Improving the Policy Relevance of Freight Transport Models

Final Briefing

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RAND Europe
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PREFACE

This final briefing describes a study that was performed for the Ministry of Transport, Public Works and Water Management, Directorate-General for Freight Transport (DGG) by RAND Europe. The study, called “Improving the Policy Relevance of Freight Transport Models”, examined the information needs of the policymakers at DGG and the information provided by existing freight transport models available through the Ministry’s Transport Research Centre (AVV).

The study proceeded along two tracks. On one track, the DGG policymakers’ information needs were gathered through a series of interviews and a workshop. On the other track, information about available freight transport models was gathered through use of a questionnaire. The information about models was then compared with the information needs of the policymakers. This final briefing presents an overview of the study, the intermediate results from both tracks, and final conclusions from the study. The slides used in the workshops form the basis of the final briefing.

An overview of the study and its final results and conclusions is contained in:


This study is the first phase of a multi-phase project to develop the tools needed to supply efficient and effective support for the current and anticipated future information needs of DGG policymakers. The primary objectives of this phase were to identify:

- the information needs of policymakers,
- the capabilities of existing freight transport models available for AVV,
- gaps between the capabilities of the models and the information needs of the policymakers.
ACKNOWLEDGMENTS

We wish to acknowledge the help of the project's Steering Group, which consisted of Drs. A.J. Simons, Ministry of Transport, Public Works and Water Management, Transport Research Centre (AVV), and Ir. G.M.M. Alink, Ministry of Transport, Public Works and Water Management, Directorate-General for Freight Transport (DGG). The RAND Europe project team met with the Steering Group weekly. The Steering Group and supporting staff at AVV helped in organizing the workshops, collected information for the project, and provided valuable suggestions for the project as it progressed.

We thank Kerry Malone of RAND Europe for her helpful review of an earlier draft of this report. We also appreciate the contribution of all the people who we interviewed, who participated in the workshops, and who filled in the questionnaires. These persons are listed below.

Persons Who Were Interviewed And/Or Participated in the Workshop to Identify Policymakers' Information Needs

Ir. G.M.M. Alink, DGG, Technology Unit, Transport Strategy & Economic Affairs Division
Drs. A.J. Simons, AVV, Freight Transport Division
Ir. P.M.W. Elsenaar, DGP, Director, Traffic & Vehicle Safety Directorate
Ir. J. Filipse, DGG, Transport Strategy & Economic Affairs Division
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Mr. I.J. Meesen, State Traffic Inspectorate (RVI)
Drs. H.G. de Ruyter, State Traffic Inspectorate (RVI)
Drs. A.J. Arbouw, DGG, Head, Infrastructure, Ports, and Intermodal Division
Dr ir. R. Papenhuijzen, AVV, Head, Freight Transport Division
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Drs. W.F.S. Holleman, DGG, Head, Transport Strategy & Economic Affairs Division
Drs. E. Baarspul, DGG, Directorate for Transport Industry, Transactie Project
Drs. R.W. Huysen, DGG, Directorate for Transport Industry
Drs. A. Baanders, AVV, Head Strategic Research
K.H. van Hout, DGG, Director, Directorate for Transport and Industry
Drs. G.A. Dubbold, DGG, Director, Transport Safety Directorate
Drs. J.A.A.M. van der Ven, DGG, Head, Staff Office, Directorate for Transport Industry
Drs. D. van Duijn, DGG, Transport Strategy & Economic Affairs Division
Drs. C.E. Weber, DGG, Transport Strategy & Economic Affairs Division
Ir. J. van der Waard, AVV, Head, Strategic Models and Forecasts Division

Persons Providing Information On Models And Other Information Sources

J. Jetten, NEA
M.Sc. P.M.F. Tardieu, NEA
Drs. J. Francke, NEA
Ir. J. van der Rest, AVV
Drs. P.B. van der Gaag, AVV
J. van Meijeren, NEA
Drs. ir. R. Saitua, GHR
Ing. J.D. de Goederen, AVV

Drs. M. Wolters, AVV
Drs. E. Bijster, AVV
Drs. T. van Bekkum, AVV
Dr. F. Hofman, AVV
Ing. H. Flikkema, AVV
Dr. F.W.C.J. van de Vooren, RWS, Directie Limburg
Ir P.C.M. Polak, AVV
Drs. G.H.M. van der Linde, AVV
This final briefing is divided into four parts:

1) **General project description** contains the objectives of the project, the approach we used, and the general framework for our analysis.

2) **Policymakers’ workshop** describes the process and results of the track that identified the information needs of policymakers.

3) **Modeler’s workshop** describes the information collected about the freight transport models and the relationships between the models and information needs.

4) **Conclusions and next steps** describes the overall results of the project and makes suggestions for Phase 2.

In addition to the annotated slides, this briefing contains two appendixes. Appendix A lists the information needs identified during the project and the information sources that are available to satisfy these needs. Appendix B contains the questionnaire that was used to gather information about the freight transport models.
Outline for the Final Briefing

- General project description
- Policymakers' workshop
- Modelers' workshop
- Conclusions and next steps
Project Overview

- Issue addressed: The perceived gap between the information needs of policymakers and the information provided by existing AVV-related freight transport models.
- Clients: DGG and AVV

Policymakers at DGG have expressed concerns that currently available freight transport models may fall short of policymakers' needs: there are policy issues that cannot be addressed by any of the existing models and policymakers and their staffs are not fully aware of which models can be used for what purposes. The project "Improving the Policy Relevance of Freight Transport Models," conducted by RAND Europe for DGG and AVV, was the first phase of a multiphase project to develop the tools needed to supply efficient and effective support for the current and anticipated future information needs of DGG policymakers. The primary objectives of this phase were to identify:

- the information needs of policymakers,
- the capabilities of existing freight transport models available for AVV,
- gaps between the capabilities of the models and the information needs of the policymakers.

In the course of carrying out the work, an additional issue was uncovered: an apparent communication gap between the policymakers and the modelers. Some persons felt that the communication gap was a bigger barrier to filling information needs than the 'model gap'.
Project Objectives

- Identify the information needs of policymakers
- Identify the capabilities of the AVV-related models
- Identify gaps between the needs and the model capabilities

The primary objective of this phase of the project "Improving the Policy Relevance of Freight Transport Models" was to create a bridge between the information needed by policymakers (expressed in their own language) and the information that is, or can be, produced by models to fill these needs. We used a single framework to capture both the policymakers' information needs and the information produced by models. This single framework, which is described later in the briefing, was used to identify the gaps between the information needs of policymakers and the information provided by the existing models.
## Approach

1. **Identify the information needs of policymakers**
   - interviews, workshop, and other sources

2. **Determine the characteristics and capabilities of existing models**
   - questionnaire, literature, and workshop

3. **Identify other sources of information**
   - literature, help from persons in AVV and DGG

4. **Present results**
   - workshop on models
   - annotated briefing with complete results

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The project consisted of two parallel tracks:

1. Information needs of policymakers were identified through interviews, a workshop, and other sources.

2. Information on available freight transport models was collected through a questionnaire, literature, and a workshop.

After the first workshop on identifying the information needs, we used sources developed by some recent studies to identify additional information needs.

The model workshop reviewed the information on model capabilities. The workshop focused on identifying which of the information needs can be satisfied by the models.

The project focused on freight transport models. However, many of the information needs can be satisfied by other sources of information. AVV provided us information about these additional sources of information.
The project started with a series of policymakers interviews. The results of these interviews were presented in the policymaker workshop. The identified information needs were combined with other sources of information needs to form the final list of information needs.

A questionnaire was designed to evaluate the information that could be supplied by existing AVV-related freight transport models. This questionnaire was handed out to the people responsible for the relevant models during an information meeting where the purpose of the project was explained. All questionnaires were returned. The results were presented at the modeler workshop in which the same people were present. At this workshop, the policymakers' information needs were also presented and a comparison of demand (needs) and supply (models) was given.

In addition to the workshop that focused on freight models as a source of information, other information sources were identified that could supply some of the policymakers’ information needs.

The slides used in the workshops were modified based on comments in the workshops before using them for this annotated briefing. Slides containing the conclusions of the study were also added.
The first task of the project was to identify the information needs of policymakers. In gathering the information needs, the policymakers at DGG were not asked to think in terms of models. They were asked to think of the information that they needed to do their jobs. They did not need to know, and perhaps did not know, where the information would come from. It is clear that there are many information sources, and a freight transport model is only one.

Throughout the project, we have separated the sources of information into three categories:

1) **Mental models of policymakers:** This refers to the expertise and intuition of the policymakers themselves.

2) **AVV-related freight models:** This source was the focus of the project.

3) **Other sources:** There are many other sources of information, including data, knowledge, and expertise at AVV, databases compiled by other organizations, and research conducted at universities and other research institutes (both inside and outside the Netherlands). Whenever we were able to match an information need to these other sources of information, we did so.
In this project, we use the term **model** to refer to conceptual models that are implemented on a computer. The conceptual model is created based on the modeler’s perceptions about the world and on measurements of the world. All the elements that a computer model is based on -- measurements, mental models, and conceptual models -- are always approximate representations of the real world. We included in the project only computer models that are currently operational and available for use by AVV.

