

PQN Country Report The Netherlands

1. Facts and figures

Key figures Pedestrians in the Netherlands.

	1970 (abs)	2000 (abs)	increase (%)	2030 (abs)	increase (%)
Built up area (sq. Kilometers)	2121	3183	50.1	3770	18
Built up area for housing (sq. Kilometers)	1883	2211	17.4	2619	18
urban roads (estimated total length)	33000	59000	78.8	69882	18
pedestrian facilities (estimated sq. Kilometers)	82.5	147.5	78.8	175	18
Population (x 1000)	12958	15864	22.4	17900	13
Number of households	3986	6801	70.6	8950	32
Average household size	3.25	2.33	-28.2	2.0	-14
Area pedestrian facilities per person	6.4	9.3	46.0	9.8	5
idem per household	20.7	21.7	4.8	19.5	-10
Killed in traffic (reported absolute numbers)	609	105	-82.8		
idem, per 1 mln inhabitants	47.0	6.6	-86.0		
Seriously injured in traffic (reported absolute numbers)	n.a.	755	n.a.		
idem, per 1 mln inhabitants	n.a.	47.6	n.a.		

Demography

In the Netherlands demography statistics are based on municipality registration of births, deaths and residence. The statistics are very accurate. Statistics are available for all years since 1947.

- Historical
- Month figures
- Households
- immigrants

Transport and travel data

Transport and travel data are collected continuously through an ongoing survey. There are yearly reports.

Key figures:

- Goods transport
- Distances covered
- Number of motorvehicles per province
- Modal choice and motives
- Motor vehicle sales
- Home-workplace travelling
- Index traffic intensity

Modalities:

- Private cars
- Commercial vehicles
- Ships
- Airplanes

Infrastructure & traffic

- Annual kilometrage of private cars
- Annual kilometrage of motor cycles
- Goods transport over land
- Road transport in NL
- International transport
- passenger transport
- international bus passenger transport

Use of modalities

- by gender
- by age
- by income and education level
- by social group
- by possession of Student Public Transport Card and availability of car

Travel motives:

- by gender
- by age
- by income and education level
- by social group
- by possession of Student Public Transport Card and availability of car

Road users:

- by gender
- by age
- by income and education level
- by social group
- by possession of Student Public Transport Card and availability of car

Modal availability and driver licences:

- by gender
- by age
- by income and education level
- by social group

Regional:

- Distances covered per province

- modal split per municipality

Infrastructure / space:

- length of roads

Reported mobility characteristics of walking (persons 12+)

year	walking trips per person per day (mono modal trips)		
	trips	distance (kms)	travel time (minutes)
1985	0.62	0.65	8.78
1990	0.62	0.64	8.36
1995	0.57	0.66	7.93
2000	0.53	0.58	6.81
2003	0.52	0.57	6.79

Source: Website CBS Statline

Predicted number of people with limited mobility

	2005	2010	2015	2020	2025	2030
% people with limited mobility	6,1	6,3	6,7	7,0	8,2	9,4
Number Younger than 65	340,000	340,000	350,000	350,000	360,000	360,000
Number 65 - 79	250,000	270,000	310,000	360,000	400,000	430,000
Number 80+	410,000	430,000	460,000	490,000	660,000	830,000
Total number	990,000	1,050,000	1,130,000	1,200,000	1,410,000	1,620,000

source: Socialdata (2005) and assessments based on Rooij en Tacken; assessment = Methorst, R, (2005).

(Urban) Land Use

Statistics Netherlands has data on:

- changes in number of houses
- number of houses per region
- new houses
- inhabitants & urbanity
- districts and neighbourhoods

Land use data:

- Verkeer (rail, main roads, airport)
- Built up (urban) area (residential use, commercial and hotel and catering industry, public facilities and services, social cultural facilities, industrial area, Bedrijfsterrein)
- Semi built up (dumping groups, car wrecking sites, burial grounds, mining, building sites, semi paved areas)
- Recreatie (parcs, sport fields, allotment gardens, daytime recreation facility, recreation facility – holiday facilities)
- Agriculture
- Greenhouse farming
- Bos & natuur
- Lakes and canals
- Sea

Health & competences

The Ministry of Health and Statistics Netherland collect data on the health situation in the Netherlands; see www.cbs.nl

Key figures on:

- Perceived health
- Deaths and death causes
- Aspects of (un) healthy behaviour
- Use of health care facilities
- Expenditure and financial care
- Health care expenditure

The populations' health situation:

- Temporary handicaps
- Permanent / long time disorders and complaints
- Handicaps and complaints
- Death causes
- Hospital patients & diagnose

Lifestyle:

- body length and obesity
- smoking and alcohol use
- breast feeding
- labour situation

Health care consumption:

- contacts with health care providers
- use of medical drugs
- Vaccinations
- Population surveys
- Admission to hospital & origin group

Supply of health care:

- welfare and child support
- hospitals
- nursing homes
- mental health care
- obstetrics
- Fysiotherapy
- Labour inspection
- Home care services

Time spending

Statistics Netherlands collects data on:

- Leisure time activities
- Time use
- Social participation

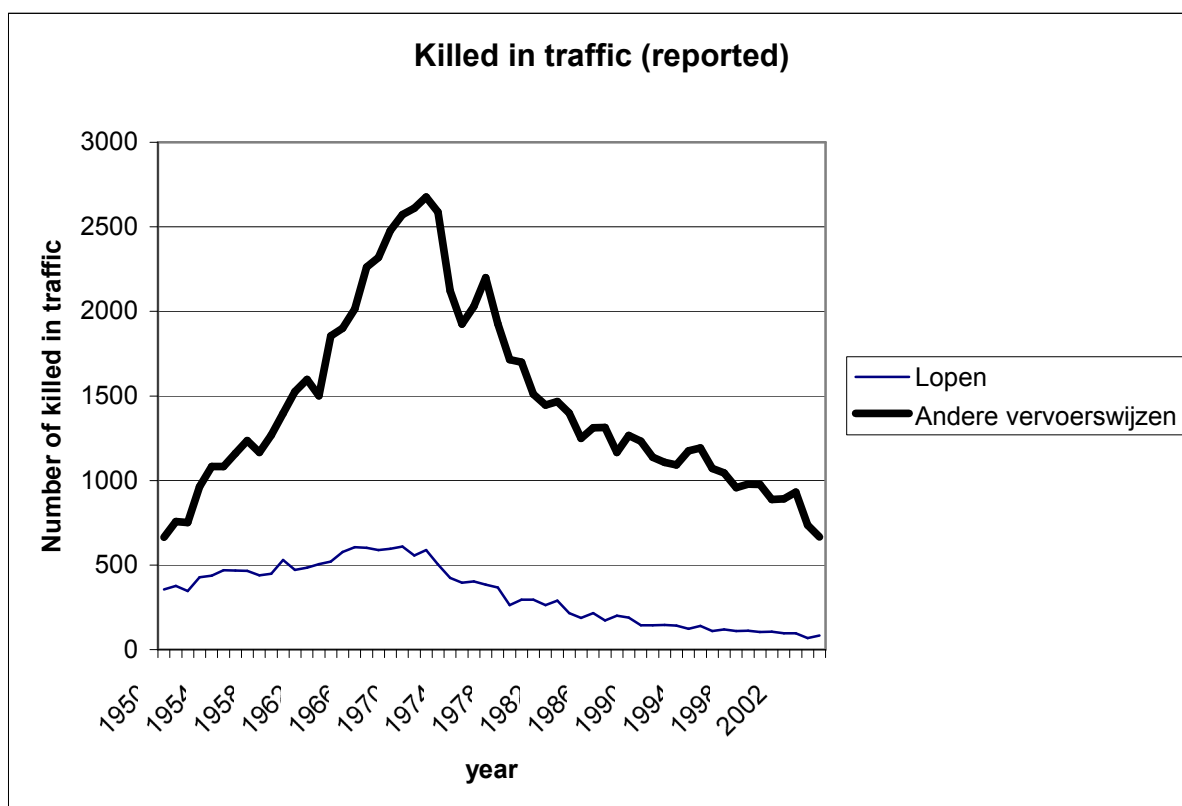
See: <http://www.cbs.nl/en-GB/menu/themas/vrije-tijd-cultuur/cijfers/default.htm>

Safety

Safety data are collected in a number of situations:

- Accident data, reported by the police to AVV Transport Research Centre and processed into the BRON database (see: <http://www.swov.nl/cognos/cgi-bin/ppdscgi.exe?toc=%2FEnglish%2Faccidents>)
- Hospital data, collected from all hospitals, concerning serious injury traffic accidents, where the involved road users were hospitalised, processed into the LMR database; do not include single pedestrian accidents (yet).
- Emergency Medical Service data from a representative selection of hospitals (15) in the NL, processed by the Stichting Consument en Veiligheid (Safety Institute). Include pedestrians' single accidents ('private accidents in public space')
- the biannual PROV-survey on road safety perception (population = 16 and over; directed specially at drivers)
- safety perception and issues (1997 – 2004 yearly data)
- victims of crime (including hit and run accidents)

Number of killed in traffic (reported victims)								
	1970	1975	1980	1985	1990	1995	2000	2005
Pedestrians	609	396	296	188	144	141	105	83
Other modes	2572	1925	1700	1250	1232	1193	977	667
Total	3181	2321	1996	1438	1376	1334	1082	750



2. (Recent) publications on pedestrian issues

Damen, M. (2000), *Footsteps in the Snow (Voetstappen in de sneeuw)*, Report, RIGO/AVV Transport Research Centre, Amsterdam/Rotterdam.

