



Year Report 2021 TRAIL Research School

TRAIL Research School, February 2022

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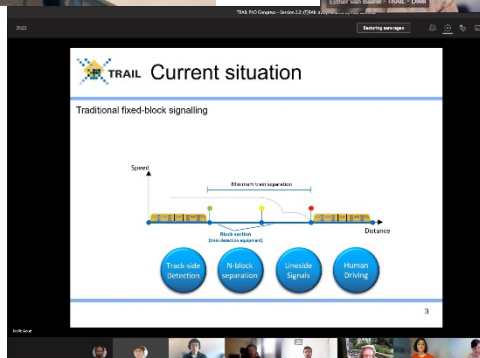
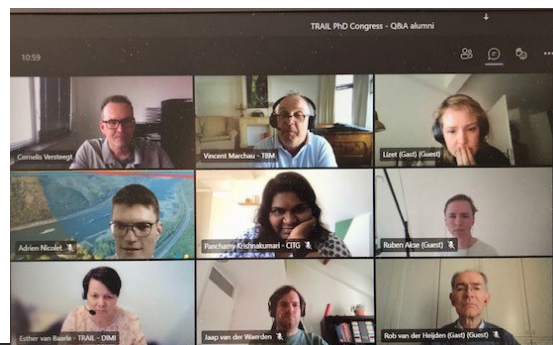
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Selected Highlights TRAIL Research School 2021

- 30 PhD-students received their PhD-degree
- 20 new PhD-students started at TRAIL
- 9 TRAIL PhD courses and 3 PhD seminars
- 8 GP-OML courses
- An international PhD Summer school on Cycles in Cities
- 7 Masterclasses for I and W policymakers
- 1 PhD theses session and 1 special topic session for I and W policymakers



1. What is TRAIL Research School?

TRAIL, the research school for TRAnsport, Infrastructure and Logistics, was founded in 1994 to combine academic education, research, and applied science in a network organization of five Dutch universities (Delft University of Technology, Erasmus University Rotterdam, Radboud University Nijmegen, Eindhoven University of Technology, the University of Twente and the University of Groningen). Now, various faculties and institutes (in the field of economics, technology, policy and management, and the social and behavioral sciences) form a strong network of scientific experts in the integrated area of transport, infrastructure, and logistics.

TRAIL carries out three types of interconnected activities:

1. Training & Education: to educate PhD students and support PhD students in organizing their projects;
2. Research & Development: to initiate and stimulate academic research opportunities;
3. Knowledge Transfer: to promote and perform knowledge transfer activities among TRAIL researchers, related research institutes, and potential users (public and private).

On 31-12-2021 TRAIL counted 60 Staff members, 1 associated staff member, and 120 PhD candidates (see Appendices 2 and 3). The organizational structure of TRAIL Research School consists of the following bodies:¹

1. Supervisory Board, consisting of representatives from the participating universities (deans), chaired by an independent chair;
2. Management Team, consisting of the Scientific Director and the Managing Director and supported by the TRAIL office;
3. Program Board, consisting of TRAIL-research theme leaders and a member of the PhD council;
4. PhD Council, consisting of seven representatives of TRAIL PhD students.

Sections 2 to 4 present specific highlights in the field of Training and Education, Research and Development, respectively Knowledge Transfer. Finally, in section 5, some concluding remarks and an overall outlook of TRAIL for 2022 and further is presented.

¹ See www.rstrail.nl for the current members of the different bodies

2. Training & Education

Training & Education is the core activity of the TRAIL Research School. In 2021 TRAIL performed the following activities:

- The organization of 9 PhD courses and 3 seminars
- The organization of 8 additional courses in the 2-years cycle of the graduate program with Research Schools Beta and ERIM on Operations Management and Logistics (GP-OML)

2.1 TRAIL courses and seminars in 2021

Table 1 gives an overview of the overall TRAIL course program.

With respect to the contents, the T&E program increasingly focuses explicitly on providing courses in the field of Transport, Infrastructure and Logistics (TIL) only (non-TRAIL related courses are the responsibility of the local Graduate Schools). TIL-courses provide knowledge about theories, methods, empirics, and skills for the TIL-domain. TIL-courses are provided by TRAIL or similar institutes (e.g. Beta, Disc, LNMB, Nethur, ERIM, Research Masters Stream (VU)). TRAIL has intensified the cooperation with these (and other) institutes.