In considering the use of models to satisfy the information needs of policymakers, it is important to remember that (1) a model represents only part of the real world, and (2) a model is an abstraction of the real world, based on a set of assumptions.
Throughout the project we used the division of the traffic and transport policy domain into three markets that was developed by RAND Europe and TNO Intro for the Questa project. This framework allowed us to:

1) classify different information needs and;

2) identify the elements of the system focused on by the freight transport models.

The system diagram is an overview of the freight transport system; the parts of the system can be defined in different levels of detail depending on the purpose for which the representation is used. For example, two models may cover the same part of the system but with different levels of detail.

An explanation of the system diagram can be found in:


**NOTE:** During the project we had extensive discussions on the best translation of “verplaatsingsmarkt” -- the market where activities to be performed are placed against the spatial and temporal structure of society creating transport flows of goods. In these slides, this market is called the “travel market”.

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Project Description: Summary

- The issue addressed was the perceived gap between the information needs of policymakers and the information provided by existing AVV-related freight transport models.
- In studying the issue, the demand side (information needs) was confronted with the supply side (information sources) using a generic analytical framework.
- The core of the analytic framework was the three-markets transport system diagram.
Outline for the Final Briefing

- General project description
- Policymakers' workshop
- Modelers' workshop
- Conclusions and next steps

The slides in this section of the final briefing are slightly revised versions of the ones that were used at the workshop.
Improving the Policy Relevance of Freight Transport Models

Workshop to Discuss Policymakers’ Information Needs

7 October 1998

Barbara van de Kerke
Mari Pöyhönen

Odette van de Riet
Warren Walker

RAND Europe

The following persons participated in the workshop:
Ir. G.M.M. Alink, DGG
Drs. A.J. Arbouw, DGG
Drs. E. Baarspul, DGG
Drs. D. van Duijn, DGG
Ir. J. Flipse, DGG
Drs. F. J.P. Heuer, DGG
Drs. C.E. Weber, DGG
Prior to the workshop, a set of interviews was conducted with DGG staff members. The workshop began with a summary of the information needs gathered during these interviews. During the workshop these information needs were discussed, revised, and new items were added.

At the end of the workshop, each participant was asked to identify his or her top five information needs.
This is DGG's organization chart. The names shown in the various boxes are the persons who were interviewed. DGG provided us with the names of the persons to be interviewed.
The workshop focused on all of the policymakers’ information needs, even though only a small portion of them might come from AVV-related computer models.
Framework

- The information needs of policymakers were categorized
  - by three markets comprising the freight transport system
  - by types of information needs
- A matrix framework was set up with
  - rows corresponding to the parts of the freight transport system
  - columns corresponding to types of information needs

The information needs of DGG policymakers were placed in a matrix whose rows refer to parts of the freight transport system and whose columns refer to different types of information needs. The following slides explain the meaning of each of the rows and columns.
The freight transport system is divided into 3 markets: travel, transport, and traffic. In order to classify the information needs, each of the three markets was further subdivided:

**Travel market:**
- Activity needs
- Spatial and temporal structure of society
- Interactions in travel market

**Transport market:**
- Travel patterns
- Transport means and services
- Interactions in transport market

**Traffic market**
- Transport patterns
- Infrastructure
- Interactions in traffic market
- Traffic patterns
<table>
<thead>
<tr>
<th>Columns of matrix: Types of Information Needs</th>
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</thead>
<tbody>
<tr>
<td>1) To understand the current situation</td>
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<tr>
<td>1 A) Factors affecting the system and their interactions</td>
</tr>
<tr>
<td>1 B) Quantitative/qualitative description</td>
</tr>
<tr>
<td>2) To define and understand the effects of policies</td>
</tr>
<tr>
<td>3) Description of the future situation</td>
</tr>
</tbody>
</table>

Based on the interviews, we identified three different types of information needs. Policymakers wanted to get information related to the current situation, the effects of policies, and possible future situations. The information needs related to the current situation were subdivided into two categories based on whether the information was needed to understand the factors affecting the system and their interactions or whether it was needed to provide a description of the system.
Information Needs Added
After Interviews

- Workshop participants identified additional information needs.
- After the workshop, we added information needs from recent studies related to rail, road, inland shipping and a study conducted by Bakkenist.

During the discussion the participants were asked to revise and add to the information needs. The main revisions were:
  - Mode-specific information needs were generalized to include all modes (including air freight).
  - Information needs related to the Port of Rotterdam were generalized to include both mainports (Port of Rotterdam and Schiphol).

The participants also added new information needs to the original needs.

After the workshop, a new list of 96 information needs was produced by combining needs that were very similar and by adding the information needs from pilot studies and a recent report:


The final list of information needs is presented in Appendix A of this briefing. The numbers shown beside the information needs in the appendix refer to the numbers used at the workshop. An item added after the workshop is identified as "new".
This slide shows the allocation over the cells of the matrix of all of the information needs identified during the project (from the interviews and all other sources). The number in a cell is the number of information needs that fall into that cell. The green cells contain 1 or 2 information needs, the orange cells 3 to 5 information needs, and the reds cells more than 5 information needs.

The information needs are spread over the different parts of the three markets and over different types of information. However, the information needs are concentrated in column 1B (information to describe the current system).
Prioritization of Information Needs

- Each workshop participant identified five most important information needs.
- This exercise produced 20 information needs that were considered to be most important by one or more participants.

The 20 information needs that were considered to be most important by one or more participant are shown below and on the next slide (numbers refer to the numbers used in the workshop):

5. Who are the players in each of the three markets?
9. What are the relationships between economic development and freight transport?
10. What factors influence mode choice?
15. How do changes in the infrastructure affect freight transport?
16. Providers of indicators should use the same definitions for indicators.
17. Who are the customers of the service providers?
26. What is the added value of transport for each mode?
29. What is modal split for different business sectors and types of goods?
34. What are transfers in tonnes by region and by mode?
43. Lack of detailed information about freight flows (not only origin and destination).
Summary of Policymakers' Information Needs and their Prioritization

- Policymakers focus on understanding the current system.
  - In understanding the current system, information is primarily needed on the transport and traffic markets.
- Prioritizations diverge over the whole matrix of information needs.
  - The highest priorities are given to information needs on the travel and transport markets.

51. How can the Dutch economy grow without the same growth in environmental and safety problems?

52. Which market should DGG focus on? How can reachable policy goals be defined and in what terms should they be defined?

53. What are the effects of policies applied to the different markets? How can the effects of policies in the different markets be measured? How can the effects in the different markets be compared?

56. How can companies and municipalities be stimulated to locate at locations that are accessible by multiple modes?

66. What are the factors (and their development) outside the freight transport system affecting the future demand for freight transport?

67. Forecasts of freight transport demand are needed for years 2010, 2020, 2030.

68. Forecasts should take into account trendbreaks in vehicle development.

77. What is the competitive position of each of the modes? (compared with the position of neighboring countries)

78. What is the lifetime of vehicles (for all modes)?

79. What is the importance of transport for different business sectors (in terms of money, employment, etc.)?

92. Transport prevention: what are the tools for this?
General Comments by Policymakers on their Information Needs

- Policymakers think it is very important to have extensive basic information and data on the current situation.
- Policymakers think they have a good gut feeling about how the system works. The focus of the information needs should be on 1B.
- Policymakers would like to know much money is being spent to collect information.

Participants thought that the most important thing is to have extensive basic information and data on the existing system. They felt that the models that focus on a future situation are not as important.

Policymakers felt that they have a good gut feeling about how the system works. The focus of the information needs should be on collecting basic information (Column 1B). It was remarked during the workshop that their gut feeling may be wrong, but the policymakers did not think that this was likely. This indicates that in their policymaking process the policymakers rely largely on their mental models and their own expertise.

It was remarked that it would be interesting to know how much money is spent in gathering different types of information, and especially how much is spent on collecting basic information.
Outline for the Final Briefing

- General project description
- Policymakers' workshop
- Modelers' workshop
- Conclusions and next steps
Improving the Policy Relevance of Freight Transport Models

Workshop to Discuss the Capabilities of Freight Transport Models

24 November 1998

Marti Pöyhönen Warren Walker Odette van de Riet

RAND Europe

The following persons participated in the workshop:

Ir. G. Alink, DGG
Drs. E. Bijster, AVV
Drs. J. Francke, NEA
Ir. J. van der Rest, AVV
Drs. ir. R. Saltua, GHR
Drs. A.J. Simons, AVV
MSc. P.M.F. Tardieu, NEA
The workshop included four separate parts:

1. An overview of the workshop and its purposes, together with an overview of the models.

2. A presentation of the main strengths and capabilities of each model, with one slide for each of the models.

3. A comparison of the model capabilities with the information needs of the policymakers to see which information needs are satisfied by the existing models. (The list of information needs was sent to workshop participants before the workshop.)