The report shows how people walk: where, when and why. It described empirical research on the neighbourhood level. It results in indicators for and against walking and controversies and eye openers regarding environmental awareness, competition between modes, home-work travel, pedestrian friendliness and time budgets.

The report is available through the AVV Transport Research Centre library. The report was also presented on the WALK21 conference in San Sebastian in 2001

Kavsek, R.A.A. (1998), *The pedestrians' Figures Book 1998 – figures about the pedestrian in traffic (Het Voetgangers' Cijferboek 1998 – cijfers achter de voetganger in het verkeer)*, The Pedestrians Association, Den Haag.

In official statistics the mobility on foot is underreported. This results in low problem awareness and has negative consequences for policy making. The report includes available figures on pedestrian mobility and safety corrected for know biases. The correction method is described in detail.

The report was published by the former Dutch Pedestrians' Association and is currently available through AVV Transport Research Centre library

Methorst, R. (2003) *Vulnerable Road Users – Report on the knowledge base for an effective policy to promote the safe mobility of vulnerable road users*, AVV Transport Research Centre, Rotterdam.

The report describes the state of the art of knowledge on vulnerable road users. The report is written as a reference book on this issue.

The first three chapters deal with the reasons for the project, the aims and the questions and the project in a birds' eye view.

In the 4th chapter the context of the project is described: which persons are vulnerable, what do we know about the issue and what theoretical framework is used within the project.

In the 5th chapter the results of the project are presented. In this chapter one can find indications of the nature, scale and seriousness of the problems, the causal factors (mechanisms), quality needs, present policy approach and countermeasures, trends in the social position of the various vulnerable groups and the degree to which the problem will increase/decrease and the consequences. In the last chapter conclusions and policy recommendations are drawn for the situation in The Netherlands.

Available in Dutch and in English via <http://www.rws-avv.nl/pls/portal30/docs/6615.PDF>

Hendriks, G.A.C.M.; Methorst, R. & Pieters, J.A.A.M. (1998), *Guideline Pedestrian facilities (Wegwijzer Voetgangersvoorzieningen)*, De Voetgangersvereniging, Den Haag

The report includes guidelines for local road authorities for pedestrian facilities. The guidelines are based on a conceptual framework, which is described in the report. Touchstone for quality is a set of values: Functionality, Perception value and Durability and Future Prospects. The authors indicate that policy making should start on the structure level (land use, re-classification of the road infrastructure into sojourn areas and traffic roads (connectors and trunk roads, based on the ideas of Sustainable Road Safety). Facilities are described both on the structure (network) and site levels. Additional supporting measures are also described.

The book was published by the former Dutch Pedestrians Association; the book is available through the AVV Transport Research Centre library. It is also available as PDF.

Methorst, R., Vermeulen, W. & Pieters, J. (1993), *The position of the pedestrian highlighted (De positie van de voetganger belicht)*, De Voetgangersvereniging, Den Haag

The authors deal with the arguments for extra attention to the pedestrian, influences on the position of the pedestrian, influences on current thinking regarding the pedestrian, target images, the role of government and NGO's and the Pedestrians Association in the force field. The report was published by the former Dutch Pedestrians Association; the book is available through the AVV Transport Research Centre library.

Hogeschool West Brabant (1995), *The crossed pedestrian – how trades people and the municipality crossed the pedestrian on the sidewalks of connector roads in Breda (De voet dwars gezet – Hoe in Breda middenstanders en Gemeente de voetganger dwars zitten op de stoep van verbindingsstraten)*, De Voetgangersvereniging, Den Haag

The authors describe how the sidewalks were obstructed by various objects and goods displays and how difficult it was to walk. The report was published by the former Dutch Pedestrians Association; the book is available through the AVV Transport Research Centre library.

CROW (2000) *Guidelines Designing Public space for children (Handboek Ontwerpen voor kinderen)*, CROW, Ede.
short abstract

The book give practical guidelines for designing child friendly streets.

CROW through www.crow.nl

Haug, J.J.M. (2004) *Footpaths for everyone – Criteria for re-surfacing, reconstruction and new design of footpaths and sidewalks (Voetpaden voor iedereen)*, Clientenbelang Utrecht, Utrecht

Based on current legislation and the interest of the handicapped, criteria and guidelines were developed for the paving of footpaths and sidewalks. The work was supported by the provincial road authority in Utrecht. The report is published by Clientenbelang Utrecht and available via <http://home.planet.nl/~haug0000/download/Voetpaden%20voor%20iedereen.pdf>

Kennisplatform VERDI (2000) *Walking and cycling: good for municipal policy (Lopen en fietsen: goed voor gemeentelijk beleid)*, KPVerdi, Rotterdam.

The report describes valid and researched arguments that can be used for policy development on the local level. Available through Kennisplatform Verkeer en Vervoer, Rotterdam

CROW (1994), *Signposts keep pedestrians informed on optional routes. (Wegwijzers maken voetgangers wegwijs – publicatie 89)*, CROW, Ede.

Road signing for pedestrians has been an undiscovered issue for a long time. Lately much work has been done to improve the situation. It however remains useful to carefully design road signing for pedestrians. In the publication 2 kinds of systems are discussed. Some general points of attention are formulated. www.crow.nl – publication 89

Schenk, M.J. (2005), *Don't be afraid of the zebra (Wees niet bang voor de zebra – afstudeerscriptie NHTV)*, NHTV/SOAB, Breda.

not available

Graduation thesis – NHTV (Breda University) in co-operation with SOAB consultants.

Spapé, I. (2006), *Safe the zebra (Red de zebra)* SOAB, Breda

The call for zebras from schools and neighbourhood councils is large. Traffic experts however are divided regarding their usefulness and safety. Local road authorities often say that zebras offer illsoory safety, or that zebras are not allowed within the Sustainable Safety Policy. The credibility of the zebra as an instrument for traffic engineers, planners and designers is at stake. It is time for a clear statement. Is the zebra an idea of the past? Under what conditions should they be implemented and when not?

Article; presentation at national Transport and Traffic Course 2006

SOAB, http://www.soab.nl/acms/index.php?option=com_content&task=view&id=51&Itemid=1

Sman, C. van der (2003), *The safety of rollators – a risk assessment (Veiligheid van rollators – een risicobeoordeling)*, Stichting Consument en Veiligheid, Amsterdam.

The report includes figures on rollators from Emergency Rescue trauma database built from a representative sample of hospitals

Stichting Consument en Veiligheid, website:

<http://www.veiligheid.nl/csi/websiteveiligheid.nsf/wwwVwContent/homepage.htm>

Sman, C. van der (2003), *The safety of travel aids (Veiligheid van verplaatsingshulpmiddelen)*, Stichting Consument en Veiligheid, Amsterdam.

The report includes figures on travel aids from Emergency Rescue trauma database built from a representative sample of hospitals.

Stichting Consument en Veiligheid, website:

<http://www.veiligheid.nl/csi/websiteveiligheid.nsf/wwwVwContent/homepage.htm>

SWOV (2006), *Factsheet Pedestrians*, SWOV, Leidschendam.

Pedestrians are vulnerable in traffic. Especially 5-11 year old children and the elderly of 75 years old and older have a high casualty rate. Relatively many crashes involving the elderly occur in the vicinity of pedestrian crossings. Cars are the most frequent collision opponents in pedestrian crashes. The following measures can improve pedestrian safety: infrastructural measures (such as laying out 30 km/h zones and safe pedestrian crossings), vehicle measures (such as pedestrian-friendly car fronts and the use of speed limiters) and behaviour measures (such as improving campaigns and education).

PDF on the SWOV website; SWOV-website

http://www.swov.nl/rapport/factsheets/fs_pedestrians.pdf

http://www.swov.nl/rapport/Factsheets/Factsheet_Voetgangers.pdf

SWOV (2005) *Factsheet crossing facilities for pedestrians and bicyclists*, SWOV, Leidschendam.

More than half of all severe crashes (with deaths or in-patients) in which cyclists or pedestrians are involved occur while crossing the road. An estimated 14% of these crashes occur on crossing facilities, in spite of the huge numbers of people crossing there (data 2002). Crossing locations are, therefore, relatively safe. There are a large number of different designs and layouts, which causes a lack of clarity among those crossing, but also among approaching drivers. What is expected of them? Crossing facilities must be understandable for everybody, especially by means of an unequivocal layout. For this reason there are provisional layout requirements for pedestrian crossing facilities according to Sustainable Safety. There must be only one rule at facilities used by both pedestrians and cyclists: either both have priority, neither have priority, or both have traffic lights. Where they do have priority, this must be indicated by triangular priority marking and by extended speed bumps to ensure a low approaching speed. Crossing facilities at crossroads that are only for cyclists should be raised. What precisely makes a crossing facility safe and understandable needs more research. PDF on website; SWOV website

http://www.swov.nl/rapport/Factsheets/FS_Crossing_facilities.pdf

http://www.swov.nl/rapport/Factsheets/Factsheet_Oversteekvoorzieningen.pdf

SWOV (2004) *Factsheet Children in traffic*, SWOV, Leidschendam.

The factsheet describes facts and figures regarding traffic safety of children in general and the Netherlands specifically.

PDF on website;

SWOV website http://www.swov.nl/rapport/Factsheets/FS_Children.pdf

http://www.swov.nl/rapport/Factsheets/Factsheet_Kinderen.pdf

Houwen, K. van der., Goossen, J. & Veling, I. (2004) *Travel behaviour of primary school children (Reisgedrag kinderen basisschool)*, Fietsberaad, Ede.

