Filcak, Richard (IF/SAS) / Rubik, Frieder (IÖW) / Kuhn, Julia (IÖW) / Sabo, Stefan (IF/SAS) / Gossen, Maike (IÖW), Sedlacko, Michal (RIMAS)

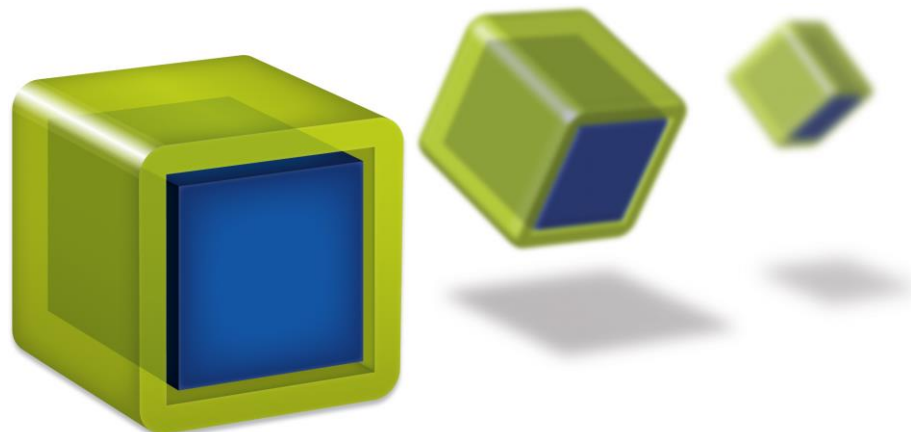# Towards Sustainable Mobility in European Cities: Insights and Issues for Policy Makers and Researchers

Background paper

2nd Multinational Knowledge Brokerage Event on Sustainable Mobility (Bratislava, 21-22 March 2013)

Version 1.1, 18 March 2013

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Executive summary

This paper provides background material on the core issues of the RESPONDER project and the 2nd Multinational Knowledge Brokerage Event on Sustainable Mobility, in order to promote active participation and engagement in the debate.

The overall aim of RESPONDER is to promote sustainable consumption by exploring novel ways of knowledge brokerage that help to improve the management of potential political, social and economic contradictions of economic growth. The challenge is not just to bridge the gap between science and policy, but also to improve mutual understanding between the "pro-growth community" and the "beyond-growth community". RESPONDER aims to improve mutual understanding and knowledge transfer between these groups by using participatory systems mapping as a core methodology. Knowledge brokerage means that the project will not conduct new research, but rather exploit existing research by new integrative modalities of linking research results to policy-making. This approach will be explored in a series of Multinational Knowledge Brokerage Events focused on five sectoral policy areas – food, housing, household electronics, mobility and private savings/debts.

The 2nd Multinational Knowledge Brokerage Event brings together policy-makers, high-level scientists, and business representatives to address pressing questions regarding the potential for, and challenges of sustainable mobility, and to provide impetus for effective policy. We will specifically explore the following questions:

- What are the trends in urban mobility and what can we learn from adverse and promising examples?

- What are the policies and practices necessary to strengthen sustainable urban mobility and to promote sustainable mobility lifestyles?

- What visions are there of low-carbon, secure and competitive mobility systems in cities?

- How could sustainable mobility approaches reduce spatial segregation, urban sprawl and the promotion of social inclusion?

- How do we move towards effective mobility policy making in the real world?

This paper first briefly outlines the *situation, key trends and challenges* in the sustainable mobility debate and cities. It briefly discusses *drivers and barriers* with the perspective of the desired future scenarios. The starting point is *defining sustainable urban mobility*. From here we move to an outline of the *visions and scenarios* of sustainable urban mobility. For visions to be reached we need *politics, approaches, tools and measures*. In the paper, we discuss some of the most important and promising. Proven and *emerging policy initiatives* are put into context and explained using concrete examples from our cities. A substantial part of the paper deals with the problems of infrastructure and behavioural changes as the key challenges to future mobility. Besides technical measures, we outline public participation, transparency, and access to decision making as approaches to be explored and enforced.

Finally, we briefly outline the meeting agenda and inform about the system mapping that represents a substantial part of the event.

1.   The RESPONDER Journey: Aims and Desired Outcomes

RESPONDER aims to promote sustainable consumption by exploring novel ways of knowledge brokerage between science and policy in the five policy-areas of food, housing, mobility, ICT, and private savings and debts. The main objectives are to help improve the management of potential political, social and economic contradictions of sustainable consumption with economic growth, bridge the gap between science and policy, and foster mutual understanding between the "pro-growth community" and the "beyond-growth community". Participatory systems mapping as the core methodology serves as the basis for systematizing empirical findings, questioning various model assumptions, analysing the effects of different policy options and identifying new research questions in the respective policy areas.

"Towards Sustainable Mobility in European Cities: Insights and Issues for Policy Makers and Researchers" is the 2nd RESPONDER Multinational Knowledge Brokerage Event focusing on mobility and its role in economic growth and sustainable consumption. As such, it serves as an arena for debate between policy-makers and researchers working on different aspects of mobility, and aims to explore open research questions and emerging policies with regards to its potential to foster sustainable consumption in Europe and arrive at a useful impetus for effective policy development. In the course of the event, in a dialogue-oriented atmosphere, we will have a closer look at emerging mobility trends and their implications for sustainable consumption, examine the associated challenges and conflicting priorities, and discuss implications for policy-making. The debate will focus on three thematic areas: visions and scenarios, technological developments and infrastructure and consumer behaviour patterns.

This background paper outlines the event context. It is intended to encourage a discussion on what kind of political interventions and activities are needed to go forward towards a sustainable urban mobility system. Thus, this paper provides a skeleton of thoughts and evidence, which we will flesh out over the course of the event.

