

Traffic paradise remains out of reach

Wanted: four thousand kilometres of tarmac

What Holland needs is a paradigm shift. We're at least four thousand kilometres of traffic lane short of even beginning to cope with congestion. While the government has been working on plans to sink more money into extra rush-hour lanes and the occasional stretch of tarmac, a team of researchers has been drawing a picture of the economically ideal road network for the country. Their findings are pretty shocking: "We have simply been thinking too small by several orders of magnitude."

MAARTEN KEULEMANS

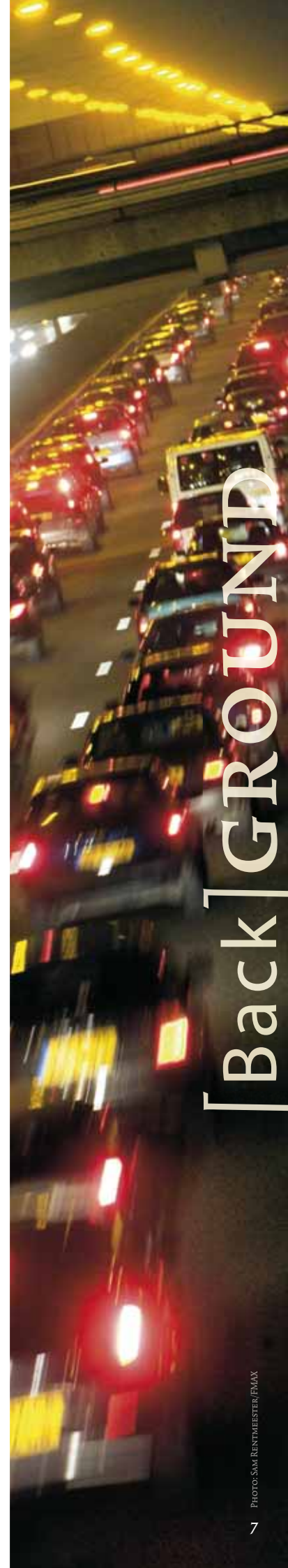
Maaiké Snelder lives in a strange world where you can get into your car in Rotterdam and drive to Amsterdam in thirty minutes along a ten-lane motorway cutting straight through the country's Green Heart. Rush hours belong to the past, and congestion has become an extremely rare phenomenon. Notorious problem roads such as the A12, A2, and A13 have been given four to five lanes in each direction; the A4 has been widened and has finally been extended into Rotterdam. In the south a ten-lane motorway lets you dash between Breda, Tilburg, and Eindhoven, and in the east the jumble of half-finished bits of motorway has been assimilated into a new traffic artery, a tarmac speed track reaching from Den Bosch all the way to Apeldoorn and beyond.

To motorists and truck drivers alike, Snelder's world is paradise come true. On average, it takes road users 17 percent less time to get to their destination, and travel distances are cut by 8 percent. While many of her motorways are wide enough to induce agoraphobia, some roads are no longer there. An example is the A7 that used to run along the dam separating the former Zuiderzee from the North Sea, and which has been abandoned for lack of traffic. Snelder's version of the Netherlands is a good sight

cheaper, too, for although the upkeep of all those wide motorways requires a little more money, this is compensated by the fact that considerably less money needs to be spent on fuel and car maintenance and that motorists spend less office time stuck in traffic. All together the savings amount to 124 million euro a week, in other words, 18 million euro a day, or 738,000 euro an hour, or 200 euro each second. Easy money.

In fact, Snelder's world has only one snag, which is that it exists only on paper. Snelder's supervisor, Prof. Henk van Zuylen doesn't expect this to change any time soon. "This is not the type of concept society has been waiting for. Proposals like this simply don't appeal to the us." After all, Snelder's multi-lane motorways would be running right across picturesque villages and cutting straight through our most beloved beauty spots.