4. A discussion of policy-related issues that were not mentioned by the policymakers but could be addressed by existing models or by extensions to the existing models.
Agenda for Modelers’ Workshop

- General overview
- Overview of model strengths
- Comparison of model capabilities with policymakers’ information needs
- Opportunities of the models not yet mentioned by policymakers

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An overview of the workshop and its purposes, together with an overview of the models.
Purposes of Workshop

- Discuss how the models can help satisfy the policymakers' information needs
- Discuss information that the models could provide that was not explicitly asked for by policymakers
- Confirm strengths of each model

The first purpose of the workshop focused on the policymakers' information needs. The list that was discussed is presented in Appendix A. The information needs in their list were compared against the information provided by the models. We noted that:

- The list is not a complete list of all possible information needs. It is a distillation of the current information needs of those who participated in the workshop.
- Policymakers were asked to think about their information needs, not their need for information from freight transport models. As a result, some of their needs are not related to models in any way.

The second purpose was aimed at determining which the models could play a larger role in supporting the information needs of policymakers than they currently have. Many of the possible uses of the models may not be being realized, and policymakers may not be aware of their potential uses.

We identified the main strengths of each of the models based on the information in the model questionnaires. (A sample questionnaire is contained in Appendix B.) During the workshop, we checked our understanding of these strengths (i.e., we made sure that we had correctly understood the information supplied) and discussed the untapped potential of the various models.
AVV-Related Computer Models Examined

- ATTACK
- GSM-7
- LMS
- NEAC
- MOBILEC
- PACE-FORWARD
- PAWN
- POINT
- SMILE
- TEM II
- VP-WEQ

The models listed above were selected by AVV to cover all of the models they use that focus on freight transport and that are currently operational. GSM-7 is the only model on the list that is not available through AVV. It is owned by GHR, Gemeentelijk Havenbedrijf Rotterdam.

In addition to these models, other computer models and information sources were considered, but ultimately excluded:

- Economic Impact Studies (EIS) is a methodology used by Policy Research Corporation to estimate the economic impacts of transport. This methodology has been used in Belgium, but the databases necessary to apply the methodology in the Netherlands do not currently exist. Thus, the methodology is a potential information source, but is not currently usable.

- BRIDGE is a framework developed at AVV to structure regional data collection. It is not a model, but more a procedure for collecting data in a consistent way at regional level. However, information collected under this framework is of use to policymakers.

- Transport Infrastructuur Grondgebruik Interactie Simulatiemodel (TIGRIS) focuses on passenger transport and does not include freight. This model has potential for studying issues related to freight transport and its use of infrastructure.
## Modes Included in Models

<table>
<thead>
<tr>
<th></th>
<th>SMILE</th>
<th>TEM II</th>
<th>NEAC</th>
<th>MOBILEC</th>
<th>ATTACK</th>
<th>VP/WEG</th>
<th>POINT</th>
<th>GSM 7</th>
<th>SPACE FORWARD</th>
<th>PAWN</th>
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This slide provides an overview of the coverage of the modes provided by each of the models. Coverage of "inter-modal" transport means that a model includes inter-modal transfer points and transfer flows.

- ● = the model covers this mode of transport
- ○ = this mode is not yet implemented in the model but there are plans to extend the model to include this mode.
This slide summarizes the years covered by each of the models -- both its base year and its forecast years.

The use of parentheses around a year indicates that the model's database is being updated for that year or that the model uses some information from that year.
Coverage of the Markets by the Models

<table>
<thead>
<tr>
<th>Travel market</th>
<th>Activity needs</th>
<th>Spatial and temporal structure of society</th>
<th>Interactions in travel market</th>
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</thead>
<tbody>
<tr>
<td>Transport market</td>
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<td>Transport patterns (e.g., O/D matrix of goods)</td>
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<td>Transport means and services</td>
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<td>Interactions in transport market</td>
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<td>Traffic market</td>
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<tr>
<td>Transport patterns (e.g., O/D matrix for transport means)</td>
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<td>Infrastructure</td>
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<td>Interactions in traffic market</td>
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<tr>
<td>Traffic patterns</td>
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RAND Europe

This slide shows which parts of the three markets of the freight transport system are covered by each of the models.

● = the model covers this part of the market

○ = this part of the market is not fully covered by the model but the model includes some approximation.

Notes:

• Models treat the issues within the markets with different levels of details and based on different assumptions.

• Activity needs in the travel market are assumed to be covered if the model uses economic growth factors to estimate the demand for freight transport.

• Traffic patterns are assumed to be covered if the model directly transforms transport patterns (i.e., an O/D matrix of transport means) into numbers of vehicles for different regions or distance classes (i.e., infrastructure need not be explicitly included).

Few models focus on the travel market -- e.g., to model relationships between transport and the economy. In this area, there are a lot of information needs that have high priority. The on-going development of models such as SMILE and MOBILEC shows movement towards satisfying these information needs.
This slide shows which of the impacts within or outside the freight transport system are estimated by a model.

● = the model calculates this impact

It should be kept in mind when viewing this matrix that the models have different geographic scopes and time scopes. Therefore, the actual measures they estimate are different. For example, a model that focuses on daily traffic patterns (such as LMS) will produce different measures of congestion compared to a model that calculates yearly impacts (such as PACE-FORWARD).

We show the impacts that the model currently produces. However, in many cases it would be easy to extend a model to cover other impacts of interest as well. An example is LMS: all the necessary elements are in LMS to calculate noise impacts.

Noise and safety issues are covered only by PACE-FORWARD and fragmentation is not studied in detail by any of the models that we studied.

Some models interact with other models -- i.e., the results from one model are sometimes used by other models. For example, GSM-7 produces the forecasts for freight flows related to the Port of Rotterdam. These forecasts are used by other models owned by the Port of Rotterdam authorities to calculate environmental and socio-economic impacts. These other models are not included in this table.

1) Fragmentation (versnippering) occurs when different pieces of the transport infrastructure make the land in between them useless; thus, the land is fragmented (versnipperd).
In our overview of the models, we highlight the strengths of each of the models.
TEM II: Strengths

<table>
<thead>
<tr>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forecasts domestic and international commodity flows on a yearly basis based on economic development.</td>
</tr>
<tr>
<td>Generates growth factors that are used by other models.</td>
</tr>
<tr>
<td>Has an extensive database</td>
</tr>
</tbody>
</table>

There are some plans to produce a TEM III that would pay more attention to intermodal transport. These plans are still in a preliminary stage. However, in the overview slides that identified the information the models provide, we showed what TEM III might be able to provide.
**NEAC: Strengths**

- Forecasts freight flows (by region, by commodity group, by mode, by route).
- Covers freight flows in entire world with varying levels of detail (new version: increased detail for Eastern Europe)
- Includes all modes and intermodal transport chains.
- Has extensive database
- Used by European Commission

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- NEAC focuses on freight transport at the European level.
- NEAC is currently being updated.
SMILE: Strengths

- Links the economic system (production chains) with the transport system (logistics).
- Includes all modes and intermodal transport chains.
- Designed for studying effects of policy changes.

- Note:
  - At the stage of pilot studies

SMILE is dynamic and includes feedback between the traffic, transport, and travel markets for each year. This makes SMILE usable for studying market behavior year by year.
MOBILEC: Strengths

- Focuses on the relationships among economy, mobility, and infrastructure for freight and passenger transport at the regional (Netherlands) level.
- Changes in infrastructure are easy to represent.

Note:
- At the stage of pilot studies.
ATTACK: Strengths

- Produces detailed emission forecasts for road traffic
  - Detailed descriptions of vehicles and their age distributions (including vans)
  - Includes all commercial vehicles (buses, fire engines, etc.)
- Is user friendly and has fast run times
VP-WEG: Strengths

| • Performs traffic conversion for freight flow forecasts produced by TEM II.  
  • Produces detailed information on freight and vehicle flows per time of day (by distance class, by vehicle class, loaded/empty trips).  
  • Note:  
    - Not operational at this moment but could be easily updated for PC environment.  

RAND Europe
POINT: Strengths

- Forecasts emissions and energy consumption for road, rail, and inland waterways on Dutch territory.
- Includes detailed input parameters on freight transport efficiency.
- A simplified version (VEV) allows very quick calculations for emissions.
- Note:
  - Only VEV is maintained.
GSM-7: Strengths

- Forecasts cargo flows related to the Port of Rotterdam.
- Takes into account economic developments in European countries.
- New countries, regions, and commodity groups are easy to add.
- Note:
  - GSM-7 is a part of a set of models used by GHR to calculate other impacts (e.g., environmental and socio-economic impacts, need for land in the Port of Rotterdam).

GSM-7 is especially useful for studying the competitive position of the Port of Rotterdam.