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2. Urban mobility: Situation, Trends and Challenges

2.1. Situation and key trends

2.1.1. General challenges

Transport and especially urban-area transport is one of the key EU environmental, social and, last but not least, economic challenges. The Commission's Thematic Strategy on the Urban Environment (European Commission, 2007a) was adopted in 2006, and describes a number of common environmental challenges and problems faced by most European conurbations, although the scale and intensity of such problems vary. This strategy lists from the sustainable mobility perspective the following primary problems: poor air quality, traffic volume and congestion, high levels of ambient noise, neglect of the built environment, high level of greenhouse gas emissions, social exclusion, and urban sprawl. (European Commission, 2007a)

Tab. 1: Key figures on mobility trends (own elaboration based on (European Commission, 2007a)

Current situation:

- Passenger cars are responsible for 75% of passenger kilometres (pxkm) travelled
- Car ownership per household is increasing (+ 38% in average between 1990 and 2004 for the EU 25, and between +14% and +167% per country)
- 50% of car trips are less than 5km, 30% are less than 3km
- Less than 5% of passenger journeys are made by bicycle
- Less than 10% of passenger journeys are made by public transport
- Walking and cycling are decreasing
- Average car occupancy remains close to one
- Urban freight is typically between 20% and 25% of road space use (space used x hours)
- Urban freight typically contributes to between 10% and 20% of urban road traffic (vehicle x kilometres).

Between 2000 and 2030 (Baseline scenario, outlook 2030):

- The demand for passenger transport (pxkm) is expected to grow by 42% (road traffic would then count for 85% and car traffic for 75% in 2030)
- Freight transport tonne kilometres are expected to grow by 63% (road traffic would count for 45%).

There has been a rapid development of new technologies and approaches, but the mobility patterns undermine technological progress. Economic growth tends to be coupled with increased car ownership and traffic volumes. This growing factor thus undermines the benefits yielded by technological progress in the field of energy efficiency or road vehicle emissions.

Figure 1: Trends in passenger transport demand and GDP (Source: European Environmental Agency (dataset available in excel at: http://www.eea.europa.eu/data---and---maps/figures/trends---in---passenger---transport---demand---5*)*
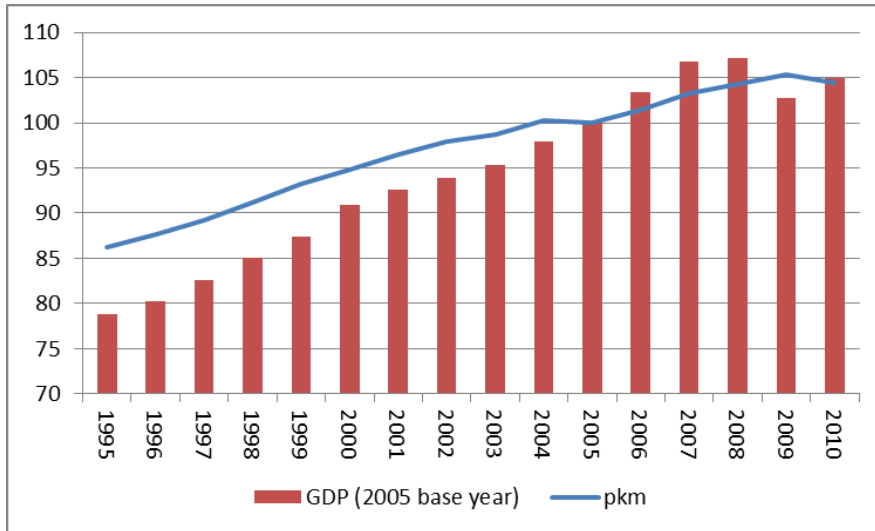
2.1.2. Challenges in cities

In most European cities, cars are occupied by one person. In many cases, cars are used for short distance trips, which means that 50% of such trips are less than 5 km and 30% are less than 3 km (Dekoster/Schollaert, 1999). Car ownership per household is increasing, and less than 10% of passenger journeys are made by public transport (European Commission, 2007a). For those and many other reasons we are seeing increased congestion of roads, emissions and noise from passenger vehicles.

Continuing urban sprawl leads to more car dependency and increased lengths of car travel. The background is the increasing distance between the place of work and the place of residence. This leads to increased distances, more roads, but at the end the travel time remains constant (the so-called "Brewer-law"). The reason is that the easiest way for cities to deal with increasing transport was to increase road capacity neglecting other transport modes. In new member states with lower levels of economic development we are gradually seeing the same development pattern.

Urban air quality continues to be a persistent problem. The pollutants for which most exceeded limits were registered are nitrogen oxides (NOx) and carbon dioxide (CO_2). The latter is especially problematic due to its contribution to climate change. Over the past 100 years the European average temperature has risen by 0.95 degree Celsius. If current trends continue, CO_2 emissions from transport in 2030 will be about 27% higher in the EU compared to 2000 (European Commission, 2007a).

Air emissions contribute to health problems and also lead to economic loss. The EU legislation on limiting national emission ceilings for certain atmospheric pollutants is an important step forward, yet as many as twelve EU member states missed the limits in 2010 (European Environmental Agency, 2012).

Two thirds of overall road accidents occur in agglomerations, and most affected is the 14-25 age group, which use motorcycles, mopeds, bicycles or are pedestrians. Current trends concerning road saturation lead to higher noise levels. Urban transport noise contributes to annoyance and sleep disturbance, which in turn affect health. Some 98% of transport related energy consumption depends on oil, the largest part of which is due to road transport.

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New car registration has recently slowed due to the crisis. Nevertheless, 12.8 million new vehicles were registered in the EU in 2011. Average CO2 emissions for these cars were 135.7 grams CO_2 per km, which is 4.6g CO_2/km less than in 2010 – a reduction of 3.3%. A combination of changes in buying behaviour, improved technology and engine efficiency was mostly responsible for this reduction (European Environmental Agency, 2012b). In 2011, approximately 8,700 electric cars were registered, representing only 0.07 % of total new cars registered. Demand for fossil fuels contributes to more greenhouse gas emissions. Therefore transport, and especially urban transport, remains a serious challenge for the EU and member states' policies. A sustainable transportation system needs to define policies and find tools and ways to address the described and upcoming trends and problems.

2.2.   Drivers and barriers

Transport tends to bring about persistent and detrimental impacts, whether at local, regional or global level, particularly with regard to environment and health. In the previous section we highlighted some environmental, social and economic drivers that influence the current and future situation in urban areas. These in many ways need to be addressed through policy, and such should deal with infrastructural issues and the behaviour patterns of consumers.

The driver for changes should provide elementary inputs for a vision of sustainable urban mobility – a vision that would be justified by the drivers. It could have many varieties, depending on city specific conditions, but inevitably it should draw a picture of mobility that serve for the wellbeing of citizens, is pollution-free, socially integrating, safe, and also provides a well-functioning transport system, where people can easily and affordably get where they need.

