

Sustainable Accessibility of the Randstad – Four Years On

Popular Annual Report 2011

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Colophon

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With thanks to all researchers who made a contribution

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Foreword

This is the fourth occasion on which the pleasurable task of informing you of progress in the NWO programme for Sustainable Accessibility of the Randstad (SAR) has fallen to me. The ten programmes are all running flat out. In fact, the first four programmes, which started in 2008, are now entering their final phase. At the time of writing, two new projects have been allocated in the field of *Transit Oriented Development*. And, I'm happy to say that the research budget still contains enough funds to initiate a research project that focuses on promoting the use of bicycles. In consultation with both scientists and knowledge users, we will be able to satisfy the requirement for more knowledge on this subject in our capacity as a research programme.

Consequently, we start 2012 with a total of 13 ongoing long-term and short-term research programmes. This means that the SAR programme is now complete and capable of offering a substantial contribution to knowledge development in the field of sustainable accessibility of urban regions in the Netherlands.

Let us now return to 2011, which, after all, is the subject of this annual report. 2011 was once again a year of intensive activity, both between and within the separate research programmes. Please refer to the concise progress reports and the ten researchers' portraits for more details. A PhD student or post-doctoral researcher presents the most important results of the work of the previous year for each programme. In my capacity as Secretary-General, I also find it interesting to make the acquaintance of these young researchers. I even had the opportunity of meeting them personally when I had the pleasure of welcoming the majority of them to the department at our Plesmanweg address in The Hague in June. The occasion was the Young Scientists Meeting, during which the researchers gave me a number of key policy recommendations, and we exchanged thoughts on the relationship between scientific research and government policy. I hope that this marks the start of a fine tradition and that we will continue to intensify the contacts between policymakers and young researchers.

The fact that different SAR researchers received awards for their work in 2011 is also worthy of mention. Feixiong Liao (Eindhoven University of Technology) of Synchronizing Networks won the *Best Paper Award* of the Hong Kong Society of Transportation Studies. Two SRMT programme papers also won awards at the 2011 CVS Congress. Niek Guis, Bart de Keizer and Rob van Nes received one of the awards and the other one, the Youth Prize, went to Gijs van Eck. One graduate, Mengchang Yang, received a *Best Student Paper Award* for the freight transport programme of Lóri Tavasszy. His paper has been linked to the work of SAR PhD student, Nilesh Anand of Delft University of Technology. Erik-Sander Smits of I-PriSM won a *Best Poster Award*.

The second major conference organised by NWO and Nicis Institute, in Utrecht in November once again, was another high point of last year. The theme of the conference was the role of accessibility as a factor in urban regions' ability to compete economically. You will find more details on this theme in this annual report, which I sincerely recommend to you.

Siebe Riedstra

Secretary-General, Dutch Ministry of Infrastructure and the Environment
Chairman of the Supervisory Board of VerDuS
(research theme: Connecting Sustainable Cities [Verbinden van Duurzame Steden])

PS: Please visit the SAR website for the popular annual reports of 2008, 2009 and 2010: www.nwo.nl/dbr

1 The year 2011 in summary

2011 was the SAR programme's fourth fully operational year. The ten programmes all made good progress and we continued the dialogue with knowledge users. This year, dialogue not only took place during meetings but also in the form of joint publications in trade magazines.

Ten programmes were active in 2011. The progress made in terms of content has been summarised in the coming chapters. Because different programmes overlap to a certain extent, collaboration between the programmes also continued in 2011 via a joint meeting of the programme leaders about data usage in April and other initiatives. This meeting was organised by SAR in collaboration with DANS, the KNAW and NWO institute that specialises in data management.

Joint publications for knowledge users

The SAR researchers also collaborated on writing articles for a professional audience. One of these articles was published in *Verkeerskunde*, a Dutch trade magazine for traffic engineering. Teams of researchers made policy recommendations to Minister Schulz in this article, following publication of the Structural Vision on Space and Infrastructure (Structuurvisie Ruimte en Infrastructuur). Among other things, the recommendations relate to the way in which the concept of accessibility can be implemented operationally, to recreational traffic, freight transport, *Transit Oriented Development* and price-setting for mobility and parking.

The other joint publication was a special for the *Tijdschrift voor Vervoerswetenschap*, a Dutch magazine for traffic science, which was coordinated by SAR researcher Caspar Chorus (Delft University of Technology). This special was completely devoted to progress within the four SAR programmes of the first hour, which have now passed the halfway stage. Jaap de Wit, Managing Director of the Knowledge Institute for Mobility Policy (Kennisinstituut voor Mobiliteitsbeleid), an institute which is closely involved in the different SAR programmes via a number of employees, wrote an introduction to the four articles.

Dialogue with knowledge users

The researchers maintain their contact with knowledge users in various ways. Each SAR programme has its own user panel, which meets at regular intervals. There are also often bilateral contacts with knowledge users. Furthermore, a number of PhD students participate in the 'sparring partners experiment'. This means that a PhD student and a practical expert pair up during the research project and communicate with each other at planned intervals. This experiment was assessed in 2011, based on a number of questions that were put to the PhD students and the sparring partners. The results ranged from positive to very positive. The sparring partner arrangement has such a degree of added value for both the PhD students and the practical experts that those involved are eager to continue. 'SAR-wide' contacts also took place with knowledge users again. The Young Scientists Meeting was held at the Ministry of Infrastructure and the Environment in June, see chapter 5 for a full description. The majority of the SAR PhD students and post-doctoral researchers attended. A conference for the 'outside world' was again held in November, which is described in more detail in chapter 6.

New research in the offing

The procedure for finalising the last SAR allocations started in 2011. This round of funding is limited in scope and focuses on the theme of 'Coordinating spatial planning and accessibility', also known as *Transit Oriented Development* (TOD). This relates to practical research within the North and South Wings of the Randstad. Two post-doctoral programmes of short duration, which focus explicitly on this theme, are expected to start in 2012.

Finally, enough budget funding was left to fulfil a desire that had been expressed previously by various parties during the November conference of 2010: a greater focus on the bicycle. During the conference of November 2011, a separate session was devoted to knowledge development on the use of bicycles, which was attended by both scientists and experts from the Dutch Cyclists' Association (Fietzersbond) and the Dutch Cycling Advisory Council (Fietsberaad). Following this session, the Programme Committee initiated a procedure in order to set up a post-doctoral research project of limited duration on this theme. This project is expected to start during 2012.

2 Three post-doctoral programmes have started

In 2011, six new post-doctoral researchers started work in three different programmes. Sjoerd Bakker and Marija Bockarjova are researching the transition to electrically powered transport under the watchful eye of Bert van Wee. Linda Nijland and Eva Gutiérrez-i-Puigarnau are investigating mobility management with a particular focus on the effect of fiscal measures under the supervision of Jos van Ommeren. Herbert ter Maat and Irina Stipanovic are studying the relationship between climate change and management and maintenance of the public roads and railways in the Netherlands under the supervision of Geert Dewulf.

Electrically powered transport: high expectations, but how realistic are they?

Sjoerd Bakker (Delft University of Technology) and Marija Bockarjova (VU University of Amsterdam) want to learn the extent to which consumers are prepared to switch to electric transport and how that transition will influence car ownership and car use, and by extension how it will affect the accessibility of the Randstad. They will also study the position of other parties, such as government authorities, the automobile industry and energy companies. One of the questions addressed is how these stakeholders can be encouraged to collaborate so that they can also contribute to the successful introduction of electric vehicles.

In 2011, the researchers carried out desk research and other forms of research in order to gain a better understanding of the mechanisms that have led to the (very optimistic) expectations in relation to emerging vehicle technologies. Even though these positive expectations support technological development in this area, there is a significant risk of false promises. Bakker and Bockarjova feel that this may be harmful to the innovation process in the long term. 'The electrically powered car has the potential to improve air quality in the Randstad and also embody the Randstad's contribution to reducing greenhouse gases. However the role that electrically powered vehicles may be able to play in the mass market

of the future is currently overestimated in the light of current policy and trends,' in the words of the post-doctoral researchers. According to the researchers, the dynamics of hype and disappointment are very important for innovation processes and moderation is required of supporters of this new technology, such as central and local government. In addition, they feel that focused support is required in order to develop the clean car of the future. There is also a very real danger of premature lock-in. The support needs to focus primarily on the niche markets that offer the greatest likelihood of success.



Researcher's perspective

Sjoerd Bakker Bakker investigates which positions different stakeholders may adopt in relation to large-scale introduction of electric transport and which interests and expectations play a role in this process.

'Our research focuses on the different interests that are involved in the introduction of the electric car. At present, all kinds of different stakeholders enthusiastically support developments in this area. Many of the limitations of this

kind of car are simply accepted without question and investments are made in order to experiment, but primarily to be part of this new trend. In fact, things are happening at a surprising pace, particularly in the Netherlands, but one should question whether this will continue at the same rate. On the one hand, there is the risk that the enormously high expectations will not be fulfilled and that a number of parties will withdraw in disappointment, as recently occurred with the hydrogen car. On the other hand, the various parties have all kinds of other interests, which could suffer if electric cars were introduced on a major scale. These parties are trying to influence the developments in their favour and will probably also withdraw if they fail to do so to an adequate extent. For example, it is not yet clear which party will be responsible for installing and maintaining the charging infrastructure and whether this will ever become operable on a commercial basis. What the automobile industry really plans to do with electric cars and how the oil industry will react are also unclear at this point in time. Tracking and analysing the dynamics of this process as it unfolds is both exciting and absorbing. At the same time however, drawing clear conclusions while the situation is still so fluid is a real challenge. That is particularly true when it comes to formulating policy recommendations: there is a real danger that such recommendations will quickly become out of date in today's dynamic environment.

