ASSIST

Assessing the social and economic impacts of past and future sustainable transport policy in Europe

SYNTHESIS - DRAFT

Synopsis of ASSIST findings

Input document to the final conference

Due date of submission: 16.09.2013

Actual date of submission: 16.09.2013

Dissemination level: **Public**

Start date of project: 01.04.2011 Duration: 30 months

Lead contractor for this deliverable: **Fraunhofer-ISI**

Work package: WP7 Revision: 1.0

Grant Agreement Number: 265381

Contract No: MOVE/FP7/265381/ASSIST

Instrument: Coordination and support actions – Support – CSA-SA

ASSIST

SEVENTH FRAMEWORK PROGRAMME

Project co-funded by the

European Commission – DG MOVE

7th Research Framework Programme

ASSIST

Assessing the social and economic impacts of past and future sustain-able transport policy in Europe

Co-ordinator:

Fraunhofer-ISI
Fraunhofer Institute Systems and Innovation Research, Karlsruhe, Germany
Dr. Wolfgang Schade, Dr. Michael Krail

Partners:

FÖMTERV

Mernoki Tervezo ZRT, Budapest, Hungary

CNRS-LET

Centre National de la Recherche Scientifique, Lyon, France

NEA

NEA Transportonderzoek en – Opleiding BV, Zoetermeer, The Netherlands

ProgTrans

ProgTrans AG, Basel, Switzerland

TRT

Trasporti e Territorio SRL, Milan, Italy

ASSIST

Assessing the social and economic impacts of past and future sustain-able transport policy in Europe

Report information:

Report no:	R4	Workpackage no:	**7**
Title:	SYNTHESIS - Synopsis of ASSIST findings DRAFT		
Authors:	Michael Krail, Wolfgang Schade, Tobias Dennison, Stephan Kritzinger, Francesca Fermi, Davide Fiorello		
Version:	1.0	Date of publication:	16.09.2013

This document should be referenced as:

Krail M., Schade W., Dennison T., Kritzinger S., Fermi F., Fiorello D. (2011): SYNTHESIS - Synopsis of ASSIST findings. Input document to the ASSIST Final Conference on Assessing the social and economic impacts of past and future sustainable transport policy in Europe. Project co-funded by European Commission 7th RTD Programme. Fraunhofer-ISI, Karlsruhe, Germany.

Project information:

Project acronym:	ASSIST
Project name:	Assessing the social and economic impacts of past and future sustainable transport policy in Europe
Contract no:	MOVE/FP7/265381/ASSIST
Duration:	01.04.2011 – 30.09.2013
Commissioned by:	European Commission – DG MOVE – 7th Research Framework Programme.
Lead partner:	Fraunhofer-ISI - Fraunhofer Institute Systems and Innovation Research, Karlsruhe, Germany.
Partners:	FÖMTERV - Mernoki Tervezo ZRT, Budapest, Hungary
	CNRS-LET - Centre National de la Recherche Scientifique, Lyon, France
	NEA - Transportonderzoek en – Opleiding BV, Zoetermeer, The Netherlands
	ProgTrans - ProgTrans AG, Basel, Switzerland
	TRT - Trasporti e Territorio SRL, Milan, Italy.
Website:	http://www.assist-project.eu/

Document control information:

Status:	Draft
Distribution:	ASSIST partners, European Commission
Availability:	Public (once status is approved)
Filename:	ASSIST_Synthesis.doc
Quality assurance:	Imke Gries, Monika Silbereis, Matilde Alpino
Coordinator`s review:	Wolfgang Schade, Michael Krail
Signature:	Date:

Project co-funded by the
European Commission – DG MOVE
7th Research Framework Programme

Table of Contents

List of tables

List of figures

1 Introduction

The ASSIST project had to deal with the social and economic impacts of sustainable transport policy. Of course, the project did not neglect the environmental and institutional dimension of sustainability, but the focus of the project was on social and economic impacts, which effectively in many cases represent the two sides of the same coin. This holds for instance for transport policies that improve accessibility thus providing better access to jobs, culture, leisure facilities, a social impact, but also improve productivity and competitiveness thus fostering economic development, an economic impact, and employment, rather a social impact.

But the link between social and economic impacts is not always that straightforward and going in the same direction. In many cases, the social impacts emerge via the environmental impacts. Transport policies that reduce emissions or noise of transport improve the health of citizens affected by these environmental impacts. Social impacts deriving from changes of the environmental impacts of transport often exhibit a distributional dimension, i.e. they affect only certain social groups of the population e.g. living alongside larger roads. Most often the distributional impact is linked with the local nature of environmental impacts like pollution and noise.

Actually we did not look only at classical transport policy (e.g. pricing, taxation and infrastructures), but introduced the wider term of "*Transport Policy Measure*" (TPM) that also includes categories like vehicle efficiency standards or research and innovation. Thus the categories reflect the measures proposed by the European Transport White Paper conceiving the single European transport area (European Commission 2011).

The task of assessing the impacts of TPMs was twofold, as both impacts already occurred in the past and expected impacts of future sustainable transport policies were considered. This meant that we undertook (1) an ex-post analysis of impacts of existing transport policies, and (2) we developed a tool for prospective analysis of impacts until 2030 and even until 2050. In addition, the analysis was combined with qualitative considerations about the variation of TPMs impacts through changes of the framework conditions given by the socio-economic systems and the environment. We called these changes "*future challenges*"; examples of future challenges affecting transport and TPM impacts include ageing of society, climate change and increase of extreme meteorological events, strongly growing or very volatile prices of resources, etc.

The basic hypothesis concerning the TPMs impacts was that genuine win-win situations, i.e. situations in which all environmental, social and economic impacts of a TPM would be positive, are rare, so that our assessments in most cases revealed trade-offs between the different impacts or between different social groups or economic actors.

2 Direct and indirect impacts of TPMs

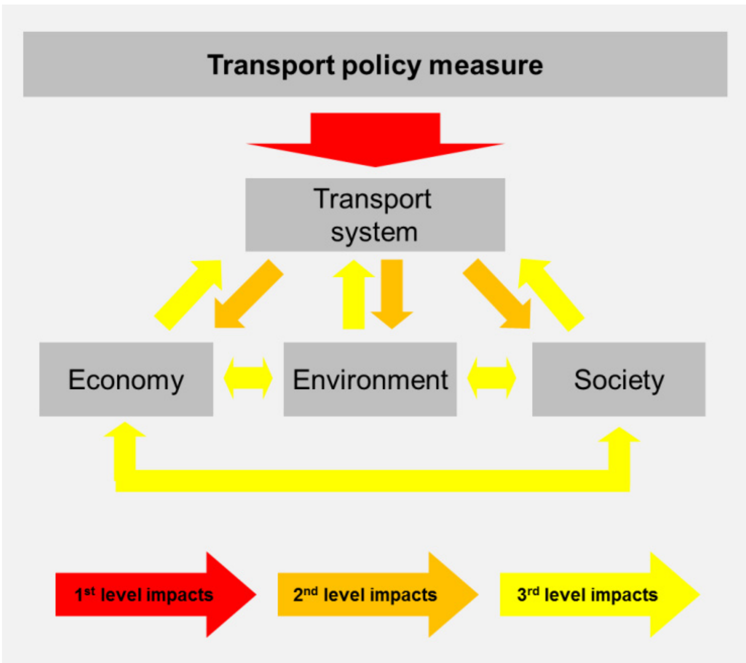
Social and economic impacts of transport policies do not arise directly from the transport policy; they develop through causal chains and constitute mainly indirect impacts, whereas the direct impacts are those affecting the transport system itself.