Easier to say than to implement, as there are many barriers to sustainable mobility. Very often it is an interconnection of institutional and technical reasons forming from current problems. Curtis and Low (2012) challenge conventional wisdom by showing, through original research, how 'car dependence' is as much an institutional as a technical phenomenon. The authors' case studies in three Australian metropolitan cities (Melbourne, Sydney and Perth) show how transport policy has become institutionally fixated on a path dominated by private, road-based transport, and how policy systems become encrusted around investments to accommodate private cars, erecting an impenetrable barrier against more sustainable mobility and accessibility solutions (Curtis/Low, 2012).

Once cities over the years have invested into expensive roads and/or transport systems, it is not an easy task to rebuild or replace it. Even if we realize that there are more sustainable alternatives and better options. This problem is closely related to the second issue: the financial resources available for financing technological and behavioural changes. Yet even if resources existed, technological progress alone is unlikely to solve these problems in the short term. Resources are always scarce, on the other hand, many progressive policies and measures can be implemented at relatively low cost, and there are plenty of opportunities to deal with "soft" measures that change the behaviour of people and move them towards more sustainable, healthy and economic ways of transport.

Browne et al. (2011) found that 100% of respondents in a survey by local authorities felt that local public transport services were inadequate in their local areas. The primary barrier to public transport provision in local authority areas was perceived to be low urban density or insufficient economies of scale, followed by a lack of incentives for potential market entrants. Responses from local authorities to barriers to public transport use indicate that perceptions of unreliability were perceived to be the primary barrier, followed by unavailable or inaccessible services. This and other reports and surveys point out the

importance of people and people's perceptions in any planning and implementation of sustainable mobility approaches (see chapter 4.3).

Typical barriers we find in many our cities, for instance:

- Lack of resources to move from infrastructure built in the past to infrastructure that reflects the needs of the future;

- Missing reliable and efficient public transport, well inter-connected and competitive in cost terms;

- Legacy of uncontrolled urban sprawl and low-density patterns of settlements;

- Lack of public support for changes, often connected to a lack of awareness of the cost of externalities from transport, and the benefits of economically, environmentally and socially sustainable mobility;

- Prejudices and misperception of public transport and alternative transport modes (e.g. social status, safety).

Both "hard" and "soft" approaches are important, and should reinforce each other during the implementation. We will therefore discuss in this paper the barriers that can be dealt with through hard measures policy interventions (i.e. infrastructure investment supported by financial resources) and soft measures (i.e. behavioural changes and the marketing of solutions enabled by hard measures).

3. Urban Sustainable Mobility – a view in the future

3.1. Defining sustainable urban mobility

Currently there is a lack of political or scientific agreement on a definition of sustainable mobility[1]. A diversity of definitions and interpretations of the concept (e.g. Becker, 2003; Holden, 2007; OECD, 2000; WBCSD, 2004) has been presented, with the risk that the concept becomes diluted and ends up as mere rhetoric offering little guidance for policy makers and scientists.

The EU's Council of Transport Ministers (April 4-5, 2001) defined a sustainable transportation system as one which "allows the basic access and development needs of individuals, companies and society to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations; is affordable, operates fairly and efficiently, offers choice of transport mode, and supports a competitive economy, as well as balanced regional development; limits emissions and waste within the planet's ability to absorb them, uses renewable resources at or below their rates of generation, and, uses non-renewable resources at or below the rates of development of renewable substitutes while minimizing the impact on the use of land and the generation of noise" (Council of European Transport Ministers, 2001, 15).

A single definition of urban sustainable mobility seems to have not been elaborated; one author defines it as "maintaining the capability to provide non-declining accessibility in time". (Zegras, 2005, 38)

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[1] There are several terms used like sustainable mobility, sustainable transport, sustainable transportation and sustainable transport systems. Holden/Linnerud (2010, 39) conclude that "despite the variety in terminology, the research literature that uses these terms essentially discusses the same topic. 'Sustainable transport' seems, however, to be the preferred term in North America, whereas 'sustainable mobility' is preferred in Europe (Black, 2003)".

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3.2. Visions and Scenarios on Sustainable Urban Mobility

Scenario development evolved as a strategy tool. It was originally applied in military planning and was developed by Kahn and his colleagues at the RAND Corporation (van der Heijden et al., 2002). Scenarios are neither predictions nor projections (Rotmans et al., 2000; van Notten et al., 2003), they rather describe alternative images of the future, with the assumption that future developments are unpredictable. They stress the need to take uncertainty into account in decision making. The future of mobility systems has been investigated and discussed extensively in recent years. The main drivers are the challenges of demographic trends (e.g. ageing, migration), of economic trends, of social change, of energy and climate challenges and of technological trends (cf. Petersen et al., 2009).

In the following, we aim to briefly characterise a few recent scenario exercises in the urban sustainable mobility domain. Of course there are a plethora of others, but a brief description may stimulate creative thinking about the future of urban mobility. In the two boxes, we highlight two interesting scenarios[2].

See also the KU on 'The Future of Sustainable Urban Mobility in Europe. Visions and Scenarios'

Visioning and Backcasting for UK Transport Policy (VIBAT)

As part of the VIBAT project, the main focus of which was examining various options to reduce CO2 emissions on behalf of the British government, Hickman/ Banister (2006) developed two scenarios for the UK transport system up to 2030. The authors took several factors into account, which mainly influence future travel behaviour, such as political, economic and demographic trends. Furthermore, aspects such as the development of globalization, trends in technology and the development of the oil price are considered.

- *The first scenario "New Market Economy"* is driven by the assumption that the economy moves through a successful transition to a technology-led new market society. In this vision, markets are strong forces, whereas government's intervention is weak. Nevertheless, the objective of transport policy is to achieve the required CO_2-emissions. Policy does not aim at changing the lifestyle or routine of people and firms, but gives incentives to use cleaner technologies; e.g. people still use cars at a high level, but alternative fuels and hybrid engines lower CO_2-emissions. Consequently, better ecological technologies represent the solution to save energy.

- *The second scenario "Smart Social Policy"* is driven by the assumption that the required CO_2 reduction is achieved by a change in behaviour. In this scenario, the vision of social welfare dominates, connected to environmental quality. The lifestyles of people are less CO_2 intense, e.g. the use of public transport and bicycles increases, travel distances get shorter, and local focus gains importance. The role of government is active, supporting behavioural change. Another feature of this scenario is the involvement of all stakeholders in several decisions, and an overall change towards more community-based thinking.