With respect to the rules, the T&E program enables a high level of flexibility for students with various backgrounds and needs. Therefore, TRAIL applies the following principles/rules:

- TRAIL welcomes all PhD students (TRAIL and non-TRAIL² PhD students) for following courses.
- At a minimum, PhD students who only follow one or more TIL-courses receive a certificate per course. If they, in addition, successfully pass for the course (e.g. by an assignment), this will be made explicit on the certificate.
- TRAIL offers the option to go for a TRAIL diploma (15 ECTS) – for more details see [our website](#).

² For non-TRAIL PhD students a fee applies, unless there is an agreement between TRAIL and the PhD student's institute. Please contact TRAIL Office for details: info@rstrail.nl

Table 1: TRAIL T&E course program

	By	Part ¹	ECTS ²	TUD GS credits ³	TUD GS category⁴
Introduction to TRAIL and the PhD student process (0.5d) ⁰ (Marchau & Van Wee)	TRAIL	S	0.25	0.5	discipline/research ⁴
I TRAIL Basic Courses ⁵					
Fundamental Knowledge on Transport, Infrastructure & Logistics (Annema & Van Wee) – (4d) ⁶	OML	D	1 - 4	4 - 5	discipline
TRAIL Theories and Methods (3d) (Marchau & others)	TRAIL	T, M	1 - 3	3 - 5	discipline/research
II General TRAIL Courses					
TRAIL Data-analysis and Statistics (3d) (Kroesen & Molin)	TRAIL	S	1 - 3	3 - 5	discipline/research
TRAIL Writing a Literature Review in the TIL Domain (2d) (Van Wee)	TRAIL	S	1 - 4	2 - 5	discipline/research
Machine Learning (4d) ⁶ (Van Hoesel)	OML	M	1 - 4	4 - 5	discipline/research
Societal Relevance of your PhD Research (1d) (Annema & Van Wee)	TRAIL	S	0.25 – 1	0.5 - 2	discipline/research
Writing and Publishing a TRAIL Research Article (1d) (Geurs & Rezaei)	TRAIL	S	0.5 - 1	1 - 2	discipline/research
Discrete Choice Analysis: micro-econometrics and machine learning approaches (3d) (Chorus & Van Cranenburgh)	TRAIL	T	2	3	discipline/research
Stated Choice Data Collection (Rasouli & Caiati)	TRAIL	M	1	2	discipline/research
Transport Innovations (1d) (Annema, Geerlings & Wiegman)	TRAIL	D	0.5 - 1	1 - 2	discipline
III TRAIL Specialisation Courses					
Traffic Flow Phenomena (3d) (Hoogendoorn/Van Lint)	TRAIL	I	1 - 2	2 - 3	discipline
Behavioural Aspects in Transport (1d) (De Waard & Veldstra)	TRAIL	I	0.5 – 1	1 - 2	discipline
Transport Logistics Modelling (4d) ⁶ (Tavasszy & Zuidwijk)	OML	L	1 - 4	4 - 5	discipline/research
Facility Logistics Management (4d) ⁶ (Adan & De Koster)	OML	L	1 - 4	4 - 5	discipline
Quantitative Modelling and Analysis of Supply Chains (4d) ⁶ (De Kok)	OML	L	1 - 4	4 - 5	discipline/research
Advanced Inventory Theory (4d) ⁶ (Dekker & Van Houtum)	OML	L	1 - 4	4 - 5	discipline
Freight Transport Management (4d) ⁶ (Vis & Coelho)	OML	L	1 - 4	4 - 5	discipline
Passenger Transport Systems (4d) ⁶ (Cats & Schmidt)	OML	L	1 - 4	4 - 5	discipline

Legend to table 1

Yearly
Every 1.5 years
Every 2 years

- 0 Between brackets number of course days
- 1 D = Domain Knowledge
T = Theory
M = Methodology
S = Skills
- 2 First number = participated in course – second number = participated in course & passed assignment/exam
- 3 The Promotor decides about the number of TUD GS credits to be administered in DMA
- 4 PhD student can choose either category, since TRAIL ‘methodology’ and ‘skills’ courses are strongly linked to the TRAIL ‘discipline’
- 5 Mandatory courses for the TRAIL Diploma
- 6 Courses given by TRAIL and Research School Beta within the Graduate Program Operations Management and Logistics (GP-OML).
- 7 T: Transport, I: Infrastructure, L: Logistics