Mobility management: increase taxation on lease cars

How employers and employees handle mobility issues is vitally important to the accessibility of the Randstad. Linda Nijland (Utrecht University) and Eva Gutiérrez-i-Puigarnau (VU University of Amsterdam) have been involved in studying the effect of mobility management measures implemented by companies since January 2011, both in relation to how employees behave in their private lives and to government policy on public transport and spatial planning. Nijland and Gutiérrez: 'We focus mainly on the effect of taxation policy on car possession with a particular emphasis on 'company cars. We wrote a scientific article on this in 2011 called 'Distortionary company car taxation: deadweight losses through increased car ownership'. One of the conclusions is that the favourable tax regime for lease cars results in the purchase of larger vehicles which contribute more to air pollution. Our plan now is to focus our further research on parking policy and the consequences of other measures, such as free parking places offered by employers.'



Researcher's perspective

Eva Gutierrez-i-Puigarnau Puigarnau investigates the effects of government policy on mobility, such as taxation on lease cars.

'Earlier research performed by Jos van Ommeren, our programme leader, and myself had already shown that the current fiscal regime relating to lease cars has a counter-productive effect. The policy actually encourages individuals to drive (excessively) in (excessively) expensive cars. However the most telling effect is not the distances that people drive but the purchases they make in association with their company car. My research indicates that the distortive effect of taxation on lease cars causes the number of cars in use in the Netherlands to increase by approximately 2%. Furthermore, the belief that lease cars increase employee productivity is a fairytale. Only 20% of lease car drivers actually use their vehicle for business purposes other than home-to-office commuting. And even in the case of this group of 20%, it is difficult to show that lease car drivers are in fact more productive than if they were to use their own vehicle for business travel. The predominantly private nature of company car use indicates that this facility is primarily a fringe benefit for employees.'

The prosperity losses resulting from increased car ownership are relatively small compared to the loss of prosperity that arises when people use more expensive vehicles more intensively. The government's best course of action would be to increase the existing tax rate on company vehicles from 24% to 50%. Higher taxation counteracts the stimulus to spend excessively on a company car but does not actually affect mobility itself. At present the average value of the most expensive car in a household is approximately €20,000 for households with a company car. In the case of families who do not have a company car, that amount is €9,000. In the absence of political or social support for a tax increase of this type, the government could consider reducing the marginal rate of taxation on cars up to a value of €20,000 (from 24% to 10% for example) while at the same time increasing taxation on cars above a value of €20,000, from 24% to 50% for example. A measure like this would partially solve the lease car over-consumption problem. People will probably still spend more on company cars than on cars they buy personally, but less than is currently the case.'

Climate-resistant management and maintenance

What consequences will climate change have on infrastructure management and maintenance? Herbert ter Maat (Wageningen University and Research Centre) and Irina Stipanovic (University of Twente) are the two researchers who aim to improve decision-making processes in organisations in the Randstad that are responsible for infrastructure management and maintenance. In doing so, the scientists link three fields of research: climate change, infrastructure performance and policy development. They have been working on this project since March 2011. Ter Maat and Stipanovic: 'We analyse historical data on the performance of the infrastructure and compare it to the meteorological data. Then we compare the results to other relevant international research studies. We are now able to indicate correlations between meteorological effects and the performance of infrastructure, including disruptions caused by the weather such as frozen train switches in the winter and distorted tracks in very hot conditions, and how the weather affects the quality of the asphalt on public roads. Ultimately, we will also be able to make predictions in this field. We expect disruptions caused by winter weather - with the exception of the first snowfall of the year - to decrease. Summer heat and rainfall however will occur more frequently and have a knock-on effect on the infrastructure.'



Researcher's perspective

Irina Stipanovic is studying the effects of weather and climate change on the performance of road and rail infrastructure and the associated maintenance costs.

‘Climate change is expected to have a major impact on infrastructure networks in the Randstad. And consequently also on decision-making regarding maintenance, renovation and reconstruction of the infrastructure. My main objective is to improve decision-making in the public sector in the Randstad in relation to those maintenance activities. It is a very complex subject, as any intervention in infrastructure management soon becomes a political issue. Even so, we are trying to develop a system for supporting decision-making based on the results of data analysis, future scenarios and the costs of infrastructure in relation to its life-cycle position. Our work to date has consisted of analysing disruptions in specific road and railway network sections which can be related to climatic effects. These analyses have made it possible for us to determine the main risks and vulnerabilities of the infrastructure during the past year. We collaborate closely with ProRail and the Directorate of Public Works and Water Management and focus on the most critical weather-related issues from their perspective so that they can also benefit from our work in practical terms. In addition, we focus on developing new scientific insights.

For me, the most interesting part of this project is definitely the collaboration with the climate researchers of Wageningen University and our joint work on relationships between cause (the meteorological influences and climate change) and effect (infrastructure performance and maintenance costs). Those really are complex phenomena. Furthermore, our research needs to provide useful information for infrastructure managers in the short term and for decision-making in the long term.

I would say that our biggest challenge in the coming period lies in assessing the true vulnerability of the road and railway infrastructure network. The process of collecting data and the fact that the databases are not compatible are still the greatest problems. This means that they are not easy to use and analyse.’



3 Three second-round programmes are nearly halfway

In 2009, three extended-term research programmes were initiated on the topics of weather, climate and transport in the city, price-setting and a sustainable, multimodal transport network in the Randstad. All of the vacant positions were filled and the teams were able to make start in 2010. So 2011 was a year in which we saw the first tentative results.

CESAR – climate change, spatial planning and transport behaviour

The first challenge of the CESAR programme, led by Martin Dijst (University of Utrecht), is to decipher the complex relationships between built-up urban areas and infrastructure, meteorological processes and behavioural patterns with regard to mobility, residential choices and car ownership. CESAR will then integrate that knowledge into the *Urban Strategy* planning support system to offset the requirements imposed by the climate, bringing them into balance with other interests in the Randstad area. Representatives of the province of Utrecht, the Dutch Cyclists' Association (Fietzersbond), the Rotterdam metropolitan area and the municipality of Amsterdam are members of the CESAR user panel.

More bicycles in mild winters, more cars in hot summers

PhD student Lars Böcker (University of Utrecht) has compiled a systematic and extensive overview of the literature on the effects of climate change and how weather conditions affect daily travel behaviour. No overview of this type had existed previously and the studies that had been reviewed in the past were found not to provide a complete picture of the situation. He has analysed the choice of networks and travel distances in today's climate conditions and the expected climate conditions in 2050 based on Dutch traffic research (MON) and the KNMI's climate change scenarios. Böcker: The preliminary conclusion is that winters will become milder and wetter. This means that active forms of travel, such as walking and cycling, will become more attractive than travelling by car. The opposite applies for the warmer summers with more extreme rainfall patterns that are forecast, meaning that travelling by car for example will become more popular.'

The relationship between temperature and the width and height of streets is more complex than people first thought

PhD student Natalie Theeuwes (Wageningen University and Research Centre) tested the meteorological 'Weather Research and Forecasting' model on a mesoscale for the Randstad (Rotterdam) in 2011. She compared different simulations with actual readings in Rotterdam. After validating the model, she tested the model's sensitivity to the 'urban canopy mechanism'. Theeuwes: 'It seems that the temperature in the model is extremely sensitive to urban geometry and the thermal properties of roofs and walls. This made it possible for me to study the relationship between the urban temperature and the shape – width and height – of the 'urban canyon'. The results are significantly different to those of a prior study. Two main processes play a role instead of one, as was thought earlier.'

Planning support system will improve strategy formation

Post-doctoral researcher Marco te Brömmelstroet (University of Amsterdam) has developed a framework for optimising the use of planning support systems, such as Urban Strategy, which spatial planners and policymakers can use to anticipate climate and weather changes. The researchers expect a system of this type (PSS) to have a positive effect on strategy-forming processes. Te Brömmelstroet: 'Currently no clear structure exists within the PSS domain that allows measurement of the use of this type of system. The academic literature on the subject writes extensively about improvement possibilities for PSS systems but no attempt has been made to link those possibilities together or apply them in practice. The limited experiments that have taken place showed that PSS systems have no effects or even negative effects on strategy formation.' The framework that has been developed by Te Brömmelstroet is a point of departure for further research and has already been used twice. The framework proved to be analytically powerful in both cases (in combination with the Urban Strategy system on one occasion and as a stand-alone entity on the other occasion). Te Brömmelstroet now intends to initiate a number of experiments in order to improve the framework further.

Combining scientific knowledge and practical experience

A new PhD student, Peter Pelzer (Utrecht University), has started work on the fourth project. He has made an in-depth study of the possibilities and limitations of planning support systems within planning and policy processes. Pelzer: 'This relates to issues such as suitable knowledge development and the integration and application of systems in complex situations. For example, spatial questions that are relevant at multiple levels and involve multiple layers of government, etc. The interdependency in spatial planning processes between scientific knowledge on the one hand, like that produced via a PSS, and the practical knowledge and experience of lay people on the other hand is a key element in these situations.'



Researcher's perspective

Natalie Theeuwes researches the influence of urban geometry and morphology on small-scale meteorology in the city.