The Bicycle Council concluded that there was insufficient insight in the travel behaviour of young children. The report summarises results of an empirical study.

Research document commissioned by the Fietsberaad (Bicycle Council).

<http://www.traffictest.nl/assets/rapporten/TT02-095.pdf>

SWOV, *Factsheet (2006) – the relation of speed and accidents*, SWOV, Leidschendam

In the factsheet facts, figures and theories on speed and safety are summarised. Special attention is given to the effects of vehicle speed on the severity of injuries of pedestrians.

PDF on website; http://www.swov.nl/rapport/Factsheets/Factsheet_Snelheid.pdf

Methorst, R (2006) *Everyday walking examined (Voetenwerk – rapportage)*, Adviesdienst Verkeer en Vervoer, Rotterdam.

The (internal) report shows the results of a trial-survey on walking trips. It shows that approximately half of all walking is multi-modal walking (to and from other modes).

Internal report, not published. Available through the author.

Kuiken, M. & Spapé, I (2006), *About crossing (Over oversteken)*, DHV/SOAB, Amersfoort/Breda.

The most risky manoeuvre of pedestrians and bicyclists is crossing the street. In the first part of the report the problem is substantiated; theory and documentation regarding causal factors on the strategic and the tactic/operational levels are discussed and logical goals stipulated. In the second part of the report leads for interventions regarding infrastructure, education,

communication, enforcement, the design of the physical environment, research, empowerment and evaluation are documented. In the conclusion some promising approaches are given. Report (to be published), The report will be available in 2007 through KPVV – www.kpvv.nl

CROW (2006) *Safe crossing? Obviously! – use and design of pedestrian crossing facilities*, CROW, Ede.

In this guide attention is given to characteristics and causes of pedestrian accidents, starting points and conditions, walking routes and networks, influences to crossability, strategies for improving crossability, crossability (without right of way), facilities for protected crossing, traffic lights and different levels crossing.

CROW book through the website www.CROW.nl, search for publication 226

Bach, B. (2006), *Urban design and traffic – a selection from Bach's toolbox* (bilingual), CROW, Ede.

The book summarises and explains the many ideas Boudewijn Bach taught on urban design and traffic. There are chapters on 'one space for two disciplines: urban design and traffic', lessons from history, from profile to network, urban planning and design in relation to transport, public transport and the urban structure, an urban design geared to pedestrians and cyclist, the car and the urban structure, the city and traffic – a look ahead.

CROW book, through the website www.crow.nl, search for publication 221

Pieters, J.A.A.M. & Methorst, R (1998), *Crossing over to Sustainable Safety (Oversteken naar Duurzaam Veilig)*, De Voetgangersvereniging, Den Haag.

The booklet gives an overview of usable and safe crossing facilities for pedestrians.

The booklet was published by AGMI and the Pedestrians Association and is available through the AVV Transport Research library.

The Dutch Pedestrians Association (1998?), *The elderly safe on foot – a guide for the elderly to help making their environment more safe. (Senioren Veilig te voet – Handleiding voor ouderen om de omgeving veiliger te maken)*, De Voetgangersvereniging, Den Haag.

The booklet contains a step-by-step guide for improvement of the walking environment of the elderly, by the elderly themselves. It includes simple questionnaires for discovering how bad the situation is, what is the matter. It explains the causal chain of problems and gives tips for actions towards those that can actually improve the environment.

Booklet, part of a course for the elderly; The booklet was published by the Pedestrians Association; it is out of print, but a copy is available at AVV Transport Research centre

Vermeulen, W. (1999), *Pedestrian accidents because of bad surfaces, obstacles and slipperiness (Ongeval te voet door slechte bestrating, obstakels, gladheid)*, De Voetgangersvereniging, Den Haag.

The brochure describes what action can be taken by a private person after a pedestrian accident. Insight is given in which authorities can be approached, what legislation there is regarding liability.

The booklet was published by the Pedestrians Association; it is out of print, but a copy is available at AVV Transport Research centre

Vermeulen, W., Hendriks, G. & Verwiël, E. (2000) *Safe sojourn (Veilig verblijven)*, De Voetgangersvereniging, Den Haag.

The report includes a vision on safe sojourn in public space. The vision is based on the Sustainable Road Safety philosophy and the so called Cascade model: first try to improve structure and then focus on design and equipment of public space; if everything possible has been done, focus on the use (behaviour) of public space.

Report. The booklet was published by the Pedestrians Association; it is out of print, but a copy is available at AVV Transport Research centre

Methorst, R., Kavsek, R. & Steenaert, C. (1996) *The quality of shopping routes (Kwaliteit winkelroutes)*, De Voetgangersvereniging, Den Haag.

The report summarises information on the demand and supply side of travelling for shopping. Results of a survey on the shopping public's view on route quality is reported on. Quality criteria for shopping routes are described.

Report; there is also a short version available, directed at road authorities.

The booklet was published by the Pedestrians Association; it is out of print, but a copy is available at AVV Transport Research centre

Vermeulen, W. (1998) *Children on their way to school – taking care of the future. (Kinderen op weg naar school – Zorgen voor morgen)*, De Voetgangersvereniging, Den Haag.

The Dutch Pedestrians Association frequently surveyed how children go to school and measures taken to ensure their safety (1970, 1972, 1985, 1987, 1992 and 1998). This report describes the 1998 findings. Some trends are found.

Report; The booklet was published by the Pedestrians Association; it is out of print, but a copy is available at AVV Transport Research centre

Steenart, C. & Methorst, R. (1998), *Trends regarding walking. (Trends op de voet gevolgd)*, De Voetgangersvereniging, Den Haag.

The study explores the future prospects for the pedestrian (horizon: 2040). In the study the situation for pedestrians is related to demographic trends, technological developments, economic developments, social and cultural developments, governmental changes and spatial developments. In the Netherlands it was the first of its kind.

Thesis; The booklet was published by the Pedestrians Association; it is out of print, but a copy is available at AVV Transport Research centre

Methorst, R. (1995), *Conflictogram-methodology – a guide for identification of traffic problems in existing and planned settlements (Conflictogram – een handreiking voor het opsporen van verkeersproblemen in bestaande gebieden en nieuwe plannen)*, ROV-Drenthe, Assen.

The report focuses on the identification of potential dangers and accidents during the land use planning process. The conflictogram method is a forecasting method, suitable when accident data are not available.

Report and sliding card. The report was published by the Regional Traffic Safety Board in Drenthe; it is available in the AVV Transport Research Centre library.

Knippenberg, K.G.H. *The pedestrian in the Netherlands (De voetganger in Nederland)*, NHTV/Adviesdienst Verkeer en Vervoer, Breda/Rotterdam

The report includes facts and figures on the mobility and safety of pedestrians in the Netherlands, policy statements on the local, regional and national level and an impression of perception of the pedestrian issue. The report is meant to be a preliminary version of a Country Report on Pedestrian Quality in the Netherlands. Graduation thesis . The report is available at AVV Transport research Centre.

Ormel, W. (2006) *Bicycle and pedestrian accident (Ongevallen by fietsers en voetgangers)*

This accident study is based on a trauma database derived from a representative sample of hospitals in the Netherlands, and does not relate directly to the road accident database. In principle the trauma database gives full coverage of victims of accidents; in the report accidents in public space are selected, including single pedestrian accidents not covered by the road accident data base.

Report; The report is written by the Stichting Consument en Veiligheid in Amsterdam for the Ministry of Transport; the report is available in the AVV Transport Research Centre library

Ormel, W. (2006) *Bicycle and pedestrian accidents – an analysis of the data of the continuous follow-up survey*, Stichting Consument en Veiligheid, Amsterdam.

This report deepens the insight that results from the database study. In the follow-up survey data are gathered on the victim and his household. The results are extrapolated to the national level.

Report. The report is written by the Stichting Consument en Veiligheid in Amsterdam for the Ministry of Transport; the report is available in the AVV Transport Research Centre library

Methorst, R., Essen, M. van, & Ormel, W. (2007), *Injury accidents of pedestrians and bicyclist – from traffic accident to travel accident?*, Adviesdienst Verkeer en Vervoer, Rotterdam.

The study draws on three independent accident and trauma databases: the national road accident database BRON, the national medical registration LMR (hospital admittance data) and the injury information system LIS from the Stichting Consument en Veiligheid. The study aimed at giving a comprehensive picture of the extent and severity of travel accidents of pedestrians and bicyclist, wherein pedestrian travel accidents are all accidents in public space. Report, to be published in March 2007 by AVV Transport Research Centre.

Philibert Petit, E. (2006) *Connectivity-oriented urban projects*, TU Delft, Delft.

This thesis is about connections in the built environment, networked connections for the mobility of people at the smallest scale of the urban realm: the pedestrian scale. It deals with applications of the new science of networks as a tool for observation and assessment of connectivity in the urban space. It explores networks theoretically through the study recently discovered scientific principles and uses such network concepts empirically by means of a GIS networked model applied to study cases before and after concrete interventions by design in the urban space. Based on the assumption that physical structures have a direct effect on patterns of social organization and behavior and vice versa, this research represents an instrumental approach to the problem of fragmentation in the city, by proposing concrete actions to gain connectivity, in the form of urban projects: connectivity-oriented urban projects. The method of investigation is research by design, with the induction of potential solutions to the problem of fragmentation in the urban tissues in the form of briefs and hypothetical design of urban projects. Briefs and designs presented in this thesis are related to a research design integrated by a theoretical cycle and an empirical cycle. In each one of these cycles, the phases of analysis, design, strategy and evaluation are present, as in a spatial planning cycle.

