

Report on Analysis of governance mechanisms in the Danish and Polish transport research sector

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Table of contents

DENMARK	2
1. Danish Introduction	2
1.1. Contents	3
1.2. This report	3
2. Status anno 2005	3
2.1. The history of Danish transport research	4
2.2. The volume of Danish transport research	5
2.2.1 Transport and other sectors	7
2.2.2 Transport research in other countries	8
2.3. Institutions conducting transport research in Denmark	9
2.3.1 Danish Technical University	9
2.3.2 Danish Transport Research Institute	10
2.3.3 Aalborg University	11
2.3.4 Roskilde University	11
2.3.5 Copenhagen Business School	12
2.3.6 Aarhus Business School	13
2.3.7 Institute for Transport Studies	13
2.3.8 The Danish Road Directorate	13
2.3.9 Other research organisations	14
2.4. Cooperation	14
2.5. Financing	15
2.6. Education	16
POLAND	17
3. Introduction	17
4. Transition of research policy and transport policy from the socialist to the post-socialist period	19
5. National innovation system, involved policy actors and governance mechanisms	20
5.1. Transport research policy actors and governance mechanisms	21
5.2. Formulation of policy plans and strategies	22
5.3. Determination of policy agendas and priorities	25
5.4. Implementation of policy activities	29

6.	MAPPING OF THE TRANSPORT RESEARCH ARENA.....	35
6.1.	<i>Mapping of academic departments at Universities and higher education sites and Non-University Public Research Centres.....</i>	<i>37</i>
6.2.	<i>Mapping of the transport industry sector.....</i>	<i>39</i>
6.3.	<i>MAPPING OF THE TRANSPORT SERVICE SECTOR.....</i>	<i>40</i>
7.	Conclusion.....	44
8.	Annex I – Danish Questionnaire	46
9.	Annex II – Bibliography	49
9.1.	<i>Journals.....</i>	<i>49</i>
9.2.	<i>Internet.....</i>	<i>49</i>

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Abbreviations

ACARE	Advisory Council for Aeronautics Research in Europe
ACMARE	Advisory Council on Maritime research and Development
AINO	R&D program on real time transport information. AINO (2004-2007) is a continuation of the research and development program activities on ITS (Intelligent Transport Systems) of the Ministry of Transport and Communications in Finland.
AKF	Local Government Studies, Denmark
CBS	Copenhagen Business School
CEPI	The European Co-ordination of Independent Producers
CLG	Centre for Logistics and freight transport, Denmark
CLT	Centre for Logistics and Transport, Denmark
COST	European Cooperation in the field of Scientific and Technical Research
CTT	Centre for traffic and transport, Denmark
DEL	Deliverable
DEUFRAKO	German-French Cooperation in Traffic Research
DRI	Danish Road Institute
DTF	Danish Transport Research Institute
DTF	Danish Transport Research Institute, Denmark
DTU	Danish Technical University
DTU	Danish Technical University
ECCREDI	The European Council for Construction Research, Development and Innovation
EDS	Education Development Strategy, Poland
EFPIA	The European Federation of Pharmaceutical Industries and Associations
EFTA	European Free Trade Association
ENT	ERA-NET TRANSPORT
ENTx	Thematic action group of ENT
Eol	Expression of interest
EPTR	European Platform for Cooperation and Coordination in Transport Research
ERA	European research area
ERDF	European Regional Development Fund, Poland
ERRAC	The European Rail Research Advisory Council
ERTRAC	European Road Transport Research Advisory Council
ESF	European Science Foundation
EU FP	EU Framework Programme
EU-COM	Commission of the European Union
EURATEX	The European Apparel and Textile Organisation
EUREKA	EUREKA is a pan-European network for market-oriented, industrial R&D (an inter-governmental initiative supporting European innovation)
EUROCORES	EUROpean Science Foundation COLlaborative RESearch

EURYI	European Young Investigator Award
EWS	Explorative Workshop
GDP	Gross domestic product
GERD	Gross Domestic Expenditure on R&D
GUS	Central Statistical Office of Poland
HD	Habilitated doctor
ICT	Innovation and communication technologies
IEA	International Energy Agency
IPR	Intellectual Property Rights
IV2S	Austrian Impulse Program Intelligent Transport Systems and Services (Impulsprogramm Intelligente Verkehrssysteme und Services) in 2002-2006.
MoU	Memorandum of understanding
NC	Nordic Council
NDP	National Development Plan for 2004-2006, Poland
NERI	National Environmental Research Institute, Denmark
NFP	National Framework Programme, Poland
NMR	Nordic Council of Ministers
NTF	Nordic Transport Forum
NTP	The National Transport Policy Plan, Poland
PAN	Polish Academy of Science
PhD	Doctor
PKP	Polish National Railway
PLK	PKP Polish Railway Lines JSC
PREDIT	Programme de recherche et d'innovation dans les transports terrestres (French program of research, experimentation and innovation in land transport)
R&D	Research and development
RTF	Council for Traffic Safety, Denmark
SMP	Strategic Environmental Research program, Denmark
SRA	Strategic research agenda
TDS	Transport Development Strategy, Poland
TP	Technology Platform
TWS	Targeted Workshop
WP	Work package (+number within ERA-NET TRANSPORT)

Foreword

Since 2004 ERA-NET TRANSPORT (ENT) concentrates on improving trans-national coordination and cooperation in transport research policy among a number of European member states. This is actively done by organizing a dialogue platform, where program owners and managers from federal ministries and subordinate state agencies (e.g. research promotion agencies or transport infrastructure agencies) and public funding bodies (e.g. national funds or national research councils) are encouraged to cooperate and collaborate, all for designing and implementing joint trans-national transport research funding and support activities. ENT encourages policy cooperation regarding the complete transport research program system, starting at the policy agenda setting and strategic policy level, throughout program implementation to even the project evaluation level. It covers the whole thematic range of transport research considering all transport modes.

In 2005 Poland and Denmark became new partner in the ENT consortium. With this membership a new working task for ERA-NET TRANSPORT was delineated. The main objective of this task is to draft guidelines, how to set up or to reset research programme systems in countries where these particular program systems are not introduced yet or countries where running program systems were closed down due to other policy priorities. A major requisite of the newly introduced research program systems is the option “open for cross-boarder cooperation” and with that operable for trans-national activities within ERA-NET TRANSPORT.

This report is the result of an in-depth analysis of the national transport research arenas in Denmark and Poland. The report does not only detail the country overviews in ENT-Deliverable 1.1. “Overview of research programming and cooperation mechanism”, but goes far beyond that mapping the current status of the transport research arenas in Denmark and Poland. It pictures as well the present innovation system related to transport research in Poland. The report is a significant starting point for the national discussions on the status and future role of transport research in both countries. Both parts of the report will be separately translated into the national languages. The Polish language version will for example in Poland be a major incentive to promote a dialogue platform and to start a broad deliberation process on future transport research priorities among the related ministries and the stakeholders of the national transport research arena and innovation system.

The Danish part about the “Status for Danish Transport Research” was written by *Ole KVEIBORG* and *Niels Buus KRISTENSEN* from the Danish Transport Research Institute (DTF – Danmarks Transport Forskning). The Polish part was written by *Prof. Marek SITARZ* (Silesian University of Technology, European Centre of Excellence for Railway Research, TRANSMEC), *Claus SEIBT* (ARC systems research, Technology Policy Department), *Martha JABLONS* (TRANS-MEC) and *Agnieszka MIERZYNSKA* (Ministry of Education and Science, Poland).

DENMARK

1. Danish Introduction

Transport is a major contributor to GDP in Denmark and the transport sector facilitates economic activities and growth. Being able to respond to new challenges with new or alternative solutions and knowing how such solutions work is very important for the efficient use of the resources in a small country such as Denmark.

Denmark is a small country with a few small research institutions and research groups at different universities where transport is the main topic. Four organisations are the main contributors to Danish transport research. Centre for traffic and transport (CTT) at the Danish Technical University, the Department of Development and Planning at Aalborg University, the FLUX research group at Roskilde University and Danish Transport Research Institute are the only organisations with more than seven full-time researchers within transport research.

Despite the earlier formulated transport research strategies there has not been a clear formulation of what type of research should be undertaken and by whom. No clear organisational strategy has been set up. The organisation is a consequence of historical reasons where individual organisation and universities or even individual researchers started on doing various kinds of research projects within transport related areas. The research projects often follow the individual researchers and not the organisations. However, following the last transport research strategy from 2000, which lead to the formation of a national transport research institute some agreements on which type of research different institutions should participate in where formulated.

The lack of a clear organisational strategy and the large variations in available financial support means that Danish transport research has been characterised by stop and go research at various institutions. In the late 90'ties transport economic research was increasing with a specific effort by both the Transport Council and the TRIP research programme. However, this was concentrated around some Ph.D. students and has now almost disappeared again. No specific courses are being taught at the economic institutes at the universities and only 1-2 Ph.D. students are presently active. Similar patterns are observed at the National Environmental Research Institute, where transport research is almost non-existing after a period in the late 90'ties, where a rather large group existed.

1.1. Contents

This report is establishing the basis for the work leading to a revision of the Danish strategy for transport research. To accommodate the process the strategy must contain the following parts:

- A status of the transport research in Denmark as it is structured today. Including the volume of research, a description of the different organisations involved, the primary areas of research, and the relation to earlier status reports.
- Indication and prioritisation of relevant themes for research seen from a Danish point of view. This is very important since it is not possible for a small country to do research in all relevant areas. Focussing research is thus necessary, and equally important making sure that relevant international research in areas not covered by Danish research is followed.
- Guidelines for how the research should be organised and financed.
- Outline the possibilities for international cooperation on research projects and on the organisation of international coordination of financing of research.
- Indication of the required efforts to obtain the objectives.
- How research results are disseminated to the research community, to decision makers, to interest groups and to the public in general. An important part of this is to outline a plan for the practical implementation of research results

1.2. This report

This report provides input to the first of the outlined activities in the process. The report gives an overview of the current situation in Danish Transport Research and links this with earlier status accounts.

2. Status anno 2005

This status account is a continuation of a series of status reports since 1993, where the first report "Dansk transportforskning – en statusopgørelse" from Transportraadet¹ over the two following reports from 1997 and 1999: "Igangværende transportforskningsprojekter i Danmark" and "Dansk transportforskning – status og visioner"² leading to the strategy for Danish transport research published in 2000 ("National delstrategi for danske transportforskning"³). Some changes have happened over this period. The following section sets the stage for the present status by providing a historical overview of the development for the past 15-20 years.

The earlier status accounts have found that transport research is done at many (small) institutes at the universities, research institutes and other private enterprises. However, only a few of these organisations have transport as the main focus and only very few have a critical mass of researchers devoted to transport research. As part of the production of this status report the main research institutes have been asked to provide us with information about the volume of their transport research. The past three status reports have made a specific effort to take the smaller organisations into account. Here such an effort is not made. The present status

¹ Danish Transport Research A status account". Published by Transportraadet in 1993.

² "Ongoing research projects on Danish transport" published by the Ministry for research in 1997 and "Danish Transport Research – Status and visions" published by Transportraadet in 1999.

³ "A national strategy for transport research in Denmark". Ministry of science and Ministry for Transport, May 2000.

account is thus somewhat more imprecise. However, the accumulation of the many smaller contributions will probably not affect the overall account by much.

2.1. The history of Danish transport research

Danish Transport research in the 70'ties and 80'ties was mainly focussed on practical and national interests. Only a few researchers at the universities published internationally and most of the research was based on individual researchers' personal interests.

There were no tradition for training of transport researchers and no formal education existed. Transport researchers had large difficulties in winning research grants from the traditional national research funds, because Danish transport researcher did not have a history of international peer reviewed research. It was in the early 90'ties recognised that research money had to specifically dedicated to transport research to improve the level as well as the quality. This lead to the founding of the Transport Council in 1992. The objective for the Transport council was furthermore to communicate research results and to council decision makers. The Transport council had a budget of 15 million DKK each year aimed at supporting transport research. It was a large priority to give grants to Ph.D. projects and hereby improving the basis for future transport research. The annual number of Ph.D. degrees increased from an annual average of one to approximately five during the 90'ties. This level has stabilised also after year 2000, where more and more of the financial support comes from other means.

The Transport council identified areas that lacked research knowledge and it was also realised that the research activities were to widely spread out on many different organisations. A problem that persisted during the 90'ties, and which has still not been completely solved. The research grants were then oriented towards the identified topics. Some of these topics were not traditionally covered by the existing research groups. An example is the idea of *sustainable transport*, environmental and societal consequences of transport. Transport research within this topic was included in 1994 in the environmental research program CeSaM concerning policy, philosophic and other social scientific approaches. The primary transport research activities were concentrated around four Ph.D. projects. The centre consisted of a number of different universities and research centres.

A large research program was in 1998 set-up concerning transport economic issues and another concentrated on sociology at the University of Copenhagen. These activities have since died out, but they have lead to a number of finished Ph.D. studies.

Parallel to the establishment of the Transport Council a research group focussing on environmental consequences of transport was formed at the National Environmental Research Institute. Together with a group researching in emissions and air pollution related to transport the National Environmental Research Institute was one of the main contributors to transport research in the 90'ties.

Many larger research programmes including aspects of transport were supported in the 90'ties and early 2000. Four of the major ones were financially supported by the *Strategic Environmental Research program (SMP)*: CeSaM from 1992 to 1997 and in a second phase from 1997 to 2001, AMOR from 1997 to 2000, SØM from 1997 to 2001 and TRIP from 2000 to 2004. Transport was only one part of the three former projects, whereas it was the main content of the TRIP project. All SMP supported projects were focussing on environmental aspects. No new projects have been

supported by SMP since 2001, where it was terminated. In 2004 the structure of national financial support to research was reorganised so that the former topic specific research programs such as the SMP now all fall under the new *Strategic Research Programme*. However, none of the themes that are specifically mentioned in the first outline of research topics include transport.

In 2001 another large research project started – the Centre for Logistics and Freight transport (CLG) supported from the Technical Scientific Research Council, but based on financial support from the Ministry for Interior and Commerce. The financial support for CLG terminates in 2006 and no new larger transport research projects are under way.