'Within the CESAR programme, I study the urban climate and the meteorological processes at city and street level. I primarily look at the perceived temperature, the actual temperature, the wind and humidity. The urban heat island

is a primary phenomenon in the city. Cities cool down in the evening at a slower rate than rural areas because the asphalt and concrete absorb large quantities of heat energy during the day. The city stays relatively warm because this energy is released again as heat at night. In the Netherlands, this can create a temperature difference of up to 9°C. In periods of hot weather, city dwellers can suffer from the effects of long-term heat stress. Clear information on the relationship between the urban heat island and different city properties will help urban planners to make allowance for these effects more efficiently in the future.

The ratio between building height and street width, the so-called aspect ratio, is a 'shape indicator' for a street in urban climate terms. My study shows that the influence of the aspect ratio on the urban heat island effect is highly seasonal. There are two conflicting phenomena. On the one hand, narrow streets retain a relatively large amount of heat at night, which leads to higher temperatures. On the other hand, the amount of sunshine

that penetrates these streets during the day is limited, which leads to lower temperatures. The first process is dominant in the winter and the second in the summer. I will quantify the effect of other urban design parameters, such as vegetation, in further research.

Dutch researchers have only recently started to work actively on urban climate studies. The thing I like most about this work is that I'm one of the first to carry out this new type of research, but of course that is also the greatest challenge. There is a danger that you will try to reinvent the wheel. I visited two international conferences last year. I met scientists there who are interested in my research. This is an extra motivation for me to carry on what I am doing.'

i-PriSM – innovative pricing policy

This research project, led by Erik Verhoef (VU University of Amsterdam), looks at innovative pricing systems that could contribute to more sustainable transport systems. The researchers review various modes of transport (road transport, public transport), various technologies (vehicles that run on electric power versus conventional fuel), and various relevant groups (travellers and key stakeholders), as well as studying the interaction between infrastructure and urban networks. The implementation and transition phase is expressly included in the considerations. A user panel set up for the project includes representatives from the Ministry of Infrastructure and the Environment, the municipality of Amsterdam, the Haaglanden metropolitan area, the Arnhem-Nijmegen urban region, the Knowledge Institute for Mobility Policy and NS Dutch Railways.

Model for predicting the effect of road pricing on spatial structure is now ready

The research group at the VU University of Amsterdam is studying the interaction between spatial planning in cities, urban job markets, traffic congestion and road pricing. Verhoef: 'We are developing a theoretical knowledge model that is inspired by previous models. Our focus lies on the analysis of the 'second best' option for policy, a topic that will also play a prominent role in future studies into network price-setting in monomodal and multi-modal networks.'

The model makes it possible for us to answer questions such as: how will the implementation of pricing affect the urban structure in the long term? How is this affected by disruptions in the job market? We are now completely ready to carry out the analyses needed to understand the design and effects of the second-best option for road pricing in an urban spatial structure. We are going put our brand-new PhD student, Ioannis Tikoudis, to work on this.'

What choices will travellers make if they have to pay?

Erik-Sander Smits (Delft University of Technology) has developed a theoretical framework with which he can estimate the effects of different innovative pricing measures on traffic, prosperity and the environment. Smits: 'This relates to the effects on travellers' behaviour in simulations within multimodal transport networks. My framework will be flexible enough to provide insight into the effects of a highly diverse range of pricing measures in the Randstad. At a later stage, the framework can be used as a support instrument for decision-making. I am developing the multimodal network model in close cooperation with the researchers from the SRMT programme in SAR.' The researchers of i-PriSM and SRMT have created a travel choice model and investigated the effect of pricing measures on the choice of forms of transport and routes in a small-scale case study performed for the Delft – The Hague route. Work has also taken place on expanding the traffic simulation model, which has been tested in theoretical networks in order to illustrate how mixing cars and trucks affects traffic. The next step is to set up a probability theory model in which all kinds of external effects (with different stakeholders) such as congestion, noise nuisance, safety and emissions are included in the assessment of pricing strategies. Smits: 'Our multimodal choice model is the first step towards price-setting for multimodal transport. For example, you drive by car to the station, wait for the train there and subsequently cycle to your final destination. If we are interested in an integral price strategy for all transport modes, including public transport, a choice model like this will allow us to predict the effect of this kind of pricing strategy. Furthermore, the new simulation model will make it possible to assess different pricing strategies for passenger transport and freight transport.'

People want to do the 'right' thing in their hearts

Jan Willem Bolderdijk (University of Groningen) is a post-doctoral researcher in the field of psychology. Economic theories predict that pricing measures can be effective in encouraging the use of a sustainable transport system. The true effectiveness and acceptability of pricing measures are however dependent on psychological mechanisms. Bolderdijk: 'To what extent do people experience prices as honest, for example? The question is how you can use knowledge of this kind of mechanism to improve the acceptability and effectiveness of pricing. We are performing a number of laboratory experiments, the first of which has been completed. This experiment investigates how consumers react to an innovative charge system in the form of personalised emissions trading credits. Instrumental but also moral motives seem to explain whether or not households are prepared to accept trading in emissions credits. People want to do the 'right' thing in their hearts. In addition, we are going to conduct a survey among car drivers, users of public transport and lobby groups in order to tackle a number of relevant research issues in our various subprojects. The specific contents of the research project will be defined in consultation with the PhD students working within our programme. Our sparring partners have already offered to assist us in carrying out the research by giving us access to their network.'

Newspapers are still influential

PhD student Özgül Ardiç (Delft University of Technology) studies the opinions of stakeholders on the implementation of price measures. In addition to desk research, she has performed a detailed media analysis. Ardiç: 'I have based my work on the fact that the acceptability of road pricing some years ago was a major problem for the public and other stakeholders. The media have a strong influence on public opinion. As a result, they are often considered to be an important player in this type of implementation process and even seen as stakeholders in the same way as politicians or lobby groups. My research analyses the content of Dutch newspaper articles during the period from 1998 to 2011. This involves a total of 411 newspaper articles from De Telegraaf, Trouw, the AD, NRC and the Volkskrant.' Some initial conclusions are:

- There was a difference in tone and frequency in the way the media wrote about pricing systems during this period;

- The level of media attention increased proportionally as more details about road pricing were revealed;
- The articles were mostly devoted to the effects on households and traffic queues, the technical characteristics and privacy issues;
- A number of uncertainties about road pricing and their impact on the forecasts were also major topics.



Researcher's perspective

Jan Willem Bolderdijk tries to explain support for pricing policy based on psychological mechanisms.

‘Many scientists and policymakers are convinced that price measures, such as toll charges, road pricing and trading in emission credits can help ensure better use of the existing transport system and make it more sustainable. However, the public is not always enthusiastic.

Road pricing, for example, was not implemented because there was inadequate support. My research focuses, among other things, on explaining the acceptance of pricing measures. When do people find pricing measures acceptable? And how can support for pricing measures be stimulated?

The first experiments we have performed in this context show that acceptance cannot be explained exclusively by financial self-interest. This is because people who find the environment important in particular are less concerned about the possible adverse effects of pricing policy on their personal financial situation. These results correspond to a more general idea that we are investigating within the project, namely that acceptance on the part of end-users is more than a simple financial cost/benefit analysis. All kinds of psychological mechanisms determine the level of support for pricing policy. People have a tendency to want to maintain the current situation, often referred to as the ‘status-quo bias’. They can also react defensively when they feel that limitations are being imposed on their freedom, a phenomenon known as ‘reactance’. A third possibility is that they modify their opinions in line with permanent changes in circumstances, known as ‘rationalisation’. These principles offer a number of handholds for stimulating support for pricing policy.

The SAR programme places major emphasis on practical application. Even though I endorse the principle that all research should have a practical application, I do feel that

a practical focus sometimes makes it difficult to comply with the other requirement that is set for young researchers: publication in highly regarded specialist magazines. Consequently, my challenge is to carry out research that is both useful in a social context and also innovative in a scientific context.”

SRMT – Cohesive strategies for achieving sustainable accessibility of the Randstad

The researchers working on SRMT are developing cohesive strategies for the Randstad based on an integral scientific approach to land use, location selection and multimodal transport networks, travel behaviour and transport policy. The programme is led by Ingo Hansen (Delft University of Technology). The envisaged research results will be relevant to sustainable mobility policy in relation to investments in the strategic transport network and Infrastructure, Space and Transport Multi-year Programme (MIRT) projects. A user panel set up for the project includes representatives from the Amsterdam metropolitan area, the Ministry of Infrastructure and the Environment, Prorail, the Haaglanden metropolitan area, the NS Dutch Railways, Bouwfonds, Travel Information Service 9292, the Knowledge Institute for Mobility Policy and the RET Rotterdam Transport Company. The different panel members contribute actively, for example by delivering data.

Intercity station increases the value of real state

PhD student Yuval Kantor (VU University of Amsterdam) has analysed the effects of public transport on urban structures based on empirical and theoretical perspectives. Among other things, he discovered that the value of commercial real estate is higher when located in the vicinity of a train station. Kantor: ‘Furthermore, the effect of intercity stations on the rental or sales price of commercial real estate is greater and extends out further than that of smaller stations.’ The important advances he has made at a theoretical level will help in integrating multimodal transport into an existing urban structure model.

Higher density construction around transport nodes

PhD student Andrew Switzer (University of Amsterdam) has developed a conceptual model which expresses how balancing space and mobility is dependent on the actions of various actors and exogenous developments, and how space and mobility are affected by the existing institutional structures. Other models, which have been used until now, do not adequately take these three factors into account. Switzer: 'Examples of *Transit Oriented Development* in foreign countries show that switching from a spatial design system in which space and mobility are not properly coordinated to a system where this does take place correctly is perfectly possible. Basically, this equates to applying a policy of higher density construction in areas where accessibility is optimal and public transport is well developed, and vice versa. *Transit Oriented Development* contributes to the efficiency of transport systems and consequently sustainability as well.'