The evaluation of design has been made with a GIS model developed to observe and assess connectivity at the level of pedestrian mobility in the urban space. Resulting of this work, a report of the design and application of a GIS model devised to observe and assess conditions of transversal connectivity in the urban space is presented. A description of the model, which is based upon the principles of urban structure and the rules of coherence of complex systems, is also included.

Thesis, Technical University Delft , <http://repository.tudelft.nl/file/232016/197314>

Rietveld, P. (2006) *Biking and Walking: The Position of Non-Motorised Transport Modes in Transport Systems*, Tinbergen Instituut, Amsterdam.

Long run developments such as income growth and urban sprawl lead one to expect a continuous decline of the contribution of non-motorised transport modes to the performance of transport systems. In terms of the total number of trips, non-motorised transport modes have retained high shares, however. The potential of non-motorised transport modes to contribute to the urban quality of life is increasingly being recognised. In this paper the possibilities of substitution between non-motorised and motorised transport are discussed. In addition, attention is paid to the issue of complementarity between motorised and non-motorised transport modes.

Report; Amsterdam : Tinbergen Institute; <http://hdl.handle.net/1871/9508>

Daamen, W. (2004) *Modelling passenger flows in public transport facilities*, TU Delft, Delft.

This thesis describes the development of a new type of simulation tool for the assessment of designs of public transport facilities (stations, airports) and other public spaces with intensive pedestrian flows. Since the available space for such facilities is increasingly under pressure, the space efficiency and walking comfort is becoming more and more important. The developed simulation tool provides designers and decision-makers with all kinds of quantitative information about the expected quality of pedestrian (traffic) flows such as travel times, waiting times, queue building, preferred routes, visits to shops and counters, etc. This information is very useful in comparing multiple designs as well as to optimise a specific design. The simulation model also is meant to improve schedules of public transport services at interchange nodes by minimising passenger transfer times. To that end, special attention is paid to the modelling of boarding and alighting processes. New insights about walking have been gained by performing unique large-scale laboratory experiments in which large groups of subjects were assigned various walking tasks, such as high volume crossing flows and walking through bottlenecks until flow breaks down. Specific walking and route choice models are developed using observations of passengers on platforms (such as in Delft) and route choice through the station (such as in Delft and Breda). The tool has proven its value in the analysis of new designs of the future Rotterdam Central Station and performance tests of the new Breskens-Vlissingen ferry terminals.

Thesis, Delft University Press; <http://repository.tudelft.nl/file/80804/161828>

Potman, J. Hoeksema, F.W. & Slump, C.H. (2003) *Tradeoffs between Spreading Factor, Symbol Constellation Size and Rake Fingers in UMTS*, STW Technology Foundation, Delft.

As an example of a systematic procedure for evaluating UMTS downlink DSP functions for adaptivity we study bit-error-rate performance tradeoffs between the spreading factor, the symbol constellation size and the number of used Rake fingers in UMTS despreading and demodulation. After an overview of the DSP functions that are used in UMTS downlink transmission and reception we present a usage scenario for studying the described tradeoffs. In the usage scenario three UMTS physical channel configurations, with different spreading factors and constellation sizes, are used to transport packet-data with a rate of 960 kbps over the ITU Pedestrian B multipath channel. The bit-error-rate performance of the different physical channel configurations is evaluated for a range of signal-to-noise ratios by means of

simulations. The simulation results indicate that the physical channel configuration that is used, and thus the spreading factor and constellation size, should be chosen based on the required bit-error-rate and the requirements of the other data streams in the cell. The simulation results also show that the number of used Rake fingers can be chosen adaptively to optimize a tradeoff between bit-error-rate and required processing power in the low signal-to-noise ratio region.

Thesis, STW Technology Foundation; <http://purl.org/utwente/46690>

Voort, Robert van de (2002) *Predicting the impact of local changes in land use and pedestrian system configuration on lunchtime itineraries*, TU Eindhoven, Eindhoven.

Abstract not available; master thesis; Technische Universiteit Eindhoven;
<http://library.tue.nl/csp/dare/LinkToRepository.csp?recordnumber=560078>

Timmermans, HJP Hagen, XHAM van der, & Borgers, AWJ (1992), *Transportation systems, retail environments and pedestrian trip chaining behaviour : modelling issues and applications*, Eindhoven.

Short abstract not available, Article / Letter to the editor
ISSN:0191-2615; <http://library.tue.nl/csp/dare/LinkToRepository.csp?recordnumber=589630>

Timmermans, HJP Waerden, PJHJ van der (1990), *Store performance, pedestrian movement, and parking facilities*, Eindhoven.

Short abstract not available ; Part of book or chapter of book, Lasselben ; ISBN:3-7847-6069-4

Borgers, AWJ Timmermans, HJP (1986) *A model of pedestrian route choice and demand for retail facilities within inner-city shopping areas*, Eindhoven

Abstract not available Article / Letter to the editor, ISSN:0016-7363;
<http://library.tue.nl/csp/dare/LinkToRepository.csp?recordnumber=589529>

Janssen, W.H. (1991) *Blinking yellow at signalized pedestrian crossings: an evaluation*, TNO Human Factors, Soesterberg.

The replacement of the red traffic light for pedestrians by 'blinking yellow' (crossing at own risk) was investigated by means of before-and-after video registration of pedestrian crossing behaviour on six sites.

The percentage of pedestrians not crossing in the green phase was, on average, doubled by the introduction of blinking yellow. The size of the critical gap when crossing outside green was not affected by blinking yellow. Also, no change was observed in the number of conflicts observed while crossing. It was concluded that the introduction of blinking yellow had improved the comfort of crossing, while the safety of crossing during blinking yellow had not worsened compared to crossing during red.

report; The report is available at TNO Human Factors.

Martens, M.H. & Bakker, P.J. (1998) *Investigation of behaviour at tram crossings*, TNO Human Factors, Soesterberg.

The tram crossings differ strongly in lay-out and design, for instance in aspects such as position of tramway in the design of the crossing, presence of prewarnings for tram signal lights, tram warning lights, etc.. On basis of the analyses, some measures are provided in order to enhance traffic safety on tramways in general.
report is available at TNO Human Factors.

Van der Horst, A.R.A., Martens, M.H. & Bakker, P.J. (2001). *The effectiveness of additional safety measures at railway level crossings: final report behavioural observations*, TNO Human Factors, Soesterberg.

As part of a large-scale project to improve the safety at railway level crossings in the Netherlands, a number of safety-improving measures has been implemented. Under commission of Railinfrabeheer B.V. a study was conducted to determine the effectiveness of these measures with respect to expected behaviour of road users.
The report is available at TNO Human Factors.

De Langen, A.C.B. (2003) *The safety of various types of urban crossing facilities; Accident analysis and behaviour observations (Veiligheid van enkele typen oversteekvoorzieningen in stedelijke gebieden : analyse van ongevalgegevens en gedragswaarnemingen)*, SWOV, Leidschendam.

The research question is whether (1) certain features of the design and layout of a crossing facility, (2) the layout of the road segment in which it is situated, and (3) external factors have a road safety influence. If so, what is the influence? The study was limited to the difference in safety between sustainably-safe (S-S) and non-sustainably-safe (non S-S) zebra crossings. As the most important feature of a S-S zebra crossing, the raised area was chosen. Seven hypotheses were drawn up and tested by behaviour observations. These concerned the behaviour (when they interacted) of the pedestrian crossing over and the driver, and the approach speed of the motorized traffic. The most important conclusions from this were: Pedestrians at a S-S zebra have less confidence in a correct granting of right-of-way than pedestrians at a non S-S zebra. The former, however, leads to less potential conflict situations; and the average approach speed at a S-S zebra crossing (39 km/h) was 7% slower than at a non S-S zebra (42 km/h), which leads to a safer situation. But the approach speed at a S-S zebra is also faster than 30 km/h, i.e. faster than permitted when mixed traffic is involved.

SWOV-rapport R-2003-23, The report is written by SWOV; <http://www.swov.nl/rapport/R-2003-23.pdf>

Hummel, T. (1998) *Dutch pedestrians research review*, SWOV, Leidschendam.

This compilation of Dutch research on pedestrians was made under the supervision of the University of North Carolina and is available on the SWOV website:
<http://www.swov.nl/rapport/R-98-07.pdf>

Minnen, J. van (1999). *Geschiede grootte van verblijfsgebieden : een theoretische studie met toetsing aan praktijkervaringen*. In opdracht van het Directoraat-Generaal Rijkswaterstaat, Adviesdienst Verkeer en Vervoer AVV. Leidschendam, Stichting Wetenschappelijk Onderzoek Verkeersveiligheid SWOV, 1999, 52 p., 13 ref.; R-99-25

In the Netherlands Centre for Research and Contract Standardization in Civil and Traffic Engineering (CROW) publication 116, the 'Guidebook for categorising roads on a 'sustainably safe' basis', the first functional demand for a 'sustainably safe' road network is called: 'Achieving as large as possible connecting residential areas'. However, it is not shown how large they are or can be. In this study, a theoretical study into the suitable size of residential

areas is described. Ultimately, the following criteria were used for the choice of area size: journey length, traffic volumes, choice of route, car speeds, and accessibility. Attention is also paid to the relationship between the size of a residential area and the ease of crossing over the distributors. An attempt was made to test the results of the study by using practical experiences. It appeared that these experiences did not reach further than areas up to c.0.65 km² for city centres and c.0.8 km² for a residential area not yet completely built-up.