GSM-7 provides forecasts for goods flows going through the Port of Rotterdam. These results combined with the model that provides forecasts for the development of industries in the region of the Port of Rotterdam are used in other models that calculate different impacts for the region of the Port of Rotterdam. A model estimating environmental impacts is under development.
PACE-FORWARD : Strengths

- Designed for studying effects of policy changes
- Estimates a wide range of impacts of policy changes on emissions, costs, congestion, safety, noise, and the macroeconomy
- Supports the identification of promising packages of policy options
- Is user friendly and has fast run times
PAWN: Strengths

- Estimates operating costs related to inland shipping and changes in infrastructure
- Has fast run times

- Note:
  - Commodities are not separated
LMS: Strengths

- Designed for detailed analyses of traffic on Dutch roads at regional (Netherlands) level
- Good model for congestion

- Note:
  - LMS focuses on passenger transport; amount of freight is given as input (from ATTACK or TEM II through VP-WEG)
The list of policymakers' information needs is shown in Appendix A. We used the questionnaires filled out by modelers to make a first cut at linking the information needs to the capabilities of the various models.

In linking a specific information need to a model, we made the following assumptions:

• Although the information needs expressed by policymakers focused mainly on the current situation (Category 1A or 1B needs), we assumed that they would like to have the same information for future situations. For example, one of their needs was expressed as: "What is the age distribution of the vehicles in current use?" In this case, we assumed that the policymakers would also have an interest in age distributions of vehicles in the future.

• In many cases an information need applies to all modes. Most models do not cover all modes. However, to keep the list simple, we linked a model with the general need even if it provides information for only one mode.
Models Have Broad Capabilities

- Models together provide information related to all markets of freight transport system.
- Each model provides all three types of information
  - Description of current situation (base year) (Category 1A and 1B)
  - Effects of policy changes (Category 2)
  - Description of future situation (Category 3)
- => Models together cover the whole matrix

The information needs of policymakers were grouped according to the three markets shown in the freight transport system diagram. They were further categorized by the type of information need (the numbers used below are also used in the list shown in Appendix A):

1. Information that is needed to understand the current situation:
   - 1A. What are the factors affecting the system and their interactions?
   - 1B. Quantitative/qualitative description of the system

2. Information that is needed to define and understand the effects of policy changes

3. Information describing the future situation

The freight transport models have broad capabilities and provide information related to all of the above categories of information needs. The models include a description of the current situation because they assume something about a base case. All of the models include some variables and assumptions that can be used to study the effects of policies. Most of the models focus on providing forecasts for the future.
Comparing Model Capabilities With Information Needs: Observations

- The models touch most of the information needs on the list, but do not provide complete answers.
- There are a few remaining gaps
  - E.g., the models we studied do not focus on safety or fragmentation issues.

The final outcome of linking the models and information needs after the revisions and corrections made by the workshop participants is shown in the table contained in Appendix A. The results show that models that were studied in this project can help to satisfy a lot of the policymakers' information needs. Although most of the information needs are addressed by the models, most needs are such that a model alone would not provide a complete answer. We connected a model with an information need if we felt that the model might contribute in part to satisfying the information need. Our assumption is that there would be an analyst providing a bridge between the policymaker and the model(s) who would supplement the model information with information from other sources to address the policymaker's information need.

Combined with additional sources of information, there are still a few remaining gaps. Examples from the list in Appendix A:

- Safety issues: e.g., what are the major factors affecting safety and what are their inter-relationships?
- Fragmentation issues: how can "versnippering" be avoided?
- Issues related to details of infrastructure outside the Netherlands: e.g., what happens if there are big changes?
- Who will be important players in the markets in the future?
- Lack of behavioral models for choices made within the three markets.
Agenda for Modelers’ Workshop

• General overview
• Overview of model strengths
• Comparison of model capabilities with policymakers’ information needs
• Opportunities for use of the models not mentioned by policymakers

RAND Europe
Additional Uses For the Existing Models

- The models can provide information not asked for by policymakers.
- Some of this information might be useful in the future.

The supply side offers more than the demand side asks for: i.e., the models are able to supply information that was not asked for by the policymakers. However, this information could be requested by policymakers in the future.

Examples of these possible future needs are:

- What would be the effects in the Netherlands if Switzerland (or some other region outside the Netherlands) were closed to freight traffic?
- What would be the effects of implementing various types of underground freight transport systems?
Outline for the Final Briefing

- General project description
- Policymakers' workshop
- Modelers' workshop
- Conclusions and next steps
Conclusions: Comparison of Model Capabilities with Information Needs

- Models provide information that can help to satisfy a major portion of policymakers' information needs to some extent.
- Together with additional sources of information, there are few information needs that cannot be filled at all.

Models that were studied in this project can help in part to satisfy a large portion of the policymakers' information needs.

Combined with additional sources of information, there are only a few remaining gaps. Some of the most important of these are:

- Safety issues: e.g., what are the major factors affecting safety and what are their interrelationships?
- Fragmentation issues: how to avoid versnippering?
- Issues related to details about the transport infrastructure outside the Netherlands: e.g., what happens if there are big changes in the road or rail links?
- A lack of behavioral models for the choices being made within each of the three markets.
- A lack of help in creating future scenarios: e.g., who will be the important players in each of the markets in the future?
Conclusions: Additional Model Opportunities

- Existing models could be used to provide information that was not explicitly requested by policymakers.
- Some important policy issues are not covered by any of the existing AVV-related models.

First, we identified information that can be produced by the models and is of possible use to policymakers, but not explicitly requested by the policymakers. (I.e., we identified some rows that could be added to the table in Appendix A.) Two specific information needs of this type are:

- What would be the effects in the Netherlands if Switzerland (or some other region outside the Netherlands) were to close its borders to freight traffic coming from or going to the Netherlands?
- What would be the effects of implementing various types of underground freight transport systems?

Second, based on our understanding on the field of transport policy, we identified some policy issues that may need to be addressed in the future, but were not explicitly identified by the policymakers and are not covered by any of the existing AVV-related models. These policy issues could be addressed by extending existing models or building new ones. Three specific issues of this type are:

- Modeling air transport (either as a separate mode or in an intermodal chain)
- Models to support the analysis of corridor policies
- Models to estimate the direct and indirect economic effects of new and improved transport infrastructure.
Conclusions: Observations on the Set of Existing Models

- The set of existing models is adequate.
- Continuing investments should be made in models that focus on the travel market or that span all three markets.
- All the models studied address some of the information needs.
- VP-WEG is not updated, but the same information is produced by other models.

Based on the work done on this project, we can draw some conclusions about the current set of freight transport models.

- Comparing the supply of information to the policymakers' demands for information shows that the current set of models combined with information from other sources is adequate to fill the policymakers' currently-identified needs. There are, of course, some remaining gaps (listed in the previous slide) that we think could be filled by additional model development.

- There are no major areas in the list of information needs for which the models would not be able to provide at least some information. However, few models focus on the travel market -- e.g., to model relationships between transport and the economy. In this area, there are many information needs that have high priority. The on-going development of models such as SMILE and MOBILEC shows movement towards satisfying these needs.

- A question posed at the beginning of the project was whether any of the models is superfluous. All of the models we studied address some of the policymakers' information needs. Thus, no model is superfluous because it produces information not being requested. When there are apparent overlaps in the information produced by different models, there are usually important differences among the models. (For example, they cover different modes.) However, there was one exception. VP-WEG produces the same information as can be obtained from either ATTACK, POINT (VEV), or LMS. This fact is already recognized by the modeling community: VP-WEG is no longer being updated.
Conclusions: Communication Issues

- Information produced by models is not useful for policymaking if communication between policymakers and analysts does not work.
- Problems mentioned in interviews:
  - Policymakers do not feel that models can help them.
  - Analysts have difficulty understanding what policymakers want, and policymakers do not get the information in a form that is clear to them.
  - The process by which a policymaker can have an information need filled is not clear.

It is impossible to discuss the information supplied by the models without touching on the topic of communication between policymakers and analysts. Information needs to flow in both directions; policymakers need to specify their information needs and analysts need to produce information in a form that is understandable to policymakers. Although this project did not focus on communication, communications issues came up regularly during the interviews and workshops. Two examples are:

- Generally, policymakers feel that they do not need computer models. They rely largely on their mental models and their own expertise.
- Policymakers and analysts use different languages. Analysts have difficulty understanding what policymakers want, and policymakers do not get the information in a form that is clear to them.
- The process by which a policymaker can have an information need filled is not clear to some policymakers.

There is no simple way to solve these communication problems. Both DGG and AVV are aware of them and are working on them. To improve communication, the issues related to organization and structure (who should be involved?), process (how to communicate?), and tools that can help (e.g., the use of the Internet) need to be considered.
Models are only one element in the information supply chain that a policymaker uses in the policy preparation process.

First, unless the policymaker also runs the models, he must communicate his needs to the persons who run the models. This may require passing requests back and forth through several links in a communication chain (both within the organization, and between organizations).

Second, the policymaker is likely to call on a variety of other sources of information (e.g., research reports, statistics, maps). Again, this may require passing requests back and forth through several links in a communication chain (both within the organization, and between organizations).

