

# Themes for future trans-national cooperation in transport research programming

Foresight report

Deliverable 2.2

May 2005

For further information on this report,  
please contact:

### Work package 2 leader

Ministry of Transport, Public Works and Water Management  
P.O. Box 20901  
2500 EX The Hague  
The Netherlands  
Phone + 31 70 351 7678  
Fax +31 70 351 7550  
[www.verkeerenwaterstaat.nl](http://www.verkeerenwaterstaat.nl)

drs. A.F. van Ommen  
[www.transport-era.net](http://www.transport-era.net) under Workplan and WP 2

### Main author

Transport Research Centre  
P.O. Box 1031  
3000 BA ROTTERDAM  
The Netherlands  
+ 31 10 2825993  
+ 31 10 2825642  
[www.rws-avv.nl](http://www.rws-avv.nl)

drs. S. Halbesma  
[www.transport-era.net](http://www.transport-era.net) under Workplan and WP2

For further information on the ERA-NET TRANSPORT programme,  
please contact:

### Coordination and Secretariat

TÜV-Akademie Rheinland GmbH  
Am Grauen Stein  
D-51101 Köln  
Phone +49 221 65035 111  
Fax +49 221 65035 115  
[www.tuvpt.de](http://www.tuvpt.de)

Oliver Althoff (Coordinator)  
[www.transport-era.net](http://www.transport-era.net) under Contact

### Secretariat

TetraPlan A/S  
Kronprinsessegade 46 E  
DK-1306 Kopenhagen  
Phone + 45 3373 7100  
Fax + 45 3373 7101  
[www.tetraplan.dk](http://www.tetraplan.dk)

Anette Enemark  
[www.transport-era.net](http://www.transport-era.net) under Contact

***This document was created as part of the  
ERA-NET TRANSPORT programme.  
All information is public and we encourage the use.***

**Copyright (c) 2005**

***Copyleft: Permission is granted to copy, distribute and/or  
use this document under the terms of the  
Free Documentation Dissemination License, Version 1,  
available at <http://pauillac.inria.fr/~lang/licence/v1/fddl.html>***

Version no.: Final 2  
Date of publishing: May 2005  
Developed by: AVV Transport Research Centre  
Connekt and SenterNovem  
Written by: Sieds Halbesma, Henk van Zuylen  
Daniëlle de Bruin  
Checked by: AE

Deliverable no.: 2.2  
Project no.: ERAC-CT-2003-10223  
Project acronym: ERA-NET TRANSPORT  
Project title: ERA-NET TRANSPORT  
Instrument: Co-ordination Actions  
Thematic Priority: ERA-NET  
Project duration: 010104 – 311207

# List of content

## Summary

<b>1. General introduction.....</b>	<b>1</b>
1.1. <i>Research objective</i> .....	1
1.2. <i>Research approach</i> .....	1
1.3. <i>Follow-up activities</i> .....	2
1.4. <i>Structure of the report</i> .....	2
<b>2. General future trends and research themes in transport policy .....</b>	<b>3</b>
2.1. <i>Introduction</i> .....	3
2.2. <i>Research approach</i> .....	3
2.3. <i>Results of the Delphi survey</i> .....	4
<b>3. Future trans-national research themes in transport policy .....</b>	<b>11</b>
3.1 <i>Introduction</i> .....	11
3.2 <i>Research approach</i> .....	11
3.3 <i>Results of the Policy seminar</i> .....	12
<b>4. Conclusions and recommendations .....</b>	<b>15</b>
4.1 <i>Introduction</i> .....	15
4.2 <i>Analysis and conclusions</i> .....	15
4.3 <i>Recommendations</i> .....	16

## Appendix 1

Overview of relevant research aspects from the Delphi survey and policy seminar



## Summary

The ERA-NET TRANSPORT (ENT) research programme is a joint effort of 11 European countries to promote efficient trans-national research cooperation in the field of transport. Until now transport research and networks have been seen from a national perspective. ERA-NET TRANSPORT aims at developing a European vision on transport research.

One element of ENT is to collect relevant information concerning topics and themes for future trans-national transport research programmes in order to develop joint research programmes for the period 2007 - 2012.

A Delphi survey was carried out during the period June-October 2004. Over 25 European managing transport researchers (supply side of research) participated in two questionnaires and one workshop to identify and specify topics and themes suitable for future transport research. The Delphi survey produced a list of trends relevant for transport (research) policy and 9 potential areas for future transport research. The results of this Delphi survey were put forward for discussion in a Policy seminar with relevant policy research programmers (demand side of research) of the ENT partners in March 2005 and resulted in a prioritised list of specific research elements, relevant for future trans-national cooperation. The following table presents the identified research elements and the related research area.

Theme	Element
Pricing and taxation	Harmonisation of ITS standards Equity and acceptability Coherence between marginal cost pricing, cost coverage and revenues
Infrastructure provision	Minimise impact on people and environment Use of information in real time
Decision support systems	Good practice in modelling Research on reliability Establish environmental values
Integration of transport systems	Multimodal freight transport systems Mobility management
T&I management	GPS and Galileo for all transport modes Advanced IT supported international logistics
Vehicle technology	Techniques to reduce noise

These results will guide the final selection of the trans-national research themes that will be worked out by the ERA-NET TRANSPORT programme in 2005 and 2006 through a series of meetings with research programme managers.