The scenarios presented above are **not exhaustive**; they represent only a share of existing scenarios on urban sustainable mobility. They refer to different contexts (local/regional, national, European or global). Whereas some are purely descriptive (e.g. Marletto, 2011; Ahrend et al., 2010), others deliver a quantification of impacts with regard to e.g. modal split, CO_2-emissions (e.g. Harwatt et al., 2011; Hickman/Banister, 2006; Institut für Mobilitätsforschung, 2010; Siemens AG, 2009).

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[2]   Summaries of these scenarios have been elaborated by Rubik et al. (2012).

The key focus of the 2nd MKBE on mobility – **infrastructural investments & technologies and behaviour** – is reflected in the scenarios. Most presented projects present a mixture of different scenarios of which some exclusively deal with pure technological measures, e.g. improvement of the energy efficiency of cars, modification/change of the power system (hybrids, E-mobility) and some mix technological with behavioural changes. However, a few publications are restricted to the technological dimension without reflecting the demand-side change (e.g. scenarios of the Institut für Mobilitätsforschung, 2010; scenarios of Ahrend et al., 2010). Most publications link at least one of the presented scenarios technological and behavioural measures. Another cluster of scenarios deals with an exclusive behavioural change approach (e.g. scenario "Ecocity" of Marletto, 2011).

Considering one important challenge – the **reduction of GHG-emissions** – it seems that a restriction on technological level is insufficient to fulfil the requested reduction targets. Infrastructural investments and the high market penetration of energy efficient engine technologies (e.g. the improvement of current technologies, electric cars and fuel cells) seem to be able to deliver an important contribution to reducing GHG-emissions, but they need a demand side change: a shift of the modal split towards public transport, biking, pedelecs and walking is reducing the use of private cars and the emissions thereof. Urban planning could support this shift by reducing transport volume.

> **Towards a European regime of low-carbon urban mobility: three scenarios and policy backcasting**
>
> Marletto's contribution (2011) is based on a socio-technical approach linked to the transformation research line; it sketches three scenarios to reach the goal of low-carbon urban mobility.
>
> - *"Automobility":* Hybrid propulsion pushes forward the transformation of the existing car regime and supports technological innovations towards electric cars. This scenario is unlikely to reach the ambitious goal of low-carbon mobility because of its slow technological transition.
>
> - *"Electricity":* The electric industry takes over responsibility for urban mobility and fosters the diffusion of electric cars. Smart grids are the key technological innovation stimulated. Electric operators collaborate with automotive companies.
>
> - *"Ecocity":* This scenario relies on a totally new vision of urbanism (dense and multifunctional cities), on reduced mobility and increasing the importance of walking, biking, car-sharing and public transport. Local governments, NGO's, providers of technologies and public transport providers in cities join forces to push this new approach to urban life and mobility.

The **role of policy** depends on the scenarios we look at. In some scenarios, policy has a passive role; in other scenarios policy is restricted to enable the development and dissemination of engine technologies, or to support rational infrastructural investments. In a couple of scenarios, policy plays an active role, especially with regard to urban planning (e.g. scenario "Smart social policy" of Hickman/Banister 2006; "Ecocity" of Marletto, 2011; "Renaw-abad" of the Forum of the Future, 2010), to regulation and economic incentives and to participation (e.g., scenario 4 of Harwatt, 2010).

Altogether, scenarios enrich our picture and understanding of the future: **different futures are thinkable** – they need policy leadership, clear decisions on the path to be followed, and also networking with stakeholders.

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Tab. 2: Overview of selected characteristics of presented scenarios

Scenario Project	Issues covered	Mobility approach	Geographical scope	Period	Policy role
E-MOBILITY 2025 – Scenarios for greater Berlin *(Ahrend et al., 2010)*	Electro mobility, traffic planning	• E-Mobility in premium segment, no behavioural changes. • Infrastructural offers, change of consumer behaviour • Infrastructural offers, no behavioural changes	District of Berlin	2025	• Passive • Integrated and systematic support, economic incentives, regulative measures • Green public procurement, economic incentives, regulative measures
Sustainable Urban Infrastructure: Munich Edition – paths toward a carbon-free future *(Siemens AG, 2009)*	Transport, electric transport, vehicle trips	• Increase of energy efficiency, electric cars, behavioural changes • Increase of energy efficiency, electric cars, no behavioural changes	District of Munich, but also countryside around	2058	• Integrated urban planning, intermodal traffic management, preferences for public transport, bikes and pedestrians, economic measures • Passive role
2050 Pathways Analysis *(HM Government, 2010)*	Passenger transport, efficiency, technology	• Modest increase of energy efficiency, no behavioural change • Stronger increase of energy efficiency, modal shift • Significant modal shift, strong increase of energy efficiency, electric cars • Radical modal shift, behavioural change, very strong increase of energy efficiency towards electric cars, fuel cell technology	UK	2050	• Passive role • Support of technologies • Supportive policy frameworks with public acceptance • Supportive policy frameworks with public acceptance
Future of mobility: scenarios for the year 2030 *(Institut für Mobilitätsforschung, 2010)*	Economy, passenger traffic, growth of mobility, sustainable mobility	• Investments in infrastructure, no behavioural changes • Increasing investments in infrastructure, no behavioural changes • Reduction of investments in infrastructure, no behavioural changes	Germany, countryside and cities	2030	• Coordinated transport policy (federal state, region, municipalities), regulative measures • Coordinated transport policy (federal state, region, municipalities), regulative measures • Regional regulative measures
Visioning and Backcasting for UK Transport Policy *(Hickman/Banister, 2006)*	Transport policy, CO_2, technological & behavioral measures	• Strong uptake of hybrid technologies, investments in alternative fuels, no behavioural change • Central role of change of behaviour, change of modal split	UK	2030	• Passive role, incentives to cleaner technologies • Investment in public transport, urban planning, new taxation and pricing incentives, traffic demand management
Personal Transport Emissions within London: Exploring Policy Scenarios and Carbon Reductions Up to 2050 *(Harwatt et al., 2011)*	Transport, CO_2, policy	• Investments in infrastructure, increase of energy efficiency, modest behavioural change • Investments in infrastructure, strong increase of energy efficiency, zero-emission technologies, modest behavioural change • Investments in infrastructure, strong increase of energy efficiency, zero-emission technologies, stronger behavioural change	Inner and outer London	2050	• Implementation of London Mayor's Climate Change Action Plan (CCAP), extension of congestion charge • Implementation of London Mayor's CCAP, extension of congestion charge, mandatory agreement with car industry resp. engine technologies • Implementation of London Mayor's CCAP, introduction of a national carbon trading system, strong periodic reduc-