For efficient and effective policymaking, this entire "decision support system" comprising models, other information sources, organizational structures, and communication processes must function efficiently and effectively.
As a result of carrying out the work described in the previous slides, we identified four tasks that should be carried out in order to satisfy the objectives of the overall project (to develop the tools needed to supply efficient and effective support for the current and anticipated future information needs of DGG policymakers). The tasks all contribute to satisfying the objectives, but they are mutually exclusive, and any or all of them would be sensible to carry out.

1. **Improve the use of existing models.** The existing models are not being used to their full potential. One possible reason for this is that few models have a user's manual or guidebook to explain all of the possibilities. There is work that could be done to produce a compendium of guidelines for the use of the existing models, including which models can be used to find answers to which questions.

2. **Expand the capabilities of some of the existing models and to build new models** to provide a better match with the (current and anticipated future) needs of policymakers.

3. **Improve the capabilities for filling information needs from non-model sources.** Policymakers have many information needs that are unrelated to models. There is work that could be done to find ways of filling the high priority needs.

4. **Improve communication processes and improve the ways in which information is presented.** Interviews with persons in AVV and in DGG revealed that in many cases a failure to fill an information need was due more to a communications gap than to a gap between the need and the capabilities of models to fill it.
<table>
<thead>
<tr>
<th>Part of the freight transport system</th>
<th>ID used in workshop (new means/adapted)</th>
<th>Information need:</th>
<th>Freight transport models studied in the project</th>
<th>Other (sources provided by AVV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over the whole system:</td>
<td>1</td>
<td>What are the major factors affecting safety and their relationship.</td>
<td></td>
<td>AVV (literature), EEB, CBS, BER</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>What is relationship between freight transport and &quot;leefbaarheid&quot;?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>To what extent do laws affect traffic safety?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Who are the players in each of the three markets? (by taking into account all the modes, also short-sea and air)</td>
<td>SMILE</td>
<td>AVV-VMG</td>
</tr>
<tr>
<td>Spatial and Temporal Structure of Society</td>
<td>6</td>
<td>How do changes in spatial planning affect freight transport?</td>
<td>SMILE, NEAC, MOBILEC, TEM II</td>
<td>AVV (literature), other sources</td>
</tr>
<tr>
<td>new</td>
<td>7</td>
<td>How do companies select their production and distribution locations?</td>
<td>SMILE</td>
<td>AVV (literature), K v K, University of Groningen, University of Utrecht, TU Eindhoven, other sources</td>
</tr>
<tr>
<td>Interactions in Travel Market</td>
<td>7</td>
<td>What are the external factors affecting freight transport demand.</td>
<td>SMILE, NEAC, MOBILEC, TEM II</td>
<td>AVV-VMG, other sources</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>How does the travel market work?</td>
<td>SMILE, NEAC, TEM II, MOBILEC</td>
<td>NEA</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Relationships between economic development and freight transport.</td>
<td>SMILE, NEAC, TEM II, MOBILEC</td>
<td>AVV/NEI/NEA, (&quot;Waar zit de groei?&quot;)</td>
</tr>
<tr>
<td>Interactions in Transport Market</td>
<td>10</td>
<td>What factors influence mode choice?</td>
<td>SMILE, NEAC, TEM II, MOBILEC</td>
<td>AVV (literature), other sources</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>Why transporters use the Netherlands as a transit country?</td>
<td>SMILE, TEM II (Port Competition model)</td>
<td>AVV-VMG</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>How do the different modes interact? (How does intermodal transport work)?</td>
<td>SMILE, NEAC, TEM II</td>
<td>AVV-VMG (literature), IVS90 (RAV), NWB</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>For the various business sectors, what are the potential benefits (and costs) from changing the modal split?</td>
<td>SMILE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>75A</td>
<td>How does the transport market work?</td>
<td>SMILE, NEAC, TEM II, MOBILEC</td>
<td></td>
</tr>
<tr>
<td>Supply of Traffic Market</td>
<td>14</td>
<td>What factors in global development affect the mainports (Port of Rotterdam and Schiphol)?</td>
<td>GSM-7 (Rotterdam), SMILE, NEAC, TEM II</td>
<td></td>
</tr>
<tr>
<td>Interactions in Traffic Market</td>
<td>15</td>
<td>How do changes in the infrastructure affect freight transport demand?</td>
<td>SMILE, NEAC, TEM II, MOBILEC</td>
<td>OEEI</td>
</tr>
<tr>
<td></td>
<td>75B</td>
<td>How does the traffic market work?</td>
<td>LMS (person transport), MOBILEC (road)</td>
<td></td>
</tr>
<tr>
<td>Over the whole system</td>
<td>16</td>
<td>Providers of basic data should use the same definitions for indicators (especially for vehicles and safety issues).</td>
<td>SMILE, TEM II, NEAC, (all modes within one model, no safety)</td>
<td>Procedures are developed, TIB indicators, BRIDGE, TILN</td>
</tr>
<tr>
<td></td>
<td>83, 84</td>
<td>Information is needed from foreign countries with respect to problems (&quot;bottlenecks&quot;) that Dutch encounter in foreign countries. With respect to polices, information about the neighborhood countries is sufficient.</td>
<td></td>
<td>other sources</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>What are the internal costs of infrastructure by mode and who should be charged?</td>
<td></td>
<td>IGO</td>
</tr>
<tr>
<td>Demand of Travel Market</td>
<td>17</td>
<td>Who are the customers of the service providers?</td>
<td></td>
<td>other sources (verladers enquête)</td>
</tr>
<tr>
<td>Interactions in Travel Market</td>
<td>79</td>
<td>What is the importance of transport for different business sectors (in terms of money, employment, etc.)?</td>
<td>SMILE, MOBILEC</td>
<td>CBS</td>
</tr>
<tr>
<td>Supply of Transport Market, transport means</td>
<td>16, extended</td>
<td>What are the proportions of different types of vehicles in use? (by age, by the country of registration, by size, by type, etc., for all the modes)</td>
<td>ATTACK (road), NI AG POINT, VP-WEG</td>
<td>CBS, RAI, NIWO, IVR, other sources</td>
</tr>
<tr>
<td>Part of the freight transport system</td>
<td>ID used in workshop (new means added later)</td>
<td>Information need:</td>
<td>Freight transport models studied in the project</td>
<td>Other (sources provided by AVV)</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>------------------------------------------</td>
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<td>-----------------------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>19</td>
<td></td>
<td>To what extent are new vehicle technologies and telematics used by companies?</td>
<td>Not a model issue</td>
<td>AVV (literature), RIVM, TNO, other sources</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>What are costs and benefits of using bigger trucks, Combi road, special vehicles?</td>
<td>SMILE, NEAC, PACE-FORWARD</td>
<td>AVV (literature), other sources</td>
</tr>
<tr>
<td>21</td>
<td></td>
<td>What are the latest technological developments with respect to vehicles?</td>
<td>Not a model issue</td>
<td>TNO</td>
</tr>
<tr>
<td>22</td>
<td></td>
<td>Environmental and safety impacts of different kinds of vehicles (for all modes)</td>
<td>ATTACK, SMILE, NEAC, PACE-FORWARD, POINT</td>
<td>EEB</td>
</tr>
<tr>
<td>23</td>
<td></td>
<td>Transport prices for each mode.</td>
<td>SMILE, NEAC, TEM II, MOBILEC</td>
<td>AVV, NEA</td>
</tr>
<tr>
<td>77</td>
<td></td>
<td>What is the competitive position of all Dutch transport sectors (by mode) compared with neighboring countries?</td>
<td>SMILE, NEAC</td>
<td></td>
</tr>
<tr>
<td>78</td>
<td></td>
<td>What is the lifetime of transport vehicles? (for all modes)</td>
<td>ATTACK (road)</td>
<td>CBS, other sources</td>
</tr>
<tr>
<td>new</td>
<td></td>
<td>How does the Dutch vehicle fleet look like compared to the fleet in other European countries?</td>
<td>NEAC</td>
<td>&quot;Jaarbericht vervoerend Nederland&quot;, other sources</td>
</tr>
<tr>
<td>1B Interactions in Transport Market</td>
<td>24</td>
<td>What is the share of transport alone from GDP?</td>
<td>SMILE</td>
<td>CBS, J.V.N., AVV-VMG, RotGoed</td>
</tr>
<tr>
<td>25</td>
<td></td>
<td>The share of different modes of the international transport in the Netherlands?</td>
<td>GSM-7 (R'dam), NEAC, TEM II, SMILE</td>
<td>AVV-VMG, CBS</td>
</tr>
<tr>
<td>26</td>
<td></td>
<td>What is the added value of transport by each mode (both money and employment)?</td>
<td>SMILE, MOBILEC</td>
<td>CBS, BER</td>
</tr>
<tr>
<td>27</td>
<td></td>
<td>Lack of good estimates for price-elasticities.</td>
<td>SMILE, NEAC, TEM II</td>
<td>&quot;Waar zit de groei?&quot;</td>
</tr>
<tr>
<td>28</td>
<td></td>
<td>What are the latest technological developments with respect to logistics?</td>
<td>Not a model issue</td>
<td>AVV-VMG</td>
</tr>
<tr>
<td>1B Demand of Traffic Market, transport patterns</td>
<td>28, 31, 32</td>
<td>More information on modal split (by different business sectors, by types of goods, by tonne-kilometers for distance categories, and by vehicle kilometers)</td>
<td>SMILE, NEAC, TEM II, MOBILEC</td>
<td>NEA, CBS</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td>Modal shift in terms of transported tonnes.</td>
<td>NEAC, TEM II, SMILE, MOBILEC</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td></td>
<td>Transported tonnes in inland shipping and in selected short-sea routes divided between containers and other freight.</td>
<td>GSM-7 (R'dam), TEM II, SMILE, NEAC</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td></td>
<td>Transfers in tonnes by region and by mode (the use of terminals).</td>
<td>SMILE, NEAC, TEM II</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td></td>
<td>International freight transport around the Netherlands.</td>
<td>GSM-7 (R'dam), NEAC, TEM II, SMILE</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td></td>
<td>Intermoda flow of goods (inside and outside the Netherlands).</td>
<td>SMILE, NEAC, TEM II</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td></td>
<td>What are the destinations of (hazardous) goods on specific routes (rail and road)?</td>
<td>NEAC, TEM II (based on approximations)</td>
<td>other sources</td>
</tr>
<tr>
<td>38</td>
<td></td>
<td>What kinds of hazardous goods are transported in trucks and vessels?</td>
<td>NEAC, TEM II (based on approximations)</td>
<td>other sources</td>
</tr>
<tr>
<td>39, extended</td>
<td></td>
<td>How are different goods packaged (percentages of different goods packaged in containers, pallets, bulk, etc. for all modes)?</td>
<td>GSM-7 (R'dam), TtM II (containers), NEAC (containers), SMILE</td>
<td>IVS90/AVV-BG</td>
</tr>
<tr>
<td>40</td>
<td></td>
<td>What is capacity utilization (benuttinggrad) by mode?</td>
<td>NEAC, SMILE, ATTACK, POINT</td>
<td></td>
</tr>
<tr>
<td>new</td>
<td></td>
<td>What are the possibilities for modal shift in terms of transported tonnes? (E.g., how much of air-freight could be transported by rail instead of by road?)</td>
<td>SMILE, NEAC, TEM II</td>
<td></td>
</tr>
<tr>
<td>1B Supply of Traffic Market</td>
<td>41</td>
<td>What is the capacity of the various segments of infrastructure (for all modes)?</td>
<td>LMS (road), SMILE (all modes), NEAC, MOBILEC</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td></td>
<td>Where are the specific versuspering locations?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part of the freight transport system</td>
<td>ID used in workshop (new means added later)</td>
<td>Information need:</td>
<td>Freight transport models studied in the project</td>
<td>Other (sources provided by AVV)</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>---------------------------------------------</td>
<td>-------------------</td>
<td>-----------------------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>65</td>
<td></td>
<td>Up-to-date maps about the infrastructure for all modes.</td>
<td>Not a model issue</td>
<td>AVV-BG, NWB (road)</td>
</tr>
<tr>
<td>66</td>
<td></td>
<td>Maps of planned projects.</td>
<td>Not a model issue</td>
<td>VRROM</td>
</tr>
<tr>
<td>Output of Traffic Market</td>
<td>43</td>
<td>Detailed information about freight flows (i.e., actual number of kilometers by vehicles by time of the day).</td>
<td>LMS (road), VP-WEG, NEAC</td>
<td>AVV-VMM</td>
</tr>
<tr>
<td>44</td>
<td></td>
<td>What is actual use of infrastructure (for all modes)?</td>