Table 2: TRAIL courses 2021

Introduction to TRAIL & the PhD students process (<i>online</i>)	25 January
Writing a Literature Review in the TIL Domain (<i>online</i>)	11 Feb. (start)
Data-analysis & Statistics (<i>online</i>)	11 Mar. (start)
Stated Choice Data Collection (<i>online</i>)	8 & 9 Apr.
Writing & Publishing (<i>online</i>)	15 April
Societal Relevance of your PhD Research (<i>online</i>)	11 May
Data Science Bootcamp (<i>hybrid</i>)	14-Sep. (start)
Traffic Flow Operations and AI (<i>hybrid</i>)	13 Oct. (start)
From Horse to Porsche: innovations in transport and logistics (<i>on-site</i>)	12 November

Table 3: GP-OML courses 2021

Machine Learning I (<i>online</i>)	10 Feb. (start)
Capita selecta: Periodic Review Inventory Management and Markov Decision Processes (<i>online</i>)	10 & 17 March
Facility Logistics Management (<i>online</i>)	3 Mar. (start)
Freight Transport Management (<i>online</i>)	7 Apr. (start)
Machine Learning II (<i>online</i>)	18 May (start)
Logistics Planning: from strategic to real-time (<i>online</i>)	9 & 16 June
Sustainable Operations Management (<i>hybrid</i>)	15 Sep. & 20 Oct.
Emergency Service Logistics (<i>alternative edition</i>)	22 Sep. & 13 Oct.
Fundamental Knowledge on Transport, Infrastructure and Logistics (<i>hybrid</i>)	29 Sep. (start)

In addition, regular seminars by (inter)national renowned scholars are offered by TRAIL (see Table 4). TRAIL organizes these seminars in the ‘slipstream’ of public defenses of PhD’s on topics related to the PhD dissertation and with input of (often international) scientists that are member of the PhD defense committee.

Table 4: TRAIL seminars associated with PhD defenses in 2021

Road Network Design and Management for Automated Driving (online)	18 Jan.
Active Modes and the City (online)	6 May
Behaviour and Safety of Vulnerable Road Users in Current and Future Traffic (online)	31 May

Also, in October the TRAIL International PhD Autumn School on ‘Cycling in Cities’ was organised in the Aula of the TU Delft. Eleven participants were on-site, nine participants joined online. This three day event was awarded with an 8.3 overall.

In summary, despite COVID-19, TRAIL has been able to continue almost all education activities (online or hybrid). Only one course was cancelled and replaced by a tailor made alternative.

2.2 Graduate Program – Operations Management and Logistics

The Operations Management and Logistics (OML)-program started early 2014. The OML-program is a joint effort of the research schools TRAIL, Beta, and ERIM (joined in) to:

1. offer PhD courses within the area Operations Management & Logistics;
2. control the quality of the offered PhD courses and the whole program.

Some specific characteristics of this GP-OML are:

- The OML program runs for 2 years and consists of 9 courses (each about 4-ects, including preparation and assignment);
- Per semester, three 4-day courses are given on a fixed day (Wednesday) every week at a central location in the Netherlands;
- Each course is examined by e.g. an assignment.

See table 3 for GP-OML course titles.

2.3 Evaluation results

A 2021 evaluation of the TRAIL T&E program revealed the following:

- Most basic and specialization courses are given on a regular basis (i.e. once every 1, 1.5, or 2 years).
- In 2021 no courses have been cancelled; for one GP-OML course an alternative was offered because of too few participants.
- Most courses have about 10 or more participants. The average number per course in 2021 was 16 participants.
- Most courses are graded highly by the students (between 7.5 and 8.5). Masterclasses on specific topics are very well attended.

The quality of courses is more important for TRAIL than the quantity. Again, the credits are for the staff members and more specifically the course managers and teachers. TRAIL is very proud to see the very positive evaluation results, and the positive trend in these results (see table below).

Table 5: average grade all courses.

year	
2013	7.8
2014	7.6
2015	8.2
2016	8.4
2017	7.9
2018	8.5
2019	8.3
2020	8.3
2021	8.3

2.4 Origins of PhD students

The Table below indicates the origin of starting TRAIL PhD students for the period 2010-2021. The figures show that after strong increases in TRAIL PhD students in 2015 and 2016, 2021 marked again an average year of inflow. This is related to varying research funding opportunities over different years (e.g. NWO).