Switching to more consistent modelling

A PhD duo, Ties Brands and Anthony Ohazulike (University of Twente), has been working on a method for optimising the design of transport networks. They use an existing instrument called OmniTRANS as the basis for their work and are now testing their findings.

PhD student Gijsbert van Eck (Delft University of Technology) has worked on the requirements with which a dynamic multimodal transport model must comply. When doing so, he looked at the expected characteristics of the networks and those of the users in major city areas. The requirements (in particular those for the Randstad) have been included in the first preliminary design for a model. Automatically integrated multimodal networks can now be constructed based on monomodal input data. Van Eck gathers empirical data from the North wing of the Randstad and uses it as the input for testing his model. Van Eck: 'Most transport models ignore multimodal journeys and fail to handle them realistically. They also often play down the inconvenience of transfers. However transfers are an important element in multimodal travel and responsible for a large proportion of the total perceived journey time. Our 'supernetwork approach' does not suffer from these limitations. Transfers are explicitly included in the network representation and therefore not played down in any way. The use of the 'supernetwork builder' and the 'option set generator', which we have developed

make a broad range of multimodal travel alternatives possible. The attractiveness of these alternatives is largely dependent on the facilities provided for transfers so that seamless transfer options become a real possibility.'

Ability to guarantee connections and transfers

PhD student Daniel Sparing (Delft University of Technology) has analysed the service timetables for public transport in the Randstad in order to investigate synchronisation between the different modes of transport. He has also gathered data from actual trips in order to understand how the effects of delays are propagated and to evaluate the stability of transfers. Sparing analyses the layout of transfer stations in order to assess the transfer process even more accurately. He has also developed a macroscopic simulation model in order to analyse the relationship between capacity and reliability under conditions of disruption and traffic guidance.

Sparing: 'The analytical approach I use is an effective instrument in gaining an understanding of the stability of multimodal public transport with guaranteed intermodal connections. The main factors in determining the stability and the attractiveness of public transport are short transfer distances, synchronised timetables and guaranteed transfer possibilities. Based on international comparisons, I conclude that the guaranteed transfer concept can be used in order to improve the attractiveness of bus and train networks. Furthermore, I have discovered a strong relationship between capacity usage and the average delay in simulations, depending on the number of trains involved.'



Researcher's perspective

Andrew Switzer investigates how boundary conditions can be created in the Randstad that favour the transition to harmonisation between spatial development and traffic and transport as well as integration between different forms of traffic at regional level.

‘Our most important achievement to date is the conceptual model. This model is a first attempt at combining the multilayer perspective of transition studies with the transport land use feedback cycle. The model shows the relationship between developments in the spatial and transport infrastructures and takes the complex interactions in the community into account. When developing the model, we also attempted to involve actual actors in focus group sessions in order to ensure that the model would not just be easily understandable to us.

Two events last year stand out as personal high points. One was the meeting in June when I and a number of other PhD students within the Space and Mobility research group had the opportunity of meeting Siebe Riedstra, the Secretary-General of the Ministry of Infrastructure and Environment. We made the most of this opportunity and presented our experience in the field of node development in domestic and foreign situations to the Minister in an advisory memorandum. We hope that this memorandum will contribute to planning practices in the Netherlands.

The second high point is related to my own research. I started work on my first practical case study in Zurich in January. After more than a year of planning and developing theory, I very much enjoyed finally putting everything I had done up to that point in time into practice. Zurich has developed a very effective and successful regional public transport system and direct democracy is one of the main factors that has contributed to this success. It was interesting for me to learn that good results can be achieved by giving citizens a strong voice in the decision-making process even though things may take a little longer as a consequence.

Analysing all the data that I gather is the greatest challenge. I will implement three case studies in 2012. These are designed to create a better understanding of how mobility transitions take place in practice. In the final phase, we will try to share our knowledge of transitions with those involved in practical application via workshops. All in all, a very busy year but also very exciting and stimulating, as my experience in Zurich indicates.’



4 Four first-round programmes enter the final phase

The first four extended-term SAR research programmes started in 2008. These programmes have now entered their final phase. The programmes focus on recreational traffic, sustainable freight transport, travel information and ICT and synchronising time/space networks.

Recreational transport behaviour

The researchers working within 'The value of recreation' programme are seeking to gain more insight into the needs and choices of travellers concerning recreation and mobility, both now and in the future. In this context, they take account of radically changing conditions, such as the rising demand for recreation, and the consequences of climate change and climate change policy. The user panel associated with the programme includes representatives from the Ministry of Infrastructure and the Environment, the Knowledge Institute for Mobility Policy, the Ministry of Economic Affairs, Agriculture and Innovation, the Knowledge Centre for Recreation (now closed) and STIRR. Bert van Wee (Delft University of Technology) leads the programme.

The relationship between recreational location and choice of recreational behaviour

Tom Gosens' (VU University of Amsterdam) PhD research has already delivered some pertinent and interesting results in the recent past. Gosens: 'Recreation is a 'space-sensitive' category in the range of daily choices open to consumers. Distance is a deciding factor. Activities that are fragmented in spatial terms, such as cultural activities, are largely undertaken by residents of the larger municipalities in the Netherlands. Destinations are easily accessible for them and the idea here is to facilitate high quality close to home. So policymakers can influence activity patterns by creating high-quality, easily accessible facilities. I should note here that selection effects may also play a role. People with a strong interest in culture mainly live in cities whereas nature lovers generally live in the country. I am still looking for a way of tackling this problem.'

Another result is that personal and contextual characteristics of consumers determine how they spend their time and money when it comes to open-air recreation. Different activities deliver different participation patterns. Gosens: 'Men tend to spend more time out in the countryside whereas women prefer open-air recreation in urban areas. In addition, increased accessibility of recreational wooded areas has been found to lead to a reduction in the recreational time that is spent there. We think that if the woods are easily accessible, people will be more inclined to visit them for a short walk. If accessibility is more difficult, they reserve more time for the activity.'

The relationship between life phase and choice of holiday

PhD student Anna Grigolon (Eindhoven University of Technology) has completed two different analyses to date. Grigolon: 'I examined students' recreational behaviour and split out the data based on short and long holidays. It seems that the choices made by students change as time passes. In addition to the expected correlations between the students' socio-demographic background and their choice of holiday, there are also correlations between things like the available mode of transport and the choice of holiday. The availability of cheap flight tickets to a particular destination has a significant effect on where you go, or at least that's how it looks.' Grigolon also analysed holiday trips made by 839 Dutch respondents in the period from 2002 to 2009. When doing so, she looked at the change in holiday choices in relation to the respondents' life phase and their socio-demographic characteristics. The life phase in which a family finds itself directly influences the choice of mode of transport, the accommodation and the composition of the travel party.

Social changes lead to changes in mobility to a limited extent

PhD student Sander van Cranenburgh (Delft University of Technology) has undertaken desk research in order to investigate the extent to which mobility patterns have changed in the last 40 years as a result of the emergence of a number of major social changes. Van Cranenburgh: 'For example, the rapid increase in the availability of affordable flights to holiday destinations, the oil crises and ICT developments. The research shows that the effects these changes had on mobility were generally of a transitory nature. Only the emergence of ICT, '9/11' and the oil crisis have caused truly

fundamental changes in mobility patterns. This does however mean that a substantial change with lasting consequences for mobility has occurred in each decade in the last 40 years. Based on my research, I estimate that the permanent consequences of these far-reaching changes amount to between 5% and 10% when evaluated against various mobility key indicators.'



Researcher's perspective

Maarten Kroesen has been given the assignment of translating the various research subprojects within the recreation programme into practical policy-making.

'I have been involved in the Recreation programme as a post-doctoral researcher for three months now. Based on my experiences to date, I feel confident in saying that recreation is not exactly a high-interest topic. There seems to be very little specific interest in this topic both in terms of policy practice and from a scientific perspective. As a result, there is a risk of underestimating the importance of recreation. That recreation is indeed important in an economic sense is supported by the simple observation that many people spend time on recreational activities. The importance of recreation is also supported by psychological research. For example, people who indulge in recreational activities on a regular basis suffer less from stress and enjoy better health (in their own assessment). Recreational destinations such as parks and green areas can also have a further important restorative function. For example, people who are exposed to traffic noise are generally less stressed by that noise if they live close to a park where they can wind down. The low level of interest in recreation may also lead to a failure to identify certain (latent) problems. The research performed in this area by Tom Gosens of the VU University of Amsterdam indicates that people spend less time on recreational activities, such as visiting parks, if these activities are also hindered by poor accessibility. This implies that many opportunities for making economic and psychological (health-related) advances remain unexploited in the current situation. I see analysing and quantifying these potential gains as effectively as possible as my personal challenge for the future. The idea is to quantitatively show what effects different policy scenarios, varying from business-as-usual to proactive recreational policy, will have on relevant economic and psychological performance indicators. Consequently, the role of science in this project is not primarily to make a contribution to resolving existing and manifest problems

such as the frequency of traffic jams, but rather to alert us to a latent, but possibly not insignificant problem, by making it visible and tangible.’