# 1. General introduction

## 1.1. Research objective

The ERA-NET TRANSPORT (ENT) research programme is a joint effort of 11 European countries to promote efficient trans-national research cooperation in the field of transport. Until now transport research and networks have been seen from a national perspective. ERA-NET TRANSPORT aims at developing a European vision on transport research and developing cooperation between national transport research programmes for the short term and trans-national cooperation in research programming for the mid and long term.

The objective of Work Package 2 in the ENT programme is to identify the relevant research areas and topics for trans-national cooperation. Related to the mid and long term research cooperation in programming a foresight study is carried out to collect relevant information concerning topics and themes in order to develop joint research programmes for the period 2007 - 2013.

This report presents (1) the activities that have been organised by Work Package 2 of ENT to collect the relevant information and (2) the result of the individual activities and the overall conclusions and recommendations regarding the follow up.

## 1.2. Research approach

The research is carried out in a sequential three-step-approach:

1. Delphi survey
2. Policy seminar
3. Analysing conclusions and recommendations

### *Delphi survey*

In the Delphi survey managing research experts from Europe (mainly from the supply side of research) identified future trends and research areas and questions, related to future objectives and instruments in transport policy. The research approach in the Delphi survey is described in more detail in paragraph 2.2.

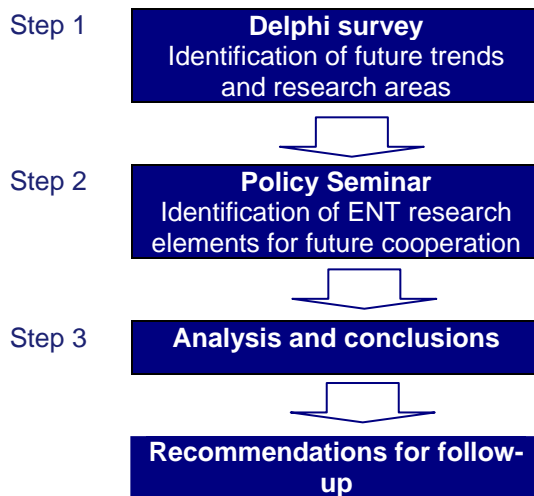
### *Policy seminar*

Based on (a) the results of the Delphi survey and (b) national preferences for trans-national cooperation, managing research programmers of the countries participating in ENT (the demand side of research) discussed, identified and prioritised ENT relevant research elements of joint interest for future cooperation. The research approach in the Policy seminar is described in more detail in paragraph 3.2.

### *Analysing conclusions and recommendations*

Based on the prioritised research elements identified at the Policy seminar, an analysis is carried out to identify the most potential areas for future cooperation in ENT. This information is used to set up the recommendations for the related follow up activities in the ENT programme.

The next figure presents the three-step approach, its order and its results:



### **1.3. Follow-up activities**

The recommendations in this report will be discussed in the Management Group of ENT in November 2005. The Management will decide which two research areas and relating elements will be worked out in Exploratory Workshops in the first half of 2006 to identify actual research cooperation activities. Participants for the Exploratory workshop are relevant research programme managers.

### **1.4. Structure of the report**

*In the next chapter* the research activities and results of the Delphi survey and the relation between the results of this survey and the input for the discussion in the Policy seminar will be presented. *Chapter three* presents the research approach and results of the Policy seminar. Finally, *chapter four* describes the analysing process and its conclusions and recommendation for the follow up activities.

## 2. General future trends and research themes in transport policy

### 2.1. Introduction

For the determination of future research themes a Delphi survey is a validated method. The procedure is to ask experts their opinion, priorities and preferences in several iterative steps. The output of a step is used to prepare the input of the next step. The Delphi method is especially suited to create consensus among experts about rather uncertain issues.

To identify the general future trends and research themes in transport policy, a Delphi survey was carried out as the first research activity in the foresight study. The next paragraph will describe the benefits of a Delphi survey and the research approach used in this study. Paragraph 2.3 will first present the specific identified research elements in the survey related to policy objectives. Finally, this paragraph will also present the relation of the identified research elements to the policy instruments, which are used as the areas for research in the Policy seminar. The Delphi survey started in June 2004 and ended in November 2004. The report with the overall results of the Delphi survey is presented in Part I of the appendix report.