Wittink, R. (2001). Promotion of mobility and safety of vulnerable road users : final report of the European research project PROMISING (Promotion of Measures for Vulnerable Road Users). Leidschendam, SWOV Institute for Road Safety Research, 2001, 97 p., 19 ref.; D-2001-3

<http://www.swov.nl/rapport/D-2001-03.pdf>

This final report of the European PROMISING research project integrates the findings of the work of six workpackages (For workpackage 3 see C 19231 (ITRD E206417). The reports of these workpackages are available separately. The final report selects main findings of the different workpackages and combines the results as much as possible. The report is policy-oriented and illustrated with photos and clear examples, in accordance with the requests of the European Union (EU) DG VII, the commissioner of the project. The aim of the PROMISING project was to develop measures that reduce the risk of injury to vulnerable and young road users as much as possible in a non-restrictive way. That is to say that safety and mobility must be improved together; the improvement of safety should not take place at the cost of reduced mobility. The potential for problem reduction was specified for four target groups of vulnerable road users: pedestrians, cyclists, motorised two-wheelers (motorcyclists and riders of mopeds), and young car drivers. The differences between European countries in their transport modes were taken into consideration. This report may be accessed by Internet users also at: <http://www.swov.nl/rapport/D-2001-03.pdf> or http://europa.eu.int/comm/transport/road/publications/doc/promising_final.pdf

Hagenzieker, M.P. (1997). The effects of 'non-infrastructure' measures to improve the safety of vulnerable road users : a review of international findings, prepared for the OECD Scientific Expert Group "Safety of vulnerable road users". Leidschendam, SWOV Institute for Road Safety Research, 1997, 51 p., 84 ref.; D-97-4

This report reviews the evaluated effects of what can be called 'non-infrastructure measures' to improve the safety of vulnerable road users. Three selected areas are discussed: education and training, measures to enhance visibility and conspicuity, and protective devices for bicyclists. Other types of non-infrastructure measures are briefly mentioned.

Hagenzieker, M.P. (1996). Some aspects of the safety of elderly pedestrians and cyclists. Paper presented at the international conference 'Road safety in Europe', Birmingham, England, September 9-11, 1996. Leidschendam, SWOV Institute for Road Safety Research, 1996, 21 p., 18 ref.; D-96-4

The numbers of elderly people are increasing world-wide. Also, the mobility of the elderly people increases and the elderly generation of the coming years will spend much more time and distance in traffic than the present elderly generation; as car drivers, but also as pedestrians and/or cyclists. This paper discusses some aspects of the safety of elderly pedestrians and cyclists.

Wittink, R. (2001). Promotion of mobility and safety of vulnerable road users : summary of the European research project PROMISING (Promotion of Measures for Vulnerable Road Users). Leidschendam, SWOV Institute for Road Safety Research, 2001, 23 p.; D-2001-4

<http://www.swov.nl/rapport/D-2001-04.pdf>

This final report of the PROMISING project integrates the findings of the work of six workpackages. The reports of these workpackages are available separately. The final report selects main findings of the different workpackages and combines the results as much as possible. The report is policy-oriented and illustrated with photos and clear examples, in accordance with the requests of EU DG VII, the commissioner of the project. The aim of the PROMISING project was to develop measures that reduce the risk of injury to vulnerable and young road users as much as possible in a non-restrictive way. That is to say that safety and mobility must be improved together; the improvement of safety should not take place at the cost of reduced mobility. The potential for problem reduction was specified for four target groups: pedestrians, cyclists, motorised two-wheelers (i.e. motorcyclists and riders of mopeds) and young car drivers. The aim was to present measures within an implementation framework, with the main focus on technical, non-restrictive aspects. The differences between European countries in their transport modes were taken into consideration. In order to determine the potential for problem reduction, available data and expertise of the following subjects were studied and combined: - safety problems, - task requirements, - measures related to problems and tasks, - effects of measures on safety and on mobility, - costs of measures. The research consists of six workpackages. The first four workpackages each focused on one of the target groups. The research approach between the packages varied. Since there is a lack of planning for the mobility of pedestrians and cyclists, the research approach in the workpackages on these subjects was to take walking and cycling as modes of transport in their own right, and consequently to combine transport criteria with safety criteria. The research approach for the motorised two-wheelers and young drivers differed from this, because of the high risk of these modes in relation to the high speed and complex driver task. In these workpackages, the most important safety measures were selected and subsequently mobility aspects were integrated. The PROMISING project paid much attention to the effectiveness of measures. Calculations of the costs and benefits of a selection of measures were needed to compare the different measures. Workpackage 5 described the technique and application of cost-benefit analyses and calculated the costs and benefits of 20 measures selected by the other workpackages. The points of view of road users and their own experiences were also considered in the comparison of the measures. For this reason, an international forum of interest groups was consulted during the project. In four countries, a national forum with representatives of governments and interest groups was asked for their opinions. These consultations are co-ordinated in WP6. In this current report, the most important results and conclusions of the six workpackages are discussed. For the final report of PROMISING see C 19230 (ITRD E206416).

Davidse, R.J. (2002). Verkeerstechnische ontwerpelementen met oog voor de oudere verkeersdeelnemer : een literatuurstudie. In opdracht van Verkeers- en Vervoersberaad Drenthe (voorheen Regionaal Orgaan voor de Verkeersveiligheid Drenthe). Leidschendam, Stichting Wetenschappelijk Onderzoek Verkeersveiligheid SWOV, 2002, 50 p., 62 ref.; R-2002-8

<http://www.swov.nl/rapport/R-2002-08.pdf>

This report is of a study within the project 'The Elderly in the Traffic of Drenthe', Netherlands. Within this project, solutions are looked for to reduce the number of victims among older road users in (the northern Province of) Drenthe. This study aims to discover which infrastructural adjustments can contribute towards reducing the number of older road accident victims. Based on the available literature, an inventory has been made of which infrastructural measures can be taken to increase the safety of older road users (car drivers as well as cyclists and pedestrians). The relevant measures are discussed. The study is concerned with measures that take the functional limitations of the older road user into account and that are relevant for the traffic situations in which there are relatively many accidents involving the elderly in which they are the responsible party. Preceding this, the concomitant functional limitations of old age are described, and those accident types in which the elderly appear to be more often responsible. The design elements offered all concern intersections (at-grade) and (grade

separated) interchanges. The recommendations regarding their implementation are aimed at: (1) giving the road user more time to observe things, to base decisions on these observations, and then to carry out a manoeuvre. These include greater sight distances, timely warnings of changes in the lane configuration, and long acceleration lanes; (2) creating clear and orderly situations. These include positive offsets of opposite left-turn lanes and traffic islands for phased crossing over; and (3) are aimed at allowing important features of the infrastructure to be prominently present. These include clearly contrasting marking (including maintenance) and emphasizing the correct driving direction.

Wittink, R. (ed.) (2001). National and international forums to discuss the approach and the results of PROMISING : Discussion in the framework of the European research project PROMISING (Promotion of Measures for Vulnerable Road Users), Workpackage 7. Leidschendam, SWOV Institute for Road Safety Research, 2001, 20 p.; D-2001-6

<http://www.swov.nl/rapport/D-2001-06.pdf>

The European PROMISING research project is aimed at the development and promotion of measures to improve both safety and mobility of vulnerable road users. Consideration was given to differences between European countries in the share of different transport modes. During the research work, an exchange was organised about the approach and results of the PROMISING project in an international forum and four national forums in: France, Finland, Greece, and the Netherlands. The reports of these exchanges are combined in this deliverable of the PROMISING project. For the abstracts of the final report of PROMISING and workpackage 3 see C 19230 (ITRD E206416) and C 19231 (ITRD E206417) respectively.

Koornstra, M.J. Lynam, D. Nilsson, G. Noordzij, P.C. Petterson, H.-E. Wegman, F.C.M. & Wouters, P.I.J. (2002). SUNflower : a comparative study of the development of road safety in Sweden, the United Kingdom, and the Netherlands. Leidschendam, SWOV Institute for Road Safety Research / Crowthorne, Berkshire, Transport Research Laboratory TRL / Linköping, Swedish National Road and Transport Research Institute VTI, 2002, X + 128 + 19 p., 17 ref. - ISBN 90-801008-9-7

<http://www.swov.nl/rapport/Sunflower/Sunflower.pdf>

The road safety performance of different countries within Europe varies substantially. The three countries with the lowest accident levels are Sweden, United Kingdom, and the Netherlands (described here as the SUN countries). The aim of this study is to determine the underlying elements in the current policies and programmes of the SUN countries, which make them particularly effective in coping with the traffic safety problem, and thereby identify policy improvements most likely to produce casualty reductions in both SUN countries and other (European) countries. Main conclusions with respect to differences between the SUN countries are: The total risks (i.e. death rates) of the SUN countries are the lowest in the world and similar, although just significantly lower in Britain (7.28 fatalities per billion motor vehicle kilometres, versus 8.44 and 8.48 in Sweden and the Netherlands); Traffic growth during 1980-2000 was largest in Britain and lowest in Sweden, and traffic densities on main roads in 2000 are also highest in Britain and lowest in Sweden. However, the motorway length per capita, area, and per number of motor vehicles is shortest in Britain and largest in Sweden; British risks are highest for pedestrians and for motorcyclists, but lowest for car occupants, compared to the other countries; Car occupant risk is highest in Sweden; Dutch mopedists have almost twice the risk of mopedists in the other countries, and drive many more kilometres. Dutch cyclist risk is lowest, but is still higher than car risk even when the risk that cars inflict on other road users is included, and Dutch citizens cycle by far the most; Sweden has 14% driver fatalities over 0.1% blood alcohol concentration (BAC) in 2000 versus an estimated 17% in the Netherlands and a reported 20% in Britain; Levels of child restraint use and seat belt use in front and back seats are high, but lowest in the Netherlands; The risk on motorways is almost five times lower than on other roads. This risk differs slightly in the three countries (2.0 per billion vehicle kilometres in Britain versus 2.3 in the Netherlands and 2.5 in Sweden); and the

risk on Dutch roads other than motorways is about a third higher than the risk on these roads in the other countries. This report may be accessed by Internet users at:
<http://www.swov.nl/rapport/Sunflower/Sunflower.pdf>.