Sustainable freight transport

The researchers working on ‘Towards a sustainable multimodal freight transport system for the Randstad’, the programme led by Lóri Tavasszy (Delft University of Technology and TNO), focus on the significant increase in freight transport in and around the three main transport hubs in the Randstad (the ports and Schiphol Airport). They are researching production, consumption, trade and supply chains and considering such topics as the concept of transshipment terminals and the issue of urban distribution. Various experts are involved in Tavasszy’s freight transport programme, including people from the Knowledge Institute for Mobility Policy (KIM), the Central Bureau of Statistics Netherlands (CBS), TNO and the Rotterdam Port Authority.

Trade flows analysed in more detail than ever before

Post-doctoral researcher Maureen Lankhuizen (VU University of Amsterdam) is working with data sets associated with national and international trade flows in the Netherlands at a regional level, expressed in Euros and gross weight. Lankhuizen: ‘In methodological terms, I contribute by using extra information about regional trade flows, which is included in the transport statistics. I integrate this data on national and international trade flows with the transport statistics of the CBS, with which we work very closely. In addition, we have made an analysis of the effects of multiple dimensions of distance on international trade. This involves looking in detail at the heterogeneity in the effects of the various dimensions of distance on trade in detailed product groups.’ The result is a new classification of products in relation to ‘distance decline’. Distance decline expresses the degree to which trade reduces (generally as a percentage) as the distance between the point of origin and destination increases (in percentage terms).

PhD student Igor Davydenko (Delft University of Technology) succeeded in extracting unique data from the CBS databases that are associated with road transport. That data relates to the exact flows, origin and destination of freight, and distribution centres. So the building blocks for the third phase of the research project, which focuses on chain choice models, are now ready.

What happens when sustainability policy impinges on the transport sector?

PhD student Mo Zhang (Delft University of Technology) has developed a GIS model for a multimodal, multi-actor and multicommodity network. Zhang: 'I can analyse the effectiveness of the CO2 prices and the introduction of biodiesel for transport and work out important geographical redistribution effects with a new application. Results of this kind are relevant for investments in the network. The new tool is intended to be used for scenario analyses relating to use of the network for current and future container transport in the Netherlands. So it contributes to optimisation of the Dutch container terminal network.'

Interactions in urban freight transport

PhD student Nilesh Anand (Delft University of Technology) has studied literature on modelling urban freight transport. He discovered gaps in the models in the area of interaction between actors. This led to a summary article and determined the further focus of this project. Anand: 'My desk research revealed that the lack of solutions for urban freight transport can often be attributed to a poor understanding of the interaction between the various stakeholders. I have studied this problem together with MSc student Mengchang Yang. Our paper based on his graduation thesis won the Best Student Paper Award of the Transport and Policy Department of the American Society for Public Administration.'



Researcher's perspective

Maureen Lankhuizen develops integrated information about national and international trade and transport for the Netherlands.

‘Our programme provides good, integrated information about trade and transport. The Netherlands is a textbook example of a trading country, but consistent information about trade and transport is very scarce and crucial.

Evidence-based decision-making in relation to the Betuwelijn, for example, proved to be very difficult, partly because of the lack of data. I would like to contribute to the process of generating information for effective, evidence-based policy that focuses on making freight transport in the Netherlands sustainable. Unusually, use is made of two data sources. We integrate data about national and international trade and transport statistics. When doing so, state-of-the-art techniques are used in order to generate consistent information via intelligent methods. The result is an integrated overview of national and international freight flows from, to and through the Netherlands at regional level. The project also makes scientific contributions. For example, we research the effects of multiple dimensions of distance on trade for different product groups. This involves looking in detail at the heterogeneity in the effects of the various dimensions of distance on trade in detailed product groups. The result is a new classification of products in relation to ‘distance decline’. That had led to a new way of categorising goods based on their distance sensitivity.

We work together closely with the CBS. We have jointly developed improved statistics for national and international freight flows. The CBS possesses very specific statistical expertise and uses specific methods. The VU contributes to developments in their methodology. Collaborations of this type are both challenging and fruitful.

I see two challenges in the coming period. Firstly, we need to be able to estimate the level of international imports and exports in the Netherlands at regional level in the future more accurately than is currently the case. We can make further refinements in this area by using additional micro information provided by the CBS. The second challenge consists of expanding the current results to create a series covering multiple years. Finally, our intention is to use information on regional freight flows to develop a multiregional input/output table.”

TRISTAM – traveller response and information service technology

The TRISTAM project researches how travellers use travel information such as travel time estimates when there is traffic congestion. In this context, the researchers are making full use of advancing ICT technology to avoid undesirable side effects of travel information, such as merely shifting congestion elsewhere. The user panel includes representatives from TomTom, the Knowledge Institute for Mobility Policy and ARS Traffic & Transport Technology.

Choice of route and travel information

PhD student Giselle de Moraes Ramos (Delft University of Technology) has investigated the success of alternative theories on how decisions are made under conditions of uncertain travel information and compared them to each other. These theories are state-of-the-art elements in transport research and have received very little attention until now. Ramos: 'I have also worked on analysing the data from the GPS experiment. Thirty-two volunteers participated in that experiment by noting down their home-to-office commuting behaviour between Delft and The Hague and indicating the extent to which they made use of travel information. Approximately 80% of the participants were given a TomTom device and were able to receive up-to-date travel information. In 2012, we will start work on modelling the route choice behaviour and its consequences for network dynamics.'

The possibilities and limitations of ICT in relation to accessibility

PhD student Ruihua Zack Lu (Delft University of Technology) has modelled the effects of travel information and tele-activities on accessibility. The constraints that a person may experience when taking decisions is explicitly included, as is the presence of uncertainty. That led to a detailed analysis of the possibilities and limitations of ICT as a driving force behind accessibility. I also worked on a journey simulator in 2011, which allows me to collect data for testing my model. I will be able to use that data from 2012 on.'

Factoring in strategic behaviour on the part of travellers

PhD student Zarah Parvaneh (Eindhoven University of Technology) has created a model in order to determine the effects of advanced ICT on dynamic activities and travel patterns. Parvaneh: 'This model allows us to assess individual reactions to information provision while taking different types of information and different types of recipients into account. The model integrates strategic behaviour when making choices. In other words, individual travellers may anticipate the actions of their co-travellers who receive the same travel advice. So they consciously take a route that is not recommended. A model of this type is completely new to transport research.'

Provision of traffic information

PhD student Sergejs Gubins (VU University of Amsterdam) has performed two research studies. The first study involved the market for traffic information in which a road network manager, a supplier of traffic information and individual motorists collaborate strategically to maximise their personal benefit. Gubins: 'The provision of traffic information by a private monopolist results in a minor to negligible loss of prosperity. Consequently, it seems that the nature of the party that provides the traffic information, either a profit-maximising or a prosperity-maximising organisation, is of no importance. This is because relatively few motorists make a decision to travel or not to travel based on travel information. These results are new and seem to be true of various different markets.'

In the second study, Gubins analysed the prosperity affects of teleworking for part of the day in relation to traffic queues. He showed in this study that free technology may even lead to a loss of prosperity as it increases the frequency of traffic queues. In addition, it seems that monopolistic price-setting can lead to greater prosperity than a perfectly competitive market. This is because the number of teleworkers is excessively high in the latter case.



Researcher's perspective

Giselle M. Ramos investigates the extent to which providing traffic information helps to alleviate congestion.

‘The growth in mobility in recent decades has led to more congestion in the traffic network and more uncertainty about journey times. My research focuses on the question of whether provision of traffic information influences travellers’ choice of route and choice of departure times and what consequences these decisions have for the traffic situation. The

final outcome indicates the extent to which providing traffic information helps to alleviate congestion.

I used GPS devices in the spring of 2011 in order to monitor the travel behaviour of 32 volunteers. They kept a record of their home-to-work commuting patterns between Delft and The Hague. During the first three weeks, they only used public sources of information that were available on a free-of-charge basis. During the last six weeks, they received personalised traffic information which was provided by special TomTom devices. They also filled out daily travel reports. They used the reports to indicate the relationship between their choices and the information they received, how the journey progressed and what their expectations were in relation to the next journey.

The experiment ultimately delivered data on approximately 1300 journeys and a stack of 1100 completed journey reports. The preliminary results indicate that commuters are good at estimating the average journey time, but that personal preferences colour their perception of routes. So they tend to find their preferred routes to be reliable, in spite of the wide spread of journey times that are sometimes visible. Furthermore, commuters seem to be more prepared to look for information when driving or just before embarking on a journey rather than planning the best possible departure time. My greatest challenge now lies in constructing a model for route choice behaviour, so that I can analyse the complete data set.’

Supernetworks of activities, space and time

The researchers working on ‘Synchronizing Networks’ are developing a supernetwork in which transport systems, spatial planning and activity patterns are viewed as an interrelated whole in time, space and ‘virtual space’. This will help designers and planners of spatial facilities, mobility and infrastructure to acquire a better understanding of travel patterns. A user panel formed for the research project comprises knowledge users from Transport Information Service 9292, the Dutch Cyclists’ Association, NS Dutch Railways, the Knowledge Institute for Mobility Policy and the Ministry of Infrastructure and the Environment.

