EUROPEAN CONFERENCE OF MINISTERS OF TRANSPORT

# TRANSPORT ECONOMICS RESEARCH AND POLICYMAKING

INTERNATIONAL SEMINAR

Paris,

10-11 May 1999

EUROPEAN CONFERENCE OF MINISTERS OF TRANSPORT

# TRANSPORT ECONOMICS RESEARCH AND POLICYMAKING

## *Summary of Discussions and Introductory Reports*

**Paris, 10-11 May 1999**

ECMT

## EUROPEAN CONFERENCE OF MINISTERS OF TRANSPORT (ECMT)

The European Conference of Ministers of Transport (ECMT) is an inter-governmental organisation established by a Protocol signed in Brussels on 17 October 1953. It is a forum in which Ministers responsible for transport, and more specifically the inland transport sector, can co-operate on policy. Within this forum, Ministers can openly discuss current problems and agree upon joint approaches aimed at improving the utilisation and at ensuring the rational development of European transport systems of international importance.

At present, the ECMT's role primarily consists of:

– helping to create an integrated transport system throughout the enlarged Europe that is economically and technically efficient, meets the highest possible safety and environmental standards and takes full account of the social dimension;

– helping also to build a bridge between the European Union and the rest of the continent at a political level.

The Council of the Conference comprises the Ministers of Transport of 39 full Member countries: Albania, Austria, Azerbaijan, Belarus, Belgium, Bosnia-Herzegovina, Bulgaria, Croatia, the Czech Republic, Denmark, Estonia, Finland, France, FYR Macedonia, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Moldova, Netherlands, Norway, Poland, Portugal, Romania, the Russian Federation, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine and the United Kingdom. There are five Associate member countries (Australia, Canada, Japan, New Zealand and the United States) and three Observer countries (Armenia, Liechtenstein and Morocco).

A Committee of Deputies, composed of senior civil servants representing Ministers, prepares proposals for consideration by the Council of Ministers. The Committee is assisted by working groups, each of which has a specific mandate.

The issues currently being studied – on which policy decisions by Ministers will be required – include the development and implementation of a pan-European transport policy; the integration of Central and Eastern European Countries into the European transport market; specific issues relating to transport by rail, road and waterway; combined transport; transport and the environment; the social costs of transport; trends in international transport and infrastructure needs; transport for people with mobility handicaps; road safety; traffic management; road traffic information and new communications technologies.

Statistical analyses of trends in traffic and investment are published regularly by the ECMT and provide a clear indication of the situation, on a trimestrial or annual basis, in the transport sector in different European countries.

As part of its research activities, the ECMT holds regular Symposia, Seminars and Round Tables on transport economics issues. Their conclusions are considered by the competent organs of the Conference under the authority of the Committee of Deputies and serve as a basis for formulating proposals for policy decisions to be submitted to Ministers.

The ECMT's Documentation Service has extensive information available concerning the transport sector. This information is accessible on the ECMT Internet site.

For administrative purposes the ECMT's Secretariat is attached to the Organisation for Economic Co-operation and Development (OECD).

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Synthèse des discussions et rapports introductifs

*Further information about the ECMT is available on Internet at the following address:*

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# SUMMARY OF DISCUSSIONS

On 10 and 11 May 1999, the ECMT held a Seminar in Paris on the topic "Improving the contribution of transport economics research to policymaking". Chaired by D. Bjørnland (N), the Seminar opened with papers by Messrs. A. Baanders (NL), A. Bonnafous (F), J. Engelhardt (PL), Mr. N. Foster (USA), Y. Geffrin (F), P. Goodwin (UK), U. Karlström (S), R.M. Kimber (UK), Mr. R. Krupp (D), J. Matejovic (CZ) and W. Rothengatter (D). All of these speakers were either from the academic research field or from research-commissioning government departments or agencies. National papers, outlining the situation in a number of countries, were also distributed at the Seminar.

The main conclusions of the Seminar are briefly outlined below.

## 1. GENERATING AND ORGANISING RESEARCH

### 1.1. Participants in favour of public/private partnerships

Some countries have research systems that are fragmented and that lack coherence, a situation which eventually leads to problems. This is because there are large numbers of actors sharing piecemeal contracts, which is not conducive to the formulation of an overall approach or to the emergence of long-term basic research. While the same comment does not apply equally to transport research in all of the countries of Europe, it does reflect a state of affairs which, in many respects, precludes a swift response to policymakers' problems and cannot provide answers to society's most fundamental concerns.

The question that arises, therefore, is whether or not there should be a dedicated body for transport research to generate a steady stream of transport issues for analysis.

There can be no all-embracing answer, as the variety of situations encountered in the countries of Europe shows. Nevertheless, it is possible to formulate some comments on this issue.

- If a single body were responsible for transport research, it would have a monopoly on such research. This is never a good idea. It would inevitably become set in its ways and in the long run would cease to be effective. In seeking appropriate structures, a framework that enables constant creativity should be the guiding principle for policymakers.
- While there should not be a monopoly on the supply side, there should not be one on the demand side either. Indeed, even the best structure for commissioning research will neglect important issues that it has not been able to foresee. It is also important to involve private institutes in defining demand. What is needed is multiple research initiators and sources of funding. The ideal would be to have three or four separate funding sources in each country.
- The operative word for governments should be complementarity. Complementarity among universities, public research institutes and consultants can ensure that competition elicits the best from each. Research contracts can forge links between all these different suppliers

and commissioners of research. The most effective way to commission research is not to call on a single institute, but to arrange for competition to elicit the best studies, based on alternative approaches.

- Although demand and supply are quite well matched when it comes to short-term research, basic research is a more problematic area and may warrant a dedicated body or, alternatively, adequate programmes, since there is no doubt a critical size for carrying forward long-term activities. Clearly, in this respect, it is difficult to think of research demand as distinct from research supply.
- The advantage of a subsidised public body is that it can concentrate on basic research. It is essential to anticipate the issues that policymakers will have to deal with a few years down the line, avoiding a solely short-term approach. This is where a public body could help. Another possibility would be to award contracts through some more streamlined structure than a public body. With this approach, it would be important that the commissioning body itself undertake some research in order to be able to foresee the issues that may arise. Generally, whatever body initiates the research should itself have research experience, if not, misunderstandings will soon arise.
- If a public research body is set up, policymakers should be under no obligation to use its services. Any such body must stand on its own merits. This is part of a positive and competitive procurement strategy in which the final selection of actors is based on sound criteria. There is no ideal way of organising research, but even if we cannot plan the contents of research programmes to be as relevant as possible, we can still optimise research structures.
- The quality of a research programme is related to how clearly the policy concerns on which it is based are formulated. A clearly stated policy strategy that precisely maps out the scope of the research is vital for a high-quality research programme. Clarity makes for a virtuous circle.

The majority of participants at the Seminar supported the idea of a public body, but one that included structures for co-operating with consultants, private sector researchers, research laboratories, etc., i.e. they were in favour of a genuine partnership between the private and public sectors.

Calling on different institutes, or indeed research programmes, can lead to duplication and overlaps. Not that either approach is open to question on these grounds, since overlaps can provide confirmation that a given policy response is correct or indeed, where responses differ, point to the need to cross-check them. As a rule, unlike oversights, overlaps do no harm. However, duplication may be due to a lack of diversity among the bodies responding to calls for proposals. Ideally, we should be able to encourage new players to enter into the research field, since multiple actors in closely related fields of research can spark off new ideas. Care must nonetheless be taken not to waste resources and duplication must therefore be kept in check. It is important not to have too great a number of funding recipients, but small and medium enterprises (SMEs) can and, what is more, should be used in research. Original thinking has nothing to do with size and may even be inversely proportionate to it in that small structures can focus all their energies on certain specific issues without acquiring attitudes and habits that stifle initiative. One of the issues to be resolved from this standpoint is the red tape that accompanies many research contracts: SMEs cannot afford to devote too many resources to administering these contracts. SME involvement is a feasible idea no matter what the size of the country concerned. Of course, one may wonder just how small a firm can be without quality suffering, but experience has shown that small firms that also invest in maintaining high levels of expertise are rarely inferior. Consequently, finding an appropriate structure for integrating SMEs into research programmes could prove worthwhile. On this point, the evaluation of

the European Union's Framework Programmes is not yet conclusive enough. Integrating SMEs in vast research programmes is a difficult exercise in itself: small- and medium-sized firms can be put off by all the administrative formalities, by the need to secure co-funding where this is an explicit requirement -- which is a problem for small teams and not always appropriate for solving policy problems (it means shared teamwork) -- and by the problem of inadequate *monitoring*. One final criticism that could be levelled at many current programmes is that researchers' fees are generally based on quantity, not quality.

### 1.2. The need for a national programme

Another issue is whether there is a need for a research programme providing funding on a continuing basis that confers a degree of stability as regards policy concerns in the field of transport economics and sociology. In practice, research always has to compete for a budget and a research programme does provide some budgetary stability. Further, a programme focuses the attention of decisionmakers and can provide a constant flow of ideas in a given field; it is an effective way of integrating strategic research. A programme that gives policymakers a voice ensures the stability essential for research. However, a programme should not be so inflexible that it precludes dealing with current issues or responding to the urgent issues that are typically high on the list of policymakers' concerns. So, it must be possible to alter the priorities without reference to the main research themes -- which tend to be on-going -- that inform longer-term policy interests. In order to avoid slippage, it is important to establish the overall budget ceiling within which priorities can be altered when a new project is added.

A national programme promotes a country's expertise and keeps its knowledge base up to date. It has an educational value and helps in training young researchers: it also contributes to the expertise and training of government administrators. A national programme ensures that a country is able to appropriate research and also enables it to transpose the results of international research at national level, transport being not only a highly specific field but also highly country-specific. Consequently, it is vital to strike the right balance between national and international programmes. This could have a positive impact on training and the dissemination of knowledge. Generally, consideration should be given not only to research but also to the dissemination of research findings, and in this respect a national programme can be an effective tool.

Programmes must be formulated in terms of the actual issues facing society, not in terms of concepts. Once we begin to talk of stability as regards policy concerns, we may well ask ourselves whether stable concepts – such as permanent indicators for measuring transport activities – are strictly necessary. Indeed, the concepts that we define may well no longer apply by the time a project is completed. All the evidence is that problems are less prone to change and are more permanent than concepts, so we would be well advised to approach research studies from a problem-solving rather than a concept-based approach.

### 1.3. The size of countries and the organisation of research

Sometimes what is feasible in a large country can be difficult in a small country. In fact, it would be absurd to try to apply formulae that can only be effective in a large country to a small country. On this point, the Seminar stressed that quality of research carried out by small countries is just as high as that of larger countries.

Often, small countries remain open to research conducted in other countries. As a result, they do not have to reinvent the same concepts or repeat the same cycle of research. However, as a country's experience is unique, models cannot be transposed without exercising caution and prudence. Solutions that other countries have used can be adapted sensibly. Another possibility for small countries is to take part in the work conducted by a larger country, either by contributing to funding or by joining international teams, as is the case with the European Union's Framework Programmes. At any rate, the experts attending the Seminar considered that even small countries were capable of putting in place procedures to encourage competition and reliance on the creativity of small structures. Open debate is one way of always ensuring that overlaps or diverging opinions, which can be mutually instructive, are identified, provided that the co-operative framework is properly organised. However, in the view of some of the experts at the Seminar, there are countries which, because of the size factor, have no need to conduct their own transport economics research and which can simply base their planning on examples taken from other countries. A small country does not always need to conduct its own national economic research, provided that research findings are disseminated properly. Small countries clearly cannot do everything, but this still does not prevent them from conducting research on their own account, which must nonetheless be to the highest standards.

## 2. EVALUATION AND DISSEMINATION OF RESEARCH

### 2.1. Relations between researchers and policymakers

The lack of understanding between the research and policy spheres is, in many respects, a structural problem: researchers have compartmentalised their particular fields of research (for example, modal research) whereas policymakers are interested in the overall operation of the transport sector, i.e. in economic, land-use planning and environmental aspects. Decisionmakers tend to think that there has been too much "speculative" research and not enough into the issues -- inevitably urgent and extremely relevant -- that are of concern to them. Researchers, on the other hand, think that advances often depend on carrying out long-term research. The last bone of contention is that the findings of scientific research are often not what policymakers want. It is important to monitor research as it progresses so that the end-product is not too far removed from the needs of the research initiators. The best approach is to have an appropriate oversight structure, composed of a mix of actors from different backgrounds and specialist fields. Likewise, new faces from the scientific community should be called in to avoid perpetuating stale ideas around which a consensus can build up too easily.

The aim should be to break down the barriers between policy and research. Perhaps when research is privatised, contact with policymakers is more direct. The United Kingdom model tends to bear this out. Contact is a key factor. Depending on the structure adopted, there may be several intervening levels between decisionmakers and researchers. This is precisely what should be avoided, since each of the intermediate actors distorts the issues by adding their own interpretation of the issue. The way they view the issues depends on what their job is. On the face of it, direct contact between policymakers and researchers is a sensitive area, but it can also prove very productive. Communications specialists, skilled in presenting results, can also be called in. Another aspect that is always important is knowing how to present basic research to the public. However, before basic research can begin, we need institutes to enter the field on a long-term basis so that some experience

can be gained. This is tantamount to saying that it should be possible to initiate research for which there is no policy mandate, simply on the basis of recognised specialists' professional judgement. This is the prerequisite for accumulating knowledge and skills. The scale of research programmes is also a factor: it is only by ensuring some stability over time that teams can be encouraged to enter the transport field on a long-term basis. A specific problem arises for countries that have opted for all-out regionalisation of their public institutions in that it might be difficult for them to design research programmes to tackle problems at national level. It could also be more difficult for them to share operational conclusions.

A crucial point is that the people who present research findings to policymakers are not the people who were responsible for translating their policy concerns into research. This is acceptable if the presentation of research results is handled by communications specialists and the presentation of policymakers' concerns is handled by research specialists. However, if we add to the intermediate levels and compartmentalise communications, we can easily add to the misunderstandings between policymakers and the research community. To ensure that research findings are fully understood and that policymakers' concerns are properly addressed, the intermediate levels must be kept to a minimum. Forging direct links between researchers and policymakers can initiate dialogue, reducing the time it takes until the findings can be factored into the problem evaluation process. Otherwise, the incubation period, before research can influence the policy context, will be one of several years.

Admittedly, there is often a conflict between the academic and the social utility of research, a point that was made several times in the course of the Seminar. The assessment of academic utility is based on formal criteria, while social utility is assessed on the basis of the relevance of research. To end this conflict, a culture of exchange, in which people move from one field to another, must be fostered; i.e. professional mobility and new lines of inquiry should be encouraged. By setting up forums in which each can present its work, the two spheres of research (academic and policy), which usually ignore each other, could be reconciled. From this standpoint, Europe lacks an equivalent to the Transportation Research Board. Attitudes have to change, starting in the academic world, where being both a faculty member and a consultant is frowned upon. With this in mind, the gap that separates professional and scientific journals would have to be narrowed.

### 2.2. Evaluation

No sooner are a study's findings mentioned than the subject of its evaluation comes up. This is a sensitive subject, given the gulf that can separate scientific or academic evaluations, which are based on formal criteria, and the practical relevance of the conclusions of a study to solving a problem or set of problems. Academic evaluation can be criticised for focusing too much on formal criteria, which do not always guarantee a study's relevance, i.e. what it tells us and how relevant it is when it comes to effecting change in the particular field of application. As far as transport is concerned, a study's input in decisionmaking is certainly more important than any purely intellectual appeal it may have. This is why evaluations of research quality cannot be left solely to the academic community. However, while it is possible to verify the scientific relevance of an econometric forecasting model in the medium term, when it comes to issues such as optimum infrastructure pricing or environmental economic theory, which have an irreversible impact on decisionmaking, then it is still very difficult to assess the relevance of certain conclusions. In any case, research findings should be disseminated so that they can be discussed widely outside the immediate circle. Wider dissemination could usefully supplement direct quality control by the commissioning customer and indirect quality control by the research community. Evaluation can indeed be a sensitive subject since it can encourage conservative attitudes and the status quo. What is really needed, if attitudes and approaches to analysis are to

change, is, on the contrary, broad-based evaluation. This is the only way to avoid self-evaluation. Where there is a public institute, it is essential that evaluations be conducted not by its own staff but by specialists who are not involved in any internal disputes. Lastly, research programmes should be evaluated, as well as the actual research conducted.

To assess research quality, international evaluation is needed. However, to avoid the situation in which research is assessed only after it has delivered its findings, with the risks of disappointment that this entails, it is advisable to:

- define clear key stages at which reviews can be carried out at regular intervals;
- ensure that the research is monitored very closely;
- involve the client right from the beginning; and
- establish criteria for selecting research organisations working in similar areas to evaluate the end product.

A review culture, bringing together funding sources and research suppliers, should be developed. The tendency of universities to allow critical review only once work is complete is counterproductive.

It is essential that people other than the commissioning customer take part in evaluations. This second line of indirect control by independent third parties, generally from the international community, supplements direct quality control by the commissioning customer. Evaluations should cover not only scientific quality but also the relevance of the research to the transport sector.

Furthermore, research findings should be presented to the wider scientific community, which would then be able to assimilate the main results rapidly. At any rate, the evaluation process should be factored in from the outset and an evaluation climate should be fostered as an integral part of the research process. Evaluations can be very costly, hence the need to define strategies clearly. Foreign researchers who are recognised experts in this field could be called in for this purpose. Clearly, a budget should be earmarked from the outset for this purpose: evaluations cannot be conducted on a voluntary basis alone. Provision should be made for paying those conducting the evaluation and for covering their expenses.

### 2.3. Dissemination

Researchers find it difficult to break out of their isolation, all the more so because often they do not really think that their work has an impact. They may lack the necessary communication skills to explain their work. The readership of scientific papers is small, a state of affairs that seems unlikely to improve in the near future. All of the above points are related to the communications policy of the institute to which the researcher belongs. The best approach would be for research laboratories to employ qualified communications staff to disseminate the operational conclusions of their research work to the media and opinion-formers.

There is real potential for communications in scientific research: the public is increasingly aware of the implications for society and decisionmakers are increasingly qualified. Hence the need for specialists in communications problems to disseminate results. Moreover, since the scope of decisionmaking is wider these days, the researcher's ability to analyse and synthesise is valuable to policymakers, even if the actual decision still calls for a policymaker's intuition (where there are factors that go beyond pure economic logic). We should also bear in mind that research taken in isolation can never explain more than a few aspects of a global process. The knowledge that flows

from one piece of research is relatively small, compared with the stock of knowledge required to obtain the overall understanding that the problem requires. This is why it takes time for research to become relevant. It could also make it more difficult to recognise the value of a piece of research and therefore could affect whether or not it is publicised beyond the circle of insiders. Evaluation, it should be noted, is a key factor in changing mentalities.

It is vital to think about disseminating results when defining research objectives. Researchers should be aware of the importance of practical applications and the dissemination of their work at a very early stage in the process. This issue also concerns institutions, inasmuch as research organisations are responsible for publicising the quality of the work that they conduct. Four basic principles should be priorities for dissemination:

- Target groups, to which the results of research should be disseminated, must be defined;
- Not everything should be disseminated, only essential information should be selected;
- A separate budget for dissemination is essential, otherwise those communicating the information will be too close to the researchers and not close enough to decisionmakers;
- Preliminary results should be published, without waiting until the final results are known to disseminate conclusions.

By staying in constant contact with opinion formers, i.e. the media, it is possible to build up a consensus on research conclusions. Newspapers, television and open forums can be springboards for getting research findings across to the public. In fact, it may also be important to take a hands-on approach to some of the means of informing the public debate in order to raise the standards of that debate. It is clear, too, that private sector actors, such as industrialists, have a duty to disseminate the research carried out by their companies. While it is not necessary to disseminate all research findings, industrialists nonetheless have a duty to carefully select the information that should be released for public debate. The process of translating research into material for public debate calls for specialist journalistic skills. The content should be concise in order to avoid overloading people with information but, in general, those providing information should be willing to discuss their research results. Preferably, information should be disseminated directly through researchers and not through ministries.

## 3. NEW RESEARCH DIRECTIONS

Whenever researchers approach a problem they tend to simplify it, which leads them to produce simplistic solutions to the problems. While this is not a widespread trend, it is a trap into which any researcher may fall. For the participants at the Seminar, research should focus on solving problems one step at a time. In contrast to pure research scientists, consultants have to talk to their customers and identify an approach suited to the latters' requirements. Without in any way wishing to draw comparisons between consultancy and basic research, it would be fair to say that each is suited to different circumstances. What matters most is that the two worlds meet and communicate. Both are operating in a context in which the search for new methodological tools and reliable data on transport is the overriding concern.

### 3.1. New methodological tools

Transport policy in European countries has seen very real changes in recent years. It is now addressing the issues of infrastructure pricing for all modes, sustainable development, the privatisation of certain public services, 'traffic calming', improving public transport, etc. This list is not exhaustive and European transport policy offers many other opportunities for multidisciplinary work. In contrast, some, not to say the majority, of the participants at the Seminar thought that the methodological tools used had not changed at the same rate. The implications of the prevailing research paradigm are that choices are irreversible and that the order in which decisions are implemented does not influence the outcome, simply because the concept of equilibrium has left its mark on the research community. This is a tempting concept and one that pervades all the models, but it is misleading, since it does not really represent reality. In real life, choices can vary, lag times and dynamic processes – phenomena not frequently addressed by researchers – are important. It can be argued that simplifying economic theory does not work, we should start again with new instruments, based on tools from different disciplines, that will enable us to take into account the asymmetry of effects, reversibility, the importance of sequence, time lags and cumulative phenomena. To be effective from a policy standpoint, new dynamic concepts must be developed. Research into process, not end-states, should be developed and would require a fundamental shift in the type of data collected and the procedures used to analyse them. The foregoing warrants a radical rethink of how research is organised. Among the new directions, today we should be focussing more on the problems of redistribution than maximisation, or on developing real-time continuous monitoring, not just *ex post* monitoring. This said, the integration of the different disciplines is not easy – the scientific community has been proposing integration for years now without any very positive results – but it is a sufficiently promising area to warrant allocating resources to it.

### 3.2. Appropriate statistical data

One point strongly emphasized during the Seminar was that the limited statistical data available made it extremely difficult to carry out effective and meaningful research. With the deregulation of transport and the regionalisation of certain decisionmaking processes, the situation is getting worse. Although some data are too detailed or too expensive to collect, the gaps in statistical coverage are too large to be ignored. Some transport policy decisions cannot be evaluated without at least a basic statistical apparatus. Governments have a duty to address this issue and to take vigorous action, for example, when a sector is about to be deregulated, to request operators to supply statistics. The data must be made available and must not be allowed to become proprietary. Generally, it is apparent that decisionmakers will have to be convinced that they should invest money in data collection.

# INTRODUCTORY REPORTS

**RAPPORTEURS FROM ADMINISTRATIVES ORGANISATIONS**

**GERMANY**

**Rudolf KRUPP**
**BASt**
**Federal Highway Research Institute**
**Bergisch Gladbach**

# INTRODUCTORY PAPER ON GERMANY (FOCUSING ON ROAD TRANSPORT RESEARCH)

## PREFACE

The main guideline in Germany's transport policy is to reconcile ecology with the economy, the aim being to maintain the mobility necessary for economic activity and at the same time to reduce the disamenities caused by traffic flows [1, p. 2].

The transport research conducted by the Federal Ministry of Transport (BMV) plays an important role in this respect. This role is reflected firstly by the fact that, within its sphere of activities, the BMV runs five bodies engaged in transport research:

-- the Federal Hydraulic Engineering and Hydrology Office;
-- the Federal Maritime Shipping and Hydrography Agency;
-- the Federal Highways Office;
-- the German Meteorological Service;
-- the Federal Aviation Office.

In addition to the internal resources provided for research activities within these bodies, the BMV has a budget for external activities of about DM 40-50 million a year, which is used for research contracts with outside bodies (universities, engineering consultants, etc.).

This external BMV research represents an important sub-sector in German transport research, particularly since university transport research in Germany is not concentrated within transport faculties proper but is distributed among many different faculties specialising in various disciplines (engineering, computer science, economics, sociology, psychology, etc.[1])

As a result of this wide distribution of transport research among many different disciplines and faculties, transport research in Germany is in most cases poorly co-ordinated [2, p. 395].

The research sponsored by the BMV has a quite special place within this decentralised research environment. It is a significant component in the German transport research system, but cannot be isolated from the research activities of other departments.

It is very closely connected with the research programme of the Federal Ministry of Education and Research (BMBF), which is responsible for basic research on transport and the technological development of transport systems. In addition, the complexity of transport research requires close co-ordination with the Federal Economics, Agriculture, Environment and Construction Ministries [1, p. 2].

Unlike the BMBF, which conducts basic research, the BMV is concerned with applied transport research. It therefore provides practical decision aids for the technical issues involved in transport policy, as well as a sound scientific basis for the definition of transport policy measures and the monitoring of their efficiency [1, p. 3].

## 1. OBJECTIVES OF BMV'S TRANSPORT RESEARCH ACTIVITIES

Five objectives have been set for BMV's various transport research activities **[**1, p. 4**]**:

### 1.1. Integration of transport in economic and social systems with the focus on:

- -- The interaction between transport, economic activity and society;
- -- The development of passenger and freight traffic;
- -- International development.

### 1.2. Environment-friendly mobility and sparing of resources with the focus on:

- -- Modern vehicle technologies to reduce $CO_2$ emissions from traffic;
- -- Pricing policy measures to reduce $CO_2$ emissions;
- -- Improved interaction between modern vehicle technologies and optimised transport infrastructure;
- -- Reduction of traffic in towns.

### 1.3. Ensuring environment-friendly mobility via co-operation among carriers and by incorporating them within a transport management system by means of:

- -- Telematics.
  Technical feasibility of an automatic toll system for motorways, effects of a toll system, satellite and communication and navigation systems, and navigation systems operating independently of the vehicle type with the use of digital road maps;
- -- Optimisation of transport chains.
  Possibilities of transfers between carriers, creation of international forwarding networks, concentration of delivery traffic via inner-city terminals, multimodal transport chains;.
- -- Infrastructure networking:
  - improvement of federal infrastructure planning with a view to optimising the entire transport system;
  - networking in short-distance transport;
  - rail/road co-operation;
  - local public passenger transport (use of electronic payment systems);

- integrated transport management (e.g. car sharing);
- improved facilities for cyclists.

### 1.4. Ensuring mobility via optimal networking arrangements involving every individual carrier, as well as maintaining and developing an integrated transport infrastructure network

-- Improving infrastructure efficiency:
  - better use of existing capacity;
  - development where appropriate;
-- Improved financing schemes with the use of private capital;
-- Improved maintenance and development of transport infrastructure:
  - forecasting procedures;
  - evaluation criteria and computation methods in federal transport infrastructure planning;
  - route studies;
-- Infrastructure financing and privatisation:
  - methods of financing infrastructure projects;
  - planning long-term and complex licensing contracts;
  - legal basis for the construction of the Transrapid magnetic cushion train.

### 1.5. Improvement of safety

-- in road transport;
-- in rail transport;
-- in shipping;
-- in air transport;
-- in the transport of dangerous goods.

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**Narrowing down the issue to road transport research by the Federal Highways Office**

In connection with these overall objectives in transport research by the BMV, the Federal Highways Office (BASt) has been given special responsibilities which are described below.

## 2. RESPONSIBILITIES OF THE FEDERAL HIGHWAYS OFFICE (BAST)

The BASt is a federal technical and scientific establishment. It was originally set up by the BMV in 1951 as the Federal Highway Construction Office and was responsible on the engineering side for promoting the construction of federal motorways and highways. In 1965, it was also instructed to undertake research, testing and advisory activities -- especially to improve road capacity and safety. The change of name to the Federal Highways Office was also connected with these wider responsibilities.

In 1970 its range of activities was extended when it became the central body for road accident research as a result of a decision by the German Lower House.

The BASt is based in Bergisch Gladbach. It has a staff of some 350-400, of whom 120 work in the Scientific Service.

The BASt is responsible for promoting the development of highways and providing scientifically sound decision aids on current transport policy and technical issues involving highways. In order to carry out this task, the BASt conducts its own research and contracts out research projects to external research bodies (universities, technical universities, engineering consultants, etc.).

## 2.1. Objectives of research

The objectives of the research conducted by the BASt are as follows:

(1) Cost-effective and functional road and bridge engineering.
(2) Systematic and efficient road and bridge maintenance.
(3) Improvement of transport safety.
(4) Efficient use of the road network, maintenance of transport quality.
(5) Prevention and/or reduction of environmental damage caused by traffic.
(6) Integration of roads in the overall transport system.

## 2.2. Research fields

In order to achieve these objectives, the BASt defines and carries out research projects which can be allocated to the following sixteen research fields, depending on the main aspect of the activity:

(1) Quality assurance and test methods in road and bridge engineering;
(2) Construction methods and techniques, building materials, dimensioning and standardization;
(3) Recycling, industrial by-products in highway engineering;
(4) Management of road and bridge maintenance;
(5) Road and traffic statistics;
(6) Road design, road equipment;
(7) Traffic control, telematics;
(8) Road maintenance;
(9) Analysis of transport users' behaviour;
(10) Accident statistics, safety analyses, safety measures;
(11) User education, driver training, information, supervision, aptitude for driving;
(12) Medical services in connection with accidents, emergency services, disabled people;
(13) Active and passive vehicle safety;
(14) Environmental damage caused by roads and vehicles;
(15) Environmental protection measures involving roads and vehicles, impact assessments;
(16) Mobility needs and modal choice.

## 3. FINANCING OF BAST RESEARCH

BASt research projects are integrated within programmes. A distinction is to be drawn between:

- Research and development work carried out by BASt (budget of about DM 60 million a year); and
- BASt external research projects (current budget of about DM 17 million a year) contracted out under the following financial arrangements:
  - About DM 7 million a year are allocated from the BMV budget to the highways research programme;
  - About DM 7 million a year are allocated from the BASt budget to the road transport safety programme;
  - About DM 3 million a year are allocated from the BMV budget to the urban transport programme;
  - About DM 0.35 million a year are allocated from the BMV budget to the emergency service programme;
  - DM 1 million a year have been allocated for the period 1996 to 1999 from the BASt budget to the efficiency monitoring project relating to the special exhaust gas study.

## 4. RESEARCH PLANNING

In order to answer questions and resolve problems, research projects are worked out and defined with regard to:

- the precise problem or question;
- the objective;
- the utility;
- the intended approach; and
- the planned work, time and cost framework.

When working out projects, the BASt co-operates closely with the BMV and other bodies -- in particular with the Association for Research on Road and Transport Systems (FGSV) -- on research on highway and traffic engineering. The Cologne-based FGSV is a non-profit body which is mainly concerned with developing practical knowledge in all road and transport systems by pooling know-how in the scientific, economics and management fields.

### 4.1. Internal research

Proposals for the various research projects are made by the BMV, the BASt or, in exceptional cases, by third parties (technical universities, the German Transport Safety Board, etc.). Internal research is not based on periodic research programmes, but focuses on current issues, which in 50 to 60 per cent of cases are defined by the BMV; some 33 per cent of the projects are initiated by the BASt itself; the remainder are proposed by other bodies.

Projects initiated by the BMV must be carried out. In the case of projects initiated by the BASt as well as those proposed by outside bodies, the operational section makes a preliminary choice and defines priorities. The projects proposed are listed and the BASt's management then examines them with regard to their compliance with BASt objectives and their priority. The projects concerned are then submitted to the BMV for approval.

Work on the BASt's internal research accounts for about 60 per cent of the operational departments' capacity. At present, work is being carried out on some 220 projects.

The BASt's own research is extremely flexible, since work can be started immediately on urgent research -- e.g. for the BMV -- by spreading out in-house projects over a longer period or postponing them. Work for outside bodies, which can be carried out only if the costs are refunded, is usually not so flexible for reasons involving contract law. Since, however, it has such a small share in total capacity, it does not affect the operational departments' flexibility.

## 4.2. External research

Owing to the different funding sources, external research is broken down among several research programmes.

### *4.2.1. The road system research programme*

The road system research programme is planned by the BMV. It is in two parts:

- One part is planned with the participation of the Association for Research on Road and Transport Systems (FGSV) as a combined BMV-FGSV programme;
- Another part is planned by the operational sections in the BMV's road engineering department as a departmental programme.

The outside contractors are:

- universities and technical universities in 60 per cent of cases;
- private firms (engineering consultants, etc.) in 40 per cent of cases.

At present, work is being carried out on 180 projects.

### *4.2.2. The road transport safety research programme*

The road transport safety research programme is planned by the BASt and submitted to the BMV for approval. The BMV can influence the choice of subjects or eliminate proposed subjects and bring in its own ideas for projects.

The programme is planned for a two-year period and then carried out according to the schedule. Flexibility is guaranteed by ensuring that current research requirements which are not included in the two-year programme can be incorporated as priority projects and given preference over planned projects.

The outside contractors are:

- universities and technical universities in 45 per cent of cases;
- private firms (engineering consultants, etc.) in 55 per cent of cases.

At present, work is being carried out on 130 projects.

*4.2.3. The urban transport research programme*

The urban transport research programme is planned and contracted out by BMV. In this programme, the BASt is responsible for supervising only those projects which come within its special technical field.

At present, the BASt is supervising some 25 projects.

*4.2.4. Other programmes*

The German Lower House has instructed the BASt to study the efficiency of the compulsory exhaust gas tests for all cars and lorries as part of its technical supervisory role. The objective is to estimate the amount of pollution which is avoided by means of these exhaust gas tests and thus prove their utility.

On behalf of the BMV, the BASt also awards and supervises contracts on projects to improve the efficiency of emergency services.

## 5. RESEARCH MONITORING AND PERFORMANCE ASSESSMENTS

To improve the focus on objectives in the exercise of its responsibilities and efficiency in the use of its resources, the BASt has started to set up information services and regularly to provide monitoring information.

Four of the scientific staff's main fields of activity, for which the objectives and content are mainly determined by standards set by the BMV, are continuously monitored at central level:

- BASt internal research, which accounts for up to 60 per cent of scientific capacity;
- Supervision of BASt external research, which at present accounts for about 7 per cent of scientific capacity;
- A small programme of work, covering answers to queries from and advice to the BMV, which accounts for up to 8 per cent of scientific capacity;
- Committee work by BASt staff at national and international level for the conversion of research findings into standards and directives, or for the co-ordination of new research activities, which accounts for about 6 per cent of scientific capacity.

In all, some 80 per cent of all scientific activities are therefore already monitored.

## 5.1. Monitoring instruments

In a "programme budget", which is drawn up every year, the expected costs (payroll and material costs including the costs of external research and investment) for all the planned activities by the operational departments are broken down by research field for the following year.

The programme budget is supplemented by a regular report on the last quarter. These quarterly reports give an overview of the:

- BASt's in-house research projects which have been completed or recently started;
- External research projects which had been completed or recently contracted out;
- Reports and statements drawn up in connection with the "small programme of work";
- Committee membership activities which have been completed or recently taken up.

For all projects there are detailed project descriptions including work, time and cost plans, by means of which progress on projects can be monitored.

Progress in BASt in-house research is monitored with regard to form and particularly schedules by a member of the staff who works full-time on this activity; changes to the schedule and plan of work must be notified and approved. Projects are examined in detail and the necessary adjustments discussed in half-yearly talks with the management.

In the case of BASt external research, a scientific supervisor from the operational departments and a project supervisor from the central department are appointed for each project. They are responsible for monitoring the progress of work which is legally binding on the contractor and, where necessary, to take action by playing a co-ordinating role.

## 5.2. Assessment of research findings

On completion of the research projects, the research reports are assessed by considering:

(1) The content of the research project;
(2) Its scientific value:
    a) critical statements on the research findings obtained (including problems which are still pending);
    b) conclusions from the research findings (including repercussions on other research projects);
    c) proposals for the practical use of the research findings;
    d) proposals for supplementary or new research topics and their priorities;
(3) The justification for publication or non-publication.

## 6. USE OF THE RESEARCH FINDINGS

The results of the assessment are passed on to the BMV. Two publication series are available:

- The BMV series of research reports relating to the road system research programme, with 500 copies per report,

- The BASt series of research reports on BASt's in-house research and on the road transport safety research programme; it covers the following 6 areas with up to 250 copies per report:
  - general;
  - bridges and civil engineering;
  - vehicle technology;
  - user safety;
  - highway engineering;
  - traffic engineering.

The research findings have various repercussions. In a particular case,they may contribute directly to policy decisions. For example, many statutory rules for road users (use of a seatbelt, the requirement for drivers of motorised two-wheelers to wear a helmet, the 100-km speed limit on motorways) have been based on the BASt's research findings. Very frequently, the research findings are used to work out rules and standards, including those in the international field.

## 7. ASSESSMENT OF THE PRESENT SYSTEM

The advantage of the present system is its great flexibility, which makes it possible to react at any time to problems raised by the BMV. With the mix of BASt's internal and external research, it is possible to cover a very wide range of specialised research as well as to adapt quickly to any change in the range of research problems.

## NOTE

1. One exception is the "Friedrich List" Faculty of Transport in the Dresden Technical University.

## REFERENCES


[1] *Forschungskonzept des Bundesministeriums für Verkehr*, A24/14.00.00-02, 14 December 1995.

[2] Deutsche Forschungsgemeinschaft: *Perspektiven der Forschung und ihrer Förderung*, Weinheim, 1997.