Implementing a transport policy measure has multiple effects and consequences (impacts) for different "user" segments (passengers, operators, economy, society etc.) and systems (transport system, economy, environment, society). However, it is expected that all the different types of measures (e.g. infrastructure developments, traffic regulations, fiscal regulations, new vehicles etc.) will first affect the **transport system**, e.g. by changing user travel times and costs, influencing trip origins / destinations, mode and route choice and finally the traffic conditions (1st level impacts).

At a subsequent stage (2nd level impacts), changes then mainly emanate from the transport system and influence the **economy** (e.g. due to less congestion, reduced travelling times for transport users and clients, changing transport costs for individuals and firms, improved accessibility for more advantageous location choice for production and services), the **environment** (e.g. fewer accidents, reduced air pollution and noise) and **society** (e.g. due to better health conditions, more acceptable working conditions in transport, easier access to vehicles, higher quality of life of the surrounding areas) with no straight or decisive sequence. The next impact level (3rd level impacts) describes the impacts on all four systems (the transport system, the economy, the environment and society), irrespective of the direction or kind of action. Hence it is also possible for there to be repercussions on the transport system.

Figure 2-1 sketches the different levels at which impacts of a TPM can be observed.

Figure 2-1: Interdependencies of the transport system, the economy, the environment and society



3 Assessing the impact of TPMs

Given that TPMs cause impacts within the transport systems, but potentially as well in the economic, environmental and social systems, the issue of assessing the impacts in all systems becomes relevant. Basically two approaches can be differentiated: (1) quantitative assessment and (2) qualitative assessment; while some kind of qualitative assessment can always be performed, quantitative assessment tends to be more complicated.

Starting with transport impacts (e.g. modal-shift, transport performance measurement) and extending the analysis to environmental impacts (e.g. emissions estimation), the quantification of impacts by established methodologies and models became feasible. In a next development step of quantitative methodologies, the transport and environmental impacts have been translated into economic indicators, e.g. by weighing travel time changes with the value of time or with a cost value per unit of emission derived from health and environmental studies. The subsequent step was to develop economic models linked with the transport models and providing economic impacts based on indicators made available by the models, e.g. equivalent variation, value-added or gross-domestic product; such models would have been integrated assessment models (e.g. econometric or system dynamics models) or (spatial) computable general equilibrium models (SCGE). On the other hand, measuring social impacts of transport in quantitative terms by models is still in its infancy, though ASSIST contributed to make progress in this field.

Since the last two steps, economic impact modelling and social impact modelling, reveal deficits, other options need to be considered as well to provide the full picture of impacts of a TPM. Story telling is one of these qualitative approaches that enable to do so. These approaches are important as we agree with the WorldBank that "*By explicitly addressing issues such as social diversity and gender, institutional norms and behavior, stakeholder analysis and participation, and social risk, projects are more likely to contribute to equitable and sustainable development*." (WorldBank 2006, p. vi).

Broadly this synthetic document reports on the three main activities undertaken by the ASSIST project:

(1) assessing the social and economic impacts of existing TPMs ex-post,
(2) analysing the impacts of relevant future challenges on the impacts of TPMs, and
(3) providing improved tools to quantify social and economic impacts of European policies to foster sustainable transport by preparing the ASTRA-EC model.

4 Policy impacts and future challenges

Based on desk research, the ASSIST project screened more than 300 policies or measures and carried out a detailed ex-post analysis of social and economic impacts of 61 TPMs, organised according to the eight policy categories as defined by the transport White Paper of 2011. These categories include:

1. Pricing
2. Taxation
3. Infrastructure
4. Internal market
5. Standards and flanking measures
6. Transport planning
7. Research and innovation
8. Others.

The following paragraphs briefly summarize the findings from the assessment of these 61 TPMs.

4.1 Social and economic impacts measured ex-post

In general, social impacts on the society as a whole or on groups have been defined in the context of economic and environmental impact assessments. It is obvious that the qualitative and quantitative extent of impacts of individual TPMs strongly depends on the geographical area of implementation (scale), the individual design (e.g. measures within the same TPM category do not necessarily have the same design) and how the measure is supported (financially, politically etc.).

The overall assessment of the TPM clearly shows that, if any social groups are affected, these are mostly income groups.

Economic impacts[1]

- Regarding economic impacts (in the sense of being influenced), the most frequently affected segments are transport operators, who are clearly positively influenced by the majority of policy measures, especially by ‘E-Freight’ and ‘End-to-End’ security certificates. In comparison, other segments such as passengers, society, the economy etc. are less frequently affected by economic impacts.

---

[1] The TPMs mentioned as examples are explained in detail in ASSIST deliverable D2.1.

- All TPMs belonging to ‘Internal Markets’ and ‘Infrastructure’ generate no negative impacts.
- Pricing and taxation measures challenge transport operators, users and the economy as a whole. As pricing and taxation measures influence transport costs directly, their efficiency depends on the economic framework and the preconditions of their implementation.
- Transport costs, competitiveness and revenues in the transport sector are the economic impact fields most frequently addressed by the selected TPMs.
- ‘End-to-end security certificates’, ‘E-freight’ and ‘Elimination of TEN-T bottlenecks’ are assumed to have the most positive economic impacts on transport costs, revenues, spatial and sector competitiveness and insurance costs.

Social impacts

- Positive impacts in social terms are mostly expected for residents, the society, the economy, employees and public bodies. Especially measures like the introduction of ‘SESAR’, ‘End-to-End security certificates’, ‘low emission zones’ as well as the ‘European Rail Traffic Management System (ERTMS)’ have undisputable benefits for these groups.
- Many TPMs contribute to improve safety and health; by far the most (positively) affected social impact fields.
- There is no transport policy measure which affects the cultural heritage or culture in general.
- To summarise, transport policies do not adversely affect societal issues or specific social groups. Only a very few measures have effects on specific social groups.