Therefore, the New Netherlands put forward by Snelder should be seen as a calculated thought experiment. The experiment started when she was doing an internship as an econometrics student from Rotterdam University at TNO Mobility and Logistics in Delft. "Everybody is always wondering how things could be made to run better. So, I thought it might be a good idea to try and >>



[Back] GROUND



PHOTO: NOUËT STEINMANN / FIMAX

... Or will it go quiet?

Is Holland heading for a traffic meltdown? The jury is still out on that one. Last year the Dutch Central Planning Bureau (CPB) studied four scenarios to see what we can expect until 2040. In three scenarios traffic congestion did not increase after 2010, but stabilised at roughly the 2002 level. In one scenario the pressure on the national road network decreased.

On the one hand the CPB expects that our wealth will increase, as will transport and mobility, but on the other hand there are such factors as the ageing population, additional road capacity, and the stabilisation of the number of cars per household.

What the end result will be depends mainly on the population. Should the population increase to 19.7 million in the year 2040, which is the upper range predicted by the CPB, we can look forward to a 70 percent increase of the number of congestion hours. In the event of the (slight) decrease to 15.8 million the CPB expects at the other end of the scale, the number of traffic jam hours will decrease by 70 percent.

work it out,” Snelder says. She then came up with the outrageous concept of simply removing every motorway in the Netherlands and redesigning the whole lot from scratch. What would an optimised roadmap of our country look like?

Car heaven

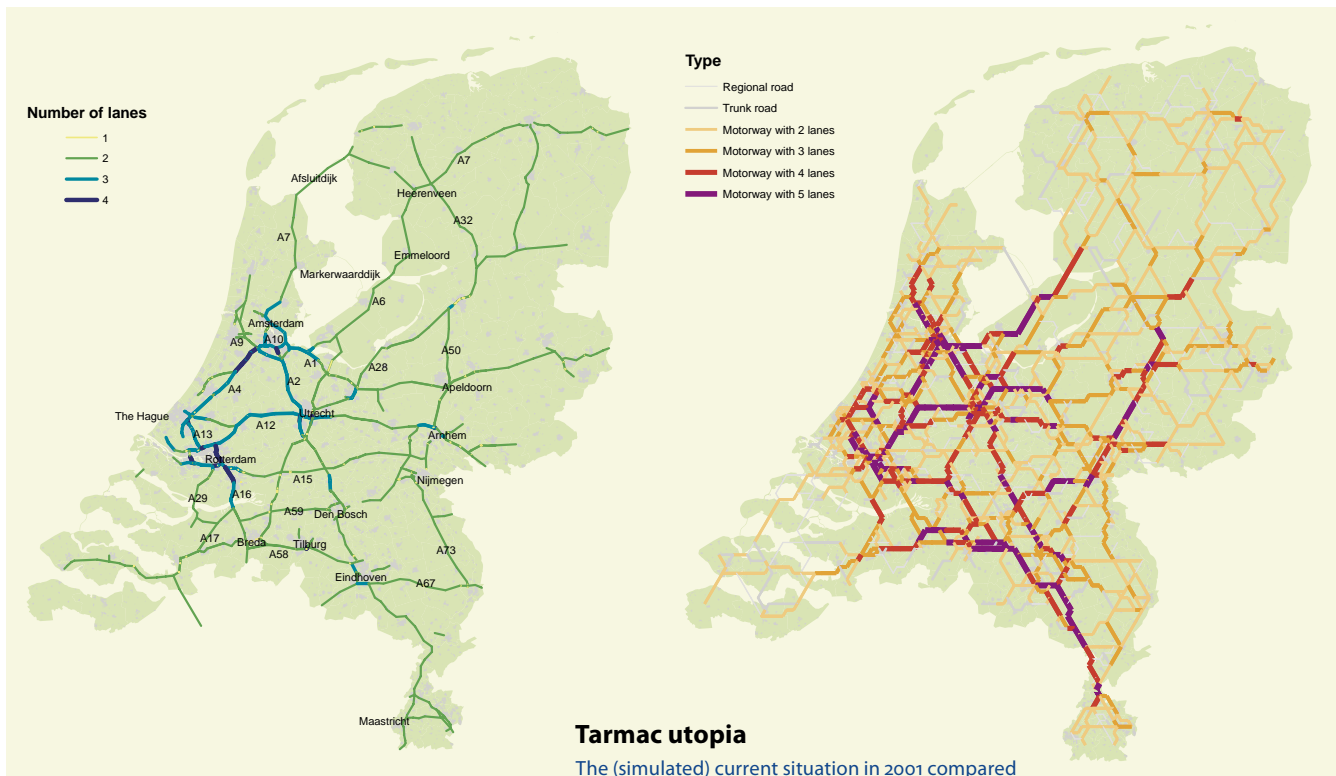
In the mean time, her contrary ideas have gathered support. Snelder’s rebellion against the existing roadmap has been noted by the department of transport and planning of TUD (Civil Engineering and Geosciences), where Snelder hopes to gain her Ph.D. in about three years’ time with supporting funding from TNO. Not surprising really, considering that Snelder’s approach entails a refreshing reversal of accepted traffic science. Normally speaking, traffic experts tend to start looking at the supply side, i.e. the existing road