Scenario Project	Issues covered	Mobility approach	Geographical scope	Period	Policy role
		• Extreme shift of modal split towards cycling and walking, very strong change of consumer behaviour, strong increase of energy efficiency, zero-emission technologies			tion targets, investment plan for infrastructure • Strong participation of citizens in city planning, implementation of London Mayor's CCAP
Towards an European Regime of low-carbon urban mobility *(Marletto, 2011)*	Mobility, CO_2, systems, actors, technologies	• Hybrid cars, no behavioural changes • Electric cars • Increase infrastructure of public transport, biking and walking	EU	2030	• R&D support of electric cars • R&D support of smart grids • Integrated and multilevel urban policy, local plans and networks of local actors
Megacities on the move - Your guide to the future of sustainable urban mobility in 2040 *(Forum of the Future, 2010)*	Mobility, cities, rural-urban migration	• Investments in technology and infrastructure, constrained behavioural change • Increase of energy efficiency, maintenance of infrastructure, no behavioural change • Investments in infrastructure, increase of energy efficiency, behavioural change • Strong behavioural change, technological change to small electric vehicles	Global, outlines for districts of Istanbul and Mumbai	2040	• Strong regulation in economy, central city planning and resource consumption • Passive role • Regulation in city growth, polycentric city planning • Decentralisation of city planning

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4. Politics towards Urban Sustainable Mobility

4.1. Emerging policy initiatives

4.1.1 Policies on the EU level

The mobility domain is an area with high policy interest. This domain and its modernisation as part of a resource efficient Europe are among the seven flagship initiatives of the Europe 2020 Strategy (European Commission, 2010). The mobility system is also dealt with in the EU Sustainable Development Strategy (Council of the European Union, 2006).

In 2007, the Commission published the "Green Paper - Towards a new culture for urban mobility" (European Commission, 2007b), initiating a debate about sustainable urban mobility. The discussion evolved in several events, such as a stakeholder conference on "The Future of Transport" organized by the Commission in March 2009[3], followed by a Communication on the topic (European Commission, 2009a), and an "Action Plan on Urban Mobility" (European Commission, 2009b) adopted in October 2009. The action plan constitutes the framework to support actions at the local level; it covers six themes explicated in 20 actions to be launched by 2012. The actions describe a focus on the further examination of technologies, as well as traffic and demand management approaches, and enhancing the exchange of experience and knowledge within the European community.

In addition, the Commission launched and supports the exchange of best-practice, and supports communities in their transformation towards a more sustainable mobility – the CIVITAS Initiative and ELTIS PLUS program:

- In CIVITAS Plus (2008 to 2013), 25 cities are working together on five collaborative projects – each with a different focus on sustainable mobility. These 'demonstration cities' are part of the larger CIVITAS forum network, which comprises almost 200 cities committed to implementing and integrating sustainable urban mobility measures.

- The ELTIS PLUS program offers practical support to cities for the development of sustainable urban mobility plans, through workshops and guidelines. In addition, the ELTIS web presence functions as an urban mobility portal for information, knowledge and experience exchange in the field of urban mobility in Europe. It is aimed at individuals working in the field of transport and related disciplines, such as urban and regional development, health, energy and environmental sciences.

Moreover the campaign European Mobility Week, which has been running since 2002, promotes cities to inform and actively involve their citizens in the transformation towards a new mobility culture and rewards outstanding municipal efforts and elaborate sustainable urban mobility plans with annual awards. (European Commission, 2012c)

On a broader level, the Commission's White Paper "Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system" (European Commission, 2011a) was issued in 2011. Its overall goal is a 60% reduction in GHG emissions in the transport sector by 2050. This is aimed to be achieved by focusing on four pillars: creating a single European transport area, promoting

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[3] See http://ec.europa.eu/transport/themes/strategies/events/2009_03_09_future_of_transport_en.htm

research and innovation, developing infrastructure, and fair pricing and intensifying international coop-eration. (European Commission, 2011c) It announced 40 initiatives foreseen in the next couple of years, some of which are environmental, carbon footprint calculators, review of the labelling Directive, smart pricing and taxation, and urban road user charging framework.

In September 2012, the Commission issued a "Communication on Research and innovation for Europe's future mobility for developing a European transport-technology strategy" (European Commission, 2012a) as a part of the new Strategic Transport Technology Plan (STTP)[4]. It expresses four strategic actions:

- strengthening of research and innovation anchorage in transport policy,

- improving the effort alignment of individual sectors and actors,

- overcoming technology lock-in and

- institutional 'silo' thinking, more investment and fewer barriers for new market entrants. (European Commission, 2012a, 7)

The communication evokes a new debate with a policy focus on the technological aspect of mobility, as it mostly aligns with the "efficiency approach" of sustainability (Holden/Linnerud, 2010, 16). The goals are planned to be achieved by further exploring three research and innovation areas: firstly clean, safe, efficient and quiet transport, secondly sustainable infrastructure and traffic and demand management systems, and finally consumer-friendly services and operations. (European Commission, 2012b, 5)

4.1.2. Developments in Member States

A study funded by the European Commission found that "none of the Member States did develop a true roadmap in the sense of a clear action plan with the main policy interventions for the next decades." (Skinner et al., 2010, 67) Some studies and visions were developed but, except for the UK and Denmark, none of the Member States has set goals for 2050.

The UK Climate Change Act strives for at least 80% lower emissions by 2050 respective to 1990. The carbon reduction strategy issued by the Department for Transport mentions various approaches covering all three dimensions of sustainable transport – reduction, shift and efficiency. However, its focus lies on the latter. (DfT, 2009, 16) The strategy for the Danish roadmap is focused on technical developments too. It concentrates on the electrification of passenger cars, alongside a strong increase in sustainable electricity and second generation biofuels. The vision provides some preliminary contours, but the transport part needs to be further detailed. (Skinner et al., 2010, 67ff)

Generally, Skinner et al. (2010, 71ff.) find a prevailing strong belief in new technologies and a large focus on biofuels and electrification of transport. Topics like modal shift and demand reduction are less regarded.