Environmental impacts

- Although as mentioned above, the social impact analysis showed many positive results, the environmental effects of transport policies are even more beneficial. Almost 95% of all impacts are environmentally positive.
- The TPMs investigated will help significantly to reduce air pollutants and noise emissions, which also has a direct positive impact on the society.
- Measures allocated to ‘transport planning’ (‘Influencing demand for sustainable transport – promotion of cycling within urban / suburban areas’, ‘City logistics’) and ‘infrastructure’ (‘Reduction of TEN-T missing links’, ‘Green transport corridors’, ‘Deployment of roadside-based ITS infrastructure for information services‘) have the most frequent environmental impacts.
- The TPMs ‘Noise emissions restrictions’ and ‘Park and ride systems’ are the measures with the most positive impacts on the environment. In contrast, the visual qual-

ity of the landscape and the land use are least affected by transport policy measures.

4.2 Spatial and sectoral competitiveness of TPMs

As competitiveness is a major concern of European policy-making a specific task was dedicated to the analysis of impacts of transport policies on competitiveness.

Over the past two decades, great attention has been paid to competitiveness due to the limitations and challenges posed by globalisation. The EC has also focused more on this issue and has implemented policies to increase competitiveness, both within Europe and between the EU and the rest of the world. The broader definition of the EC[2] covers both spatial and sectoral competitiveness:

- Spatial competitiveness refers to competitiveness on a geographical level like a municipality, region or nation.
- Sectoral competitiveness relates to the competitiveness between firms of a sector in different sectors like agriculture or industry.

In both cases, competitiveness aims to increase productivity. Obviously, this analysis does not claim to present a comprehensive definition or measurement of competitiveness, but it does try to link the concept of spatial and sectoral competitiveness to the transport system, transport policy and the impacts of transport policy measures.

Spatial competitiveness analysis

Spatial competitiveness concerns the improvement of employment and productivity on a certain geographical level, such as a region or a nation. The changes in employment and productivity are benchmarked against other regions or nations. Productivity improvement is dependent upon different factors, such as research and development or foreign direct investments. For a region or nation, sufficient accessibility is a precondition to stimulate employment or economic growth.

The impacts of TPMs have been checked concerning the area's accessibility. In the transport system, the most relevant key variables are travelling time, distance or costs.

2 'When identifying economic impacts, particular attention should be paid to factors that are widely considered as being important to productivity, and hence to the competitiveness of the EU. Competitiveness is a measure of an economy's ability to provide its population with high and rising standards of living and high rates of employment on a sustainable basis. Vigorous competition in a supportive business environment is a key driver of productivity growth and competitiveness.' [EC (2012), p. 4].

A change in any of these variables will affect the accessibility and consequently the spatial competition.

The most important TPMs influencing transport costs and hence the accessibility of certain regions are belonging to the categories ‘Pricing’ and ‘Taxation’, such as e.g. area charging, internalisation of external costs for specific modes of transport or the energy taxation directive. Supply measures such as infrastructure and internal market also have been relevant as they usually provide for a positive effect on accessibility, thus increasing competitiveness in terms of economic growth, productivity and employment. However, some distributional effects regarding spatial competitiveness (e.g. from one region to another) may occur as well.

Research and innovation do not lead directly to improved accessibility. However, increasing research and innovation improves the employment situation of this sector. Also, top level research is able to increase the positive public image of a region or nation.

Sectoral competitiveness analysis

Sectoral competitiveness is closely linked with productivity. Its fundamental determinants include qualitative and quantitative changes of inputs and technological improvements as well as unit labour costs and price / quality competitiveness. Two different types of sectoral competitiveness must be distinguished:

‘Intra-sectoral’ changes of competitiveness deal with the structural (modal) shifts within the transportation sector which imply changes concerning the competitiveness of transport operations. If possible, the competitiveness changes influenced by the individual transport policy measure have been explained by the variables cost, time and level of service (reliability, frequency etc.).

The ‘inter-sectoral’ level identifies direct and indirect impacts of measures on the competitive preconditions for clustered economic sectors (and services) on a broader scale. In a holistic consideration of measures and their impacts on competitive aspects, it became obvious that positive effects prevailed with respect to the general European policy objectives. Although negative intra- and inter-sectoral impacts appear, they do not seriously influence the competitiveness of transport operators and economic sectors.

Secondly, generally it can be stated that transport policy measures affect “intra-sectoral” aspects much more than “inter-sectoral” competitiveness. Furthermore, the analysis revealed that intra-sectoral agents like transport operators, as mostly road and rail transport service suppliers, are much more affected by TPMs than others. This is clearly caused by the type (recipient) of measures, which constitute the different categories and its areas of application.

It became evident, that the competitiveness analysis has been a first attempt to provide insights into the impacts of TPMs. It makes no claims to be complete; further, measure-specific assessments focussing on competitiveness are required, preferably supported by additional quantitative investigations or surveys.

4.3 Importance of future challenges for transport policy

For the purpose of the ASSIST project, a 'challenge' is defined as "*an exogenous condition or change at a structural level, already taking place or expected for the future, which brings about structural modifications of the current state or that requires an adaptation of current habits and policies to be addressed*."

This definition requires some further explanations: The term '*exogenous'* means that the condition or change is originated in the macro-environment outside of the transport system (e.g. thus the development of electric cars is a response not a challenge). '*Structural level*' means the involvement of a fundamental aspect rather than a specific circumstance. '*Challenge*' is used rather than 'trend' for two reasons. First, a 'challenge' communicates that attention should be paid to what is going on and the way transport policy could be affected. Second, trend provides more the idea of some 'natural' movement towards one direction, while the challenges considered to become important by ASSIST are in most cases not 'natural' but policy driven. Some of them are not evolving conditions, but existing or foreseen circumstances that might exist in a certain time and disappear afterwards (for example the debt issue).

Transport policies are first confronted by the challenges of sustainability. These challenges, environmental, social and economic, involve in particular the crucial questions of energy costs and climate change, but also relate to financial constraints. The transport sector is directly concerned and it is interesting to observe how the priorities of transport policies are changing in many European countries. Instead of encouraging road and motorised traffic the goal of transport policies is now to promote sustainable mobility. But up to what extent are transport policies ready to constrain and even to reduce passenger and goods mobility? What are the consumer behavioural changes to set up considering all the coming challenges?

Several other external challenges can affect the transport system in the future. Most of such challenges are already recognisable (such as globalisation, urbanisation and sprawling, debt), others can become very relevant in the near future (such as diffusion of ICT, migration pressure) others are longer term issues that nevertheless should be addressed (such as shortage of fossil fuels, climate change). Most of the challenges are already recognised by policy makers and have been addressed in several documents by the European Commission. Especially in the White Paper 2011, references to climate change, fossil fuels shortage, ageing and migratory pressure, globalisation, urbanisation, air and noise pollution are included. The debt problem (even if especially the public debt) is at the top of the EU agenda when this report is being written.