Supernetwork model under development

PhD student Feixiong Liao (Eindhoven University of Technology) is responsible for what is known as the Model Project. He has developed the following components:

1. a database for the Randstad that integrates data relating to public transport (provided by OV9292), the road network (NWB), the cycle path network (provided by the Dutch Cyclists’ Association), geocodes for private addresses (provided by BridGIS) and land usage (LISA);
2. a method for generating efficient supernetwork representations on the scale required for the Randstad;
3. a method for formulating cost functions for transport and transaction connections that takes into account the preferences of travellers in terms of travel options (time, price, effort, comfort);
4. a method for generating personalised supernetwork representations based on specified activity programs and the characteristics of travellers;
5. a method for including ICT facilities, such as teleworking and teleshopping, in supernetwork representations;
6. a method for including time-window constraints relating to the activities and transport services in the network model;
7. a method for synchronising paths via a supernetwork in order to make corrections for social interactions between individuals (meetings for social or business purposes).

Liao: ‘I am now working on application of the model in the Rotterdam region at P&R locations.’

Coping with time pressure and task complexity

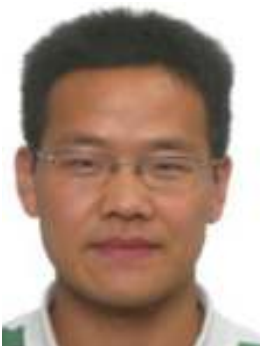
PhD student Chao Chen (Delft University of Technology) is responsible for executing the Usage Project. 'I have developed a choice model that explains and predicts the choices made by travellers in synchronised networks. The model allows for time pressure and task complexity, two aspects of decision-making that play a key role when making choices in complex multimodal networks. These aspects have been largely overlooked until now. The model can probably be validated using standard software, which is available to professional users and scientists. In addition, a highly advanced journey simulator has been developed, which simulates a synchronised environment of car, train and land usage. The simulator is used to gather data. The simulator is very realistic and state-of-the-art, with a highly advanced user interface and graphics. The complete activity/movement patterns for a full day can be programmed and the task complexity and time pressure simulated very realistically. The journey simulator is produced by an external company. A prototype version is now available, which we are currently testing.'

Coordination of spatial policy leads to different spaces

PhD student Sara Levy (Radboud University Nijmegen) is working on the Governance Project. She has developed an agent-based model which allows investigation of how policy coordination affects different actors in spatial development. Levy: 'We use this model to specifically investigate the process of office developments in the vicinity of public transport nodes. We compare a situation in which two neighbouring municipalities both implement policy that focuses on *Transit Oriented Development with a situation in which one of the municipalities implements a policy that focuses on the road system*. The results showed that if both municipalities implement a Transit Oriented Development policy, the number of companies that set up offices in the vicinity of public transport nodes will increase even though fewer companies will open offices in both municipalities. However, if one of the municipalities operates a policy that focuses on motorways, fewer companies will set up offices close to the public transport nodes in the municipality that implements a *transit oriented* policy. The conclusion is that if a municipality wants to implement *transit oriented* policy, it must be aware of what neighbouring municipalities are doing in this area.'

Highly promising synchronisation strategies

Post-doctoral researcher Wendy Bohte (Delft University of Technology) is responsible for the Design Project within Synchronizing Networks. She has investigated current spatial policy via interviews with policymakers and other experts. Bohte: 'I asked them to tell me about highly promising synchronisation strategies that would be worthy of further investigation. Their answers indicate that there is currently a strong focus on creating better connections between different modes of transport, for example improving P+R facilities and the use of bicycles for the preliminary and final stretch of the journey. In addition, there is interest in *Transit Oriented Development*, which considers the use of space in the vicinity of multimodal transport nodes, and in the New Way of Working with its possibilities for working independently of time and place, avoiding the rush-hour, etc. We are now going to translate these synchronisation strategies into concrete policy measures for specific cases. We will determine the accessibility affects of those policy measures using the supernetwork model. The first case, which we are working on now, is the Rotterdam Stadionpark in Rotterdam-Zuid where major developments are planned for sports and residential facilities, offices, shops and infrastructure.'



Researcher's perspective

Feixiong Liao's research relates to modelling a 'super-network' which integrates spatial design and management, transport, ICT and common activity programs of private citizens.

'During the past year I have worked on the construction of an extensive system, a so-called 'multi-state supernetwork'. This network allows us to study people's travel behaviour and analyse their mobility and activity patterns. We have completed three important phases in the construction of the system. The first phase was to build a 'personal' network. That is a highly 'simplified' network that only shows the relevant locations and journeys, which are linked to a specific daily activity programme. The second phase was to improve the efficiency of the supernetwork representation. We had to downsize the scope of the super-

network without adversely affecting the solutions for executing activity programs which are offered by the model.

The third phase involved developing algorithms that take into account the fact that preferences relating to activities and journey times may vary depending on the time of day or depending on traffic conditions. This was a first in the context of supernetworks. We have now created a solid basis for future use of the model in case studies.

The thing I enjoy most about my project is that my research offers the possibility of creating something completely new and allows me to influence the process. I can really contribute to the way in which the system is built and improve it. I also very much enjoy the meetings with the members of the user panel, who are all interesting people. And of course the debates with some of the great minds in the academic world. Put simply: life is difficult, but fun.

The research programme is now entering a critical phase. The main challenge lies in creating the link to other projects within our supernetwork programme. And in guaranteeing the continued robustness of the system.'



5 Impression of the Young Scientists meeting in June

Approximately 20 scientists gathered in June 2011 in order to meet a number of policymakers, see each other (again) and discuss a number of policy topics with the highest government official in the Ministry, Secretary-General Siebe Riedstra.

Professor Henk Meurs, a member of the SAR Programme Committee, welcomed everybody on behalf of NWO, Nicis Institute and the Ministry of Infrastructure and the Environment. All the PhD students and postdoctoral researchers who were present briefly introduced themselves. Some of them already knew each other very well, others were new faces in the group.

Structural vision on Infrastructure and Space

The next speaker, Jeroen Haver, a policy coordinator at the Ministry, gave a presentation on the most recent developments in national policy and explained the finer points of the new Structural Vision on Infrastructure and Space to the participants. One very important aspect in this new vision is decentralisation of responsibility for spatial design and management, which will be delegated to the provinces and municipalities in the future. This topic was revisited during the discussion following Jeroen's presentation. A new paradigm for the board is that of national interests versus decentralised responsibilities. The new accessibility indicator was another interesting topic of discussion.

KIM: link-pin between science and policy

The second presentation was made by Odette van de Riet, a member of the management team of the Knowledge Institute for Mobility Policy. She introduced the Institute, which is the link-pin between science and policy and finds itself in an interesting position. It is part of the Ministry, but has an independent character where knowledge development is involved. Odette emphasised the importance of evidence-based policy, which political processes sometimes make impossible to achieve in practice. The Institute has a circle of associated 'fellows', which includes a number of well-known university Professors who specialise in the field of mobility.

Accessibility indicator

Next, Jeroen, Odette and Henk elaborated on the process that had led to the new accessibility indicator. The problem presented by adding spatial aspects was that, ultimately, the rural parts of the Netherlands would seem to be very inaccessible as opposed to the Randstad, where accessibility would seem very high, which would hardly match the public's perception of congestion. So this indicator had been found not to be acceptable from the perspective of 'framing'.

Six very brief presentations

The next part of the programme consisted of six very brief and lively presentations given by Sara Levy (about supernetworks), Zack Lu (about information for travellers), Daniel Sparing (on *transit oriented capacity management*), Irina Stipanovic (on the consequences of climate change for management and maintenance policy), Els Beukers and Niek Mouter (Nici researchers, on the topic of social cost/benefit analyses) and Paul Chorus (an ex-Nici researcher, on *transit oriented development*). Each person had 10 minutes to present the following information:

- how their research would (ultimately) contribute to sustainable accessibility of the Randstad;
- what was new, innovative or worthy of note in their findings at that point;
- what professionals in the field of sustainable accessibility could (or should) learn from this research.

Discussion with Siebe Riedstra on six points

Secretary-General Siebe Riedstra attended the last part of the meeting. Henk Meurs summarised what had been discussed with the participants during the earlier part of the meeting first. Following this, Riedstra and the researchers embarked on a lively discussion based on a number of statements. Each statement was presented by one of the researchers.

Accessibility paradigm

Lars Böcker presented the first statement for discussion, which referred to the accessibility paradigm. His point was that this paradigm should not only

include mobility aspects, but also aspects of spatial structure and behaviour. Riedstra was able to relate well to this point. He stated that the Ministry does in fact also look at these aspects, but the communication associated with the new accessibility indicator requires a very different approach. 'What we need from you scientists is more than *facts & figures*, or more models. We need to combine complexity with simple messages for the public,' Riedstra said.

Recreational traffic behaviour

Tom Gosens drew everybody's attention to the fact that protecting the green areas in the Netherlands may become a problem due to decentralisation of spatial policy. Riedstra answered that there is indeed a problem with the green areas (the green heart). Is this nature there because of its own intrinsic value or for the people who live on its periphery? Nature must be as accessible as possible for the public, if this is acceptable from a nature conservation perspective. Accessibility is not necessarily a financial problem, it is far more a question of organisation. Riedstra: 'There are all kinds of possibilities that we don't yet use.' 'At the same time,' Henk Meurs emphasised, 'we must not overestimate the collaborative ability of provinces and municipalities.'

Price-setting for parking

Henk Meurs introduced this theme personally. The government should implement fiscal measures in order to eradicate 'subsidisation' of parking facilities; this was the statement for debate. Riedstra responded by saying that the government was aware of this problem. 'However, there is no easy solution in political terms. The KIM is also reviewing this question. Influencing price-setting for company parking facilities via fiscal policy may be an option for the future.'