**UNITED STATES**

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# UPDATE ON NORTH AMERICAN RESEARCH INTO TRANSPORT ECONOMICS

## *INTRODUCTION*

*This presentation describes recent economic research relating to transportation that has been conducted in the United States and, in some cases, Canada. The author would like to thank the European Conference of Ministers of Transport for inviting TRB to take part in this Seminar and to exchange research results.*

*The Transportation Research Board's mission is to promote innovation and progress in transportation through research. The Board accomplishes this mission by stimulating needed research, managing research programs (http://www4.nas.edu/trb/crp.nsf/), disseminating research results and conducting studies on major transportation policy issues. Information on most TRB publications is available on the Internet (http://www2.nas.edu/trbbooks/). The table presented below shows the intervention of the TRB compared with other bodies which undertake research in transport economics.*

*The author works as an Economist with the Minnesota Department of Transportation and serves as chair of the TRB Committee on Transportation and Economic Development. Dr. David Forkenbrock, who chairs the Committee on Transportation Economics, regretted that he could not attend the Round Table and he has greatly assisted the author in reviewing these remarks.*

| ***ECONOMIC RESEARCH*** | | | |
|---|---|---|---|
| ***Type of research*** | ***Sponsor*** | ***Selection*** | ***Undertake*** |
| *TRB Special Report* | *TRB* | *TRB* | *TRB* |
| *NCHRP/TCRP* | *AASHTO* | *AASHTO* | *Consultant, Universities* |
| *State research* | *State DOT* | *State DOT* | *Consultant, Universities* |
| *University Transportation Centres* | *US DOT* | *Universities* | *Universities* |

## OVERVIEW

This presentation covers a number of major areas: pricing of transportation facilities, the economic impact of transportation, incorporating environmental issues into policymaking, financing, transportation and land use, and freight issues. A number of these areas overlap to a large degree so the areas are simply broad descriptions rather than fixed and independent topics. Internet addresses are included where appropriate for those who wish to explore any of these issues in more depth.

## 1. PRICING

The issue of transportation pricing continues to generate a large number of studies and feasibility analyses but relatively few actual cases of implementation and thus measurement of effects and impacts. In the past few years the focus of attention has been on HOT lanes--high occupancy toll lanes. These projects involve the conversion of an existing or the building of a new HOV -- high occupancy vehicle or car-pool -- lane, with single drivers being allowed to pay a toll to use the facility.

The most visible projects have been in California, especially the SR91 project. This 10-mile (16 km) construction of two HOT lanes in each direction was privately financed and uses variable pricing by time of day. An extensive evaluation of this project was undertaken by the University of California at San Luis Obispo (http://airship.calpoly.edu/~jwhanson/sr91.html). It is interesting to note that this evaluation found that users of the toll lanes tended to use them on a selective basis, not every day, and represented a reasonable mix of incomes for the corridor, which overall is relatively affluent. Travel delays in the non-priced lanes fell quite substantially with the addition of the two HOT lanes.

Other important HOT lane projects have been undertaken in Texas and in San Diego in Southern California. These projects involved the use of existing HOV lanes, not the construction of new lanes. One very interesting finding in San Diego is that allowing single drivers to pay to use an HOV lane actually led to a greater number of carpools using the lane than previously. Perhaps the fact that the value of the lane is clearly established at $2 per trip encouraged people to realize the monetary benefit of ridesharing. Even more intriguingly, in the initial stages, the project reduced violations of the HOV lane by more than the additional single driver vehicles added, so traffic flow was actually improved.

A wide range of updates and reports on congestion pricing is available at the Congestion Pricing Internet web site (http://www.hhh.umn.edu/Centers/SLP/Conpric/conpric.htm).

Some observers have commented that much of the work on pricing is now overly focussed on HOT lanes. Market research and surveys of local opinion have indicated that people desire additional choices, rather than controls on driving. HOT lanes address this desire in at least some circumstances, although there is little enthusiasm for converting general-purpose lanes to HOT lanes -- the trend has been to add new HOT lanes or convert existing HOV lanes. Whether this is a viable long-term effective strategy remains to be seen.

## 2. ECONOMIC IMPACTS OF TRANSPORTATION

Throughout the 1990s, a number of researchers have been engaged in a set of studies to determine the macroeconomic relationship between transportation and economic output or performance. Important work in this area was carried out by Ashauer, Munnell, Holtz-Eakin, Eberts, Garcia-Mila and McGuire, Deno, Bell and many others.

In recent years, three important studies have been added to this literature. First, Bell and McGuire's *Macroeconomic Analysis of the Linkages Between Transportation Investments and Economic Performance* (TRB NCHRP Report 389, 1997) assessed the state of the literature, developed a new disaggregated data set of transportation infrastructure investment and capital stocks for 1950 to 1992, by mode and state, and tested models against this new data set. The relationships found varied by mode, industry and state and showed the importance of demographic and economic trends in determining relative economic performance.

Second, Nadiri used a cost function approach to examine how different industries were affected by changes in transportation infrastructure (see *Economic Returns from Transportation Investment*, Eno Transportation Foundation, Lansdowne, Virginia, 1996). He found that the economic return on total highway capital was highest in the 1950s and 1960s (about 35 per cent) and declined to about 10 per cent in the 1980s, as the interstate system neared completion.

Third, Bedi (bedi@mto.gov.on.ca) and Gillen have developed estimates of the value of the highway system for the province of Ontario, Canada, using a willingness-to-pay approach to measure "value", including both the household and industrial/commercial sectors. Bedi and Gillen estimate that the conventional capital stock measure in 1992 for Ontario's highways was $12.5 billion (1986 Canadian dollars) versus about $41 billion when valued from the users' perspective.

In the past year, a new study has been completed that gives an overview of *Research on the Relationship Between Economic Development and Transportation Investment* (TRB NCHRP Report 418, 1998). This report proposes that future research look at the economic implications of congestion on businesses (which was an issue at the ECMT Round Table 110 on *The Spread of Congestion in Europe*), communication issues with policymakers and the public, macroeconomic impacts of public transportation, project and program evaluation (including indirect effects), multimodal and intermodal assessment and social impacts. This program of future work suggests that not every question has been answered fully up to this point.

## 3. ENVIRONMENTAL EFFECTS AND IMPACTS

During the 1990s, a number of important studies have been undertaken to investigate the impacts that transportation has on the environment. Mark Delucchi of the University of California-Davis was the lead researcher on the most important of these studies: the monumental *The Annualized Social Cost of Motor-Vehicle Use in the US, 1990-91,* which resulted in twenty separate volumes published in 1996, covering topics as broad as *Personal Nonmonetary Costs of Motor-Vehicle Use*, *Motor-Vehicle Goods and Services Priced in the Private Sector* and *Monetary Externalities of Motor-Vehicle Use*, as well as relatively new areas such as *The Cost of Reduced Visibility Due to Air Pollution from Motor Vehicles*.

These volumes have been the standard against which most other studies are compared. A full listing of these studies is available (http://socrates.berkeley.edu/~uctc/text/papersuctc.html). The summary report is also available as an Adobe Acrobat file (http://socrates.berkeley.edu/~uctc/text/papers/311.pdf).

Table 1. **Summary of the costs of motor-vehicle use**

| | **Total cost ($billion)** | | **Share of total** | |
|---|---|---|---|---|
| | **Low** | **High** | **Low** | **High** |
| (1) Personal nonmonetary costs of motor-vehicle use | $544 | $953 | 33% | 29% |
| (2) Motor-vehicle goods and services produced and priced in the private sector | $807 | $919 | 49% | 28% |
| (3) Motor-vehicle goods and services bundled in the private sector | $76 | $279 | 5% | 9% |
| (4) Motor-vehicle infrastructure and services provided by the public sector | $132 | $241 | 8% | 7% |
| (5) Monetary externalities of motor-vehicle use | $30 | $124 | 2% | 4% |
| (6) Nonmonetary externalities of motor-vehicle use | $69 | $755 | 4% | 23% |
| **Grand Total Social cost of highway transportation** | **$1 658** | **$3 272** | **100%** | **100%** |

*Source:* Annualized Social Cost of Motor-Vehicle Use in the US, 1990-1991: Summary of Theory, Data, Methods, and Results, Mark A. Delucchi, June 1997, p. 47.

Other researchers have made estimates of the full cost of transportation, including Lee (*Full Cost Pricing of Highways*, Research and Special Programs Administration, US Department of Transportation, Cambridge, Massachusetts, November 1994) and Littman has produced a number of reports on full costs of transportation, automobile insurance reform and many facets of public transit and alternative modes (see http://www.islandnet.com/~litman/homepage.html for Adobe Acrobat versions).

A number of important studies have also begun to expand our knowledge of the economic cost of the environmental impact of particular policies or transportation tradeoffs. See, for example, Small and Kazimi's article, "On the Costs of Air Pollution from Motor Vehicles," in the *Journal of Transport Economics and Policy* 29: 7-32 (1995).

A very useful collection of articles was published in Germany, edited by Greene, Jones and Delucchi: *Measuring the Full Social Costs and Benefits of Transportation* (Springer-Verlag, Heidelberg, Germany, 1997). It includes articles on safety by Miller ("Societal Costs of Transportation Crashes"), Gomez-Ibanez ("Estimating Whether Transport Users Pay Their Way: The State of the Art") and Anderson and Mohring ("Congestion Cost and Congestion Pricing"), work that was in part sponsored by the Minnesota Department of Transportation.

TRB has also been very active in addressing the role of sustainability in transportation policymaking. In 1997, *Toward A Sustainable Future: Addressing the Long-Term Effects of Motor Vehicle Transportation on Climate and Ecology* (TRB Special Report 251) was released.

## 4. FINANCING

A number of interesting developments are being explored in the area of transportation finance. I will mention two issues that represent an interesting development on past practice, building on the full cost work mentioned earlier, and an examination of the future of surface transportation financing in the next century.

First, the US Federal Highway Administration periodically conducts a Highway Cost Allocation Study to estimate the relative damage caused and revenue attributed to various classes of vehicles, such as cars, light trucks and different kinds of large trucks. In the latest update, conducted in 1997, the study extended beyond the traditional costs of pavement, bridge and right of way to consider environmental and other external costs. The initial national estimates for these external costs total about $400 billion, with air pollution not yet released.

Table 2

| **Type of cost** | **US $ billions** |
|---|---|
| Air pollution | Not yet released |
| Noise | 4.3 |
| Congestion | 61.8 |
| Safety (user) | 294.6 |
| Safety (non user) | 45.2 |
| TOTAL | 406.0 |

This broadening of traditional economic and financial analyses within transportation to cover external costs is growing and greatly helping policymakers understand the full effects of transportation systems and uses on society at large.

Second, there has been concern about the financing system for transportation over the medium and long term in light of likely advances in fuel efficiency and in the growing use of alternative fuels, since the tax on gasoline represents a major portion of highway and transit financing in the United States.

In 1995, TRB looked at this question in a report on Alternatives to Motor Fuel Taxes for Financing Surface Transportation Improvements (TRB NCHRP Report 377, 1995). That report found that the United States needs to explore alternatives to motor fuel taxes because of the emergence of vehicles powered by electricity or special fuels. It concluded that Intelligent Systems Technology offers promising approaches to charging road users.

This year, a new study is beginning, sponsored by a number of states led by Minnesota, which will examine the potential of new technology both in vehicles and satellites, to develop a completely

new financing system that would vary by time and place of roadway use. This research, led by Dr. Forkenbrock at the University of Iowa, promises to open up new options for developing financing systems that will be sustainable over the long run. Similar to approaches being tried in the Netherlands and Australia, the new system would use global positioning technology and a small, on-board computer to establish road user charges.

## 5. TRANSPORTATION AND LAND USE

The general relationship of transportation and land use, questions of "sprawl" and concepts such as Livable Communities have continued to be important topics for research. In January 1999, Vice President Al Gore announced a new Livability Agenda and he has indicated that this will be a key issue in the next presidential election, which he incidentally hopes to take a major role in. Among the major issues identified in the Agenda are two that relate directly to transportation and land use:

- Ease traffic congestion by improving road planning, strengthening existing transportation systems and expanding use of alternative transportation;
- Promote collaboration among neighboring communities -- cities, suburbs or rural areas -- to develop regional growth strategies and address common issues like crime.

The general term that describes this approach is Smart Growth and, as befits an important new issue, Internet web pages are already plentiful (such as http://www.smartgrowth.org/index_text.html).

Among the large number of research projects completed or underway on the general issues of transportation and land use that bring an economic perspective to the debate is *The Costs of Sprawl -- Revisited* (TRB TCRP Report 39, 1998). This extensive literature review summarized two decades of studies on alleged positive and negative impacts of sprawl on public and private costs, the natural environment, quality of life and social issues. The report discusses whether each impact has been found to exist and how strongly it is linked to sprawl.

Current research efforts are underway to incorporate land use, transportation planning and the full cost approaches described earlier. The Federal Highway Administration has sponsored the development of a prototype model to estimate the full cost of alternative land use patterns. The Excel-based spreadsheet is called the *Social Cost of Alternative Land Development Scenarios* (SCALDS) model. The model builds on three areas of research -- least cost planning which has been used by electric utilities for a number of years, full cost of travel studies and cost of service/cost of sprawl research (http://www.ota.fhwa.dot.gov/scalds/).

One issue that is gaining increasing attention is the question of induced traffic after transportation infrastructure is improved. Europe has probably done the most work in this area, as evidenced by the SACTRA research in the UK, and the ECMT Round Table 105 on *Infrastructure-induced Mobility*. TRB has issued a circular on *Highway Capacity Expansion and Induced Travel: Evidence and Implications* (Circular 481, 1998) that presents some analysis of North American case studies.

## 6. FREIGHT ISSUES

The movement of freight continues to be an area of extensive study, especially with growing international trade and continuing interest in modal tradeoffs. In 1996, a TRB panel examined the external costs associated with freight movements in *Paying Our Way: Estimating Marginal Social Costs of Freight Transportation* (TRB Special Report 246, 1996). This report compared a number of different origin-destination pairs and types of freight and estimated the private and external costs associated with various modal alternatives. The report found that shippers are paying less than the costs transportation imposes on society.

Forkenbrock has also estimated the external costs of trucks and rail for moving freight in *External Costs of Truck and Rail Freight Transportation* (1998), Forkenbrock estimates four general types of external costs for a ton-mile of freight shipped by truck or rail: accidents (fatalities, injuries and property damage); emissions (air pollution and greenhouse gases); noise; and unrecovered costs associated with the provision, operation, and maintenance of public facilities (primarily roads and bridges). He focuses on intercity freight truck and rail transportation and concludes that external costs are about equal to 10 to 20 per cent of the private costs shippers now pay. On a ton-mile basis, trucks create external costs that are five times as large as those of rail (http://www.uiowa.edu/~ppc/trans.html).

At a more national policy level, a 1998 study on *Policy Options for Intermodal Freight Transportation* (TRB Special Report 252) recommended that freight facilities should continue to be largely privately financed and justified, but that important external benefits could justify public sector participation in particular cases.

## 7. THE CASE OF MINNESOTA

In closing, let me describe a few efforts underway in Minnesota on this issue. Over the past few years, Mn/DOT has been increasingly using economics to evaluate transportation policies, projects and plans. In terms of the particular topics presented here, Minnesota has examined proposals to develop privately funded toll roads, a HOT lane project and other pricing proposals. None has been implemented to date. A major study of Transportation and Regional Growth is underway at the University of Minnesota (http://www1.umn.edu/cts/TRG/TRG.html), covering development patterns, full costs of transportation, transportation demand modelling, financing of transportation systems and other issues.

As some of you may have heard, the State of Minnesota has recently elected a new Governor, Jesse Ventura, who had previously been a city mayor, radio talk show host, movie actor and professional wrestler. Governor Ventura has developed a set of budget principles to guide his administration, which are:

- Be fiscally conservative and prudent -- Never forget it's the people's money;
- Do the right things and do them well;
- Provide incentives for desirable behavior.

In transportation, Governor Ventura is pursuing Minnesota's first Light Rail Transit (LRT) line, supports efforts to limit urban sprawl, and has proposed reducing the fixed tax that automobile owners pay to register their vehicles.

**RUSSIAN FEDERATION**

**Oleg AGAPOV**
**Ministry of Transports**
**Moscow**

## 1. INTRODUCTION

The question of improving the effectiveness of transport economics research is one of particular importance, given the prospects for the growth of transport; likewise, the safe and stable operation of transport depends to a considerable degree on the contribution made by research to transport policymaking.

The Ministry of Transport of the Russian Federation oversees the transport sector, which consists of legal persons and individual entrepreneurs engaged in transport and transport-related activities: sea, inland waterway, road, municipal passenger and industrial rail transport.

The research and technical capability of the Ministry comprises 43 research organisations in various forms of ownership, employing more than 3 000 people or 0.2 per cent of the total number of workers in the transport sector.

Research is conducted in accordance with an annual plan, which is divided into general research and research by mode. Priority research areas are: improving the legislative and regulatory framework of transport, the development of information technology, improving the safety of the transport system and environmental protection, implementation of a system of monitoring the transport market, co-ordination of the functioning and development of the transport sector, scientific back-up for specific federal programmes.

Annual spending on research accounts for more than 2 per cent of total federal spending on the transport sector.

## 2. PRESENT SYSTEM OF ECONOMIC RESEARCH

Under the present system of economic research in the Ministry, research for which funding has been provided is contracted out on a competitive basis.

In contrast with the previous system of setting rigid research assignments to departmental scientific organisations financed out of the budget, the current system of co-operation between the Ministry and the scientific community is based on the principle of selecting the best providers and payment according to results.

Research institutes are being broken up into smaller units, independent business entities and scientific groups are being spun off, and small enterprises operating on a commercial basis are being set up.

To a certain extent, the new commercial orientation of research has helped to make research organisations more efficient and brought the structure of the scientific community closer into line with that in countries with developed economies.

Also, the difficulties being experienced by Russia during the transitional period, together with the destabilization of its social and economic situation, are having a damaging impact on the country's scientific potential and disrupting efforts to equip scientific organisations with modern computer technology.

The Scientific and Technical Policy Division, in conjunction with other departments of the Ministry, organises the implementation of scientific research, draws up the Ministry's R&D plan, determines the allocation of funding with the Ministry of Science and Technology and prepares and organises competitive bidding for research contracts.

Each department submits proposals for R&D in accordance with the transport policy objectives it has been set, and which require scientific input.

Nearly 10 per cent of research is financed by an off-budget fund financed by transport enterprises. Similar funds exist in the sea and inland waterway transport departments of the Ministry.

In the framing of transport policy, an important place is given to consultation with transport associations and unions and to co-ordination with regional administrations. Legislation relating to the tax, contractual and legal framework for transport undertakings is jointly formulated.

## 3. COMMISSIONING OF RESEARCH

Research is commissioned by legislative acts of the supreme state organs orby decisions of ministerial boards regarding the preparation and implementation of transport regulation measures. The departmental heads of the Ministry decide whether those decisions need to be accompanied by research.

Contracts concluded between research organisations and the Ministry, represented by the head of the scientific and technical policy division, stipulate the main aims and stages of the research to be carried out and the form of the final documents. During the bid selection process, the Ministry checks that the bidder complies with these requirements.

With a view to framing a unified scientific and technical policy, consistent with the social and economic prospects for the transport sector, programmes and forecasts, sub-divided by scientific and technical area, are periodically drawn up; a medium-term document entitled "Main orientations of scientific and technical policy regarding transport" and an annual R&D plan, are also prepared.

With a view to the development of international transport corridors, research is also being done on the creation of transnational transport links on Russian territory.

## 4. ACCEPTANCE AND EVALUATION OF RESEARCH

Acceptance and evaluation of research is carried out by the department of the Ministry which commissioned it, in conjunction with the scientific and technical policy division.

The main criteria for evaluating research are conformity with specifications and timely submission of reports for each stage of the work. The specifications stipulate basic documents, legislation, programmes, other sources and provisions that should guide the research and be reflected in the reports.

The department commissioning the research supplies the organisation carrying out the research with the basic reference materials and monitors the progress of research and, if necessary, co-ordinates interim research findings with other departments of the Ministry.

If the research is to be performed by several parties, the contract stipulates the lead organisation and the partners. The lead organisation co-ordinates the research and the preparation of the reports.

Under current legislation, state and private organisations, as well as individuals, are equally entitled to tender for research contracts.

State organisations currently account for less than one-quarter of the organisations undertaking research in the transport sector. The bulk of research is carried out by non-state scientific collectives.

## 5. RESEARCH FINDINGS USED BY THE MINISTRY

Research findings are used by the Ministry to promote the development of the transport sector in collaboration with legislative and executive bodies, to co-ordinate the activity of regional administrations and transport management bodies, to regulate and oversee the transport sector, to licence transport undertakings and to deal with transport administration on the ground.

Research findings are used to elaborate a legal environment for transport, such an environment being considered the prerequisite for increasing the effectiveness of the system of state control and the stable functioning of the transport sector.

The effectiveness of the present system of transport research depends, to a large extent, on the conditions of funding research, equipping research organisations with network software, access to

systemic information about the operation of the transport sector and developments in transport legislation, the main problems that exist and the measures planned to resolve them.

The current system of monitoring the transport market does not reflect the actual situation, since it does not take account of the considerable changes that have taken place in the transport system since economic reforms were launched.

In order to provide feedback to enterprises and to enable them to compile complete indicators of their financial and business activity, it is planned to introduce a number of measures to improve transport statistics and to develop licensing.

The difficulties Russia is currently experiencing in collecting tax revenue are having an impact on the funding allocated to science; as a result, research that has been completed remains unpaid.

The funding situation will be improved by making greater use of off-budget financing, contributions from transport undertakings to the Ministry's off-budget R&D funds and disbursements from funds specialised in providing support for scientific projects.

**FRANCE**

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# A CASE STUDY OF FRANCE

## INTRODUCTION

It is by no means easy to give a precise definition of the area covered by research into transport economics, in that the terms "research" and "transport economics" are both open to widely differing interpretations. It is also more than possible that definitions of these terms will vary from one country to another. The following discussion will explain the sense in which these terms have been interpreted with regard to the situation in France.

However, in order to understand the situation in France in this area, or rather the peculiarities of the situation in France, it is worth drawing attention to a number of distinctive national characteristics. France is a country which:

- produces cars, railway locomotives and rolling stock;
- builds motorways and nuclear power plants;
- has a low population density;
- has recently (and partially) devolved administrative power to the regions;
- has a powerful government administration, staffed almost exclusively by the graduates of a very small number of *grandes écoles* (engineering schools);
- has a Transport Ministry which is divided into sectoral directorates by mode and whose remit is limited strictly to transport;
- is divided into a large number of basic territorial units (36 000 communes);
- has a large public and quasi-public sector (SNCF, RATP, Highway Operators, etc.);
- draws a schizophrenic distinction between "studies" and "research", i.e. between "theorists" and "practitioners". This latter distinction is perhaps the one that is hardest for foreigners to understand since it reflects the structure of the French educational system in which the universities co-exist with *grandes écoles*, whose graduates have a very different type of culture and, above all, pursue very different types of career.

It is almost tempting to complete this eclectic and somewhat idiosyncratic list of attributes with the fact that France also produces a large variety of cheeses and fine wines!

However, to return to more serious matters, it would be fair to say that these characteristics have an impact on the structure (or lack of structure) of the social and economic research system:

- Powerful lobbies opposed to research (or the application of research findings);
- The difficulty of pursuing an overall approach;
- Far-reaching structural changes in public procurement with the increased importance at the national level of the Ministries of Urban Development and the Environment and, at the local level, of the demand for expert services from public authorities;
- Weaker and later impact of "sustainability";

Against this background, it is hardly surprising that transport, unlike the situation in English-speaking countries, has not been organised into a separate area of scientific study (with its own elite, schools and publications), but is instead usually grouped together with sociology to form the not so much meaningless as indeterminate subject of the socioeconomic analysis of transport, an area that is highly sensitive to changes in the economic climate with regard to public procurement.

It would only be a very mild exaggeration to say that, in line with the distinction drawn above, for many years transport was not considered to be a "scientific field" worthy of interest to "theoretical" university researchers and that "practical" engineers had no need to devote time to socioeconomic considerations in order to keep traffic flowing and design infrastructure.

It might be helpful at this stage to look briefly at the historical background before describing the current system and analysing its strengths and weaknesses.

## 1. RECENT HISTORY OF THE SOCIOECONOMIC ANALYSIS OF TRANSPORT[2]

### 1.1. The 1970s

The initial basis for the current organisation of the socioeconomic analysis of transport in the early 1970s may be seen in the creation of the *Institut de Recherche des Transport*s (IRT), which was later to become the INRETS in 1985 after merging with the ONSER and, above all, with the introduction by the Ministry of Research in 1973 of the "special research theme programme" (*action thématique programmé* -- ATP) for the socioeconomic analysis of transport.

Aided by the events of May 1968, there was a sea-change in this area which led to the introduction of sociological and economic considerations into transport research studies.

This change in emphasis is largely attributable to a number of strong-minded academics who based their professional case on a high degree of personal militancy that was highly unlikely to have any lasting impact on an administration dominated by civil servants recruited from the *grandes écoles*.

Two vestiges nonetheless remain of this period: the first and most obvious example is the INRETS, but the second and perhaps the most important is a certain degree of recognition by technical and administrative circles of the need for an overall approach, at least with regard to urban development. The CETUR (later to become the CERTU), established in 1976, is the most obvious indication of the account taken by the technology community of the need for such an overall approach incorporating socioeconomic elements to urban mobility.

However, apart from these two bodies, both of which are administered directly by the Ministry of Transport, there has been no lasting creation of a scientific community for the study of transport economics, the one notable exception being the *Institut d'Etudes Economiques de l'Université de Lyon II* which later produced the LET (*Laboratoire d'Economie des Transports*), set up in collaboration with the ENTPE.

It would be fair to say that the efforts in the early 1980s to construct a research base in response to the ATP on the socioeconomic analysis of transport simply died a death ... and that for some time these efforts would remain a marginal "sub-product" of the five-year technology-oriented plans that we shall now examine.

### 1.2. The PRDTTT (1983-1988)

While the ministries had already identified a number of research areas pursued in conjunction with major industrial programmes but treated separately, the PRDTTT, the first technological R&D programme for inland transport, was launched by joint decision of the Minister responsible for transport and the Minister responsible for industry and research in November 1983. This programme first introduced what was later to become a tradition in the field of transport research, the idea of a "mobilising", "target-oriented" or even "priority" programme, the latter being a term already in use in other research sectors.

The programme was largely managed by an Evaluation and Prospective Studies Committee, made up of twenty or so well-known figures and chaired by Mr. Lagasse (Director of scientific and technical affairs at Renault and the author of a preliminary report to the PRDTTT) and a liaison team drawn from administrative departments and major project monitoring committees.

The first programme designed to ensure the co-ordinated mobilisation of public authorities, industry and research bodies, the PRDTTT, was divided into four subject areas: rail transport (A), road traffic management (B), organisation of transport systems (C) and automobile technology (D).

Research area (C) covered all the social and organisational aspects of urban and regional transport, nuisances and comfort, freight transport and social sciences applied to transport. The latter topic was subsequently described as "heterogeneous" in later assessment and an analysis made of its primary dysfunctions; the main cause of the difficulties encountered with this topic, in addition to a certain degree of anger felt towards the mobilisation of teams through successive calls for tender, was attributed to "the excessive dissipation of research teams ... leading to a large number of actions receiving lower levels of funding."

However, this programme clearly paved the way for the account taken of socioeconomic analysis in subsequent interministerial programmes and the emphasis of its distinctive characteristics in national policy towards transport research.

The PRDTTT was to be periodically assessed and the main conclusions drawn from these assessments incorporated into the mission statement regarding the contents and management procedures for the following programme, to be directed by Mr. Payan[3]. In addition to the development of working themes, it will be noted that the management systems were kept in place and expanded and that there was already a need to set up a database and make special recommendations with regard to the social sciences:

- "creation of a committee, funded under a specific budget, for each theme";
- "discontinuation of the tendering procedure with regard to social sciences applied to the transport sector and replacement with two new procedures: 'pluriannual funding for a small number of strong teams' and a simplified and standing 'one-shop' procedure, provided that the future programme meets the specified requirements and that proof can be shown of a partnership agreement."

The Payan report concluded by stating that the efforts undertaken during this initial phase had to be pursued and built upon and, in order to achieve this goal, recommended the adoption of an overall approach in which reliance would be placed on the "government's ability to distribute rapidly, without the customary administrative delays, the funding promised ... ." This latter recommendation was aimed at the programme as a whole and therefore undoubtedly targeted industrial research rather than socioeconomic research.

### 1.3. The first PREDIT programme (1990-1994)

This first programme was launched under heads of agreement signed in March 1990 between the ministries responsible for industry, research and transport, respectively. It was divided into five research areas: rail transport (1); road vehicle technology (2); freight transport (3); road traffic management systems and technology (4) and a fifth theme entitled "organisation of transport systems ensuring mobility".

Despite being organised exactly along the lines recommended by previous assessments, this first version of the PREDIT, chaired by Mr. Payan, the Head of Research at Renault, was to run into management problems, exacerbated by the withdrawal of support by the ministries due to shortage of funds.

The problems that dogged the previous programme were to recur with the following programme, which was faced with the same need to find solutions:

- "The lack of incentives provided by the State", which instead concentrated resources on providing support for industry or prominent operators;
- "The lack of an inventory of work covered by the PREDIT, which precluded the effective monitoring of such a large (FF 2.4 billion) and complex programme[4]";
- "The fact that the only way in which the experts on the Evaluation and Prospective Studies Committee could work was by offering their services free of charge; even getting the experts' travel expenses reimbursed posed problems and led to kafkaesque ramifications[5]";
- "The co-ordination of government departments is starting to fall into worrying disarray ... we cannot but note that administrative delays and errors are starting to accumulate[6]".

In particular, despite the quality of the research projects carried out, a number of negative comments were to be made with regard to socioeconomic analysis and theme 5[7]:

- Irreversible deviation from the initial objectives;
- Lack of coherence and lack of firm directions for the mobilisation of resources;
- Major organisational and budgetary problems;
- In procedural terms, a return to the oft-decried tendering system and piecemeal approval of projects negotiated with administrations;
- The low profile given to research theme 5, low funding and low level of application/dissemination of research findings;
- No standing structure for the programme secretariat;
- No organisation or expansion of the research community.

Why such criticism? It would seem that what could be forgiven the first time around in a new programme, the PRDTTT, could not be forgiven a second time if not put right; or had the assessment criteria become more stringent for the second programme or perhaps the method of managing this first PREDIT programme had genuinely deteriorated compared with the earlier PRDTTT phase?

This brief review of the historical background is not intended to cast light on the reasons behind these events but simply to learn lessons from what happened:

- Failure to place the current PREDIT programme properly into its historical context would run the risk of overlooking the fact that, in terms of both content and forms of organisation or procedures, the current system has been designed in reaction to the criticisms levelled at it; since one thing explains another, it is possible to gain a better insight into the occasionally painstakingly slow process of targeting objectives and planning, the large number of systems needed to both organise and ensure flexibility, the integration into upstream planning of the need for communication and the application of findings, the will to break out of a bureaucratic determinism in order to cope with variety and complexity.
- Now that the new PREDIT programme has been running for two years and, at a time when the half-way stage assessment systems are starting to be put in place, rereading an account of the endemic weaknesses to have plagued earlier programmes should give us no cause for joy in that many of these problems remain topical and should encourage us to remain vigilant. Although a fuller discussion will follow later in this paper, it is worth mentioning, for example, some of the potential problems that lie ahead:
  - The apparently smooth functioning of the PREDIT programme may be hiding weaknesses in the partnership arrangements (no specific budget for the programme and the possibility that the policy directions and options taken with regard to the PREDIT programme may not be taken into account in the annual budget programmes of ministries and agencies);
  - The lack of resources allocated to standing managerial structures means that work must either be carried out free of charge or given to sub-contractors and trainees;
  - The partnership arrangements between administrations have been unable to overcome the prerogatives, grading systems and independence of certain sectors of ministries;
  - There is a structural mismatch between the selection of research projects under the PREDIT programme and the procedures employed by government departments to commit funding, given the failure to match funding rules to the programme's objectives;

- The complexity of the organisational structures leads to delays and limits ability to respond (several hundred experts have been called upon to take part in the various groups set up under this new PREDIT);
- The linkage to other programmes, at both national and European level, still remains limited.

Treading a middle path between the two extremes of the fatalistic "bad luck always comes in threes" and the "this time things will be different" siren-call of novelty, continuity and improvement are undoubtedly the two cornerstones that will provide the basis for further planning and action with regard to the management of public research. In other words, as part of the continual process of which it is part, the current stage of the PREDIT programme, regardless of its own internal dynamics, must be understood as the outcome of the previous efforts reviewed above. However, the current situation must also be seen as the new foundation on which the next programme will be established, either as a complement to or a reaction against what has preceded but nonetheless as part of a continual process.

## 2. THE SCOPE FOR FUTURE DEVELOPMENT OF PUBLIC RESEARCH AS MATTERS STAND AT PRESENT

It is clear from the above that, following the implementation of the socioeconomic ATP and then the PRDTTT and PREDIT 1 programmes, the transport economics research community is notable for, firstly, the strong dilution of research potential between different bodies, which nonetheless remain highly polarised around the Ministry of Transport and, secondly, the low number of potential researchers actually mobilised.

### 2.1. Large number of bodies

Starting inside the Ministry of Transport and then moving outwards we find the following:

#### *2.1.1. Within the Ministry of Transport*

a) A directorate of research and scientific and technical affairs (DRAST) responsible for:

- firstly, supervising the science and engineering network run by the Ministry of Development, Housing and Transport. This network includes bodies such as INRETS (National Institute for Research into Transport and Safety, a research body supervised jointly by the Ministry of Transport and the Ministry of Research), the CERTU (Centre for Research into Networks, Transport, Urban Development and Public Building, a department of the Ministry of Transport) and SETRA (Roads and Highways Engineering Department);
- secondly, supervising and co-ordinating the work carried out by the Ministry under the interministerial transport research programme (PREDIT 1996-2000). It also provides the staff and resources needed to run the standing secretariat for this programme. In particular, the DRAST is responsible, in connection with the PREDIT programme, for supervising the strategic research and urban travel management research themes which cover research relating to socioeconomics;

b) The other sectoral directorates (Directorate of Inland Transport, Highways Directorate, Safety and Road Traffic Directorate, General Directorate of Civil Aviation, Directorate of Maritime Transport, Ports and the Coastline) have study budgets, and sometimes research budgets too, which allow them to fund socioeconomic studies and research. A committee, made up of all the directors with responsibilities for transport, ensures the necessary co-ordination even though, by all accounts, this committee gives priority to operational rather than research issues;

c) Technical bodies such as SETRA, CERTU, CETE, etc.;

d) Ministerial departments at the level of the *départements* and regions (regional directorates for development, departmental directorates for development) fund studies relating to the territory under their jurisdiction.

#### *2.1.2. The following actors also work in conjunction with the Ministries:*

e) Scientific bodies administered jointly by the Ministry of Transport and the Ministry of Research: INRETS, *Ecole Nationale des Ponts et Chaussées*;

f) Major public bodies and enterprises: *Réseau Ferré de France* (manager of rail infrastructure), SNCF, RATP, which carry out or commission third parties to carry out transport economics projects or studies for their own needs.

#### *2.1.3. Not administered by the Ministry*

g) Universities working in the transport field: Lyon 2 (*Laboratoire d'Economie des Transports* -- LET), Aix Marseille (*Centre de Recherche en Economie des Transports*), Toulouse, Cergy, etc. Some *grandes écoles* such as *Mines de Paris*, *Ecole Polytechnique*, etc.;

h) Research bodies such as the CNRS (*Centre National de la Recherche Scientifique*);

i) Various public bodies: urban development agencies (particularly in Brest, but also Bordeaux and Strasbourg);

j) Local and in particular regional authorities, which may fund research infrastructure (provision of premises, equipment, etc.) or research projects;

k) A large number of design and engineering consultancies which have developed research capacities in this area, usually as a sideline to their main activity.

### 2.2. The potential for public research

A survey of public research bodies [which include in particular the bodies specified in paragraphs (e), (g) and (h) above] carried out under the PREDIT programme made it possible to determine the potential number of researchers in such bodies involved in research into inland transport. A table summarising the results of this survey is attached in Annex 1.

Clearly, this general survey does not address directly those areas of concern to the ECMT. However, it would seem possible to obtain a fairly reliable approximation of the potential number of researchers involved if account is taken of the fact that the classification used in this survey covers the following aspects of economic research and corresponding full-time equivalents (FTE):

1. Mobility and its determinants ..... 46.50 FTE, of which
   - 1.1 Economic determinants ..... 8.3 FTE
   - 1.2 Life-styles, behaviour, location ..... 20.7 FTE
   - 1.3 Outlook ..... 17.5 FTE
5. Policy, regulation and economy of the sector ..... 44.0 FTE, of which
   - 5.1 Public policy ..... 24.8 FTE
   - 5.2 Legal and institutional aspects ..... 6.3 FTE
   - 5.3 Economy of the sector ..... 12.9 FTE

This yields a total of 90 full-time equivalent researchers within public research bodies involved in transport economics in the broad sense of the term, compared with 1 100 active researchers in the inland transport sector.

This extremely low percentage, merely 8 per cent of public research into the most "public" of domains, does not seem likely to change in the near future, given the number of doctoral students in this area: 76 FTE out of 830 FTE are currently working in the transport economics sector in the broad sense of the term as defined above.

Two pessimistic comments may be made at this point:

- Economics in the strict sense of the term only has 13 FTE workers;
- There would appear to be absolutely nobody working in what is held to be the fundamentally important field of the legal and institutional aspects of intermodality!

However, these two pessimistic observations may be offset by two rather more optimistic ones:

- Since the figures represent full-time equivalents, it would be fair to assume, as a first approximation, that the researchers surveyed spend between a third and a half of their time working on these topics. The "human" potential that can be harnessed should therefore in practice be between two and three times larger;
- The survey does not properly take account of the potential that can be mobilised outside the traditional transport sphere (such as lawyers or economists who have never worked in this area but who might do so in the future). In addition, the survey takes absolutely no account of the research potential of the private sector.