SWOV (2005). The elderly and infrastructure. Fact sheet. Leidschendam, SWOV Institute for Road Safety Research, 2005, 4 p., 8 ref.;

http://www.swov.nl/rapport/Factsheets/FS_Elderly_and_infrastructure.pdf

The elderly have a larger than average death rate in traffic. The most important cause of this high death rate among the 75 year olds and older is their greater physical vulnerability. In addition, functional limitations can influence their road safety and can lead them to being more often involved in certain types of crashes. The elderly are relatively often involved in crashes that occur while turning left at intersections. Infrastructural measures can reduce the crash involvement of the elderly. Examples are a well-maintained contrast level of road markings and a positive offset of opposite left-turn lanes. They ensure that motorists get information in good time about the traffic situation they are approaching. This is especially important for the elderly because they generally need more time to select the right information and use it to take the correct action.

SWOV (2007). Factsheet Vulnerable road users. Fact sheet. Leidschendam, SWOV Institute for Road Safety Research.

http://www.swov.nl/rapport/Factsheets/FS_Vulnerable_road_users.pdf

The group of vulnerable road users can be subdivided in a number of ways such as the amount of protection in traffic (e.g. pedestrians and cyclists) and the amount of task capability (e.g. the young and the elderly). Vulnerable road users do not usually have a protective 'shell', and also the mass difference between the colliding opponents is often very important. Vulnerable road users can be spared by limiting the driving speed of motorized vehicles and separating as much as possible unequal road user types. Adapting motor vehicles (e.g. by side-underrun-protection of lorries and collision-friendly car fronts) can lessen the injury severity of vulnerable road users.

ERSO (2006). Pedestrians and cyclists. (Erso web text)

Zie http://www.erso.eu/knowledge/content/40_pedestrians/pedestrians.htm

3. Current research projects

In 2001 the **Ministry of Transport, Public Works and Water Management** initiated the Vulnerable Road Users project. In 2003 AVV published a report on the knowledge base and identified gaps. The COST 358 project builds on that results. Since 2003 the ministry is working on policy development, for which smaller, dedicated research projects were started. At the moment (July - September 2006) KPVV, a knowledge platform for local and regional authorities, commissioned DHV and SOAB consultants to substantiate starting points for policy measures at the national, regional and local levels. AVV coaches the consultants.

TNO Defence & Safety will, under the condition that the so called Demand Controlled Research Programme 'Traffic, Transport and Logistics: an intelligent and sustainable step forwards' is accepted, contribute to this COST Action by studying vulnerable road users in the transport system. The study will cover behavioural and perception research from an ergonomic and human factors perspective. Deliveries will include a benefit assessment vulnerable road users, quality requirements from ergonomic and human factors perspective, specially adapted injury criteria for future accident populations, a Demonstrator Intelligent System Vulnerable Road Users and a human factors contribution to guidelines for sustainable solutions for pedestrians. On behalf of TNO two persons will be involved; the research costs will be 50,000 Euro in 4 years.

SWOV Road Safety Institute will contribute road Safety knowledge. Although the SWOV Research Programme is not yet finalised, in 2007 a detailed accident study regarding pedestrians (and cyclists) is planned. In addition to this SWOV will contribute expertise gathered in the context of the periodical Road Safety Balances and Road Safety Prospects studies. The financial value of the SWOV contribution, amounting at least 40 person days for the accident study, is 35,000 Euro in 2007 and 2008. At least 3 SWOV staff are involved.

ITS Radboud University Nijmegen will contribute to COST 358 by performing a secondary analysis on empirical data regarding pedestrians attitudes and behaviour and, under the condition that funding can be found, a study into typical pedestrians and non-pedestrians attitudes and behaviour, resulting in distinction of subgroups regarding attitudes and behaviour for targeting policy development. ITS delegates 1 researcher to the project. The value of the contribution is estimated to be 15,000 Euro; if budget can be found for the attitudes and behaviour study, the total value will amount 65,000 Euro.

The **Technical University Delft – Faculty of Architecture**, will contribute to the action through input of expertise stemming from current research on public space design, will look for external budgets for associated research projects and will mobilize students for these studies within the context of this COST Action. The TU Delft is involved with 1 researcher and probably several students. The value of the contribution without additional research is estimated at 25,000 Euro; if associated research projects can be financed, the value of the contribution will amount at least 75,000 Euro.

The **Stichting Consument en Veiligheid (Consumer Safety Foundation)** collects emergency and hospital data on injury accidents in public space. The foundation reports on specific issues like the safety of rollators and of electric scooters for handicapped persons. The results of such studies will be used as input for the PQN study.

The **Keuning Institute** promotes the concept of 'Shared space'. The concept is implemented in several cities in the Netherlands and in the United Kingdom. Because of the unexpected popularity of the concept abroad and a somewhat critical attitudes in The Netherlands, the Keuning Institute now stimulates evaluation studies. The outcome of these studies may be relevant for this COST Action.

4. Policy statements

National level

Transport and traffic is embedded in a comprehensive policy paper on land use, the Nota Ruimte (<http://international.vrom.nl/pagina.html?id=7348>).

There is a difference between 'national' and 'central': The national policy papers are also signed by (representatives of) regional and local authorities, whilst central government (the ministry) can have a policy of its own, not (yet) followed up by national agreement.

This principle is laid down in the Planning Act Transport and Traffic, that introduces a hierarchical system of plans: the National Transport and Traffic Plan (now called Mobility Paper), Regional Transport and Traffic Plans and local plans. The latter are not obligatory, the first two are.

The national policy on transport and traffic is laid down in the Nota Mobiliteit = Policy paper on Mobility. see:

<http://www.verkeerenwaterstaat.nl/english/130%5Fmobility%5Fpolicy%5Fdocument/>
<http://213.156.8.79/pdf/nm4/pkb4-UK.pdf>

The ministry of agriculture, nature and food quality is responsible for walking as a form of recreation. This ministry subsidises national walking networks.

This ministry is also responsible for green spaces in and around urban areas. Key policy issue is the enlarging and interconnectivity of green structures. This includes construction and relocation of footpaths.

In the National mobility policy paper the pedestrian is not given much attention. Only a few words are spent on walking and the pedestrian. In the cabinet statement – part the word walking (wandelen, lopen) is used 13x, the word pedestrian is mentioned 3x, particularly as a consequence of public participation, where it was noted that the pedestrian is not adequately included in the policy paper.

National government states that pedestrian policy is decentralised and that it is the responsibility of local authorities.

See also SWOT analysis.

Regional and local level

Provinces and Large Urban Areas Authorities are obliged to issue regional Transport and Traffic Plans. These plans follow the directives of the national plan. Thus hardly any attention is given to walking and the pedestrian.

Municipalities are not obliged to issue Transport and Traffic Plans, but there appear to be at least 50 municipalities (of 458) that give some attention to pedestrians. Some, like Den Haag and Amsterdam even have specified policy on the issue. It appears that policy depends on local problems; mid-size and large municipalities give more attention to pedestrian issues than the smaller ones (Knippenberg, 2006). All municipalities implemented the Sustainable Road Safety related 30 km/h zones. Over 50% of all urban roads in NL have a 30 km/h speed limit nowadays.

Knippenberg (2006) found that most common measures with respect to pedestrians are:

- construction of safer pedestrian crossings

- safety and comfort facilities for children, the elderly and the handicapped (accessibility of public spaces)
- construction of more (and sufficiently wide) sidewalks
- construction of sidewalks on both sides of the road
- improvement of accessibility of public transport and parking spaces
- preventing that pedestrians get the feeling that they have to walk round
- realisation of a high-quality pedestrians network
- realisation of a public safe and secure public space.

More than 75% of the municipalities indicate to have locations where pedestrians have difficulty crossing a road or street. All larger municipalities admit these problems. There does not seem to be one single approach for tackling the problem. This result corresponds with the figures from road accidents, where crossing accidents are dominant (70% of all injured pedestrians).

All municipalities have a complaints department or bureau for infrastructure deficiencies. The number of complaints varies very much from municipality to the other.

See SWOT on regional and local policy.

5. Legal position of pedestrians

National legislation and jurisprudence

Relevant national legislation is the Wegenverkeerswet 1994 (Road Traffic Act) and a number of Algemene Maatregelen van Bestuur (General Management Measures) issued by the Minister of Transport, like the Reglement Verkeersregels en Verkeerstekens (RVV 1990 = Regulation of traffic rules and traffic signs) and the Besluit Administratieve Bepalingen inzake het Wegverkeer (BABW 1990 = Resolution Administrative Provisions concerning the road traffic).