In order to identify the list of future challenges which are relevant with respect to social and economic impacts, we collected information on challenges from various references, classified these challenges with reference to their relevance according to the ASSIST purposes (i.e. making reference to impacts of TPMs), and produced a list of selected future challenges. Challenges may vary in the driver behind them, the probability of their occurrence, the scale and the time horizon and they must be relevant with respect to transport policy and its social and economic impacts.

Based upon this approach fifteen relevant challenges were selected. Table 4-1 provides an overview of these challenges.

Table 4-1: Selected challenges and the driver they belong to

Drivers	Challenges
Environment	Fighting climate change
	Shortage of fossil fuels and other natural resources
	Increasing air pollution and noise
	Urbanisation and sprawling
Society	Ageing of the European society
	Migratory pressure
	Unemployment
	Income inequality or income distortions
	Terrorism and the feeling of insecurity
	Individualism
Technology	Diffusion of ICT
	Third manufacturing revolution
Economy	Globalisation and outsourcing
	Public and private debt
	Fragility of the European Monetary Union

Source: TRT

Other challenges were revealed from the analysis, with reference to a variety of contexts: e.g. earthquakes and volcanic eruptions, geopolitical conflicts, illicit trade and organised crime, growth of global population, resurgence of nationalisms, power shift eastward, obesity, etc. These other challenges were considered to be less relevant for the purposes of the ASSIST project and were therefore not included in the analysis. For instance, we excluded the challenge of shifting global power eastwards, though we believe that *power shift eastward* is of utmost importance, but at the same time we consider that, as far as transport policy is concerned, its implications are not significantly different from those addressed by the challenge of globalisation.

4.4 Will future transport policies tend to increase inequality?

The answer to this question could be a moderate “yes”. For a number of reasons most studies assuming future transport cost trends expect cost increases. There seem to be two major reasons for that:

1. energy cost are expected to grow, in particular due to the growth of fossil fuel prices driven by growing energy demand in emerging countries. Taking into account that transport on average depends to more than 90% on fossil fuels this should cause growth in transport energy cost, even though part of that growth can be offset by efficiency improvements.
2. major transport policies would lead to increasing cost either by increased taxes on fuel/energy, by infrastructure charges or by other market-based instruments (e.g. emissions trading). Political reasons to do so are grounded in the internalisation of the different external cost of transport, in infrastructure funding needs, in particular as maintaining the existing infrastructure will require growing budgets for transport, and in reducing the financial support to public transport and improving its self-financing.

On the other hand, two trends are debated that together with increasing transport cost would potentially increase inequality: (a) zero- or moderate economic growth over a longer-term period, and (b) despite economic growth catching-up growing disparities between income groups, in particular leaving lower income groups behind. In both cases there would be substantial population groups that experience a reduction of their mobility due to the diverging trends of stagnating/reduced income and on the other hand growing transport cost.

As for well-off groups the transport cost increase might be uncomfortable but not really affecting their mobility, the social and economic inequality would increase in societies affected by these developments. In some countries, the situation could be aggravated by their ageing, which means that the share of retired persons increases, while the share of active labour force decreases. As a most probable result the retirement pensions would decline putting at risk of reduced mobility a growing share of retired.

5 Story telling as part of the analysis

The link between transport policies, future challenges, social and economic impacts is often best explained by telling a plausible story about it. Story telling as well constitutes a potential mean in analysis and assessment of social impacts that supports completeness of analyses. Stories enable, though not all impacts and causal chains of impacts can be quantified, to demonstrate that there could be wider impacts not captured by the quantitative analysis. Therefore this section presents a brief example of story-telling to demonstrate the connection between the previously discussed TPMs, future challenges and social impacts.

Climate change increases the risk of extreme weather events, which may cause direct impacts on the transport systems, but as well significant social impacts through impacts transmitted via the transport system. Extreme events relevant for transport can be storms/hurricanes and floods, both at the coast and along rivers or even in the country side, as recent examples in Central Europe in May/June 2013 have shown. Seven European countries located along the rivers Elbe and Danube have been severely affected by storms and long lasting intense rainfalls. In some areas the country side kilometres away from the river Elbe has been flooded for days and the infrastructure partially was destroyed. This includes housing, public facilities infrastructure and transport infrastructure. Even two months later in mid of August, the German high-speed rail system was not fully operational, and according to the latest announcement repairing the high-speed link will last until December 2013. Obvious social and economic impacts are the destroyed houses of the population in the flooded area and the devastated agricultural harvest. But also the economic and social impacts of the blocked high-speed link are substantial. Berlin is a city offering a high number of qualified employment opportunities such that commuters from the regions West of Berlin are affected by longer travel times or even cut-off connections, impacting their job and social life.

One could argue that planning failures are the cause of these social and economic impacts. On the other hand the transport infrastructure is prepared at least to stand the 30 years flooding risk – but of the flooding level experienced some decades ago. The future challenges, in this case climate change, together with continuous downgrading of water retention capabilities of rivers, lakes and soil alter these empirically grounded construction guidelines for infrastructures. Thus the future challenges also alter the impact of transport policies, in this case the building of the high-speed infrastructure, which is at risk to become regularly taken out of service by flooding events. The negative effects would become even more severe, if in parallel to building the high-speed link other links constituting alternative routes to that link would have been closed.