What would happen if all the Dutch motorways were to be removed? What if the road network were to be redesigned from scratch?

network, and the current set of rules. Not so Snelder, who focuses on the demand for road transport. Her car heaven is what you would end up with if motor traffic were given a free rein.

It’s an eye opener, according to Prof. van Zuylen. “The Dutch way of thinking is to follow existing patterns. Each little piece of land has been allocated to a specific purpose, each square metre of motorway has to be fought over. There is certainly a case to be made for abandoning this strategy and experimenting with an entirely new approach.” Together with Prof. Dr. Albert Wagelmans (Erasmus University Rotterdam) and Prof. Ben Immers and Jeroen Schrijver of TNO, Snelder and van Zuylen hope to be able to present the new road network in scientific publications.

Snelder prepared her ideal road map using smart mathematics. She started by covering the map of the Netherlands with a grid of small triangles measuring three by three by three kilometres, representing imaginary motorways. Snelders then had the country’s population travel along the road grid, based on Dutch traffic data provided by the Netherlands Institute for Spatial Research. She was soon able to start discarding bits of motorway that were in little or no demand. She introduced pay-as-you-drive schemes where fewer people using a stretch of road meant that motorists had to pay more. At the same time, she started widening the most heavily used roads. The ideal



Tarmac utopia

The (simulated) current situation in 2001 compared with the ideal situation (showing kilometres).

	Current situation		Snelder	
	Road kilometres	Traffic lane kilometres	Road kilometres	Traffic lane kilometres
1 lane	21.860	21.860	3.973	3.973
2 lane	4.116	8.232	7.038	14.076
3 lane	642	1.926	2.642	7.926
4 lane	92	368	1.417	5.668
5 lane	2	10	973	4.865
Totaal	26.712	32.396	16.043	36.508
				+ 4.112 traffic lane km

road map of the Netherlands was beginning to take shape. “After about twenty optimisation runs it had reached its optimum state, where little or no change occurred.”

The resulting dream of economy shares some remarkable similarities with the real world. Major connections such as the A1, the A2, the A6, the A12, and the A15 spontaneously reappeared. On the other hand, the experiment also produced a road that has been the subject of major controversy, the A3 between Rotterdam and Amsterdam, straight through the country’s Green Heart. This is the proposed road that finally ended up being scrapped in the late nineteen sixties after a fierce public debate. “In fact, there is more than a bit of logic in

200 Euro every second.

Easy money

having a direct connection between the two largest cities in the country,” Snelder says. “At least, there is from a traffic point of view.”