The “Betænkning 1368, Dansk Transportforskning – Status og Visioner” from 1999 outlined a new transport research strategy and gave a number of recommendations. One of the major suggestions was to establish a national transport research institute, which in 2001 led to the formation of the Danish Transport Research Institute (DTF). The vision of establishing DTF was to concentrate and focus on applied research activities related to the Danish infrastructure and hereby create a scientific basis for political decisions. DTF was formed on the basis of a larger group researching in environmental issues related to transport and traffic safety from the Danish Road Directorate and on the former Council for Traffic Safety (RTF), which have both existed for more than 30 years.

Following a change of government in November 2001 much of the financial support for transport research vanished. The Transport Council and its budget for transport research were removed, DTF had its budget reduced by a third and the ministry administered research money was cancelled. Some of the ongoing activities were allowed to continue (mainly Ph.D. and post doc projects), but based on the budget for 2002 it was projected that the financial support for transport research would be halved in 2005 (assuming that the universities would continue their basic funding of transport research).

The declining available funding naturally lead to a drop in transport research activities and some of the research groups formed during the 90'ties gradually lowered their activities and researchers moved to other research areas. However, the large support for transport research and especially the education of new researcher during the 90'ties (mainly from the Transport Council) did lead to large improvements in the quality of the research and a number of transport research projects has since 2002 achieved financial support from the traditional national research councils (primarily from the Research Council for Social Sciences), moreover Danish transport researchers increased their activities in international research projects funded by the EU Framework programmes. Also the level of research training through Ph.D. projects seems to continue at the level from 2001 with approximately five finished Ph.D. projects per year. A formal masters program in transport research has also started in 2004 at the Danish Technical University (DTU) and a masters program in maritime sciences will start in 2006 at the University of Southern Denmark.

2.2. The volume of Danish transport research

Based on the returned questionnaires we have estimated the level of Danish transport research. The results are shown in Table 1. The total number of researcher corresponds to 83. full time researchers. The primary research institutions are Centre for Traffic and Transport at the Danish Technical University,

Danish Transport Research Institute, Aalborg University and Roskilde University where more than seven full load man years are oriented at transport research.

Table 1: The volume of Danish Transport Research in different institutions. Based on year 2004.

Institution	# Employees involved in transport research	# Full-load man-years in transport research
Danish Technical University • Centre for traffic and transport, • Section of Maritime Engineering	20	15 0
Aalborg University • Division of Technology, Environment and Society • Division of Urban Planning, Roads & Traffic	9 12	7* 4.5
Roskilde University	9	7
University of Southern Denmark • Maritime research unit		
University of Copenhagen • Institute of Geography	2*	1.5
Copenhagen Business School • Department of Operations Management • Department of Marketing	10*** 2	3 0.5
Aarhus School of Business • Logistics/Supply chain management group	4	2
National Environmental Research Institute	5	1
Danish Transport Research Institute	17	15
Institute for Local Government Studies	3*	1.5
Institute for Transport Studies	5	5
Danish Road Directorate including the Danish Road Institute	12	10
Consultancies (Cowi, Tetraplan, Carl Bro, WS Atkins, NIRAS, Traffitec)		10.5
Total		83.5
Danish Technological Institute		46**

* Figure not supplied. Our guess.

** This is the figure provided by the institute, however most of the work is concerned with vehicle technology and is thus not included in the total figure.

*** Including all researchers at the institute and not only those undertaking transport research.

However, a few words of caution about the figures should be given. It seems as many of the institutions have used different definitions of transport research. Some of the institutions have provided us with the total number of people employed and some have only reported those working with transport research. Also the differentiation between pure research activities and teaching, consultancy work and

counselling has not in been done the same way in all institutions. We have tried to correct some of the figures based on the different organisations' own description of their work in order to make the figures comparable. The figures in the table should thus be read bearing that in mind.

We should further note that we have left the research activities undertaken at the Technological Institute out of the total volume figure, because the activities are almost entirely research in vehicle technology. Also we note that the Maritime research unit at the University of Southern Denmark is left blank. This is because the unit did not exist in 2004 and because there is still no research activities taking place. However, the expected volume is between 4-6 researchers.

The volume of 83.5 full load man years in transport research is a reduction of 15-20 per cent since 1997, where the approximately 100 man years were active. Obviously there may be differences in the actual counts of the two figures, but there is no doubt that a large reduction has happened due to the reasons described earlier. It should be mentioned that the account from 1997 does not show a large research activity at Roskilde University (less than two man years). This volume increased heavily until 2002 and declined again afterwards to the present seven many years. There have in the years between 1997 and today also been more transport research activities at other institutions compared to both 1997 and 2004. This emphasises the large reduction in the volume that has happened during the past 3-4 years.

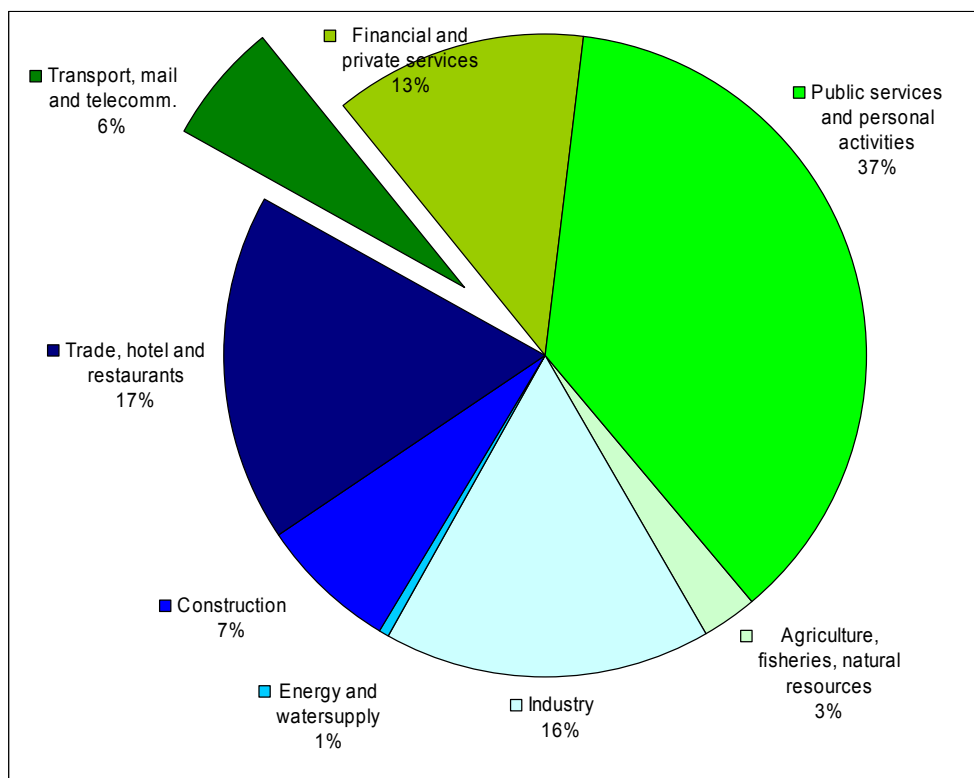
The main scientific disciplines of research are engineering, social sciences (primarily economics) and planning. Sociology and psychology is not a very widespread disciplinary approach. Sociology is concentrated at Roskilde University and the National Environmental Research Institute, psychology is almost fully concentrated at the Danish Transport Research Institute.

The largest disciplinary change since the latest status account from 1999 is that research in social sciences has increased quite much. In 1997 60 per cent of the research was based on an engineering approach and only 10 per cent were in economics. This picture is changed because many of the activities in engineering have stopped – especially research in environmental issues, whereas activities in economic disciplines and other social sciences have grown. The increase in these areas have mainly happened at the Danish Transport Research Institute, but also some of the activities at Roskilde University and at Centre for Traffic and Transport have increased the activities in social sciences.

2.2.1 Transport and other sectors

Transport is a major sector in the Danish economy and Danish companies are also major players on the international scene with the world's largest container carrier company – Maersk Sealand and the large Scandinavian airline company – SAS. Transport (excluding telecommunications) contributes with 6 per cent of Danish GDP (in 2000). Only financial services, public administration and industry production contributes with a larger share, whereas traditional Danish industries such as agriculture and fisheries together only contribute with about 5.6 per cent of the total production. Note however that the food production industry by itself contribute with additional 5 per cent. Transport is also a major sector measured in number of employed with about 6 per cent of total employment. Only industry production (including food production), construction, and services are larger. The distribution on sectors is shown in **Fehler! Verweisquelle konnte nicht gefunden werden..**

Figure 1: Employment per sector in per cent



The figures on the contribution to over economic activities do not consider the large amount of transport activities undertaken by individual households. Private households use approximately 14 per cent⁴ of their disposable income for transport and an average individual spends about one hour every day on transport. This amount to substantial use of resources not accounted for in traditional economic statistics. In e.g. evaluations of large infrastructure projects it is the individual time savings that amount to the largest part of the benefits.

However, measured in activities within research transport accounts for only a very small part (2.1 per cent) of total research activities. This is a small figure compared to 9.8 per cent within agriculture, fisheries and hunting. Most research activities are categorised as basis or common scientific development (The Danish Centre for Studies in Research and Research Policy: *Forskning og udviklingsarbejde i den offentlige sektor – Forskningsstatistik 2003*). The research institute on fisheries with 120 researchers compared to the only transport research institute with only 10-15 full time research positions is a clear example of the underrepresentation of transport research activities compared to the overall contribution to economic activities. The construction sector, which is similar in size to the transport sector in production value terms account for 3 per cent of public research funds compared to approximately 1 per cent for the transport sector (source: Ministry for Commerce, Ministry for Transport and the Ministry for environment: *Godstransport*. From 2003).

2.2.2 Transport research in other countries

A comparison of transport research in the Nordic countries has shown that Sweden 340 full time positions are employed in transport research (including technology

⁴ Figures from *Trafikredøgørelsen 2004*, published by the Ministry for transport.

development), in Finland 180 positions and Norway and Denmark approximately 83 full time positions. Taking population into account leaves Sweden and Finland with the highest level of activity and Denmark with the lowest level of activity. The large Swedish volume of transport research is also due to large activities within the large Swedish automobile industry.

The total budget from the Ministry for Transport and telecommunications in Norway to research activities in 2005 is 18 million Euro of which 4.7 million are devoted to transport research. Besides these earmarked funds there are in addition possibilities for funding through the general research financing institutions. The corresponding Danish budget was 7.3 million Euros to research and development (including infrastructure development and maintenance).

2.3. Institutions conducting transport research in Denmark

The definition of transport research is difficult. The general definition of what is research is made according to the Frascati manual using four different categories: basic research, strategic research, applied research and experimental development. This is one dimension of the definition. The other dimension is how to define what areas is transport research. In this approach a rather restrictive definition is used. Transport research is research directly related to the *transport system*. This means that areas such as vehicle development, development road pavement (analysis of the strength etc. of the pavement) and infrastructure design (how bridges, roundabouts etc. can be constructed, designed and which types of materials are best suited for their use), and the development of vehicle technologies are not categorised as transport research even though there are uses of this knowledge within the transport sector. Also topics such as general tax policies and the design of tax systems are not directly transport research unless it is the analysis of specific transport taxation. Danish transport research is also carried out by private enterprises. To facilitate the answers to the questionnaire for such organisations it has been chosen to define research as the projects carried out using own financial means or research carried out on grants from national or international research programs (the EU framework programs and Danish strategic research programs).

In the following subsections we will give an overview of the transport research activities at different institutions. The information for these sections is based on a questionnaire about research activities at these institutions during summer 2005. The questionnaire has been sent to many other institutions as well covering also the large group of different private enterprises that deliver various consultancy works within transport.

2.3.1 Danish Technical University

The efforts in transport research at the Danish Technical University (DTU) are concentrated at the Centre for Traffic and Transport (CTT). The centre was formed in 1999 based on the earlier Institute for Planning. The most recent outcome is the formation of a complete master program in transport.

Research at CTT is based on a long tradition of transport infrastructure and traffic safety. In the 70'ties also urban planning issues were introduced. However, this topic was heavily reduced in 1996 together with a large reduction in traffic safety. At the same time research in transport modelling and decision aid methods were introduced. The long tradition at the Institute for Mathematical Modelling of optimisation methods and statistical modelling was continued after the formation of CTT and is now the third pillar at CTT.

Each of the three main areas of research at CTT has its own full professor and a total of four associate and two assistant professors work at CTT.

Primary research areas are:

- Logistics and Transport,
- Traffic and Transport Models,
- Geographical Information Systems,
- Decision Models and Evaluation Methods,
- Traffic Informatics,
- Traffic Engineering,
- Traffic Planning,
- Highway Engineering.

Three other institutes at DTU do transport related research: *The Section for ships, coast and constructions*, the *Institute for mechanics, Energy and Construction* and the *Center for Biofuels*, which was established together with the National Laboratory at Risoe. However, research at these three institutes are concerned about the technology development for vehicles, ships etc. and are thus not defined as transport research in the definition employed here.

Information about transport research at CTT can be found on www.ctt.dtu.dk.

2.3.2 Danish Transport Research Institute

DTF was formed partly as a response to the recommendations in the previous Danish status report about transport research ("National delstrategi for dansk transportforskning. from September 2000), which recommended the establishment of a national transport research institute. The institute was originally expected to continue the research from the former "Council for traffic safety research" and the research carried out at the "Department for safety and environment" at the Road Directorate, which were both included in DTF. After a change of government in 2001 most of the research in environmental issues and infrastructure design was closed down. As a new area of research a department for transport economics and modelling was established. The institute is also assisting the Ministry for Transport in areas closely related to the research carried out.

The primary research areas are traffic safety and risk, travel behaviour, transport modelling of passenger and freight transport, the relationship between transport and the economy, regulation of transport. The institute is now primary responsible for the national annual travel survey and has in 2005 established a centre for models, which will function as a "library" of Danish transport models.

There are 18 researchers and 4 Ph.D. students including one research assistant at DTF. The amount of research corresponds to 15 full-time researchers of which 9 are senior researchers and 6 are researchers. The research is partly externally funded by national research grants and partly funded by EU research programmes and INTERREG funds.

The primary research areas are

- Traffic safety and risks.
- Transport behaviour.
- Welfare economics, the relation between transport and other sectors.
- Strategic modelling and traffic modelling.

More information about DTF can be obtained from www.dtf.dk.