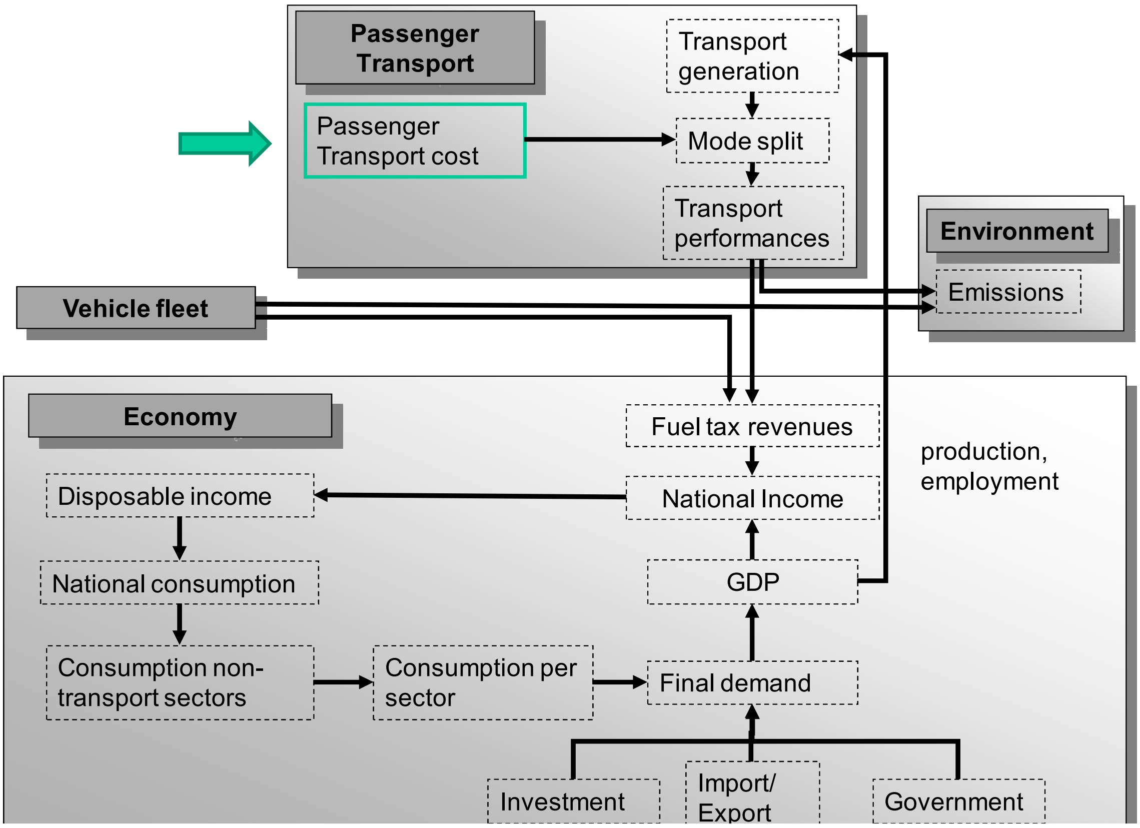
6 Capability of ASTRA-EC to cover social and economic impacts

One of the major outcomes of ASSIST is the development of ASTRA-EC: a modelling tool that can be applied for the strategic assessment of transport policy measures in the medium and longer period (up to the year 2050).

ASTRA-EC is a model based on the principles of system dynamics, which is the simulation of how different elements evolve over time given the interactions among each other. In ASTRA-EC a large number of different elements are represented. Part of them belong to the transport system – e.g. number of trips, tonnes moved, mode split, vehicle fleet – whereas other elements are part of the demographic system (segmented population), the economic system (e.g. consumption, investment, taxation, trade), the environmental system (energy consumption, emissions) and the social system (employment, accidents). A complex modelling structure links the various elements, also by means of parameters representing technological levels (e.g. emission factors), behavioural attitude (e.g. demand elasticity with respect to cost) and policy environment (e.g. fuel taxation).

Thanks to its multidimensional structure, ASTRA-EC is capable to simulate a wide range of impacts stemming from the application of a transport policy measure. Making reference to the concepts introduced earlier in this note (see section 2, Figure 2-1), ASTRA-EC can address direct impacts as well as second-level and third-level impacts of transport policy measures. Figure 6-1 provides an example of how the impulse generated by a change of transport cost (e.g. due to different energy taxation) modifies the transport system, propagates to other domains like the economy and the environment and also feedbacks again to transport.

ASTRA-EC can cover **economic impacts** thanks to a detailed representation of the linkages between the transport sector at the microeconomic level and the macroeconomic level. For instance, in the example of Figure 6-1 passengers transport costs are represented in the model at a “micro” level for each transport mode, with energy cost separated by driver costs, fuel taxes explicitly recognised, etc. Changes of some components of the transport costs give rise to a different expenditure for transport, which in macroeconomic terms means different aggregate consumption, which in turns has effects on GDP.



Source: Fraunhofer-ISI - TRT

Figure 6-1: Some effects generated by passenger transport cost variations in ASTRA-EC

The main micro-macro bridges modeled in ASTRA-EC concern:

- Passenger transport and sectoral consumption
- Transport and sectoral investment
- Transport and sectoral employment
- Freight transport and total factor productivity
- Transport and intermediate inputs of input-output tables
- Transport and exports.

Social impacts are addressed by ASTRA-EC in two manners. On the one hand, the model provides some indicators related to the social dimensions such as safety (number of accident, fatalities), accessibility and employment. On the other hand, some results in the transport and economic domain are segmented by income groups.

In fact, income distribution itself is modelled in ASTRA-EC, simulating the complex coherences with socio-economic trends on the basis of the age structure of society, educational skills, the dynamics in household structure, employment per sector and the development of demand and supply side of economies. This differentiation is an important input to simulate passenger transport, as confirmed by the analysis of personal mobility trend showing that income distribution has a visible impact on transport mobility habits.

Therefore, several variables reflecting mobility and consumer patterns in the field of transport are segmented by social groups, differentiating people according to their income, age, gender and household type. This enables to differentiate the reactions of social groups and analyse the social impacts of transport policy, e.g. in terms of transport expenditure by income group as well as mode split or average distance travelled. Using these indicators, it is possible to assess whether policy measures affect social dimensions and whether an income group is more or less affected than another one.

7 Draft conclusions

ASSIST aspired to improve the state-of-the-art in terms of assessing and modelling economic and social impacts of transport policies. The ex-post analysis of TPMs selected with reference to the Transport White Paper of 2011 developed a compendium of existing knowledge on economic and social impacts differentiated into impact on transports modes, spatial impact and impacts on certain population groups. The analysis revealed that in general social impacts would be improved by the White Paper policies at European level. However, at local level this conclusion would not always be appropriate, as these social impacts may also be negative. In general it emerges that it lacks both the European tools to assess the social impacts and, most often, the European responsibility to mitigate the impacts due to the subsidiarity principle.

An important outcome of ASSIST is to point to the potential difference between impacts of the same transport policy in the past and in the future. This difference emerges because (some) of the future challenges becoming reality and thus changing the framework conditions of transport policies. Obvious examples of these challenges would be ageing, with different age groups having different vehicle ownership and mobility patterns, or strongly increasing crude oil prices.

A suitable tool to consider these changing framework conditions seem to be the ASTRA model approach, as it enables to implement scenarios over time, i.e. scenarios with changing trends of oil prices, population structure, technology features, etc. The newly developed ASTRA-EC model enables quantitative assessment of economic and social impacts, though it must clearly be said, that the full picture of impacts can still not be provided. Indeed, the capabilities to quantify economic impacts (e.g. in terms of gross domestic product, valued added or employment) can better be tackled by the ASTRA-EC model than the social impacts, for which only a few like the distributional effects on different income groups could be reflected.

In that sense, the ASSIST project made progress to assess the social and economic impacts of past and future sustainable transport policy in Europe, but it still leaves room for improvement of the quantitative assessment tools as well as for qualitative approaches to describe and consider, in particular the social impacts in European transport policy-making.