Road pricing

Anthony Ohazulike asked Riedstra why this instrument had not been implemented. The principle can also be applied without monetary implications (by using a points system, for example). Riedstra told the researchers that, while he had spent a great deal of time on this instrument, he had had to abandon the project because of the lack of political support. 'The process

was fraught with handicaps. For example, implementation had to take place without leading to extra expense for the public. The process was also too lengthy. And there were misunderstandings.’ The young researchers expressed their surprise about the process. The situation with the ANWB, which was not really opposed to the instrument, had looked very favourable at one point. And yet the process still failed.

Social cost/benefit analysis (Maatschappelijke Kostenbaten-analyse or MKBA)

The fifth theme, on the subject of MKBA, was presented by Niek Mouter. He put forward four recommendations, one of which was documenting knowledge and experience in a database. Riedstra replied that the largest problems had been encountered outside the circle of specialists. ‘There are MKBA supporters and MKBA sceptics. I need help in convincing the sceptics. There is also a problem between politicians and policymakers.’ Niek Mouter also referred to the question of the quality of analyses and the point of the problem analysis at the start of processes.

Transit Oriented Development (TOD)

Andrew Switzer gave a brief presentation on behalf of a number of researchers of NWO and Nicis Institute. He also offered Riedstra a concise memorandum containing recommendations for the Minister. The government must do more with the basic principle of TOD, he declared. Henk Meurs asked whether this was truly a task for central government. Switzer answered that it was, in view of the fact that central government should stimulate other government bodies to take more action in this area and also create a favourable climate for this. Meurs suggested that the government could perhaps stimulate NS Dutch Railways with a new contract. Riedstra pointed out that central government steers based on results, in combination with a market-oriented approach and decentralisation. ‘The question is what stimuli and instruments do we have in that constellation? Perhaps we put too much effort into control processes and do too little to stimulate other parties to take action,’ he admitted.

The meeting closed with an enthusiastic evaluation and an exchange of ideas on how to arrange meetings of this kind between young researchers and policymakers more often. It was suggested that subsequent meetings could be organised around a specific subject and involve specialised policymakers and researchers from the Knowledge Institute for Mobility Policy.

6 Impression of the conference in November

How can we keep the urban regions in the Netherlands accessible in a sustainable way and preserve these regions' ability to compete? This was one of the main questions during a conference in Utrecht in November, organised by NWO and Nicis Institute. More than 100 policymakers, scientific researchers and other mobility professionals attended. In addition to lively debates and presentations on new results and applications of NWO research, new knowledge questions were also examined. 'We have all made progress this afternoon', was how Hans Leeflang, the conference chairman, summed the day up at the end of the conference. He was referring to a possible new limited-term project on how to stimulate cycling, in which various parties in the auditorium wanted to participate.



Hans Leeflang (the Director of Knowledge, Innovation and Strategy of the Ministry of Infrastructure and the Environment and closely involved in the NWO's Sustainable Accessibility of the Randstad programme) was not the only chairperson that afternoon.

University Professor Lóri Tavasszy (TNO and Delft University of Technology, NWO researcher) opened the conference together with Leeflang in a dialogue on the importance of collaboration between policymakers, scientists and practical actors. 'As a researcher, aren't you bothered by policymakers breathing down your neck?' Leeflang asked. 'I do see huge interest on the part of policymakers and other

Knowledge Institutes for what we are doing within the Sustainable Accessibility of the Randstad programme,' Tavasszy replied. Representatives from all those institutes were also present in the auditorium in large numbers and the large proportion of practical professionals from decentralised government bodies and other practical organisations when counting the raised hands was particularly noticeable.

Congestion really is a problem

Frank van Oort, University Professor in Urban Economics at Utrecht University brought everybody up-to-date on the role played by accessibility in the urban regions' ability to compete. The results of his recent research on this topic in collaboration with the PBL Netherlands Environmental Assessment Agency were due for publication within a few months and would even be used for a new web application. 'Accessibility is not the most important factor when it comes to a region's ability to compete. That is the size of the urban agglomeration. But congestion is a real problem. So we do have to take action in this area, even if all we achieve is maintaining accessibility at its current level,' he advocated.



The Netherlands competes with completely different European competitors in the different sectors (agriculture, business services, creative industry) and the different regions. But London and Paris head up all those lists. 'And those are cities where accessibility is sometimes less than ideal,' says Van Oort. 'And a high-quality living environment is also crucial for a sector like the creative industry. We possess that here and we must preserve that. Building more roads may be counter-productive in this respect. After all, each region has its own niche.' Members of the audience pointed out that we should not seek to compete with London and Paris, but far more with the German Ruhr area and the Flemish Diamond.

What is beneficial for one region is often bad for another

In a later debate between specialists, a number of speakers put forward prudent warnings. For example, implementation of accessibility measures must be given careful consideration. Making economically less powerful regions more accessible also means a displacement away from these regions towards the Randstad. After all, a road or railway route accommodates two-way traffic. So improving accessibility is not necessarily the right solution for contraction. August Mesker, a mobility specialist at VNO-NCW, was however very clear on this point: 'If you can strengthen the accessibility of the region through relatively modest investment then obviously you should do so.'

Bert van Wee, University Professor in Transport Policy at the Delft University of Technology 'The only real solution I see is price-setting. All the other measures we can think of deliver too little for the Dutch economy. We have never been good in package measures. Investing in the accessibility of one region always has a detrimental effect on another region. And we also have to refrain from scenario reasoning along the lines of "if you make public transport cheaper, the environment will benefit" or "if we build more motorways, we will improve our ability to compete". These are just not true.'

The bicycle – worthy of further research



Jan Francke of the Knowledge Institute for Mobility Policy pointed out among other things that the journey times in the Netherlands are relatively lengthy in international home-to-office commuting comparisons. 'I'm almost certain that the researchers are unaware of the fact that so many people cycle here.' Even so, the bicycle still has major

advances to make in terms of its place in sustainable mobility policy. A different debate examined the question of which policy and which knowledge resource would be required for this. Hugo van der Steenhoven (the director of the Dutch Cyclists' Association), Otto van Boggelen (coordinator of the Dutch Cycling Advisory Council) and NWO researcher Marco te

Brömmelstroet (University of Amsterdam) all acknowledged the complexity of this subject. Cycling is important, we want to encourage it, but it does create all kinds of practical problems. And we have knowledge gaps in this field as well.



Van Boggelen: 'It's a paradox. The bicycle is a simple and cheap form of transport, but scientific research into bicycle policy is much more difficult and more expensive than scientific research into car-related policy and public transport policy.' Te Brömmelstroet advocates taking a broader view. 'If you want to encourage cycling, focusing too much on one of the many influencing factors, such as the infrastructure, is not a sensible approach. This would cause us to ignore the potential and synergy of other cheap and efficient measures such as marketing.' Hans Leeftang indicated that the NWO's Sustainable Accessibility of the Randstad programme would be prepared to fund a limited-term research project. At the end of the conference, he appealed to other government bodies in the auditorium to participate in the research as one of the commissioning parties. The representatives of two metropolitan areas in the auditorium spontaneously indicated that they were prepared to consider this proposal.

Science helps policymakers

Tavasszy interviewed two visitors during the closing session of the conference. Martien Das of Agentschap NL advises municipalities and provincial authorities on sustainable mobility. She was pleasantly surprised by the level of attention given to the bicycle and the interesting suggestions made by

one of the researchers regarding tax measures associated with lease cars, which currently have the unintended effect of a subsidy. 'The the other thing I noticed is that this afternoon focused to a major extent on the economy and somewhat less on sustainability.'



The second visitor, spatial strategist Jeroen van Schaick of the provincial authority of Zuid-Holland, concurred. Among other sessions, he had attended a session on supernetworks, which not only looked at the seeming incompatibilities between science and practical application but also came up with solutions. 'I think that science, as in this case, can be of enormous assistance in looking at policy tasks from another perspective. Science plays an important role in setting the policy agenda.'

In addition to debates, workshops were also held in which researchers and practical professionals demonstrated the applicability of NWO research and PhD students and post-doctoral researchers gave high-speed presentations under the title of 'My advice for practical professionals'.

7 Who's who in SAR?

First Round



Synchronizing networks

Programme leader: **Dr. Eric Molin**, e.j.e.molin@tudelft.nl

- **Modelling of supernetworks**, PhD student Feixiong Liao, f.liao@tue.nl, supervisor Theo Arentze, t.a.arentze@tue.nl
- **Use of supernetworks**, PhD student Chao Chen, cchen@tudelft.nl, supervisors Eric Molin, e.j.e.molin@tudelft.nl, and Caspar Chorus, c.g.chorus@tudelft.nl
- **The governance of supernetworks**, PhD student Sara Levy, s.levy@fm.ru.nl, supervisor Karel Martens, k.martens@fm.ru.nl
- **Design of supernetworks**, post-doctoral researcher Wendy Bothe, W.Bohte@tudelft.nl, Eric Molin, e.j.e.molin@tudelft.nl



TRISTAM: Traveller Response and Information Service Technology

Programme leader: **Professor Harry Timmermans**, h.j.p.timmermans@tue.nl

- **Analysis and Modelling of Network Effects**, PhD student Giselle de Moraes Ramos, g.moraesramos@tudelft.nl, supervisor Serge Hoogendoorn, s.p.hoogendoorn@tudelft.nl
- **Analysis and Modelling of Accessibility Effects**, PhD student Ruihua Zack Lu, r.lu@tudelft.nl, supervisor Caspar Chorus, c.g.chorus@tudelft.nl
- **Analysis and Modelling of Spatial Externalities**, PhD student Zarah Parvaneh, z.parvaneh@tue.nl, supervisor Harry Timmermans, h.j.p.timmermans@tue.nl
- **Analysis and Modelling of Economic Effects**, PhD student Sergejs Gubins, sgubins@feweb.vu.nl, supervisor Erik Verhoef, everhoef@feweb.vu.nl
- **Integration and Show cases**, post-doctoral researcher Anna Kononova, a.v.kononova@tue.nl, supervisor Harry Timmermans, h.j.p.timmermans@tue.nl