<td>LMS (road), MOBILEC (road), NEAC (including passengers)</td>
<td>AVV-BG, TIC (road), VOIR, Radarschapenteler</td>
</tr>
<tr>
<td>45, 50, 66</td>
<td></td>
<td>Integration of comparison of modes based on environmental and safety impacts (lack of good indicators for environmental and safety impacts)</td>
<td>SMILE (no safety)</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td></td>
<td>Freight transport’s share of environmental impacts compared to other sectors.</td>
<td>ATTACK (road), POINT</td>
<td>CBS, RIVM Miliubalans</td>
</tr>
<tr>
<td>47</td>
<td></td>
<td>Areas with noise emissions from road vehicles</td>
<td>PACE-FORWARD</td>
<td>RIVM, Silence, VMK</td>
</tr>
<tr>
<td>48</td>
<td></td>
<td>Congestion in the hinterland.</td>
<td>LMS, PACE-FORWARD, NEAC, MOBILEC</td>
<td>NBW, AVV-VMM</td>
</tr>
<tr>
<td>49</td>
<td></td>
<td>Lack of graphical information on accidents for road, rail, and inland shipping.</td>
<td></td>
<td>AVV-BG</td>
</tr>
<tr>
<td>52</td>
<td></td>
<td>Proportion of freight transport of total traffic flows, and its contribution to congestion.</td>
<td>LMS (road), PACE-FORWARD, NEAC</td>
<td>AVV-VMM</td>
</tr>
<tr>
<td>98</td>
<td></td>
<td>What are the vehicle loss hours caused by congestion (for freight)?</td>
<td>LMS (road), NEAC</td>
<td>AVV-BG, AVV-VMM, NEA</td>
</tr>
<tr>
<td>Over the whole system</td>
<td>51</td>
<td>How can the Dutch economy grow without the same growth in environmental and safety problems?</td>
<td></td>
<td>RIVM</td>
</tr>
<tr>
<td>52</td>
<td></td>
<td>Policy questions: Which market should DGG focus on? How can reachable policy goals be defined and in what terms should they be defined?</td>
<td>Not a model issue</td>
<td></td>
</tr>
<tr>
<td>53</td>
<td></td>
<td>Information needs: What are the effects of policies applied to the different markets? How can the effects of policies in different markets be measured? How can the effects in the different markets be compared?</td>
<td>All models (too generic information need)</td>
<td></td>
</tr>
<tr>
<td>54</td>
<td></td>
<td>What can DGG do to respond to various external developments?</td>
<td>Not a model issue</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td></td>
<td>How can we maintain or even strengthen the social acceptance (drayguyak) for freight transport?</td>
<td>Not a model issue</td>
<td></td>
</tr>
<tr>
<td>59</td>
<td></td>
<td>What are the factors that define the success of a public-private partnership?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>93</td>
<td></td>
<td>When do the effects of policies take place? (What is the time perspective of policies?)</td>
<td>MOBILEC, SMILE (all models can be used, depends on the market)</td>
<td></td>
</tr>
<tr>
<td>Interactions in Travel Market</td>
<td>56</td>
<td>How can companies and municipalities be stimulated to locate at locations that are accessible by multiple modes?</td>
<td>SMILE</td>
<td></td>
</tr>
<tr>
<td>57</td>
<td></td>
<td>How to affect the amount of freight that needs to be transported?</td>
<td>SMILE, NEAC, TEM II, MOBILEC</td>
<td></td>
</tr>
<tr>
<td>Demand of Transport Market</td>
<td>58</td>
<td>What are the possibilities to reduce the demand for transport? E.g., by stimulating the use of telematics or by supplying information to reduce the number of empty vehicle kilometers.</td>
<td>SMILE, POINT, NEAC</td>
<td>&quot;Waar zit de groei?&quot;</td>
</tr>
<tr>
<td>59</td>
<td></td>
<td>How to stimulate the use of new vehicle technologies?</td>
<td>Not a model issue</td>
<td></td>
</tr>
<tr>
<td>59</td>
<td></td>
<td>Lack of insight into the demand side of the transport market (spatial and temporal assignment of activities).</td>
<td>SMILE</td>
<td></td>
</tr>
<tr>
<td>Supply of Transport Market</td>
<td>60</td>
<td>What would be the effect of various tactics on modal split?</td>
<td>SMILE, TEM II, PACE-FORWARD, NEAC</td>
<td></td>
</tr>
<tr>
<td>Interactions in Transport Market</td>
<td>61</td>
<td>How can logistics be made more efficient by government actions?</td>
<td>SMILE</td>
<td></td>
</tr>
<tr>
<td>ID used in workshop (new means added later)</td>
<td>Information need:</td>
<td>Freight transport models studied in the project</td>
<td>Other (sources provided by AVV)</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>------------------</td>
<td>-----------------------------------------------</td>
<td>-------------------------------</td>
<td></td>
</tr>
<tr>
<td>95</td>
<td>How to transform the railway sector into a privatized, competitive market?</td>
<td>NEAC (European scale)</td>
<td>other sources</td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>How to use land more efficiently? (to avoid &quot;versnippering&quot;)</td>
<td>INDRIS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>91</td>
<td>How can the flow of information be improved to influence the perceptions of actors so that the infrastructure is used in a more efficient way?</td>
<td>SMILE, NEAC, TEM II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>new</td>
<td>Where should new multi-modal terminals be located?</td>
<td>AVV-IB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>How can the existing infrastructure be used more efficiently (higher utilization) (all modes)?</td>
<td>SMILE, MOBILEC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>How should pricing policies be implemented? (What rules should be used in charging for the use of infrastructure?)</td>
<td>SMILE, MOBILEC (all models can be used in some way)</td>
<td>AVV-VMO</td>
<td></td>
</tr>
<tr>
<td>96</td>
<td>Who will be the most important actors in the future, and how can they be influenced (over all three markets)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>What are the factors (and their development) outside the freight transport system affecting the future demand for freight transport?</td>
<td>SMILE, NEAC, TEM II, MOBILEC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>Forecasts of freight transport demand are needed for years 2010, 2020, 2030</td>
<td>SMILE, NEAC, TEM II, MOBILEC, ATTACK (road)</td>
<td>other sources</td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>Forecasts (emissions, vehiclekilometers) should take into account trendbreaks in vehicle development.</td>
<td>ATTACK (road), SMILE, POINT, NEAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>What are the relevant new developments in vehicle technology?</td>
<td>TNO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>What will be the modal split in the future?</td>
<td>NEAC, TEM II, SMILE, MOBILEC</td>
<td>other sources</td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>Forecasts of transport means needed for years 2010, 2020, 2030.</td>
<td>ATTACK, NEAC, MOBILEC (road)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>new</td>
<td>What are the future possibilities for the modal shift in terms of transported tonnes? (E.g., how much air-freight in 2010 might be transported by rail instead of by road?)</td>
<td>SMILE, NEAC, TEM II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>new</td>
<td>What are the future situations in packaging different goods (percentages of different goods packaged in containers, pallets, bulk, etc., for all modes)?</td>
<td>GSM-7, TEM II, SMILE, NEAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>The forecasts should pay more attention to the possible changes in infrastructure (both the Netherlands and abroad).</td>
<td>LMS (road), NEAC, TEM II, SMILE, MOBILEC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>73</td>
<td>There is a big difference in the forecasts for emissions produced by different organizations.</td>
<td>RIVM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>74</td>
<td>What are the trends in the number of accidents?</td>
<td></td>
<td>other sources</td>
<td></td>
</tr>
<tr>
<td>97</td>
<td>What will be the traffic patterns of passenger transport in the future? (This is important, since less person traffic leaves more space for freight transport on the roads)</td>
<td>LMS (road), MOBILEC (road), NEAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>99</td>
<td>New indicators for describing traffic and transport</td>
<td>Not a model issue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ABBREVIATIONS</td>
<td>Description</td>
<td></td>
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<td></td>
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<tr>
<td>---------------</td>
<td>-------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ATTACK</td>
<td>Analysis of Truck Traffic: Air Pollution, Cargo, Kilometrage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AVV - IB</td>
<td>A department of AVV</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>AVV - VMO</td>
<td>A department of AVV</td>
<td></td>
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<tr>
<td>AVV-BG</td>
<td>A department of AVV</td>
<td></td>
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<tr>
<td>AVV-VMG</td>
<td>A department of AVV</td>
<td></td>
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<tr>
<td>AVV-VMM</td>
<td>A department of AVV</td>
<td></td>
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<tr>
<td>BER</td>
<td>Beleidseffectrapportage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BRIDGE</td>
<td>Beleidsrellevante Regionale Integrale set van Data en instrumenten op het gebied van Goederenvervoer en Economie</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBS</td>
<td>Centraal Bureau voor de Statistiek</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CE Delft</td>
<td>Centrum voor Energiebesparing en Milieuvriendelijke Technologie Delft</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GSM-7</td>
<td>Goederenstroom Module Nummer 7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INDRIS</td>
<td>Inland Navigation Demonstrator for River Information Services</td>
<td></td>
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<tr>
<td>IHO</td>
<td>Instituut voor Onderzoek van Overheidsslagvagen</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>IVR</td>
<td>Internationale Vereniging van Rijnschepenregister</td>
<td></td>
<td></td>
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<tr>
<td>IVS</td>
<td>Informatie en Volgssysteem Scheepvaart</td>
<td></td>
<td></td>
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<tr>
<td>K.V.K</td>
<td>Kamer van Koophandel</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>LMS</td>
<td>Landelijk Model Systeem</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>NEAC</td>
<td>NEA transport simulation system for the European Community</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>NEI</td>
<td>Nederlands Economisch Instituut</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NIWO</td>
<td>Stichting Nationale en Internationale Wegvervoer Organisatie</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>NWB</td>
<td>Nationaal Wegen Bestand</td>
<td></td>
<td></td>
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<tr>
<td>OEEI</td>
<td>Onderzoek Economische Effecten Infrastructuur</td>
<td></td>
<td></td>
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<tr>
<td>PACE-FORWARD</td>
<td>Policy Analytic and Computational Environment for Dutch Freight Transport</td>
<td></td>
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</tr>
<tr>
<td>PAWN</td>
<td>Policy Analysis for the Watermanagement of the Netherlands</td>
<td></td>
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<tr>
<td>POINT</td>
<td>Pollution Indicators of Transport</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>RAI</td>
<td>Dutch division of the road transport industry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIVM</td>
<td>Rijksinstituut voor Volkgezondheid en Milieuhygiëne</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SMILE</td>
<td>Strategisch Model Integrale Logistiek en Evaluatie</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>TEM</td>
<td>Transport Economic Model</td>
<td></td>
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<td></td>
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<tr>
<td>Tib</td>
<td>Transport in Balans</td>
<td></td>
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<tr>
<td>TIC</td>
<td>Traffic Information Centre</td>
<td></td>
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<tr>
<td>TLN</td>
<td>Transport en Logistiek Nederland</td>
<td></td>
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<tr>
<td>TNO</td>
<td>Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek</td>
<td></td>
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<tr>
<td>VOIR</td>
<td>IVS routing</td>
<td></td>
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<tr>
<td>VP-WE</td>
<td>Verkeers Productiemodel Wegvervoer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VROM</td>
<td>Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer</td>
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</tr>
</tbody>
</table>
APPENDIX B: Model Questionnaire

