America in policy-relevant indicators of transportation and sustainable development. The focus should be on measures of mobility relative to sustainability. The measures should be simple, rely on existing data, and consider appropriate weighting schemes regarding the population and geographical context of different nations or regions.

10. *Web-based Infrastructure for Transportation Research*. Research portals, customized Web search engines, synchronous and asynchronous communication systems are needed to build and sustain networks for transportation researchers. The website would provide access to shared data and software, key publications, and possibilities for offering web-based courses and workshops that link groups of students and researchers from around the world. Resources on meta-research would provide information on how research is funded and disseminated.

11. *Effects of Demographic Change*. Aging populations, gender balance, permanent and temporary migrations, and other demographic factors are altering transport demands (e.g., mode requirements, public transit scheduling, etc.), and are altering safety considerations for transportation developments. Large differences in these trends within and between continents lend themselves to comparative studies at a variety of geographical scales.

These eleven STAR future research directions are largely consistent with the above-presented STELLA future research pillars. Table 1 shows the compatibility between the STELLA and STAR research ideas for the future.

Table 1. The allocation of 11 STAR research directions over the 4 STELLA research pillars

The 4 STELLA future research pillars	The 11 STAR future research directions										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Life style, spatial mobility and transport externalities		x	x	x		x		x	x		x
Open markets, technological change and (inter) modal logistics in transport systems	x	x	x	x			x			x	
Performance and barriers in transport systems	x	x			x		x		x	x	
Policies, institutions and regulatory systems in the transport market					x	x		x			x

Table 1 demonstrates many common interests on both sides of the Atlantic. The main difference is that the STAR ideas are more focused on distinct and specific research proposals, whereas the STELLA issues cover broad fields of research interest. This table shows once more that there is a great scope for new joint research endeavors, as has convincingly been demonstrated in the past years of the STELLA operation. Clearly, this table could be further distinguished according to spatial scales, transport modes etc. The next section will be devoted to the question of how such future cooperation might take place.

5. Search for New Horizons

The five STELLA Focus Groups have been instrumental in pointing out commonalities between North-American and European researchers, as well as between the research interests of each Focus Group. The fundamental goal of STELLA – to promote collaborative research and information sharing among scholars in Europe and North America – has clearly been achieved. But all publications and reports emerging from STELLA also state that much more remains to be learned. Some Focus Groups have identified key problems to be examined in future research; others have made a call for advanced demonstrations or field experiments to test novel ideas in the real world. Thus, there is need for continuing the STELLA experiment, given the fact that all participants agree on the following:

- current trends in transport in both Europe and North America are towards less sustainability rather than more,
- technological changes may be promoted and will play a key role in future sustainability of the transport systems,
- public policies at all levels of government and institutional constellations will also play a key role, and
- sustainability must be considered broadly to encompass economic, social and environmental considerations.

These elements may be seen as reasonable ways of organizing international cooperative efforts. But which topics are particularly appropriate for such efforts and how can a reasonable selection be made? The following criteria for international joint research at the transatlantic edge of our world seem to be plausible:

- research issues are common and strategic to Europe and North America, or are expected to be so in the near future,
- the manifestation, characteristics or outcomes of the transport problems concerned are preferably different in Europe and North America,
- there is a demonstrated lack of research or sharing of information on the problems at hand,
- the transport issues have a far-reaching impact on sustainable development (including e.g., land use, urban form or rural development),
- significant benefits may be expected from joint, coordinated research efforts beyond what could be achieved by separate efforts.

These criteria are undoubtedly relevant for the choice of the future STELLA research pillars, as well as for the identification of the eleven STAR research needs statements. By applying these criteria, it is possible to design a focused research agenda that can be pursued in the near future. Clearly, this agenda will be dynamic, given the rapid developments in international mobility, the demographic evolution, the fast developments in the logistics domain, the evolution of integrative networks and of fast moving consumer goods, the emergence of order-based production, the rise of multimodal (mega)hubs for air, sea, road or rail traffic, or the increasingly important role of e-commerce. It is thus plausible that the portfolio of operational actions for future cooperation on transport research at both sides of the Atlantic display quite some heterogeneity. Thus, the question is now: how to complement effective strategies that ensure the fulfillment of the future STELLA agenda? After a thorough discussion of all options for future collaboration at various recent STELLA meetings, three major future action lines may be identified:

- networking
- joint information bases
- actual research collaboration.

It should be stressed that transatlantic research collaboration and the pursuit and analysis of comparative research questions is never an end-product in itself; it is also a stepping stone in order to identify new ideas for research (Reggiani and Schintler, 2005). It goes without saying that a proper analysis and sophisticated modeling exercise of the complex force field of transportation, communication and mobility presents an enormous challenge for the transportation research community.

The research activities should be oriented towards a transition from speculative arguments to solid theory, from subjective reflections to testable models, from aggregate macro-oriented analysis to behavioral, micro-based experimental models, and from a mono-disciplinary approach to a creative exploration of the opportunities for sustainable mobility at the nexus of different disciplines. A clear need exists for systematic fact-finding, leading to consistent and harmonized empirical databases, so as to pave the road for international comparative research and to derive principles for promising transport policy research (Giuliano and Small, 1993). This would be a *sine qua non* for a mature comparative study program on European and North-American/Canadian mobility and transportation patterns, and elsewhere in the world.

Is striving for a sustainable transport system something new in our history (see also Banister, 2005)? It ought to be recognized that our world has in the past years become an open world.

Globalization is a concept that is very much 'en vogue' nowadays. If globalization (including network formation, free trade, ICT developments) is a rather autonomous mega trend, should a sustainable transport policy take this for granted? But is there sufficient maneuvering space in such a globalizing world for sustainable transport? And is there a need to discriminate between passengers and goods, between local and international movements, between behavioral and technological drivers, and so forth? And how to shape a policy agenda, if there are equity issues involved (socio-economic, gender, demographic, intergenerational, and international)? Has the idea of sustainable transport any operational policy implications? If it does, what would be an appealing and viable research agenda? Are there striking differences between Europe and North America, leave aside the rest of the world?

STELLA has been a novel and important vehicle for the exchange of views and experiences by experts on two sides of the Atlantic. A Thematic Network like STELLA can only become successful, if it is driven by scientific spirit, intellectual quality and innovative minds. It calls for a careful timing of synchronous activities on two sides of the Atlantic, based on an effective modus operandi, a great research passion, a cooperative attitude, non-bureaucratic procedures and a will to advance the transport research field. Clearly, a network is only an instrument for creating new scientific opportunities by exchange of experiences and research collaboration. In this way, new research directions may be expected, such as the use of GIS in transport policy research, the development of e-commerce instigated logistics in international transport, or a social science based approach to the acceptability of new transport policy measures. The STELLA Network has recognized the surprising commonalities in transport and mobility developments in both Europe and North America, but also observed significant differences in life style, policy, culture and institutional constellations in these regions. This has shaped the ground for creative common research on both sides of the Atlantic, where comparative analysis is a useful methodological instrument to understand commonalities and dissimilarities in transport and mobility behavior and related policy.

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