2.3.3 Aalborg University

Transport research at Aalborg University goes back to the very formation of the university in 1974. It is primarily related to the engineering studies at the university, however, there also close links towards geographical and social sciences. Research is primarily concentrated at two divisions in the same department: the Department of Development and Planning. The *division of Urban Planning, Roads & Traffic* includes a *Traffic Research group* and an *Urban Planning group* who both do transport research. The research approach reflects the integration of traffic in the society covering issues such as planning, design and construction of infrastructures, traffic related problems with specific focus on accident prevention and avoiding environmental damages caused by traffic. Another issue is assessment of new infrastructures and a final issue is administrative and planning organisation and processes. A very important approach is the technological possibilities in relation to the above mentioned research issues, where especially intelligent transport systems using IT to optimise transport systems with respect to e.g. environment and accidents.

The division has been heavily involved in the organisation of the annual Danish conference on transport research: "Trafikdage på Aalborg Universitet" (Traffic days on Aalborg University) and has since the closing of the Transport Council had the full responsibility of the organisation. From 2006 and onwards this will be a cooperation between Aalborg University and Danish Transport Research Institute.

The other *division of Technology, Environment and Society* was formed in 2001 joining two existing groups – *Ecology and Energy* and *Technology and Society*. The research is highly cross disciplinary and combines different perspectives from social sciences with the more traditional engineering and planning related approaches. A specific focus is on technological changes and the environment. Most of the research within the division is carried out in the *Urban Planning and Mobility Studies* group.

The primary research areas are:

- IT and transport, intelligent transport systems (ITS),
- Transport safety and other traffic related problems including environmental damages,
- Transport planning, infrastructure planning,
- Urban structure, localisation,
- Regional and local transport policies.

In total two full professors and ten associate and assistant professors work with transport research, but also other topics are covered by the two research groups.

More information about the Department of Development and planning is available from www.plan.aau.dk.

2.3.4 Roskilde University

Transport research at Roskilde University is undertaken at Department of Environment, Technology and Social Studies where it is further concentrated at the research area "Transport, Environment and Planning" in the research group "FLUX". FLUX was formed in 1999. Transport research has its point of departure in the environmental consequences of transport and the possibilities for changes in transport through regulation and planning. Transport research is through this able to support the education of environmental planners who specialise on transport.

Transport research has also its point of departure in societal problems, which the development of transport creates. Transport research is based on science already developed within existing disciplines. The goal is to develop a common understanding of mobility through the understanding of the driving forces behind the demand for transport, the demand for management of transport, the growth of transport, and its societal implications.

Research is concentrated on:

- Environmental consequences of transport,
- Decision making in transport,
- Transport and society,
- Transport and mobility,
- Transport logistics,
- Transport policies and planning.

A full professor and 4 associate professors are involved in transport research in the FLUX group. More information about the research is available from www.ruc.dk/teksam/omteksam/Kortom/transport

2.3.5 *Copenhagen Business School*

Transport research at Copenhagen Business School has since the mid 1960'ties, where the former *Institute for Traffic, Turism and Regional economy* was established undergone some serious changes. It was changed into the *Institute for Logistic and Transport*, where focus changed to the institutional relation between freight transport research and logistics. However, this institute was demolished in 1998 and split into two and absorbed by other departments. One group continued at the *Department of Marketing* and another group at the *Department of Operations Management*. The research programme PROTEUS was the basis for the establishment of the research groups in 1997 at the Department for Marketing. The primary focus of the research was the internal and external organisation of the supply chain. The other group at the Department for Operations Management has focussed on supply chain management.

At both groups it is difficult to distinguish transport research as a separate activity because much of the work is often part the analysis of a complete production and distribution chain.

In later years transport research at CBS has been concentrated at the Department of Operations management with only a limited activity level in the other group due to changes in the research staff. In 2004 research in transport only amounted to half a year and it is next to nothing in 2005. There are no signs that a larger activity level can be expected in the near future. The activities are carried out by two full professors and three associate and assistant professors. However, not all work full time on transport related issues. The total amount of research at CBS amounts to 3.5 man years.

The research at CBS is primarily concentrated on:

- Supply chain management,
- Transport logistics.

Information can be obtained from www.cbs.dk/forskning_viden/fakulteter_institutter_centre/institutter/oekonomi/om and www.cbs.dk/departments/mpp

2.3.6 Aarhus Business School

Transport research is focussed around logistics and supply chain management in the *Logistics/SCM Research Group* at the *Department of Accounting, Finance and Logistics*.

The research is both focussing on mathematical programming and optimisation methods (operational research) as well as on using an enterprise approach to study supply chain management. The work is headed by three associate professors.

The research is described on www.asb.dk/departments/afl

2.3.7 Institute for Transport Studies

The institute carries out sector research and various consultancies in logistics and freight transport. The primary business areas are analysis and optimisation of freight transport chains and investigation and description of the development, requirements and options in the transport sector.

The institute was established in 1989 initiated by public and private parties. The institute is an independent foundation.

Institute for Transport Studies and University of Southern Denmark have in 2001 established CALT. The objective of the centre is to carry out user oriented research and communication in the field of logistics, distribution and transport.

The activities are concentrated on:

- Freight transport,
- Organisations of the freight transport industry.

Five persons are involved in the research and consultancy activities, but no formal research training is required. More information about the activities at the institute can be found at www.transportstudier.dk

2.3.8 The Danish Road Directorate

A large part of research in noise and environmental consequences of road traffic was until the formation of the Danish Transport Research Institute undertaken at the Danish Road Directorate including the Danish Road Institute. As part of the formation of DTF most of these activities were transferred from the Road Directorate to DTF (where it was later completely removed after the large reductions in the budget in 2001) and as part of this change it was decided that no research was carried out at the Road directorate. However, the Danish Road Institute continued in research activities, but at a reduced level nevertheless.

The Danish Road Institute (DRI) has long roots back to the National Road Laboratory formed in 1928. It continued to grow in size until 1970 where it peaked with a staff of 140. It became a part of the Danish Road Directorate in 1972. In 1994 a budget revision initiated large changes including a change of name to the present Danish Road Institute. This was followed up through a series of budgetary changes

leading to the present two research and testing departments: the asphalt department and the environment and material department.

DRI supplies technical knowledge and consulting to the Danish road sector. DRI carries out research in many road related fields such as bearing capacity and surface properties which include durability, noise and friction. We promote knowledge on roads to Danish and foreign customers and other interested parties. In this manner DRI contributes to a well functioning road network.

The transport research activities at the Road Directorate including DRI is carried out by approximately 12 persons all at assistant and associate professor level corresponding to 10 full-time researchers.

2.3.9 Other research organisations

Transport research is furthermore undertaken at various public organisations such as the Institute for Local Government Studies (AKF), Institute of Geography at the University of Copenhagen. A new maritime institute has recently been formed at the University of Southern Denmark and is expected to increase the volume of transport research by 3-6 researchers in transport and logistics. The institute will also participate in a new master study in maritime transport and logistics. There are also many activities at the Danish Technological Institute. However, these activities are very much concentrated around vehicle technology, which we have chosen to leave out of the definition of transport research. Until the beginning of 2001 there was also a large concentration of transport research at the National Environmental Research Institute (NERI) in two departments (Department for Policy Analysis and Department for Atmospheric Environment). The volume at NERI has heavily declined and now only some activities in exposure measurement and emission coefficients take place. In the context of this report these activities are not defined as transport research.

Also a number of private companies participate in transport research. The two largest in that respect are Cowi Ltd and Tetraplan Ltd.

A number of other companies also participate in transport research to some extent. They are Carl Bro gruppen, NIRAS, PLS Rambøll, Atkins, and Traffitec. However, the amount of research is very limited at these places.

2.4. Cooperation

Danish transport research is spread on many institutions who each undertake only a limited contribution to transport research activities. The total level of research is also limited. This requires good cooperation and division of focal areas between the different institutions to have a high efficiency in the research and maximise the outcome and use of the research activities.

The cooperation takes place at project level, joint masters and Ph.D. courses, as well as more formalised networks. The cooperation is both national and international. Most of the institutions take part in EU funded projects (e.g. the framework programs), but some institutions do not have cooperation within the field of transport research.

The formalised national networks has in the recent years primarily been concentrated around freight transport and logistics through the *Centre for Logistics and freight transport (CLG)* funded by the Technological and Scientific Research Council and the *Centre for Logistics and Transport (CLT)*. Until 2003 also the TRIP centre concerning passenger transport were active. However, there has been no

follow up on this. The CLG will also end its activities through 2006 and will be dependent on individual research funding from the participating institutions.

The questionnaires further showed that many institutions have close cooperation within the Øresund region and especially with the university in Lund.

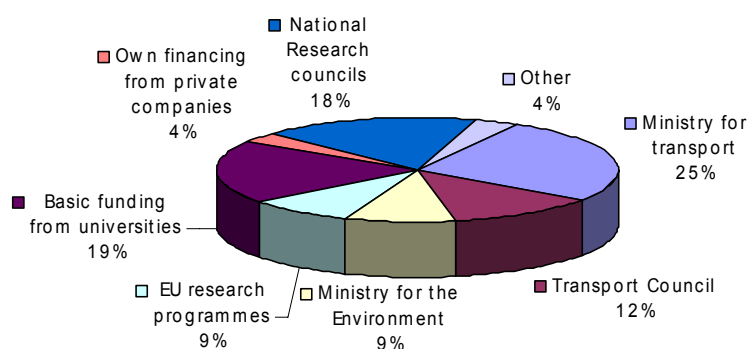
2.5. Financing

In the past five years we have seen some changes in the financial situation for transport research. The earmarked transport research budget (a little less than 2 million Euro per year) administered by the Transport Council was removed and also large funds available through the so-called 'Transport pool funds' ("Trafikpuljemidler") disappeared following the change of government in Denmark in 2001. This means that there is no longer a dedicated program for transport research. It is also not a specific named area of interest in the general funding through the Strategic Research Council, but is partly present through the program for energy and environment.

A large part of research activities at the research institutions are dependent of external funding. Most external research funding requires large own funding both because the research grants do not fully cover the overhead costs and because some own funding is often required in the research projects. This implies that a relatively large share of the funding of transport research comes from basic funding from the institutions' own budget. This is independent of the type of organisation (governmental or private consultancy). The requirement of own financial contribution to every research project funded through external sources puts an upper limit to the volume of research that the individual organisations can undertake. For some institutions this limit has almost been reached, which implies that these institutions cannot increase their activities without having increasing basic funds.

The distribution of financial sources came from different sources with a distribution in 2002 as shown in Figure 1. The figures should be taken with some caution as it is not possible to calculate the exact contributions from all sources.

Figure 2: Distribution of sources of finance in 2002.



The primary sources of finance are national research funds (note that the large share coming from the Ministry for transport includes the basic funding for DTF). The distribution has not changed much based on the questions asked in the questionnaire. However, the questionnaire does not allow us to distinguish between grants from the research councils and grants from ministries, local governments or other national funds. It is thus difficult to say to what extent transport research is successful in getting research grants in competition with other research areas. However, financing from the Transport council has completely disappeared and the Ministry for Transport now contributes with a slightly larger share, whereas the contribution from the Ministry for the Environment has decreased since 2002.

Another source of funding is the international (EU framework) programs. Danish organisations have only to a certain degree been active in this area. The level of international research funding is about 25 per cent in the organisations that have received international funding. For private organisations there is a higher share of international funding of research. Historically many private firms have been very active in applying for funding through the EU framework programs. Some firms have continued this, but due the large reduction in the overhead rates on the framework programs it is no longer attractive to participate in these projects.

2.6. Education

It is important to have a continuous supply of researchers to maintain the knowledge gained. This implies having to educate new researchers. This requires courses in traffic and transport related issues at post graduate and Ph.D. All the universities doing transport research give courses at both master and Ph.D. level. At the Centre for Traffic and Transport there is even a complete masters program in transport, but several courses are also being taught at Aalborg University. The newly founded Maritime Research Institute will soon start a master program in maritime transport and logistics at the University of Southern Denmark. Unfortunately there is no bachelors program in transport at CTT. This makes the recruitment of students for the masters program difficult.

An equally important way of training new researchers is to supervise e.g. dissertation works, which is especially important for the non-university organisations. The level of this is quite low at all organisations. However, the level has remained unchanged at 5 finished Ph.D. studies per year since the mid 90'ties.

POLAND

3. Introduction

This initial report “*Analysis of governance mechanisms in the Polish transport research policy sector*” was drafted within the activities of ERA-NET TRANSPORT. Poland (Ministry of Science and Education) is a participant in ERA-NET TRANSPORT from the 1st of January 2005. This is the first case study prepared in Poland, which tries to map the Polish national research and innovation arena in the transport sector and furthermore to analyse the changing policy regimes and emerging governance mechanisms within transport research policy in Poland. Transport research policy is on one hand a newly emerging policy arena within science and research policy. On the other hand it is a research policy arena with a broad horizontal range, that means with a high need for integration with other policy fields in particular transport policy, but economic and innovation policy and environmental policy. The basic investigations for this report were achieved during the year 2005. The first hypotheses were presented and discussed during a Workshop 1 “*Shaping transport research policy and transport research in Poland*”, held in 18-19th of May 2005 in the former Ministry of Science and Information Society Technologies (today Ministry of Education and Science) In this workshop a number of representatives from Polish ministries as well as from relevant national research organisations and the technology platforms took part:

- Ministry of Science and Education,
- Ministry of Infrastructure,
- Ministry of Economic Affairs & Labour,
- Ministry of the Environment,
- National Contact Point,
- National R&D Technology Platforms.

Furthermore a small number of participants from ERA-NET TRANSPORT, members of Danish, Dutch and the Austrian transport ministries, the French national transport research program PREDIT and the Secretary of ERA-NET TRANSPORT took part.

- Bernard DUHEM, Permanent secretary of Predit programme in France, France.
- Sieds HALBESMA, Ministerie van Verkeer en Waterstaat Rijkswaterstaat, AVV Transport Research Centre, The Netherlands.
- Susanne KRAWACK, Tetra Plan, Denmark.
- Heimo KROPF, Austrian Federal Ministry for Transport, Innovation and Technology – BMVIT, Austria.
- Thilo PETRI, TUV Rheinland Group, Germany.
- Claus SEIBT, ARC systems research, Austria .
- Niels SELSMARK, The Danish Ministry of Transport and Energy, Denmark.