INTRODUCTION

Policymakers at DGG have expressed worries that currently available freight transport models may fall short of policymakers’ needs: there are policy issues that cannot be addressed by any of the existing models and policymakers are not fully aware of which models can be used for what purposes. The project “Improving the Policy Relevance of Freight Transport Models” aims at developing a plan for supporting the information needs of DGG policymakers. The plan will show

- the capabilities of existing models,
- the information needs of policymakers,
- how to expand the capabilities of existing models to meet changing needs, and
- what new models can be built to fill gaps in the information needs of policymakers.

One task in developing this plan is to compile information on characteristics and capabilities of existing freight transport models.

We kindly ask you to fill in all the information related to .......... (name of the model) ............ since you are knowledgeable of this model. The questions do, however, vary and thus the questionnaire may require input from more than one person.

We would like to have the enclosed questionnaire completed before 25 September 1998. You can send questionnaires back by mail or by telefax (or by e-mail if you filled the questionnaire in electronically) to the address below.

RAND Europe
Landbergstraat 6
2628 CE Delft
Fax: 015 – 278 1788
E-mail: marip@sepa.tudelft.nl

If there are any questions, do not hesitate to ask more information from

Mari Pöyhönen
Tel: 015 – 278 6488
E-mail: marip@sepa.tudelft.nl
Contact person for filling out questionnaire:

Name: ...........................................................................................................

Position/function: ...........................................................................................

Relation to the model: ........................................................................................
....................................................................................................................
....................................................................................................................
....................................................................................................................
....................................................................................................................

Address: .......................................................................................................;
....................................................................................................................
....................................................................................................................

Telephone: ....................................................................................................

E-mail: .............................................................................................................
1. GENERAL INFORMATION

1A. Name of the model (both the full name and the used acronym, if applicable):

-------------------------------------------------------------------------------------

-------------------------------------------------------------------------------------

1B. Are there sub-models (models that can be extracted from the model and that are basically individual elements)?

○ YES       ○ NO

if YES, what are the names of relevant sub-models? :

-------------------------------------------------------------------------------------

-------------------------------------------------------------------------------------

1C. For whom was the model built (name and/or organization)?

-------------------------------------------------------------------------------------

1D. For what purposes was the model initially built?

-------------------------------------------------------------------------------------

-------------------------------------------------------------------------------------

1E. When was the model built (year)? .................................................................

1F. By whom was the model built (name and/or organization)?

-------------------------------------------------------------------------------------

Availability and Contact information

1G. What organization owns the model? .................................................................

1H. What organization(s) operates the model? (if not the same as owner)

-------------------------------------------------------------------------------------
11. Existing **main** documents providing information about the model (please enclose them):

........................................................................................................................................

........................................................................................................................................

........................................................................................................................................