8 References

European Commission (2011): *Roadmap to a Single European Transport Area. Towards a competitive and resource efficient transport system*. Transport White Paper, COM(2011) 144 final, Brussels.

European Commission (2012): *Operational Guidance for assessing impacts on sectoral competitiveness within the commission impact assessment system. Commission Staff Working document.* SEC(2012) 91 final, Brussels.

WorldBank (2006): *Social analysis in transport projects: Guidelines for incorporating social dimensions into bank-supported projects*. WorldBank Social Development Department, Washington.

9 Annex: Example of ASSIST fact sheet

The assessment of impacts of TPMs is described and documented by the ASSIST fact sheets. An example of such a fact sheet is presented in the following pages. The details on the analysis underlying the fact sheets is presented in Deliverable D2.1 that can be downloaded from the project website at:

http://www.assist-project.eu/assist-project-wAssets/docs/ASSIST_D2-1_Assessment_of_social_and_economic_transport_policy_measures_final_complete.pdf

Legend of fact sheets:

Explanation	
Assessment scale	
Estimation of change	
↑	strong increase
↗	increase
→	change of amount occurs, but is marginal, direction is unclear or increase and decraase occur at the same time
↘	decrease
↓	strong decrease
x	relevant for geographical level
(grey)	unrelated, no connection and must not be filled in
e.g.:	
A ↗ or ↑	for travel or transport time means more time is needed.
A ↘ or ↓	for vehicle mileage means less vehicle-kilometers are caused.
Impact assessment	
(blue)	impact with positive effect (with respect to the TPMs objectives)
(red)	impact with negative effect (with respect to the TPMs objectives)
Geographical levels	
L	Local Level
R	Regional Level
N	National level
I	International
Source differentiation	
S	Study, report, ex-post
E	Ex-ante assessment

FACT SHEET NO.: 6 / 6 **PERFORMED BY: PRO**

A GENERAL INFORMATION

A 1	**Category**	**Transport planning**
A 2	**Subcategory**	**Urban mobility - "zero/low emission" strategies**
A 3	**Transport policy measure (TPM)**	**Influencing demand for sustainable transport – promotion of cycling within urban / suburban areas**
A 4	**Description of TPM**	Congestion in urban areas has negative impacts on the economic, the society, the level of health, [and] the environmental and degrades the natural and built environment. In order to preserve and improve the quality of life within cities it is crucial to enhance and promote sustainable mobility. A demand-oriented approach to sustainable mobility is based on information, co-ordination and motivation. Besides, it complements traditional, infrastructure oriented transport planning, and it can be applied to a range of target groups. [1] [2] [7] There are different ways to positively influence and induce sustainable transport. As this TPM solely focuses on cycling as relevant transport mode, there are two ways to basically influence the demand for cycling: Through infrastructure improvements (1) or by so-called 'soft measures' (2): (1) (Local) authorities can improve the attractiveness of cycling by expanding their cycling infrastructure. There exist various methods to expand cycling infrastructure, like: introduction of fast cycling lanes, dedication of cycling lanes, designation / generation of bicycle parking's and introduction of cycling bridges / tunnels. These are 'traditional' and new infrastructure measures. [7] (2) Furthermore, cities, companies and schools can promote cycling, for example by introducing awareness campaigns, traffic games, road safety assessments, financial incentives (mostly within companies) or educational packages. This measures are often referred to as 'soft measures', which are designed to encourage people to use bicycles (in combination with public transport) for a journey that previously have been made by car. [7]
A 5	**Implementation examples**	The implementation examples follow the two methods as mentioned in the above description: 1. CIVITAS (City-Vitality-Sustainability) example Gent - Belgium: Sustainable mobility planning by the construction of bicycle tunnels and bridges; completion of the main bicycle routes; smaller improvements on bicycle routes (plateaus, cycling in one way streets, etc…). Goal: creating an integrated, sustainable mobility policy to reduce the number of cars and promote cycling and public transport. Results so far: 10% more bicycle use on average and a growing number of train commuters cycle between their home and the railway station (+10 % every year). [6] 2. ELTIS (The Urban Mobility Portal) example: Ocean's 11 - Promoting Active Travel in the East End of London. In order to promote a more active lifestyle for the local population, the "Get out Get Active" project was introduced. The project aimed to educate the residents on the rewards of travelling more actively (walking and cycling). Over 60 % of the 800 participants felt healthier at the end of the project than they did at the start (see www.eltis.org for further details). 3. The CIVITAS example of Graz: several infrastructure investments (new cycling zones, new safer junctions, bike & ride facilities) combined with promoting activities (a new electronic route planning that helps cyclists to plan fast and safe bicycle trips, a series of information campaigns, organised tours and other events organised together with professional bicycle retail shops) have led to an increased use of bicycles by 6 %. [7]
A 6	**Objectives of TPM**	The objective is clear: promote cycling and cycle-related multimodal transport and reducing road vehicle usage in order to achieve a more sustainable transport system within cities and urban areas. Promotion of cycling targets to improve the quality of life for citizens and reduce environmental impacts. [1]
A 7	**Key changes concerning:**	
A 7.1	- Choice of transport mode / Multimodality:	Cycling becomes more popular and private automobile usage will decrease. A modal shift occurs from road to slow modes. Moreover, public transport might increase due to increased multimodal transport options.
A 7.2	- Origin and/or destination of trip:	The accessability of city centres will become easier by slow modes and car trips will end up more often at the edge of cities. (P&R / B&R). It is unlikely that a change of origin/destination due to cycling policies occur, even in case of B&R applications, because the origin and final destination do not change, while the choice of route with different modes change.
A 7.3	- Trip frequency:	No key changes
A 7.4	- Choice of route:	Change from roads to cycling paths and railroads.
A 7.5	- Timing (day, hour):	No key changes
A 7.6	- Occupancy rate / Loading factor:	No key changes
A 7.7	- Energy efficiency / Energy usage:	Energy usage will decline as cycling requires far less energy (for instance no fuel/oil required) compared to passengers cars and even compared to public transport.
A 8	**Main source**	[1], [5]

B IMPACTS

B 1	**OVERVIEW ON IMPACTS**	**AFFECTED SEGMENTS**																**Geographi-cal level**		**Source**	
		Passengers					**Transport operators**						**Employees in transport**	**Residents**	**Economy**	**Public bodies**	**Society**				
		Road	Rail	Air	Public transport	Slow modes	Road	Rail	IWW	Air	Maritime	Public transport						1st level	2nd level	Source of assessment	Spatial level of source
B 1.1	**Summary**																	**L**	**R**	**S**	**I**

- Although mobility plays a crucial role in contributing to the socio-economic growth of urban areas, its negative effects have been increased (partly because of increased mobility) extensively over the years. Promoting sustainable transport (example: cycling) will mostly have positive impacts on all road users (especially slow modes), public transport operators, residents and society. They will benefit from increased well-being (less passenger cars -> less air pollutants and noise emissions), increased physical activity (and expansion of the cycling network).
- Road transport operators (car industry) will face negative impacts because of the initiated modal shift from road to slow modes and public transport. A reduced demand of passenger cars will lead to a decreased sale of cars which will implicate unemployment in the car industry. [5]
- Public bodies will have to invest in cycling infrastructure, but will save part of the expenses (maintenance) because of a lower demand for road infrastructure.
- The private income will increase due to less travel and transportation costs (e.g. commuting costs) and less investments for the infrastructure.