Important rules concerning the pedestrian are (RVV 1990):

- parking is not allowed within 5 meters from a zebra
- straight on going pedestrians have a free passage right over turning traffic
- with a Erf, pedestrians can use the full width of the street
- pedestrians are allowed to use the main carriageway if they form a column, procession, parade or funeral procession
- drivers have to give way to pedestrians and users of vehicles for the handicapped crossing on a zebra, or when they apparently intend to cross.
- drivers have to give way to all blind people and all persons that move with difficulty.

Regulations for road authorities are described in the BABW 1990: when and where to place traffic signs and signals, how the urban limit is defined and how parking cards for the handicapped are to be issued.

When a road authority changes a regime (speed limit, parking regulation, no-entry sign etc.) the public can object within 30 days after the decision was published.

Liability for damage suffered on a faulty road can be claimed in court. This is a rising phenomenon in the NL.

Local Legislation

Local legislation can include the duty to keep the pedestrian space clean of litter, snow and ice. However, most municipalities have stricken rules on this issue. Other local legislation concerns the use of sidewalks for terraces, display of goods or advertising signs. Most municipalities have some rules on this point ensuring pedestrian space, but these rules are seldom enforced.

Pedestrian traffic light

There are three kinds of traffic lights for pedestrians:

- the usual red and green signs, placed at the opposite side of the crossing
- a yellow blinking light at (some) mid section crossings, meaning that the pedestrian may cross at his own risk; on call (press the button) the green light can appear, giving the pedestrian the right to cross
- red and green signs placed before the crossing (so called Maastricht Lights), having the same consequences as the common pedestrian traffic lights; the lights cannot be seen by the pedestrian when crossing, making it possible to have only a very short green phase combined with adequate crossing time.

Jurisprudence

There are approximately 210 arrests concerning the pedestrian. It appears that pedestrians have a very strong position in liability cases against drivers and road authorities. The most important jurisprudence is:

liability of road users

Most common liability cases are damage claims after accidents. In almost all cases are quite distressing, like collision with a wheelchair in bad weather or a pedestrian killed by a motorcyclist. The pedestrian has a strong position in such cases. In almost all cases motorized traffic is held liable for at least 50% of the damage costs. This 50% rule also counts for bicyclist. For children under 14 years of age motorists are 100% liable.

procedures against local authority rulings

Procedures against local authorities mostly concern closings of roads for motorized traffic. These claims weaken the position of pedestrians.

appeals against fines and punishment

With regard to offences against pedestrians appeals are made; most of the times this concerns neglect of yielding pedestrians at pedestrian crossings (fine is € 130).

liability of road authorities

In a limited number of cases pedestrians claim damage from local authorities. Most of the times these claims relate to falls caused by faulty maintenance.

Enforcement

There are no data on enforcement of pedestrian behaviour or behaviour towards pedestrians. This probably means that such enforcement hardly exists.

6. Best practices

At the moment we do not have an overview of best practices from municipalities. From the consultancy agency SOAB (one of the very few agencies having special attention for pedestrian issues) the following list originated:

- Hitch-a-ride- projects:
 - commercial area De Dubbelen
 - MMM scan
 - 30 km/h zoning in Nieuw Borgvliet
 - Kerkbrink Hilversum
 - Safety scan roundabout N617
 - Re-furnishing streets in Woerden
 - Shopping centre Westermarkt (Amsterdam)
- Special pedestrian projects
 - Zebra-action Rotterdam
 - Urban through road Werkendam
 - Pedestrian circles Breda
 - Going further on foot – Heusdenhout
 - Autodetection pedestrian crossing Breda
 - Eyes on the zebra – Amsterdam
 - Safe the zebra
 - Who is afraid of the zebra?
 - report About Crossing the street
- Kindlint-projects (Child ribbon projects)
 - Westerpark (Amsterdam)
 - Delft
 - Middelburg
 - Noord-Beveland
 - Cadzand-Bad
- Health Care Residence Zones
 - The Hague – Moerwijk
 - Harderwijk
- Educations and schools:
 - Schoolenvironment plan Houten
 - Safe to school in Tholen
 - Zeveraar 4 times daily
 - Safe to school in Noordwijkerhout, Vlaardingen and Delft
- Yellow pedestrian routes for the elderly
 - Breda, Bavel, Ulvenhout, Brabantpark, Heusdenhout (see: www.kcwz.nl)

7. Innovations

Koen Knippenberg made an inventory of innovations with regard to pedestrians. Most of these innovations have an international scope. He indicates the following innovations:

Vehicles

Some new cars have received 4 stars in EuroNCAP for pedestrian safety (Jaguar, Citroen C6) for bonnet-mechanisms that rise when a collision occurs. This prevents that the pedestrian collides with the engine block, causing severe head injury. In addition to this innovation the use of softer front materials is increasing.

In Belgium the so called courteous light is invented: a green brake light at the front of a car so that pedestrians, waiting at zebras can assess better whether a driver notices them or not. In NL the proposal is received with scepticism.

A new vehicle type is the segway. This is a self-balancing people mover. the rider stands on a small platform. A recent user study in Germany made clear that the segway is not a particularly safe vehicle. AVV recommends to be very cautious with promoting the vehicle and not to admit it in pedestrian areas.

Outdoor gadgets

Skeelers have been followed up by heelskates, invented in Korea. It seems to take a while before one is able to use the gadget. Like skeelers they do not seem to be very safe for pedestrians (see: <http://www.pliws.nl>).

Another new invention is the Powerizer (see: <http://www.poweriserpages.com>), which also is mainly meant for recreational use. Its safety for pedestrians is not guaranteed.

Infrastructure

Much more positive are new technical devices for infrastructure:

- pedestrians detection for traffic lights (infra red, radar, video- based)
- aluminum tactile tiles
- waiting time indicators for traffic lights (various types: indicating seconds before green, hour glass like indicator etc.)

8. General atmosphere.

The general atmosphere regarding the position of pedestrians is more or less determined by the following factors and conditions:

1. spatial and environmental conditions
2. culture and subcultures
3. position in transport and traffic
4. position within the political and societal force field
5. feelings of relevant practitioners
6. media attention and public opinion.

These factors and conditions will be discussed below. This first draft is based on personal observations, discussions with colleagues and signals from Dutch reports, articles and various news letters. References will be added later.

1. Spatial and environmental conditions

- The climatic and geomorphologic situation in the Netherlands are very favorable for walking (and cycling). The country lies in a moderate climate zone: temperatures are very moderate; frost is rare, temperatures above 30° C are even rarer. Wind may be a problem and the climate is relatively moist (it rains approximately 6% of the time). The country is very flat apart from a small part in the south of the Netherlands (Zuid-Limburg: the Maastricht area).
- Since the 17th century the country had restrictive urban planning laws. This resulted in rather compact, walkable cities and towns. Up till now food is sold in relatively centrally located shops. It is forbidden to sell food in mega-shops in industrial areas. There is however a trend towards mega-shops in industrial areas. This trend was led by Ikea and large Do-it-yourself home improvement shops.
- In 1998 the Dutch road authorities agreed to the so called Starting-Up Program Sustainable Road safety. One of the major accomplishments of this program is that no more than 50% of the urban road network is fixed up as 30 km/h zone. The norm for sojourn areas now is 30 km/h. In addition to this there are also (older) Woonerfs (shared space home zones, where the speed limit is 15 km/h and parking is only allowed in specially assigned parking spaces).
- In the Netherlands urban space is expensive. It pays to reduce road space. Traffic calming makes it possible to make narrow narrow or to make road users share the space (Woonerf!). Currently in most of the cases the reason for making a Woonerf is financial, not safety of liveability (although the latter is used as the prime sales argument by both the local authorities and the real estate agents).
- Because of the parking pressure in home zones sidewalks are sometimes narrowed to make room for more cars.
- In cities almost all streets have two sided sidewalks. In villages (outside heavily populated the Western part of the country) sidewalks are not so common.
- There is a system of long distance walk paths, but the network is not very dense. The system is made up of long distance routes. The most famous ones are signed, like the Pieterpad (approximately 300 km from Pietersberg near Maastricht to Pieterburen in the North of Groningen)
- In some regions the soil is rather soft and peaty, particularly in the low western part of the Netherlands, where the majority of the population lives. In these circumstances every few years roads and parcels have to be leveled up and the pavement has to be renewed. This makes it possible to update the functional quality of the physical environment. On the other hand, since renewal costs are quite substantial, low cost materials will be used
- In larger cities like Rotterdam, Amsterdam, Utrecht, The Hague, Almere, Groningen large high rise building have become very fashionable. For pedestrians and bicyclists this has

severe disadvantages: walking distances increase, in windy and rainy situations there is severe draft, there are no longer 'eyes on the street' (security).

- Maintenance of urban green space is mostly privatized; local authorities do not take care of the green themselves, but commission this to private companies. The budgets are severely cut. As a result the quality of parks and green strips has decreased substantially. The area of play areas for children have been downsized and 'economized' as well.