### 2.2. Research approach

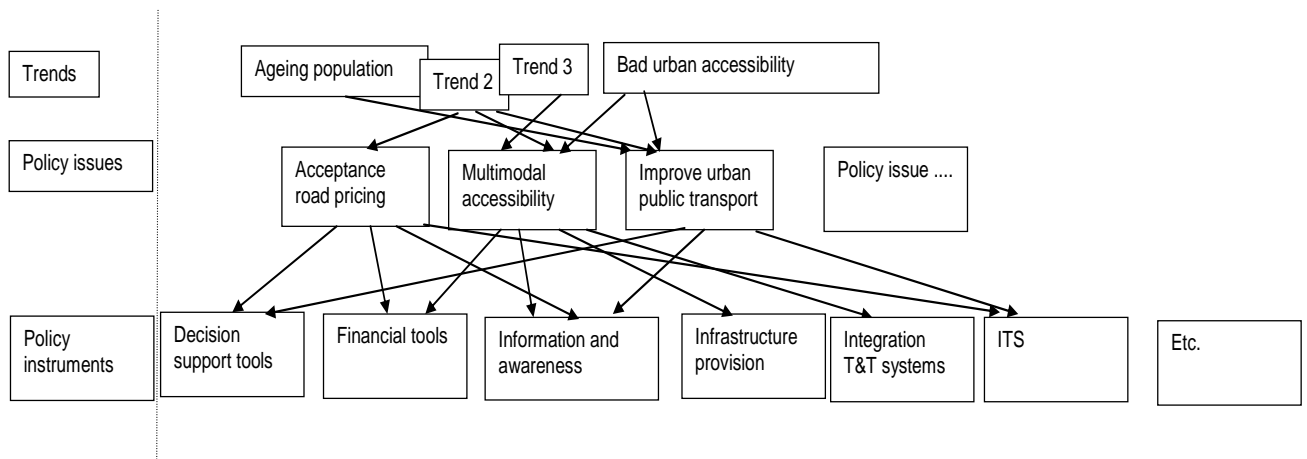
To bring focus to the research themes a process with 4 phases in the Delphi survey is being followed. In the first phase towards the Delphi survey interesting themes for future transport programming are identified by desk research. In the second phase the number of themes is extended and focussed by asking managing research experts (supply side of research) from all over Europe about priority themes and new themes. Also the suitability of themes for trans-national cooperation was investigated. In the third phase of the survey the themes that appear to be relevant for most researchers are further analysed in terms of the need for knowledge and the urgency. This phase and the preceding one are carried out by means of questionnaires sent to approximately 50 experts in Europe. The final phase was a workshop in the Netherlands with several experts, who are asked to evaluate and complete and the results of the questionnaires.

A Delphi survey has the objective to gather the views of many experts and to get consensus about the priorities. In general a process aiming at consensus will not be the best way to find creative, new views. The strength of a process like Delphi is that the existing ideas are gathered and that a focus emerges. In many cases it appears most of the themes that come out of the survey are known for a great deal, but that the structure and priorities are new.

To structure the Delphi survey the research themes have been ordered according to the two dimensions *Policy domains* and *policy tools*

Policy domain (category of goals and problems)	Policy instruments
Economic development Transport efficiency Safety and security Environmental aspects Equity and accessibility  User <sup>1</sup> satisfaction	Decision support tools Financial tools Information and awareness Infrastructure provision Integration of transport and infrastructure systems Intelligent transport systems and services (ITS) Regulation and deregulation Land use planning Transport and infrastructure management Pricing and taxation Vehicle technology

In the policy domain we can distinguish between several goals and problems to reach some policy goals. The priority for a certain goal and the related problems often emerge as a result of certain trends: The term *Policy instrument* has to be understood in a wide sense. It means all kinds of tools, methodologies and tactics to realise certain policy goals. Most policy instruments can be used for several policy goals, e.g. the tool *vehicle technology* can be applied for the improvement of the environment (clean engines), for the economy (less fuel consumption, alternative fuels), for safety etc. The figure illustrates this process.



### 2.3 Results of the Delphi survey

In total 28 experts from 18 different countries and international organisations participated in the survey. The Delphi questionnaires did not result in very surprising research subjects. In general at least about 30 respondents are needed to make the result of questionnaires like this sufficiently reliable. The size of the initial group (50 possible respondents) was sufficient, but the response rate (55%) is slightly less than the optimal number of independent opinions. The number of respondents in the second phase is rather low to ensure the completeness of the lists of policy instru-

<sup>1</sup> User is the transport user

ments. A larger group of respondents would certainly have given more research topics and then the prioritisation would have been more certain. However, the professional quality of the respondents was very high. The final step in the Delphi survey, the workshop, has further strengthened the validity of the results of the questionnaire.

#### General conclusions

1. Several of the research questions raised are certainly important. One may observe that the more functional policy domains, like accessibility and economy provide a clearer prioritisation than domains like user satisfaction and environment. This certainly not concludes that more attention has to be given to the well-ordered and prioritised policy domains. On the contrary, much emphasis should be given to clarify the research priorities for the themes that are still fuzzy.
2. The interests of the new member states and their priorities might be different from the ones of the old member states, since there are differences in the development and consequently there might be different urgencies of problems. In a part of the questionnaires this difference in priorities and vision can be observed. The following differences have been identified:
  - The old member states give a higher priority to fair and efficient pricing policy, a market development for road pricing and the need to let all transport users pay for their costs.
  - The old member states are more concerned about the future of oil production and availability.
  - The new member states give a more priority to interoperability of rail (this conclusion is based on very few observations) and the TEN-T connections, harmonisation of standards, new time tabling for public transport, the development of global navigation systems.
  - The old member states give, in general, a higher value to regional cooperation than the new member states, also on subjects that the new member states find important for the present situation.