Clearly, the current PREDIT is attempting to work in the most "optimistic" directions by embracing an increasingly wide range of actors. This aspect is the one that we shall now examine.

## 3. SOCIAL ECONOMIC ANALYSIS IN THE PREDIT 1996-2000 PROGRAMME

A brief general presentation of the PREDIT programme is given in annex and we shall therefore limit our discussion here to "socioeconomic" aspects and the problem over definitions mentioned a number of times above. We shall reverse the order of presentation previously adopted by attempting to show how the structure of the programme -- in terms of both contents and management -- has been designed to attempt to obtain more relevant replies by harnessing a broader segment of the "world of research".

By analogy with the 4th R&D framework programme, socioeconomics may be considered to be dealt with under the "strategic research" theme[8], even though, in the PREDIT as in the 4th R&D framework programme, other themes also address socioeconomic issues.

### 3.1. A three-fold objective: to understand, help and provide insight

Transport interacts strongly with changes in life-style or production, urban or demographic change, environmental constraints or those relating to energy and technological, organisational or financial changes in the sector. *The general objective of "strategic research" is therefore to improve the overall understanding of the transport system and its environment*; to do that, it is necessary to:

- collect data and carry out relevant analyses;
- develop the benchmarks and tools needed to assist the decisionmaking process;
- plot the possible future development of mobility in the long run.

A steering committee, consisting of some 15 leading experts and chaired by Maurice Bernadet from the *Laboratoire d'Economie des Transports* (LET), was set up to address the issue of strategic research. This committee lays down the directions for the Strategic Research theme and either selects research projects directly or delegates that task to the working parties for mobilising programmes.

The steering committee meets three or four times a year and is assisted in its daily work by a science secretariat supplied by the Directorate of Research in the Ministry of Transport (DRAST) and responsible for managing the programme (funding commitments and follow-up of research, relations between administrations, logistics, logbooks, co-ordination and overviews, communications).

This system complies with that planned for the PREDIT programme as a whole, namely:

- a general framework set out in an interministerial protocol;
- the lines of research of the 13 themes covered by the programme are set out in a statement of objectives approved by a planning council;
- the steering committee for each theme clearly identifies the lines of research and in some cases may break them down into "mobilising programmes";
- the "mobilising programme sub-committees" draw up calls for proposals, choose proposals and follow up on approved projects under the supervision of the theme steering committee.

In the case of the strategic research theme, the possibility of stepping down managerial focus has been used to apply "mobilising programmes" to only part of the field. In practice, there are therefore three types of organisation operating in parallel:

- **mobilising programmes**, with clearly identified political or societal objectives which allow scientific advances to be made in a given research area while leaving scope for action in the short term. Most of the funding effort and supervisory activities, as well as the developments outlined in this paper, are directed towards such mobilising programmes;
- **complementary research**, which makes it possible to investigate in greater depth certain themes addressed by work programmes in progress, encourages the emergence of innovative ideas arising from research activities or their users, or allows technology watches and future studies to be initiated;
- **accompanying measures** for research programmes, aimed at the logistical aspects of research management and co-ordination, the organisation of or participation in various types of activity and the growing work involved in communicating and capitalising on research findings. These systems are an indispensable complement to research actions and play an increasingly important role in the success and impact of programmes[9].

### 3.2. Mobilising programmes

These eight priority programmes, despite being completely separate from each other, can nonetheless be divided into three categories:

- The first two groups, "information systems" and "employment and social watch", are relatively new topics within the field of transport research and are designed to lend structure and provide knowledge input in their area;
- These first two groups are followed by a further three, "decisionmaking and assessment processes", "costing the external effects of transport" and the "socioeconomic relevance of new technologies, innovation time-scales", are designed to assist in decisionmaking and assessment, either through an analysis of the interactions between actions or by new forms of economic calculation or through new methods of assessing technological choices;
- The last three groups, "mobility, economic development", "transport locations: continuity and breaks" and "non-motorised travel and non-private use of private cars", addressing topics that link mobility and territorial management at different levels, are aimed at monitoring possible trends in mobility in the medium and long terms.

Mandated by the steering committee, each of the "programme groups", which are also made up of a chairman, secretary and panel of experts, sets priorities, organises calls for proposals, selects research projects and supervises the research programme in order to ensure the application and dissemination of research findings.

Each of these mobilising programmes will now be examined in greater detail below.

#### *3.2.1. New fields of research aimed at providing an insight into complexity*

*Information systems*

While the changes made to transport monitoring systems must reflect the changes in the needs of the transport sector itself and its environment, they must also remain consistent over long periods of time in order to allow the requisite comparisons to be made over the long term.

Moreover, information systems must reconcile growing demands and technical feasibilities with the diminution of the statistical system, due as much to increased competition as to institutional change or the opening of borders ...

The Information Systems theme has, for the first time in France, been incorporated into a national research programme. The scope of the work of the group, based on the experience gained from earlier work (CEDIT), must match demand from other PREDIT groups in terms of databases as well as linkage with EU projects under the 4th R&D framework programme.

*Employment and social watch*

While the transport sector is a net creator of jobs, the disparities and differences in forms of development between types of enterprise, jobs or skills identified in the sector are such that this relatively new area in transport research needs to be brought properly into focus through the three inputs contained in the first call for proposals:

- Quantitative trends in branches of the sector, modes of regulation and various forms of organisational innovation;
- Qualitative and sociological investigations of changes in jobs, trades and qualifications with reference to organisational, technological and social changes;
- A more diffuse social demand as a result of "new requirements" (security, new services, exclusion), giving rise to new types of job, primarily in the area of urban public transport.

### *3.2.2. Assistance with decisionmaking -- development of tools*

*Decisionmaking and assessment processes*

The crisis in economic methodology and the crisis over the notion of general interest are seriously undermining the concept of "assistance with decisionmaking", both from a technical and from a political standpoint. The general objective of the programme is to "attempt to produce fairer assessment and better-founded decisions in order to ensure more consistent policies."

This group addresses the various stages in the provision of aid with the decisionmaking process and assessment of projects or transport policies, in terms of both procedures and processes (comparison, choice, selection, follow-up, overall result, impact) and is broken down in terms of the spatial scale (urban, regional or intercity, national, international)[10].

To ensure that decisionmaking is both reliable and acceptable, the first call for proposals for the programme is aimed initially at analysing practices concerning the design and implementation of projects and transport policies such as major transport projects or Urban Mobility Plans.

*Socioeconomic relevance of new technologies, time-scales and innovation in decisionmaking and assessment processes*

Due to past mistakes, the current wave of new technologies (notably NICTs[11]) and the risk of rapid obsolescence associated with the latter, there is considerable social demand for the choice of technology to be properly assessed. The aim of the programme is to develop tools or procedures that can help in the supervision of projects involving technological innovation in the field of transport on the basis of socioeconomic analyses addressing the following:

- The management of innovation in response to organisational and institutional change focused on the end-user;
- The integration of "off-the-shelf" technologies from other areas, notably telematics;
- Local innovation networks versus traditional, single-mode institutions;
- The new time-scales applicable to decisionmaking processes and project financing.

The call for proposals made it possible to select several research proposals based on case studies of technological products or systems, whether they are successful or not, or rather more prospective or comparative case studies of technology supply and its environment.

The initial work primarily addressed projects involving breaks in technology, systemic analysis of the freight sector or innovation policy with regard to privatisation.

*Costing the external effects of transport*

There is a strong demand for tools capable of assessing and costing the external effects of transport, i.e. tools that can take account of noise, pollution, health impacts of transport, the greenhouse effect, etc., in economic calculations.

Current economic calculation methods have reached their limits and the aim of this research group is to find new approaches that can provide national values for such costing exercises.

Further to the identification of various methods (avoidance cost, cost of personal injury and damage to property, depreciation of real estate values (hedonistic values), willingness to pay and to receive compensation (contingency assessment), a call for research proposals was issued. The initial work addresses the costing of the noise generated by rail and road traffic as well as state-of-the-art measures to combat air pollution, severance effects and the impacts on public parks and gardens or the landscape.

### *3.2.3. Mobility and territorial developments -- some insights and recommendations*

*Mobility, economic development, upgrading*

Research has already been conducted into this theme, whose importance with regard to the future development of cities and urban mobility is universally recognised, but has not been properly organised into a coherent whole. The group therefore defined its general programme as research into the major determinants of mobility and analysis of the influence of transport on the urban system and the location of activities:

- Strategies aimed at siting household service activities in peripheral areas of urban centres: a call for proposals enabled research projects to be launched with regard to most of the commercial, cultural, public, etc., services considered to be new sources of mobility in peripheral areas (cinema complexes, fast-food outlets, educational or employment services, shopping mall, etc.);
- The links between forms of development in peripheral urban areas, strategies adopted by local authorities and their implications with regard to mobility;
- Assessment and understanding of congestion.

*Transport locations -- continuity and breaks*

From the standpoint of both passenger and freight transport, the strategic importance of sites undergoing comprehensive redevelopment (platforms, stations, transhipment centres) merits further analysis and promotion. The group, which noted the emergence of problems common to such theoretically disparate universes and objects as those relating to passenger and freight transport, issued a call for proposals and selected research projects addressing the following issues:

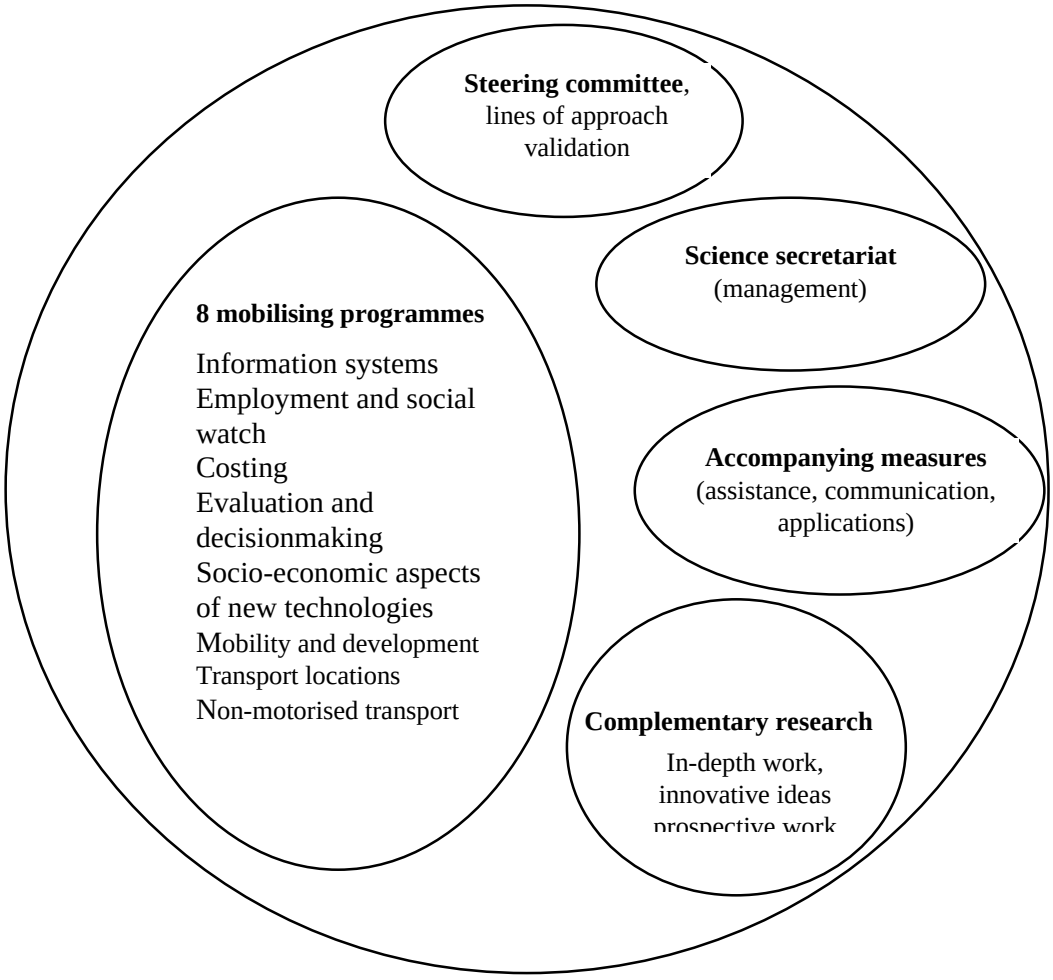
- The distinctive characteristics of intermodal connection sites (architectural aspects and associated services);
- Location (economic aspects, design partnerships, integration into the urban environment);
- Operation and management (everyday and emergency management, organisation of operators and co-operation between operators);
- Attractiveness of sites (user-friendliness, urban sophistication, residential or professional use).

Forthcoming projects will address the linkage between inland transport systems and port or airport platforms.

*Non-motorised travel and non-private use of private cars*

Car traffic is currently the main source of damage to the environment in urban settings. However, unlike the situation in other countries, knowledge about and use of non-motorised modes of transport is not yet widespread among planners, a fact reflected in proposals regarding changes in urban transport policy. An initial series of research projects addressing non-motorised modes of transport has been launched with a view to obtaining detailed information regarding the practices and behaviour of users of non-motorised modes of transport or the savings afforded by measures such as reserved lanes or car-sharing.

**THE PREDIT STRATEGIC RESEARCH PROGRAMME**




### 3.3. An initial evaluation in 1997

If we were to succumb to the temptation to blow our own trumpet in public, we could point to the fact that, in 1997 alone, the strategic research group undoubtedly held more seminars to exchange information and follow up on findings than were held during the fifteen previous years since the PRDTTT programme was first launched in 1983! However, those whom this might offend would instantly retort -- and quite rightly -- that starting with nothing we have not yet accomplished much. A cynic might say that that was already quite a lot.

On a more serious note, however, there have been advances which reflect a break with the past, even though what has been achieved still remains to be consolidated. In particular:

### *3.3.1. A clear programme of scientific research and a simple* **modus operandi**

It might seem odd but it is worth recalling that the PRDTTT and PREDIT 90-94 programmes did not actually produce a programme as such but "simply" an interministerial protocol referring non-explicitly to a preliminary report. PREDIT 1996-2000 would seem to be the first programme to be based on a document whose science content has been properly validated and which in addition explains how it is designed to work. This advance has made it possible to set up a decentralised supervisory system which (to a certain extent) allows monolithic managerial structure to be broken down into smaller elements.

### *3.3.2. Decentralised supervision*

At the beginning of the year, the theme steering committee and the eight programme groups produced initial "lines of approach", a synthesis of programme work and a framework for the future; in the course of 1997, over fifty meetings to organise the work of programming, selecting and supervising research activities were held between researchers, experts and government departments, bringing together 140 experts in the various levels of supervision of the strategic research programme. The eight programme groups manage their theme under the supervision of the steering committee, but are afforded a large degree of autonomy. Meetings between the steering committee and the chairmen of the programme groups ensure consistency without any undue degree of formality.

### *3.3.3. A co-ordination and outreach system*

The strategic research group organised four seminars in 1997, aimed at presenting its programmes to the socioeconomic research community and its users. In addition, it carried out an audit of other PREDIT groups in order to be able to respond more effectively to demand for socioeconomic and prospective research.

In addition to the lines of approach document mentioned above, the group published a four-page bilingual document in French and English. It also published a report on its activities in 1997, with a description of the research in progress or completed. This report is available on the Internet.

In more quantitative terms, compared with the situation outlined in the 2nd and 3rd section of this paper, it should be noted that:

- 20 out of the 41 research projects funded in 1997 were conducted by teams that had not had a contract under the previous PREDIT;
- 25 projects were conducted in the private sector, compared with "merely" 16 in the public sector.

### *3.3.4. Success of calls for proposals*

The procedure for issuing calls for proposals in the socioeconomic research field had been decried and even condemned in assessments of, or preliminary reports on, the previous programmes. The routine use of this procedure has been the rule for all the mobilising programmes and has had two major benefits:

- It has opened up the programme to new teams: over 130 proposals were received;
- Most of the research effort (two-thirds) has remained focused on the lines of approach determined beforehand[12].

Furthermore, competition between proposals followed by appraisals by different experts would, in principle, seem to be a guarantee of higher quality than that afforded by "administrative despotism, even if it is enlightened".

The mistake made in the previous appraisal of the PRDTTT and PREDIT 1 is doubtless due to the fairly obvious benefits of hindsight: it is easier to mobilise unknown teams to pursue research in known lines of direction than to mobilise known teams to work in unknown lines of direction.

#### *3.3.5. The system nonetheless still remains highly fragile*

The first comment which needs to be made is that this system is based on skill and in many cases the free provision of services by a few individuals. It would probably be fair to say that the functioning of the system relies upon fewer than a dozen motivated individuals, without any real support from a consolidating organisational structure. It is clear, on the other hand, that the resources needed to manage a research programme and to capitalise on the resultant findings increase at much the same speed as ... the interest shown by the politicians and decisionmakers who initiated the programme wanes.

## 4. VALUE JUDGEMENT ON THE CURRENT SYSTEM AND THE OUTLOOK FOR ITS FUTURE DEVELOPMENT

The preceding comments obviously display a personal bias that many people might feel misplaced or simply wrong, but until the findings of the half-way stage assessment of the entire PREDIT programme are available, in principle by the end of 1998, it is nonetheless possible to make a few tentative comments, in a personal capacity, of what might be held to be the strengths and weaknesses of this system.

### 4.1. Strengths

Without any doubt, the main strength lies in the organisation of the research themes put in place. Although the structural complexity of the system as it stands makes it necessary to devote substantial time and effort to explaining how it works, after two years of operation it would seem that the structure is basically sound and that people are starting to learn how to use it. Evidence of this may be seen in the following:

- A satisfactory level of mobilisation of research teams, which have replied in large numbers to the proposals launched under the programme;
- Renewed contracts with many research teams, and notably new entrants in the field;
- Satisfactory operation of the "programming, publication of calls for proposals, selection" procedure;

- A fairly satisfactory level of co-ordination of funding decisions between partners in the administration;
- The structure of the programme makes it possible both to raise the profile, over time, of research priorities and to maintain a certain degree of flexibility over the choice of projects, including those relating to new themes, through calls for innovative ideas and through investigation of themes in greater depth;
- The active efforts made to co-ordinate the programme with the 4th R&D framework programme are exemplary and have included contacts between officials and the organisation of meetings and seminars, even though the results in practical terms are still at a rudimentary stage;
- The benefits derived from the programme, its objectives and operating procedures are satisfactory at this stage of the programme. It is planned to make a major effort to capitalise fully on the results, notably with a view to using them to formulate public policy.

### 4.2. Weaknesses

Besides the weaknesses outlined in paragraph 1.3 above, the following points are probably worth mentioning:

- A survey carried out at the request of the steering group has revealed the chasm that still lies between strategic research and those who conduct it and the researchers involved in projects with a more technological slant. The cultural divide between these two communities still remains wide and efforts are currently being made to present and summarise the work of both sides in order to remedy the situation;
- The ability of strategic research to influence the decisionmaking process, at the European, national, regional or local level, still remains to be demonstrated. There is a certain degree of incompatibility between researchers who aim to become part of a leading elite in order to be recognised by their peers and decisionmakers who want a pragmatic and comprehensive approach in order to be able to come to grips properly with all the aspects of a given situation;
- The organisation that has been put in place is based upon a small number of individuals who, over time, have become accustomed to exchange information and to work together. As a result of this, the organisation is far too tenuous and fragile;
- The PREDIT is neither designed or able to co-ordinate all the economic research carried out in the transport field. A certain number of research projects remain outside its scope of action. Linkage with the 4th R&D framework programme, in particular, remains too weak;
- The number of proposals made by pluridisciplinary teams remains very low, a result attributable as much to the working practices of research laboratories as to the administrative difficulties in processing such proposals;
- Some areas attract little interest (modelling, taxation, prospective studies, etc.). A call for proposals in specific areas was in fact issued in 1998 in order to lend impetus to such research. The question now is to what point the number of mobilising programmes can be increased without spreading efforts too thinly .. but can we reasonably deny ourselves the insights that research can bring in such areas?

In view of what we know about similar systems in other countries, notably within Europe, it is reasonable to think that many lessons can be learned for France's organisation of research from

Sweden's experience with regard to the assessment of transport research and the experience of the Netherlands with regard to the emergence of new topics and original themes.

### 4.3. Conclusion

Since we opened this paper with a few comments aimed at explaining the peculiarities of the French system and the weakness of the socioeconomic research sector, we shall complete the circle by ending with a review of a number of developments which might help to dilute these particularities and at the same time to enhance the research potential. The following comments are not intended to be exhaustive and are not ranked by order of importance:

- EU framework programmes of research have already substantially modified both the contents of programmes and the practices of research teams at the national level in France. In purely practical terms, it is likely that the practices of issuing calls for proposals would have been universally condemned had it not been for the "Brussels precedent";
- The emergence (at long last) of environmental issues in the transport sector, which challenges previous practices (hence the emergence of new research topics) by involving outside teams in the traditional field of transport;
- The gathering pace of decentralisation and associated redefinition of powers, which is fuelling demand for counter-appraisals (favourable to the development of research) and greater concern over operational aspects (better liaison between the research sector and the decisionmaking process);
- The emergence of competition (deregulation, etc.), which is prompting operators to ask questions regarding their future and the Government to ask questions regarding its role. Now that market forces have started to appear in the transport sector, "real" economists are starting to take an interest, particularly in the economics of regulation. Since transport is no longer a sector administered by government, there is an even greater need for economic analysis of trends in the transport sector and, by the same token, the administrations responsible for regulating the sector;
- Problems in urban areas have become such pressing issues that the Government can no longer afford to ignore them and a macroeconomic approach has now become essential, thus going once again beyond traditional approaches based on the internal profitability of modal projects. At the other extreme, the globalisation of the economy also calls for global approaches.

In short, it would clearly seem that the over-determination of the transport sector through the three components of sustainability (economic, social and environmental aspects) is increasingly becoming a daily reality in the unstoppable opening-up of the sector to competition.

The climate was right for the practices established under the previous programmes to be challenged and the strategic research group was able and willing to grasp this opportunity to redefine the issues in the field of transport socioeconomic analysis by bringing in new research teams.

Will the superstructure be able to evolve in a way which will ensure that knowledge can be capitalised upon in order to improve public decisionmaking?

Unfortunately, there is as yet no answer to this question.

## NOTES

1. Ce texte reprend très largement des éléments d'une note interne de P. FIGUERAS (Secrétariat permanent du PREDIT) et surtout d'un document-bilan (à paraître) établi par A. PENY, (Secrétaire scientifique du thème Recherches Stratégiques).

   Ce texte a de plus bénéficié des remarques de A. BIEBER, C. BERLIOZ (SNCF), M. BERNADET (LET-PREDIT), G. BOURGEOIS (RATP), J. COLIN (CRET), Y. CROZET (LET), M.-C. GRIMA (DAEI), G. JOIGNAUX (INRETS), A. MORCHEOINE (ADEME), J.-M. OFFNER (LATTS), E. QUINET (CGPC), mais bien entendu les idées exprimées ici n'engagent que leur auteur.

2. For more information please consult:

   - Jean-Marc Offner, *20 ans de socioéconomie des transports urbains en France, Les Cahiers Scientifiques du Transport*, pp. 125-140, No. 22/1990.

   - The various reports presenting and/or assessing various programmes (the Lagasse report on PRDTTT, the Payan report on PREDIT 1, the Causse assessment).

3. The information given in this chapter has been drawn from "*Les transports terrestres, recherche et développement*", report by the Commission chaired by J.J. Payan, *La Documentation Française*, Paris, 1990.

4. This diplomatically worded comment simply means that there was no reliable list of the research projects funded!

5. Final report on the PREDIT programme (1990-94), Messrs. Causse, Bellec and Smagghe.

6. Report on activities in 1993 by the PREDIT Evaluation and Prospective Studies Committee.

7. Taken from the assessment made by R. Fichelet: "*Elements pour un bilan du PREDIT, thème 5 : Organisation des transports et systèmes de mobilité*", 1994 report by the DRAST, No. 42.

8. It would not be appropriate here to hold forth on the effect of this change of terminology, either in terms of the "empowerment" of researchers or "consideration" by the theoretically hostile world of "engineers" ... However, what ranked bottom in the previous programme is now ranked first!

9. Further information on the planning and organisation of the programme may be found in the document "*Recherches Stratégiques, document d'orientation*", published by the DRAST in May 1997 (Tel. 01 40 81 14 30; fax 01 40 81 14 44).

10. A seminar was organised in February 1997, when the group was launched, in order to conduct a thorough survey of the field of research. The proceedings of this seminar were published in collaboration with the DRAST and PREDIT under the title "*Evaluer et décider dans les transports*" in issue No. 106/107 of *Metropolis Review*, June 1998.

11. New information and communications technologies.

12. "*When attempts start to be made to change the lines of approach of a given research programme, the speed at which the directions of research change rapidly overtakes the speed at which the research progresses*", Yves Dubreuil, Renault, member of the steering committee for strategic research.

**ANNEXES**

| **Total bodies** | | **Transport system components** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of researchers (FTE) | | A – Transport system as a whole | | | B – Road component | | | C – Rail component: train and others | | D – Intermodality, other modes | | E – Users, drivers | | Total |
| Aspect of research | | A1 Freight | A2 Passengers | A3 Undif-ferentiated | B1 Infrastructure (ex. civil works) | B2 Freight vehicles | B3 Passengers vehicles | C1 Infrastructure (ex. civil works) | C2 Vehicles (passenger, freight) | D1 Terminals | D2 Other modes | E1 Passengers, charterers | E2 Drivers (professional, individuals) | |
| **1** | **Mobility and its determinants** | **3.75** | **13** | **18** | **1** | **0** | **3.2** | **0** | **0** | **1** | **0** | **1** | **0.75** | **41.7** |
| 1.1 | Economic determinants | 2 | 3 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| 1.2 | Life-styles, behaviour, location | 0.75 | 7.25 | 8 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0.5 | 18.5 |
| 1.3 | Outlook | 1 | 2.75 | 8 | 0 | 0 | 3.2 | 0 | 0 | 0 | 0 | 0 | 0.25 | 15.2 |
| **2** | **Design and development of technical ressources** | **1** | **12** | **200.8** | **13** | **56.4** | **196.9** | **11** | **31** | **0** | **1.7** | **0** | **1** | **524.8** |
| 2.1 | Structural components and materials | 1 | 7 | 68.3 | 11.5 | 27 | 68.7 | 7.5 | 21.7 | 0 | 1 | 0 | 0 | 213.7 |
| 2.2 | Engines and transmission systems | 0 | 4 | 44 | 0 | 12.13 | 62.87 | 0 | 5.2 | 0 | 0 | 0 | 0 | 128.2 |
| 2.3 | Energy and fuel supply chain | 0 | 1 | 53 | 0 | 11.1 | 22.3 | 0 | 0 | 0 | 0 | 0 | 0 | 87.4 |
| 2.4 | Sensors, automatic systems, other | 0 | 0 | 35.5 | 1.5 | 6.17 | 43.03 | 3.5 | 4.1 | 0 | 0.7 | 0 | 1 | 95.5 |
| **3** | **Organisation, operation** | **7** | **5** | **35.7** | **3.5** | **4.5** | **27** | **1** | **14** | **1.5** | **0** | **4** | **4.5** | **107.7** |
| 3.1 | Quality of services, comfort, quality of usage | 0 | 0.5 | 1.5 | 1.5 | 0 | 15 | 0 | 3 | 0.5 | 0 | 4 | 3 | 29 |
| 3.2 | Operations engineering, traffic management | 0 | 3 | 11 | 1 | 2.5 | 6 | 0 | 5.5 | 0 | 0 | 0 | 0 | 29 |
| 3.3 | Communications systems, logistics, telematics | 7 | 1.5 | 23.2 | 1 | 2 | 6 | 1 | 4.5 | 1 | 0 | 0 | 0 | 47.2 |
| 3.4 | Work organisation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1.5 | 2.5 |
| **4** | **Impacts of the transport system** | **2** | **6.25** | **46.55** | **6.5** | **11.4** | **31.55** | **2.5** | **9.6** | **0** | **1** | **0** | **3.75** | **121.1** |
| 4.1 | Risks, safety | 0 | 3.25 | 10.25 | 4 | 1.5 | 12.25 | 0 | 7.1 | 0 | 1 | 0 | 3.75 | 43.1 |
| 4.2 | Health | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 4.3 | Air pollution | 0 | 1 | 16 | 0.5 | 6.27 | 13.03 | 0 | 0 | 0 | 0 | 0 | 0 | 36.8 |
| 4.4 | Noise pollution | 0 | 0 | 5.3 | 0.5 | 3.33 | 3.87 | 1.5 | 2.5 | 0 | 0 | 0 | 0 | 17 |
| 4.5 | Wastes and recycling | 2 | 0 | 5 | 0 | 0.3 | 2.4 | 0 | 0 | 0 | 0 | 0 | 0 | 9.7 |
| 4.6 | Environment, other | 0 | 2 | 5 | 1.5 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 9.5 |
| **5** | **Policy, regulation and economics in the transport sector** | **7** | **6** | **14.75** | **0.75** | **1** | **2.25** | **0.75** | **0** | **0** | **0** | **0** | **2.25** | **34.75** |
| 5.1 | Public policy | 2 | 2 | 5.75 | 0.25 | 0 | 0.25 | 0.25 | 0 | 0 | 0 | 0 | 2.25 | 12.75 |
| 5.2 | Legal and institutional aspects | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| 5.3 | Economics of the sector | 3 | 2 | 7 | 0.5 | 1 | 2 | 0.5 | 0 | 0 | 0 | 0 | 0 | 16 |
| **Total** | | **20.75** | **42.25** | **315.8** | **24.75** | **73.3** | **260.9** | **15.25** | **54.6** | **2.5** | **2.7** | **5** | **12.25** | **830.05** |

| **Total bodies** | | **Transport system components** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of staff preparing doctorates | | A – Transport system as a whole | | | B – Road component | | | C – Rail component: train and others | | D – Intermodality, other modes | | E – Users, drivers | | Total |
| Aspect of research | | A1 Freight | A2 Passengers | A3 Undif-ferentiated | B1 Infrastructure (ex. civil works) | B2 Freight vehicles | B3 Passengers vehicles | C1 Infrastructure (ex. civil works) | C2 Vehicles (passenger, freight) | D1 Terminals | D2 Other modes | E1 Passengers, charterers | E2 Drivers (professional, individuals) | |
| **1** | **Mobility and its determinants** | **7.5** | **24.3** | **11.7** | **0.3** | **0** | **0.9** | **1.0** | **0** | **0** | **0** | **0** | **0.8** | **46.5** |
| 1.1 | Economic determinants | 4.0 | 2.0 | 1.5 | 0.3 | 0 | 0 | 0.5 | 0 | 0 | 0 | 0 | 0 | 8.3 |
| 1.2 | Life-styles, behaviour, location | 2.0 | 12.5 | 5.2 | 0 | 0 | 0 | 0.5 | 0 | 0 | 0 | 0 | 0.5 | 20.7 |
| 1.3 | Outlook | 1.5 | 9.8 | 5.0 | 0.1 | 0 | 0.9 | 0 | 0 | 0 | 0 | 0 | 0.3 | 17.5 |
| **2** | **Design and development of technical ressources** | **0.2** | **12.3** | **196.5** | **18.6** | **70.7** | **286.6** | **11.3** | **46.4** | **0** | **2.1** | **0** | **2.0** | **646.5** |
| 2.1 | Structural components and materials | 0.2 | 7.5 | 72.1 | 16.7 | 9.2 | 50.3 | 7.3 | 29.9 | 0 | 0.5 | 0 | 0 | 193.7 |
| 2.2 | Engines and transmission systems | 0 | 4.0 | 35.8 | 0 | 12.6 | 127.4 | 0 | 10.3 | 0 | 0 | 0 | 0 | 190.1 |
| 2.3 | Energy and fuel supply chain | 0 | 0.8 | 50.5 | 0 | 39.8 | 60.7 | 0 | 0.3 | 0 | 0 | 0 | 0 | 152.1 |
| 2.4 | Sensors, automatic systems, other | 0 | 0 | 38.1 | 1.9 | 9.1 | 48.1 | 4.0 | 5.9 | 0 | 1.6 | 0 | 2.0 | 110.6 |
| **3** | **Organisation, operation** | **3.0** | **5.3** | **26.4** | **10.6** | **8.2** | **34.5** | **1.2** | **15.6** | **4.5** | **0.5** | **4.4** | **15.8** | **129.8** |
| 3.1 | Quality of services, comfort, quality of usage | 0 | 1.2 | 2.0 | 6.1 | 1.1 | 16.5 | 0.5 | 3.9 | 1.5 | 0 | 4.4 | 6.8 | 43.8 |
| 3.2 | Operations engineering, traffic management | 0 | 3.3 | 9.0 | 2.6 | 4.1 | 12.4 | 0.1 | 5.5 | 1.0 | 0 | 0 | 0 | 37.9 |
| 3.3 | Communications systems, logistics, telematics | 3.0 | 0.8 | 15.0 | 1.9 | 3.0 | 5.7 | 0.7 | 5.9 | 1.5 | 0.5 | 0 | 3.0 | 40.9 |
| 3.4 | Work organisation | 0 | 0 | 0.5 | 0 | 0 | 0 | 0 | 0.4 | 0.5 | 0 | 0 | 6.0 | 7.4 |
| **4** | **Impacts of the transport system** | **1.5** | **3.8** | **86.1** | **16.7** | **21.8** | **45.5** | **6.7** | **15.1** | **0.2** | **2.0** | **2.5** | **13.8** | **215.5** |
| 4.1 | Risks, safety | 0 | 1.1 | 18.5 | 6.2 | 2.9 | 19.4 | 0.1 | 10.3 | 0.2 | 2.0 | 2.5 | 13.8 | 76.9 |
| 4.2 | Health | 0 | 0 | 16.3 | 0 | 0 | 1.0 | 0 | 0 | 0 | 0 | 0 | 0 | 17.3 |
| 4.3 | Air pollution | 0 | 0.8 | 25.4 | 2.7 | 13.2 | 18.2 | 0 | 0 | 0 | 0 | 0 | 0 | 60.2 |
| 4.4 | Noise pollution | 0 | 0 | 11.6 | 6.3 | 4.2 | 3.3 | 6.0 | 4.8 | 0 | 0 | 0 | 0 | 36.1 |
| 4.5 | Wastes and recycling | 1.0 | 0 | 8.3 | 0 | 1.6 | 3.3 | 0 | 0 | 0 | 0 | 0 | 0 | 14.1 |
| 4.6 | Environment, other | 0.5 | 2.0 | 6.0 | 1.5 | 0 | 0.3 | 0.7 | 0 | 0 | 0 | 0 | 0 | 11.0 |
| **5** | **Policy, regulation and economics in the transport sector** | **3.1** | **6.5** | **22.6** | **0.8** | **1.5** | **2.6** | **0.8** | **0** | **0** | **0** | **0.5** | **5.8** | **44.0** |
| 5.1 | Public policy | 1.4 | 3.5 | 12.9 | 0.3 | 0 | 0.8 | 0.3 | 0 | 0 | 0 | 0 | 5.8 | 24.8 |
| 5.2 | Legal and institutional aspects | 0.8 | 1.0 | 4.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6.3 |
| 5.3 | Economics of the sector | 0.9 | 2.0 | 5.2 | 0.5 | 1.5 | 1.8 | 0.5 | 0 | 0 | 0 | 0.5 | 0 | 12.9 |
| **Total** | | **15.3** | **52.1** | **343.3** | **46.9** | **102.2** | **370.0** | **20.9** | **77.0** | **4.7** | **4.6** | **7.4** | **38.0** | **1 082.3** |

## Annex 2

## A framework for the co-ordination of research in the field of inland transport: PREDIT 1996-2000

The PREDIT, which was launched at the initiative of the Ministries of Research, Transport, Industry and the Environment, with the support of the ADEME and ANVAR, is designed to co-ordinate public funding for research in the field of inland transport. Over the period 1996-2000, the programme will oversee the award of over FF 7 billion of funding for research projects, of which FF 2.5 billion francs of public aid.

### 1. AIMS OF THE PREDIT

- Develop the quality of public transport services in order to make them more accessible, comfortable and reliable;
- Speed up the time needed to bring to the market new vehicles and cleaner, quieter and more fuel-efficient transport systems;
- Improve the overall safety of vehicles and networks, particularly in the road transport sector;
- Enhance the performance of French companies on international markets, notably by reducing the cost of equipment and operating systems;
- Promote the construction of major European transport networks by harmonizing operating conditions and by ensuring that they blend properly into the environment.

### 2. PRINCIPLES OF IMPLEMENTATION

- Improve the focus of research projects in relation to the needs of end users;
- Produce projects, prototypes or demonstrations that can validate the concepts developed from the standpoint of usage and the market;
- Mobilise the public research sector to a much higher degree;
- Establish linkages between national and European programmes.

## 3. ORGANISATION OF THE PROGRAMME

- A steering committee made up of industrialists, operators, research centres and government administrations;

- A restricted executive office to take decisions;

- A permanent secretariat made up of funding providers (ministries and agencies);

- A theme group has been set up for each research theme in the programme and given the task of drawing up and implementing a programme of work.