This case study report provides a first knowledge base for the discussion of the future of transport research in Poland. National follow-up meetings with different stake-holders of the national transport research arena and innovation system took place during autumn 2005. These activities will be continued during 2006. The meetings are due to discuss and refine the investigation results with experts and policy makers to get a complete and broadly agreeable picture of the Polish transport research landscape and a picture of the present science, research and innovation policy arena in Poland.

In a world where global competition grows, the significance of nations increased, not decreased.⁵ National innovation systems play a crucial role for economic growth and technological progress. A national innovation system has the function to attract local research organizations and companies to underline scientific research and R&D towards innovation activities. Innovation is an important factor which affects the international competitiveness. New products and high technologies bring a lot of benefits to an economy: the application of new technological and organizational solutions is an essential element for a country's economic development. Innovations, new technologies, and new ways of management can for example increase the effectiveness and competitiveness of a national economy. Poland is looking for market niches in European and world markets to position its home economy within the global economy. Poland has to improve its regional and national markets as well as heading towards European markets and even become leader in particular fields of international markets.

To progress towards an economy based on information and knowledge public and private investments in scientific research, R&D and innovation are essential. Unfortunately public funding and private investments in R&D is today not very high and only a small part of Polish GDP. R&D intensity in Polish companies is still low due to the fact that most companies manufacture in low-tech and medium low tech industry sectors. Public investment in R&D is as well comparably low but it is quickly growing due to the obligations of the Lisbon goals. But it has to be mentioned, that public funding of scientific research and R&D can only obtain an additional effect. In advanced national innovation system like Finland or Austria national funding of R&D is around 5-10% to the overall investments in R&D. Private investments in R&D and innovation activities are a multiple of public investments. With that public funding has to set clear priorities and act as a leverage to attract R&D investments and investments for innovation activities in the private sector.

From the 90's onward the Polish government has introduced several policy plans and strategy documents regarding the future of science, research and innovation. A main goal of the Polish national framework program is to close the value chain from scientific research to applied research, R&D and further innovation activities. Collaborative research projects among science and industry are central to reach this goal. Furthermore the renewal of the Polish science and research infrastructure stays significant. To underline this process and to attract additional effects in the private sector, policy actors have to govern as interest groups among other interest groups like e.g. industrial stakeholders (new governance mechanisms). For single research areas, like transport research, it is necessary to develop a sectoral strategy with a focus on research to accompany transport infrastructure development and to solve the upcoming problems with the heavy increase of traffic load.

⁵ Porter M, *Porter o konkurencji*, Warszawa 2001, s.191.

4. Transition of research policy and transport policy from the socialist to the post-socialist period

The 90's in Poland was a period of enormous political and economic transformation. In 1989 Poland liberated itself from the soviet bloc and the subordination to the USSR. This political change went together with an economic transformation from a central planned to a market oriented economy and the introduction of a democratic state and a new political culture. Polish economy in the post-socialist period faced problems of technical and structural backwardness caused by ages of stagnation and isolation. Like other socialist countries Poland's central planned economy did not take part in the technological turning-points of the 70's and 80's and concepts for the international competitiveness of Polish economy came into prominence not until 1989. Today political decisions from these times do still influence economic change in Poland even though the major transformation stages are concluded thus far.

The membership of Poland in the bloc of socialist countries has influenced in an essential way the direction of science, research and innovation policy. In the socialist period science, research and economic development was dominated by USSR (The Union of Soviet Socialist Republics) and isolated from western attainments. In the communist period (1945-1989) science and research policy was in command to enforce the development of industry – mainly heavy industry – at the cost of light industry and the service sector. According to Jan Kozłowski⁶ during this 50 years socialist control of science, research and economic development, political functions and objectives were fixed by the party and the RWPG. Federal ministries were in control of science and research organizations which were state property. The federal ministries did not have strategic departments but departments for central planning and administration. In this period science, research and economic development had to serve the communist utopia but was not considered as an international competitiveness factor or a factor to raise prosperity by increasing the national gross domestic product. The post-socialist period in the 90ties and the pre-assignment policy of Poland to join into the European Union in the last few years brought a new formulation of objectives for science, research and innovation policy and several fundamental structural and institutional changes.

The membership of Poland in the bloc of socialist countries influenced as well the direction of transport policy and transport infrastructure development. In the socialist period a transport system with a clear dominance of railway transport was set up: railway transport achieved an almost monopolist position. In the socialist and as well in the first years of the post-socialist period underinvestment in the maintenance and the modernisation of transport infrastructure caused a serious consumption of capital assets. Today with support of the European Union the main transport corridors are modernised, as well the road network and the railway network. Railway transport has lost its dominant position regarding in particular freight transport. Short-sea transport in the Baltic Sea is still very significant. Regarding passenger transport the use of individual cars is steadily increasing but public transport stays central within urban and metropolitan areas. Travel abroad by aircraft in particular by cheap air carriers is the most heavily growing transport service sector in Poland.

⁶ *Uwagi o polityce naukowej* (remarks about scientific Policy) w : Forum akademickie nr 6/2005,s.28.

5. National innovation system, involved policy actors and governance mechanisms

In modern economies the main drivers for economic growth and competitiveness are public and private investments in research and development, innovations and product development going along with human capital improvements at all levels of education. But it is as well evident that flexible labour markets and a balanced social system preventing social insecurity and reducing inequity are necessary to drive economic development. To govern and coordinate economic and political change a modest public policy is significant. A scientific approach to analyse the interrelation between public policy and economic change is the so called innovation system approach. In a national innovation system several national key-players join forces to drive economic and political change. For its role as governor of this process public policy holds various policy instruments; within this whole bunch of policy instruments public research funding initiatives are only one measure beneath several others.

As first step applying the innovation system approach the key-players of an innovation system are identified and their functions are characterized. Key-players are public policy actors from the parliament and the government, e.g. federal ministries as well as public agencies subordinate to the ministries or actors of other important public institutions. Meanwhile there is a new perspective on national innovation systems viewing them as so called multi-level, multi actor frameworks (innovation arenas). This follows the view that in reality innovation systems are not nationally bounded but are interwoven with other policy levels: the international level (European Union) but as well the regional policy level of provincial or local authorities. To reduce the complexity of public policy making and to govern the innovation system effectively, a large number of stakeholders are today involved in the policy process. It can be observed that existing public policy regimes are changing and new governance mechanism emerge. One of these new governance mechanisms is for example the participation of experts from the research arena and industry in the formulation of policy goals. Policy making is today widely understood as a policy negotiation process among different stakeholders with specific interests and policy agendas: stakeholders from ministries, industry and research institutes.

In a second step the negotiation processes between the key-players of the innovation system are investigated. It has proved to be beneficial to distinguish into sectoral innovation systems: that means to identify policy actors for which e.g. transport research is of main interest and a relevant topic on their policy agendas. In our case we focus the transport research and innovation arena mainly as a sector of science and research policy but as well an important issue at the policy agendas of transport policy, environmental policy and economic and innovation policy. The key-players of the transport research and innovation arena have different stakeholder competences within the negotiation process along the so called policy cycle. The policy cycle model describes in a simple way a general policy process starting with the formulation of policy plans and strategies (policy formulation) continuing with the determination of policy agendas and priorities (policy determination), implementing then policy actions (policy implementation) and disseminating and advocating them to the public (policy dissemination) and at last monitor the new policy practices (policy monitoring and evaluation) and learn lessons for the next policy cycle. We use the stages of the policy cycle to structure the observed policy negotiation process and will further try to investigate and assess changing policy regimes and governance mechanisms.

5.1. Transport research policy actors and governance mechanisms

In the transport research and innovation arena a large number of policy actors and stakeholders are involved. Transport research is an object of science and research policy, an object of transport policy and as well an object of economic policy and environmental policy. From the perspective of science, research and innovation policy scientific research and R&D in the transport sector is in Poland a key area. Several research organisations have high research capabilities and scientific excellence in transport research. Applied transport research and R&D is an important factor at several universities and non-university research departments. Transport industries in Poland are not very R&D intensive yet, but are slowly expanding their R&D efforts. From the perspective of transport policy, transport research is very important to accompany the modernisation of the transport infrastructure. Transport research can e.g. provide concepts to reduce costs of infrastructure construction or concepts to raise traffic safety. From the perspective of economic policy the transport sector is as such crucial for economic development. The Polish transport service sector is one of the most fast growing economic sectors. There are several entrepreneurs and SME introducing innovative products. From the perspective of environmental policy, transport and mobility research is a significant research issue, e.g. concepts to reduce greenhouse gas and particle gas emissions, noise reduction as well as spatial planning and nature preservation.

The involved policy actors in the transport research and innovation arena are various. At the top level of policy making political decisions are taken by the Parliament. In 2004 there was a parliamentary forum debating a new law for public science, research and innovation support. Actual decisions on science and research policy and transport and infrastructure policy are taken at the governmental level at the Cabinet of Ministers and in the federal ministries represented by the Ministers. The Polish Minister of Education and Science is main accountable for science and research. The Transport Minister is main accountable for transport infrastructure modernization. Another important role plays the Chamber of the Prime Minister and its subordinate, the Polish Government Centre for Strategic studies. The last mentioned is in charge of blueprinting the national policy plans. These plans stay on a very high comprehensive level and have to be further specified into more detailed policy agendas and priorities under command of the respective ministries.

- **Representative organs and senat** (Sejm i Senat) – legislative function.
- **Parliament and parliamentarian committees.**
- Cabinet of Ministers and respective Ministers.
- **Chamber of Prime Minister and Government Centre for Strategic Studies:** functions, among other are blueprinting social and economic programs, plans.
- **Ministry of Transport and Construction** (was till the 30th of October 2005 the Ministry of Infrastructure). The Ministry is responsible for road-, railway transport, sea- and air transport, construction and housing and telecommunication. The main goal is the modernization of national road infrastructure, the harmonization of traffic rules, the improvement of road safety and quality of public transport. The Ministry is responsible for spatial planning, construction and housing.
- **Ministry of Education and Science** (was till the 30th of October 2005 Ministry of Science and Information Society Technologies). This ministry is accountable for education and science. The Ministry is in control of the public funding budget for scientific research and R&D. The Ministry was founded by a Cabinet declaration at the 31th Oct. 2005 – the former Ministry of Science and Information

Technologies was integrated into the Ministry of Education; the declaration defines as well the forthcoming agenda for the Ministry of Education and Science.

- **Ministry of Economic Affairs and Regional Development** (was till the 30th of October 2005 the Ministry of Economic Affairs and Labour) The Ministry is responsible for the development of the Polish economy. The Ministry underlines very much the importance of innovation policy as key factor to improve competitiveness and to drive economy.
- **Ministry of Environment.** The Ministry is responsible for environmental policy and nature preservation. Currently a main task of the Ministry is to harmonize Polish environmental legislation with EU obligations. The ministry is responsible for the national sustainable development plan.

The policy agenda setting process is taking place under command of the ministries. In this agenda setting process several institutional actors are involved as well from public institutions and private organisations. In 2005 the State Council for Science was formed – in place of State Committee for Scientific Research (SCSR) – as an advisory body for the Ministry of Science and Information Society Technologies (actually Ministry of Education and Science). The Council consists of four bodies:

- Committee on Scientific and Technology Policy,
- Committee on Research for the Development of Science,
- Committee on Research for the Development of the Economy,
- Committee of Appeal and Chairman of the Council for Science.

The institutionalisation of the Science Council is a further step towards specifying science and research policy in Poland. The Council is for example responsible for the evaluation of public research centers. The Council acts as an advisory body to the Ministry of Education and Science and is in charge to give recommendations for the funding of individual research projects (research grants). The Ministry of Education and Science is the major research funding body in Poland. The Minister of Education and Science takes decision on the actual research funding budget. But other Ministries like the ministry for economic affairs and regional development hold as well relevant funding schemes. Currently it is planned to establish under the direction of the ministry of transport and construction a national road.

The association of stakeholders in the agenda setting process is in our opinion currently not systematically enough organized. Each ministry or ministry sections collaborate with particular panels of experts or particular research departments. Some research departments act almost as subordinate agencies to the ministries and cover the particular knowledge base of the ministries. But the governance mechanisms are meanwhile changing. Important key players are today the national technology platforms – these platforms were established following the model of the European Union technology platforms. They act with their specific knowledge bases as advisory bodies to the ministries. But a more holistic dialogue platform or policy network to coordinate the distinct knowledge bases for an integrated transport research policy is not further institutionalized yet. This would open the chance to develop an integrated transport research policy agenda and to define common research priorities for the future of transport research in Poland.

5.2. Formulation of policy plans and strategies

There are several documents regarding the social and economic development of Poland and documents concerning the modernisation of the Polish transport sector. Poland is referring to these documents in transition to a knowledge based economy.

Further economic growth (measured by raise of GDP) and higher competitiveness of the economy will be attained by higher investments in scientific research and R&D, investments in education and in human resource development and strengthening of specific branches of industry and services relevant for a knowledge based society. The national transport policy plans are focusing strongly on the modernization of the Polish road and railway network. Poland has a central location in the middle of Europe and situates main transport corridors between East and West. Furthermore transport services are expected to be a very important economic sector in the future.

Proposed directions of science and technology development in Poland 2020⁷.

This policy document proposes directions of science and technology development in Poland till 2020, describes key factors for the current Polish economy to transform in a knowledge based economy and to achieve economic growth and public welfare.

National Development Plan for 2004-2006 (NDP)⁸ is a document which sets up the agenda for the economic development for the years 2004-2006 and with that for Poland's first few years in the European Union. It describes central conditions to support economic growth and development. The NDP integrates particular sectoral and regional policies. One of the most important horizontal NDP's goals is the development of a knowledge intensive economy in Poland. The NDP points out the required extension of public and private investments in science and R&D and the extension of the ICT infrastructure. In the field of transport most important goals are the upgrading of transport infrastructure, the enhancement of accessibility to all cities and regions in Poland and connections to the European transport network. These goals will be achieved by the reconstruction and modernization of the Polish transport infrastructure: the development of an appropriate road network, the modernization of principal railway lines and a better sea side access to the ports. Financial sources will come from the European Regional Development Fund (ERDF) and national sources – 892,3 Million Euro will be spent with a national share of 265,1 Million Euro. The NDP supposes a future limitation of road traffic to reduce negative impacts on the environment and a continuous rise of road traffic safety.