Draconic

If there is anything to be learnt from the map Snelder has produced, it must be that our country had better learn to live with congestion. Ideal traffic conditions appear to be achievable only through positively Draconian measures such as cutting through nature reserves or building suspended traffic lanes over existing roads. “I’m not a great fan of tarmac,” van Zuylen says, “but this experiment shows that the optimum of economy is still a long

way out of our reach. The simple fact is that our country needs road transport, and lots of it. The Ministry of Transport is far too hesitant in spending money on the traffic infrastructure. We really are thinking to small by several orders of magnitude.” This agrees with previous signals. For instance, the Netherlands Institute for Spatial Research published an alarming report three years ago in which it stated that without a change in policy the Netherlands were heading straight for a traffic meltdown. In 2020 the off-peak hours will be as busy as the evening rush hour is today. Passenger transport by road is expected to increase by 20 percent, with road haulage increasing by as much as 40 to 80 percent according to the Institute’s report. Only two months ago [??Gaat dat kloppen met de verschijningsdatum? Zo niet, dan “Only a few months ago”. MCDG] the Organisation for Economic Cooperation and Development (OECD) urged for road construction to be speeded up and for the accelerated introduction of pay-as-you-drive schemes in the Randstad area. The growth of Randstad productivity has been at a steady level of 1.2 percent for a decade, and this is considerably lower than in other European agglomerations, thanks to our traffic problems. The Ministry of Transport has published >>

a Mobility Memorandum, which is to result in regional plans within a matter of months. The memorandum aims for an investment in traffic solutions of 80,000 million euro for the 2010-2020 period. Of this money, 19,000 million has been set aside for the construction of new motorway lanes and roads. However, Snelder's idealised world shows up these schemes in a different light. In her traffic paradise, the total capacity of the road network has been doubled. It features no less than 13 percent more traffic lane length than was actually available in 2001. This amounts to over four thousand kilometres, a traffic lane stretching from

Amsterdam to Tehran. On multi-lane motorways, the total lane length has even been increased by 22 thousand kilometres. The current MoT target stands at one thousand to twelve hundred kilometres of new tarmac.

The difference is indeed rather disturbing, van Zuylen acknowledges. "The ministry is aiming for an increasing in lane length of about 10 percent by 2020, but our calculations show that we were in fact 13 percent short five years ago. Put simply, we're in trouble. If we consider the capacity we actually need, our road network needs to be considerably extended and intensified."

TNO researcher Prof. Ben Immers agrees that the government may be basing its policy on an illusion. And, he argues, there is a downside to simply stuffing the road network to capacity. "We are now in the process of using up the last bit of spare capacity of our main road network, by levelling traffic speed and controlling access to motorways for example. What we now see is that even small problems can have major effects due to lack of backup facilities. Any production man will tell you not to exceed 70 percent of your capacity if you don't want to make your production system inherently unstable."

Crib sheet

The map is only a rough, simplified sketch, Snelder knows. Minor local roads are ignored, and single-carriageway trunk roads are only partly included in the sketch. Snelder's experiment results in 80 percent fewer N roads than there actually are, but this result is distorted due to the road map with

In 2020 off-peak hours will be as busy as today's evening rush hour

which Snelder compared her ideal layout of the Netherlands, and which she used to define road types. "In reality you would not just build four- or five-lane roads everywhere, Immers says. "It is very important to offer alternative routes, backup roads for when you run into trouble."

The map lacks accuracy on other points too. For example, it does not take into account the attractive effect that all that lovely new tarmac will have on motorists, nor did Snelder include the cost of bridges, tunnels, and viaducts. The map doesn't address such problems as noise, air pollution and lack of space either. Nonetheless the map may still be useful as a kind of crib sheet for the real world, Snelder thinks. "Some differences are helpful, others aren't. We might well be able to spread out our network map and point out where the priorities



A distorted view of Holland

Know your country. This is what the Netherlands look like, or at least, what the country would look like if one were to measure distance by the time it takes to travel by car from Amsterdam. This 'tempographical map' was produced a few years ago at the TUD Faculty of Architecture by Marijn Schenk and Bart Reuser, now both partners of Next Architects.

"The idea was to visualise how traffic in the Netherlands works," says alumnus Michel Schreinemachers, who also worked on the project.