## 4. FINANCIAL FORECASTS

| **Programme domains** (FF millions) | **Programme** Budget | **Public funding** | | |
|---|---|---|---|---|
| | | Total | Of which R&D framework programme | Of which national aid |
| 1. Strategic research | 200 | 150 | 40 | 110 |
| 2. Science and technology | 1 300 | 650 | 190 | 460 |
| 3. Technological objects | 3 800 | 1 145 | 95 | 1 050 |
| 4. Transport systems | 2 000 | 685 | 200 | 485 |
| 5. Management of programme | 20 | 20 | - | - |
| Total | 7 320 | 2 650 | 525 | 2 125 |

## 5. AREAS COVERED BY THEMES

### 5.1. Strategic research

As both a field of research and a theme for the programme, strategic research (which is modelled on the section of the same name in the 4th EU framework programme) occupies a place slightly apart in the PREDIT. This theme is designed to provide other PREDIT groups, and indeed all research users, with benchmarks in the field of transport economics and the environment of the latter (determinants and impacts) over the medium and long term; it is aimed at providing an insight into the strategies pursued by actors and to provide an overview of the main challenges in the area.

- *Theme group 1:* Strategic research

## 5.2. Science and technology

This field of research aims to add to the basic science and technology data used in the field of inland transport. The research organised around the three theme groups attempts to promote technological breakthroughs in areas of major concern to the public authorities and firms and to pave the way for the development of new products, equipment or services in ten years' time.

- *Theme group 2.1:* Energy, Environment.
- *Theme group 2.2:* Safety, Ergonomics, Comfort
- *Theme group 2.3:* Design, Production.

## 5.3. Technological products

The field of research addresses the development of new products, vehicles or equipment which will constitute the next generation of transport systems. The projects concern either components and sub-systems which can improve the performance of vehicles in terms of safety, the environment and quality of service, or new generations of cleaner and safer vehicles, and more efficient rolling stock for mainline rail services and urban light rail systems.

- *Theme group 3.1:* Components and sub-systems.
- *Theme group 3.2:* Clean and safe vehicles.
- *Theme group 3.3:* Railway rolling stock.
- *Theme group 3.4:* Rolling stock for urban light rail systems.

## 5.4. Transport systems

The work planned in this area is designed to field test the new transport systems or services proposed to users, in collaboration with local authorities, operators and manufacturers. Each of these experiments will comprise a number of preliminary economic studies, one or more "pilot" operations and detailed assessment of the results obtained.

The research work is divided into five theme groups:

- *Theme group 4.1:* Management of urban trips.
- *Theme group 4.2:* Smart roads.
- *Theme group 4.3:* Freight transport.
- *Theme group 4.4*: Instrumentation and control systems for rail operations.
- *Theme group 4.5:* New services to users.

## ANNEX 3

List of research work undertaken in 1997 in connection with the "Strategic Research" theme (the author, title of the proposal and PREDIT funding agency for each project are given below).

### MOBILISING PROGRAMME No. 1
### INFORMATION SYSTEMS

- INRETS/DEST : *Préparation d'une nouvelle enquête auprès des chargeurs* (DTT);
- CRÉDOC : *Les « profils globaux de mobilité »* (ADEME 50%, DRAST 50%);
- INRETS/DEST : *Analyse de trafic observé par GPS et comparaison avec d'autres sources statistiques* (ADEME);
- ITHAQUE : *De l'offre à la demande de production de connaissances sociales dans le transport routier de marchandises* (DRAST).

### MOBILISING PROGRAMME No. 2
### EMPLOYMENT AND SOCIAL WATCH

- CEREBE/CNRS : *Impacts sociaux, organisationnels et commerciaux de l'automatisation des métiers de la conduite* (DRAST);
- TRANS/FORMATION : *Solitude et conflictualité dans le transport collectif* (DRAST);
- *ECONOMIE ET HUMANISME : Agents d'ambiance( DRAST);*
- ITHAQUE : *De l'offre à la demande de production de connaissances dans le TRM : contribution à la définition de systèmes d'observation* (DRAST).

### MOBILISING PROGRAMME No. 3
### DECISIONMAKING AND ASSESSMENT PROCESSES

- INRETS/DEST : *Evaluer, débattre ou négocier l'utilité publique ? Conflits d'aménagement et pratiques de conduite de projet* (DTT);
- SET (CNRS) : *La constitution d'une expertise environnementale transalpine et sa portée sur les conduites de projets en France* (DRAST);

- ARCH'URBA : *Politiques de transport des villes moyennes : la décision entre pression associative locale et contraintes supra communales* (DRAST);

- ENTPE/RIVES : *Des politiques locales de déplacements urbains en quête de cohérence et de coordination : Le Plan de Déplacement Urbain de Lyon* (DTT);

- ESSEC : *Le modèle de Conflict Resolution, comme aide au management des grands projets de transport* (DRAST).

**MOBILISING PROGRAMME No. 4**
**MOBILITY AND ECONOMIC DEVELOPMENT**

- L'OEIL : *Coût de la congestion en France* (DRAST);

- ADEUP'a : *Forme et intensité de la périurbanisation et aptitude à la canaliser* (DRAST 50%, ADEME 50%);

- MESTRANS : *Stratégies de localisation des complexes cinématographiques et médiastores* (DRAST);

- EPPA : *Stratégie de localisation de l'hôtellerie-restauration en IDF et conséquences sur la mobilité* (DREIF + INRETS);

- CRÉDOC : *Etude prospective des stratégies de localisation de la grande distribution et impact sur la mobilité des consommateurs* (DRAST);

- ARAUC : *multiplex périphériques : mobilité, urbanisation et action des pouvoirs publics* (DRAST);

- CERFISE : *Localisations et circulations dans le procès de production des services publics* (DRAST).

**MOBILISING PROGRAMME No. 5**
**SOCIOECONOMIC RELEVANCE OF NEW TECHNOLOGIES, INNOVATION TIME-SCALES**

- ENOES : *Recherche état de l'art sur la pertinence socioéconomique des nouvelles technologies* (DRAST);

- SNCF : *Analyse systématique du produit transport combiné* (DRAST).

**MOBILISING PROGRAMME No. 6**
**TRASPORT LOCATIONS: CONTINUITY AND BREAKS**

- *Atelier d'Urbanisme de l'Agglomération de Tours : Les petites gares du périurbain en région Tourangelle « Continuité territoriale et rupture de charge »* (DRAST);

- Cynthia GHORRA-GOBIN : *Le lieu du transport : aide à la conception d'un objet hybride à partir d'un centre commercial américain* (DRAST);

- Prospective RATP : *La gestion des espaces publics de transport et les métiers de l'accessibilité dans les pôles d'échanges* (DRAST);

- METROPOLIS : *Les lieux du transport : passerelles méthodologiques entre le fret et le transport de voyageurs* (DRAST).

**MOBILISING PROGRAMME No. 7**
**NON-MOTORISED TRAVEL, PARKING AND NON-PRIVATE USE OF PRIVATE CARS**

- BEAUVAIS CONSULTANTS : *Recherche sur le comportement des familles non motorisées* (DRAST 50%, Env. 50%);

- EPFL : *De l'automobilité à l'écomobilité* (Env. 50%, ADEME 50%);

- INRETS DERA : *Connaissance fine des trajets des cyclistes* (DRAST);

- CNRS - LTMU : *La pratique de la bicyclette dans les villes nouvelles* (*Environnement*).

**COMPLEMENTARY RESEARCH**

- GIP-RECLUS : *L'inégale accessibilité des villes françaises face à l'offre de transport* (DRAST);

- GDR RESEAUX : *Réseau de communication et aménagement du territoire* (DRAST);

- SARECO : *La surveillance du stationnement payant sur voirie* (DRAST);

- BERTIN : *Optimisation des coûts de transports urbains* (DRAST);

- CERNA : *Les péages d'accès au réseau ferroviaire* (DRAST);

- UTP : *Recherche sur la clientèle des seniors* (DRAST);

- CODRA : *Définition d'indicateurs de la part de marché réelle des transports publics urbains* (ADEME);

- INRETS : *Distribution géographique des émissions polluantes dans les grands bassins d'emploi français* (ADEME).

## ACCOMPANYING MEASURES

- BDCC : *Conseil et assistance au pilotage du groupe R S du PREDIT* (DRAST);

- CRISTAL : *Recherche exploratoire en vue d'élaborer de nouveaux axes de travail pour le PREDIT : liens entre Recherches Stratégiques et les autre groupes* (DRAST).

**NETHERLANDS**

**Ambrosius BAANDERS**
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# - THE EXPERIENCE IN THE NETHERLANDS -

## INTRODUCTION

This paper describes the experience in the Netherlands with organising and programming research related to the making of transport policies at the national level. Its principal emphasis is on the Dutch Ministry of Transport, Public Works and Water Management, the author's employer, but it also describes the wider field of transport policy research in the Netherlands, with its many actors, as seen from the national level. Although the title of the ECMT Seminar mentions "transport economics research", the scope of this paper is broader. In the practice of transport policymaking it is difficult to distinguish economics from the other relevant disciplines (technical, sociological, psychological, etc.) and therefore all relevant disciplines are, in principle, covered in this paper.

The paper consists of three parts. **Part 1** describes the market for transport research in the Netherlands. Where is the demand for such research and who are the suppliers? It goes on to describe some of the past attempts and the present plans to diminish the fragmentation of this market. **Part 2** deals with a very important player in this market: the Ministry of Transport. It gives a brief description of the way the transport research is organised, which is performed on behalf of the Ministry. It indicates the way the research agenda is defined, the research is funded and the results are disseminated. It describes the role of the Ministry's Transport Research Centre AVV and the way the other services of the Ministry use the results and influence the agenda. In **Part 3**, some conclusions are given.

This paper only reflects the personal views of the author and not necessarily those of the Dutch Ministry of Transport, nor of the Transport Research Centre AVV.

# 1. THE MARKET FOR TRANSPORT RESEARCH IN THE NETHERLANDS -- DEMAND AND SUPPLY

## 1.1. Supply and demand for transport research -- an overview

In the Netherlands, as in other countries, economic and other research related to transport can be seen as a market. There are parties supplying research and there are parties who have a demand for research. In some cases, organisations satisfy their own needs by doing research in house. But in most cases, there are different parties on the demand and on the supply side. On the demand side, we find organisations like transport companies, providers of transport-related services, central and local public authorities and shippers. On the supply side, there are quasi-public and private research institutes, consultancy firms and universities.

In-house research is mainly carried out by large organisations (e.g. the Ministry of Transport, the municipal Port Authority of Rotterdam, the national railway company, NS). But probably in none of those cases is the need for transport research satisfied solely by in-house research work. The needs are spread over a wider field than any of the organisations are able to cover on their own.

Although there are no clear figures, both on the volume of in-house research and on the contracted work, it is safe to say that far more than half the volume (in man-hours) is indeed governed by contracts between market parties.

The universities also analyse transport problems at their own initiative. But in the last two decades, the structure of university funding has changed and they have become more and more dependent on outside sources for the funding of their research. In theory, university research should have a more fundamental character than the research performed by other institutes and consultancies. In practice, however, this is only partly the case. In a number of specialised fields, university projects are hardly more fundamental than some of the work crried out by commercial consultancies.

It may be said that, in general, the market for transport research is a particularly fragmented one, with many actors both on the demand and on the supply side. On the demand side, there is one actor which has a more substantial demand than all others, namely, the Ministry of Transport. The way this Ministry manages its research and acts in the market is described in Part 2 of this paper. On the supply side, there are larger and smaller institutes and consultancies, some having transport as just one of their lines of interest, others specialising in transport only. Some of the suppliers are relatively dominant in certain parts of the market, but there are no really dominant suppliers in the transport research market in general.

## 1.2. The quest for co-ordination -- the intermediary organisations

The idea that this market is too fragmented is not new. It has been the inspiration for a number of efforts to co-ordinate transport research in the Netherlands. On a number of occasions, these efforts have resulted in the founding of intermediary organisations. To give a complete history of these organisations is outside the scope of this paper. Some were reorganised and merged with others and new ones were founded recently. In most cases, they cover one or some aspects of the transport system and the Ministry of Transport or another Ministry participated in founding and funding the organisation.

Again, in most cases, these intermediary organisations have been set up as public-private partnerships, in which the partners define a problem to be researched and pool their funds, after which the organisation finds a research supplier to do the work. The results then become available to all partners. It should be noted, however, that these intermediary organisations vary widely in scope, in legal form and in the way they function and are funded.

The intermediary organisations that are most relevant for the purpose of this paper at the moment are listed below. Acronyms are used and a translation of the full Dutch names is given[1]. The very short descriptions of their activities do not do full justice to their work, but only serve to illustrate the variation that exists:

- **CROW:** "Information and Technology Centre for Transport and Infrastructure", developing regulations in civil engineering and earth moving, organising research into civil engineering and earth moving as well as transport, and organising the transfer of knowledge, on behalf of the authorities who own and operate infrastructure and of the building and civil engineering companies;
- **NIM: "**Netherlands Institute for Maritime Research", dealing with the problems of maritime shipping companies;
- **KMR:** "Knowledge Infrastructure Main Port Rotterdam", furthering the knowledge needed by the actors in the Port of Rotterdam (this has more of an education than a research focus);
- **CTT:** "Centre for Transport Technology", dealing with technical development in freight transport;
- **ITS-Nederland:** "Intelligent Transport Systems -- Netherlands", working on the development and application of intelligent transport systems, especially in road traffic engineering.

Two intermediary organisations which have a more public character should also be mentioned:

- **NOVEM:** "Dutch Company for Energy and Environment", dealing with issues of energy conservation and environmental protection, of which transport is an aspect. This is funded by the ministries responsible for energy policy and for the environment, but its activities are aimed at both private and public actors, including those active in transport. NOVEM's main activity is to manage a subsidy programme, but it also funds some research and development;
- **Projectbureau IVVS:** "Project Bureau for Integrated Transport Studies", dealing with long-term questions of the interaction between transport, land use and environment policy. This is a co-operation between ministries, namely, those responsible for transport, for land use, for the environment and for economic development, with participation from the national railway company, NS. It manages a research programme. One or two staff members from each of the participants are seconded with the Project Bureau.

As can be seen from this list, even the co-ordination efforts show a rather fragmented landscape.

### 1.3. Developing co-operation on the supply side of the market

Towards the end of the 1980s, both the Ministry of Education, Science and Culture and the Ministry of Transport, Public Works and Water Management came to the conclusion that, despite the existence of the intermediary organisations, there still was too much fragmentation. Dutch society was faced with enormous challenges with regard to transport. More and better focused research and development were one of the prerequisites to meet this challenge. It was thought that the large number of actors, both on the demand and on the supply sides, meant that the research effort was too dispersed, that it lacked focus and that it was not fundamental enough. Particularly, universities were not doing enough fundamental research on transport, despite these challenges and the fact that transport is one of the key sectors of the Dutch economy.

In 1988, both ministries started some working parties to look into possible solutions. One of the conclusions was that it was difficult for universities to increase the amount of fundamental research in the field of transport, if the demand for this research would remain as fragmented as it was. With the increasing dependency on outside funding for their research, universities were inclined to use their own resources to improve their competitive position for contract work. This meant that the fundamental work was done in those fields where there was a clear and strong demand for contract research. This was not the case in the field of transport, because of the fragmented demand, spread over too many actors. Thus, the conclusion was that a better co-operation between the actors on the demand side would produce a more focused and less fragmented demand and this, in turn, would incite the actors on the supply side to co-operate more fully.

Subsequently, during the 1990s, two successive committees were instituted by the four Ministers of Transport, Public Works and Water Management; of Housing, Land Use Planning and Environment; of Education, Science and Culture and of Economic Affairs. These committees were chaired by a politician, Mr. J. Laan, and are best known as “Committee Laan 1” and “Committee Laan 2”. The members of these committees included representatives of the public and private actors in the transport sector. The committees were asked to produce a programme for transport research that would appeal to both private and public parties on the demand side and would result in a commitment from these parties to jointly fund this programme. The projects from this programme would then be contracted to universities, institutes and consultancies on the supply side. In this way research in the field of transport would get the desired clearer focus and also the volume of transport research would increase, helping policymakers to meet the long-term challenges posed by the rapidly changing social demands.

The work of both committees proved to be difficult and progress was slow. They did not succeed in producing a programme which the private sector would be willing to fund together with the public sector. The “Committee Laan 2” concluded its work in 1997 by presenting a draft R&D programme. But this did not receive a firm commitment from the private sector to fund it jointly with the public sector.

In the meantime, the Dutch Government had initiated a policy to strengthen what was called the “knowledge infrastructure” of the Netherlands, i.e. the entire framework of institutes and actors, that causes knowledge to play a role in the economic development of the country. Part of the nation’s profits from the exploitation of natural gas had been set aside for proposals to strengthen this infrastructure and in a number of sectors successful bids had been rewarded. One such initiative should be mentioned here: **COB**, the “Centre for Underground Construction”. This has the task to further innovation in the (mostly technical) disciplines relevant to underground construction and is

therefore very important to transport infrastructure development. Constructing tunnels in the weak Dutch soils is a big challenge. However, some bids that came directly from the transport sector had not been successful.

### 1.4. A new plan to strengthen transport research

After the "Committee Laan 2" had finished its work, a new initiative was clearly needed. This was taken in 1997 by the Ministry of Transport, in the shape of a plan to found a "Knowledge Centre for Transport" (**CONNEKT**). At the time of writing, this CONNEKT is being developed. The logic is still the same as in the committees "Laan 1" and "Laan 2", i.e. produce a coherent and clearly focused programme on the demand side of the transport research market and the supply side will follow this. The difference is, however, that the programme will not be funded solely by the participating partners, but that extra public funds will be made available to stimulate the relevant private and public parties to commit their own funds. In the autumn of 1998 a bid for the "knowledge infrastructure" funds, mentioned in 1.3, was made and in early 1999 a provisional decision was taken to honour this bid.

A draft R&D programme for CONNEKT was written earlier in 1998 and this will be elaborated during 1999. It draws heavily on the conclusions of the "Committee Laan 2". It is not intended to offer short-term solutions, but to address long-term strategic questions. The main themes are:

- The burden transport imposes on society (environment, land use, safety, finite natural resources);
- The integral costs of transport, including the external costs;
- Distribution of goods in urban areas;
- Transfer points and intermodal linkages;
- Mass customisation;
- Supply chain optimisation.

CONNEKT is being set up as a public-private partnership. The intention is that both public and private parties will commit themselves to funding the programme and that members of their staff will be seconded with CONNEKT. The preparations include consultations with the intermediary organisations mentioned above. For the time being, aviation is not covered. CONNEKT should not just become another intermediary organisation, but instead lead to a reduction in the number of intermediary organisations. CTT, ITS-Nederland and Projectbureau IVVS will become part of CONNEKT and cease to function independently. The other four organisations mentioned in section 1.2 will enter into co-operation agreements for those parts of their work that are related to the CONNEKT programme. The four ministries involved are prepared to make part of their funds available to help finance the programme. A similar commitment from the private sector is actively being sought.

At the time of writing, it is hoped that CONNEKT will start to function before the end of 1999. It is, of course, too early to say whether it will indeed be successful in reducing the fragmentation on the demand side of the transport research market.

### 1.5. The international aspects of the Dutch transport research market

As is the case in many countries, Dutch transport R&D is heavily influenced by the work done in other countries, in the international organisations and by multinational companies. This is not surprising, especially in freight transport, as international freight transport is very important in the Dutch economy.

On the supply side of the market, Dutch transport research institutes (universities, consultancies) have always been very open to international influences and co-operation, particularly with the English-speaking world (probably because English is the most common second language). Some consultancies have developed important activities in other countries and some foreign consultancies have conquered a market in the Netherlands. But Dutch institutes are still very dominant on the supply side of the Dutch market and they seem to hold a rather stable position.

The Framework Programmes (FPs) of the European Commission (EC) are an increasingly important source of international experience. The transport-related parts of the 2nd FP, APAS and the 4th FP, managed by DG VII and DG XIII, provided opportunities for Dutch research suppliers, as they did for researchers in other EU countries, to improve their international networks and their understanding of the research that was done in other countries. This will no doubt continue under the 5th FP. A limited number of Dutch research institutes was rather successful in the competition for FP contracts. To a larger number, however, the FP procedures present too much of a risk to consider taking part in the competing consortia, despite some efforts by the EC to facilitate this. This may create the danger in the future that these institutes will not be able to follow the movement towards a more international market.

The international orientation of the actors on the demand side of the market is also quite well established. As far as the public authorities are concerned, this does not mean that many contracts are concluded with foreign suppliers of research, despite the fact that the EC procedures are being followed. The co-operation mostly takes place through international exchange programmes and conferences.

## 2. THE EXPERIENCE IN THE MINISTRY OF TRANSPORT

### 2.1. Tasks and organisation of the Ministry

As the purpose of transport research done by or on behalf of the Ministry of Transport, Public Works and Water Management is to assist in policymaking, it is important to understand how the mechanisms for policymaking work. Therefore, this section starts by indicating the tasks and the internal organisation of the Ministry.

The formulation of the national policies for which the Ministry is responsible is done by the Policy Units within the Ministry [2]:

- **DGP:** D-G (=Directorate-General) for Passenger Transport (all private and public transport modes: car, bicycle, bus, tramway, railway, including infrastructure and safety);

- **DGG:** D-G for Freight Transport (all modes of inland and maritime transport: lorry, barge, railway, coastal and ocean shipping, including port policies);
- **RLD:** D-G for Civil Aviation (including airport policies);
- **DGTP:** D-G for Telecommunications and Postal Services.

The implementation of most of the policies, notably those of the first two Policy Units, DGP and DGG, is the responsibility of another branch of the Ministry:

- **Rijkswaterstaat (RWS):** D-G for Public Works and Water Management.

*Rijkswaterstaat* is by far the largest unit in the Ministry (some 10,000 employees). It is responsible for the state-owned infrastructure (there is also infrastructure owned by provinces and municipalities). This infrastructure includes the national highway and waterway network and (very important in the Low Countries) the dikes and coastal water protection works. This responsibility covers management and maintenance of the existing network and design and construction of new national infrastructure. Another task of *Rijkswaterstaat* is the development and management of the knowledge necessary for all of these tasks: policy, infrastructure management and construction.

The Ministry sees itself as having three core areas of competence: policy development, implementation and knowledge. The former is the responsibility of the Policy Units and the latter two of *Rijkswaterstaat*. All three core competencies serve each other.

The internal organisation of *Rijkswaterstaat* reflects this. Apart from the headquarters, there are ten **Regional Directorates** responsible for policy implementation, infrastructure management and infrastructure construction in their region. There are also six **Specialist Directorates**, which furnish specialist knowledge to the Regional Directorates and the Policy Units. Their specialities include, for example, road and waterway construction techniques, geodetic services, water dynamics, water environmental protection. One of the specialities is transport and traffic and this is the responsibility of the **Transport Research Centre AVV** (AVV = *Adviesdienst Verkeer en Vervoer*).

## 2.2. Tasks and position of the Transport Research Centre AVV

### *2.2.1. AVV and its clients*

The Transport Research Centre AVV was constituted in 1993 by bringing together a number of units responsible for parts of the knowledge about and the research into inland transport. It is one of the Specialist Directorates of *Rijkswaterstaat*. What was developed was a "demand driven" organisation, i.e. each project is undertaken at the demand of a "client".

Clients are the Policy Units of the Ministry and the Regional Directorates which are part of *Rijkswaterstaat*. They demand specialist advice in the field of transport, which may be given either on the basis of new research or on the basis of existing knowledge. This existing knowledge comes from earlier research or from work done elsewhere (nationally or internationally) which AVV is familiar with. A part of the new research is done by AVV's own staff; an important part of it is contracted in the market, to universities, research institutes and consultancies.

In fact, AVV's work is divided into three categories:

- Advice and development for clients (see subsection 2.2.2);
- Basic information (see 2.2.3);
- Research in anticipation (see 2.2.4).

### *2.2.2. Advice and development for clients*

"Advice and development for clients" is the work commissioned to the Transport Research Centre AVV by the Policy Units and the Regional Directorates. For each client, an annual work programme is developed. AVV has an account manager for each client, who is responsible for the co-operation with that client and who develops the programme as part of this co-operation. The work programme specifies the projects that will be undertaken that year (with some attention to future years) and the amount of research and development that is necessary. It also specifies the staff capacity reserved for this work at AVV and the budgets for the external R&D contracts. Those budgets are furnished by the client and passed on to AVV, which concludes the contracts with the suppliers in the market.

Before starting a project, AVV staff normally first scan the information they have already available on the subject. This may come from earlier research by AVV, but also from work done elsewhere, which they know through the contacts AVV maintains with other institutes, through the conferences in which AVV staff take part and through literature study. In many cases, an outside contractor is hired to do some (or a lot of) research or development. When the work of the outside contractor is finished, AVV uses the results in its advice to the client (in many cases, the consultant report goes directly to the client, but it is always accompanied by the advice from AVV).

In practice, it proves to be very difficult for a client to plan his needs for policy advice for more than a couple of months ahead. This is especially true for the Policy Units. Therefore, the annual programme has to be flexible. AVV achieves this in two ways. First, during the year, changes are made in the programme. As AVV also has programmes for other clients, the total staff capacity for this client should remain the same. In practice this means that when a client wants AVV to start a new project, which is not in the programme, he indicates which other project is given a lower priority (i.e. is deleted or postponed). Second, AVV reserves a part of its staff capacity for "ad hoc advice", quick answers to urgent questions. The ad hoc advice only involves AVV's own staff, no outside contractors, and is based on its accumulated knowledge and experience. In most cases it represents no more than a few days' work.

### *2.2.3. Basic information*

"Basic information" involves data and statistics that are collected. To a large extent, these are time series and there is a long-running programme for this. As most of the data sets are useful to several or many of AVV's clients, the *Rijkswaterstaat* headquarters act as a client for all of this work and there are no separate programmes for each client. A large part of this data collection work is done by AVV's own staff, but another part is contracted to outside parties.

Basic information is also an important input to many projects of advice for clients, e.g. the projects to monitor policy implementation.

### *2.2.4. Research in anticipation*

"Research in anticipation" is the work which the Transport Research Centre AVV does at its own initiative. Often, a Policy Unit requires advice at short notice, but the research work that is needed would take much longer. However, Policy Units tend to be very occupied by the immediate questions they are facing and it is difficult to have them accept projects in the programme which are not of immediate interest, or which take a long time to produce results. Therefore, each Specialist Directorate has a part of its capacity (in staff and in budget for external contracts) reserved for "research in anticipation".

Each Specialist Directorate uses this for projects for which there is no current policy demand, but of which it (by its own professional judgement) estimates that there will be a demand in, say, 2-3 years' time. The *Rijkswaterstaat* headquarters act as a client for this work and provide the budget. As the programme is agreed at a level of rather widely formulated themes, the Specialist Directorate has some freedom to decide on the content of the actual projects within these themes.

The freedom this creates for the Transport Research Centre AVV is limited, however, by the fact that, as part of the civil service, its work is always subject to political control by the Minister. Therefore, before starting a project "in anticipation", AVV staff discuss it with the relevant Policy Unit. If they feel that it would be politically inopportune, AVV will not start it. But the Policy Unit staff do not decide on the priority of the project; in fact, they give it a low priority as it is not in the programme AVV agreed with them.

How does this system work in practice? On the one hand, the results of the projects "in anticipation", once finished, generate in many cases much interest with the relevant Policy Unit or Regional Directorate. Hardly ever is it questioned afterwards if the project warranted the priority. This category of work is important for AVV, as it provides room for innovation and fosters its staff's creativity as well as that of the external contractors. On the other hand, the absence of an immediate demand means that it is sometimes difficult to give this work sufficient priority. This holds for *Rijkswaterstaat* headquarters, when they have to decide about the budgets, as well as for AVV itself, when other projects have to be done at the same time, for which there are clients with a pressing demand.

### *2.2.5. Volume and organisation of the work at AVV*

It is beyond the scope of this paper to give an overview of the contents of the programmes of the Transport Research Centre AVV. Part of the work has the character of technological development, particularly in the field of dynamic traffic management: new technologies to increase the capacity of the existing motorway network. Another part can be qualified as policy research. Here, apart from technical disciplines, the economic and social sciences are also important.

The staff of AVV totals over 450 people. Apart from the overhead, about 59 per cent of their time is spent on "advice and development for clients", 32 per cent on "basic information" and 9 per cent on "research in anticipation" (planning figures for 1998). The total budget for external contracts is about 54 million ECU in 1998. Of this about 82 per cent is used in "advice and development for clients", 15 per cent in "basic information" and 3 per cent in "research in anticipation".

The annual programmes that are established for each client mean that there is a constant source of funding for the parties on the supply side of the market in the relevant field. In many fields, AVV is one of the most important parties on the demand side.

An important function of the Specialist Directorates is to accumulate all knowledge gained in the R&D projects and to keep it accessible for future use. At AVV this is done in "knowledge centres", i.e. teams of staff members with a certain speciality, who keep the knowledge of AVV in their field up to date and accessible.

Especially in policy research, the AVV staff are often highly involved in the work of the outside contractors. This means they follow the external work very closely. The advantage is that the experience from the project can easily be used for other work, without contacting the contractor again.

In the "research in anticipation" programme, there are some developments of models and other instruments that have been sustained over long periods. For instance, AVV maintains a national travel model system that is capable of forecasting travel flows by car and public transport on the main network on a nationwide scale. The development of this system started in the 1970s and is still going on. It is now very sophisticated and many policies can be and have been tested on it. Such a long-term development could never have been justified on policy demands alone, even though its use in "advice to clients" is now very important. A degree of freedom for the research managers to use their own professional judgement was necessary for sustaining this development.

The international activities of the Transport Research Centre AVV should also be mentioned briefly. AVV takes part in the research programming discussions with the European Commission (DG VII, DG XII and DG XIII). It also participates in the OECD Road Transport Research Steering Committee, in the ECMT Economic Research Committee, in PIARC, PIANC, etc. Moreover, there are bilateral contacts with similar ministerial institutes in other countries. These activities allow AVV to put its work in a wider context and to take account of developments elsewhere.

### *2.2.6. Dissemination of results*

In the "demand driven" model of the Transport Research Centre AVV, the main target for the dissemination of the results is the "client". In the category "advice and development for clients", each project ends, of course, with a final report to the client. But also reports from "basic information" and "research in anticipation" projects are presented to the relevant clients within the Ministry. Frequently, oral presentations to ministerial staff complement the reports.

The decision about publication outside the Ministry (to the politicians, to the public, to the scientific community) has to be taken by the relevant Policy Unit or Regional Directorate. In the majority of cases, all results are made public in some way or another. The outside contractors and AVV's staff often write articles about their work. They also present papers at conferences, where they exchange experiences.

## 2.3. The evolution to the present situation in the Ministry

### *2.3.1. A concentration of transport research management*

It is beyond the purpose of this paper to give a full description of how the Ministry evolved into the present situation, but some elements of this are worth highlighting, because they illustrate the issues of programming transport research for policymaking.

*Rijkswaterstaat* has had Specialist Directorates for a long time. They were responsible for the research and development that was needed for the tasks of *Rijkswaterstaat*: infrastructure design, construction and maintenance, sea and river water management and water quality. In the beginning of the 1970s, the Traffic Engineering Division (DVK) was founded as a new Specialist Directorate, dealing with traffic engineering and traffic management on the national highway network and also with the need for and design of, the future motorway network. In this period, a major extension of the motorway network was started, leading to the very dense network that the Netherlands has at present. Public transport and freight transport (by rail, road or water) were the responsibility of other Policy Units. They did not have Specialist Directorates, but had a small number of staff that did pass contracts in the research market in support of policy development. However, these Policy Units did not have a tradition of supporting this policy development with research and efforts to bring more continuity in the programming were not very successful.

Since the 1970s, the transport system in the Netherlands, as in many other countries, has increasingly become a concern to the public and the politicians. The burden it imposes on Dutch society has increased: land use in a very densely populated country, environmental impacts, congestion, safety, etc. But it is also clear that a well-functioning transport system is important for the economy and for society in general. This increasing concern had two consequences:

- It became impossible to just study highway traffic and car use, public transport and freight transport separately. The term "integrated transport research" became fashionable to indicate the simultaneous consideration of all modes; and the term was subsequently extended to the effects on land use and spatial planning, on the environment, on the economy and on society in general;
- The building of new infrastructure and the policies of the Ministry were more and more contested in society. Each measure now has to be accompanied by extensive demonstration of the benefits, consideration of the alternatives, attenuation of the negative impacts, etc. In other words, the need for policy research has increased. The question "Do we need all this research?" arises frequently within the Ministry. But still there is a steadily upwards trend in the demand for it, and this is in line with what can be observed in many other countries.

In a reaction to this, it was decided at the beginning of the 1990s to concentrate all the Ministry's transport research and development and its management in one Specialist Directorate, working both for *Rijkswaterstaat* (including the Regional Directorates) and for the Policy Units in the other parts of the Ministry. Thus the Transport Research Centre AVV was formed in 1993 by bringing together all relevant units. This enabled a more "integral" way of working in all study and R&D projects. It also allowed the capacity for research of public transport and freight transport to be extended.

### *2.3.2. The co-operation between AVV and its clients*

In order to keep as much co-operation as possible with the Policy Units, which were afraid of losing control over the research they needed, the "client driven" system was developed. Clearly, the co-operation has to be learned. The account managers appointed by the Transport Research Centre AVV play an important role in this respect. One of the lessons is that it is very difficult for a Policy Unit to plan its research needs more than a year ahead. New needs frequently come up at very short notice and the programme therefore has to be flexible. In a number of cases, it has been very difficult to agree with an individual Policy Unit upon a balanced programme, different parts of the Unit having opposing interests. On the other hand, it was found that as soon as the management of a Policy Unit undertakes an effort to define or redefine its strategies, the definition of a balanced programme of research and specialist advice becomes much easier.

The Transport Research Centre AVV sees it as its role to watch over the balance of the programme from a scientific angle. This means, for example:

- Questions that need thorough research should not be addressed by quick studies only;
- The methods should be scientifically appropriate, not chosen only considering the speed of producing results;
- Results should also be published (and the lessons learned!) if they are not liked by the policymakers.

If the need arises, AVV uses its capacity for "research in anticipation" to try and redress the balance. This role may inspire discussion with its clients. But in the final analysis they agree that AVV has to play this critical role. In some instances they have asked AVV to be more critical than it was.

### *2.3.3. The position of AVV: the results of discussion*

It took a lot of discussion within the Ministry for the Transport Research Centre AVV to arrive at its present position. A few of the discussion points are worth mentioning here.

There was the question from many Policy Unit staff members ("policymakers") as to why it is necessary to have a Specialist Directorate. Agreeing on a contract with an outside contractor does not seem very complicated and in doing so, the policymaker keeps direct control over the way his questions are answered. The answer was that AVV provides added value (as do the other Specialist Directorates). AVV has an extensive experience with the parties that operate on the supply side in the research market and knows who does what kind of research best. The policymakers do not have the time or the interest to document their experience with research in their project; when it is over, they tend to move on to other projects. It needs organisational measures to accumulate the experience and to keep it accessible. This is the function of the "knowledge centres" described in subsection 2.2.5. AVV staff also have the insights in scientific developments that allow them to place the policy question in a scientific context; they are thus able to judge how the question should best be approached. In this way, knowledge as one of the three core areas of competence of the Ministry (see section 2.1.) is assured.

Another question is the volume of "research in anticipation". The fact that it is generally seen as important, does not mean that it gets priority in the budget allocation process. This is the object of a constant struggle. The Director-General of *Rijkswaterstaat* formulated a norm some years ago, of 10 per cent of staff capacity and of budget for research in anticipation. For AVV, the present figures are lower (9 per cent and 3 per cent respectively in 1998, see section 2.2.5), as they have always been.

Should the clients be obliged to use the services of the Transport Research Centre AVV? Should there be some kind of truck system? The argument has been put forward that it does not seem very efficient if the Ministry pays for the AVV staff costs and then does not use it for the tasks it is supposed to perform. At first sight, an obligation to use its services looks very comfortable for AVV. But experience shows that in such a situation the clients (who feel limited in their choices) would immediately value AVV's services less. AVV therefore prefers a situation where the Policy Units and Regional Directorates are free to use its services or not and where it constantly has to "earn" its position.

Should the Transport Research Centre AVV work for parties outside the Ministry of Transport? This is a question that has arisen a couple of times in the past. AVV's policy is to work only for third parties when there is an instruction from the relevant Policy Unit to do so. This happens, e.g., when the Policy Units involve AVV in public-private partnerships. But it means that AVV, as part of the civil service, does not compete with the supply side of the market.

Some partnerships with other public authorities in which AVV is involved are worth mentioning:

- The Projectbureau IVVS (on "Integrated Transport Studies") was already mentioned in section 1.2. This is a co-operation between a number of Ministries;
- In 1997, an agreement was concluded between the Ministry of Transport on the one hand and the provinces and municipalities on the other, about the decentralisation of a number of powers. As part of this agreement, the Ministry is making its knowledge on transport available to the provinces and municipalities. To this end the Transport Research Centre AVV has, in co-operation with the provinces and municipalities, set up an information transfer desk for the benefit of these authorities;
- A similar information transfer desk was set up by AVV around the same time as part of a programme for "Sustainable Traffic Safety", at the request of the Policy Unit DGP. This also involves the local authorities;
- A third area of co-operation with the local authorities concerns decentralisation with regard to public transport. Under a new law, the market regulations for urban and regional public transport will be changed from a highly centralised regime to a more decentralised one, in which public transport operators will compete for fixed duration contracts passed by provinces and large municipalities. This kind of competition is new in the Netherlands and there is little experience in this matter. Therefore, AVV has been charged to set up, together with the provinces and municipalities, an office to do research, to monitor and to transfer knowledge concerning these new forms of decentralisation and competition.

## 3. CONCLUSIONS

The Ministry of Transport, Public Works and Water Management in the Netherlands has developed a system for managing its transport research and development, which works relatively well. In this system, the "demand driven" Transport Research Centre AVV plays a key role. However, this has not brought sufficient change in the Dutch transport research market as a whole. In the eyes of many observers, Dutch transport research is too fragmented and lacks a clear focus. A new "Knowledge Centre" ("CONNEKT"), set up as a public-private partnership, is being developed at the moment, in the hope that this will improve the situation. It is too early, however, to say if it will be successful.

