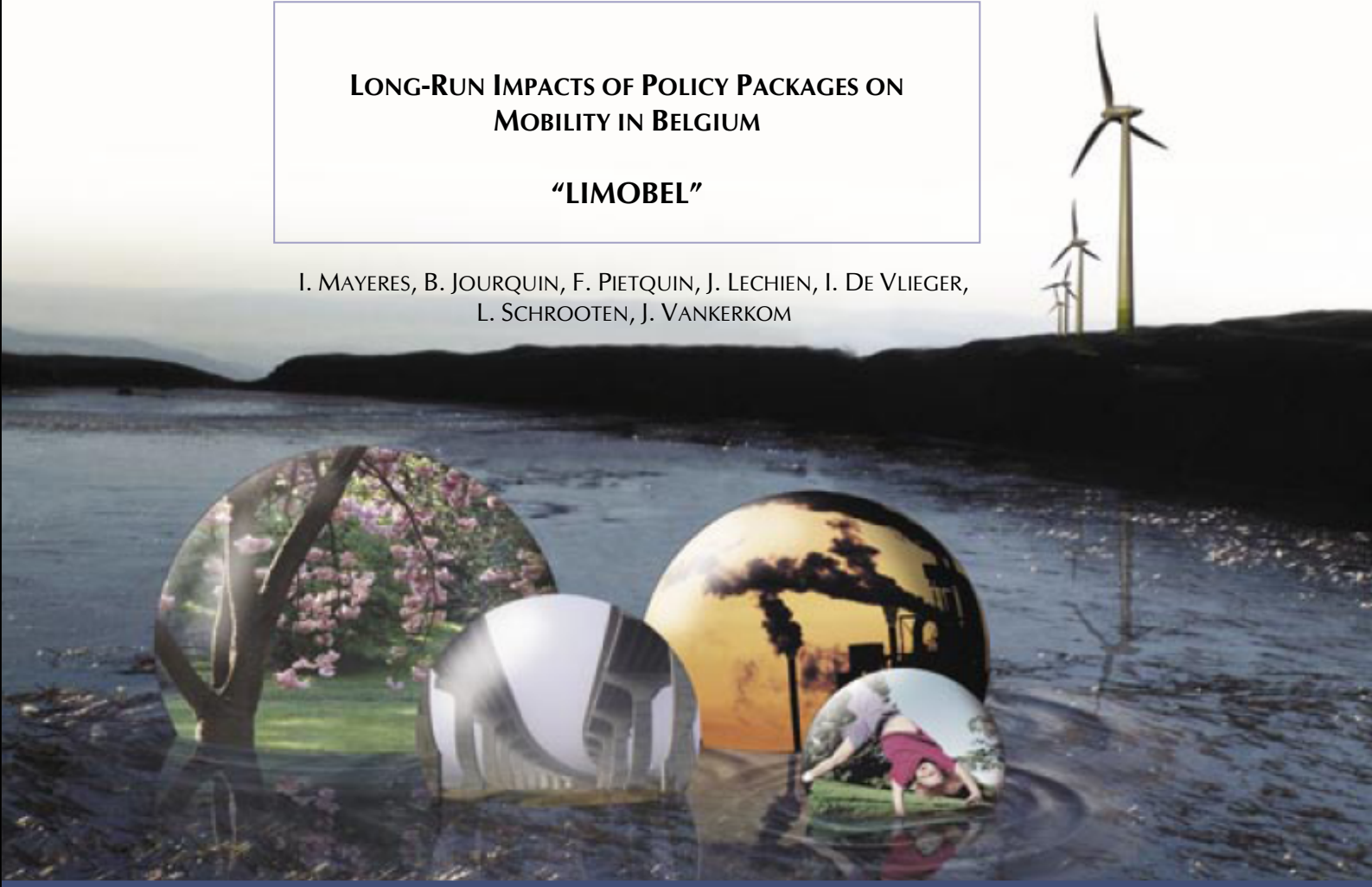
SSD

SCIENCE FOR A SUSTAINABLE DEVELOPMENT

LONG-RUN IMPACTS OF POLICY PACKAGES ON MOBILITY IN BELGIUM

"LIMOBEL"

I. MAYERES, B. JOURQUIN, F. PIETQUIN, J. LECHIEN, I. DE VLIEGER, L. SCHROOTEN, J. VANKERKOM



ENERGY

TRANSPORT AND MOBILITY

AGRO-FOOD

HEALTH AND ENVIRONMENT

CLIMATE

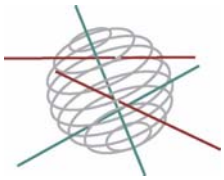
BIODIVERSITY

ATMOSPHERE AND TERRESTRIAL AND MARINE ECOSYSTEMS

TRANSVERSAL ACTIONS

.be

SCIENCE FOR A SUSTAINABLE DEVELOPMENT
(SSD)