Implementation strategy for the National Development Plan 2007-2013⁹.

The main goal depicted in this document is to build a knowledge based economy. This will be achieved by the improvement of the quality of education, public and private investments in scientific research and R&D and a substantial rise of innovation activities. In the transport sector the reconstruction and modernization of the Polish transport network is pointed out: the construction and extension of road infrastructure (building around 800 km of motorways and 1700 km of high-speed roads), the construction of bypasses/ring roads, the modernization of the minor road network (esp. road surface improvements), the rebuilding and modernization of the railway network, the modernization and extension of maritime transport and the improvement of inland waterways and the modernization of the air transport sector.

The NDP document assumes high public investments (exceedingly 142 Bio. Euro). The total investments via EU funds will be 73,6 Bio Euro (from European Regional Development, European Social and European Cohesion Fund).

⁷ *Proponowane kierunki rozwoju nauki i technologii w Polsce do 2020 roku*, Ministry of Science and Information Society Technologies, Warsaw, November 2004.

⁸ *Narodowy Plan Rozwoju*, created by the Cabinet, 14 of January 2003.

⁹ Initial Project of *Narodowy Plan Rozwoju na lata 2007-2013*, 11 January 2005, accepted by the Cabinet.

National Transport Policy Plan for the year 2001-2015 for a continuous Development of the Country¹⁰. The national transport policy plan is referring to two former documents: one is called "*Transport Policy – a program to transform the Polish transport system into a system adapted to the requirements of a market economy and economic co-operation in Europe*" (1995), the other is called "*Plan for the development of transport infrastructure till 2015*" (1998). In the National Transport Policy Plan the main principles stated in the two former documents are further developed and adapted to the current situation in Poland. This new planning document assumes the improvement of the actual transport situation, in particular the proliferation of the transport infrastructure capacity, the reduction of negative impacts on the environment and the formation of a balanced transport system for the future. As well pointed out is the modernization of the transport infrastructure, the probable introduction of a congestion charge, the enhancement of transport accessibility in all regions of the country and the improvement of traffic safety. According to the document the most significant directions of transport policy for the future are: the reorganization of the railway system, the improvement of road surface conditions, the construction of motorways and high-speed roads, the expansion of seaports and extension of airports and a better access to them, the privatization of public transport operators, the improvement of bicycle traffic in urban areas, the improvement of public transport, the extension of multimodal freight transport and passenger transport services and the support of particular transport industry branches.

The National Transport Policy Plan (NTP) for the year 2005-2025¹¹.

This document mentions among other as principal objectives of transport policy: the improvement of the quality of the Polish transport network by taking into account the principles of sustainable development. The NTP focuses on six major goals: the improvement of accessibility, connectivity and transport quality, enhancement of the competitiveness of Polish economy providing an efficient transport system, integration of the transport systems regarding spatial and territorial aspects, the raise of traffic safety and reduction of the total number of accidents, the reduction of impacts on the environment and on human health. Financial sources will be federal and local public funding, funding from European Union, international credits from financing institutions like the European investment bank and as well private financial sources by public private partnerships. General policy priorities are for example: the radical improvement of road surface conditions (all road categories), the expansion of motorways and high-speed roads, an increase of railway competitiveness and effectiveness, the raise of traffic safety, improved quality and competitiveness of public transport, improved conditions for pedestrian and bicycle traffic, development of multimodal transport systems, the development of the air service sector and the further development of sea ports and inland waterways.

The modernization of the transport infrastructure will be mainly funded by financial sources of the European Cohesion Fund and prioritizes the extension of important international transport corridors and connections to the European transport network. Financial resources by the Cohesion Fund amount to around 1 866,7 Million Euro with a national share of 330,8 Million Euro.

¹⁰ *Polityka Transportowa Państwa na lata 2001-2015 dla Zrównoważonego Rozwoju Kraju*, created by Ministry of Transport and Maritime Economic.

¹¹ Project *Polityka Transportowa Państwa na lata 2005-2025*, Ministra of Infrastructure, Warsaw, January 2005.

Transport Development Strategy (TDS) for years 2007-2013¹² describes objectives and preparatory actions for the transport infrastructure development. The strategy puts emphasis on transport infrastructure modernization as a key factor for a steady economic growth and to increase competitiveness of the Polish economy. The raise of road traffic safety, the raise of the effectiveness of particular transport services and the increase of the quality of railway transport are major goals. The TDS document recommends the cooperation with societal and economic partners: local authorities, environmental organizations, trade unions, economic associations, academic societies and with citizens interested in the field of transport. The strategy characterizes adaptation of Polish transport policy to EU obligations and the European *White Book* on Transport – *Transport Policy for the year 2010: Time for decisions*. Further actions recommended by the TDS will be financed by sources of the Cohesion Fund, the European Regional Development Fund and by national financial sources, e.g. financial sources of the forthcoming National Road Fund as well as international financial credits – from institutions as the World Bank, the European Bank for Reconstruction and Development and the European Investment Bank. A broader share of other financial models like public-private partnerships or international contracting will be as well taken into account.

5.3. Determination of policy agendas and priorities

One of the latest most important documents regarding science and research policy is the **National Framework Program (NFP)** prepared by the Ministry of Science and Information Society Technologies (today Ministry of Education and Science). The NFP is a significant step towards the further specification of science, research and innovation policy and a new public science and research program management system in Poland. According to Prof. Michal Kleiber all research areas are priority-zed, which have in principle a high importance for social and economic development in Poland. The following research areas are prioritized in the NFP:

- Health,
- Environment,
- Agriculture and food,
- State and society,
- Safety,
- New materials and technologies,
- Communication technologies,
- Energy and energy supply,
- Transport infrastructure.

The NFP is now the general scientific research and R&D funding program in Poland. The NFP underlines the importance of cooperation among education, science, research and economy and follows with that a modern SRI-Policy approach. The central goal of NFP is to direct scientific research and R&D towards an integrated economic development, which will contribute to economic growth and to improve life quality. The NFP suggests three levels for policy monitoring: a continuing review of the prioritized research areas (program evaluation), a review of submitted research projects (project proposal evaluation) and a final review of accomplished research projects (project evaluation). The financial sources for the NFP will be a significant part of the planned budget for science and research for 2006 and following years.

¹² Project *Strategia Rozwoju Transportu na lata 2007-2013*, created as a part of National Development Plan by Ministry of Infrastructure, December 2004.

Following the announcement of the Ministry of Education and Science an interdisciplinary expert panel will be assigned to discuss the most relevant research fields and research topics within the prioritized research areas. This panel will set up as well program management rules and standards for the administration of the national framework program. For the evaluation of research project proposals various evaluation criteria like scientific excellence, economic benefits and as well social and environmental impacts have to be considered. According to the NFP the proposed research projects should on one hand concentrate on research topics with a high potential and a strong leverage effect for the Polish economy. This means for example the development of the knowledge base in technology niches based implicitly on Polish research competences and capabilities. On the other hand the proposed research projects have to show convergence with EU research directions to intensify the connections of the Polish national science and research arena to the European science and research arena. The NFP promotes all research domains from basic research to applied research and further experimental development.

Regarding in particular education a key role will take the Education Development Strategy (EDS)¹³. In accordance with the National Development Plan for the years 2007-2013 the EDS agenda aims to initiate a policy initiative called *Education and Authority*. The main objective of this initiative is to raise education of Polish society. EDS assumes an integrative education system regarding all levels of education. The following basic issues are phrased among several others in the document:

- facilitate everyone to realize his ambition and use his talents;
- teach an active and responsible participation in social, cultural and economic life in Poland;
- respond to transformations connected with the development of modern science and research, technologies and globalization;
- coach flexible and quick alignment to changing labour market;
- A first outline for a policy agenda for innovation policy in Poland is summarized in the document "*Increase of Innovation in Polish Economy to the year 2006*". Policy measures to realize particular issues on this policy agenda are proposed in the innovation support program "*Growth of Competitiveness of the Economy and Development of Human Resources*". According to the program document Polish innovation policy has to concentrate firstly on the arrangement of an innovation culture in Poland for example by establishing innovation networks and other structures and mechanisms which are supportive for innovation activities and which are enhancing the efficiency and effectiveness of the Polish economy;
- On the innovation policy agenda are as well priorities launched which focus on alternative production systems and changing consumption patterns towards a more sustainable economic, social and environmental development. Along with that goes a strategy for transition from central to regional innovation policies.

Very influential regarding innovation policy is a new law from the 29th of July 2005. It defines rules and procedures for provide financial credits for R&D and innovation activities (given by the National Bank or from financial sources of the Technological Credit Funds). This law aims to improve the competitiveness and innovativeness of Polish economy by trying to enhance private investments in R&D and innovation. A main purpose of this public funding scheme is to increase R&D intensity of Polish economy. The law expands the competence of the Polish Enterprise Development Agency in order to improve the efficiency of the governmental innovation policy

¹³ *Strategia Rozwoju Edukacji na lata 2007-2013, Ministerstwo Edukacji Narodowej i Sportu, sierpień 2005.*

as well at the national and the regional level. According to the document *"Enterprise in Poland in the year 2004"* a particular declaration has to be pointed out which was assigned by the Cabinet of Ministers in the year 2003 and is called *"Direction of the government activities towards small and medium sized enterprises from 2003 to 2006"*. In this declaration several public support activities are depicted which are aiming to increase economic, entrepreneurial and innovation activities in Poland and as well to raise competitiveness and drive employment growth. This declaration assumes better access for enterprises to external expert knowledge and advisory assistance. The most important direction of support activities stated are to facilitate access to expert knowledge for running and developing a company and better access to advisory assistance and financial support in order to adapt international obligations and standards. The financial sources for these activities are taken from the science and research funding budget (in accordance with the above mentioned law dated to the 8th of October 2004), by program initiatives of the 6th framework program (e.g. the SME program initiative), by the UE guarantee fund, the technological credit fund and as well indirect R&D funding mechanism like tax incentives.

The Strategy of Transport Infrastructure Development for the years 2004-2006 sets a policy agenda for the next two years for transport infrastructure modernization. It prioritizes the improvement of accessibility to the main regions and urban areas and the connection of these regions to the European transport network. According to the transport infrastructure development plan, land and air transport connections between Warsaw and the main Polish economic centers and with other European capitals and main economic centers will be established at first. This gives the country the option to enlarge foreign trade and is as well seen as an important factor to attract foreign investors. The second priority will be the development of land and air transport connections to the most important inland regions for a better deployment of the regional economic potential. This will enlarge on one hand competition among the regions and opens on the other hand a high cooperation potential. There is also a proposal to adapt the general road network for the ride of vehicles with 11.5 tones per axis. To enhance traffic safety is another priority as well as the modernization of sea ports and the development of multimodal transport systems. The realization of these priorities will be supported by the European Cohesion Fund for 2004-2006, the Polish Transport Infrastructure Development Program for 2004-2006 and as well by the Integrated Regional Development Program for 2004-2006. Therefore financial sources will be provided by national funding, European Union funding (ISPA, cohesion and structural funds), credit from different international financing institutions (EBI credits, MIF) and as well by revenues of the planned fuel tax and probably and extended road charging system in the future.

The Transport Development Strategy for 2007-2013 – drafted by the Ministry of Infrastructure (today Ministry of Transport and Construction) – was outlined to define policy priorities based on the goals of the National Development Plan. The TDS strongly assumes the development and modernization of transport infrastructure in Poland. The following policy priorities are for example indicated:

- modernisation of 85% of the Polish motorway network till 2013.
- modernizing of 40% of high speed roads in a two-lane standard.
- building around 90 ring-roads for taking transit roads from the cities.
- modernization of roads in order to adapt them to EU standards (technical conditions and safety requirements).
- improvement of by road quality (e.g. road surface conditions).
- reconstruction of around 50 % of the railway network.

- improvement of the technical conditions of the railway system.
- better infrastructure of seaports and access to them from the sea side.
- better railway and road access to the seaports.
- development and modernisation of inland waterways.
- rebuilding of the main airports in Poland.
- infrastructure investments in regional airports.
- better railway and road access to the airports.

Most important road infrastructure investments planned for the years 2007-2013

- Construction of the motorway A1 (corridor Gdansk- Vienna).
- Termination of building the A2 and A4/ A18 motorway.
- High-speed roads will be built in a two-lane standard.

Main railway routes expected for termination these years are: the modernization of E20 (Berlin-Moscow), E65 (Gdynia-Vienna) and E75 (*Rail Baltica*) – these railway routes are the most important investments not only from a national point of view but as well from a European perspective; rebuilding the railway routes E59 and E 30.

Further policy priorities are for example the formation of a modern waterborne transport system by upgrading the marine and inland waterway fleet, modernization of the rolling stock and the privatization of Polish rail cargo and the privatization of the Polish aviation sector. As well following issues are listed on the policy agenda:

- Acceleration of the reorganization of PKP (Polish National Railway).
- Reduction of operating costs of PLK (PKP Polish Railway Lines JSC) .
- Development of sea motorways in the Baltic Sea.
- Improvement of the quality of dock/sea port services.
- Support and development of smaller Polish sea ports.
- Sea navigation safety and navigation infrastructure.
- Achievement of the high security standards in air transport.
- Increase of waterborne passenger transport (tourist traffic).
- Application of Intelligent transport systems for all transport modes.

In the field of urban transport the following issues are on the policy agenda: the building of a fast and efficient public transport infrastructure, the improvement of comfort, quality and safety of public transport, integrated public transport hubs, reduction of barriers for handicapped people, the extension and development of bicycle lanes, the increase of combined cargo transport in urban areas and the organization of city logistic centres.

Regarding road traffic safety and traffic noise reduction the following issues are indicated: Decreasing the number of victims and people badly injured in traffic accidents (including accidents caused by young drivers), the reduction of the number of drunken drivers (prevention and control actions), traffic noise reduction on transit roads crossing towns and villages, modernisation of dangerous road sections (so called black points) and campaigning for road traffic safety audits.

Environmental protection is today a significant issue on the transport policy agenda. Environmental problems were passed over for many years like for example:

- the lack of decoupling of energy consumption and transport growth,
- the loss of undisturbed areas for ecosystems and preserved nature,
- the rise of the road freight transport and drop of railway transport,
- the decline of public transport and increase of individual motor transport.