## NOTES

1. In Annex, a glossary of the English and the official Dutch names of all organisations mentioned in this paper is given.

2. See the glossary in Annex for the official Dutch names.

**ANNEX**
**GLOSSARY OF ORGANISATIONS**

For the benefit of those readers who have an understanding of the Dutch language, the Dutch and English names of the organisations mentioned in this paper are given below.

| Acronym | English | Dutch |
|---|---|---|
| **AVV** | "Transport Research Centre AVV" | *Adviesdienst Verkeer en Vervoer* |
| **COB** | "Centre for Underground Construction" | *Centrum voor Ondergronds Bouwen* |
| **CONNEKT** | "Knowledge Centre for Transport" | *Centrum voor Onderzoek en Kennis op het gebied van Transport* |
| **CROW** | "Information and Technology Centre for Transport and Infrastructure" | *Centrum voor Regelgeving en Onderzoek in de Verkeerstechniek en de Grond- Weg en Waterbouw* |
| **CTT** | "Centre for Transport Technology" | *Centrum voor Transporttechnologie* |
| **DGG** | "Directorate-General for Freight Transport" | *Directoraat-Generaal voor Goederenvervoer* |
| **DGP** | "Directorate-General for Passenger Transport" | *Directoraat-Generaal voor Personenvervoer* |
| **DGTP** | "Directorate-General for Telecommunications and Postal Services" | *Directoraat-Generaal voor Telecommunicatie en Post* |
| **ITS-NL** | "Intelligent Transport Systems – Netherlands" | *Intelligente Transportsystemen – Nederland* |
| **KMR** | "Knowledge Infrastructure Main Port Rotterdam" | *Kennisinfrastructuur Mainport Rotterdam* |
| **NIM** | "Netherlands Institute for Maritime Research" | *Nederlands Instituut voor Maritiem Onderzoek* |
| **NOVEM** | "Dutch Company for Energy and Environment" | *Nederlandse Onderneming voor Energie en Milieu* |
| **Project-bureau IVVS** | "Project Bureau for Integrated Transport Studies" | *Projectbureau Integrale Verkeers- en Vervoersstudies* |
| **RLD** | "Directorate-General for Civil Aviation" | *Directoraat-Generaal Rijksluchtvaartdienst* |
| **RWS** | "Directorate-General for Public Works and Water Management" | *Directoraat-Generaal Rijkswaterstaat* |

**CZECH REPUBLIC**

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# PUBLIC TRANSPORT RESEARCH IN THE TRANSPORT ECONOMIC FIELD -- THE CASE OF THE CZECH REPUBLIC --

## 1. THE CURRENT SYSTEM OF TRANSPORT ECONOMICS RESEARCH

### 1.1. Current organisation of the Ministry of Transport and Communications

The Ministry of Transport and Communications of the Czech Republic is divided into seven Divisions -- **Division of the Minister** and **Divisions 1 to 6** (see Annex 1).

**The Transport Policy, International Relations and Environment Department** (Division 2) plays a key role as contractor in matters of economic transport research projects. Obviously, this department is closely associated with the **Department of Finance and Economics.** The principal orientation and activity of this Department is the creation of specific research tasks and co-ordination between individual departments.

### 1.2. Research bodies which work with the Ministry of Transport and Communications

- Centrum dopravního výzkumu (Transport Research Centre – the only state transport research organisation);
- Transconsult, s. r. o., Hradec Králové;
- Dopravní rozvojové stredisko Ceské republiky;
- CITYPLAN, s.r.o.;
- SBP (Sofretu Bceom Praha), s.r.o.;
- SUDOP PRAHA, a.s.
- Univerzita Pardubice.

Transport economics research is divided mainly among the above-mentioned bodies. The role of the local authorities in the present system is minimal.

### 1.3. Links with other ministries and public bodies

Transport economics research is also carried out by other ministries: the Ministry of Finance, the Ministry of Industry and Business, and the Czech railways. Transport problems are also mentioned in these projects.

### 1.4. Fields covered by research

The research covers all transport modes including questions of transport policy issues. Short- and medium-term projects are generally involved.

### 1.5. Budget, sources

Projects are financed from a state budget through the partial budgets of individual ministries.

## 2. COMMISSIONING OF RESEARCH

### 2.1. Definition of main lines of research

The main principles of transport research are defined by State transport policy. Specific projects are announced annually by the Ministry of Transport and Communications in the framework of transport research programmes. The projects are linked with the main EU programmes (4 FP and 5 FP) and other international research activities.

### 2.2. Research clients

The main clients for research are state administration authorities, which are also the contractors of the projects.

### 2.3. Links with other programmes

All projects are co-ordinated by the Ministry of Transport and Communications respectively with other responsible authorities.

## 3. RESEARCH MONITORING AND EVALUATION

### 3.1. Starting process and scheduling of research operations

The Ministry of Transport and Communications annually announces a public tender to solve the research projects for own purposes. The system guidance for solution/scheduling remains with the Ministry of Transport and Communications.

### 3.2. Monitoring of research operations

The monitoring during the project is carried out according to an approved timetable by the contractor or sub-contractor. The financial questions, stage of solutions and other problems are controlled at work meetings.

### 3.3. Assessment criteria for evaluation

The results of the research project are evaluated by the contractor. Assessment is provided annually by a commission for projects financed from the state budget.

## 4. USE OF RESEARCH FINDINGS

### 4.1. Dissemination

The research results – mainly final research reports -- are divided by contractor. Other dissemination is realised by the public media, depending on the type of result.

### 4.2. Exploitation and impact of research activities

The research results are usually used immediately by the contractor and for other research activities. The results are also used in the decision process -- transport policymaking -- by the state authorities.

## 5. VALUE JUDGEMENT ON THE PRESENT SYSTEM

The process of evaluation and co-ordination among different contractors requires improvement.

It is also necessary to widely improve the exploitation of transport research results. Economic transport research must provide a better base for policymakers, especially in the field of modelling and forecasting transport developments, as mentioned in the document “Transport Policy of the Czech Republic”. Chapter 13 of the document is entitled “Research, Development and Technological Policy in the Transport Sector” and an abbreviated version can be found in Annex 2.

For the list of projects commissioned by the Ministry of Transport and Communications of the Czech Republic, see Annex 3.

# ANNEX 1

## STRUCTURE OF THE MINISTRY OF TRANSPORT AND COMMUNICATIONS OF THE CZECH REPUBLIC

**0010**
**Office of the Minister**

**0020**
**Dept. of Integration into the European Union**

**0030**
**Dept. of Crisis Management**

**0040**
**Dept. of Inspection**

**Division 1**
Division of road transport, road communications, tracks and railway transport, public transport and main transport authority project

**Division 2**
Division of transport policy, internatinal relations, environment, civil aviation, navigation and waterways

**Division 3**
Division of post, telecommunications and information systems

**Division 4**
Division of finance, economics and internal administration

**Division 5**
Legislative Division

**Division 6**
Czech Telecommunications Authority

**0110**
Dept. of Road Transport

**0210**
Dept. of Transport Policy, International relations and Environment

**0310**
Dept. of Telecommunications

**0410**
Dept. of Finance and Economics

**0510**
Legislative Department

**60**
Section of the Managing Director

**0120**
Dept. of Road Communications

**0220**
Dept. of Civil Aviation

**0320**
Postal Department

**0420**
Dept. of Internal Administration

**61**
Section of Regulation

**0130**
Dept. of Tracks and Railway Transport

**0230**
Dept. of Navigation and Waterways

**0330**
Dept. of Information Systems

**62**
Section of State Administration and Inspection

**0140**
Dept. of Public Transport

**0150**
Main transport authority project

## ANNEX 2

***Chapter 13 from "The Transport Policy of the Czech Republic"***

## RESEARCH, DEVELOPMENT AND TECHNOLOGICAL POLICY IN THE TRANSPORT SECTOR

*The current status of the transport sector as regards research and development management in the Czech Republic is not satisfactory.*

In general, emphasis is to be laid on strategic research and complex transport issues demanding a large share of forecasting. At the same time, it is necessary to take a greater share in the supra-national research in co-operation with other transport entities and supply organisations.

The objective of the reorganisation of the research must be an efficient interconnection of research institutes and universities and their involvement in international co-operation. This means the generation of a research and development management system in the transport sector based on:

- The creation of preconditions for the participation of the Czech Republic in selected research and development projects organised by international organisations, especially by the EU and UN/EEC;
- The creation of a long-term research plan in the transport sector for the needs of the Czech Republic and the establishment of a co-ordinator from the staff of some dominating and prestigious research organisations or universities (who would be also able to substitute the co-ordinating function of the Czech Academy of Sciences, where the transport sector is not represented so far); to create space also for dealing with topical issues;
- To specify means for tackling (through project proceedings) newly emerging problems (with substantial preservation of current processes but in a restricted manner for projects that are subject to examination – not by substituting research capacities for the decisionmaking of the state administration);
- To invite for open tenders concerning any material grant, including principal selection criteria. In this context, to follow the Act No. 2/1995 Coll., on state support for research and development, and the system of research and development projects of the Ministry of Transport and Communications of the Czech Republic. To use experiences of the hitherto existing evaluation committees related to such projects in order to innovate the whole system and, in particular, to achieve greater involvement of research capacities of transport-oriented universities;
- To define more precisely the technical standards and conditions for the development and operation of means of transport and to gradually adopt, for the whole of the transport sector, technical standards of the EC and other international organisations.

Apart from this, it is necessary to systematically improve the education of transport specialists, including their further training, career rules and their preparation for entry into the EU in particular.

With regard to the fact that the Czech Republic does not dispose of departmental or state testing facilities for technical design tests and for checks on technical requirements placed on road vehicles (such activities are performed by authorised private organisations), it is necessary to completely resolve the role of the state in this field.

## ANNEX 3

### List of projects commissioned by the Ministry of Transport and Communications of the Czech Republic

The projects listed below were commissioned by the Czech Ministry of Transport and Communications through a public call for tender. The topics were taken from the Transport Research Programme and are those which it was felt most needed to be addressed in order to solve current and future transport problems in the Czech Republic.

PD101330603
**STUDY OF COMBINED AND INTEGRATED TRANSPORT INFRASTRUCTURE WITH A VIEW TO MAKING GREATER USE OF TRANSPORT AND LOGISTICS SYSTEMS**

Design of road/rail and road/inland waterway combined transport infrastructure in relation to logistics systems and investigation of the scope for the development of combined and integrated transport systems in the transport market. Specification of infrastructure requirements with a view to further developing combined transport and logistics systems. Assessment of infrastructure needs with regard to the development of urban areas, the Czech transport network and links between the latter and the European combined transport network.
Contractor: Transconsult s.r.o.
Duration of contract: 3 years.

PD103120602
**FORECASTING FUTURE TRENDS IN ROAD TRAFFIC DENSITY**

Development of mathematical models to forecast future trends in road traffic on the basis of different scenarios for the construction of new motorways and four-lane highways in the Czech Republic in accordance with Acts Nos. 631/1993 and 513/1994.
Contractor: Centrum dopravního výzkumu (Transport Research Centre)
Duration of contract: 2 years

PD103130604
**DEVELOPMENT OF AN ECONOMIC MODEL OF THE CIVIL AVIATION SECTOR AND MACROECONOMIC MODELS TO FORECAST OPERATIONAL OUTPUTS**

Forecasting of operational and economic indicators for the civil aviation sector on the basis of macroeconomic indicators. Determination of the relations and ratios between operational and economic indicators, on the one hand, and macroeconomic indicators on the other through comparison with developed economies in Europe (Austria). Determination of anticipated trajectories in accordance with future trends in the civil aviation sector.
Contractor: Ing. Drahoslav Koláø
Duration of contract: 4 years

PD103330601
**ALTERNATIVE TRENDS IN THE MODAL SPLIT**

Analysis of trends in transport modes and the transport market. Forecast scenarios. Model for the creation and analysis of different scenarios. Network development and trends in financial requirements.
Contractor: BSP (Sofretu BCEOM Praha) s.r.o.
Duration of contract: 3 years

PD103330603
**FORECASTING MODEL FOR ROAD TRANSPORT EXTERNALITIES**

Assessment of trends in growth in road traffic, the impact of such growth on road accident rates and the environment, comparison with other European countries, development of a model to forecast trends in accident rates and the environmental impact of road traffic.
Contractor: Centrum dopravního výzkumu
Duration of contract: 3 years

PD201330601
**HARMONISATION OF THE CZECH TRANSPORT MARKET AND ASSOCIATED EXTERNALITIES**

Harmonisation of Czech transport legislation with EU directives. Analysis of Czech transport policy. Market trends in the Czech Republic and infrastructure requirements. Government funding. Transport externalities.
Contractor: BSP (Sofretu BCEOM Praha) s.r.o.
Duration of contract: 2 years

PD401330601
**STABILISATION AND GRADUAL REDUCTION OF THE ENVIRONMENTAL BURDEN ATTRIBUTABLE TO TRANSPORT IN THE CZECH REPUBLIC**

Working papers will be drawn up on the basis of an analysis of the environmental burden attributable to road traffic in the Czech Republic in order to determine how this burden might be stabilised and gradually reduced in the following areas: adoption of UN/ECE and EU regulations in the Czech Republic, introduction of measures to reduce the impact of transport on the environment, proposal of effective economic instruments and criteria, application of external costs with regard to international development, methods of investigating emissions from mobile sources and involvement in international activities in this area.
Contractor: Centrum dopravního výzkumu
Duration of contract: 6 years

PD408220601

**RESEARCH INTO THE CHANGES IN VEHICLE FLEET COMPOSITION REQUIRED FOR COMBINED TRANSPORT OPERATIONS -- SWAP BODIES**

Designing of measures to develop combined transport by optimising fleet composition; technical, economic and legal conditions.
Contractor: Centrum dopravního výzkumu
Duration of contract: 3 years

PD501220601

**DEVELOPMENT OF A DECISION SUPPORT SYSTEM FOR USE IN AN EXPANDED COMBINED (ROAD/RAIL) TRANSPORT SECTOR IN THE LIBERALISED TRANSPORT MARKET IN THE CZECH REPUBLIC**

Support for the development of combined transport and integration of the combined transport sector into the Trans-European network. Different scenarios of how to achieve this goal. Series of measures. Flexible computer model.
Contractor: BSP (Sofretu BCEOM Praha) s.r.o.
Duration of contract: 3 years

PD501220602

**THE ROLE THAT GREATER MARKET PRESENCE FOR COMBINED TRANSPORT CAN PLAY IN STRENGTHENING TRANSPORT CHAINS**

Analysis of the transport market and proposed solutions to problems currently preventing transport quality from being enhanced and optimised in a way that will ensure adequate levels of mobility and that is environmentally friendly.
Contractor: Dopravní rozvojové støedisko Èeské republiky
Duration of contract: 3 years

PD503330601

**PROPOSED METHODOLOGY FOR THE MULTICRITERIA ANALYSIS OF TRANSPORT ON THE BASIS OF ECONOMIC, SOCIAL, SCIENTIFIC AND TECHNICAL DATA**

Application of management theory to the transport sector. Information systems and decision support systems. Use of multicriteria analysis to develop and evaluate different scenarios.
Contractor: BSP (Sofretu BCEOM Praha) s.r.o.
Duration of contract: 3 years

PD503330702

**GREEN PAPER ON PASSENGER TRANSPORT IN THE CZECH REPUBLIC**

Design of a strategy towards passenger transport in the Czech Republic on the basis of an analysis of anticipated changes in the macroeconomic environment and population growth in the Czech Republic, in accordance with the Government's basic policy instruments and the EU traffic policy programme of action.
Contractor: Centrum dopravního výzkumu
Duration of contract: 2 years

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# THE ORGANISATION OF RESEARCH

## 1. CONTEXTUAL BACKGROUND

Transport economics research has underpinned policy decisionmaking primarily by evaluating value-for-money in infrastructure investment and other operational and social factors in surface transport, as well as contributing towards appraisal in airport provision and maritime provision. The changing emphasis in high-level political objectives has brought a changing context: sustainability and social inclusion need to be taken into account by encompassing them in the broad economic concepts. A further complication is the changing commercial status of railway provision in Britain.

The Department of the Environment, Transport and the Regions (DETR) is a major instigator of transport economics research. Its annual research budget is established by policy divisions identifying which research they think is likely to be required, establishing the likely costs and submitting spending proposals. The amount of funding actually provided is determined firstly by priorities within the Department and eventually by the requirements of the Government's overall spending programme.

For surface transport, Directorate Research Committees (DRCs) determine the strategies for research, and from time to time publish Research Strategies which lay out the overall directions of research. There are two DRCs: the joint Integrated and Local Transport and Roads and Traffic (ILT/RT) Research Committee and the Road Safety and Environment (RSED) Committee. The research programme is managed by these committees; membership is typically drawn from senior officials within each Directorate, other research customers in DETR and the Highways Agency (HA) and representatives from the Scottish Office, the Welsh Office and the Department of the Environment (Northern Ireland). The process of identifying research needs is driven by "theme co-ordinators" identifying research needs and priorities, on the basis of input from external research advisors, in addition to suggestions by project officers and policy staff. The DRCs determine overall priorities and allocate budgets to individual "customer" divisions. Increasingly, government is involving both researchers and policymakers in the process of establishing research needs.

The DRCs' interests include a wide range of issues relating to transport economics. On the highways side, the recent themes include the appraisal of trunk road schemes; the wider role of the road programme, road pricing and road funding and commercialisation. For urban and local transport, the themes include urban transport management, driver information, environmental issues and mobility and social policy.

Research priorities have also been identified through the Foresight Programme, operating under the auspices of the Department of Trade and Industry (DTI). This aims to improve the competitive drive of the UK economy, and enhance the quality of life, by bringing together business, the science base and government to identify and respond to emerging opportunities in markets and technologies. The programme is spearheaded by sixteen panels, each representing an important sector of the economy. *Transport* is one such panel. The panels comprise representatives from business, the science base and government. Foresight is to be relaunched early in 1999.

Research strategies are currently being re-examined in the light of the Government's recent White Paper[1]. This White Paper provides a radical agenda for action at national, regional and local and individual level. It sets out a wide range of policy initiatives, many of which will need to be informed by focused research, both now and in the future. This has altered the research agenda, and the DETR is consulting widely on the research required to implement provisions in the White Paper. Key areas will include: developing and enhancing appraisal frameworks; investigating links between regional economic growth and transport supply; addressing the trade-offs between the movement of people and goods and services; demand management; modal shift (including less use of the car); and road user charging.

There have already been changes in the emphasis of transport scheme appraisal. The DETR has recently set out a new approach to the appraisal of a wide range of road investment proposals, with greater emphasis on the non-money costs and benefits. A central element is the provision of an Appraisal Summary Table, which allows the relative merits of different options to be exposed more clearly. The information presented in this Table is generally acquired by established techniques to assess the environmental, economic and social consequences of options. The White Paper is likely to lead to further examination of the structure of investment appraisal methodologies.

The DETR is also concerned with the more *"macro"* aspects of transport investment. In particular, the Standing Advisory Committee on Trunk Road Assessment (SACTRA) is currently studying for DETR the relationship between transport provision, user costs and economic growth. It is examining the effectiveness of conventional appraisal methods in measuring the effects on economic growth of improvements in transport provision, and the appraisal of the effects on economic growth of measures to reduce transport intensity.

The Highways Agency, an Agency of the DETR, is also a significant commissioner of research. The majority of its transport economics research is commissioned by the Traffic Appraisal, Modelling and Economics Division, largely in support of methods for the appraisal of highway infrastructure projects.

The other primary commissioners of research are the publicly-funded Science Research Councils, most particularly for transport economics the Economic and Social Science Research Council (ESRC) and the Engineering and Physical Sciences Research Council (EPSRC). These support research and training, mainly at higher education and research institutions, under a number of different programmes.

The DETR (and other government departments) have joint programmes with the Science Research Councils and private-sector organisations for the commissioning of research (see below).

Local authorities, particularly the larger metropolitan authorities, may also commission research, but this tends to be relatively short term and application based. Relatively little transport economics research is funded in this way.

## 2. COMMISSIONING OF RESEARCH

Within DETR, research projects are commissioned to help policy divisions meet their objectives and discharge their functions. Generally, individual projects are grouped into research themes, with the intention of allowing projects which address broadly similar issues to be brigaded together to establish the link between research and the wider objectives of the Directorate.

Until 1992, much of the Department's (i.e. DETR) research programme was channelled through the Transport Research Laboratory, which was the land transport "research arm" of the former Department of Transport. While the main directions of research were then, as now, determined by the requirements of policy, the execution and management of the research programme, including the funding, was devolved to the Laboratory. In 1992, however, the TRL was converted to an Agency of the Department. The funding was then administered by customer divisions within the central Department and a "customer-contractor" type of relationship between the Department and its research contractors (including TRL) was established. Further change occurred in 1996, when the TRL entered the private sector under the ownership of the Transport Research Foundation, a non-profit distributing company limited by guarantee. Relationships with the Department are now fully commercial.

Since the Department's research is determined by the requirements of policy, it tends to be relatively clearly focused on particular issues, with a view to developing understanding and methodology which will feed into, inform and underpin policy initiatives and decisions.

The contractors for DETR-commissioned work can come from all sectors, including both academic institutions and private institutions. It may be that the more theoretical economic studies are carried out by universities, and the more applied work by consultants, but this is more to do with the nature of the expertise available rather than features of the procurement system. The contractual arrangements are similar whether consultants or universities are involved.

However, the DETR has also invited proposals (i.e. a "responsive" mode) through a "seedcorn" programme. While broad indications of topics which might be suitable for study were given, the process was that researchers could apply for funding for proposals which were less tightly related to policy interests and which often had a longer-term aspect. The availability of such funding was, however, tightly limited both in total and on an individual project level. Applicants could be from both the public and private sectors and, once a proposal was accepted, the contractual process was as for any other Department contract. The scheme is being evaluated to inform consideration of a successor "seedcorn" programme.

It is also possible for the DETR to consider that a proposal developed and speculatively submitted by a research organisation is particularly relevant to its interests and merits full or partial financial support. Again, the resulting contractual process is common.

The Science Research Councils, especially ESRC and EPSRC, support research and training, mainly at higher education and research institutions, under a number of different programmes. In general, research grants can be made in two ways: firstly, where the choice of subject is determined by the applicant and, secondly, where calls for proposals are made for specified areas of research, which are often interdisciplinary and involve a third-party funder. Priorities for research are determined by panels who consult widely within the profession and outside; often they reflect the current and foreseen government policy interests. For the Research Councils, the programme themes are generally set over a specified number of years.

Involving both government departments and the Research Councils is the LINK Programme, co-ordinated by the OST (Office of Science and Technology -- part of the DTI). The LINK Programme is funded by departments and Research Councils and aims to promote partnership in research between industry and the research base, and thus to stimulate innovation and wealth creation. There are several LINK programmes, each of which supports a number of research projects, including LINK-IST (i.e. Inland Surface Transport: sponsored by EPSRC, ESRC, DTI and DETR), addressing land transport issues. Government generally funds up to 50 per cent of eligible costs of these projects.

The DETR also supports, and is sometimes actively involved in, projects being carried out for the EU's Framework and other programmes. Where support is given, it is generally for those projects which are perceived as having particular policy relevance for the UK.

Academic institutions and research organisations, and, indeed, private sector bodies, also undertake their own internally supported research. For non-public organisations, this is usually to invest in their own intellectual property, sometimes with a view to the development of a marketable "product".

## 3. RESEARCH MONITORING AND EVALUATION

For DETR-commissioned research, the objectives, outputs, timescales and costs are determined by the client, taking into account the requirements of the work and the contractors' recommended approach. The schedules and outputs are determined by the policy interests under which their work is conducted. Some small items of research may be pursued within the Department, but most is contracted out, as described above. Each project is managed by a designated Project Officer, who is responsible for ensuring delivery of the research in time and to satisfactory quality. In general, individual project officers with the Department work closely with their contractors to ensure that the research is not only conducted to a good standard but also to ensure that it is directed to the appropriate policy interests. For the ILT/RT Research Committee, an evaluation subgroup looks at a final report by each project officer on the completion of the project, and again after some time to assess longer-term lessons.

For the Research Councils, each project is evaluated to ensure that research has been properly conducted and to make an assessment of its quality. There are no formal assessment criteria, although reviewers are required to judge the research under a number of headings, including potential beneficiaries. This is achieved through a peer review process.

## 4. USE OF RESEARCH FINDINGS

Generally, the DETR encourages its contractors to publish its results, but retains the right to withhold permission in special circumstances. The research may be publicised through a variety of channels, especially the technical press and conferences. These outputs are clearly easily accessible. DETR also makes information about completed, current and prospective research available through newsletters and compendia as well as through the DETR Website. Wide dissemination through articles and conferences is a requirement of Research Council sponsored research.

As it tends to be commissioned as a result of a policy interest, research funded by DETR is more likely to influence and inform policy decisions, although the degree to which this occurs directly depends much on the nature of the research itself. Pilot trials are usually preceded by a whole raft of background research, which may have been undertaken over a number of years and for a variety of different objectives. However, the Department recognises that there may come a point within a research programme when pilot trials are necessary as being the only way in which necessary data and other information can be obtained.

Being rather further removed from policymaking, Research Council and other research conducted by research organisations tends to have less immediate impact on policy decisions, but they do provide some of the very important bedrock of understanding and background which helps ensure that policy is properly founded on what is achievable. Nevertheless, it is also clear that some fundamental and important research projects which might, for instance, demonstrate some clear consequences of following particular courses of actions, can lead to direct and sometimes immediate changes in policy.

## 5. VALUE JUDGEMENT ON THE PRESENT SYSTEM

In general, the various channels through which transport economics research is identified and commissioned ensures that the research is closely related to policy interests. Increasingly, there are strong and beneficial links between government, industry and the science base. Nevertheless, some issues do arise:

- It is necessary to distinguish between the short-term research needs, which will help get policies and plans forward into implementation, and the longer-term research needs. The management of long-term research can, however, be difficult. The pressures are for short-term research -- the funding mechanisms (especially where, for instance, it is necessary to find commercial partners) often contribute to this. There is also tension between government's requirement for "early wins" and the fact that research projects begun now may not bring results for many years. There are often differing views on where the priorities should lie between getting such "early wins" and longer-term research.

- Transport economics research in the Research Councils is competing with funding for a whole range of programmes and disciplines. This means that the quality of *proposals* is extremely important; proposals to which limited effort has been devoted have a much weaker chance of succeeding, even if the research proposed is important.

- However, the Research Councils do support quality research which will help provide the tools, knowledge and understanding that will inform decisionmaking in the longer term. They have the opportunity to fund innovation and speculative "blue skies" research.

- Transport economics research is often conducted in conjunction with, or as part of, research addressing wider issues. This raises challenges for the research community in putting together appropriate partnerships for delivering some research. Such partnerships may need to be forged across some fairly traditional boundaries, both in terms of the academic disciplines and between different transport sectors and modes.

- The methods and sources by which transport research is funded can lead to fragmentation of knowledge and experience. A key issue is the need not just to undertake new work but to consolidate and summarise past and present work. This would aid the identification of gaps and weaknesses and prioritise future research activities.

- While the funding system ensures that the research community accumulates knowledge, there can be difficulties in communicating that knowledge in an accessible and understandable way to decisionmakers.

**NOTE**

1. DETR (1998), *A New Deal for Transport: Better for Everyone. The Government's White Paper on the Future of Transport.*

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# TRANSPORT RESEARCH IN SWEDEN

## INTRODUCTION

Sweden invests substantial amounts in research. Measured as a proportion of GDP, Sweden is in the forefront amongst OECD countries with its overall investment of some 3.3 per cent of GDP in research and development (R&D). Swedish R&D investments are based on the major contribution in this field of industry, which accounts for about 70 per cent of Sweden's total research.

The main research performers in Sweden are, as in most other countries, industry and universities and colleges. Sweden has a relatively small institutional sector.

## 1. SWEDISH RESEARCH FUNDING

The Government's investment in research at universities and colleges has a turnover of about SKr 15 billion per year. Publicly financed research at universities obtains its resources from four different sources today:

- Universities' own faculty budgets;
- Research councils;
- Sector research organs and other state authorities;
- Research foundations with resources drawn from the former employee investment funds.

The Ministry of Education has responsibility for basic research and postgraduate studies and allots resources directly to universities and colleges (faculty budgets). These faculty budgets are allocated to different universities to enable them to distribute their resources according to their own priorities; this enables the universities to keep up their own activities and initiate their own research programmes.

In addition, the Ministry of Education allocates resources to the research councils. These research councils fund R&D at universities and colleges or at research institutes. The research councils' main function is to support scientifically motivated research and serve as national agencies for the distribution of research funds within various areas.

The structure of the research council system is in accordance with the scientific subject areas. Postgraduates at universities elect the majority of the research councils' boards via a system of electoral colleges.

Sector research agencies support research directly based on the needs of various sectors of society, such as communications, energy, construction and housing, technology and industrial development, working life and the labour market and the environment. The basic idea is that within each sector of society there is a need for an overall research-based information strategy. The various sector research organs are government authorities receiving their funds directly from the Government. However, they are not accountable to the Ministry of Education, but to the respective government departments. The research resources at the disposal of the sector research organs have been budgeted with the various departmental areas in competition with other purposes. They serve to balance the "free" researcher-controlled research and are motivated by the need to conduct research within various areas of society.

The fourth source of funding emerged at the beginning of the 1990s, when some vast state-controlled investment trusts, known as employee investment funds, were wound up and some of their financial resources were allocated to research. A number of different research foundations have been established, each with a different research focus. The Government appoints the boards of the foundations, but otherwise they function autonomously on the basis of the assignments they receive.

The main features of the current structure of Swedish research funding date back to the mid-1960s. They are characterised by a balance between researcher-controlled research and problem-oriented sector research. Sector research has resulted in close involvement within many sectors of society in the funding of research programmes and the creation of research environments of particular interest to the sectors in question. By the same token, this has resulted in fragmentation of research funding. The number of authorities which fund research is remarkably large, and it is difficult to get a general view of what is happening. The Government has taken various measures to co-ordinate investments in research in order to give coherence to research policy. The Government now presents a co-ordinated research policy bill to the Swedish Parliament every third year.

## 2. CURRENT SYSTEM OF TRANSPORT RESEARCH

The publicly motivated transport research in Sweden is mainly financed via the system for sector research. KFB, *Kommunikationsforskningsberedningen* (the Swedish Transport and Communications Research Board), is the key purchaser and funder of governmental transport and communications research, i.e. research within the areas of transport, postal services, telecommunications and IT. In addition to KFB, *Vägverket* (the National Highways Administration) and *Banverket* (National Railtrack Administration) also fund research within the transport field.

KFB has received 180 million kronor for 1999, which is an increase of almost 100 per cent during the 1990s. In addition to these funds, Vägverket and Banverket fund research and development programmes for some 200 million kronor. Furthermore, the Government makes a direct grant of some 30 million kronor to VTI (*Väg och transportforskningsintitutet* -- the Road and Transport Research Institute), the leading research institute within the transport field. Swedish transport research is financed mainly with these funds. Certain other sector research agencies within adjacent fields are, however, in a position to finance research of relevance to the transport sector.

KFB's research contracts are in accordance with the goals established by the Government and Parliament in these fields. They serve as the point of departure for state communications research, for both the purpose and problem areas of the research.

The Government's general guidelines are based on two different bills. Matters of organisational principle for transport research are discussed in the Research Policy Bill. The object of the research is, on the other hand, considered within the framework of transport policy. In connection with the Government's and Parliament's decisions on a new transportation policy, certain guidelines for research goals within the transport field were also established.

The underlying principle is that the research should help to develop the information base needed for reaching the political goals established for the transport sector. However, it is also established that research should not only be focused on this. Another important task is to increase readiness to take action in the event of problems arising that cannot presently be foreseen by investments in research. This is accomplished by building up a base of knowledge and competence for the future. A further role of this type of research is to initiate "questioning" research.

Two basic demands are therefore made on transport research. Firstly, it shall develop the factual base for measures needed to achieve the goals established by Parliament in the transport field, and secondly, it shall create a state of readiness to handle problems that cannot currently be foreseen by building up a base of knowledge and competence for the future. It is also laid down in the Government bill that the knowledge and competence developed via publicly financed transport research must be particularly broad ranging and cover different aspects of the transport sector and its interaction with other sectors. In order to follow up on the effects of government decisions, continuous analysis of the effects of policy on the transport sector and related sectors is a further research task of great importance.

The role of the Government and Parliament in terms of controlling transport research is to stipulate the overall financial constraints and guidelines for the research and to take responsibility for ensuring that an effective organisation is created for administering the resources budgeted for this purpose. The planning and implementation of the research should, on the other hand, be delegated to the relevant authorities and to scientists. However, certain guidelines have been laid down for their work.

The Government has established that one of the aims of research within the transport field is that it should help to achieve the goals of transport policy. The overall transport policy goal has been formulated by the Government as follows: "the goal of transport policy shall be to ensure the provision of national, economically efficient and sustainable transport for the public and the business sector throughout the entire country."

The Government decided on a new transport policy in the spring of 1998. Certain overall guidelines for the goals of transport research were included in the decision. The following areas were some of those highlighted.

### 2.1. Strategic transport research

The area shall help to increase understanding of the role of communications in society, for instance, what the driving forces are and what consequences transport systems have on individuals and society as a whole. Strategic transport research spans a wide area of problems and touches on many subjects and disciplines.

### 2.2. "Eco-friendly" means of transport and fuels

In the long term, the existing transport system will not be sustainable, as it is based on non-renewable energy resources and causes adverse effects on the environment locally, regionally and globally. Many different types of input are required to bring about cost-effective and sustainable transport solutions.

### 2.3. Public transport and publicly-financed travel

R & D investments are important if public transport and other types of publicly-financed travel are to be developed and become more effective and attractive. It is important that we know more about the travel requirements of different groups in society as well as how different transport systems can develop new types of service. It is also becoming increasingly important to develop information systems and new forms of co-ordination.

### 2.4. Safety in transport

So far, research into transport safety has, in all essentials, been focused on road safety. This ranking of priorities is understandable in view of the number of road accidents. It is, however, important to broaden this research to include other types of traffic and to highlight issues pertaining to risk management and security.

### 2.5. Logistics and joint solutions for freight transport

The rapid changes in society and industry's production of goods will present the freight transport sector with major challenges. Logistics has an overriding role when it comes to the control of flows of materials, from raw material to finished product and delivery to the customer. The recycling of waste products must also be incorporated into this chain. Co-ordination between various types of transport is important, as is environmentally-adapted freight transport within built-up areas.

### 2.6. Transport informatics

The combination of information and communications technology will give rise to new systems and services. This will improve the chances of reaching the transport policy goals. An important task for research within this area is to demonstrate what the societal effects will be of the introduction of intelligent systems.

### 2.7. Management and maintenance of infrastructure

Research in this area should be given priority as a means of reducing costs, improving safety, improving accessibility and reducing environmental pollution. The connection between capital costs and future maintenance costs needs highlighting, as does the connection between the design of the infrastructure and the actual traffic process.

However, the Government also underlines the interaction between transport and IT. It is no accident that the Government is endeavouring to co-ordinate the goals for passenger and freight transport with those for the communication of information within a single communications policy. Advances within the field of IT are leading to the closer integration of telecommunications and computer-based information processing. More and more information is now being transmitted via the various telecom networks, which is broadening the scope for communications policy-based research. The mutual dependence of passenger and freight transport on the one hand and information transfer on the other, is becoming increasingly evident. This interaction may mean that they can both complement and replace each other. The rapid developments in information technology also present new opportunities to reduce the adverse effects of the transport system on the environment and in the form of accidents. These new opportunities are an important precondition for Swedish research strategy in the communications field.

## 3. COMMISSIONING OF RESEARCH

KFB will perform its role of initiating, funding and evaluating research, development and demonstration activities within the area of communications on the basis of these general directives.

The guidelines provided are general and do not involve detailed political control of research. KFB is run by a board of directors and a director-general appointed by the Government. The Swedish authorities act autonomously within the limits laid down by the Government. KFB thus has ample freedom, in common with other sector research agencies, to operationalise the goals and transform them into concrete research projects.

If it is to carry out its duties, KFB must be well informed about the area and the research required there, as well as about the ability of the research community to satisfy this research requirement. It is in this unique intermediate position that KFB's strength lies. To use a modern expression, KFB is a *virtual organisation*. This means that KFB functions as the hub in a system which includes key players and processes in the communications field, and that KFB is in a position to influence these players and events outside their own organisation. A virtual organisation possesses a larger and broader competence than is at its disposal within its own organisation. KFB will achieve this by:

- Engaging external experts for assessments of the relevance and quality of applications of and for evaluations of completed research;
- Expanding the financial resources by means of joint funding of projects together with other financiers.

How well KFB succeeds in helping to achieve the goals of communications policy depends on how well the whole chain works, from the interpretation of problems and statement of political intent, via various types of initiative, research, results and dissemination of knowledge, to the intended effect. This chain of activities from problem to evaluation can be described in six stages. The various stages thus also describe the different roles performed by KFB.

### 3.1. To demonstrate the need for and initiate new research

KFB has established the direction of its activities in the form of an operational plan which indicates both its working practices and the structure of the research programmes. The plan is estimated to have a duration of some five years. More detailed research programmes have been drawn up for each of the programme areas. The programmes are developed in close contact with both researchers and problem-owners and are established by KFB's board. The programmes then serve as the basis for the various research projects funded by KFB.

An important aspect of the task of demonstrating the need for research is to continually gather information on the international research situation within specific areas. This task is becoming increasingly important, especially within areas that are developing rapidly, such as IT.

