



Dr. Ingo Hansen is Professor of Transport and Planning and works at the Faculty of Civil Engineering and Geosciences at Delft University of Technology.

## 4 Public transport as the backbone of the Randstad of the future

The scientists from the ‘Strategy towards sustainable and reliable multi-modal transport in the Randstad’ programme (SRMT) are looking at spatial use, location choice, multimodal transport networks (combinations of different forms of transport), mobility behaviour and mobility policy. This allows them to research various ways of keeping the Randstad accessible in a sustainable manner, addressing the issue from a broad perspective. The programme is a collaboration between researchers from Delft University of Technology, VU University Amsterdam, the University of Amsterdam and the University of Twente.

“If we want to keep the Randstad accessible in future in a sustainable manner, it is not possible without using all sorts of different forms of public transport. On the strength of that conviction and my own background in traffic analysis, I brought a number of people with various expertises together to see whether we can use a multidisciplinary route to find a multimodal approach.” Ingo Hansen is not averse to a bit of complexity and ambition. He prefers to combine analyses, models and insights from economics, spatial planning, traffic research and management studies.

### Never again sitting on the Intercity express service stuck behind the slow train

Hansen is the man behind a series of tools that can predict the travel times of the trains with extreme precision, down to the second. The research he has done in the past ten years may ultimately result in train timetables expressed not in minutes, but in units of less than a minute. He is responsible for a series of expansions to the Train Number Tracking system used by ProRail, which constantly registers when tracks are occupied or empty, and monitors the status of signals and switches. This information makes it possible to optimise use of the existing rail infrastructure, catch

up on delays more efficiently, and eventually give traffic controllers access to a real-time decision-making support system to facilitate intervention in the event of system malfunctions. In summary: "Once this works, you will never again be sitting on the Intercity express service stuck behind the slow train." Hansen's research is one of the leading initiatives in the field world-wide. "The railway here is just as busy as in Switzerland and Japan, but more vulnerable. If we can also improve the technical conditions, such as the outdated overhead contact system, signal houses and switches, then we'll have the most efficient railway system in the world." And now there is also the SRMT programme in SAR, which will result in integral strategies that seem very remote from the world of timing trains down to the second. However, appearances can be deceiving. "Our programme will ultimately deliver more effective coordination and various designs for transport junctions, transport networks by road and rail, and property development around the key locations and development areas in the Randstad. The public transport system as a whole will also have the potential to become more attractive and reliable using the knowledge we develop. Less waiting, fewer delays and better connections between the different modes and lines of transport. All these things have positive consequences for prosperity, accessibility and the environment."

## Reducing travel resistance in public transport travellers

Hansen: "In our models, we combine high-intensity built-up areas around station locations - where people can live, work and recreate - with optimal accessibility by public transport, in all relevant modalities. In the past, we did not have sufficient capacity to display the effects of more accurate modelling of public transport systems in such a way that people could obtain a realistic impression of their travel time and their travel resistance." Travel resistance? "That is your travel time plus the costs you incur for the trip - including the time you wait, for example. Public transport involves a relatively high travel resistance in chain mobility due to waiting times during transfers and, for instance, problematic transport before and after. As a result, the travel resistance for a traveller taking public transport may on average reach as much as twice the amount as the straight travel time for a person travelling the same route by car. Not strange at all, in other words, that public transport ranks low on the list of options, except for destinations in the centre of large cities."

Hansen wants to reduce travel resistance in public transport by making transfers much easier thanks to optimal connections. “In the end, it will make the percentage of public transport in the modal split much higher than it is now.”

## Hybrid buses are the future

Hansen’s researchers are taking existing regional transport models and calibrating them based on actual observations. The models are unleashed at the network level of e.g. the North or South Wing of the Randstad. “It presents a significant mathematical undertaking with quite a few combination problems due to all the variants we take into account. It requires a great deal of intelligence and calculating time. We will ultimately be able to show which variants of transport and spatial structure will have specific influences on the economy and the environment. Our research looks at the station locations that have the most potential, so it will not be an overall design for the Randstad as a whole. We are basing our choices on the spatial plans of the municipalities and property developers. Another starting point is the existing infrastructure for public transport in the conurbation. No major new investments are needed in the short term to optimise it. See, if we were to base our research on the widespread introduction of electric cars, for instance, you would essentially be looking at a scenario that costs a lot of money and a lot of non-renewable energy. For the time being, there is simply not enough electricity available from renewable sources to power all those cars. I am a much bigger proponent of optimising the railways and using hybrid buses, for example. They do still use a small diesel engine, but they combine it with electric wheel hub motors and regenerative braking, like in the *Whisper* now used in Apeldoorn. I see much more potential for this in the shorter term than, for instance, the hydrogen-powered buses that are currently being experimented with in Amsterdam.”

## No express trams stuck in traffic

The SRMT programme is cleverly constructed. “The spatio-economic project headed by Piet Rietveld at VU University Amsterdam offers insights into the economic potential of key locations. That provides input for projects

3A and 3B run by Erik van Berkum at the University of Twente, which will show us which junctions and networks will have the most potential. The urban development project headed by Luca Bertolini at the University of Amsterdam is researching how the countries around us are doing in terms of innovation in public transport networks and urban architecture. How have those innovations been implemented and how have the barriers been overcome? Which measures were taken by which stakeholders? We can also learn from Japan, where transport companies invest in residential neighbourhoods and recreational options at the end of their rail lines. Bertolini's project focuses on bringing different stakeholders together and giving them food for thought. Project 4, headed by Rob van Nes here at Delft University Technology, will yield new modules for the government's multimodal regional transport models. It will give us more realistic modelling of transport flows. Project 5 headed by Rob Goverde, also from Delft, looks at the capacity of the networks. Those high-frequency services we anticipate seeing will of course have to actually be possible within the constraints of space and time. Otherwise you're putting your train, bus or express tram in the middle of traffic congestion. Projects 4 and 5 also provide input for 3A and 3B, which are researching what optimal transport networks would look like in terms of travel time, operating costs, returns on investment and influence on the surrounding area."