The value of recreation

Programme leader: **Professor Bert van Wee**,
g.p.vanwee@tudelft.nl

- **The value of recreational areas in metropolitan regions**, PhD student Tom Gosens, tgosens@feweb.vu.nl, supervisor Jan Rouwendal, jrouwendal@feweb.vu.nl
- **Recreation and space: Dynamics of agenda formation and execution**, PhD student Anna Grigolon, a.b.grigolon@tue.nl, supervisor Astrid Kemperman, a.d.a.m.kemperman@tue.nl
- **Traveller response to unconventional trends**, PhD student Sander van Cranenburgh, s.vancranenburgh@tudelft.nl, supervisor Caspar Chorus, c.g.chorus@tudelft.nl
- **The planning of recreation: Choosing locations and managing accessibility**, post-doctoral researcher Maarten Kroesen, m.kroesen@tudelft.nl, supervisor Bert van Wee, g.p.vanwee@tudelft.nl



Towards a sustainable multimodal freight transport system for the Randstad

Programme leader: **Professor Lóri Tavasszy**,
lori.tavasszy@tno.nl

- **Modelling complex freight demand structures – trade and transport data**, post-doctoral researcher Maureen Lankhuizen, mlankhuizen@feweb.vu.nl, supervisor Henri de Groot, hgroot@feweb.vu.nl
- **Modelling complex freight demand structures – logistic chains**, PhD student Igor Davydenko, i.y.davydenko@tudelft.nl, supervisor Lóri Tavasszy, l.a.tavasszy@tudelft.nl
- **System optimization of multimodal freight networks**, PhD student Mo Zhang, mo.zhang@tudelft.nl, supervisor Bart Wiegman, b.wiegman@tudelft.nl
- **A situated MAS for urban logistics in the Randstad**, PhD student Niles Anand, n.anand@tudelft.nl, supervisor Bert van Wee, g.p.vanwee@tudelft.nl



CESAR: Climate and Environmental change and Sustainable Accessibility of the Randstad

Programme leader: **Professor Martin Dijst**,
m.dijst@geog.uu.nl

- **Impact of climate change on mobility and residential choices**, PhD student Lars Böcker, bocker@geo.uu.nl, supervisor Martin Dijst, m.dijst@geog.uu.nl
- **Developing and evaluation of a modelling framework for urban weather and climate studies**, PhD student Natalie Theeuwes, natalie.theeuwes@wur.nl, supervisor Bert Holtslag, bert.holtslag@wur.nl
- **Improving integration of expert with tacit knowledge for strategic planning Processes**, post-doctoral researcher Marco te Brömmelstoet, M.C.G.teBrommelstroet@uva.nl, supervisor Luca Bertolini, L.Bertolini@uva.nl
- **Urban Strategy climate proof**, PhD student Peter Pelzer, p.pelzer@uu.nl, project leader Stan Geertman, s.geertman@geo.uu.nl



i-PriSM: Innovative Pricing for Sustainable Mobility

Programme leader: **Professor Erik Verhoef**,
everhoef@feweb.vu.nl

- **Implementation of transport pricing: an economic perspective**, PhD student Ioannis Tikoudis, i.tikoudis@vu.nl, and post-doctoral researcher Jasper Knockaert, jknockaert@feweb.vu.nl, supervisor Erik Verhoef, everhoef@feweb.vu.nl
- **Transport pricing: a multi-modal dynamic network perspective**, PhD student Erik-Sander Smits, e.smits@tudelft.nl, supervisor Michiel Bliemer, m.c.j.bliemer@tudelft.nl
- **Acceptability of transport pricing: a psychological perspective**, post-doctoral researcher Jan Willem Bolderdijk, j.w.bolderdijk@rug.nl, project leader Linda Steg, l.steg@ppsw.rug
- **Implementation of road pricing: vehicle technology, governance, and institutional transition**, PhD student Özgül Ardic, o.ardic@tudelft.nl, supervisor Bert van Wee, g.p.vanwee@tudelft.nl



SRMT: Strategy towards sustainable and reliable multimodal transport in the Randstad

Programme leader: **Professor dr-ing. Ingo Hansen**,
i.a.hansen@ct.tudelft.nl

- **Spatial economic analysis of multimodal transport systems**, PhD student Yuval Kantor, ykantor@feweb.vu.nl, supervisor Piet Rietveld, prietveld@feweb.vu.nl
- **Integrated transition strategy towards SFRMT**, PhD student Andrew Switzer, a.w.switzer@uva.nl, project leader Luca Bertolini, L.Bertolini@uva.nl
- **Robust Multimodal Multi-objective**, PhD students Ties Brands (0,6), t.brands@utwente.nl, and Anthony Ohazulike (0,4), a.e.ohazulike@utwente.nl, supervisor Erik van Berkum, e.c.vanberkum@utwente.nl
- **Dynamic assessment of multi-modal transport networks**, PhD student Gijsbert van Eck, g.vaneck@tudelft.nl, supervisor Rob van Nes, r.vannes@tudelft.nl
- **Capacity management in SFRMT and reliable transport chains**, PhD student Daniel Sparing, d.sparing@tudelft.nl, supervisor Rob Goverde, r.m.p.goverde@tudelft.nl



The feasibility and impact of the transition to electric mobility in the Randstad

Project leader: **Professor Bert van Wee**,
g.p.vanwee@tudelft.nl

- **Economic and psychological aspects of the introduction of electrical vehicles**, post-doctoral researcher Marija Bockarjova, mbockarjova@feweb.vu.nl, supervisor Piet Rietveld, prietveld@feweb.vu.nl
- **An institutional and managerial scientific perspective on the transition to electric vehicles**, Sjoerd Bakker, s.bakker-1@tudelft.nl, supervisor Bert van Wee, g.p.vanwee@tudelft.nl



Mobility management and climate change

Project leader: **Professor Jos van Ommeren**,
jommeren@feweb.vu.nl

– Public Policy and Firm Mobility Management: Implications for Climate Outcomes,

post-doctoral researcher Eva Gutiérrez-i-Puigarnau, e.gutierrezpuigarnau@vu.nl, supervisors Jos van Ommeren, jommeren@feweb.vu.nl, and Piet Rietveld, prietveld@feweb.nl

- **Mobility Management and Space-Time Patterns: Implications for Climate Outcomes**, post-doctoral researcher Linda Nijland, e.w.l.nijland@uu.nl, supervisor Martin Dijst, m.dijst@geog.uu.nl



Sustainable Maintenance Policy for Infrastructure Networks in the Randstad: A climate change perspective

Project leader: **Professor Geert Dewulf**,
G.P.M.R.Dewulf@ctw.utwente.nl

– Impact of climate change on infrastructure networks,

post-doctoral researcher Herbert ter Maat, herbert.termaat@wur.nl, supervisor Pavel Kabat, pavel.kabat@wur.nl

- **Implications of climate change for maintenance policy**, post-doctoral researcher Irina Stipanovic, i.stipanovic@utwente.nl, supervisor Geert Dewulf, g.p.m.r.dewulf@ctw.utwente.nl

8 The management structure of the SAR programme

The SAR research programme has a Supervisory Board, a Programme Committee, one or more internationally oriented ad-hoc Assessment Committees and an ad-hoc Policy Committee. The Programme Committee is responsible for the coordination and coherence of the programme, assesses progress and draws up the budget. In addition, this committee is responsible for prioritising the research proposals on the basis of the outcomes of one or more Assessment Committees and promoting knowledge transfer to the users. The Supervisory Board allocates subsidy on the basis of the Programme Committee's advice and oversees the implementation of the research programme.

At the end of 2011, the composition of the various bodies involved in the SAR programme was as follows.

Supervisory Board for Connecting Sustainable Cities (Verbinden van Duurzame Steden or VerDuS)

S. Riedstra, Ministry of Infrastructure and the Environment, chairman
P. Buijink, Ministry of Economic Affairs, Agriculture and Innovation
M. Frequin, Ministry of the Interior and Kingdom Relations/Housing, Communities and Integration (BZK/WWI)
P.G.A. Noordanus, Major cities
P. Hooimeijer, for NWO

Programme Committee

H. Leeflang, Ministry of Infrastructure and the Environment,

Government representatives

K. de Jong, Ministry of Infrastructure and the Environment
N. van Paridon, Amsterdam Metropolitan Region
E. Reiding, Ministry of Infrastructure and the Environment
Mrs O.A.W.T van de Riet, Netherlands Knowledge Institute for Transport
Policy Analyses
E.J. Visser, Ministry of Economic Affairs, Agriculture and Innovation

Scientific representatives

A.N. Bleijenberg, TNO
P.P.J. Driessen, Utrecht University
Mrs M.A.J. Kuijpers–Linde, TNO
H.J. Meurs, Radboud University Nijmegen
H. Priemus, Delft University of Technology
E. van de Voorde, University of Antwerp

Secretariat

H.W. Waaijers, NWO Social Sciences
Mrs J. van der Veen, NWO Social Sciences

Communicatie

Ms. Y. M. de Boer, YM de Boer Advies v.o.f.