### 3.2. Financing high-quality research

In KFB's instruction, great importance is attached to the long-term build-up of knowledge. Sweden needs research environments which can provide a knowledge base for the communications sector and which focus on issues involving the development of theory and methods. Consequently, the funding of transport research is becoming increasingly concentrated on certain environments as a means of giving the research activities greater stability. KFB is able to budget resources for a period of six years. For this to be possible, the Government has, in addition to the annual financial resources, also allotted KFB a financial budget for a period of six years. Almost 70 per cent of KFB's resources are used for projects that last for a minimum of three years.

The greater portion of KFB's funding (more than 65 per cent) is earmarked for universities and colleges in Sweden, in addition to which there is a dominating transport research institute, VTI, which also receives a large proportion of its funds via KFB.

The funding of research projects is decided on the basis of applications submitted to KFB, which are assessed by one or more of its priorities committees. These committees consist of researchers and problem-owners. The assessment of research project applications includes an examination of scientific quality as well as of relevance to the transport sector.

### 3.3. Implementation of research results

KFB shall take steps to ensure that the research results are put into use effectively. An important task, therefore, is to provide information about and facilitate the implementation of research results. As far as KFB is concerned, this involves increasingly intensive work in identifying target groups within the communications sector for various research projects, documentation of the research results and adapting information to the varying needs of different groups of users.

Reference groups to which problem-owners belong are often associated with the various research projects to facilitate contacts between researchers and the various groups with an interest in the research results. Annual seminars and conferences are also arranged, such as Transportforum, which is normally attended by some 1 500 delegates.

### 3.4. Co-ordination of programmes and projects

As there are many bodies involved in the funding of transport research in Sweden, KFB has the important task of improving co-ordination between the various financing organs in order to achieve the greatest possible effect from total state support. There is very close co-operation between KFB, Vägverket and Banverket, and these authorities often co-finance major R & D investments.

However, co-ordination of programmes and projects also involves KFB in an endeavour to establish multi-disciplinary research environments. Many central problem areas within the field of transport require a multi-disciplinary approach.

### 3.5. Internationalisation of Swedish research

Internationalisation of research is important. KFB's activities should serve to broaden the international connections of Swedish transport research, which is one way of raising its scientific quality. Another goal is to capture and make use of foreign research results for the development of the Swedish communications sector.

Active participation in joint EU research is also important. KFB represents Sweden in those of the EU's research programmes which relate to the transport sector.

KFB has also set up an International Scientific Council as a means of facilitating this process of internationalisation.

### 3.6. Evaluation of research

KFB's role as client includes the need to control orders on the basis of achieved results. Such control of results requires the research activities to be monitored and evaluated regularly. This should be done with regard to scientific quality, relevance to society and effective use of resources. The focus on follow-up and evaluation has assumed growing importance in KFB's activities during the past few years.

In KFB's directive, it is stated that some 20 per cent of the projects supported by KFB should be evaluated each year. KFB establishes an evaluation plan each year to ensure that this is done.

## 4. RESEARCH MONITORING AND EVALUATION

Follow-up and evaluation of research is assuming growing importance for the funding of research within the transport sector. Such evaluations are now an integral aspect of KFB's activities, and they play an important role in the assessment of whether the research activities reach the goals established by the Government.

KFB's evaluations involve four different dimensions:

1. Quality -- the scientific quality that the research environments achieve;

2. Relevance -- to what extent problem areas central to the sector are researched;

3. Effectiveness -- the relationship between input and output in terms of use of resources;

4. Efficiency -- the effect of the research on the transport sector.

All these aspects are included in the evaluations that KFB performs on a regular basis. Evaluations are made not only during the course of a research project, but also *ex ante* and *ex post*.

*Ex ante* evaluations provide the information needed for research funding decisions. This is a process that is well regulated and includes all dimensions, although it concentrates on scientific quality and relevance. KFB's various priority committees carry out these evaluations.

*Ex post* evaluations are quite extensive. Various types of evaluation are made to enable KFB to manage all four evaluation dimensions. The purposes of the evaluations differ and they are therefore arranged differently.

The following types of evaluations have been carried out by KFB during the past few years:

i) Peer-reviews. This is the most common type of evaluation. In principle, KFB always engages foreign researchers to evaluate the scientific quality of the various research projects. This enables KFB to assess Swedish research in its international context. Some research fields evaluated by KFB in this way over the past few years include public transport, freight and logistics, road safety, transport and energy related research and road and railtrack infrastructure techniques.

ii) User-oriented evaluation. Evaluations of this type focus on the relevance of the research project to the transport sector. In other words, the utility aspect of the research is emphasized. How useful are the research results? Have the results been achieved? A necessary first step in these evaluations is to define the target group. If the target group was already identified prior to the initiation of the research project, then the conditions for effective dissemination of its results are far better than if this is not done until the evaluation phase.

iii) Process evaluation. The entire research process is subject to evaluation - from goal formulation to the practical use of the research results. The results of these evaluations are of great importance in improving KFB's ability to carry out major research programmes. Three evaluations of this kind have recently been completed: a programme concerning the use of biofuels, demonstration inputs to improve the efficiency of public transport, and energy-related transport research.

iv) Goal-oriented evaluation. These evaluations focus on the goal-effect dimension. It is not always easy to identify the effects on the transport sector. It is therefore desirable to have a broad approach so that non-predictable effects can also be determined. KFB has recently carried out an evaluation of this kind in the field of road safety. The object of this evaluation was formulated in the following way:

*To what extent is the Swedish national traffic safety programme based on scientifically documented knowledge and what element of this knowledge has been procured by KFB funded research?*

v) Effective use of resources. This type of evaluation focuses on the cost aspect of the research project. Each year, all research projects supported by KFB should submit a report of the progress of the project, with particular emphasis on the consumption of resources. These reports serve as the basis for an analysis of the effectiveness of the project. Certain in-depth analyses are also made of how the various research environments have used the economic means with the assistance of external auditors.

Some conclusions can be drawn from KFB's evaluations:

a) Sector research aims to fulfil several goals. Therefore, different types of evaluation must be made.

b) *Ex ante* evaluations are very important and must be performed in a transparent manner. The credibility of the research-funding authority depends on the financial decisions being characterised by clear quality assessments, objectivity and integrity.

c) *Ex post* evaluations, including those that focus on scientific quality as well as those that assess relevance to society, should be planned before the research work begins. These evaluations are important for the further development of the various research environments.

d) Although evaluations are very expensive, the money is mostly well spent. Ex post evaluations, if properly used, also provide an excellent basis for decisions on the allocation of research resources.

e) Evaluating the effects of research is very difficult. Our experience is that initiating evaluation projects is of great value, even if the measures and analytical methods used are not always ideal. An evaluation begins a process that is important as such. A great deal of methodological development is needed in this area.

## CONCLUSION

Swedish research policy is based on two different approaches as to how the research should be controlled. One approach involves each sector of society as having responsibility for the research needs of the sector by working out R&D plans and funding the necessary research. The other approach involves the allocation of substantial research resources directly to the scientific community so that researchers can channel the research into the areas where it is required. Transport research in Sweden is predominantly based on funding received via sector research organs.

These two approaches as to how research should be controlled have always been topics of some controversy. Last December, a parliamentary committee of enquiry put forward proposals for a new research policy in Sweden. These proposals included the winding up of sector research and the transfer of the resources at its disposal to the researcher-controlled system. The committee's proposals are now being circulated for comment, and a government decision is expected this spring. The consensus view within the transport sector is that sector research is necessary if research which is essential for the transport sector is to be carried out.

**SWITZERLAND**

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# TRANSPORT RESEARCH AND TRANSPORT POLICY IN SWITZERLAND

## INTRODUCTION

In Switzerland, despite small budgets and rather scattered research activities, transport economics have had some considerable policy influence, e.g. with regard to external costs and taxes.

A concentration of academic efforts and research programmes seems necessary. Among other things, two national research programmes with a number of policy relevant topics and some private institutes with strong research efforts and consulting activities have contributed to establish quite a strong link from research to policy.

## 1. SWISS TRANSPORT RESEARCH

As in most countries, Swiss transport research is carried out in various programmes and by various institutions with sometimes overlapping topics. The main activities can be categorised as follows[1]:

| Type of research | Main financing institutions and programmes | Main research institutes |
|---|---|---|
| Technical basic research | Federal Government | Federal technical universities (ETH Zurich, EPF Lausanne) |
| Non technical basic research | Cantonal governments | Universities |
| Oriented (policy driven) technical research and development | Federal Office of Energy, Research Programmes (for light vehicles, electric and hybrid engines, etc.); Technology and Innovation Programme of the Federal Government | Technical highschools, industry |
| Oriented (policy driven) non-technical research | National Research Programmes (e.g. NRP Transport & Environment) of the Swiss National Science Foundation; COST Actions and EU Programmes; to some degree studies of the Transport Ministry (Bureau for Transport Studies of the Ministry) | Universities, private research and consulting companies |
| Practical (mostly planning and engineering) road studies | Road Research Programme of the Federal Road Office | Private research and consulting companies and universities |
| Policy studies | Several Federal Offices (road, rail, aviation, planning, statistics, energy, environment, etc.) | Private research and consulting companies and universities |

**Budgets**

Compared to other countries, the research budgets are very small. The total (non-industrial) Swiss Transport research budget is very roughly about 20 million Euros.

Since the energy research programme involves some technical R&D, its budget is relatively large (about 3 million Euros per year), whereas the National Research Programme on Transport and Environment has a budget of about 1.7 million Euros per year (6.7 for four years). The policy studies on transport are estimated at a volume of about 2 million Euros per year, the road research programme's budget is around 2 million Euros as well.

**The National Research Programme "Transport and Environment, Interactions Switzerland/Europe" (NRP 41)**

***Objective:*** ***To improve the scientific basis for a sustainable Swiss transport policy***

*Projects:* 52 research projects are currently at work and the first publications are available. Keywords of the projects include:

-- Social factors influencing mobility;
-- Modelling freight transport;
-- Regulatory, fiscal and soft policies;
-- Environmental impacts;
-- Technology assessment.

*Time schedule*: Most projects which started in 1997 will end in 1999, the synthesis is planned for the end of 2000. From all projects, comprehensive reports are made available with German, French and English summaries on the Web.

*Budget:* 10 Million CHF (for 5 years) = 6.7 million Euros.

*Information:* -- Call, fax or e-mail:

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-- Find all information on the web: **http://www.snf.ch/nfp41/home.htm**
All publications include English, French and German summaries which can be downloaded from the homepage.

**Transport economics:** Many universities dedicate just a part of a full professorship to transport economic research (Basle, Zurich, Saint Gall, Neuchâtel, Lausanne, Lugano, Geneva and the technical universities of Zurich and Lausanne). Transport economics holds quite a strong position in the national research programme "Transport and Environment" and, to a lesser degree, among the policy studies from several government offices.

**Private institutes:** One of the characteristics of the research "scene" is the strong position of some private consulting and research institutes, which are in some way filling a gap in the portfolio of the universities.

**European co-operation:** Switzerland participates quite successfully in the European Framework Programmes, especially within the Transport Programme of the 4th Framework Programme and its economic tasks, again with the successful contribution of private institutes. The fact that Switzerland is not a member of the European Union does not present a major obstacle (sometimes even a plus for European consortia, since the Swiss contributions are not paid by the Commission, but directly from the Swiss Government). Furthermore, Switzerland is active in many COST actions.

**Non-governmental research institute:** The only unit dealing to some degree with transport research is the "Bureau for Transport Studies", a small unit of about eight persons within the Secretariat General of the Transport Ministry.

## 2. LINKS BETWEEN POLICY AND RESEARCH

Whereas for the basic research there is no direct government influence, for all other research, the Federal Government has quite an important role in defining the research issues. Examples are:

- Defining the topic of National Research Programmes, which led to the programme "Cities and Transport" (around 1989-94) and "Transport and Environment" (1996-2000), co-financing of some studies;
- Deciding on the studies within the road research programme;
- Deciding on the studies within the energy/transport research programme;
- Commissioning a number of studies, especially on external costs, transport modelling, monitoring and statistics, environmental impacts and mitigation measures, etc.

The National Research Programme "Transport and Environment" is an example of a systematic and very close linkage between government agencies and research institutes:

- The Government is represented in the scientific steering committee (expert group), however, the majority within the decisive bodies are academics;
- Government officials are invited to take part in the advisory groups of the projects and discuss intermediate reports at several stages of the projects;
- Various federal offices have contributed financially to those projects which were of particular interest to them.

## 3. SUCCESS STORIES: FROM RESEARCH TO POLICY

There are many examples of a positive interaction between research and policy:

- Studies on the **external costs** of transport have been carried out partly within National Research Programmes (Cities and Transport; Transport and Environment), partly through studies commissioned by the "Bureau for Transport Studies"; they have led to a circle of leading transport economists finding a consensus about a lower limit to the external costs of transport. These figures have been used directly for the justification of the lorry tax (adopted in a referendum in September 1998)[2];

- Studies on the economics of **parking fees** from the National Research Programme "Cities and Transport" have contributed substantially to the introduction of systematic and increased parking fees in cities like Bern and Zurich. The studies have often been quoted in policy documents and even court decisions[3];

- For the assessment of **costs and benefits of nature and landscape protection** measures, a tool developed within the Research programme "Transport and Environment" has been used by the Federal Environmental Office as well as by the Canton of Thurgau[4];

- A study on **indicators of sustainable transport,** the research programme "Transport and Environment", has been used for the establishment of the new strategy of the Transport Ministry[5].

Apart from this, policy studies like those on the economic viability of the Alpine Rail Crossings have, of course, had a strong influence on political decisions.

## 4. ASSESSMENT: STRENGTHS AND WEAKNESSES

In the author's personal opinion, the following strengths and weaknesses are the most important ones with regard to an optimal contribution of transport economics to policymaking:

**Strengths:**

- High standard of policy studies commissioned by some Federal Offices (especially Bureau for Transport Studies, Environmental Office and others);
- Open-minded people with regard to scientific and economic issues, working at key positions in the Government;
- Two national research programmes with a strong link from research to policy and *vice-versa;*
- Compared to other policy areas (economic policy, social policy), a reasonably large (although not very big) budget for policy studies;
- Competition among institutes and transparency are nowadays an asset, whereas for a long time, some programmes have been said to be "insider" or even "self-service" programmes;
- Strong efforts in some quarters for the dissemination of results (e.g. seminars of the national research programmes, Web-sites, etc.).

**Weaknesses:**

- The various research activities are too scattered, even if considerable co-ordination efforts have been undertaken in recent years compared to previously;
- Lack of concentration: no academic centre of any size and importance for transport economics, scattered activities at almost all universities; therefore: relatively bad market position of university institutes and relatively good position of private institutes in policy-oriented research;
- Weak position of economics within government decisions: cost-benefit considerations have often been considered as "too economistic" and policy-driven factors from planning or juridical disciplines or simply policy considerations have been stronger (example: Alpine Rail Crossings, highway network); however, recently, external cost calculations and other issues have become very popular compared to other countries;
- Even though the Swiss participation in European programmes is good, Swiss authorities are somewhat lagging behind with regard to the application of European studies;
- If the National Research Programme "Transport and Environment" ends (in 2000), the budget for transport economics will again become relatively small.

## 5. KEY FACTORS FOR AN EFFECTIVE POLICY/RESEARCH INTERACTION

According to our experience, some of the most frequent mistakes in the dissemination of research results are:

-- research teams try to communicate results and hope for a policy impact after the research is accomplished instead of defining a clear dissemination concept at the beginning and taking into account the specific needs and questions of the target groups;
-- results are published regardless of different needs and habits of different target groups;
-- due to the lack of analysis of target groups and clients, new information channels (bulletins) are created instead of using existing ones which are well known and used by target groups;
-- everything is disseminated instead of selecting rigorously;
-- the agenda and the timing is defined by research programmes instead of trying to use "opportunity windows" offered by the political process and relying on the needs expressed by the clients;
-- those interested in promoting new ideas (politiclal parties, interest groups) are not addressed enough;
-- too little money is dedicated to managing the dissemination.

Based on the Swiss experience, the following elements may be of importance for a productive co-operation between research and policy:

**Elements already well established:**

- Competition among institutes (the lack of government-owned research institutes has not been a weakness, in our opinion, since a number of institutes have always been able to carry out the research needed);
- Reasonable budget and independence for policy studies with a longer time horizon;
- Strong research efforts of institutes involved at the same time in policy consulting;
- Strong involvement of government officials in ongoing research.

**Elements to be improved:**

- Co-ordination of various research programmes and sponsors;
- Dissemination of research (for some programmes);
- International co-operation; improvement of financial conditions for participation in European programmes;
- Concentration of skills in transport economics in one or two academic centres; co-operation of transport institutes from various universities.

## NOTES

1. An extensive survey in German can be found at **www.snf.ch/nfp41/home.htm**

2. For the most recent survey, see ECOPLAN (1998), *Externalitaten im Verkehr - methodische Grundlagen and Externalitaten im Verkehr -- Leitfaden für die Verkehrsplanung*; see **www.ecoplan.ch**.

3 For an English summary: ECOPLAN (1994), Parking Policy, sub-report within the project "Greening Urban Transport of the European Federation for Transport & Environment (T&E)"; see **www.ecoplan.ch**.

4. Report Cl of NRP 41; see **www.snf.ch/nfp4l/home.htm**

5. Reports G5 and Ml, M2, M3 of NRP 41, see www.snf.ch/nfp4l/home.htm

**RAPPORTEURS FROM UNIVERSITIES**

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## 1. INTRODUCTION

Three main trends in transport economics and policy can be identified:

- New economic methods are being developed, helping to solve well-known problems;
- New technologies and organisational structures are being introduced, which require an adjustment of economic methods;
- New policy issues are emerging, calling for new types or new packages of economic instruments.

Examples of the first trend are the development of activity-based modelling of transport choices and the use of operations research to solve well-defined problems like freight assignment or crew scheduling. The second trend is exemplified by developments in information technology, in particular telematics, which offer a new choice of alternatives when making decisions or which change the features of existing ones. The third trend stems from changing political challenges, such as European integration, job creation or environmental conservation.

As the main focus of this paper is on policymaking, it will confine itself to the policy issues formulated in the European Common Transport Policy (CTP). Section 2 will analyse briefly the contributions of economics research to the CTP. Section 3 will summarise the findings.

## 2. POLICY AREAS ADDRESSED BY THE CTP AND THE CONTRIBUTIONS OF ECONOMIC ANALYSIS

The CTP addresses the following policy areas:

- Market organisation, deregulation, privatisation, harmonization;
- Infrastructure provision, Trans-European Networks and pan-European corridors;
- New technology, in particular telematics;

- Intermodality and interoperability of networks;
- Fair and efficient pricing of infrastructure and external diseconomies;
- Environmental sustainability.

It is self-evident that, to take informed decisions, a solid **statistical data base is required**. Unfortunately, this basic requirement is not met. Eurostat's regional and transport statistics are not fully comparable and have many gaps, and the standard compendium on transport statistics is the pocket book produced by DG VII. Little attention is given to traffic surveys, and Member countries do not seem to be very interested in European initiatives to construct common data bases on travel behaviour. As regards road freight transport, the statistical situation has deteriorated considerably since the reporting system was replaced in 1993 by sample surveys of transport companies. In particular, the gaps in data on international transport, cabotage and transport chains are such as to make analysis and forecasting of major transport trends subject to a high degree of uncertainty.

The very unsatisfactory situation in the statistical area – despite all the research done under the Commission's 4th Framework Programme – is mentioned in order to dampen expectations that rapid progress in economic research could improve policymaking in the medium term by ensuring that decisions are based on hard facts and figures.

### 2.1. Market organisation, deregulation, privatisation and harmonization

The ruling by the European Court of Justice in 1985 seemed to clear the path for the liberalisation of the European transport sector. But liberalisation has made strides only in the road and airline sectors, in which market forces have been unleashed. This progress was made at the expense of the railways; also, the potential of inland waterway transport has not been exploited for want of market harmonization. The result has been a modal shift from rail and inland waterways to road and air, which is contrary to the goal of sustainability. The traditional issue of harmonization will thus become increasingly important in the future, calling for careful economic analysis of what the market and regulatory framework should look like in order to ensure fair competition without adverse environmental and social effects. The admission of new countries to the EU will only highlight still further the urgent need for harmonization.

From the standpoint of economic analysis, this means that the traditional neo-classical theories which have been dominant in the past will have to be supplemented by the contributions of **institutional economics.** Institutional economics takes a longer-term view of the incentives introduced by liberalisation. It addresses the role of the State and the extent to which existing state institutions are able to perform that role effectively in a dynamic context, i.e. in a world of interest groups and stakeholders who exert pressure on political bodies.

### 2.2. Infrastructure provision, Trans-European Networks and pan-European corridors

Until now, thinking on infrastructure planning has been project-oriented; the same holds for the methods of assessment used. Preliminary ideas for a systemic view of network development can be found in the guidelines of the Commission for TransEuropean Networks ("Strategic Environmental Assessment" of TENs) and the decision of the Austrian Ministry of Transport to evaluate federal infrastructure investment on a network scale. The suggestion of the German Federal Environmental Agency, that federal infrastructure investment planning be based on a well-defined, integrated environmental transport concept, may also be mentioned in this connection. A political initiative like the TENs, which in its present form is little more than a summary of national shopping lists of

projects, should be subject to systematic review. This could be performed using the following extensions of existing methodologies:

***Strategic Network Analysis (SNA)***

Network modelling has made such rapid progress that it is now possible to study network or corridor features and to optimise infrastructure with respect to a number of underlying political objectives. Impacts on regions and economic sectors can be studied in a broader context.

***Ex-post evaluations***

No systematic *ex post* evaluations of the benefits and costs of projects have been conducted on a European scale. Widely used by the World Bank to measure the effectiveness of its investment policy, such evaluations could become a standard method of monitoring good and bad practice. Empirical evidence of the economic effects on regions and sectors is particularly useful.

***Institutional conditions for private involvement in planning, operation and finance***

A drawback of most private/public transport investment partnerships is that the private contribution is not clearly defined. Usually, the private investors are invited to tender after the project design has been finalised by the public partner, so that their role is confined to building, operating and financing the project and no more. Institutional and organisational theory (**principal – agent theory**) can help to define the private partners' role so that they are included in the planning process from the outset and financially viable projects can be put together.

## 2.3. Developing new technology, especially telematics

**Technology assessment** has proved to be a useful instrument for preparing policy, and can help to set the direction of future technological development in transport. Nevertheless, there are important fields in which more use could have been made of it to reduce uncertainty about the impact of innovative technologies.

One example is the MAGLEV technology developed in Germany ("Transrapid"), which is under consideration in Switzerland ("Swiss Metro") and is also being strongly pushed in Japan ("MLU"). In all these cases, transport policymaking may be likened to a game between enthusiastic engineers, rent-seeking companies, sceptical economists and hostile environmentalists. Although this innovative technology is said to have many spin-off effects, so that there might be positive impacts beyond the transportation sector, the technology assessment studies which would be needed to substantiate this claim have not been done.

A second example is the new information and communications technologies and their application in the transport sector. Many studies exist which show the large potential of telematics to improve capacity use, traffic guidance and individual travel. But little is known about the limits of the technology. We still know little about the counter-productive effects of information overkill or the changes in the behaviour of people who are subject to user- or systems-optimal guidance strategies.

Technology assessment must take into account not only the potential economic effects but also the **social impacts**, e.g. the impact on values and social disparities.

## 2.4. Intermodality and network interoperability

In order to be used by many users and operators, transport and communications networks need a high degree of standardization. The air traffic sector has paved the way in showing how an efficient system of standardized communication technologies can be set up to control air traffic movements world-wide according to a common set of rules. This would be a realistic ideal for other sectors such as rail and waterway transport. The co-ordination of activities in a railway network can best be studied by using **network simulation and optimisation techniques**. Activity analysis can be extended by means of the constraint-logic programming tools being developed in computer science.

The same holds for intermodality. Intermodal chains are very sensitive to the quality of transhipment points and the robustness of the transport chain in the event of any disruption. New intermodal developments are **hyper-networks** of networks, which can be used for intermodal transport chains and detailed modelling of transhipment activities. The more detailed the modelling, the clearer it is why industry is currently not very eager about intermodal transport. In many cases, the costs of transhipment can be high, reliability low and control of the overall transport chain almost impossible. To achieve its aims, transport policy must therefore seek the most effective points of leverage.

## 2.5. Fair and efficient infrastructure pricing and external diseconomies

In the past two years, the Commission has published a green and a white paper on this subject, but it is still no clearer what "fair" and "efficient" means with respect to infrastructure pricing, or how to put a price on external diseconomies. Lacking clear definitions of fairness and efficiency and sticking to traditional neoclassical concepts of pricing, such as short-run marginal costing, the practical feasibility of such pricing is still very much open to question. The design of pricing arrangements that are adapted to the real world thus represents a major challenge to economists.

Areas of **price theory** like multi-part tariffs, game-theoretical schemes or other second-best approaches which take account of the impacts of transport prices on other sectors, in particular land use, were not given sufficient attention by the EU papers. Studies should focus more on dynamic incentive effects than on the short-run static impacts that are the focus of marginal cost theory.

## 2.6. Environmental sustainability

Environmental studies are usually based on forecasts of impacts of exhaust emissions or noise. Recent research by the EU and the OECD has also used **backcasting** techniques. Engineers, ecologists and economists try to define a future state of the world which they regard as sustainable. A transition path from the present situation to the future state is then drawn, together with a timetable of policy actions conducive to the aim of sustainable development.

Economic analysis is needed for such long-term scenarios, for three reasons: firstly, the future state of the world should not only be sustainable from the ecological point of view. The economist has to answer the question whether it would also be economically and socially sustainable. Secondly, the transition path has to be evaluated with respect to economic feasibility, because it implies a large number of actions-responses both within the transport sector and between the transport sector and other sectors. Thirdly, the economist can contribute to the design of policies over time with a view to minimising the negative impacts of regulatory measures on firms and consumers.

It may be doubted whether classical methods such as cost-benefit, cost-efficiency or multi-criteria analysis are effective ways of assessing sustainability. The crucial problem is the long-term horizon and the speculative character of scenarios which lack parallels in observed developments. Other approaches such as **system dynamic modelling** (SDM) are thus more appropriate to this type of assessment. SDM is intrinsically dynamic and based on feedback mechanisms over time. Furthermore, it can be composed of modules which are econometrically tested (empirically validated modules) and others based on expert judgements (mental constructs). New developments in SDM show that its potential goes far beyond the Club of Rome's use of it for its long-term world scenarios.

## 3. SUMMARY

While basic research is conducted to a large extent independently of policy considerations, empirical economic research is largely driven by the perceived demand for practical problem-solving. A large variety of economic instruments are being developed but a few may be singled out as being particularly relevant to decisionmaking within the framework of the European CTP. They are:

- Institutional economics;
- Strategic network analysis;
- *Ex-post* evaluations;
- Technology assessment of innovative vehicle technology and telematics;
- Network simulation and optimisation, using constraint-programming techniques;
- Hyper-networks for supply-side modelling;
- Second-best pricing strategies;
- Backcasting;
- System dynamic modelling.

Most of these methods are not new but they can be adjusted to changing policy needs.

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# RESEARCH AND TRANSPORT POLICY

The question as to whether or not transport economics research provides the knowledge that policymakers need to come to properly informed decisions is a valid one. If it does not, then this is an initial shortcoming that has obvious drawbacks for effective decisionmaking. This first scenario and its implications are addressed in sections 1 and 2 below).

A "yes" answer to this question is contingent upon meeting a number of requirements, which we outline in section 3. If this is indeed the case, i.e. if research is indeed delivering the information needed for sound decisionmaking, we still need to know whether decisionmakers understand the message that researchers are trying to get across to them. If they are not, we need to examine the reasons for this breakdown in communication and ways in which it might be remedied (section 4).

## 1. SOCIAL UTILITY AND ACADEMIC UTILITY

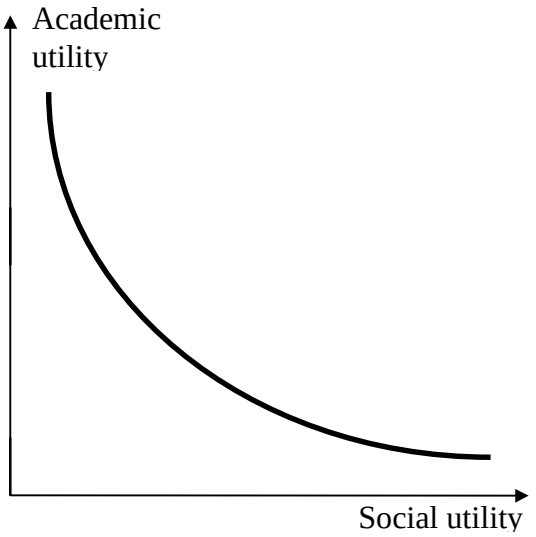
One way of analysing the situations we have just outlined is to assess the outputs of research in terms of two criteria -- social utility and academic utility -- which may either be correlated or, conversely, diametrically opposed to each other, depending on the individual country, the period or even the subject concerned. The first of these criteria can be taken to represent society's need for knowledge and expertise, the second, the specific needs of the scientific community. For the sake of argument, we will also assume that these are measurable criteria and that all research outputs can be plotted against two axes, representing social utility and academic utility.

First, there are a number of reasons why research should be subject to two distinct types of criteria. The social utility of research resides primarily in its ability to provide timely answers to questions as they arise or when urgent decisions are needed. A good example of research affording a high level of social utility would be to devote major resources to generating and processing data in order to construct a forecasting model that is as consistent as possible. Work on the formal properties of such a model, on the other hand, would be kept to a bare minimum.

Along the same lines, a high level of academic utility would require the development of a much more sophisticated model that differed, at least formally, from existing tools. Since its academic utility will primarily depend on how well it meets the criteria of the academic community, whether it is operational or not will be a secondary consideration compared with its formal properties. Rather than testing the model against observable data, what is important is how it compares to the "state of the art", i.e. what recognised authors have established on the subject. In a way, theory has become a substitute for empirical analysis.

For a given amount of resources, a curve such as that in Figure 1, representing the two types of research, shows how one criterion can be substituted for another.

Figure 1. **Substitutability of criteria**




This curve does not mean to say that the world of academic research is closed to the demand for social utility. A university research institute, for example, may divide its activities between research aimed at producing scientific papers for publication and contract research commissioned and funded by decisionmakers. Publication provides an incentive for theoretical research and, at the same time, advances the careers of researchers in the academic world. The advantage of contract research is that it draws researchers towards issues of immediate concern to society and, at the same time, attracts funding capacities. Without such funding, research programmes would be severely handicapped as soon as there is any need to generate and process specific data.

Conversely, a research consultancy firm will clearly have to cover all of its costs through contract work. However, it is also in its interest to devote some of its activities to a science watch and to extending its theoretical knowledge-base, failing which it will run the risk of finding itself limited to repetitive tasks and to the use of methods that will eventually become obsolete.

By exploring the social utility axis, the academic community ensures that it has the requisite empirical knowledge. By exploring the academic utility axis, research consultancies ensure that they are able to renew their theoretical knowledge base. The two movements from opposite directions will

eventually meet and the language that decisionmakers use to frame their practical questions will find itself confronted with that of scientific publications, with each group contributing in its own way to the task of translating that work into the "language"of the other.

However, it does not follow from the fact that there is mobility along the substitutability curve that the resultant dynamics will necessarily be stable. In short, the two professions – research and consultancy -- do not have the same client base, but each needs the other's clients in order to secure its development. Their response may take one of two forms, depending on how they view the legitimacy of this two-way contest: they will either view each other with suspicion, or they will see the process as an opportunity and will attempt to emulate each other.

## 2. THE MUTUAL SUSPICION SCENARIO

The most striking symptom of this hostile dynamic is that *players on both the research and the decision-making sides are only able to influence the "market" that concerns them directly,* if only because they do not know what is going on in the other market. The players on the demand side are the first to withdraw into their respective spheres.

In the academic sphere, the players are the referees responsible for selecting the papers that will appear in authoritative journals, those who sit on thesis panels or elect young colleagues and those who allocate public funding to research teams (often these are the same people). Their power derives from a reputation for being difficult to please, which they have to maintain by rejecting everything that is not considered as meeting high academic standards. This is what led to the well-documented drift in economic science which, in the early 1970s, provoked a healthy backlash from some who could more legitimately speak out than others.

One such was O. Morgenstern, who, after outlining the difficulties inherent in statistical analysis in economics, commented that it was no surprise that econometricians found it easier to develop sophisticated abstract methods than to put them into practice[1]. W. Leontief was not surprised either by the fact that many economists at the time seemed quite content with a situation in which they could demonstrate their prowess by building more and more complicated mathematical models and devising more and more sophisticated methods of statistical inference without ever engaging in empirical research[2].

*The worst about the situation that Leontief objected to is that it can be self-perpetuating.* In the academic world, the criteria for personnel selection are such that there is every reason to believe that future referees will exacerbate existing trends, since they will be even less familiar than their predecessors with the world of empirical data and observable fact. To avoid having to face this world, they treat it with disdain and, in order to convince themselves that they are right, criticise it as second-rate. The requisite vocabulary is to hand: pure research (high-brow), on the one hand, versus applied research (pedestrian) on the other.

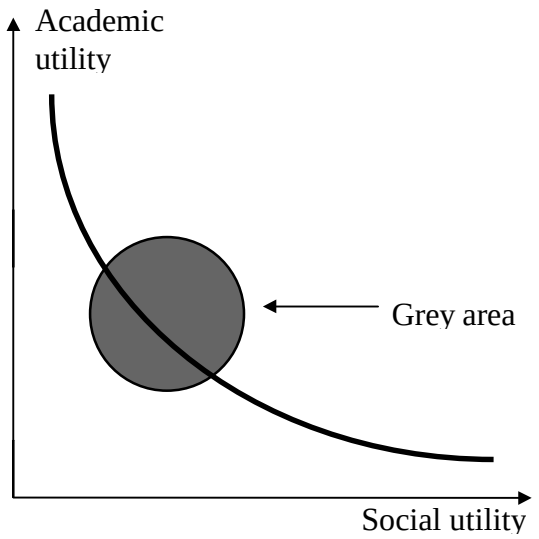
On the academic market, to be published, employed, promoted or eligible for public funding, the author-supplier has to demonstrate the formal "prowess" that demand requires. What he has to offer will be rejected if it does not score well on the academic scale, however socially useful the results may be. In extreme cases, social utility may even be a handicap.

On the second market -- knowledge to inform policy decisions -- demand has been totally discouraged from using the academic research community. The latter has a reputation for producing only theoretical constructs that bear little resemblance to reality; constructs that decisionmakers find painfully abstruse when what they need is something that is readily comprehensible.

Demand from the decisionmakers' side has no alternative but to turn to its own suppliers, in particular, consultancy firms specialised in the issues for which that demand is highest. To ensure the development of methodological tools, decisionmakers can count on the innovative capacity of the best organised consultancy firms or, failing this, on their own research delivery system. This is why large research and consultancy departments have developed within central government and major national firms. The results of their research are measured by their effectiveness in the field and are rarely published in the scientific press. If they were, decisionmakers would simply ignore them, such is the climate of distrust between the two markets.

As a result, a no-man's land emerges between the opposite poles of social utility and academic utility; which corresponds to the grey area of publications that is not recognised by either market, as shown in Figure 2.

Figure 2. **Mutual suspicion scenario**




Quite clearly, this situation is not conducive to overall effectiveness: deprived of the forum for debate that books and the field offer, the academic community delights in producing research valued only for its formal aesthetic; deprived of the conclusions of theoretical debate, the decisionmaking world has to make do with tools that are seldom updated. Quite the reverse, in short, to what can happen in a mutual benefit scenario.

## 3. THE MUTUAL BENEFIT SCENARIO

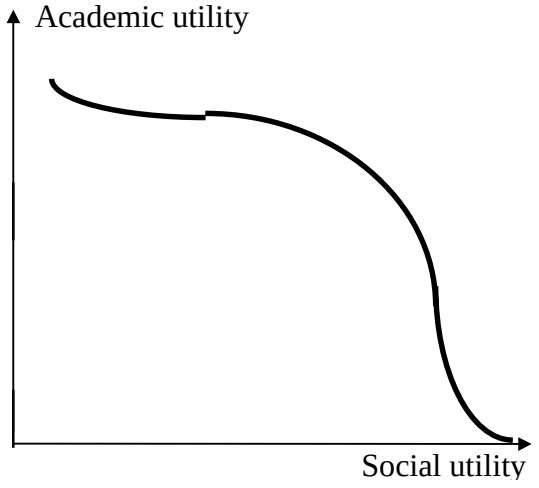
As everyone will have realised, the preceding scenario is based on "anthropological" assumptions about the two groups of actors. Of course, with another set of very different assumptions, a totally different dynamic is possible.

The differences seem to us to relate essentially to the demands of the academic community. *As soon as the academic sphere chooses to rate the scientific substance of its theories higher than their formal "prowess", it inevitably invites comparison of those theories with observable reality* and, therefore, encourages what W. Leontief called "empirical research". Of course, it is not enough just to organise factual data in an orderly fashion and fool oneself that this is "statistical inference". It means building a theoretical, quantitative or causal model by checking it constantly against observable fact.

Once this requirement -- *fundamental to any modern theory of knowledge* -- has been met, the generation and processing of data assume their rightful importance and require resources that frequently exceed those available to academic research. Additional resources can only be found on the social utility market, where the work of the researcher may coincide with the decisionmakers' need for knowledge. By allowing research to profit from this (in both senses of the term), the referees of the academic world will cease censuring work that has an empirical content or even a practical application. Where there is a complete change of attitude, social usefulness may even be included in the academic evaluation criteria. This will stimulate what is known as the practical application of research work.