#### Conclusions regarding policy domains

Regarding each of the 6 policy domains the following future trends and research elements are identified:

##### *Equity and Accessibility*

Four main future trends were identified:

1. Redistributive effects of pricing of infrastructure
2. Ageing of the population
3. Urban centres becoming less accessible
4. Social exclusion

Increasing redistributive effects of pricing of infrastructure develops because pricing will become an important element for a lot of future transport problems, though politicians are afraid for the introduction of pricing of infrastructure and car users will possibly pay more for using infrastructure than train users. The ageing population will develop changes in social/economical structure of city centres and a larger group of people will be less able to move around. There will be an increasing need to know more about user expectations and the characteristics of future population characteristics of younger and older people.

Urban centres will become less accessible. There is a need to know more about the structure (working and living), dynamics (migration) of the cities and the effects of land use. Social exclusion will increase and travellers with less money or less physical possibilities are depending on public transport

These trends lead to an additional set of transport research topics:

- improvement of (urban) passenger transport
- reliable urban accessibility
- the acceptance of road pricing
- knowledge on the relation between accessibility and economic growth

Regarding the improvement of (urban) passenger transport new forms of urban transport with integration of services and information, better real time information systems and managing of systems, the development of a seamless system (multi modal) with integration of systems, information and charging and knowledge on optimising the way you put the money in the transport system is needed.

Related to reliable (urban) accessibility a better distinguish has to be made between different transport motives by intelligent transport systems and services and integrated transport management has to be encouraged instead of traffic management only. Finally, knowledge is needed to understand the expectations regarding reasonable accessibility of the users.

Acceptance of road pricing and charging needs a clarification of the goal of road pricing: is it to generate of money or to manage the transport system (or both)? Furthermore, a better quantification of the different options (what are the real costs for the transport system) and more information and awareness research, i.e. understand the behaviour and response on several circumstances to modify the system and the attitude of politicians and how they react on changes in the system, is needed.

Finally, better understanding of the relation between accessibility and economic growth needs improvements of decision support system, which incorporates all modes of transport and more knowledge on the reasonable expectations of the infrastructure.

#### *Economic development*

Important relevant future trends regarding economic development are:

1. the increase in trade within the EU
2. increase in productivity and raise in private consumption
3. increasing global thinking

The increase of trade within the EU is a result of the opening of the European market and will develop a changing way of pricing transport and investing because of a lack on public money and increasing need for goods transport. The increase in productivity and raise in private consumption in the new EU member states gives rapid growth in passenger transport. Finally, the increasing global thinking is stimulated by multinational control and 24 hours economy and product development by the industry all over the world.

Several important research topics were identified:

- New regulatory measures
- Market development in road pricing
- Change of the oil production and availability in the future

Regarding new regulatory measures, e.g. privatisation of roads, development of decision making tools and increasing awareness is needed. But also research on the infrastructure and services, on the outcome of privatisation benefits models for including all costs of transport in the price for the users and better data on European transport flows is needed. Related to market development in road pricing new instruments like structures for infrastructure provision, pricing schemes, frameworks for organisation and responsibility issues and electronic toll collection technology is needed, because of the new regulation measures on EU level.

Finally, the change of the oil production and availability in the future, needs better instruments: decision support tool (models for predicting impact oil prices), vehicle technology (more efficient propulsion; alternative fuels) and pricing measures (Initiatives for improved fuel efficiency; voluntary agreements with manufacturers).

Also the cost of distribution could become substantial. Therefore there will be a need for the identification of the cost of transport; in which way consumers will respond on real costs of transport?

### *Safety and Security*

The important future trends regarding safety and security in the transport system are:

1. Growing awareness that benefits of measures to improve safety are higher than the costs
2. Intelligent in-car systems, including automatic driving as the end of the development
3. Traffic safety per car is increasing (generally) and risk is decreasing.
4. Security of transport systems is becoming more important
5. Growing impact of failure of the system

Important research topics in this domain are:

- Traffic safety
- Protecting of transport consumers
- Reliable transport by ITS

Traffic safety needs new research on transport technologies (effects of advanced driver support systems, collision avoidance systems, enforcement and introduction of black boxes), information and awareness (accident databases and training new systems) and the monitoring transport of dangerous goods (GPS systems). Related to the topic of protecting of transport consumers, better knowledge is needed on (1) information systems and acceptable safety levels for the integration of transport and infrastructure system is needed and (2) vehicle technology for protection against theft and robbery, not only of cars, but also of consumers. Finally, to develop more reliable transport by ITS new traffic management (strategy) systems, better travel information and safer user decision-making systems are needed.

### *Efficiency*

Regarding the domain of Efficiency in the transport system the following important future trends are to be mentioned:

- 1 Growing transport flows between Middle European and Western European countries
- 2 More integration of Transport Services across modes
- 3 Growing goods transport needs because of globalisation
- 4 Regional approach of transport
- 5 Unreliability begins to come more important than congestion

- 6 Congestion begins to become less important than unreliability
- 7 Congestion infrastructure (roads, rail, airport and terminals), increased focus on efficient utilisation (pricing ITS etc) improvements in bottlenecks, etc.)