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[4]   See http://ec.europa.eu/transport/themes/research/sttp/

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4.1.3. Outlook and 'missing' topics

The policy focus is on the efficiency approach of sustainable mobility, either through technologies or system improvements. Topics like decoupling transport growth from economic growth are underrepresented in the recent discussion on sustainable mobility. Although the EC stated the need for actions "to bring about a significant decoupling of transport and GDP growth" (COM (30.11.2012)) in 2001, the topic was never centre of attention. The Institute for Transport Studies (2002, 3ff.) identified seven illustrative measures to tackle decoupling. The recommended approaches show an interesting mix of measures to change the mobility behaviour of people and foster new car technologies. However, the debate on decoupling did not seriously appear again. In Dec 2009, there was one publication within the "EU Transport GHG: Routes to 2050?"[5] project concerned with the topic. This paper illuminates the topic from another angle and refers to the travel time approach, which states that travel time is almost constant over time, hence higher speeds encourage longer travel distances. According to this approach, "curbing transport demand growth and increasing the average travel speed are incompatible". (van Essen et al., 2009, 36) Furthermore the paper highlights the importance of rebound effects, which reduce and possibly even counterbalance the promising effects of teleworking. The paper enlarges the road pricing approach by three others, namely reduction of road capacity, introduction of speed limits and urban planning. (van Essen et al., 2009, 37)

In 2011, the impact assessment (European Commission, 2011b) of the 2001 White Paper resumed the discussion and stated a slight decoupling in passenger traffic from GDP in recent years, but in the light of constantly rising CO_2-emissions in transport comes to the conclusion that "(relative) decoupling appears not to be sufficient". (European Commission, 2011b, 129) Moreover, the review reveals that the essential strategy was to internalize external costs for all modes of transport. Reflecting on the proposed measures and approaches cited above, there is still a long way ahead.

The different strategies and concepts highlight the attention of policy makers to greening the mobility domain. However, approaches that integrate sustainability challenges are still hard to find. Strategies that deal with topics like material efficiency, social inclusion, traffic accidents and health, urban and regional planning, or a multimodal mobility approach are often not linked with each other, and do not consider the interrelationships of such topics.

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[5] See www.eutransportghg2050.eu

4.2. Policy instruments in the area of mobility

In recent decades, many policy instruments to support changes leading to sustainable urban mobility have been conceptually elaborated and applied, at least partly. For overviews, please refer to Tab. 3.

Tab. 3: Framework of policy instruments to promote sustainable mobility

Strategies Instruments	Avoid (Reduction)	Shift (Alteration)	Improve (Efficiency)
Direct regulatory instruments	• Car-free events • Spatial planning • Urban planning	• Restricted zones (e.g. environmental zones, car-free districts, pedestrian areas) • Separate lanes for public transport • Lanes for high-occupant vehicles • Spatial planning	• Biofuel-share • Environmental zones • Speed limit • Emission standards • End-of-life treatment
Market-based financial instruments		• Fuel tax • Congestion charge • Registration tax • Prices of tickets of public transport	• Scrapping schemes • Tax incentives • Annual circulation tax • Registration tax • Road pricing • Green public procurement • Research subsidies
Information-based instruments	• Mass awareness campaigns • Endorsement labels	• Comparative labels • Endorsement labels • Rankings • Mass awareness campaigns • Carbon footprint calculators	• Comparative labels • Endorsement labels • Rankings • Mass awareness campaigns • Carbon footprint calculators
Support for behavioural change	• Flexible work models • Car-sharing schemes • Car-free residential areas	• Social marketing campaigns • Job tickets • Car sharing schemes	• Carbon compensation schemes • Eco-driving programs
Provision of infrastructure	• Integrated city planning	• Public transport infrastructure • Cycling infrastructure (e.g. cycling lanes, bike parking facilities) • P+R facilities • Bike sharing • Integrated city planning	

Sources: Rubik et al., 2011, 10; based on EEA, 2005, 2006, 2008a and 2008b; GTZ, 2001; OECD, 2006; small additions.

4.2.1   Changing infrastructures: Policy and Activities

Reconstruction of old and the creation of new infrastructures for sustainable mobility may have many faces. It deals with physical infrastructure, business infrastructure, urban and regional planning.

Inevitably, we need to start with infrastructure for walking, cycling and public transport. Recent trends in urban sprawl and ambitious projects of city development impacted the previously well developed pedestrian paths network, which was historically in place in most European cities. Cycling has been witnessing a revival in Europe in recent decades, but it is still a problem to find safe, well connected and well designed networks of cycle paths.

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Infrastructure for public transport has very uneven development in European cities. In some we see trends towards high tech new solutions, employing more connections and routes. In other cities we have seen trends that even the well developed and working network of public transport modes may be endangered by the narrow minded decisions of municipalities guided by short–term economic balance sheets, without taking into account the broader picture of the pros and cons of investments and/or subsidies to public transport in the longer term.

Infrastructure for charging the batteries of electric cars is another example, where the state and/or municipalities need to get involved in order to speed up the process and create well functioning infrastructure for their increasing use in cities.

By business infrastructure we mean here new and emerging concepts of car sharing (based on commercial interests). Information technologies increasingly enable new and better coordination for this service, and provide substantial impetus for the concept. The optimal approach for cities appears to be a combination of car sharing and electric cars, as we see for instance in Brussels, Belgium.

See also the KU on 'Bike-Sharing in European Urban Mobility'

Another area, where business infrastructure may provide additional opportunities is shopping. Shopping has become one of the most important sources of increasing transport in urban areas. Internet shopping in combination with well-developed logistical schemes for goods deliveries may decrease the need for transport and provide new opportunities for free time.

Last but not least, changing office infrastructure and working places to enable working from home or using information technologies for video-meetings provide additional opportunities for decreasing the amount of transport.

4.2.2. Changing behaviour: Policy and Activities

The aim and puzzle of behavioural changes could be described as an attempt to attract new users to public transport and to alternative modes of transport (i.e. those who currently use private transport, such as cars and motorcycles), while at the same time retaining current public/alternative transport users who might feel compelled to buy a private vehicle.

Not an easy task, as a crucial problem in changing a transport system into a sustainable direction is actually the users of such system. Their perceptions, habits and behaviour are part of the problem, but need to also be part of the solution. The first step is to determine and analyse the motives behind transport choices - why and how people decide about transport? What are their perceptions, norms and what barriers do they see to using alternative or public transport instead of cars?