Transport and Mobility

FINAL REPORT PHASE 1
SUMMARY

LONG-RUN IMPACTS OF POLICY PACKAGES ON MOBILITY IN BELGIUM

"LIMOBEL"

SD/TM/01A

Promotors

Inge MAYERES
Federaal Planbureau (FPB)
Kunstlaan 47-49, 1000 Brussels, Belgium
Tel: +32 0(2) 507 73 25
im@plan.be

Bart JOURQUIN
Facultés Universitaires Catholiques de Mons (FUCaM)
Chaussée de Binche 151a, 7000 Mons, Belgium
Tel : +32 (0)65 32 32 93
Bart.Jourquin@fucam.ac.be

Ina DE VLIEGER
Vlaamse Instelling voor Technologisch onderzoek (VITO)
Boeretang 200, 2400 Mol, Belgium
Tel: +32 (0)14 33 59 33
ina.devlieger@vito.be

Authors

Inge Mayeres, Bart Jourquin, François Pietquin, Jonathan Lechien
Ina De Vlieger, Liesbeth Schrooten, Jean Vankerkom

January 2009

BELGIAN SCIENCE POLICY

Rue de la Science 8
Wetenschapsstraat 8
B-1000 Brussels
Belgium
Tel: +32 (0)2 238 34 11 – Fax: +32 (0)2 230 59 12
http://www.belspo.be

Contact person: Georges Jamart
+32 (0)2 238 36 90

Project Website : http://LIMOBEL.plan.be

Inge Mayeres, Bart Jourquin, François Pietquin, Jonathan Lechien, Ina De Vlieger, Liesbeth Schrooten, Jean Vankerkom. ***Long-Run Impacts of Policy Packages on Mobility in Belgium "LIMOBEL"*** Final Report Phase 1 Summary. Brussels : Belgian Science Policy 2009 – 6 p. (Science for a Sustainable Development)

Introduction

The aim of LIMOBEL is to develop a fully operational modelling tool to study the impact of transport policies on the economy and on emissions in order to help the government that is facing different objectives, to make choices. The project will produce long-term projections (up to 2030) of passenger and freight transport demand in Belgium. A baseline scenario will be constructed which will be compared with alternative policy scenarios for a more sustainable transport. In the alternative policy scenarios, packages of instruments will be considered, including pricing instruments, regulation and infrastructure measures. The pricing and regulation instruments can concern both the use and the ownership of vehicles. Besides transport instruments the project may also consider more general instruments (such as labour taxes or transfers) in order to ensure budget neutrality.

The first output of LIMOBEL consists of a baseline scenario for Belgium with a time horizon of up to 2030. It will provide projections of the economic activity in Belgium and of transport demand. The transport related output will consist, amongst others, of the following aspects:

- the number of trips per trip purpose and consumer type (for passenger transport), the tonnes transported per goods type (for freight transport), the origin and destination of the transport flows, the modal choice and the time of day (peak and off-peak), the route choice and the vehicle technology;
- the energy use by transport;
- the transport emissions;
- the net transport tax revenue for the federal and regional governments;
- the marginal external costs of transport.

Secondly, LIMOBEL will perform a cost-benefit analysis of a number of budget-neutral policy packages. The project tool computes the impact of these policies on the economic performance, transport demand, energy use, emissions, congestion, accidents and welfare (in general and of the different consumer groups). As such the modelling tool allows us to study the trade-offs which often have to be made between different government objectives.

The three LIMOBEL model components

The project basically uses three models

- PLANET2: the model for long-term transport projections, which includes a long-term economic model (PLANET2 extends PLANET1 by integrating the two-way interactions between the economy and transport);
- NODUS: the network model for passenger and freight transport;
- E-motion: the environmental impact assessment model.

The three models are linked to each other, but do not optimise simultaneously. However, various inputs and outputs are exchanged between the models. Given the aims of LIMOBEL a certain level of detail is required.

Long-term economic model

The long-term economic model that is being constructed is a recursively dynamic computable general equilibrium model for the Belgian economy and the three Belgian regions. It incorporates elements of "New Economic Geography" theory. The model considers different consumer groups (per region) which allows for the analysis of the distributional impacts of policies. Environmental quality is one of the determinants of

consumer welfare but is assumed not to influence their consumption decisions. 24 sectors (per region) are modelled, 7 of which are transport sectors. A distinction is made between perfectly and imperfectly competitive sectors. The model integrates "love of variety": all consumers may benefit from the expansion of varieties. If the number of varieties increases they can achieve efficiency gains in the volume and costs of their consumption. The labour makes a distinction between two skill types. Frictional unemployment in Belgium is modelled through wage bargaining between employers and unions at the sectoral level.