The related research topics with importance for future research programming are:

- Interoperability of rail,
- Robust transport infrastructure
- Harmonisation of standards for transport
- Global navigation systems
- Use of spare capacity
- Efficient use of infrastructure
- Improve quality of the transport system.
- Reduce costs of transport.

Related to interoperability of rail one new standard for the European railway infrastructure has to be developed. Robust transport infrastructure needs research on incident management and the integration of different classes of roads. For the harmonisation of standards it is needed to develop standards for road pricing, timetabling in public transport and cross border timetables and slot allocation. Multi sensor monitoring and the development of traffic models coupled to GPS could encourage research on global navigation systems. Related to the use of spare capacity better traffic information is needed and better knowledge on how to deal with lack of robustness. To improve the quality of the transport system, a user-centred transport system with multimodal integration is needed and to reduce costs of transport benchmarking the freight transport market in the US is of importance, so as the development of systems to reduce the number of driving empty trucks and the improvement of DSS for logistics.

#### *User satisfaction*

Future trends relevant for the domain of User satisfaction are:

1. More complicated and valuable products
2. Low awareness of transport costs and benefits
3. More demanding customers (transport users)

The increase of more complicated and valuable products need more reliable freight transport. The same goes for passenger transport: high value of time gets more and more important. The rather low awareness of transport costs and benefits by the users and politicians could need better communication. Costumers (transport users) are becoming more demanding because of a wider variety of activities and needs (for instance the increase of tourism). More educated and demanding citizens, demanding higher quality in passenger transport is acknowledged as such.

Relevant future research topics to the domain of User satisfaction are:

- Harmonisation of the procedures throughout EU
- Tourist travel; Identify specific requirement
- Transport safety
- Traffic rules
- Quality and comfort passenger transport\
- Awareness Cost/benefit
- User as a customer

Tourist travel needs the identification of specific requirement. Regarding travel safety infrastructure improvement and Adaptive Driver Assistance Systems need

additional research. Traffic rules need situation dependent rules and simplification/reduction of signs and rules. Related to the quality and comfort of passenger transport, new contract form should including all kinds of quality aspects for the use of less interchanges between modes and the improvement of transport related internet services are object for research. Finally, the stimulation and communication of the use of cost/benefit analyses in the transport system studies, to show external effects and relation between tax and destination, is needed.

### *Environment*

The important future trends relevant for the environmental objective in transport are:

1. Long term trend increasing CO<sub>2</sub> emissions in transport and growing share of transport
2. The international agreed CO<sub>2</sub> reduction cannot be achieved, though
3. Increased awareness of citizens of environmental problems

Related to the increased awareness of the environmental problems citizens consider local air quality a bigger problem than CO<sub>2</sub>. The following future research topics are identified:

- Air pollution and reducing CO<sub>2</sub> -emission caused by transport
- Vehicle emissions reduced to EU 4 standards.
- Local air quality in urban centres
- Noise problem.
- Market penetration of new technology

Air pollution and reducing CO<sub>2</sub>-emission caused by transport are considered too big for inter-regional solutions only. Alternative fuels and new propulsion systems need research but also consistent regulations for all vehicles, based on sound technological state of the art research. Related to vehicle emissions reduced to EU 4 standards it is important to have a view on the impact of existing technology/vehicles on improvements in vehicle technology. Local air quality in urban centres reaches worrying levels. New tools to predict air quality impact of traffic measures have to be developed. There should be regulations for all vehicles, based on research for all modes. One could use traffic measures to meet air quality limits in urban zones. Another potential option is the development of silent vehicles. The growing noise problem could use research on the effects of control of speed limits. In case of noise and visual problems, research on the effects of separation of transport infrastructure from residential areas (tunnels) is important. In many cases the technology is already available, but it still has to be introduced. Market penetration of new technology needs research on the form and successful conditions of introducing.

### Conclusions regarding policy instruments

The policy domains structured the results of the questionnaires and workshop. To identify the research themes and questions, related to the policy instruments, a restructuring is possible. In total 9 actual policy instruments are to be identified. The policy instruments *Financial tools* and *Intelligent transport systems and services* were not explicitly recognised. The next table presents the number of research themes and questions put forward by the experts in relation to the policy instruments. At the same time the relation of the research themes and topics with the relevant policy domain is presented.

<b>Prioritised policy instrument / re-search theme</b>	<b># topics</b>	<b>Economy</b>	<b>Efficiency</b>	<b>Environment</b>	<b>Safety and security</b>	<b>Equity and accessibility</b>	<b>User</b>
Traffic and Infrastructure management	14	x	X		x	x	x
Infrastructure provision	9	x	X	x			x
Decision support systems	8	x		x	x	x	x
Information and awareness	6		X		x	x	x
Regulation / de-regulation	6	x	X	x			x
Vehicle technology	4			x	x		x
Integration of transport systems	3		x		x		
Pricing and taxation	3	x	x			x	x
Land use planning	2		x			x	

These 9 identified policy instruments, with the related research themes and topics, are used to structure the discussion in the Policy seminar to identify the future themes for transport research programming in more detail.