B 1.2	**Summary: Income groups**	- Cycling is an inexpensive way of transport within the financial reach of almost everyone. For each kilometre travelled, travel costs for the bicycle are lower than those of any other means of transport, except walking. Promotion of cycling will thus be beneficial for low income groups, because these depend on cycling when it comes to means to transportation (as other means are to expensive). [11]
B 1.3	**Summary: Age groups**	
B 1.4	**Summary: Disabled people**	
B 1.5	**Summary: Gender groups**	
B 1.6	**Summary: Ethnic groups**	

B 2	**TRAFFIC IMPACTS**	**AFFECTED SEGMENTS**																**Geographi-cal level**		**Source**	
		Passengers					**Transport operators**						**Employees in transport**	**Residents**	**Economy**	**Public bodies**	**Society**				
		Road	Rail	Air	Public transport	Slow modes	Road	Rail	IWW	Air	Maritime	Public transport						1st level	2nd level	Source of assessment	Spatial level of source
B 2.1	Travel or transport time	↘				↘												**L**	**R**	**E/S**	**I**
B 2.2	Risk of congestion	↘																**L**	**R**	**E**	
B 2.3	Vehicle mileage	↘	→		→	↗												**L**	**R**	**S**	**I**
B 2.4	Service and comfort					↑												**L**	**R**	**E**	

B 2.I	**Overall impacts on social groups**	
B 2.II	**Implementation phase**	
B 2.III	**Operation phase**	
B 2.IV	**Summary / comments concerning the main impacts**	- Travel or transport time for slow modes will decline when additional cycling infrastructure is going to be built. Cycling paths and extensive cycling networks will reduce the number of stops and enable an efficient travel by bike [3]. - The risk of congestion for road users will decline when more people will switch from passenger cars to slow modes, which will slightly influence the road transport time positively. - Vehicle mileage of passenger cars will decrease and vehicle mileage of slow modes will increase. Fast cycling lanes, cycling lanes, cycling bridges and other cycling infrastructure investments will reduce travel time for slow modes and allow people using a bicycle to cover greater distances in a shorter period of time. Vehicle mileage for public transport (including rail transport) will stay the same, or notice a minor increase. The latter will only take place when multimodal transport is being promoted (for instance by introducing improved cycling facilities at rail/bus stations) [1] [7]. - Service and comfort will increase significantly for slow mode users (cyclists). User-friendlyness will increase by more parking facilities and improved hiring options.
B 2.V	**Quantification of impacts**	- A reduction of travel time by bicycle of 10 % will increase bicycle use by 3 % [10].

B 3	ECONOMIC IMPACTS	Passengers: Road	Passengers: Rail	Passengers: Air	Passengers: Public transport	Passengers: Slow modes	Transport operators: Road	Transport operators: Rail	Transport operators: IWW	Transport operators: Air	Transport operators: Maritime	Transport operators: Public transport	Employees in transport	Residents	Economy	Public bodies	Society	Geographical level: 1st level	Geographical level: 2nd level	Source: Source of assessment	Source: Spatial level of source
B 3.1	Transport costs																				
B 3.2	Private income / commercial turn over														↘	→	↗	L	R	E/S	I
B 3.3	Revenues in the transport sector						↘											R	N	S	N
B 3.4	Sectoral competitiveness																				
B 3.5	Spatial competitiveness																				
B 3.6	Housing expenditures																				
B 3.7	Insurance costs																				
B 3.8	Health service costs																↘	N		S	N
B 3.9	Public authorities & adm. burdens on businesses															→		L	R	S	I
B 3.10	Public income (e.g.: taxes, charges)																				
B 3.11	Third countries and international relations																				

B 3.I	**Overall impacts on social groups**	
B 3.II	**Implementation phase**	- Public bodies will have to invest in cycling infrastructure (e.g. cycling lanes, cycling bridges, fast cycling lanes) during implementation phase. [See quantification for cost examples of cycling infrastructure measures.] - Administrative burdens for public bodies and participating companies will increase when starting awareness campaigns or introducing financial incentives to promote cycling.
B 3.III	**Operation phase**	- Public bodies will have less maintenance costs concerning road infrastructure (due to reduced vehicle mileage of passenger cars). [5]
B 3.IV	**Summary / comments concerning the main impacts**	- Public bodies, responsible for cycling infrastructure, will have to invest in new cycling infrastructure or promotion campaigns. But investments in bicycle infrastructure and maintenance are much cheaper than investments in car infrastructure. [5] This means, that investments of public bodies will increase during implementation and will decrease during operation. - Revenues in the car industry will decline when there is a demand shift from car to cycle. [5] - Health service costs for society will decline when more people decide to cycle instead using the car. Mainly, because physical activity (like cycling) leads to a longer and healthier life which will reduce health costs. [5] - Administrative burdens will rise when public bodies or companies start awareness campaigns, traffic games, road safety assessments, financial incentives (mostly within companies) or educational packages. [2] - The private income will increase due to less travel and transportation costs (e.g. commuting costs) and less investments for the infrastructure.
B 3.V	**Quantification of impacts**	- Each kilometer of travelling by cycled instead of car saves €0.97 of indirect costs (costs like time savings, air pollutants, noise, health problems, etc.). [2] - Within the CIVITAS II city of La Rochelle (France) the costs for one kilometre bicycle path was EUR 150.000 (in Poland one kilometre costs 250.000 EUR). [7] - Cycling promotion campaigns proven to be effective in Denmark. The "We bike to work" campaign led to about 10.000 new cyclists annually. [11] - The construction of a two-way cycle track (2.5 – 3.0 m wide) in Denmark cost DKK 2.5 – 6.0 millionen (within cities) and DKK 1.0 – 2.5 millionen (countryside) per kilometer. [11]