1J. Is there a maintenance / updating manual? ○ YES ○ NO

1K. Is there a user's manual? ○ YES ○ NO

1L. The contact person for the questions related to the model (if not the same as the person filling out the questionnaire):

Name: .................................................................

Contact information: ..................................................
.............................................................................
.............................................................................
.............................................................................
.............................................................................
2. MODEL CHARACTERISTICS/METHODS

Model structure

2A. Could you give a general diagram representing the **structure and/or flow of calculations of the model**?

- Yes, it is enclosed on a separate sheet or in the enclosed document:

- No, there is no general representation of the model.

Model coverage and freight transport system representation

2B. The model covers the following modes of transport:

- Road
- Rail
- Inland waterways
- Air
- Maritime
- Pipelines
- Intermodal (a single trip can include several modes). Please specify how (e.g., the trip definition may include more than one mode, etc.):

- Other:

2C. Does the model differentiate commodity classes?

- Yes, NSTR –classes: ................. digits

- Yes, other (please specify):

- No.
2D. What is the geographic scope of the model?

- Cities:

- Regions:

- Countries:

- Other:

2E. Please describe (and/or include a map showing) the geographic disaggregation (e.g., the model divides the Netherlands into X regions; goods flows are related to a network including Y nodes and Z links between the nodes):

2F. The model represents the following flow types:

- National (domestic) freight
- International freight (coming or leaving the Netherlands)
- Transit
- Transport chains
- Other
2G. **The freight transport system representation**: Please indicate (circle) in the following diagram (or give your own representation of) the parts of the freight transport system that the model focuses on (a circled part need not be modeled fully). (A detailed explanation of this diagram is given on the following page.)

Comments:
Description of the Freight Transport System

The freight transport system can be considered as a market: a system with dynamic interaction between demand and supply. In this interaction, implicit and explicit choices are made on both the demand side and the supply side. These choices interact. The result of the interaction is three-fold: a realized supply, a realized demand, and an allocation of the demand to the supply.

In total, three market segments can be distinguished in the system, where each of these market segments has its own supply and demand sides. The three market segments are a travel market, a transport market, and a traffic market. The three markets and their relationships are depicted graphically on the previous page and described below.¹

In the literature on the traffic and transport system, only two market segments are generally distinguished: the traffic market and the transport market (this is also reflected in the name of the policy area: traffic and transport). To emphasize that the demand for travel does not come ‘out of the blue’ but is a result of human decisions, a third market has been added: the travel market. This is the market in which the origins and destinations of trips are determined.²

The Travel Market
In the travel market, the demand side consists of the activities to be performed whose location and time are as yet unknown. The supply side consists of the spatial and temporal distribution of the locations where the activities could be performed and the trips associated with them. The output of this market consists of a set of trip patterns: an allocation of the activities to location and time.

The Transport Market
In the transport market, the demand side consists of the demand for vehicles to transport people and freight: the travel patterns. This demand is the output of the travel market. The supply side consists of the available supply of vehicles and services to accommodate these trips (specified according to place and time). The output of this market consists of a set of transport patterns: an allocation of the trips to the transport vehicles and services.

The Traffic Market
In the traffic market, the demand side consists of the demand for infrastructure to accommodate the vehicles and services: the transport patterns. This demand is output of the transport market. The demand side can be described as an origin-destination matrix (with both a location and a time dimension) of the transport vehicles and services. The supply side of the traffic market consists of the available infrastructure and its attributes. The output of the traffic market consists of a set of realized traffic patterns: an allocation of the transport vehicles and services to the infrastructure (where congestion can occur).

Example
Suppose that a set of personal computers has to be transported from a factory in Eindhoven to a retailer in Delft, and that the shipper decides to make use of the train and to have pre- and post-transport done by truck.

The decision to have the personal computers transported from Eindhoven to Delft is an output of the travel market. This decision is probably a decision of the retailer based on his perceptions of the costs, convenience, etc. of ordering the computers from the factory. Alternative options could be to order the personal computers from another factory or to buy them from an intermediate organization.

The choice to use the truck-train-truck chain of modes to transport the personal computers from Eindhoven to Delft is an output of the transport market. This decision is made by the shipping agent. A possible alternative option is to use solely trucks to transport the personal computers.

The train trip is based on the schedule set by the Netherlands’ train company Nederlandse Spoorwegen and the adaptations made by the train operators during the trip, and the routes taken by the truck drivers are outputs of the traffic market.

¹ A detailed description of the traffic and transport system can be found in: Riet, O.A.W.T. van de, and B. Egeter, Systeemdiagram voor het beleidsveld vervoer en verkeer: Beschrijving vervoer- en verkeersysteem ten behoeve van het project Questa, RE-98.003, RAND Europe, Delft, March 1998.
Model calculations

The previous question identified the parts of the freight transport system that are the focus of the model. In the following questions, we would like to get more insight into how these parts of the system are modeled (the figure below shows a generalized view of the model):

- what is the required input?
- how can the assumptions of the system be varied?
- what is the primary output?

![Diagram of model inputs and outputs]

The **INPUT** consists of **all the model parameters** that are used in the model. Model parameters can either be changed (**variable parameters**, which could also be called key parameters, policy variables or control variables) or remain fixed within the model (**fixed parameters**).

The **OUTPUT** consists of the **outcomes** that the model can provide. Some of the output may be **intermediate outcomes**: outputs that are further used for other calculations but that are themselves of interest. For example, the allocation of trips to modes and vehicles is an important outcome that can also be used to calculate other outcomes (e.g., emissions).

2G. Freight transport **demand** can be either **input** (given for the model) or **output** (an outcome from the model). In this model the demand:

- is given as an origin/destination matrix of goods to the model.
- is estimated based on (describe the input information and the model methodology):

  - ...
  - ...
  - ...
  - ...
  - ...

- is given in some other way (please specify):

  - ...
  - ...
  - ...
  - ...
  - ...
2H. **INPUT:** The model uses the following **input information** that can be changed (variable parameters) (e.g., cost and emission characteristics of vehicles, description of road network, etc.).

**NOTE:** Some models use huge amounts of input information that can be changed. If this is the case with this model, we ask you to specify the **most relevant categories of input** that can be changed instead of listing hundreds of variables. (You can also answer this question by providing references to reports that are enclosed with this questionnaire).

2I. What year(s) are reflected by the current input data (database and fixed parameters)?

- base year (real data):
- synthetic year(s) (data estimated):
- future year(s):

23. **OUTPUT:** The model produces the following **intermediate outcomes** (outputs that are further used for other calculations, but that are themselves of interest, e.g., the allocation of trips to modes and vehicles).
2K. **OUTPUT:** The model produces the following outcomes (e.g., origin/destination matrix for goods, origin/destination matrix for transport means, congestion, operating costs, etc.).

**NOTE:** Some models provide huge amounts of output information and the output of some models can be adjusted to suit the application. If this is the case with this model, we ask you to specify the most relevant categories of output instead of listing hundreds of variables. (You can also answer this question by providing references to reports that are enclosed with this questionnaire).

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2L. Is the model dynamic or static?

- Dynamic (calculations proceed through several time steps that are linked with each other). Please specify the time step used (e.g., an hour, a day, or a year):

  ..............................................................

- Static (outcomes are calculated for a single point in time).
2M. Does the model pay special attention to uncertainty (e.g., in demand data, model parameters, outcomes)? If so, how (e.g., by use of scenarios)?
3. USING THE MODEL

Applications and history

3A. Has the model been used for those purposes for which it was initially built?

3B. Applications areas: For what types of studies could the model be used? (e.g., develop freight flow forecasts, infrastructure planning, fleet planning)

3C. For what purposes has the model been used in the past? (Give also references to relevant reports, if applicable.)
3D. Who (organization/department/person) has used the information generated by this model in the past?

Model maintenance and updating

3E. Which organizations/persons are responsible for model maintenance and updating?

3F. Technical requirements (operating system and software, and their versions):

3H. When was the last time the model was updated?

3I. Where did the data (both databases and information for parameter updating) come from for the most recent update?

Practicalities of using the model

3K. What is the time for each run?

- preparation time (give maximum and minimum times if the model can be used in different ways):

- computer time needed for one model run (give maximum and minimum times if the model can be used in different ways):
3L. After the results are estimated, are the outputs presented in a user-friendly way (e.g., in graphs)? (Enclose some example model output, if possible.)
4. Model Opportunities

4A. The model currently covers the part of the freight transport system that you indicated in question 2G. The model represents this part of the system in a way that was partly elaborated in previous questions. However, the freight transport system continually changes over time. For example, there may be new transport modes or changes in the infrastructure. Although there are an infinite number of ways in which the system may change, we ask you to think for a minute how the model might be adapted to reflect possible changes in the system. You can yourself define these possible changes in the system based on what you think that the model is most capable of doing.

- Only routine work is needed to model the following system changes:

- Some thinking is needed to model the following system changes:

- In-depth thinking and model rebuilding is needed to model the following system changes:
4B. What are the strengths and weaknesses of the model (in your opinion)?

4C. Other comments:

THANK YOU!