## 3. Future trans-national research themes in transport policy

### 3.1. Introduction

The previous chapter described the activities in the Delphi survey, which have led to the identification of 9 policy instrument related research areas. These research areas are used as the structuring input in the Policy seminar. In the next paragraph the research approach of the Policy seminar will be explained, followed by the results of the seminar in the paragraph 3.3. These results will be presented by cooperation interests (1) on the individual research areas and (2) on the overall interests for cooperation. The Policy seminar was organised in March 2005 in the Netherlands. The overall results of the Policy seminar are presented in Part II of the Appendix report.

### 3.2. Research approach

The objective of the Policy seminar was to identify the, ERA-NET TRANSPORT relevant, research areas and topics for future trans-national cooperation in research programming. In order to reach this aim two types of information were discussed with representatives from the partners in the ENT programme (demand site of research):

1. the results of the Delphi survey on future trends, research areas and topics, especially to be used as basic and background information
2. national interest for future trans-national cooperation on the selected research areas, especially to be used as the starting point of the identification of joint interests

In the preparation of the Policy seminar several partners in the ENT programme were asked to prepare presentations on the selected research areas. The division of countries and research areas was as follows:

- |   |                      |
|---|----------------------|
| • Vehicle technology                      | Austria              |
| • Transport and Infrastructure Management | Netherlands          |
| • Regulation and deregulation             | France               |
| • Decision support tools                  | UK                   |
| • Infrastructure provision                | Sweden <sup>2</sup>  |
| • Information and awareness               | Finland <sup>3</sup> |
| • Pricing and taxation                    | Norway               |
| • Land-use planning                       | Germany              |
| • Integration of transport systems        | Belgium <sup>4</sup> |

Each presentation followed the same format what led to a comparable overview of interests by the participating countries. The format existed of at least the following 6 items:

1. a definition of the research area
2. the most important trends in the country

---

<sup>2</sup> Sweden was because of severe weather conditions not able to reach the Policy seminar, but its presentation was used in meeting

<sup>3</sup> Finland dealt with the same weather problems, could also not participate and its presentation was not available in the seminar

<sup>4</sup> Belgium was not at all in the position to participate in the Policy seminar, the research areas was presented on the basis of the Delphi results

3. the important policy objective in the country
4. the important future research programmes in the country
5. the main future research question
6. the most suitable elements for future cooperation

These presentations were given in 2 sub-group, which each discussed the list of suggested elements for trans-national cooperation by the introducing presentation, completed the list of elements and finally prioritised all discussed elements.

The results of both sub-group sessions (prioritised research elements per research area) were presented and discussed in a plenary session and finally overall prioritisation was made by all countries participating in the Policy seminar by expressing its interest for financial investment in the identified elements.

### **3.3. Results of the Policy seminar**

In total 7 countries, all partners in the ENT programme, participated in the Policy seminar. Four ENT countries did not participate, for different reasons. Based on the discussions on the individual research areas and the overall discussions rather clearly focused interests were identified.

#### Conclusions regarding the individual research areas

Based on the introducing presentations, lively discussions and clearly set priorities the following conclusions related to elements for future trans-national cooperation can be presented:

<b>Research theme</b>	<b>Prioritised research element in sub group meeting</b>
Vehicle technology	Techniques to reduce noise and emissions Protection of pedestrians Safety through driver assistance systems (ICT) Propulsion systems (Energy in motion)
Transport and infrastructure management	Buying and sharing (traffic) information with private partners From supply to demand mobility market ("door to door") Advanced, IT supported international logistics GPS and Galileo for all transport modes
Regulation and de-regulation	Funding and new regulatory measures (Comparison of different scenarios of public transport at the horizon of 2030) Regulation and renewal of the fleet (Incl. pollution aspects) Regulation, liberalisation and strategy of actors
Decision support systems	Establishing environmental issues Research of reliability (esp. travel time) Good practice in modelling Time of day choice
Infrastructure provision	Use of information in real time Minimising impacts on environment and people Value for money / long life infrastructure.
Pricing and taxation	Coherence between marginal cost pricing, cost coverage and revenues Harmonisation of ITS standards (esp. freight) Equity and acceptability of road pricing
Land use planning	Multi actor decision making Integrated Multimodal Transport interchanges Real and future costs of public transport and infrastructure
Integration of transport systems	Mobility management Multimodal freight transport systems Integration of transport management Easy interchanges between modes

### Conclusions regarding the overall prioritisation of research elements

The overall prioritisation is developed by the possibility for all countries participating in the ENT programme to divide a maximum of 10 point of all research elements presented in the previous table<sup>5</sup>. A top 13 list can be identified, based on the following criterion:

- The elements should be supported by at least 3 countries because ENT is intending to start up multinational cooperation