This fact has as well influenced the membership of Poland in the EU and other international organizations, which dedicate attention on environmental protection and emission reduction (e.g. the Kyoto Protocol). Joining European Union connected Poland with a number of new obligations for the adaptation of EU environmental protection standards. The policy of a balanced transport development assumes a high demand for more environmental friendly transport technologies, a modal shift to more environmental friendly transport systems and a clear reduction of individual motor car mobility. Nowadays it becomes for example popular to promote bicycle traffic as an environmental and health friendly transport mode. To realize the EU obligations, public policy measure, like e.g. fiscal incentives are very significant.

In Poland in freight and passenger transport one of the main goals is the reduction of energy consumption and CO₂ emissions and the reduction of other emission like particle gas or in particular noise emissions¹⁴. The reduction of negative impacts of transport on the environment depends on many factors. Among other things it depends on the ability of the economy to implement new technological and organizational solutions. On the other hand society with its individual mobility and transport demands is main responsible for turning trends in the transport sector. With that the rise of awareness for environmental problems regarding transport as well as knowledge building regarding technological and organizational options for a more environmental sound transport and mobility behavior stay central. Transport and mobility is today a significant factor for all forms of social and economic activity. Poland as a new EU member state aims at an active implementation of the EU policy goals. Poland wants as well take advantage of the knowledge, expertise and experience of European countries with more developed transport systems. But Poland does not want to make the same mistakes these countries did years before in transport policy setting inappropriate policy priorities from today's perspective.

5.4. Implementation of policy activities

The progress to a knowledge based society is a central goal referring to the National Development Plan and other strategic documents. The problem to finance this challenge is among other thing that overall public science and research financing budgets and as well private investments in R&D are still very low in Poland. Polish economy is not very R&D intensive yet. Collaborative research activities between industry and scientific research organizations are still not very frequent. Even though on the way to a knowledge based society Polish economy becomes more and more dependent on patents and licences; but most of this patents and licenses are still imported.¹⁵ A very significant policy instrument is to support collaboration among science and industry to initiate knowledge and technology transfer in both directions.

The membership in the EU since May 2004 opens Polish research organizations opportunities to attain financial sources from European funding actions and to collaborate in different kinds of European research programs and projects. Technological change is a main driver which enhances the competitiveness of particular industrial branches. Basic research and applied research are main factors in the value chain towards innovation activities. The share of high technology sectors has an important impact on the competitiveness of a country. According to data of the OECD Secretariat Poland with Greece, Austria, Turkey, New Zealand and Iceland belong to the group of countries, which are characterized by the highest

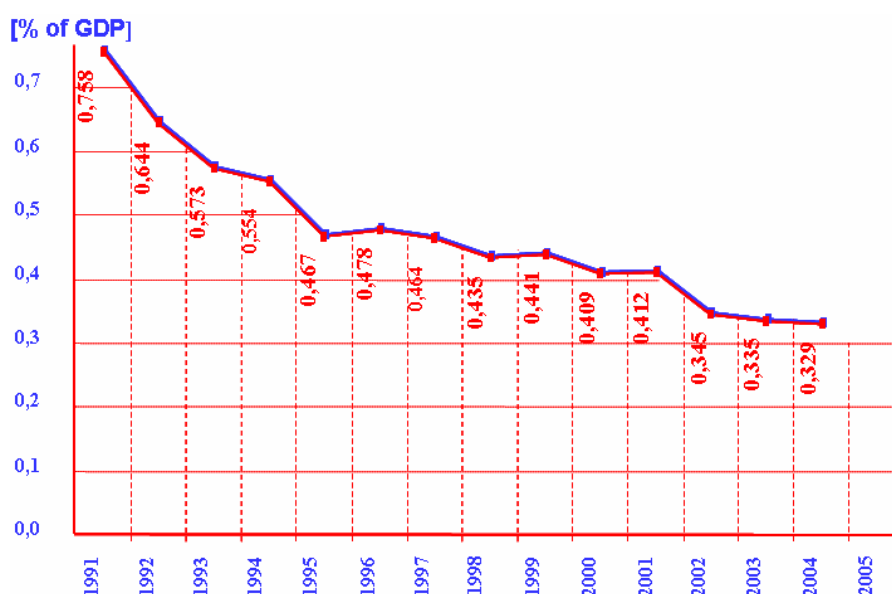
¹⁴ (red) Rydzkowski W., Wojewódzka-Król, *Transport*, Warszawa 2002, s.406.

¹⁵ *Ministry of Science and Information Society Technologies*, seminary Modernization.

relative domination of medium-low and low technology sectors and at the same time a relative shortage in high- and medium-high technology areas.¹⁶ To grade up low- to medium-low and medium-low into medium-high and high technology sectors is a main challenge for Polish economy on the way to a knowledge based society.

One of the most important policy goals at the moment is to gain higher financial resources for science, research and innovation activities as well from private investment and public funding. An input indicator for public and private expenditures on R&D (GERD – Gross Domestic Expenditure on R&D) in 2003 amounted 4 558,3 million zloty. Whereas the value of the relation GERD/ GDP – is one of the lowest in the EU and OECD countries (in 2003 it was 0, 56%). The National Development Plan for 2004-2006 assumes a growth of this relation to 1,5 %. The share of the GDP allocated for scientific research and R&D by public budgets and private investment amounts now in Poland 0,33%, meanwhile compared with Japan – 3,1 %, in Czech republic – 1,2 %, in EU countries average 2 %.¹⁷

Figure 3: Share of GDP expenditures on science In 1991-2005



Source: Ministry of Education and Science (2005).

Investments in R&D by public funding and private financial sources in the last 15 years has been formed on a very low level (public funding of R&D decreased from 0,55% GDP in 1995 to 0,34% GDP in 2003). Private investments in R&D and non-governmental financing was in this period on a level of around 0,3 % of GDP. It can be assumed that Poland will not be able to reach a level of 3% GDP till 2010. The realization of the Lisbon goals has to be prolonged at least till 2013 that means to the end of the realization of National Development Plan 2007-2013 in Poland.

¹⁶ Science and Technology in 2003, GUS, Warsaw 2004.

¹⁷ Science and Technology in 2003, GUS, Warsaw 2004.

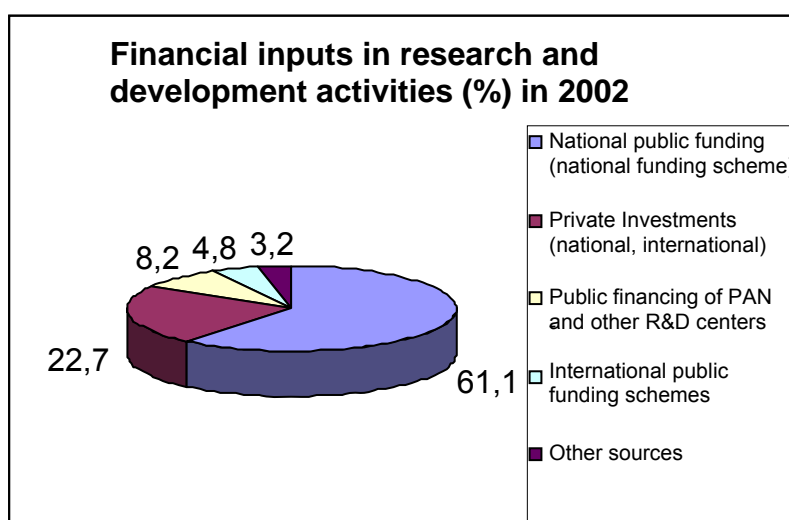
Table 2: Expenditure on R&D activities for the years 1995-2003.

Inputs in R&D activity	1995	2000	2001	2002	2003
Ratio to Gross Domestic product (GERD/GDP) in %	0,65	0,66	0,64	0,58	0,56
For one person in Zloty	55	125	126	118	119

Source : *Science and Technology in 2003 r.*, GUS, Warsaw 2005

The financial input for scientific research and R&D activities in 2002 is presented in picture 2. Following this picture the national public funding and financing sources are still very high in comparison to private investments in R&D in Poland.

Figure 4: Sources of financial inputs in R&D activities in Poland.



According to the Ministry of Education and Science the main reasons for low private investments in R&D are financial budget problems. In order to encourage entrepreneurs to invest in R&D, tax incentives for R&D activities were lately introduced and the access to venture capital and high-risk capital was widely improved. A new law was stated in Polish Parliament last year to enhance competitiveness and encourage innovation activities in Polish economy by activating private R&D investments and by reorganizing the public science and research funding system.¹⁸ In contrast to R&D expenditures, private expenditures on basic innovation activities (e.g. market introduction of products or services) were raised in the private sector in 2003 around 12% compared to 2002 – by a total amount of 15511,6 Million zloty. Polish economy is in some branches fairly innovative on domestic markets.

¹⁸ *Nowe instrumenty w ustawie o wspieraniu działalności innowacyjnej*, Konferencja Polskie Platformy Technologiczne, Ministerstwo Gospodarki i Pracy, warszawa 2005.

But most companies have still a very low R&D intensity referring e.g. to the small number of national inventions reported by the Patent Office¹⁹.

In accordance to the new public financing principles announced in the new law dated to the 8th of October 2004 the public science and research funding budget is distributed into an institutional funding and direct program/ project funding budget. With the budget earmarked for institutional funding statutory activities and the expenditures for the infrastructure of public research centers, the Polish Academy of Science, higher education institutes, intermediaries and the public administration for the management of the funding budget are financed – e.g. the costs for the Science Council, stakeholder platforms, costs for peer reviews and other program management costs. With the earmarked funding budget investments in science and R&D infrastructure, collaborative research projects, foreign scientific co-operation and networking activities, mobility of researcher initiatives and several measures and programs defined by the Ministry of Education and Science are financed.

In Table 3 the research projects are listed which are reported and financed by the State Committee for Scientific Research for the years 1995-2003.

Table 3: Research projects reported and financed by State Committee for Scientific Research (today Council for Science) for 1995-2003 (in million zloty)

	1995	2000	2003
Individual research projects:			
Reported:			
Number.....	8280	7980	8707
Value.....	1037,2	1319,7	1387,0
Financing:			
Number.....	6415	8193	7883
Value.....	183,0	366,5	360,9
Purposeful research projects :			
Reported:			
Number.....	516	564	277
Value.....	211,1	546,4	194,4
Financing:			
Number.....	732	1292	1016
Value.....	140,7	230,8	189,4
Research ordered projects :			
Reported:			
Number.....	102	-	-
Value.....	65,8	-	-
Financing:			
Number.....	104	46	-
Value.....	38,6	15,0	-

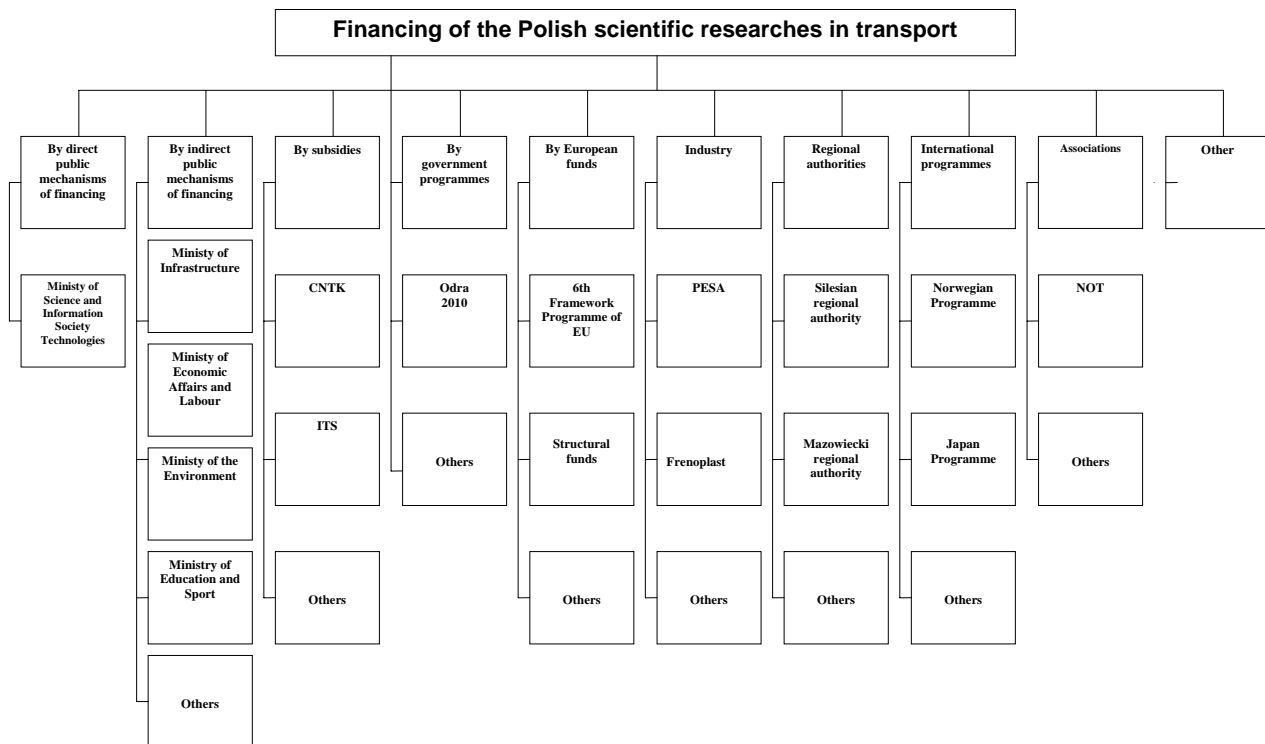
¹⁹ Science and Technology in 2003, GUS, Warszawa 2005.

Research Projects ordered by SCSR (now the Council for Science):			
Reported-number:.....	-	19	25
Financing:			
Number.....	-	8	77
Value.....	-	11,1	72,5
Purposeful projects ordered :			
Reported-number:.....	-	36	24
Financing:			
Number.....	-	16	30
Value of financing by SCSR.....	-	7,6	9,1

Source : GUS

Regarding in particular public and private investments in Polish transport research there are several direct and indirect public financing sources. Transport research policy is a horizontal policy issue and on the policy agenda of several ministries and public and private stakeholders. Transport research is for example a prioritized area in the National Framework Program. Transport research is as well high on the agenda of transport policy going along with the reconstruction and modernization of Polish transport infrastructure. Transport research is on the policy agenda of economic and regional development policy and transport and mobility research is a significant topic on the policy agenda of environmental policy.