B 4	SOCIAL IMPACTS	Passengers: Road	Passengers: Rail	Passengers: Air	Passengers: Public transport	Passengers: Slow modes	Transport operators: Road	Transport operators: Rail	Transport operators: IWW	Transport operators: Air	Transport operators: Maritime	Transport operators: Public transport	Employees in transport	Residents	Economy	Public bodies	Society	Geographical level: 1st level	Geographical level: 2nd level	Source: Source of assessment	Source: Spatial level of source
B 4.1	Health (incl. well-being)					↗								↗			↗	L	R	S	N
B 4.2	Safety	↗				↗												L	R	S/E	I
B 4.3	Crime, terrorism and security																				
B 4.4	Accessibility of transport systems					↗												L	R	E	
B 4.5	Social inclusion, equality & opportunities																				
B 4.6	Standards and rights (related to job quality)																				
B 4.7	Employment and labour markets						↘					→	→					R	N	S	N
B 4.8	Cultural heritage / culture																				

B 4.I	**Overall impacts on social groups**	
B 4.II	**Implementation phase**	
B 4.III	**Operation phase**	
B 4.IV	**Summary / comments concerning the main impacts**	- Health of slow mode users will increase due to a better physical condition e.g. less chance of cardiovascular diseases, less chance to become overweighed, etc. (see quantification of impacts). [9] - Well-being of residents and society will increase due to the modal shift from road to slow modes (and public transport). Air pollutants and noise emissions will decline substantially if more people will use bicycles instead of passengers cars, especially within congested urban areas. [1] - About 60 % of the accidents and 25 % of the road fatalities occur in urban areas and affect slow modes users as the most vulnerable road users. The risk of being killed in a road accident is six times higher for cyclists and pedestrians than for car users. A well designed infrastructure, especially at intersections, can increase the level of safety for cyclists significantly. [1] - Accessibility of slow modes will increase when promoting leads to more bike & ride areas, "rent a bike" stores and particularly if (local) authorities offer financial incentives to low-income groups. In other words, there will be more possibilities to hire and use bicycles. - A modal shift from road towards slow modes and public transport will have a negative impact on employment within the car industry. Still, more jobs can be expected in public transport (if cycling will lead to an increase of multimodal transport) [5], if the demand increases. - Road passenger safety level increases when there is less traffic.
B 4.V	**Quantification of impacts**	- Over 70 % of all cycle accidents resulting in lethal or serious injuries occur at intersections. [5] - Everyday cycling to work increases the level of fitness 13 % on average. [9] - The health effect of the individual cyclist (internalised benefits as optimised weight, less risk of a cardiovascular disease, etc.) are calculated to approximately DKK 3.80 per kilometer (compared to car based travelling). [11] - Employees which travel to work by bicycle everyday are approximately 2 days fewer ill (on average) than employees travelling by car. [9] - Society (residents, health sector and state) benefit by about DKK 1.81 per kilometer. The benefits include cost savings for medical treatments and increased work value due to less sick leave (compared to car based travelling). [11]

B 5	ENVIRONMENTAL IMPACTS	Passengers: Road	Passengers: Rail	Passengers: Air	Passengers: Public transport	Passengers: Slow modes	Transport operators: Road	Transport operators: Rail	Transport operators: IWW	Transport operators: Air	Transport operators: Maritime	Transport operators: Public transport	Employees in transport	Residents	Economy	Public bodies	Society	Geographical level: 1st level	Geographical level: 2nd level	Source: Source of assessment	Source: Spatial level of source
B 5.1	Air pollutants													↓			↘	L	R	S	I
B 5.2	Noise emissions													↓			↘	L	R	S	I
B 5.3	Visual quality of the landscape																↘	L	R	E	
B 5.4	Land use																↘	L	R	S	N
B 5.5	Climate																↘	N		S	N
B 5.6	Renewable or non-renewable resources																↘	N		S	I

B 5.I	**Overall impacts on social groups**	
B 5.II	**Implementation phase**	
B 5.III	**Operation phase**	
B 5.IV	**Summary / comments concerning the main impacts**	- Short-distance trips (< 10 km) by passengers cars are the most fuel - inefficient car trips and generate the most pollution per kilometre compared to long-distance trips. These short-distance trips can be replaced by cycling, which will lead to a strong decrease in air pollutants on a local scale. [2], [8] - If road vehicle transportation is being reduced; noise emissions will decline (see quantification). [2] - A modal shift from cars to bicycles will save land use. Cycling will require less space for parking and travelling. [4] [5] [9] - The visual quality of urban areas will increase when less space is needed for parking and roads. - Climate will benefit from less greenhouse gases produced by passenger cars. [5] [9] - A reduction of vehicle mileage of passengers cars will lead to a decreased demand for oil (non-renewable resource). In other words, a modal shift from passenger cars to slow modes will decrease the amount of non-renewable resources used. [1]
B 5.V	**Quantification of impacts**	- If road vehicle transportation on an urban road is being halved; noise emissions will decline with 3 db(a). [2] - If all trips up to 7.5 kilometres by passengers cars will be replaced by trips on bicycles than this will save about 300-900 ton NOx, 20-60 ton PM and 100-300 ton SO2 annually [9]. - The space need for a parked bicycle has been calculated to be only 8 % of the space needed to park a car. [5]

C	REFERENCES	
C 1	**Other TPMs of this subcategory**	
C 2	**References**	**International** [1] European Commission (2007): Green Paper - Towards a new culture for urban mobility, COM (2007) 551 final, Brussels [2] European Cyclists' Federation (2011): Call for an integrated European Cycling Policy - ECF Position on the European Commission's White Paper on Transport, Brussels: ECF Publications [3] PRESTO consortium (2010): Promoting Cycling for Everyone as a Daily Transport Mode - Cycling Policy Guide - Cycling Infrastructure [4] PRESTO consortium (2010): Promoting Cycling for Everyone as a Daily Transport Mode - Cycling Policy Guide - Promotion of Cycling [7] Gualdi, M., Proietti, S. (2007): CIVITAS in Europe - A proven framework for progress in urban mobility, Rome: ISIS [8] European Parliament (2010): Directorate general for internal policies, Policy department B: Structural and cohesion policies: The promotion of cycling, Brussels: European Parliament **National** [5] Hout, K. van (2008): Annex I: Literature search bicycle use and influencing factors in Europe. Instituut voor Mobiliteit (IMOB): University of Hasselt [9] Hendriksen, I. Gijlswijk, R. van (2010): Fietsen is groen, gezond en voordelig - Onderbouwing van 10 argumenten om te fietsen, TNO: Leiden (in dutch) [10] Nijland, H., Wee, B. van (2006): De baten van fietsen en de mogelijkheden van fietsbeleid, Bijdrage aan het Colloquium Vervoersplanologisch Speurwerk 2006, Amsterdam (in dutch) [11] Andersen, T., et al. (2012): Collection of Cycle Concepts 2012, Copenhagen: Cycling Embassy of Denmark **Regional** [6] Bekeart, V. (2011): Cycling policy in Ghent, City of Ghent: Mobility Department