	<b>Selected Research Element</b>	<b>Score</b>	<b>Nr. of countries</b>
1	Multimodal freight transport systems	9	7
2	Minimise impact on people and environment	9	7
3	Techniques to reduce noise	7,5	7
4	Coherence between marginal cost pricing, cost coverage and revenues	7	5
5	Use of information in real time	7	5
6	Establish environmental values	7	4
7	Harmonisation of ITS standards	6	4
8	GPS and Galileo for all transport modes	5	4
9	Equity and acceptability	5	4
10	Mobility management	5	4
12	Good practice in modelling	4	4
11	Research on reliability	4	3
13	Advanced IT supported international logistics	3	3

*Multi-modal freight transport systems* (Integration of transport systems) is specified by easy interchanges between modes, integrated logistic system for better freight transport within Europe, integrated multi-modal transport interchanges, the concept of “from a supply to a demand mobility market” (door to door) and advanced, IT supported international logistics. *Minimise impact on people and environment* (Infrastructure provision) is illustrated by safe and sustainable road infrastructure, low impact maintenance techniques, silent asphalt and standards and criteria for impact studies/assessments.

Propulsion system is the specification of the research element *Techniques to reduce noise* (Vehicle technology). *Coherence between marginal cost pricing, cost coverage and revenues* (Pricing and taxation) consists if balancing price and tax measures and the three relating elements of “getting the prices right”, “getting the supply right” and “getting the proper revenue”.

Regarding the *Use of information in real time* (Infrastructure provision) it is stressed that this is particularly useful in public transport, that infrastructure itself can provide many data and information and research on achievement of goal of fluent traffic using real-time information services, development of traffic control centres and the de-

---

<sup>5</sup> The presented list with priorities is based on the results of the Exploratory workshop and an additional email hearing with the ENT countries that were not able to participate in the workshop

development of transport information management is needed. The element of *Establish environmental values* (Decision support systems) could benefit by more focus on research for methods and acceptance, rather than values as such.

*Harmonisation of ITS standards* (Pricing and taxation) needs a worldwide and European comparisons and standard international technology regarding road pricing: 1 standard for EU. *Equity and acceptability* (Pricing and taxation) deals with redistribution effects and impact of pricing on different groups of travellers. Regarding *GPS and Galileo for all transport modes* (Transport and traffic management) it is needed to prepare for potential advantages of Galileo. It is better for both individual countries as EU wide. If well prepared, Galileo can serve several goals (safety, efficiency) at the same time.

Redistribution effects and impact of pricing on different groups of travellers are the specifications of the research element *Equity and acceptability* (pricing and taxation).

*Mobility management* (Integration of transport systems) is illustrated by easy interchange between different modes, integration of transport management and land use and information management and –exchange.

*Good practice in modelling* (Decision support systems) deals with urban transport interactions modelling, reliability research and establishing environmental values: models for monitoring and evaluation of impacts. *Research on reliability* (Decision support systems) is specified by valuation and incorporation into modelling framework.

Finally, *Advanced IT supported international logistics* (Transport and infrastructure management) needs research on electronic devices for logistics, TMS to reduce the transportation time of all kinds of freight and different types of information.

## 4. Conclusions and recommendations

### 4.1. Introduction

Chapter 3 presented the results of the Policy seminar, in which the strategic research programmers identified the most interested research elements for future trans-national cooperation, based on research priorities and reflected by the suggested research topics in the Delphi survey. In this chapter a further analysis will be made on the results of the activities as described in chapter 3 and 4. In the next paragraph the analyses and its conclusions will be presented. Paragraph 4.3 will finally present the recommendations for the following ERA-NET TRANSPORT process, based on the conclusions.

### 4.2. Analysis and conclusions

The Policy seminar identified a top 13 of research elements that are of interest for future trans-national cooperation. These research elements and its enclosing research theme form the principle aspects of future activities, related to the content of the cooperation, within the ENT programme.

#### Most potential research themes and elements

The restructuring of the previous table in chapter 3.3 by a refection of the research element to the relevant research theme on the sum of the scores and the number of interested countries lead to the following overview, based on the input of 10 ENT countries.

On top of the list is the research theme *Pricing and taxation*. It is represented by three research elements, which sums up to a score of 18 and is supported by 9 ENT countries. Next is the theme of *Infrastructure provision* is supported by all prioritising ENT countries, represents two research elements that sums up to a score of 16 points. Number three is *Decision support systems* with 3 research elements with a total score of 15, which are supported by 7 countries. *Integration of transport systems* is the fourth in the list and represented by two research elements in the top 13 and sums up to a sore of 14 points, with support of 8 of the 10 ENT countries. Number 5 in line is the research theme *T&I management*, though represented by three elements, reaching a score of 8 point with support of 6 countries. Finally, the theme *Vehicle Technology* is represented by 1 research elements in the top 13, reaching a score 7,5 and support of 7 countries.