Figure 5: Financial Sources for Polish transport research



The main direct public financial sources for transport research originate from the National Framework Program. Minor direct financial sources may come from the National Road Fund or Regional Development Funds for example for research projects accompanying transport infrastructure or regional development activities. The sections of the ministries have currently no or a very low genuine budget to finance for example policy studies or small research projects. But most of them have close relations to experts or particular public research departments. It has to be underlined that there is still a large share of institutional funding in Polish transport research. Public financing of transport research from international sources originates from intergovernmental funding actions (Norwegian program, Japan program, EUREKA, ERA-NET) or European Union funding actions like the 6th Framework Program or the Structural Funds. At the regional policy level are as well direct public financial sources for transport research in particular to assist spatial and transport planning. Public and private donations are not really noteworthy to mention for transport research: there are no major financial sources from this side.

Private investments in scientific research and R&D, is still not strong in Poland. Polish industry has still a low R&D intensity. In particular low tech and medium low technology sectors are prominent in Poland. As well in the transport industry sector most companies have no particular R&D divisions, they act mainly as manufacturing sites for foreign or domestic companies. There are some investments in R&D from private and public-private organizations and associations like e.g. the large transport service operators. But they had strongly reduced there R&D efforts in the last few years due to financial budget problems and changing business priorities.

According to GUS²⁰ the following main financial sources to conduct scientific research and R&D in the transport sector can be summarized

- Public program/ project funding (NFP),
- Institutional financing of public research departments/centres,
- Institutional financing of Polish Academy of Science (PAN),
- Institutional financing of higher education institutions,
- Public funding from international programs,
- Other public financial sources (public-private investments),
- Private investments in R&D and scientific research.

Public science and research administration is currently reorganised referring to the law of the 8th of October 2004. The National Science Council is in charge to reorganize the public research funding and program management system, e.g. by introducing procedures to involve experts and stakeholders into the further research priority setting process or setting up a peer-review system to assess incoming research proposals. To disseminate science and research policy the Ministry of Science and Information Society Technologies (today Ministry of Education and Science) started an internet portal (www.mnii.gov.pl) dedicated to science, research and innovation. At this portal Polish research programs, funding actions and the proposed research projects are disseminated to the public. To establish a monitoring and evaluation system for Polish science and research activities is as well a central goal of the above mentioned reorganization process to reach European standards, close the policy cycle and assure policy learning.

6. MAPPING OF THE TRANSPORT RESEARCH ARENA

Following a broader definition, scientific research and R&D activities are including basic research, applied research and experimental development.²¹ In our opinion the following scientific research and R&D organizations are most relevant:

- Public scientific research and R&D departments.
- Academic Institutes at universities, higher education sites.
- Institutes of the Polish Academy of Science (PAN).
- Industrial research divisions and laboratories.
- Divisions of public/ private organizations, associations.
- Private research, engineering and planning companies.

The number of science and research organizations and R&D divisions performing transport research in Poland are presented below:

²⁰ *Science and Technology in 2003*, GUS, Warsaw 2004

²¹ *Main Polish Science and Technology Indicators 2000-2003*, Central Statistic Office (GUS), Warszawa 2005.

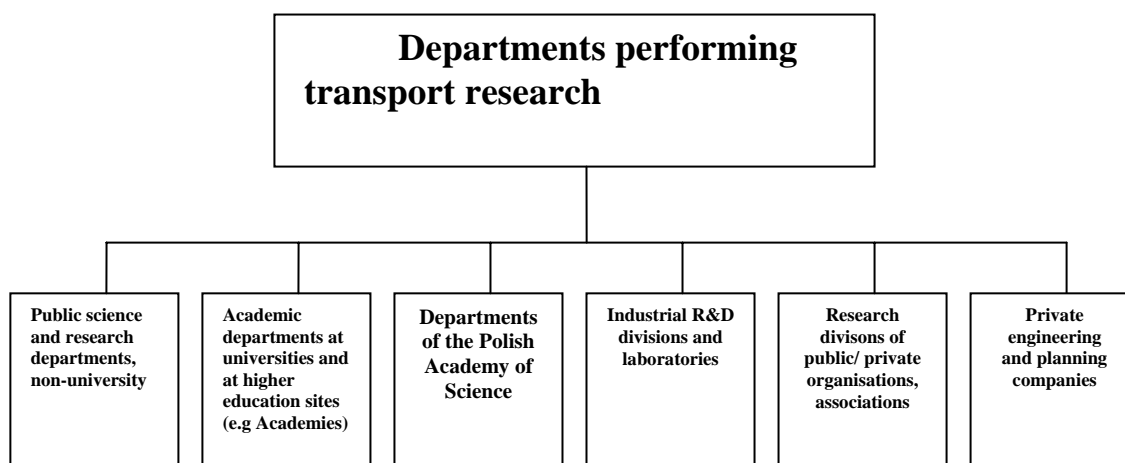
Table 4: Departments performing transport research in the years 1995-2003.

Specification	1995	2000	2003
Total	737	860	925
Scientific research departments of PAN	80	81	80
scientific research departments of PAN	54	58	58
independent research departments	26	23	22
Public science and research centers	218	222	201
scientific research departments	128	137	135
Central laboratories	10	11	8
Public R&D departments	80	74	58
Support divisions (intermediaries)	4	18	31
Other divisions from the field 73 PKD	35	18	33
Industrial R&D divisions	296	402	446
Academic departments at universities and higher education sites	104	114	128
Other organisations	-	-	6

Source : *Transport – wyniki działalności w 2004 roku*, GUS, Warsaw 2005

The following illustration shows the structure of the Polish transport research arena: types of scientific research and R&D departments conducting transport research.

Figure 6: Structure of the Polish transport research arena – types of scientific research and R&D departments.



To strengthen the transport research and innovation arena it is central to promote Polish science and research departments at home and in international arenas to cooperate and collaborate in research and innovation networks.

The structure of the Polish science and research arena was lately changed by establishing so called centers of excellence. The main aim of these centers is to underline the role of science and research by strengthening the cooperation among scientific research and R&D (applied research) working on similar research topics and to support further innovation activities with industrial partners.

6.1. Mapping of academic departments at Universities and higher education sites and Non-University Public Research Centres

Academic departments at universities and other higher education sites play an important role in transport research in Poland. They are very significant regarding the link between education and research. According to data of GUS²² the number of students is still increasing: in 2003 the number of students amounted 1858,7 thousand students (57 % are women). Compared with 2002 this number increases about 3 %. Technical branches of study as well in the transport branch become more and more popular again. Polish universities and higher education sites with departments dealing with transport research are presented below²³:

- Warsaw University of Technology (faculty of transport),
- Silesian University of Technology (faculty of transport),
- Radom University of Technology (faculty of transport),
- Szczecin University of Technology,
- University of Szczecin (transport economy and logistic),
- University of Gdansk (transport and logistics),
- Gdynia Maritime University,
- Szczecin Maritime University (maritime transport),
- Cracow University of Technology,
- Wrocław University of Technology,
- International Logistics and Transport University in Wrocław,
- Military Academy of Technology (mechanics and construction of vehicles),
- Warsaw School of Economics (transport economics),
- High Technical School in Legnica,
- Silesian College of Economics and Administration in Bytom (transport economics and transport and logistics),
- Polonia University (transport and logistics),
- Elbląg University of Humanities and Economy (transport and logistics),
- Economic Academy in Katowice (transport economy),
- AGH University of Science and Technology in Cracow.

The main non-university research departments in the field of transport research are:

- Scientific and Technical Centre of Railway Engineering,
- Institute of Automobiles,
- Institute of Aviation,
- Maritime Institute,
- Institute of Road Construction and Bridges,
- OBRPSz Poznań,

²² *Science and Technology in 2003*, GUS, Warsaw 2004

²³ Chudzikiewicz A., *Standardy nauczania na kierunku transport* (Standards in education on the transport faculties) : Przegląd Komunikacyjny –dodatek specjalny, grudzień 12/2004.

- Ship Design and Research Centre – Gdańsk,
- Institute of Roads and Bridges,
- Automotive Industry Institute,
- The Motor Transport Institute,
- Institute of Logistics and Warehousing,
- Air Force Institute of Technology,
- Automotive Research and Development Centre.

In Polish science and research infrastructure there are still several public financed research departments. They are partly situated at universities, some of them have their own centres. During the socialist period several more public research departments, e.g. for industrial research, were in operation. But many of them were closed down in the last decade. In a number of national transport research arenas large non-university research centres like INRETS in France, ARSENAL in Austria or VTT in Finland are still very common.

In the last decades a systematic growth of students who conferred a doctor's degree or a habilitated doctor's degree can be observed. In this period as well the share of women among total number of persons who awarded a doctor's degree increased.

Table 5: The number of titles and academic degrees awarded in 1995-2003.

	1995	2000	2002	2003
Title of profesor.....	367	470	789	578
Women.....	61	111	214	155
Scientific degrees:				
Habilitated doctor (HD).....	628	829	923	803
Women.....	171	240	249	258
Doctor (PhD).....	2300	4400	5450	5460
Women.....	763	1832	2434	2563

Source : GUS, Warszawa 2005

According to a report of the Ministry of Education and Science, in spite of the significant role of academic departments at universities and higher education sites, most of these departments are not very well performing in the international science and research arena. This performance is measured by the number of publications in international scientific journals shown by the Citation Index of Science/ Information (Philadelphia). Although in the last years the number of international publications increased around 25%, the share of Polish scientific publications in international journals compared with other countries is still comparably low. On the other hand there is a very lively domestic discourse arena in several science and research areas. In transport research are for example several national scientific research journals referring to particular transport technologies like railway or maritime technologies but as well on transport planning and spatial planning subjects. So an efficient transfer of knowledge between science, research and education, transport planning and public authorities as well as industrial actors is assured.

Table 6: The number of the scientific publications in the world in 2002.

Country	Number of publications	Share in the world pool of publication (%)
US	245.578	27,19
Japan	69.183	7,66
Great Britain	65.395	7,24
Germany	63.428	7,02
France	44.999	4,98
Italy	31.562	3,50
Russia	23.441	2,60
Spain	22.901	2,54
Netherlands	18.823	2,08
Sweden	14.846	1,64
Poland	10.046	1,11
Finland	7.229	0,80
Norway	4.923	0,55
Czech Republic	4.478	0,50
Hungary	3.864	0,43
Portugal	3.567	0,40

Source : Science and Technology, GUS

Besides of articles in domestic and international scientific journals there are yearly publications of text books, monographs, conference proceedings. These publications are mainly edited in Polish language and lately as well in English. Polish academic departments in the transport sector are very active in organizing international symposia and conferences. The researches are present on international conferences. There is still alliance with other middle and eastern European countries. A strong alliance for example continues in railway transport research with the large and still significantly important Russian research arena in this branch.

6.2. Mapping of the transport industry sector

The Polish government aims to attract transport industry to invest more into R&D and innovation activities. It is as well intended to involve Polish transport industry more into the formulation process of transport research priorities. As well a dialogue on political framework conditions for innovation activities is directed. The dialogue with stakeholders from industry has an essential influence on attracting private domestic as well as foreign investments. A close cooperation among public authorities and transport industry is particularly in the transport sector very significant. National industries depend not only on private markets but as well on "regulated markets" and with that on the procurement strategies of the public sector. It is for example very beneficial, if a new transport technology invented at home can be demonstrated firstly in the domestic transport network. This provides a so called light-house effect and opens public sector market opportunities in other countries.

In the Polish transport research and innovation arena this dialogue is mainly focused at four transport technology platforms: railway, maritime, automotive and aeronautics. Each platform stands for a transport industry branch in Poland. Polish Rail Transport Technology Platform for example is represented among other things by: Bombardier Transportation- Katowice, Alstom Konstal jsc.- Chorzów, Siemens Transportation Systems Ltd.- Warszawa, Rail Vehicle Company PESA – Bydgoszcz, PROVEN-TUS Ltd.- Katowice, FRENOPLAST – Wołomin- Majdan, PTK TABKOL jsc.– Rybnik, NEWAG jsc. – Nowy Sącz, TUV Rheinland Polans Ltd., ecc. The Polish Technological Platform for Maritime Transport is represented among other things by : Szczecin Shipyard Ltd, Gdynia Shipyard jsc., Gdańsk Shipyards jsc., Navy Shipyard, Group of ODRA Shipyard jsc., Nord Shipyard jsc. A fifth technology platform stands for the transport infrastructure sector with a major focus on road construction. The Polish Technology Platform for Road Transport includes around 20 organizations: The Road & Research Institute (Coordinator), the Polish Economic Chamber of Road-Building, The Polish Chamber of Steelworks, the Polish Cement and Lime Association etc.

Polish transport industry cooperates with academic departments at universities, public research centers and the Polish Academy of science and other academies. Science-industry relations are an important driver to upgrade from a low-tech to a more high-tech oriented industrial system – the perspectives to fill market niches within European and global markets are raised. Even though it can be observed that the collaboration between scientific research and industrial research in Poland is still comparably low. The reason for that is on one hand the currently small demand of Polish industry for research cooperation due to a still low R&D intensity. On the other hand following social science literature there is a further contextual reason: during the socialist period scientific research was quite autonomous and not well connected with industry research. The picture today is very dissimilar.

There are areas in transport research, where close relations between academic research institutes and industry can be observed and other areas where this cooperation is still very low. As an important policy instrument it has to be proved beneficial to establish next to the above mentioned centers of excellence so called centers of competence where industry strongly cooperates with science and research. These partly public funded centers are actually a very important factor of the success stories of science, research and innovation policy in several European and non-European countries like Austria, Finland, Australia and Canada.

6.3. MAPPING OF THE TRANSPORT SERVICE SECTOR

The 90's initiated a change of the share in particular transport modes. The significance of road transport heavily rose and the share of railway transport declined. Railway transport became more specialized on long distance passenger transport and commuter transport in urban areas. These changes were influenced by a privatization process and obligations connected with the membership of Poland in the EU. In this period as well a considerable decline of the transport sector can be noticed – referring to its share at the GDP. The tempo of this decline is higher than in countries with market economies (an average yearly decrease of 4 %). Today a moderate raise of the transport sector at the GDP can be noticed yet again.