Perception of public transport deeply influences habits and behaviour. People see various modes differently. Even in cases where empirical experience goes against some of the perceptions; it is difficult to change such perceptions. People sometimes perceive public transport as slow, dirty, and inconvenient. Car drivers seem to perceive public transport as stressful, whilst setting aside their own experience of traffic jams and encounters with other drivers.

Other factors influencing behaviour may be comfort and privacy (a car is usually sold as a symbol of quiet and personal space), perception of time (it is easier to get into the car outside your home than to walk down the street to the bus stop or change lines); price factor (people often neglect the cost of car depreciation, repairs and tend to underestimate the total cost of car travel, making public transport less attractive).

It is extremely difficult to change the perception and behaviour of people; it is nevertheless possible and brings important impetus for the debate about and the implementation of steps towards sustainable urban spaces.

As outlined above in Tab. 3, there are various approaches that may stimulate behavioural changes. We list some:

Pricing is an important signal and factor impacting people's behaviour. Generally speaking, different transport modes should to a maximal potential degree internalize the external costs of their operation. Cars are more expensive and more problematic than public transport in all possible aspects. Starting with the cost of transport infrastructure, operation in terms of emissions from the production of cars, to emissions per passenger, and ending with the cost of accidents. There are two levels in the debate how to reach proper pricing. Firstly the cost of petrol, taxes on cars, scrap cost and insurance, where the state and or the EU may have an influence. Secondly, it is city policies using tolls, charges, restrictions and barriers (some are discussed in another part of the background paper).

The ***ticket prices of public transport*** are another important aspect. Practically all cities in developed countries subsidize public transport as a means to keep it competitive compared with cars. Yet public transport fulfils a very important social role in addressing the problem of poverty and supporting social inclusion in cities. On the other hand, there is a negative connotation widespread in many cities where the perception of public transport invokes the problem of status. As Margaret Thatcher famously summarized: Anybody seen in a bus over the age of 30 has been a failure in life. This is a rather common misperception, which needs to be targeted in the marketing of public transport.

*See also the KU on '**Bike-Sharing in European Urban Mobility'***

Very interesting are attempts to change the behaviour of people with ***changed structural conditions***. Some experiments with public transport for free and for all (e.g. recent example of Tallinn in Estonia), or in the Greater Copenhagen area where car owners received free travel cards for public transport.

Marketing and awareness campaigns or making the alternatives cool need to be based on knowledge and context. Marketing and communication strategies that encourage sustainable means of transport must build on an understanding of the roots of behaviour, and work with negative perceptions and positive examples and impacts. Examples range from the Dialogue Marketing Campaign for Munich's New Citizens in Germany, through a direct marketing campaign, designed to promote public transport use among new university students in Brno, the Czech Republic, to a car sharing campaign in Bratislava, Slovakia. Just to mention a few examples from nearby cities.

Public awareness may break down barriers and generate support for policy measures. Examples of cities around Europe show that people are willing to support measures even aimed at measures that may personally affect them, such us pricing or tolls, if they understand the underlying reasons and feel that the overall benefit outweighs the cost. For instance, people will agree with limiting cars in urban zones if they feel that it is safer for them and their children.

RESPONDER
Linking SCP and Growth Debates

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4.3. Public participation, transparency and access to decision making

All the challenges presented above require a political vision, clear leadership and strong support from the people. We build here on the thesis that more public participation leads to co-ownership and active involvement, usually resulting in a better environment and more sustainable cities.

There are at least three interlinked issues framing transparency, accountability, and participation in decision-making:

- Procedures and processes: *Are they fair and transparent?*

- City and actions: *Do representatives advocate policies that inhabitants favour?*

- Policy outcomes: *Do they reflect citizen preferences?*

As the first step in public participation, the authorities responsible for urban transport management and land use planning need to generate public understanding of the challenges, opportunities and problems. Secondly, progressive plans and vision need public support. Where there is public demand and pressure for progressive politics, it enables them to be implemented. Politicians need a mandate from citizens for the development and implementation of integrated and holistic solutions curbing adverse trends.

In order to jointly bring about more sustainable urban transport patterns, cities firstly need to be transparent and accountable. A priority setting system must be based on clear criteria and justifiable means. Some cities directly involve citizens not only in sectorial issues (i.e. transport planning), but even in the overall discussion of priorities. There are tools such as participatory budgeting that may bring strategic issues under public scrutiny.

The accountability of cities should be based on free access to information, which enables ongoing checking of the relationship between what citizens want and what government officials do. Subsequently, if there are discrepancies, there need to be ways to discuss them and initiate changes.

Public participation generally increases the quantity and quality of information for good decision making. It makes decisions co-owned and supported by the community, and in this way increases public support and participation in the approved projects and policies. It makes cities more transparent as citizens know where the challenges are faced by municipalities and service providers. Involvement means better understanding of policies and their acceptance. Ideally, participation occurs during many phases of projects and programming, including project identification and planning, project development, and project or program operations.

Among the objections against more participation are that it slows the process and does not bring much additional value. Beierle (2000) analyses 239 published case studies of stakeholder involvement in environmental decision-making. These cases reflect a diversity of planning, management, and implementation activities carried out by environmental and natural resource agencies at many levels of government. Overall, the case study record suggests that there should be little concern that stakeholder processes are resulting in low quality decisions. The majority of cases had evidence of stakeholders improving decisions over the status quo; adding new information, ideas, and analysis; and having adequate access to technical and scientific resources. Processes that stressed consensus scored higher on substantive quality measures than those that did not. Indeed, the data suggested interesting relationships be-

tween the more "political" aspects of stakeholder decision-making, such as consensus building, and the quality of decisions (Beierle, 2000).

New technologies not only provide brand new opportunities for transport dematerialization and traffic effectiveness, they also enable new and promising opportunities for public participation. Among others are social networking, innovative web platforms and various internet and digital applications. They dramatically expand the opportunities for sharing ideas, collecting inputs, and supporting or blocking decisions.

For instance, the ExtrAct website (MIT's Center for Civic Media) provides citizens with the opportunity for the early identification of emerging urban planning issues such as natural resource extraction plans. Brainstorm Anywhere web application (PlaceMatters) enable planners and administrators of projects to collect, analyse and act on public opinion. As in many other areas of human activities, IT technologies may help, but there must be genuine interest to use them on both sides of the discussion table.