Theme	Element	Score	Countries
Pricing and taxation	Harmonisation of ITS standards Equity and acceptability Coherence between marginal cost pricing, cost coverage and revenues	18	9 A, DK, FI, F, N, NL, P, S, UK
Infrastructure provision	Minimise impact on people and environment Use of information in real time	16	10 A, D, DK, F, FI, N, NL, P, S, UK
Decision support systems	Good practice in modelling Research on reliability Establish environmental values	15	7 DK, F, FI, N, NL, P, UK
Integration of transport systems	Multimodal freight transport systems Mobility management	14	8 A, D, F, FI, N, P, S, UK
T&I management	GPS and Galileo for all transport modes Advanced IT supported international logistics	8	6 D, F, FI, N, NL, UK
Vehicle technology	Techniques to reduce noise	7,5	7 A, D, F, FI, NL, P, S

Appendix 1 presents the related research questions collected in the Delphi survey and the Policy seminar on each of the 13 prioritised research element.

### 4.3. Recommendations

The objective of the foresight study was to identify relevant research themes and elements for future trans-national cooperation in transport research programming within the ERA-NET TRANSPORT programme. On the basis of the identified research themes and elements a selection has to be made for further activities in the ENT process.

Work Package 2 in ENT will organise two Exploratory workshops in 2006, in which two of the identified research themes will be explored for actual future research cooperation activities with the relevant research programme managers.

It is recommended to select the two themes for the Exploratory workshops in 2006 from the prioritised research themes, with its specified research elements, in the previous table to be worked out in the two Workshops.

The selection of the themes have to be made by the Management Group of ENT and will take place in the end of 2005. To facilitate this selection process the following additional actions will be carried out:

- reflection to the input and output of the Workshops that already took place in 2005, to select research topics for quick wins in trans-national cooperation
  - Environmental improvements through vehicle technology
  - Safety and security improvements through transport and infrastructure management
- reflection to the developments in 7<sup>th</sup> Frameworks Programme of the European Commission and other relevant international initiatives

---

# Appendix



## Appendix 1

### Overview of relevant research aspects from the Delphi survey and policy seminar

	<b>Selected Research Element</b>	<b>Delphi survey results</b>	<b>Policy Seminar results</b>
1	Multimodal freight transport systems (Integration of transport systems)	Harmonisation of standards for transport means by regulation and standardisation of intermodal transport units such as mini-containers. Networking logistics (transport) centres User centred transport systems.	Easy interchanges between modes. Integrated logistic system for better freight transport within Europe. Integrated multimodal transport interchanges. From a supply to a demand mobility market "door to door". Advanced, IT supported international logistics: there are many electronic devices for logistics, TMS can be used to reduce the transportation, time of all kinds of freight.
2	Use of information in real time (Infrastructure provision)	Multi modal (travel) info systems. Improve transport related internet services. User as a customer.	Particularly useful in public transport. Infrastructure itself can provide many data and information. Achievement of goal of fluent traffic using real-time information services. Development of traffic control centres. R&D concerning development of transport information management.
3	Establish environmental values (Decision support systems)	Air quality: impact of traffic measures on air quality and tools to predict air quality. Study to show external effects and relation between tax and destination.	Focus on research for methods and acceptance, rather than values as such.
4	Techniques to reduce noise (Vehicle technology)	Technology of silent vehicles. Alternative propulsion. Silent tires.	Propulsion systems.
5	Minimise impact on people and environment (Infrastructure provision)	Separation transport infra in residential areas (tunnels). Silent asphalt.	Safe and sustainable road infrastructure. Low impact maintenance techniques. Silent asphalt. Standards and criteria for impact studies/assessments.
6	Coherence between marginal cost pricing, cost coverage and revenues (Pricing and taxation)	Clarify the goal of road pricing. Internalisation of external costs.	Balance Price and Tax measures. "Getting the prices right", "Getting the supply right" and "Getting the proper revenue"

7	GPS and Galileo for all transport modes (Transport and infra management)	Sensor monitoring and the development of traffic monitoring models. Instrument for pricing systems. GPS for tracking of dangerous goods.	Prepare for potential advantages of Galileo. It is better for both individual countries as EU wide. If well prepared, Galileo can serve several goals (safety, efficiency) at the same time.
8	Mobility management (Integration of transport systems)	Improvement of (urban) passenger transport system. Multimodal urban accessibility. User centred system. Comfort; less interchanges between modes.	Easy interchange between different modes. Integration of transport management and land use. Info management + info exchange.
9	Good practice in modelling (Decision support systems)	Relation between accessibility and economic growth. Safe user decision making systems. Understanding of impact higher oil prices on decisions in goods and passenger transport. Impact of traffic measures on air quality and tools to predict air quality.	Urban transport interactions modelling. Reliability research. Establishing environmental values: models for monitoring and evaluation of impacts.
10	Research on reliability (Decision support systems)		Valuation and incorporation into modelling framework.
11	Harmonisation of ITS standards (Pricing and taxation)	Development of regulation standards for pricing.	Worldwide / European comparisons. Standard international technology regarding road pricing: 1 standard for EU.
12	Equity and acceptability (Pricing and taxation)	Acceptance of road pricing; Information awareness, clarify goals, quantify options.	Redistribution effects. Impact of pricing on different groups of travellers.
13	Advanced IT supported international logistics (Transport and infra management)	GPS and Galileo for all transport modes. GPS for tracking of dangerous goods.	Electronic devices for logistics TMS to reduce the transportation time of all kinds of freight. Different types of information