According to the GUS report²⁴ in the railway transport sector the main emphasize in the last few years was put on the acceleration of modernization and privatization of the PKP group and the reconstruction of the railway network. But railway rolling stock needs as well a substantial modernization and adaptation to international standards. Large railway companies have normally for this objective own R&D departments working closely together with academic institutes at universities and public research centers. The R&D department of PKP (engineering and planning) still succeeds but was cut down due to other business priorities. In 2004 the extension of the railway network amounted around 20,3 Thousand kilometers. Railway freight transport carried 2,3 Million tons of cargo in 2003. A further growth of railway transport and combined transport is planned till 2013 (up to 1,8 %). The railway network in Poland is a part of the trans-European railway transport network. In urban areas transport service operators over 49 employees dominate. Although currently the share of private public transport service operators is increasing. They frequently run so called Micro Buses on particular passageways. Public transport companies concentrated in 2004 over 90% buses and 100% trams and trolley-buses. In total they transported 97% of passengers in urban areas. Most of these companies have no R&D divisions, but engineering and planning units.

Today the majority of domestic freight transport is served by road transport. Transport and logistic services is a fast developing branch for Polish economy. The domestic market for freight transport is characterized by deregulation and strong competition, which stimulates business development and innovation activities. It can be noticed that international transport has as well heavily increased. There are several academic institutes at Polish universities prominent for research in transport and logistics, e. g for supply chain management or on new business models for transport and logistic services. The transport and logistic sector is at present worldwide very dynamic due to the heavy increase of international trade. Poland is a significant transport network hub between Western and Eastern Europe. According to the GUS report²⁵ the total length of public roads at the end of 2004 was 379,5 thousand kilometers. 66 % of these roads were hard surfaced roads and around 34 % soil-surfaced minor roads. The general density of hard surfaced roads at the end of 2004 was 80,7 kilometer on 100 square kilometer. The length of motorways and high-speed roads increased in 2004 by 36 % - 551.7 kilometer (motorways) and 232.7 (high-speed roads). In the last years the number of heavy duty vehicles considerably increased. The number of heavy duty vehicles and tractors registered rose by 5 % comparing to 2003 and the number of light duty vehicles and motorcars – 6,5 % (around 12 millions).

The last years characterized a clear increase of the activities of air carriers and the liberalization of the air transport market. Cheap air carriers emerged at the Polish air transport market and this enlarged competition. PLL LOT was forced to introduce more beneficial conditions and lost its dominant position at the domestic market. In 2004 already eight Polish airports were served by low cost air carriers. Air transport is the fastest growing transport service branch in the last few years in Poland. Unfortunately Polish airports in respect to the quantity of served passengers are still on a low position in international rankings. In 2004 for air cargo transport a growth in domestic (4,9 %) and international transport (0,8 %) was noticed. Air transport as such compared with the year 2003 increased by around 5,2% (the most in Katowice – 37,1% and Gdansk – 26,4%).

²⁴ *Transport – wyniki działalności w 2004 roku* (transport – activity effects in 2004), GUS, Warsaw 2005.

²⁵ *Transport – wyniki działalności w 2004 roku* (transport – activity effects in 2004), GUS, Warsaw 2005.

The amount of foreign take-off's and landings increased about 37%, however Polish take-off's decreased around 5,6 %.²⁶ In 2004 passenger traffic on airports was about 25 % higher than in the previous years. In the last ten years a dynamic development of regional airports can be observed. The number of passengers at regional airports increased almost five times and the ton-nage of cargo over two times. The most growing airport in Poland is the International Airport Katowice in Pyrzowice – his growth dynamic in 2004 exceeded 240%. This is caused, among other things, by charter traffic and activities of low cost airlines, e.g. the Hungarian air carrier Wizz Air has the Polish base in Katowice)²⁷. Taking into account cargo transport, this airport holds now the second place in the country.

The Polish maritime transport fleet in 2004 consists of 118 ships (compared with 247 ships in 1999). The Polish maritime transport fleet was deteriorated by the age structure of its tonnage (medium age of ship in 2004 was 19,5 years). According to GUS report²⁸ Polish foreign trade by the maritime transport sector decreased in 2004 about 53,3%, However maritime transport among international ports increased (14,2% compared with 2003). Freight transport among foreign sea ports achieved a dominant share (70,4%) of total maritime transport. As well the number of passengers using sea transport in the Baltic sea rose by 19 %. For scientific research and R&D in the maritime sector there is traditionally a close relation among transport operators, shipyards and harbor companies on the one side and research institutes at universities or the maritime academy on the other. Sea ports are important transport network hubs and clusters for maritime industry at the Polish sea ports: Gdansk, Gdynia, Szczecin and Świnoujście. Polish sea ports need a modernization as they are still less competitive compared with Scandinavian ports. A central factor which stimulates the development of the Polish maritime sector is the formulation of the European transport corridors among North and South. They will join Scandinavia by Baltic Sea, Poland and Middle-East Europe to the Mediterranean Sea.

Inland waterway navigation in transport is relatively low in Poland. One of the reasons of a very low share of inland waterway transport and a shortage of its competitiveness is the bad condition of inland waterway infrastructure, an outdated fleet and the difficult financial situation of the ship owners. Inland waterway transport was heavily underestimated (compared with railway transport) and not treated as an important transport branch in the last decades. One of the priorities in the national transport policy plan is the modernization of the inland waterways till 2013.

²⁶ *Transport – wyniki działalności w 2004 roku* (transport – activity effects in 2004), GUS, Warsaw 2005.

²⁷ *Polskie porty lotnicze w statystyce* (*Polish airports In statistics*) in : Przegląd Komunikacyjny No 6/2005.

²⁸ *Transport – wyniki działalności w 2004 roku* (transport – activity effects in 2004), GUS, Warsaw 2005.

Table 7: Freight Transport regarding modes of transport for 2000-2003.

	2000	2002	2003
Total	100,00	100,00	100,00
Include: railway transport	14,7	18,1	21,4
road transport	79,2	75,5	73,6
of profit	29,6	28,0	27,9
economic	49,6	47,5	45,7
pipelines	3,5	3,7	4,2
inland waterways	0,8	0,6	0,6
sea transport	1,8	2,0	2,1

Source : *Transport – wyniki działalności w 2004 roku, GUS, Warsaw 2005*

Table 8: Passenger Transport regarding modes of transport for 2004

Transport modes	Passengers			Passenger-kilometres			Medium distance (in km) of transport 1 passenger
	in thousand	2003=100	total in%	in million	2003=100	total in%	
Total	1085 509	97,6	100,0	56071,6	98,9	100,0	52
Rail transport	272162	96,0	25,1	18689,7	95,2	33,3	696616
	283279	96,0	26,1	18688,4	95,2	33,3	
	80	106,3	0,0	1,3	100,0	0,0	
Motor transport	807281	98,1	74,4	30118,0	100,4	53,7	37
Air transport	4044	101,7	0,4	7071,4	102,9	12,6	1749
Inland nav.	1396	77,8	0,1	23,0	68,5	0,0	17
Sea nav.	626	119,0	0,1	169,5	123,5	0,3	271

Source : *Transport – wyniki działalności w 2004 roku, GUS, Warszawa 2005*

7. Conclusion

The transport research and innovation arena in Poland holds strong capacities, promising capabilities and has a high future potential in some of its branches. The question is simple, in which research departments and industrial R&D divisions are transport research capacities located and how can they perform in the national and the European innovation arena. The way to a knowledge intensive society is twofold: at one hand the knowledge base within the country has to be enlarged. At the other hand R&D and innovation activities have to be encouraged to increase competitiveness on regional and international markets and perform in particular market niches in the national and in the global economy.

Poland has in some respect a very interesting transport research and innovation arena. There are on one hand promising industrial actors in the transport sector with a high potential to up-grade from low-tech to medium-low and high-tech industries by forcing their R&D efforts. There is for example an automotive supply industry in Poland which became lastly an international supplier of car components. This industry sector has a high potential to progress from Tier 3 to a Tier 2 supply industry and strengthen with that its position in the global value chain of the automotive industry. In some transport industry branches regional research and technology clusters are prominent like in the Katowice region railway technology, in the Szczecin region maritime equipment and custom-build vessels or in the so called aviation valley – Rzeszow region – aeronautics. As well the transport service sector in Poland is very promising. Poland plays an important role for international transport and logistic providers managing the European and global supply chains due to its location along the main axis between Eastern and Western Europe and newly due to a North-South axis regarding the planned trans-European transport corridor between the Baltic and the Mediterranean Sea. In academic transport research at universities and higher education sites next to applied research in the classical transport technology areas like railway or maritime technologies transport economics and transport planning and spatial planning are prominent. Polish researchers in these areas are well situated in European and international research networks. These research networks play a crucial role in finding solutions for the local but as well the global challenges regarding the modernisation of the global transport system by decoupling economic growth and transport growth or the modernization of the transport system towards a hydrogen fuelled economy.

The main role of public research funding is to leverage private investments in scientific research and R&D. This takes into account that public funding is comparably low to private investments in R&D and innovation activities. In modern science, research and innovation policy public funding takes the role “to fill the gaps” along the value chain from basic research and applied research to innovation activities, e.g. by financing market-far basic research to extend the knowledge base or by funding high-risk innovation oriented research projects in national industries. Another important direction to attain an knowledge intensive society is the high support of all levels of education, in particular higher education and human resource development. But present science, research and innovation policies have a further reason. The main governmental rationale is in fact to minimize societal risks and to act precautionary in a long perspective. That means regarding the transport sector to promote scientific research on future transport systems to solve environmental, economic and societal problems and to attain a so called double dividend next to the promotion of national industries to get competitive on European and global markets.

In the socialist period the science arena acted rather autonomously from the large R&D and engineering divisions of the industrial complex. There were not really strong science, research and industry relations. Knowledge Transfer from Science to Industry was organized centrally. In the western European countries the strategy to establish intermediaries for knowledge and technology transfer proved as well not to be as efficient as expected, even though these intermediaries play still a central role to direct networking or cluster initiatives. Today collaborative research projects and research and innovation networks among science and industry and further key-players take progressively over the role of knowledge and technology transfer.

The introduction of the Polish National Framework Programme is a significant step from an unspecified public research funding model to a specified research funding system. The Ministry of Education and Science has at present the role to modernize the public research funding system and the research program management. The Council of Science is in charge as an advisory body to the ministry of Education and Science and competent to give recommendations. The new public research funding system in Poland holds not only funding schemes for program/ project funding but as well to finance several public research centres and co-funding European and intergovernmental research program actions. It addresses as well the funding/ co-funding of science and research infrastructure development. It is e.g. estimated that in the coming years the financial sources from the European structural funds to modernize the Polish research and innovation system will be several times higher than from the financial sources from the European framework program. The structural funds can be used for science and research capacity building like cluster initiatives, centres of excellence or centres of competence, technology parks etc.

One major issue regarding the modernization of the Polish research funding system and the national program management system is to involve in a broad dialogue relevant stakeholders of the national research and innovation arena in the agenda setting process. A broad dialogue is central to discuss strength- and weaknesses of the Polish research and innovation system and to define detailed research priorities and further research questions. In most Western European countries this process was successfully launched in the last few years to identify e.g. promising technology niches and research areas. Even though there is not the picture of a distinct national innovation system. There are several sectoral innovation arenas, partly with a strong national focus and others which are intensely embedded in the European research area. Regarding transport research the early cooperation among public authorities, industrial actors, transport operators and research organisations stays central due to the particular structure of the transport research and innovation arena.

The ERA-NET TRANSPORT initiative opens the opportunity to start a broad dialogue in the Polish transport research and innovation arena for a joint agenda setting process regarding the future of scientific research and R&D in transport – e.g. to detail the prioritized research area “transport infrastructure” in the Polish Framework Program but as well for DISTINCT program initiatives in other policy fields like transport policy or environmental policy. The initiative opens as well the opportunity to connect the Polish transport research and innovation arena with other national arenas and the European innovation system. A broad dialogue platform and stakeholder process gives the chance to find a broad consensus on future research areas and priorities for scientific research and R&D in the Polish transport sector. The dialogue is good starting point for a common policy agenda and a national strategy and roadmap for the future of transport research in Poland and as well a option for a national program management open for trans-national cooperation.

8. Annex I – Danish Questionnaire

Antal forskere (kun relevant for forskningsinstitutioner)	Antal
Professorer	
Lektorer/Seniorforskere	
Adjunkter/Forskere/Post Doc	
Ph.d. studerende	
Forskningsassistenter	

<p>Forskerårsværk. Angiv ca. hvor mange årsværk, der er transportforskning. For ikke forskningsinstitutioner f.eks. hvor meget tid, der udføres som udvikling for egne midler samt for nationale og internationale forskningsprogrammer – eller se afgrænsningerne nedenfor.</p>	
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Primære forskningsområde(r)	Kollektiv trafik	Regulering	Godstransport/ Logistik	Infrastruktur Udformning	Adfærd	Planlægning	Andet (specificer)
Specificer "Andet"							

Primære fagdisciplin <ul style="list-style-type: none"> • Ingeniør (ing.) • Planlægning (Scient Adm/Tec Soc el. lign) • Geografi (Scient) • Samfundsvidenskab (Polit/Oecon/Scient Oecon el. lign) • Sociologi (Scient Soc) • Psykologi (Psync) • Andet (Mat/Stat el. lign) 	Ingeniør	Planlægning	Geografi	Samfundsvidenskab	Sociologi	Psykologi	Andet

Antal ph.d.'ere uddannet siden 2000	
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Færdige kandidater i 2004	0-5	5-10	10-20	20-50	50+

Udbydes specifikke ph.d. kurser , evt. i samarbejde med andre	Ja	Nej

Finansiering (% fordeling) <ul style="list-style-type: none"> • Basisfinansiering • Danske forskningsprogrammer • EU/andre internationale forskningsprogrammer • Andre opdragsgivere (inkl. konsulentopgaver) 	Basis	DK programmer	Int. programmer	Andre	I alt
					100 %

Samarbejdspartnere

Angiv de væsentligste danske og internationale samarbejdspartnere.

- Angiv kun de væsentligste (tætte) partnere og ikke alle partnere i f.eks. EU projekter

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- Sprawy Nauki (Science affairs) nr 4,5,6/7/2005
- Przegląd komunikacyjny (Transportation review)

9.2. Internet

Poland:

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