5. Knowledge Brokerage Event on "Towards Sustainable Mobility in European Cities"

The second Multinational Knowledge Brokerage Event on "Towards Sustainable Mobility in European Cities" takes place from March 21 - 22, 2013 at the Danube Hotel, Bratislava, Slovak Republic.

5.1. Outline of the Event

On *Thursday, 21 March*, following the welcome and introductory address by *Martina Lubyová* (Head of the Institute for Forecasting Studies/Slovak Academy of Sciences), and RESPONDER coordinator *André Martinuzzi* (RIMAS, Vienna University of Economics and Business), the workshop will be opened by the first panel of experts. The title of the first session is "Visions of the Future". Brokerage event facilitator *Peter Woodward* (Quest Associates) will guide the process and moderate discussions.

Key note presentations by *Johannes Hartwig* (Fraunhofer Institute for Systems and Innovation Research, Karlsruhe/Germany) will open the stage and describe some of the key trends, challenges and possible scenarios. After this opening, we turn to the host city Bratislava as an example of the problems how to define approaches to sustainable mobility and the challenges ahead. *Tibor Schlosser* (City Hall Bratislava), *Jana Pangracova* (UNDP) and project advisor *Angel Aparicio* (Technical University of Madrid) will provide various perspectives, and discuss their experiences of city plan implementations.

These presentations will set the scene for the core questions with which RESPONDER deals. In particular, what are the key issues and problems that we need to focus on and how to approach them? The programme then continues with groups and plenary discussion to enrich visions and identify key issues.

Following the lunch break we move to session 2 "The Influence of Urban Structure on Transport and Infrastructure Challenges to Sustainable Mobility". *Petter Næss* (The Norwegian University of Life Sciences, Aas/Norway) will start with an introduction to sustainable urban development challenges. To appreciate lessons learned and see approaches and challenges, we move to the second presentation city of Munich, Germany. *Wigand von Sassen* (City of Munich/Germany) will share his experience and ideas, based on examples from this Bavarian city.

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The core part of Thursday afternoon is dedicated to the method that RESPONDER uses for exchanging knowledge and fostering mutual understanding – participatory systems mapping. After a brief introduction to the method by *André Martinuzzi* (RIMAS, Vienna University of Economics and Business), participants   will be divided into three thematic working groups, and jointly elaborate and debate system maps from the perspective of infrastructure issues and policy measures. System mapping exercises will be facilitated by *André Martinuzzi*, *Frieder Rubik* (IÖW, Heidelberg/Germany) and *Michal Sedlacko* (RIMAS, Vienna University of Economics and Business).

In the concluding part of the day, all participants will get the opportunity for a poster walk. Firstly, we will hear five brief presentations of projects related to urban mobility and sustainability, and will be invited to discuss them in front of the posters developed for the presenters. The poster walk will provide an informal opportunity for face-to-face discussions and debates about various projects and initiatives of sustainable urban mobility problems, and present progressive approaches.

As the final point on the agenda on Day 1, a dinner will be hosted at Castle Restaurant.

On **Friday, 22 March**, we start with *Richard Filcak* (IF/SAS) and a brief presentation of the interim outcomes from the first day of the event. Session 4 "Political, Environmental and Social Aspects of Sustainable Mobility" is the next point on the agenda. *Heinz Hoegelsberger* (Austrian Federation of Trade Unions, Vienna) will provide his perspective on the social and labour issues in the transport debate. *Jakob Hurrle* (Charles University Prague) will share his experience of the social and societal aspects of mobility trends and challenges in Prague, and last but not least, *Marina Olshanskaya* (United Nations Development Programme) will present and discuss her experience from transition countries and challenges in diverse counties.

Following a period for questions and discussion, a second session on participatory systems mapping will take place, focusing on exploring sustainable mobility through system maps – behavioural and social aspects.

In the final part of the event, we will aim to piece together all the parts and information discussed and brought under the spotlight during the process. We conclude with a discussion of the emerging messages for policy makers and the research community.

RESPONDER project coordinator, *André Martinuzzi*, will wrap-up the debate and give an outlook of upcoming events and activities planned in the project. The workshop will provide plenty of opportunities for informal discussions and social interaction.

5.2.   System Mapping

As already mentioned, RESPONDER aims to improve mutual understanding and knowledge exchange between policy and science by using participatory systems mapping as a core methodology. 'System maps' serve as the basis for systematising the links and contradictions between sustainable consumption and economic growth in various consumption domains. The knowledge brokerage event on "Towards Sustainable Mobility in European Cities" will put a thematic focus on the two key topics "The Influence of Urban Structure on Transport and Infrastructure Challenges to Sustainable Mobility", and "Political, Environmental and Social Aspects of Sustainable Mobility".

The **first topic** will focus on three approaches to deal with the challenges; we will split the auditorium up into three parallel system mapping groups related to the topic area of **'technical mobility infrastructure'**, each group is being oriented towards a policy instrument intended to contribute to resolving a problem:

- How would '*restricted zones*' (such as environmental zones, pedestrian areas, car-free districts and city centres) influence greenhouse gas emissions? (Group 1 for the purposes of this outline, map A)

- How would the development of *urban cycling infrastructure* (such as cycling lanes, bike parking and rental facilities) influence greenhouse gas emissions? (Group 2, map B)

- How would the development of *urban public transport infrastructure* (such as separate public transport lanes, investment in public transport infrastructure) influence greenhouse gas emissions? (Group 3, map C)

The **second topic** will focus on three approaches to deal with the challenges; we will split the auditorium up into three parallel system mapping groups related to the topic area of '**behavioural change**', each group being oriented towards a policy instrument intended to contribute to resolving a problem:

- How would *congestion charges* (as introduced in Stockholm or London) influence natural resource consumption? (Group II.4, map D)

- How would the introduction of *a car-sharing scheme* influence natural resource consumption? (Group II.5, map E)

- How would *campaigns* combining raising awareness and incentive instruments and targeting specific groups (such as new citizens in Munich) influence natural resource consumption? (Group II.6, map F)

All groups share the following questions in the session:

1. What are the key determining factors for the success (or failure) of the discussed policy instrument?

2. What recommendations can we formulate for the implementation of this particular policy instrument so as to maximise its potential for the reduction of GHG emissions in the EU?

3. Can we record the knowledge gaps that we have encountered during the discussion as research questions?

In the case of any time remaining, the following questions should be pursued:

4. What are the potential effects of the discussed policy instrument on jobs in the EU?

5. What are the potential effects of the discussed policy instrument on social inclusion in the EU?

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