From a traffic point of view, Holland is a pretty strange, haphazard country, according to Schreinemachers. "We're lacking a number of superhighways. In Germany there is a hierarchy of long-distance autobahns, followed by trunk roads and local roads. We have nothing above our main network of roads. In fact, our motorways are simply trunk roads."

SOURCE: NEXT ARCHITECTS, AMSTERDAM

should be, or give advice like add a few kilometres here, include a rush-hour lane there.”

For the time being, Snelder and her colleagues use the map in the quiet of their office for less exuberant, rather more academic work. For instance, the map adds useful information to what is known as the network design problem, a stubborn piece of mathematics notorious for its tendency to quickly become unsolvable when it turns into a so-called ‘NP-complete’ problem.

The map also serves a purpose as a research tool. Snelder, van Zuylen, and Immers are considering

An extra lane here, a rush-hour lane there

the idea of putting the ideal network to the test, for example by throttling one of its oversized arteries, or by removing a few main routes from the map. This could provide new knowledge for another classic traffic engineering problem: what does it take to make a road network robust? How many obstructions can it take? What can you expect in the way of capacity loss if a road becomes blocked? And, how can the robustness of the road network be improved? “The purpose of Maaike’s study is to find out how a network functions without any backup options,” Immers says. “We want to be better able to pinpoint the vulnerabilities of the road network.” Politicians take note, is what the TUD researchers are saying. Van Zuylen mentions the decision makers’ preference for measures against rat-running. “The A13 motorway has two roads running parallel to it. One of these has been blocked off, while the other has sleeping policeman in it to discourage motorists. The upshot of it is that things come totally unstuck the moment something goes wrong on the motorway.”

Vehicle tax

For the time being, the real-world Holland will have to make do with partial solutions like extra traffic lanes in some places, and rush-hour lanes in others. Government plans include a new method for taxing road users. Vehicle tax is to go, to be replaced by a pay-as-you-drive scheme. “Under the new legislation, a sales rep driving his diesel-powered car along the Amsterdam ring road during the morning rush hour will be charged more than someone up north driving a low-pollution car to work outside the rush hour” is how the Ministry of Transport puts it in a leaflet.

It all adds up. In 2002 researchers of CE consultants in Delft, the Vrije Universiteit Amsterdam, and 4Cast consultants in Leiden calculated what the results would be if pay-as-you-drive were to be introduced

together with, on a limited scale, toll roads. The conclusion was that, on top of the proposed traffic lane additions, ‘only’ 400 kilometres of traffic lane would have to be added until the year 2020. Another weapon in the fight against congestion that is rapidly gaining popularity among traffic engineers is the use of buffer zones, large staging areas on and near motorways where motorists will have to wait their turn in order to take the pressure off the roads – a bit like queuing up for a fairground attraction. These intentional traffic jams will take some getting used to, van Zuylen admits. “However, people will understand that there is little point in simply jamming a road.” Better to just park the car, is what van Zuylen would say. “It saves fuel and aggravation. At least you’ll be able to sit and read the paper, have a bite to eat, or shave.”

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PHOTO: SAM RENTMEESTER/EMAX

Experiments in the mind

It was the great Albert Einstein who gave the thought experiment its current place in the exact science toolbox. Traditionally, the thought experiment was the prerogative of philosophers, but when Einstein was working out his two theories of relativity, he did so using imaginary voyages at the speed of light and in a lift that accelerates endlessly. By now it has become established practice for exact scientists to experiment in the mind. There is Erwin Schrödinger’s thought experiment with its famous cat that is both alive and dead at the same time, Edwin Abbott visualised the fourth dimension by contemplating the two-dimensional world

of Flatland, and Max Tegmark mused on quantum suicide (result: the universe would split and Tegmark would remain alive). Some months ago a British group of ecologists and climatologists tried to imagine what would happen if humankind were suddenly to disappear from the face of the earth. Among other results, the outcome of this thought experiment was that after fifty years 80 percent of all buildings would be overgrown, global warming would continue for at least a thousand years, and after a short reign of mice, rats, and dogs, the animal kingdom would recover.