2. Culture and subcultures

- The Dutch culture can traditionally be characterized as Calvinistic (austerity, business sense, 'luxury is a sin'). This reflects on the design and material use in public space. Even in high profile areas like shopping streets and central market places and plazas simple, non costly materials are used. Roads are relatively narrow, which proves to be a positive point for walking and pedestrians: relatively easy to cross because of short distance and lower car speeds.
- Contrary to most countries the bicycle has not been abandoned by the public. Cycling has a good image. Even the prime minister, the Queen and other celebrities use the bicycle in public. Of course car use is very common, too
- Culture demands that children and the handicapped are to be protected
- Children, women and the elderly (dominantly women) walk more than average
- Recreational (long distance) walking: mid-aged women over-represented
- In the Netherlands vulnerable road users have limited liability in case of accidents. Children younger than 14 year of age are not liable at all, apart from very evident malice situation. Others in principle are liable for at most 50%. This favorable legal position of vulnerable road users is currently under debate (see below: relation to tendency towards more self regulation and personal responsibilities).
- Since the eighties Government stimulated home ownership. Currently the majority (56%, source: CBS) of inhabitants are home owners, making it the norm for housing. Home ownership generally makes people feel more responsible for their home environment. During the last decade home prices have risen substantially. At current prices 'starters' can no longer afford to buy their own home and need to rent.
- Since the seventies people demand more privacy (Cocooning) and shield their homes with gates, fences and high hedges and position their living room area at the back side of their homes. This results in less supervision of and attention to the public area in front of their homes.
- People spend increasingly less time in their streets. Living concentrates in-house and in their gardens.
- Like most countries, the Netherlands have a growing number of immigrants (19.2% of the population is immigrant; almost half of them are non-western). Society becomes more and more multicultural. Immigrants do not use the bicycle so much; they walk more and use public transport more than non-immigrants.

3. Position in transport and traffic

- The situation in the Netherlands differs fundamentally from most other countries: for space, rights and investments the pedestrian has to compete with the bicycle, which is perceived as much more important.
- pecking order in traffic (commercial traffic → car traffic → motorized two wheeler → bicycle → pedestrian); cyclists generally perceive pedestrians as irritating.
- In many cases pedestrians are shielded from traffic by parked cars.

4. Position within the political and societal force field

- main issue of pedestrians is road safety; the road safety of pedestrians is perceived to be better than that of the bicycle, moped and the car, which is true from the traffic accidents points of view, but not with regard to general accidentology and risks.
- National level: in the formal sense pedestrian safety and mobility is the shared responsibility of 4 ministries: utilitarian traffic = Ministry of Transport, Public Works and Water Management, recreational walking = Ministry of Agriculture and Fishery and Tourism, health aspects: ministry of Health, Welfare and Sports; health and safety of the working environment = Ministry of Social Affairs and Employment. The ministry of Health does not focus on trauma due to accidents; it feels that this is the responsibility of the other ministries. In practice central government perceives the issue as a local matter.
- Regional level: apart from recreational walking, walking and pedestrian are not seen as a relevant issue on this level
- At the local level pedestrian safety, particularly regarding children and the handicapped, is seen as an issue, but there are more important issues to be tackled. They argue that there are not many complaints on this issue from the public. Problems are generally solved ad hoc.
- In general local authorities are sympathetic to the issue and to complaints regarding pedestrian issues. Taking care of it simply does not come to their mind, but if some points out the need for improvement, most of the times they do not object or deny its need. Most local authorities react positively and make (small) repairs.
- In national program manifestos of political parties the pedestrian is rarely mentioned. In local manifestos quite the opposite is the case. Here the smaller Christian and left wing parties devote more space and force to the issue than the large parties; right wing parties seem to have no affinity with walking or pedestrians (Knippenberg, 2006)

5. Feelings of relevant practitioners and policy makers

- The tendency to minimize government (lean government target) leads to disposing of tasks and a 'return to core business'. Thus National government decentralizes policy responsibility to local authorities. Local authorities have many other concrete and urgent matters to attend, refer to the citizen's own responsibility to take care of their environment and argue that there are hardly any complaints.
- The police often argue that there are many much more serious problems to attend and find that traffic safety is the road user's own responsibility. In the past the police seemed hardly really interested in pedestrian issues. In fact traffic has low status within policing. Violation of traffic rules with regard to pedestrians were seldom reinforced. As a rule pedestrians do not get fines for traffic rules violations. There seems to be some change in attitude. In Rotterdam for instance in 3 months time almost 800 car drivers were fined for endangering crossing pedestrians (Telegraaf, 25 March 2006). Reactions to the article were not all positive: some respondents named it racketeering or nonsense.
- A direct result from the lean government tendency are a new forms of contracting, in which the contractor is given full responsibility for design and realization, including safety measures during the building process. It is clear that the contractor / builder has other interests than safe freedom of movement of pedestrians. There are quite a few examples where pedestrians are obliged to make a (lengthy) detour, cross four traffic lanes etc., even in the vicinity of train stations (Rotterdam-Blaak, Apeldoorn) and other public attraction sites. Government no longer acts as a safety net and gives the necessary permits without any check. When there are a lot of complaints the public is simply ignored: 'the permits have been issued, there is nothing we can do...'
- The Shared Space (Monderman) movement fits nicely into the (political common sense) call for more self regulation. Some experts however argue that self regulation in traffic has undetected side effects: parents keep their children out of potentially dangerous

situations, the elderly and the handicapped also evade such situations that are perceived as dangerous (self censure)

- The national Road Safety Institute SWOV does not give priority to gathering expertise on pedestrian safety; the institute refers to AVV as the expert organization. AVV merges with the Roads and Waterway Building Agency to the new DVS Transport and Navigation Agency, which will focus on serving the Rijkswaterstaat (national road and waterway authority) where pedestrians do not fit in. Advising policy makers at the Ministry of Transport is no longer key product.
- Delft Technical University focuses on efficient and agreeable use of public space and public facilities; in general attention to pedestrian issues is related to individual preferences and interest
- The Central Statistics office (Statistics Netherlands) does not pay much attention to the pedestrian in statistics, because there is hardly any demand for that (a spokesman said).
- Within the traffic and transport sciences circle walking is getting more and more attention. In the last bi-annual National Traffic and Transport Experts Workshop more than 25% of the presentations dealt with vulnerable road users. In earlier years the number never exceeded 10%.
- In most cases the argument for taking measures beneficial for pedestrians (like traffic calming, reconstruction of a street into a Woonerf or 30 km/h zone, pedestrianisation, street lighting) is not perceived pedestrian problems but other issues like aesthetics, urban renewal, sewerage reconstruction, commercial needs.
- Traffic engineers have far less eye for pedestrian issues and pedestrian quality than urban designers, urbanists, architects, town planners. Traffic engineers focus of facilities for (car) traffic (capacity, circulation, parking, safety) and generally do not pay much attention to perception of public space. An exception is the relatively new Shared Space movement, which concentrates on the rather intensively used central locations within smaller and mid sized towns. Again, this movement is more architect / urban design oriented than on the efficiency transport and traffic. Special groups like children, the handicapped and the elderly are not implicitly included.
- In the traffic engineering community vulnerable road users issues are seen as 'girly traffic engineering issues' (Ineke Spapé during the 2007 National Traffic and Transport Experts Workshop).
- Although only few local authorities explicitly deal with pedestrian structures and facilities, there are some that mention the issue. In those cases the argumentation is: 'Because walking routes fall within the sojourn areas, there is no need to deal with it in a the municipal traffic structure plan. During the elaboration of the design of the sojourn area walking routes will be dealt with. The measures that are taken into account in this structure plan are related to the pedestrians' need to cross main roads in Veenendaal....' (Goudappel Coffeng, Veenendaal veilig bereikbaar - Verkeersstructuurplan, Deventer, 1998). In Knippenberg's survey 65% of the municipalities indicate to be interested in research of pedestrian issues.
- In general children, and to a lesser extent the handicapped, are the 'motor' for attention to walking and pedestrian facilities. Many cities have or had a policy paper on school routes and/or handicapped routes (Amsterdam, The Hague, Voorschoten, Leiden, Zeewolde, Hilversum: see Knippenberg, 2006). Lately the ageing of the population is also used as argument, particularly on the national level. In some cases on the local level home – care zones have become a leading issue.
- Bicyclist are much better of in traffic and public area policies than pedestrians. In almost all relevant plans policy with regard to bicyclists and bicycle facilities are mentioned, whereas pedestrians and walking hardly gets any attention.
- In general expert perceive the Dutch situation as relatively adequate.
- Lately there is discussion going on regarding zebra crossings. Some municipalities (a small number) indicated to remove zebra crossings, whilst others indicated to have improvement plans. Within the traffic engineering community the opinion that zebra's

alone are not sufficient, dominates. They promote additional measures like elevated crossings, middle islands, narrowing of the street, highly visible portals etc.

6. Media attention public opinion.

- In general only deviant developments and special situation get media attention. The fate of common things is that they do not get attention. The national media pay hardly any attention to pedestrian issues; local media pay some attention to pedestrian accidents, particularly on zebra crossings. In public opinion columns pedestrian issues are quite frequently dealt with, mostly from the vulnerable position.
- The national mobility and traffic safety NGO's (VVN, ANWB, Fietserbond, Wandelvierdaagse, Stichting LWA) pay limited attention to walking and pedestrians. They focus on 'easy' groups like children, the handicapped and potential tourists. Most of the times the message gets lost in abundance of competing messages.
- On internetfora rather obedient reacties are found (possibly the nasty ones are censured by the forum editors).
- In the national traffic safety campaign "I love..." compliance to traffic rules is advocated (I love ... stopping for zebra's; I love... 30 km/h zones).
- In general the public opinion regarding pedestrian issues is favorable, but hardly anyone gives it top priority. Thus the influence is lost in the competition of issues that are perceived to be more urgent.