Conversely, the more that the operational market finds that innovative concepts or methods from the world of research are borne out by its applied work, the more it will open its doors to the latter. With this sort of dynamic, the two worlds cannot fail to see that they have something to learn from each other. What academic research gains in relevance, applied research gains in theoretical power. Instead of alternative criteria, we have complementary criteria and the output curve of the two markets falls into areas that are more effective for both criteria, as shown in Figure 3 below.

Figure 3. **Climate of dialogue**



As the curve suggests, there is still, of course, scope both for purely academic work and for work with a high social utility content, but that is of little interest to the academic community. These extreme cases may be short-lived, however, since purely theoretical research may have a positive impact on methodology and so coincide with the applied field. Equally, strictly empirical work may produce results that are not clearly understood, giving rise to new questions for research to resolve, or may even result in new databases, which will provide an untapped resource for innovative research.

Contrary to what happens in the mutual suspicion scenario, it is no longer mutual rejection but shared curiosity that is the basis for relations between the two markets, to their mutual benefit; although, for the system to reach its full operational and academic potential, communication has to be established between the two communities.

## 4. COMMUNICATION PROBLEM

Once the obstacles created by the climate of suspicion are removed, information must circulate between the two sides if any mutual benefit is to be gained from the interplay between policymaking and scientific issues. This poses three problems: dissemination of knowledge, continuous verification and professional mobility.

The *dissemination of the results of transport economics research* relies on media that are not designed to reach a wide audience. The international journals which have the most well-established and authoritative review committees have a readership of barely more than 1 000. The last four meetings of the World Conference on Transport Research were attended by at most 1 200 people. These orders of magnitude demonstrate, were proof needed, that the audience interested in this type of research work is roughly equivalent to the population of people producing it.

Certainly, efforts have been made, particularly by the ECMT, to make this research work accessible by setting up an efficient documentary database and cataloguing work in progress. In conjunction with the ECMT database, several university research centres have developed their own documentation systems. The principal users of these databases are, for the most part, authors of the works they catalogue and students. This said, an increasing number of users are consultancy firms providing services for decisionmakers.

The trickle-down of knowledge in this way can hardly be considered adequate and it is up to the academic community to make a special effort to disseminate the results of its research. Many research institutes take pains to produce regular newsletters. On the other hand, few researchers undertake the work of popularisation that would make the main or most recent approaches to an issue more accessible to the wider public. The reasons are that this is a difficult and laborious exercise and that this type of publication generally does not receive much attention from academic reviewers.

Conversely, research work specifically commissioned by decisionmakers is rarely published, still less catalogued. The output of “grey literature” is in fact only catalogued in documentary databases when it arrives by accident at the research centres administering the databases. It is often only through special, carefully conducted documentary searches that high value-added studies or studies that shed some light on the decisionmaking issues that first prompted them can be tracked down.

The *continuous exchange of experience* between the actors in the two markets has probably been more successful than the dissemination of knowledge. The TRB[3] meeting, held every January in Washington, is certainly a model in this area. Topics on transport economics and its tools, alone, bring together several thousand participants from all of the organisations concerned: decisionmaking centres, consultancy firms, universities, etc.

In Europe, apart from the PTRC -- which, outside of the United Kingdom, only has a modest following -- there is no equivalent forum for all of the actors concerned. The only regular meetings that bring together the full range of the actors are the ECMT's Round Tables. These play a key role in this exchange of views but are limited to a few topics per year and 30 or so participants at each Round Table. Symposia that are open to all the actors concerned also play a substantial role. However, all things considered, there is no European equivalent to the annual meeting of the TRB -- a regular event for which contributions can be scheduled a long time in advance -- always of high standards and conducted in an atmosphere conducive to an exchange of views between the two worlds. However, we should note the substantial growth in European research programmes (framework programmes), which have gradually increased in relevance and are becoming steadily better at encouraging collaboration between consultancy firms and university teams. Decisionmaking circles are also included, although less directly involved, but academic efficiency and social efficiency are working well alongside each other in these programmes.

Lastly, the extent of *professional mobility between the academic and decision-oriented research environments* varies a great deal from one country to another. Clearly, this would be an excellent way of transferring experience and, generally, of fostering mutual recognition between the two environments. However, where mobility is particularly low, as in France, the reasons run much too deep to expect to see them change in the short term.

If my closing remarks have been about communication issues, it is because they are both causes and symptoms of the poor quality of dialogue that we now have between the research and decisionmaking spheres. Consequently, we could consider systematic international evaluation of the quality of that dialogue, not directly, but through indicators for each of the three aspects of communication which we have just outlined. How could I possibly close without suggesting further research, but, typically, for the purposes of informing policy decisions?

## NOTES

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**POLAND**

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# RESEARCH IN THE FIELD OF TRANSPORT ECONOMICS AS A CONTRIBUTION TO THE FRAMING OF TRANSPORT POLICY IN POLAND

## 1. INTRODUCTION

Since 1990, social and economic processes have been underway in Poland that are often succinctly referred to as "transition from socialism to capitalism". From the economic standpoint, this process is a transition from a planned economy to a market economy.

The declared aim of the centrally-planned control economy was the maximum satisfaction of needs, which led to the maximisation of total production and at the same time maximisation of expenditure. The direct, central planning implied the functioning of a direct, centralised management of state-owned economic units. This situation created a framework in which the market could not develop and meant that such financial instruments as money, price, credit, interest rates and taxes were of only minor importance because they were subordinate to the flows of physical goods and services. Since the physical production plan was more important than financial planning this meant that there was not the slightest reason to have strict budget accounting. The rejection of the market mechanism, the administrative control of prices for investment and consumer goods together with weak budgetary restrictions for enterprises are the main factors that caused the general shortage of all goods throughout the whole period of the centrally controlled and administered planned economy. The availability of financial resources by no means guaranteed that enterprises could obtain the necessary investment goods and inputs, as this depended on a central distribution system. There is therefore no need to justify the claim that the so-called shortage economy was economically inefficient, because it promoted neither the mechanisms of rational management from below, nor technical progress nor economic growth. Such an economic system was able to last for a few decades only because its proponents held the political power over the entire country and hence had political supervision over enterprises.

In 1989, Polish society expressed massive support for political forces that were in favour of a complete change in the social and economic order and the creation of new institutional and legal structures in order to make social and political relations fully democratic. A return to an efficient market economy was thus recognised as the normal and natural way to develop. The transformation taking place is characterised by two aspects: one political and the other socio-economic. In the first, it is a matter of the radical transformation of the political situation and ownership conditions, reflected in

the development of private ownership, political pluralism and parliamentary democracy. The second aspect concerns a significant increase in the productivity of the resources available to enterprises, i.e. it is a matter here of enhancing the efficiency of business management and the economy as a whole. This means that the system transformation consists of all the political and socio-economic changes taking place in the post-socialist economy, in which the creation of an efficient market economy is the overriding factor and a precondition for the success of the system change. In economic theory, at least three main constitutive characteristics of a market economy are named:

- Private ownership, which is seen not only as an economic phenomenon, but is also considered as a philosophical, ethical and legal category;
- Economic freedom, as a many-faceted phenomenon with politico-economic and institutional dimensions;
- Competition, as a process in which buyers and sellers, in order to satisfy their own interests, seek to present more favourable offers than other buyers and sellers.

Private ownership, economic freedom and competition constitute the foundation for the market and market mechanisms, which in their turn force all economic actors and households to organise their activity according to the principles of rational economic management.

Although the creation of an efficient market economy is the main goal in Poland, this does not in itself determine the concrete solutions used in the economic structure. There are in fact different types of market economy, not only in Europe but also in the rest of the world. They are characterised by different property structures, diverse institutional solutions and in the differing extents to which governments intervene in the functioning of the market economy and in the social protection provided for the poorer strata of the society.

The shaping of the above-mentioned factors and other elements which determine the concrete form of the market economy is the task of economic policy, which is to be understood as the deliberate influencing by the State of the economy as a whole, its dynamism, structure and functioning, of economic relations within the country and economic relations with other countries. In the activity of the State, a distinction can always be made between five basic types of policy:

- Economic stabilization policy, which uses anti-inflation instruments;
- Economic growth policy, which aims at stimulating the economy;
- Structural policy, concerned with the subject- and object-related restructuring of the economy and the pattern of ownership;
- Trade policy, concerned with economic relations with other countries:
- Social policy.

The above-mentioned policies contain different sub-policies relating to function (e.g. financial, fiscal and customs policies) or branch of activity (e.g. industrial, agricultural, trade and transport policies).

In the transition from the planned economy to the market economy, the main effort is directed at structural change, in particular the commercial orientation and privatisation of the public sector. The concepts discussed here have already become established in the economic vocabulary as the period of system change in Poland, although it is sometimes differently understood and interpreted.

Polish researchers in the field of transport economics have been actively engaged in the processes of system transformation which have been underway since 1990. Here, however, we must point to the

great variety of fields of activity within the transport sector that have to be covered by scientific research and support; in addition, the rapidly developing system transformation had an urgent need for significant scientific support from the outset. No country had previously completed the phase of system transformation, so at the beginning of the 90s Poland had no general theoretical transformation model that it could use.

It is impossible to discuss all scientific research in the field of transport economics or all activities of Polish economists connected with the framing of transport policy since 1990 in a single paper. The author has therefore limited himself to describing some areas of his own work which have to some extent helped shape transport policy in Poland.

Specialists in the field of transport economics have been playing an active role in developing Polish transport policy since 1990. There was initially a broad debate regarding the principles of this policy, concerned with two main aspects:

- The general methods of Polish transport policy;
- The aims of Polish transport policy.

Specialists in the different branches of the transport sector tackled the specific problems of their own fields. As an example of the enormous harnessing of the scientific potential, we can take the railway sector, where three main fields in which scientific research has helped in the framing of Polish transport policy should be mentioned:

- The restructuring and eventual privatisation of rail transport;
- The approximation of the operating principles of Polish railways to European Union requirements;
- The calculation of fees for access to railway infrastructure.

The problem areas listed above, the first two of a general nature, concerned with the transport system as a whole, and the second three concerned specifically with rail transport, will be discussed in some detail in what follows. They appear as good examples of the practical involvement of transport economists, using the findings of their research to help frame transport policy in Poland.

## 2. TRANSPORT POLICY METHODS -- RECOMMENDATIONS FOR ECONOMIC PRACTICE

In economic theory, a state can adopt either of two contrasting economic policy models, although in practice neither exists in pure form: liberalism, or *laissez-faire* and interventionism. Liberalism is broadly defined by the following characteristics: limitation of the role of the State to the guidance of the economy as a whole, privatisation of formerly state-owned sectors, freedom for all economic activities, low taxes to promote economic growth, and competition. Interventionism, on the other hand, is based on a policy of active intervention by the State in the development and functioning of the economy, using different instruments such as price and wage control, the instrumental use of taxes,

direct investment and various administrative measures. Over time, neither of the two economic policy models can remain in its pure form, so that we can speak only of the more or less liberal or interventionist nature of an economic policy.

The debate over whether the pursuit of a given transport policy constitutes interventionist interference in the economy or not, is of a purely rhetorical nature if we take into account that liberalism itself has no economic policy principles of its own, in particular in individual economic sectors. It therefore follows that if the State does adopt a policy in an economic sector, for example, the transport system, using appropriate instruments, this determines the choice of the policy model, insofar as this policy immediately takes on an interventionist nature. Five preconditions which justify state intervention in the economy are generally named:

- The existence of public goods -- these are characterised by the fact that nobody can have exclusive use of them, i.e. the actors who are potential users are ordinary members of society;

- External effects -- here, it is a matter of negative and positive effects of the activity of enterprises which do not impact on the profit and loss account (the best known negative external effect is environmental pollution, while positive effects are innovations of all kinds that bring more advantage to the economy as a whole than to the enterprise itself;

- Natural monopolies -- these are often producer monopolies, where, because of economics of scale, the supplier concerned can sell its goods or services at the lowest cost. Such advantages appear above all in utilities and infrastructure networks (energy, gas, telecommunications, railways). To a certain extent, it is possible to increase the loading of these networks at will with only a small increase in costs. In this case, a monopoly is an optimal solution for the economy as a whole;

- Cut-throat competition -- this situation arises where enterprises, whose activity is necessary to satisfy demand, are not happy with their market position and start competing fiercely on prices. Big enterprises, whose unit costs are generally lower, are in a position to lower prices to such a level that not only the weakest but also medium economic actors are forced out of the market;

- Structural crises -- these are characterised by the fact that a permanent surplus production capacity has appeared, due to external factors (import bans, embargoes) or internal factors.

The above preconditions for state intervention in the transport sector of the economy are present in all European countries, including Poland, which justifies specific transport policies. All transport sector infrastructures -- roads, railway lines and waterways, bus stations, railway stations, airports and seaports -- are public goods. The transport system also causes many negative external effects, such as environmental pollution, noise, vibration, land use and the great number of road accidents leading to injury, mutilation or death. There is natural network monopoly in rail transport. Cut-throat competition is characteristic of large parts of the road haulage industry. Structural over-capacity is present in western Europe mainly in rail, inland waterway and air transport, while in eastern Europe it has been aggravated as a result of the system transformation policy.

It is also clear that the transport system is one of the economic sectors in which individual branches meet the objective preconditions that justify the pursuit of a policy of state intervention to eliminate or reduce the impact of phenomena and processes that are negative and undesirable from the

standpoint of the economy as a whole. If we assume that the State, despite the existence of the above-mentioned preconditions for intervention in the transport field, in fact does not intervene in this economic sector and does not introduce any special regulations for the transport system (e.g. laws, regulations, etc.), then this would be a completely liberal policy. However, already with the first special regulations for this sector, initially in the form of appropriate legislation to create the organisational and legal framework for the functioning of the entire transport system (e.g. the Transport Act) or its individual branches (e.g. the Railways Act) and later in the form of regulations and administrative decisions of the supervisory authorities under the provisions of the basic legislation, we clearly have an interventionist policy.

It is therefore clear that a distinction between a liberal economic policy, which is characterised by the lack of any intervention in the transport sector, and an overall transport policy or any policy in the individual transport modes, which simply through its adoption and by its very nature is based on the principle of the state intervention, can only be made in the above sense. It thus follows that the transport policy model is necessarily that of state intervention. The extent of the intervention can vary, however, according to whether the State's policy includes many interventionist subsystems with their various instruments. The least possible state intervention in the transport system is therefore that where only the general organisational and legal frameworks are established for the sector as a whole and the individual modes, and economic instruments are used extremely sparingly and only in well-defined cases. In the first place it is a matter of such basic legislation as the above-mentioned Transport Act, a Road Traffic Act and corresponding laws regulating the operation of rail, road and international transport, with just a necessary minimum of economic instruments -- for example, to limit prices in the case of monopoly formation.

With an increase of state intervention in economic policy, in particular policy in the individual branches of the economy, the number of instruments used increases, with orders, bans, public service obligations, detailed tax regulations, price and wage policy measures and other forms of intervention, that end up with negative phenomena such as conflicting effects of individual instruments, ineffectiveness of certain instruments and general over-regulation of the branches concerned.

Negative phenomena of this type, in particular over-regulation, have been seen in the transport policies of many countries. With regard to general transport policy and policy in the individual transport modes, this led in many countries, logically enough, to calls for deregulation, sometimes called liberalisation, of the transport system. This process consisted in the gradual elimination of many interventionist instruments in the transport policies of states and economic groupings, whereby particular attention was paid to the removal of any kind of obstacles to access to transport markets. In this sense transport deregulation policy can be equated with a certain liberalisation of its operating principles, though there can be no talk of a transition of a state or of the European Union to economic liberalism as the transport policy model so long as the typical organisational and legal regulations of the transport sector are maintained in these countries.

In Poland, we can scarcely speak of deregulation of the entire transport system in the fullest sense of the word, because the country lacks regulations characteristic of the market economy. The absence of market mechanisms in Poland over a period of several decades following the second world war was the result of the type of regulations characteristic of the planned economy. In the process of system transformation, it is now a matter of rapidly getting rid of these regulations. In the resulting gaps we need new legal texts that take account not only of the fact of the transition to market economy principles but also Poland's future accession to the European Union. We can therefore say that in Poland in the 90s it has been more a matter of building an appropriate set of transport policy instruments taking account of the experience (above all the negative experience) of highly developed

countries in this connection, than deregulating transport activity (which is indeed the general trend in the western European countries).

Poland's transport policy is and will remain a policy based on the principles of state intervention. The problem lies in deciding the extent of this intervention and the type of instruments used. In order to avoid over-regulation of the transport system, it would appear to be necessary to base future rail policy on the principle of "pragmatic intervention". The essence of this transport policy methodology is, on the one hand, the withdrawal of the State from intervention in those parts of the transport system in which this is possible and rational, e.g. through privatisation and the abandonment of price control but, on the other hand, the maintenance of active intervention to control phenomena and processes wherever this is necessary in the given stage of material and organisational development, e.g. through infrastructure investment, internalisation of external costs, stimulation of restructuring and privatisation processes, repayment to transport undertakings of the costs associated with the fulfilment of public service obligations. This means that the direction in which state intervention in the Polish transport system is going to develop is not clearly determined, i.e. it ranges from over-regulation of parts of the transport system through various instruments to complete deregulation and liberalisation of the operating principles of this sector. In the system transformation underway in Poland, the changes in state intervention in the transport system involve doing away with certain instruments but, at the same time, introducing new instruments or increasing or reducing the role of existing ones.

The scientific debate on transport policy that took place in Poland in the 90s, the results of which included recommendations for economic practice, no doubt led to economic policies in this field now being approached more pragmatically.

The contribution that scientific circles have made to the Polish transport system lies in their having made the economic policymakers aware that exaggerated liberalism can cause many additional and often unexpected social and economic problems in Poland.

## 3. AIMS OF POLISH TRANSPORT POLICY

The scientific debate on the aims and tasks of Polish transport policy was of a practical nature. Already at the beginning of the 90s, members of the scientific community had begun to discuss the subject of the aims of Polish transport policy before a broad public. The problems were addressed in many articles in the specialist press and in contributions to conferences and scientific seminars. There was no lack of polemical and controversial statements. In 1993, the Ministry for Transport and Shipping commissioned transport system experts to produce an official document for the Government setting out the principles, entitled: "*Transport policy -- Action programme for reorganising the transport system to meet the requirements of the market economy and the new conditions of economic co-operation in Europe*". This task was taken on by Prof. Jan Burniewicz of the University Gdansk with a group of collaborators (the author of this paper took part in the first phase of the work on this document). After much discussion, argument and reworking, the final version of the document appeared in 1995. It was accepted by the Government as the official document setting out Polish transport policy.

Today, some years later, it is clear that despite various criticisms, the production of this document was a big success for the experts and for Prof. J. Burniewicz personally.

The study discusses many transport policy aims and tasks. The following are the strategic goals of Polish transport policy for the period 1995-2020:

- Support the privatisation process, restructuring giant transport undertakings and combating the formation of monopolies;
- Adjust the Polish transport system to European Union requirements and to the transport systems of the rest of Europe;
- Implement technological and organisational progress, in order to make the transport system more efficient and enhance the transport system contribution to the stimulation of economic growth.

Having decided on the above strategic goals, the following list of basic aims of the Polish transport policy programme was adopted:

- Upgrade Polish transport structures and mechanisms to bring capacities up to high performance requirements;
- Generally improve the financial situation of the transport systems, renew the materiel and create better development opportunities for individual actors;
- Increase the economic autonomy and financial equilibrium of the transport system against the background of international, intersectoral and intrasectoral competition;
- Create equal conditions for competition and ensure fair competition;
- Supervise transport safety and technical standards;
- Create conditions that encourage public and private investment in transport;
- Guarantee economic access to public passenger transport services and enhance their attractiveness as compared with using private transport;
- Combat monopolist practices on the market and guarantee equality of access to public infrastructures for all actors;
- Protect national interests against unfair activities of foreign firms and enterprises;
- Revise and extend the commercial law governing the functioning of the transport system in the transition to the market economy;
- Support the restructuring and privatisation processes in the transport system;
- Create a transport services market which allows the interplay of supply and demand with minimal regulation by the State;
- Provide the greatest possible amount of readily accessible state financial resources for investment in the development and modernisation of the transport system and, at the same time, create conditions to encourage greater private and foreign investment in the transport system;
- Create alternative methods of financing the development of the transport system;
- Make as much use as possible of international co-operation in the transport field, and in particular take advantage of the aid possibilities available for Polish transport under the European Union association contract.

The achievement of these fifteen basic aims of transport policy will come up against financial and temporal constraints. The priority aims of transport policy therefore involve projects that:

- Are characterised by high socio-economic effectiveness (NPV, IRR, PP and B/C indicators);
- Help to eliminate system bottlenecks, reduce incompatibilities and improve transport safety;

- Effectively shorten the distance from the European Union (improve the traffic capacity of infrastructures, guarantee the continuity of the networks, increase transit traffics, reduce waiting times at frontier crossings);
- Substantially improve the economic situation of Polish transport enterprises (increase the competitiveness of the services, streamline procedures, reduce fuel and energy consumption);
- Appear most attractive to private and foreign investors (clearly defined property rights, satisfactory share of profits, certainty of realisation of the project);
- Promote the transfer of advanced transport techniques and technologies to Poland (high-speed services, multi-modal transport chains, logistics systems);
- Facilitate the solution of major ecological and social problems (e.g. exhaust emission and noise reduction, create employment).

The highest priority should be given to those tasks whose realisation meets all the above criteria. Tasks that meet only one or two criteria will have a correspondingly lower priority. In view of this ranking of transport policy aims, in the above-mentioned document a list of aims/tasks was presented, divided into urgent, less urgent and least urgent tasks.

The following were categorised as urgent aims/tasks, to be achieved within the next three years:

- The creation of a new transport system at both macro- and microeconomic levels (legislative work, creation of new financing sources, new tax solutions, restructuring of enterprises, privatisation processes);
- Effective investment projects aimed at eliminating the major transport system bottlenecks and reducing transport delays for the population;
- The completion of investment projects that involve no new financing requirements (well-advanced sections of motorway, Okêcie II Airport, Œwinoujœcie ferry terminal, many urban transport systems);
- The implementation of new investment projects which are highly profitable and meet all of the adopted criteria (new motorway stretches with the highest expected traffic intensity, frontier-crossing infrastructures);
- The repair of the roads which have suffered most through neglect and delays in recent years.

Less urgent aims/tasks, to be fulfilled within the next five to ten years, are as follows:

- Fulfilment of the obligations arising from the international agreements (Europe Agreement, AGR, AGC and AGTC Contracts), above all, in the case where there is big interest in the project on the part of private and foreign investors;
- Investment projects that improve and strengthen the competitiveness of Polish transport services.

The least urgent tasks, which can be fulfilled within the next ten to twenty years, are:

- The less dramatically effective investment projects, for which no financial resources are available at present;
- Radical technological changes that entail high expenditure;
- Environment-friendly measures that will require an evolutionary adjustment of Polish transport techniques, the work of Polish enterprises and user behaviours.

The above classification of the defined aims of transport policy was hotly debated and strongly criticised after the publication of the document. Attention was drawn to shortcomings in the methodological approach, which should consist in setting a main goal and a set of subsidiary and supporting goals. The mixing together of aims, measures and implementation methods was also criticised. Other commentators were of the opinion that the entire government transport policy programme document, characterised by imprecision and superficiality, contained proposals for discussion rather than a set of aims and tasks that could be concretely implemented.

Without getting involved in any detailed argument over the methodology of the setting and ranking of the transport policy goals, it can nevertheless be said that the government document only indirectly defines the aims and tasks relating to the individual transport modes. These can, however, be easily identified by taking the listed strategic goals and the fifteen main aims/tasks and appropriately interpreting and implementing them for the individual transport modes. Such an approach appears understandable, because the "Transport policy. . . " list of aims is not concerned with individual modes, and it can be added that the transport policy goals defined in this document for the transport sector as a whole cover all important spheres of activity of this sector, and are thus correctly formulated from the standpoint of the terms of reference. Some reservations may, however, be expressed regarding the ranking of transport policy aims/tasks, because the absolute priority given to the road transport aims and tasks means that projects in the railway sector are put on the back burner, despite the recommendation that they should be realised "in the case where there is big interest in the project on the part of private and foreign investors".

## 4. RESTRUCTURING OF RAIL TRANSPORT

Researchers interested in rail transport have been actively involved in the problem of the restructuring of the railway sector in Poland since the beginning of the 90s. In the first phase of the transformation of the economy, a number of consultancy firms turned up in Poland and proposed to the Government various spectacular and thoroughly impressive reforms in rail transport. A common feature of these studies was their unrealistic nature, because the foreign consultants did not know enough about the Polish legal system or the economic and social conditions.

In 1992, experts produced a major study: *"Strategy of the 'Polish State Railways' undertaking -- Polish rail transport to the year 2000"*, edited by Professors J. Perenc and W. Morawski. The Polish writers preferred a more evolutionary but effective approach to the problem of restructuring the railways, recommending certain structural changes, such as privatisation of part of the property of the Polish State Railways (PKP), the transfer of property to local authorities, solution of the social problems of PKP employees, increased autonomy of decisionmaking for the PKP. All the proposed changes were oriented according to the already known Directive 91/440 on the development of the Community's railways.

This study had a big influence on the direction taken by the subsequent restructuring of the PKP. There was a series of articles in the specialist press as follow-up to the study. Many seminars were held on the reform of the PKP. In the railway undertaking itself, people began to prepare for reorganisation and restructuring in line with the general ideas put forward by Polish scientific circles. As we approach the end of the 90s, it can be said that the model developed by the scientific circles in Poland of a phased restructuring of the railways is being implemented and will continue. The author

of this paper was active in the PKP management in 1994 and proposed, in an internal PKP pamphlet "Our railways -- why and how they should be restructured", that a railway holding company should be created in Poland, a large part of which could be privatised.

By and large it can be noted with satisfaction that Polish scientific circles have made an enormous contribution in the 90s to the development of the railway restructuring concept. The researchers thus now form a strong opinion-forming group, which is putting pressure on the politicians, and the PKP management, to reform Polish rail transport better and faster, and above all to proceed to at least partial privatisation.

## 5. HARMONIZATION OF THE OPERATING PRINCIPLES OF POLISH RAIL TRANSPORT WITH EUROPEAN UNION REQUIREMENTS

On 16 December 1991 in Brussels, Poland signed, for both political and economic reasons, the Europe Agreement, establishing an association between the European Communities and their Member States and the Republic of Poland, known as the Europe Agreement. After ratification by the parliaments of the states concerned, the Agreement entered into force on 1 February 1994. Since that moment it has been of vital importance for the process of Poland's integration with the European Union.

In accordance with the Europe Agreement, the Polish economy is being adjusted to the requirements of the European Union in the following respects:

- Liberalisation of trade;
- Promotion of competition and abolition of monopolies;
- Harmonization of the tax systems;
- Adjustment of monetary policy;
- Adjustment of the banking system;
- Adjustments in customs clearance;
- Unification of norms and standards.

The most urgent and primary task against the above background is the necessary approximation of Polish legislation to that of the European Union in accordance with Art. 68 of the Europe Agreement. The adjustment of Polish law is also Poland's most important obligation under the Europe Agreement. Art. 69 of the Agreement stipulates that: *"The approximation of laws shall extend to the following areas in particular: customs law, company law, banking law, company accounts and taxes, intellectual property, protection of workers at the workplace, financial services, rules on competition, protection of health and life of humans, animals and plants, consumer protection, indirect taxation, technical rules and standards, transport and the environment."*

The problem of integration with regard to transport services is directly addressed by Articles 56 and 81 of the Europe Agreement and, to some extent, by the provisions of other articles. Article 56.3 states: *"With a view to assuring a co-ordinated development and progressive liberalisation of transport between the Parties adapted to their reciprocal commercial needs, the conditions of mutual market access in air transport and in inland transport shall be dealt with by special transport agreements to be negotiated between the Parties after the entry into force of this Agreement."* Article 56.5 further stipulates that *"During the transitional period, Poland shall progressively adapt*

*its legislation including administrative, technical and other rules to that of the Community legislation existing at any time in the field of air and inland transport insofar as it serves liberalisation purposes and mutual access to markets of the Parties and facilitates the movement of passengers and of goods."* With the signing of the Agreement, Poland and the European Union undertook to reduce obstacles to access to transport markets. This will be a political and economic process that proceeds relatively slowly, so that the principle of mutual market access (as mentioned in Article 56.5 of the Europe Agreement cited above) and the signing of special transport agreements between Poland and the Community (Article 56.3) will be of particular importance. Thanks to these provisions, it will be possible in the future transport agreements to appropriately safeguard Poland's transport interests. Until the time when the transport agreements enter into force, there will be a transition period that can last for a maximum of ten years and during which Poland must fulfil many adjustment tasks in the transport sector. Taking into account the provisions of the entire Europe Agreement, five basic adjustment tasks for Poland in the field of transport may be named:

1) Economic, administrative and technical preparation for the need to facilitate market access;
2) Adjustment of the infrastructure and the vehicle stock to requirements, norms and standards of the European Union;
3) Realisation of programmes to develop infrastructures of international significance;
4) Promotion of the organisation and use of computerised systems;
5) Approximation of Polish laws and regulations to those in force in the EU.

Each of the above aspects is potentially an approach to a detailed programme of adjustment to EU requirements in the individual transport modes. Such a programme must not only comply with the provisions of the Europe Agreement, but also take into account the general principles, aims and tasks of Community transport policy.

Scientific circles played a twofold role in the adjustment of the operating rules of Polish rail transport to EU requirements. First, the experts were themselves forced to quickly learn certain aspects of the EU legal system in order to then be able to present the essence of the regulations and directives relevant to transport in many articles and at seminars. In the second role, they again appeared as transport experts on Parliamentary committees working on the preparation of the new legislation for the individual transport modes. Such expert contributions were without doubt a big help in the framing of transport policy in Poland. A good example here is the drafting of legislation in the railway sector.

In the years 1994-97, the railway sector in Poland was given a new legal basis for its existence. The solutions adopted took into account the greater part of the rail transport requirements resulting from the EU legislation. Thus, the obligatory adjustment measures for Poland set out in the Europe Agreement concerning this field of the transport system are now almost completed.

Directive 91/440 instructs national governments to create conditions for real independence for railway undertakings. In Poland these conditions have been fulfilled, as the *Sejm* on 6 July 1995 adopted a new law on the PKP undertaking. According to this law, the PKP is formally given broader powers of independent decision as a result of the setting up of the PKP Council and PKP Board, endowed with very broad powers. In view of the fact that the rules for subsidising the PKP before 1990 differed from the rules governing financial aid for the western European railway undertakings, in Poland in the 90s, the problem of accumulated indebtedness simply did not exist in the case of the PKP. Therefore, the reduction of the indebtedness of the railways, covered by Art. 9 of Directive 91/440, is a problem that does not arise in Poland in the context of the process of adjustment to EU requirements.

An important EU recommendation and, at the same time, an adjustment obligation for Poland is the separation between infrastructure management and railway operations, i.e. the "use of the railway infrastructure", as set out in Articles 6-8 of Directive 91/440. The minimum requirement in this case is accounting separation of these fields through the organisation of distinct divisions within a single undertaking. Individual states can go further, separating infrastructure and operations by creating completely separate organisations (enterprises), though this is optional. Aid paid to one of these two areas of activity may not be transferred to the other and the accounts for the two areas of activity shall be kept in a way which reflects this prohibition.

A further important obligation for Poland arising from the Europe Agreement regarding rail transport is to grant access to Polish rail infrastructures for the foreign rail operators defined in Art. 10 of Directive 91/440. This right of access and transit is the main rule of European rail transport policy. According to the provisions of Art. 5 of Directive 91/440, a regulation has to be introduced in Poland to ensure that railway enterprises are to conclude contracts for the public services obligations imposed by the State.

Under Directive 95/18, Poland is obliged to introduce a licensing system for railway operators. Directive 95/19, on the other hand, contains the recommendation to delegate to an "allocation body" designated by the State the right to allocate infrastructure capacity. This body may be a separate infrastructure manager which is at the same time commissioned (empowered) to perform this function.

According to the provisions of Art. 8 of Directive 91/440 and Directive 95/19, the State shall establish the principles for the level of fees for the use of the infrastructure by railway operators and shall ensure that there is no discrimination among the railway undertakings in the levying of fees.

The scientists' contribution to the approximation of the operating rules of Polish transport to the requirements of the European Union lies, in the first place, in their function as experts in the drafting of the new commercial law and in the promotion of new ideas and organisational solutions in Poland, as essential conditions for Poland's entry to the EU.

## 6. CHARGES FOR ACCESS TO RAILWAY INFRASTRUCTURE

The problem of fees for access to railway infrastructure arose in Europe with the adoption of Directive 91/440. From the standpoint of both research and economic practice, this was a completely new state of affairs. The managers in the individual railway administrations began to set up special task forces to create appropriate calculation systems. At the beginning of the 90s, Polish economists did not have the theoretical background to prepare them for solving this problem. In the course of the next few years, publications on the technical bases for calculating charges for infrastructure use appeared in Poland and abroad (e.g. J. Engelhardt, "What charges for access to railway infrastructure?", *Rail International* 1995, No. 11). The Polish legislation was adjusted to the requirements of Directive 95/19 on the allocation of railway infrastructure capacity and the charging of infrastructure fees. In the years 1998-99, the PKP worked out their own system for calculating charges for access to the infrastructure. Not all the problems were eliminated, however, so that further scientific support and assistance is still required in this connection.

The shift to organisational separation between "infrastructure management" and "transport operations" is essential under the terms of Directive 91/440. Thus, even if there is not full-scale liberalisation in rail transport in the next few years in the individual European countries, the existing

railway undertakings will nevertheless have to be separated internally and prepare for the need to introduce an internal charging system. The organisational unit of a railway undertaking that manages the infrastructure will make the infrastructure available to another organisational unit of the same undertaking which is responsible for train operation, for a fee. This means that many railway undertakings in Europe will be faced with a new challenge, i.e. they will have to calculate the fees for the use of lines (routes) on the basis of the actual costs of these lines. Regardless of the systems used, all the possible calculations and analyses for the different levels of charges, reductions or discounts must, in fact, be based on data concerning the maintenance and repair costs of the infrastructure, broken down by individual lines as well as on the basis of the capital assets (including the infrastructure) in the accounts, again for individual lines.

The creation of such a system is extremely difficult and involves a lot of work and appropriate electronic data processing systems. Many big railway undertakings in Europe do not at present have detailed maintenance and repair costs for individual lines and sections, although there has long been talk of the need for such detailed costs for the maintenance and repair of the infrastructure. For this reason, calculations for infrastructure use fees are generally based on the average costs of a particular category of line over which different categories of trains run, not on the actual costs of specific lines. The recording of at least part of the infrastructure costs for individual lines (direct costs), broken down into fixed and variable costs, together with a corresponding calculation for the purposes of estimating the various indirect infrastructure costs and imputing them to the individual lines, including the costs of train control and the overhead costs of the infrastructure management company, is of paramount importance for the correct calculation of the infrastructure use fee. What is more, the European Union should introduce measures to unify the principles for the calculation of charges for access to the rail infrastructure, otherwise it would be difficult to imagine freedom for train operating companies to work on the networks of different countries.

In the 90s, the figures for individual railway undertakings show great differences in infrastructure costs. Taking for example the figures produced by the SNCF in 1992 for infrastructure maintenance costs in ECU per kilometre of line, with the SNCF as 100 per cent, the corresponding costs for six other European railway undertakings were: DB -- 197 per cent, FS -- 344 per cent, SBB -- 276 per cent, SNCB -- 195 per cent, ÖBB -- 152 per cent, PKP -- 31 per cent. Regarding the problem of differences in infrastructure costs and in the procedures for the collection of fees for railway infrastructure use, reference should be made to the European Commission White Paper “A strategy for revitalising the community's railways”. The Commission expressed its concern at the fact that while Germany and the United Kingdom intended to completely cover the infrastructure costs by means of their fees, the Netherlands and Spain, on the other hand, allowed operators to use the infrastructure free of charge, and this was likely to be a major obstacle to the market entry of new train operators. It should be added that the commission was basically opposed to the possibility of using infrastructures free of charge, pointing out that in this case mechanisms exerting pressure for rationalisation and infrastructure cost reduction would not be present.

According to Art. 7 of Directive 95/19 on the allocation of railway infrastructure capacity and the charging of infrastructure fees, Member States shall lay down the rules for determining the infrastructure fees. It is obvious that these rules should be subject to alignment at European Union level. Above all, it would be advisable in this regard to make use of the experience of the Working Group of experts from the International Union of Railways (UIC), which in 1993 worked out a unified cost outline to be used to establish the charges for the use of the infrastructure by foreign train operators. A second relevant element in this alignment should be to agree on the principle that the infrastructure maintenance and repair costs, possibly together with a capital cost surcharge, should be the basis for calculating the fees, and this should apply equally in all EU Member States. In this case, fairly strict principles should be laid down and the provisions of Art. 6.1 of Directive 95/19 should be

made more explicit. In this Article there is a general provision which says that income from infrastructure fees plus State contributions on the one hand and infrastructure expenditure on the other should balance over a reasonable period of time. But this could also be formally interpreted differently: the higher the state contributions, the lower the income from the fees can be to balance the overall infrastructure expenditure, and hence the fees to be collected from train operators can be lower. Such a situation would then lead to substantial differentiation in the fees for infrastructure access, depending on the level of subsidisation of the rail infrastructure by the State (high subsidies ➔ low fees), while the infrastructure costs remained at a similar level. Divergent policies with respect to calculating the fees for infrastructure access, with at the same time differences in the approaches and economic strengths of states, would certainly do nothing to help the general liberalisation of access to railway networks for different train operators. The European Union should therefore introduce the measures necessary for harmonization in this field.