The model includes different transport goods. It explicitly models the demand for freight and business transport by producers. Consumer demand includes, besides the demand for other goods and services, also the demand for passenger transport, for different purposes: commuting, school and other. In all cases a distinction is made between different modes. The time costs of transport are based on the outcomes of the network model and depend on the congestion level. The flows between the regions are the outcome of gravity models with transport costs as one of the determinants. The models take into account possible barrier effects that may arise because of the linguistic border in Belgium. The emission factors of the transport sector are based on the environmental model, as are the damages caused by the emissions.

Given the institutional setting of Belgium, two government levels are included: the federal and the regional level. The main government instruments are modelled, with a focus on transport (taxes, regulation and infrastructure measures). The choice of a computable general equilibrium model allows for an explicit calculation of the full welfare impacts of policy changes, taking into account the impacts on all economic agents.

Technological change is assumed to be exogenous. Environmental technologies that exist already but are currently too expensive, are modelled as backstop technologies. Changes in relative prices and the further development of these technologies may increase their competitiveness in comparison with conventional technologies and allow them to enter the market in the future.

The network model

The network model is based on the Nodus software, which was initially oriented towards multi-modal freight transport modelling. In the LIMOBEL project the methodological approach is being extended to both freight and passenger traffic. Beside the fact that the success of such a generalisation needs extensive data collections and generation in order to obtain comprehensive origin-destination matrices for commodities and passenger trips, special attention must also be paid to two additional topics.

First of all, a set of realistic cost functions must be developed for passenger transport. Indeed, and probably much more than for freight transport, the value of time plays a very important role, including the fact that people do not like transit points. The overall perceived quality of the different possible transport alternatives is also much more important, as it is one of the key variables of modal choice.

The second methodological issue is related to the use of the network infrastructure. Nodus has been used for a while at the trans-European level, for which the exact itineraries at the sub-regional level do not play an important role. Therefore, the concepts of "lines" (the planned routes for trains or buses) and "services" (the frequency of a train, for example) were

not included in the model. The introduction of these concepts implies important methodological changes.

Once all these issues addressed, the network model will be used to set up a reference scenario on top of which a series of scenarios will be build, making the link with the other two models.

The environmental impact assessment model

The environmental impact assessment tool consists of an emission model for road, railway and shipping traffic on the one hand and an external environmental cost model on the other hand. The main aim of this tool within the LIMOBEL project is to provide the long term economic model with the latest know-how on fuel efficiency, emission factors and damage per tonne of emissions.

The emission model is basically a technological model that contains new evolutions in conventional vehicle technology, as well as alternative fuels and motor vehicle technologies which could be coming up within a time horizon up to 2030.

The external environmental cost model is based on the work done within the series of European projects commonly known as ExternE. The ExternE model has proposed both exposure-response functions and economic values for all known impacts. The major external costs of transport emissions are global warming effects on one hand and public health impacts on the other. The latest updates for these major categories have been taken from the recently finished NEEDS project.

Results of the first project phase

In the first phase of the LIMOBEL project the first task was the identification of the main links between the different model components. These concern the type of information that is communicated between the long-term transport model, the network model and the environmental impact assessment model. A framework was set up for the future work in LIMOBEL.

Secondly, we have been able to determine the basic set-up of the long-term economic model. We decided on the type of model to use – a computable general equilibrium model with a regional dimension and different household groups – and on the crucial aspects that should be included in the model. For this we based ourselves on a review of both applied and theoretical models, complemented by a data collection exercise. The construction of the model is currently ongoing.

Thirdly, work was undertaken to obtain an updated and more realistic network model. The result is a better insight in the components of the generalised costs for passenger and freight transport, the introduction of the line concept for rail transport and an update of the network.

Finally, the methodology for the environmental impact assessment model was developed further. This concerns first of all a better data set for the historical fleet: the distinction between trucks of different weight classes and the selection of new motor fuel and vehicle technologies. Secondly, work was undertaken to update and refine the emission functions, taking into account the results of COPERT IV, together with the impact of air conditioning and the impact of the

voluntary agreement between the car manufacturers and the European Commission on CO_2 emissions of new cars. The emission module has been validated on the basis of figures for the Flemish region. Furthermore, purchase costs for motor fuel and vehicle technologies have been determined to apply as an input in the computable general equilibrium model. In addition, first runs have been performed with the technological emission model for rail traffic.