## 7. SUMMARY

In the above we have attempted, by means of selected examples, to show the extent to which scientific research in the field of transport economics can be used to help frame transport policy. The examples presented confirm that the scientific potential concentrated on problems of transport economics could and should be harnessed for and used by the people responsible for transport policy in our country. It should also be stressed that the examples presented in this paper were chosen subjectively and represent only a small part of the research carried out in Poland. It is a fact that after 10 years of system transformation the interests of Polish researchers connected with the transport system are no longer restricted solely to problems connected with Polish domestic reforms. Polish researchers in the transport field are becoming increasingly involved in work on European transport policy problems in such fields as:

- Impact of transport on the environment;
- External costs of transport and their internalisation;
- Deregulation and liberalisation in the transport system;
- Ownership structures and competitiveness in the transport system;
- Linked transportation, logistics and telematics;
- Changes in the demand structure in the transport system.

The above fields of interest of Polish transport economists indicate possibilities for them to make a contribution to the framing of not only Polish but also European transport policy.

## ANNEX

## ORGANISATION AND PRINCIPLES OF RESEARCH FINANCING IN POLAND IN THE FIELD OF TRANSPORT ECONOMICS

Research in the field of transportation in Poland is carried out by specialised research and development units, institutes and enterprises, as well as by some universities.

The three following research institutes are directly subordinated to the Ministry of Transportation and Maritime Economy:

-- **Institute of Motor Transportation (ITS)** in Warsaw: this unit deals with economic research and motor technology. The main research fields are as follows:

- Economics of transportation enterprises;
- Individual motorisation;
- Motor accidents;
- Pollution to the environment caused by vehicles.

Moreover, the ITS fulfils the role of authorised government institution dealing with certification approval of vehicles.

-- **Roads and Bridges Research Institute (IBDM):** deals mainly with technical design of roads and bridges constructions, but also carried out the following:

- Pre-investment studies on construction of motorways and roads as well as civil engineering constructions;
- Studies covering the economic efficiency of the construction of motorways and other roads.

-- **Maritime Institute (IM):** deals with economic and organisational problems pertaining to navigation and sea ports.

These units function on the basis specified by the Act as so-called "research and development units", being state-owned property. Officially, they are subordinate to the Ministry of Transportation and Maritime Economy, which fulfils -- on behalf of the State -- the function of establishing body. The Ministry partly finances the above-mentioned units; however, they obtain a large part of their incomes from external sources.

Another R&D unit involved in research in transport economics is the **Institute of Environment Protection (IO•)** in Warsaw, subordinate to the Ministry of Environment Protection and Natural Resources. The Institute deals, *inter alia*, with research on the impact of transportation on the environment.

The **Research Centre for Transportation Economics (OBET)** has played a significant research role in the field of transport economics. Since 1993, the Centre has been an independent and self-reliant state enterprise (not subordinate to the Ministry of Transportation and Maritime Economy).

Previously, the Centre was for many years the research centre of the Polish State Railway (PKP). OBET deals with research comprising organisational and economic problems of overland transportation. Among the main research fields of the Centre are the following:

-- Internalisation of external costs of transportation;
-- Demand forecast for haulage;
-- Transportation policy;
-- Economics of transportation enterprises;
-- Restructuring and privatisation of enterprises;
-- Internal analysis of enterprises;
-- Studies on transportation costs;
-- Pre-investment studies on projects.

Also, university centres in Poland deal with research on transportation economics; however, there are not many of them. It should be emphasized that in the 90s the universities' role in transport economics research has undergone certain changes. During this period, a reform of academic economic education in Poland was carried out. The idea of the reform was, *inter alia*, to depart from education in limited (narrow) transportation specialities in favour of more general education. At present, not many of the economic universities in Poland are offering courses in economic studies connected with transport, but two leading centres are the University of Szczecin and the University of Gdansk. The professors of these universities who deal with transport economics, participate in projects carried out by research institutions, often as their research managers. They also directly co-operate with the Ministry of Transportation or with enterprises. Additionally, the university centres not only provide young adepts but also offer practically the only possibility to obtain university degrees by the employees of the institutes.

The financing of research in the field of transport economics is undertaken by the government branch (ministry) under the name of Research Committee (KBN). The Committee annually divides the general pool of budget funds into departments. The Ministry of Transportation receives from the Research Committee (KBN) funds for research in the field of transport economics. The Department of Transportation Policy -- within the confines of the ministry -- is responsible for the ordering and monitoring of all research. The subordinate institutes are partly financed by the Ministry of Transportation from the Research Committee (KBN) funds. The Research Committee (KBN) also retains part of the funds for its own disposal. These funds are designated for research projects and ordered to all interested domestic and foreign institutions -- and universities -- in the form of tender. Moreover, the Ministry of Transportation can order from the Research Committee (KBN) certain large, inter-trade research projects. For such projects, the Research Committee invites tenders in which foreign institutes can also participate.

Foreign fund sources represent an important part of the financing of Polish research institutions since the foreign institutions co-operate with the World Bank, participating in studies in the framework of the PHARE projects. The Polish research institutes also participate in the international consortia which realise specific projects, e.g. OBET (PL) + INRETS (F) + IWW (D) + NEA (NL). It may be added that the representatives of the research institutes actively take part, as Polish experts, in negotiations with the European Union.

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## INTRODUCTION

This paper is based on the conclusions drawn by the author from his own personal experience and from discussions with colleagues. The author has experience of a wide variety of research contexts, ranging from the relative isolation of the academic world to close contacts with decisionmakers in both government and the highest echelons of corporate management, as well as discussions with officials working in national and international public administrations.

Inevitably, a number of generalisations have had to be made in the interest of consistency. While it is possible that none of the statements made in this paper are universally applicable, the author nonetheless feels that the terms in which they are qualified faithfully reflect the reality of the situation. The aim of this paper is simply to present the pros and cons of current practice and to identify the future direction of research activities designed to provide decisionmakers with information that will help them better promote the well being of citizens living in democratic societies.

## 1. DEMAND FOR TRANSPORT ECONOMICS RESEARCH

Since it is widely recognised that demand for transport is a derived demand, it might perhaps be thought that demand for research on transport issues would also be derived, i.e. from the failure of the transport sector to deliver what other sectors and society at large expect from it. This is only partially true, however, since the size of the transport sector is such that it generates its own specific needs and meeting those needs is also a source of demand for research.

There are, therefore, several groups of initiators of transport (economics) research. The first group, representing society in general and other sectors of the economy, consists of politicians and to a lesser extent (national or multilateral) public agencies and administrations, as well as civil associations (consumer groups, environmentalists, etc.) which in recent years have started to play a more visible and complementary role. The second group, representing interests within the transport sector, comprises the same public agencies and administrations, although in a different role, and lobby groups made up of suppliers to the sector.

The universities are also present in both groups in that they are able, to some extent, to choose their research themes. In the earlier stages of research, each group will choose an issue which it perceives to be of importance to society and which it feels competent to investigate. In later stages, it is perhaps as much the interest in pursuing the research to greater depth as the need to ensure the survival and reputation of the research group which determines the choice of research topic.

Even though there is a danger that research may be pursued out of self interest, the fact that university groups have scope to develop and pursue their own fields of research is very important, but would now seem to be under threat in some countries as funding is reduced for research initiated by university groups, who are forced to survive by devoting more time and effort to research into themes chosen by other actors in society.

If we now address the issue of the purpose of the research currently in progress, it would be fair to say that the studies currently being conducted fall into two broad categories: those relating to a specific project (normally initiated by the project promoter, either to comply with a legal requirement or to ensure that the best choices are being made) and those relating to a given policy issue, which may either be pressing in the short term or seen as likely to pose problems in the medium or long term.

A third aspect which merits further investigation is the range of options taken into consideration. It is common (and normal) practice for the range of options to be wider when it is a matter of considering policy, but much narrower in the case of specific projects. Indeed, in the latter instance, economic research is commonly carried out simply to validate options that have more or less already been chosen. It is only if such studies were to demonstrate that this preliminary decision were substantially mistaken that a different course of action would be adopted.

If we look at the historical background to the decisionmaking process with regard to transport systems, we can see that, for many years, the main considerations were those relating to engineering and that the best available technology (preferably with a high level of reliability) would ultimately be chosen. In recent decades and primarily since the end of World War II, economic realism has started to prevail and although engineering criteria are still applied they are mainly used to define the underlying set of reasonable choices.

The diffusion of the results of economic research has been facilitated by the emergence of international bodies through which the money needed for investment is channelled. The introduction of a consistent set of rules regarding the selection of projects and the conditions of funding which, to some extent, corresponds to a number of underlying policy preferences, will thus ensure consistency in the methods used to assess the economic viability of projects.

## 2. SUPPLY OF TRANSPORT ECONOMICS RESEARCH

Transport economics research was largely carried out by highly qualified staff working in the institutions which had identified a need for such research. All of the larger national administrations and the international institutions dedicated to financing transport systems therefore built up significant in-house capacity for this purpose.

At the same time, the universities also started to devote more resources to these issues and to press for their inclusion in research programmes. In most countries, however, the research teams working within the promoting institutions were far larger than those in the universities and the latter therefore concentrated primarily on the development of methodological tools.

It is only in recent years that research projects have systematically been entrusted to outside bodies (universities and consultancy companies), in most cases in the form of a contract for the performance of a research task specified beforehand by the promoting agency. This is in line with the general economic recommendation to promote efficiency through competitive pressure. Naturally, most agencies still employ a significant number of researchers on a permanent basis, both for in-house developments and for the specification and monitoring of outsourced studies.

Over the past ten years or so, the European Commission has joined the ranks of the multilateral agencies promoting research into transport economics, but its involvement has one distinctive feature in that the teams it commissions to carry out studies must have a multinational composition. Even though this requirement was clearly aimed at promoting greater European cohesion, it has led to a much clearer understanding of the differences in style and content between practices of the most developed countries, which normally do not have to submit their policy and project decisions to multilateral agencies. In doing so, it has raised awareness and encouraged debate, both of which may possibly act as catalysts for the next generation of challenges and results.

## 3. TRACK RECORD WITH THE PRODUCT DELIVERED (SUCCESSES AND FAILURES)

The quality of the decisions taken in recent decades with regard to transport systems has clearly improved, mainly due to the greater availability and consistency of the results of economic research. Several projects and policies were shown not to make economic sense and, as a result, were abandoned. In other cases, however, projects which were perhaps equally unjustifiable in economic terms were subsequently implemented because they enjoyed political support from powerful allies.

In conceptual terms, major progress has been made in clarifying issues and in identifying both market failures and the shortcomings of state intervention. Advances in the construction of mathematical models and the continued application of such models have also led to a better understanding of behaviour of market actors.

The introduction of standard procedures for the study of certain types of problem has also facilitated the comparison of results, thus giving analysts and politicians a much better insight into the real significance of each new project put forward.

This same process of standardization, however, has also led to a certain number of “self-evident truths”, which the entire profession had perpetuated over a relatively long period of time. These were accepted far too readily without due consideration of the constraints they would subsequently impose or the potential drawbacks of application of the policies recommended. Perhaps the best example of this trend may be seen in the approach adopted in most urban transport studies published during the 1970s, and even the 1980s, in which the only solution proposed to the recurrent problem of road

congestion was the construction of additional infrastructure, since, as long as the rate of expansion exceeded the rate of traffic growth, the models would invariably predict good performance figures, primarily because no account was taken of the possible secondary impacts of such construction.

It should be noted that the perpetuation of such misconceptions is not an adverse effect of research activities but rather of the way in which research results are disseminated and applied in practice. It is also because we fail to communicate our results that we so often find ourselves speaking about the need to "change mentalities". Mentalities change when there is a change in the perception of the forces at work and the dangers and opportunities they present. If this is the case, then either we have not been clear about those dangers and opportunities (poor signal-to-noise ratio in our message) or the population, which has already recognised their potential impact, does not consider them as genuine dangers and opportunities (we may think we have accurately determined their core values, but in fact we have not).

The difficulties arising from the need to consider the future evolution of various clusters of variables, regarding which there are many uncertainties in terms of technology, social organisation, individual and collective preferences, etc., have already been addressed through the development of methodologies such as sensitivity analysis, risk analysis and scenario building. While some degree of methodological consolidation is currently taking place, we all feel that our models are still very poor in this respect and especially when it comes to assessing mutual interactions between evolving clusters. Here, it would simply seem that we have not enjoyed a sufficiently long period of systematic observation and analysis to be able to understand those interactions. Consequently, the management of risks on this front is still very poor, as it has been so many times in the past in other areas of policy.

In general terms, we have not been capable of dealing adequately with the concerns of citizens and their elected representatives, frequently producing recommendations which are considered unrealistic.

This may be due to a over-simplistic representation of reality in our mathematical models, where we mostly look solely for maximum efficiency. Although this concept is simple to understand and explain in general terms, it is very difficult to recognise whether such a condition has been reached in any real context, and that makes such a goal difficult to share.

Not only that, there are also other serious weaknesses in our models: here are a couple, just as an example:

- We consider that there is a linear relationship between the level of provision of a given item (e.g. time saved) and the level of utility derived from it, when it is easy to see that in reality this is far from being the case. However, this hypothesis facilitates aggregation across society and so we use it (and in many cases, perhaps, abuse it too);
- We ignore the effect of repetition and memory in the analysis of behaviour in urban settings, although it is clear to us all that these factors can provide greater insight into such behaviour. They alter the choice set and the values attached to the attributes of the "utility function" but, more importantly, they may bring the individual optimum closer to the social optimum, as has long been recognised in the context of the prisoner's dilemma.

Obviously, other goals as legitimate as efficiency are totally absent from these models. These other goals have the advantage of being much easier to communicate and share, and the degree to which they have achieved is also easier to measure. Taking an example from a recent paper the author has prepared on urban road pricing, the following three goals (arguments) can be put forward on a par with efficiency:

- Financial effectiveness, that is to say, the level to which investment and traffic control costs are covered by revenue;
- Fairness, i.e. the extent to which the producers of external costs are made to pay for them and the way in which different groups of citizens (primarily residents and non-residents) are treated in terms of what they have to pay;
- Quality of the traffic system, i.e. the extent to which the prices charged help to restore fluidity to traffic movements.

If we neglect these other goals and continue to talk solely in terms of efficiency and marginal cost pricing, then there is not much hope for either the message or the messenger.

We also frequently forget that society is not a central-command structure and that it is frequently necessary, when making decisions, to take account of the impact of such decisions on various groups of stakeholders. In this kind of process we cannot assume that the winners will offset the losers, as we so readily do in cost-benefit analysis. Even within the same individual or group, a gain or a loss of similar dimensions are not felt to have symmetrical impacts on our wellbeing.

Accordingly, I believe that we clearly need a far more complex representation of the decisionmaking process than the one we have been using.

## 4. RECOMMENDATIONS

The first recommendation to be made here is the need for humility: we are no more than researchers and technical specialists, whose task is simply to help politicians take decisions that are in the best interest of society. It is they who have been elected on the basis of the expectations they have been able to generate in their electors about the quality of their future under their guidance. If we feel we have a superior understanding of the needs of society, than we should try to get elected on the basis of that understanding and not try to force our agenda onto those who were elected on the basis of a different agenda.

Politicians are in the business of providing citizens with positive expectations about their future, and normally make intuitive decisions regarding the best mix of actions and promises. We should see ourselves as being instrumental in ensuring that scientific knowledge illuminates (that is, it supports or corrects) those intuitions, and thus helps to secure a better match between what is promised and what is achieved. Our basic role is that of making complex systems simpler to understand, namely, by producing informed assessments of the various responses of those systems when certain stimuli are applied to them.

While we cannot produce optimal packages of "elementary actions", we should be able to steer this packaging exercise according to the goals put forward by the politicians and to evaluate whatever interim versions are produced and the various stages reached.

At a more technical level, we would seem to have reached a point in time comparable to one at which the purely engineering-based approach to the support of transport decisions gave way to a mixed engineering and economics approach. We therefore find ourselves on the threshold of another transition, given that the basic economic issues have now mostly been solved, and there is increasing recognition of the need to seek a broader perspective.

Crossing that threshold will mean entering the social and political arena and we therefore need to develop the tools that will allow us to examine the social and political aspects of decisionmaking on a firmer scientific basis. When engineering criteria alone were applied to the decisionmaking process, economic factors were not ignored but treated in too simplistic a manner -- just as social and political factors are now. At present, as in the past, factors which are not dealt with scientifically are taken into account intuitively by politicians.

Our recommendation is therefore a simple one: to a large extent, engineering and economics have become current knowledge and must be incorporated into the decision process as conditions which define a set of choices based on "good practice". Research in these areas is still needed for some issues that lie at the boundaries of current knowledge, and indeed many interesting results are likely to emerge from the continuation of such efforts. But, for better policy decisions, it is essential that other scientific fields be brought into the support group from the social and political sciences. This does not make transport economics poorer just because it has to share the stage with other performers. On the contrary, like the synergy that economics brought to engineering, it will provide new challenges for the advancement of transport economics as a science based on a better understanding of what makes things move and how best to ensure that they continue to do so.

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# NEW POLICIES MEAN NEW RESEARCH REQUIREMENTS

## INTRODUCTION

This paper focuses on research which is directly or indirectly related to transport policy. It argues that there is a new policy context, and the specific nature of the research that is needed derives from that context. It also summarises some policy-sensitive research already carried out in the past, which gives insight into the nature of the relationship between research and policy.

## 1. THE POLICY CONTEXT

In July 1998, the British Government issued a White Paper titled, with deliberate historical resonance, *A New Deal for Transport* (DETR, 1998). The Minister in charge was John Prescott, who combined his responsibility for the new, combined Department of the Environment, Transport and the Regions with the very senior post of Deputy Prime Minister. In his foreword to the White Paper, Prescott opened with the words:

> "*There is now a consensus for radical change in transport policy. The previous Government's Green Paper paved the way with recognition that we needed to improve public transport and reduce dependence on the car. Businesses, unions, environmental organisations and individuals throughout Britain share that analysis. This White Paper builds on that foundation.*
>
> "*For the last two decades, the ideology of privatisation, competition and deregulation has dominated transport policy. Bus and rail services have declined whilst traffic growth has resulted in more congestion and worsening pollution.*

*"This White Paper fulfils our manifesto commitment to create a better, more integrated transport system to tackle the problems of congestion and pollution we have inherited. It is timely. In its Green Paper the previous Government recognised that we could not go on as before, building more and more new roads to accommodate the growth in traffic. With our new obligations to meet targets on climate change, the need for a new approach is urgent."*

The central precept of the White Paper is unambiguous: current trends in traffic are unsustainable, from the point of view of the environment, business efficiency, health and the unfeasibility of providing growth in road capacity that would keep pace with predicted growth in traffic. Much of the policy logic in the White Paper stems from the explicit abandonment of "predict-and-provide" as a desirable -- or *possible* -- strategy. This leads to a recognition of the importance of a co-ordinated approach to public transport, walking and cycling, together with policies aimed at reducing less necessary travel where possible; ensuring that the costs of congestion and environmental pollution are, as far as practical, met by those who cause them (in which the revenue from new pricing systems would be kept under local control and used for transport improvements); an emphasis on better maintenance and management of the road system rather than increasing its capacity; consideration of the effects on transport of other policies in land-use, health, education etc.; development of institutional structures or contractual arrangements able to bring these changes about; and conditions in which people's everyday behaviour and attitudes may be in harmony with policy, finance and environmental constraints.

## 2. SOME RESEARCH INFLUENCES ON POLICY BEFORE 1989

The year 1989 produced a watershed in transport policy thinking. But the precursors to that were extended over a long period. For at least sixty years, there have been two parallel streams of argument on what to do about the relationship between the car and the infrastructure it uses. One view has been to control, moderate or tailor car use so that it is in some way kept within bounds defined by broader objectives of traffic or social efficiency. The other has been to accept its growth as inevitable, and provide the road capacity necessary to accommodate it.

This is not a new argument. Tripp (1942), for example, outlined techniques of "traffic calming" long before the phrase was coined. Buchanan (1961) argued persuasively for this approach in his own books, and the logic also underpinned parts of *Traffic in Towns* (HMSO, 1963), though with some ambiguity. But at each period the dominant argument has been that it is proper to provide capacity to match the traffic levels, even though those traffic levels have arisen in the context of costs of transport which have been distorted.

An early example of the dominant orthodoxy, imported to Britain from the USA, was a study in London (Freeman Fox, 1966). In summary, this said that population, employment and incomes in London would rise. As a result, car ownership would almost double in twenty years. The total number of trips would increase by nearly 50 per cent, the share of car would increase from a third to over a half, the share of bus would decrease from a third to a sixth and the share of rail would decrease from a sixth to a tenth. A "high class" road network would be needed, and could be provided, of sufficient capacity to serve such demands. Public transport must be provided for the people unable to use cars, although they would become relatively few in number.

The detailed policies developed in London, other cities and the country as a whole, were constructed around two key assumptions, each led by demand trends. Private car use would increase, therefore it was necessary to increase road capacity; and public transport use would decline, therefore it would be logical to reduce service levels.

Both of these actually happened. Extensive road construction schemes were planned and sometimes implemented, though never at a pace which approached the growth in traffic, and with increasing political opposition when road schemes meant destruction of homes and green space.

In the early 1970s, many transport planners found themselves increasingly uncomfortable about the social and equity effects of this policy. Hillman *et al.* (1973) and Plowden (1972) and, in the US, Schaeffer and Sclar (1975), for example, contested the technical and economic efficiency of the approach, and described it as "self-fulfilling". They argued that even when household car ownership was high, it was not universal. People in car-owning households did not have access to a car for all their journeys. The people who lost most from such a strategy were precisely those who already had the greatest travel problems, namely children, the elderly, the poor and women, and together these formed a majority, not a minority. The implications of all this were profound. Schaeffer and Sclar note, for example, that child development psychologists before the 1950s were able to use "independent travel" (by bus) as a key measure of 8-14 year olds' ability to orient and master space. As bus services disappeared from American suburbs, even the affluent young could leave their immediate neighbourhood only if someone would chauffeur them, and independent travel was delayed until they were old enough to get a driving licence and access to a car. A central feature of the development from childhood to adulthood was modified.

## 3. METHODOLOGICAL AND RESEARCH INFLUENCES IN THE WATERSHED: 1989 AND AFTER

In the UK, the year 1989 represented the high point of the "predict and provide" approach, and its final hour. The Department of Transport (1989a) issued revised national road traffic forecasts, suggesting that car traffic would increase by between 82 per cent and 134 per cent between the years 1988 and 2025.

There are many criticisms of the forecasting models used to obtain the forecasts, but at the time the technical question of their validity was essentially a side-show compared with their policy impact. This may be divided into two phases, immediate and considered. The immediate impact was the launching of a substantially expanded road construction programme, called "Roads to Prosperity", (DoT, 1989b), described as the "greatest road programme since the Romans". The considered reaction, which evolved over the subsequent two years or so, in effect had the opposite implication. A radically new situation developed, in which, for the first time, there was a universal recognition that there was no realistic possibility of increasing road supply at a level which approached the forecast increases in traffic. This recognition started in the cities, but the underlying logic swiftly spilled over into rural and inter-city movement. This was influenced significantly by research into the implications of the forecasts (e.g. Goodwin *et al.*, 1991). It was argued that, from the forecasts, it logically followed that whatever road construction policy is pursued, the amount of traffic per unit of road would increase, not reduce.

On the face of it[1], this implied that all available road construction policies only differed in the speed at which congestion would get worse. Therefore, demand management would force itself to centre stage as the essential feature of future transport strategy, independently of ideology or political stance.

At this point, however, the nature of the argument was radically transformed by concern about environmental questions of a much broader significance than transport, i.e. the effects of human activity on global warming, acid rain, entire ecological systems, threats to individual health and life, and possibly to the survival of human societies.

The key turning point in bringing these global questions effectively into transport discussions was a conference of the Ministers of Transport of 19 European countries, in November 1989. The conference received a series of expert research reports on the extent to which transport was an important contributor to environmental pollution. The picture that emerged is now reasonably well known. In summary, the transport sector is one of the major polluters. This varies, of course, according to the specific emission considered; broadly, transport is responsible in advanced industrial countries for about 5 per cent of total emissions of oxides of sulphur, 10 per cent of the particles, nearly half of the hydrocarbons, over half of the oxides of nitrogen, and around 80 per cent of the carbon monoxide. In a separate category, transport is the source of about a quarter of the man-made emissions of carbon dioxide, inherently involved in the burning of fossil fuels and the main cause of the greenhouse effect.

Transport is also one of the most rapidly growing sources of these pollutants, mainly (though not exclusively) due to increases in private car ownership and use. In other words, the same social developments which were most closely bound up with the problem of congestion, were now perceived to also be a major cause of environmental impacts.

It is not surprising, therefore, that policy remedies which had already emerged in the discussions about congestion should re-emerge as priorities in discussions about pollution. The European Conference of Ministers of Transport (1990) adopted (unanimously) a resolution which went considerably further than any previous multi-national statement of its form, and which indicated a number of emphases that had not previously been very apparent in British Government thinking (or indeed the practice of many of the other signing countries).

## 4. THE RESEARCH BASE OF POLICY

For the rest of the 1990s, a string of scientific and research-based reports had the effect of underpinning and increasing confidence in the tentative policy reorientation described above.

One recurrent theme was the identification of specific elements of best practice in other countries which had progressed further than in the UK (e.g. pedestrianisation of city centres in Germany; public transport investment in cities in many countries; tentative experiments with road pricing in Scandinavia; traffic calming in the Netherlands, etc.).

Some other research outputs related to this evolving policy context, were:

- *Trends in Transport and the Countryside*, published by the Countryside Commission (Stokes *et al.*, 1992), which showed even faster rates of growth in rural areas;

- The Royal Commission of Environmental Pollution 18th Report (1994), which demonstrated the environmental unsustainability of current trends in transport [and the follow-up 20th Report (1997), expressing disappointment in progress made];

- The SACTRA report, *Trunk Roads and the Generation of Traffic* (1994), which demonstrated that increases in road capacity, in conditions of congestion, typically led to some increase in the total volume of traffic, which reduced the duration of any relief from congestion;

- The RAC (1995) report, *Car Dependence,* which persuaded the RAC (and some other agencies) to support policies intended to reduce car dependence and encourage less car use for about 20 per cent of the current car journeys;
- The SACTRA (1997) interim report, *Transport Investment, Transport Intensity and Economic Growth,* which argued that in conditions of imperfect competition, some of the economic impacts of transport investment would not be captured in current appraisal methods, and that these impacts might be either positive or negative;

- DETR and London Transport research on *Traffic Impacts of Highway Capacity Reductions* (Cairns *et al.,* 1998), which demonstrated that road capacity could be reallocated to pedestrianisation, public transport priority, etc., without necessarily causing intolerable extra congestion on alternative routes).

It is not argued here that the above research *caused* the shift in policy, which would not be credible. But the policy shift provided a favourable context in which research of this sort, instead of being shelved as embarrassing or ignored as irrelevant, could be quickly appreciated and in turn inform the policy debate.

## 5. SPECIALIST RESEARCH REQUIREMENTS FROM THE WHITE PAPER

Some specific aspects of the White Paper call for rather specialist data and analytical requirements.

- *Walking and cycling.* We shall need to abandon all surveys which collect data on "walking/cycling", treated as though they were a single method of transport. These data are useless. We need data on walking, and we need data on cycling, and adding them together into a spurious "non-motorised mode" will not give us any useful policy discrimination;

- *Effects outside transport.* We shall need to be more alert to the transport consequences of non-transport decisions, e.g. where to locate a school or hospital. This means that other government departments (also in local government) will need transport expertise in collecting and analysing data;

- *Road capacity.* Those specific new road schemes which do go ahead will need to be justified with reference to their relationship with the whole strategy, and notably its economic and environmental impacts, *not* only the temporary relief of congestion. In other situations there will be reductions of road capacity, or its reallocation to pedestrian areas, for example, which also raises questions of environmental and economic impact -- typically in connection with a rather complex package of policies, not all components being implemented at the same time;

- *Monitoring methods.* We shall need new emphases on monitoring the actual evolution of local conditions, over time, related to changes in transport conditions. The advisory committee, SACTRA (1997), published an interim report which had some very sharp words of criticism for

the state of the art of empirical quantitative work on this question, much of the published material really being little more than statements of hope or aspiration. Concerning environmental impacts, there really is no alternative to an expansion of real-time, continuous monitoring. The technology is developing quite quickly, but they are not yet widely enough used.

For these sort of initiatives there has been an informal convention that some sort of before and after survey is done, but usually spanning quite a short period -- normally one year, sometimes even less -- and then interest tails away. That is not going to be sufficient as the scale of schemes gets bigger and their cumulative effect becomes more complex.

- *Public transport.* There is commitment to the importance of public transport and especially to the prospect of reversing its long-term decline in a big way.

This raises a problem. We now have a largely commercial, privately-owned, public transport sector, with great difficulty about collecting, or releasing, data which is likely to be commercially significant -- which is most of the data about evolution of markets and costs. We shall have to break through on this. There is a separate policy problem about devising incentive structures to ensure that commercial and social objectives are in harmony, and those incentive structures will be legally complex, and will have to be monitored for success in their intended effects, and even more to detect the ever-present problem of unintended effects.

So, to sum up at this stage, we have already seen a shift from single, cross-section surveys, used basically to diagnose problems and build models, to one-off, before-and-after surveys focused on a particular initiative. We shall see a further shift in the same direction, to continuous monitoring (not just one "after", but repeated many times), with a broader scope so that they do not just focus on the short-term impacts of one specific policy initiative, but the cumulative effects of many interacting initiatives, covering a longer time and a larger space. I simply do not see an alternative to this.

## 6. THE NEED FOR A NEW CONCEPTUAL AND ANALYTICAL FRAMEWORK

My argument is that at the same time as a very obvious sea-change in transport policy, there is a less obvious, slower, still uncompleted sea change in the methodologies and assumptions of analysis, forecasting and appraisal; and this itself will change the nature of the data we need and the statistical analyses applied to them.

At the same time that concern has been mounting about the effects of growth of traffic, there was a technical recognition that the volume of traffic is, in part, the *result* of policy and is therefore subject to some degree of choice.

This was a crucial shift in understanding. For a generation, transport professionals had encouraged politicians to think that the total volume of traffic was an inexorable quantity, driven almost entirely by income and largely unaffected by policy. The result was a systematic policy bias: it led to a tendency to *overestimate* the relief from congestion offered by a new road and to *underestimate* the potential and benefit for road space reallocation.

Consider three questions we may now be called upon to provide technical advice.

1) Are choices, once made, reversible? For example, is the choice to reduce car ownership or use influenced by the same factors, at the same strength, as the choice to increase car ownership or use? All common sense says no. Our models assume, in general, yes.

2) For policy packages, does it make a difference to the outcome in which order we implement the component parts? That is, does it matter whether we introduce road pricing first and public transport improvements later, or the other way round? All politicians know that the answer is yes -- it will make a difference to the outcome. Our models, assume, in general, not. The end result will be the same.

3) For any policy involving money and prices, does the market respond immediately, or is it a cumulative process over time? In other words, when do we actually receive the income from new pricing strategies, year by year? All bankers know that the answer to this question makes the difference between fortunes and bankruptcy. Our models, in general, imply (though rarely have the courage to state explicitly) that all market responses are virtually instantaneous.

If the technical assessment of reversibility, delays and market build-up are crucial to the new policy agenda, then the essence of the answers must lie in certain fundamental dynamic concepts, namely, transition costs (which lead to hysteresis and non-symmetrical reversibility); lags and leads (which result in a displacement in time of cause from effect); negotiation of outcomes (where different processes can lead to different end-states) and natural variability of choices, from day to day and from year to year (which lead to what, in opinion research, is called "churn").

All this focuses attention on the critical behavioural question, *what do people actually do when travelling conditions change?* Research already carried out establishes that they can change their driving styles, they can alter their route, the time of day they travel, the frequency of trips, the destinations they choose, the location of their home and workplace, the method of transport, the arrangements they come to with family or neighbours, the sequence of activities on a round trip, the substitution of trips by other forms of communication or activity and many other more subtle changes.

This contrasts strongly with a view of travel as stable and repetitive -- the commuter who makes the same journey every day, the shopper doing the same journey every week. Without question, such repetitive patterns exist. They are so important that they dominate our perceptions of our own lives, and our interpretation of other people's, and they are reinforced when we see roughly the same traffic conditions at roughly the same time, day after day.

But the *apparent* stability is composed, we now know, of volatile, unstable, changing undercurrents, or "churn". The actual individuals in a traffic queue, even at the same time on two successive mornings, are not, in most part, the same individuals. Every year, anything up to a third of people change their jobs, perhaps one in seven move house. They get a pay increase. Or they get sacked. People leave home, get married, have babies. Their children change school, leave school, leave home. Some get divorced. They retire. A member of their family dies. If car ownership grows by a steady 2 per cent in a year, what that really means is that 12 per cent of households increase their cars, and 10 per cent reduce them. At each of these life events there may be a reason to reconsider travel choices.

So the *response* to policies which change the condition of travel is composed of at least two quite different processes:

First, there are responses by specific individuals. They are limited by habit, by the desire to experiment (or not to), by ignorance, preferences and by domestic and economic constraints which are very powerful at any point in time, but which change and evolve. For these people, minor adjustments may be quite swift, but bigger changes proceed at the pace of change in their own lives and the pace of evolution of their attitudes and tastes.

Secondly, all the time, some individuals drop away and are replaced by different people making a new set of trips. These can react to whatever prevailing conditions they find, sometimes bringing a more open mind to the new situation.

As a result, the process of adaptation to a new policy starts on Day One. But it takes between five and ten years before the adjustment is near enough to completion to get lost in other even longer-term processes.

*Understanding this process of response is crucial to policy analysis, because that is what gives us space and time to design a strategy of implementation*; and the bigger the change, the more important it is to manage it over time. This leads us to confront the concept of equilibrium. Our ability to treat the new policies analytically, to understand their effects, to assess their costs and benefits, is *seriously* hindered by our inheritance of an analytical tool-kit that is bright, impressive, of unchangeable intellectual achievement, and wrong.

The concept of "equilibrium" has exerted a commanding authority over the development of economic theory in general, and travel behaviour modelling in particular. But the most widely-used analytical tools based on equilibrium have *nothing* to say about sequence and time scale and build up, because the elegance and power of this concept of equilibrium focuses all the attention on notional end-state conditions *after* everything has settled down.

Not only that, but even their description of the end-state may be biased. The reason for this is the following. Just because equilibrium can exist as a potential state of an individual or a system, clearly does not necessarily mean that an equilibrium actually does exist at the moment of an observation. But the assumption that it does is ubiquitous. All models estimated using cross-section data assume that equilibrium is not only reachable, but reached. If this does apply at the point of an observation, we would be entitled to assume that relationships estimated (from a well-specified model) accurately represent the end-state strength of the various influences, and the estimated relationships can then be used to describe some other equilibrium end-state which would apply in the future as a result of different values of the influencing variables than have been observed.

But that leads to an inherent source of mis-specification bias, because the logic described only works on quite strong conditions. Models based on cross-section analyses, or on unlagged time series analyses, are only able to deliver correctly estimated equilibrium relationships if the variables of interest have not changed systematically, in the period before the observation, for a time long enough to have allowed the effects to settle down.

Since the adaptation period is in the order of years, and since many of the important variables have a tendency to change more in one direction than in the opposite (e.g. income, prices, network conditions), this condition is rarely, if ever, likely to apply in conditions observable in modern economies in the real world. Therefore, the parameters estimated from such data and models will not, in general, be successful in describing even the equilibrium end-states that are their focus. Their so-called equilibrium relationships are based on observation of uncompleted processes.

So I argue that the sort of improved understanding that is necessary for policy assessment will *depend* on treating travel behaviour as an uncompleted process of change and adaptation: processes by which travel habits are formed, or broken, the process by which cultural values and patterns of travel behaviour are transmitted from person to person, between producer and consumer, or from generation to generation, and how the constraints acting as barriers to change themselves get stronger, or relax, in the course of individual, household and social growth.

From this it follows that the strength of the individual constraints inhibiting demand responses will be determined, in part, not by the present situation of the individual, but by his or her previous history -- a question we rarely ask, and almost never analyse.

This suggests that there are two paradigm shifts going on, not just one. One is rethinking the relationship between travel demand growth and the capacity and policies provided to cope with, counter or moderate it. The second is a deep shift from analytical tools based on the concept of equilibrium to those based on the concept of process. The second is proceeding more slowly than the first. I do not really understand why this is, but it seems to me quite certain that the role of one-off, cross-section surveys, analysed with the presumption that equilibrium relationships have already been obtained, will give way to the collection of longitudinal data, capable of revealing the process of behavioural change over time, analysed without the presumption of already achieved equilibrium.

What this means is panel surveys instead of cross section surveys; it means time series data not only at aggregate level (which is well-established) but at disaggregate level as well. It means ingenious methods of analysis such as pseudo-panel or cohort studies. It means linking continuous counting methods (for example, used for traffic levels and measurement of pollutants) to discontinuous counting methods such as repeated surveys. It means the econometrics of time-series analysis rather than the convergent iterations of equilibrium.

## CONCLUSION

To summarise: we have a simple problem, and a complex one. The simple one (though not so simple in practice) is that the new policies draw attention to certain key areas of policy -- walking, cycling, public transport, car use and so on and, therefore, we need to make sure that the data we collect is relevant to testing success, detecting problems and improving the policies. The complex one is that collecting data is not an autonomous activity insulated from the way we think about and model problems. The overall strategy in the White Paper cannot be understood, let alone improved, by focus on equilibrium end-states -- it is about understanding and redirecting processes. That requires a more fundamental shift both in the data we collect and, even more important, the procedures we use to analyse them.

## NOTE

1. This implication is not strictly correct -- if traffic would substantially change its distribution in time and space, all predicted traffic could be accommodated without any additional road construction at all. But the policy instruments necessary to achieve such a redistribution were not embedded in the forecasting methods available at the time, and this policy track did not become important until after “predict-and-provide” had been abandoned.

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