Table 6: Origins of PhD students

Country	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010
Netherlands	8	5	7	8	3	14	13	2	7	6	7	9
China	6	6	6	2	8	10	10	10	2	5	5	1
Europe	2	6	3	5	5	8	1	4	0	1	5	5
Middle-East	4	2	4	3	1	4	1	2	2	3	4	2
North-America						1						1
South-America			1		1	1	1	0	0	0	0	0
Africa												1
Asia		1	4	3	1	5	4			1	1	1
	20	20	25	21	20	43	30	18	11	16	22	20

2.5 TRAIL Training and Education outlook

The education activities mentioned in section 2.1-2.3 will be continued in 2022 and further. Due to COVID-19 developments, TRAIL has gained a lot of experience with online and hybrid lecturing. These experiences will be used in the future, e.g. some courses might be offered hybrid (or even fully online) to attract more PhD students (also from outside TRAIL). In addition, courses might be recorded so that students can take these in their own time.

3. Research

TRAIL PhD students and staff members perform research activities on Transport, Infrastructure and Logistics. The logical structure of the TRAIL Research Program follows this simple triad and distinguishes the following themes and subthemes are:

- A. TRAnsport and Mobility
 - a. Demand – Supply Interaction
 - b. Policy, Planning, and Management
- B. Infrastructure and Traffic Management
 - a. Drivers' Behavior
 - b. (Dynamic) Traffic Management
 - c. Intelligent Transport Systems
- C. Logistics and Transport Organization
 - a. Logistics and Supply Chain Management
 - b. Transport (Service) Networks
 - c. Network Design.

3.1 PhD Research

Dissertations

In 2021, 30 TRAIL PhD students received a PhD degree (see below). In Appendix 1 the summaries of these theses are given.

1. Castelein, B., *Accommodating Cold Logistics Chains in Seaport Clusters: The development of the reefer container market and its implications for logistics and policy*, T2021/1, January 2021, TRAIL Thesis Series, the Netherlands
2. Krabbenborg, L.D.M., *Tradable Credits for Congestion Management: support/reject?*, T2021/2, January 2021, TRAIL Thesis Series, the Netherlands
3. Madadi, B., *Design and Optimization of Road Networks for Automated Vehicles*, T2021/3, January 2021, TRAIL Thesis Series, the Netherlands
4. Schneider, F., *Spatial Activity-travel Patterns of Cyclists*, T2021/4, February 2021, TRAIL Thesis Series, the Netherlands
5. Walker, F., *To Trust or Not to Trust? Assessment and calibration of driver trust in automated vehicles*, T2021/5, February 2021, TRAIL Thesis Series, the Netherlands
6. Methorst, R., *Exploring the Pedestrians Realm: An overview of insights needed for developing a generative system approach to walkability*, T2021/6, February 2021, TRAIL Thesis Series, the Netherlands
7. Gavriilidou, A., *Cyclists in Motion: From data collection to behavioural models*, T2021/7, February 2021, TRAIL Thesis Series, the Netherlands
8. Li, Z., *Surface Crack Growth in Metallic Pipes Reinforced with Composite Repair System*, T2021/8, January 2021, TRAIL Thesis Series, the Netherlands
9. Li, X., *Development of an Integrity Analytical Model to Predict the Wet Collapse Pressure of Flexible Risers*, T2021/9, February 2021, TRAIL Thesis Series, the Netherlands
10. Boelhouwer, A., *Exploring, Developing and Evaluating In-Car HMI to Support Appropriate use of Automated Cars*, T2021/10, January 2021, TRAIL Thesis Series, the Netherlands
11. Zhang, B., *Taking Back the Wheel: Transition of control from automated cars and trucks to manual driving*, T2021/11, February 2021, TRAIL Thesis Series, the Netherlands
12. Beirigo, B.A., *Dynamic Fleet Management for Autonomous Vehicles: Learning- and optimization-based strategies*, T2021/12, March 2021, TRAIL Thesis Series, the Netherlands
13. Nagalur Subraveti, H.H.S., *Lane-Specific Traffic Flow Control*, T2021/13, March 2021, TRAIL Thesis Series, the Netherlands
14. Duivenvoorden, K., *Speed Up to Safe Interactions: The effects of intersection design and road users' behaviour on the interaction between cyclists and car drivers*, T2021/14, April 2021, TRAIL Thesis Series, the Netherlands

15. Núñez Velasco, J.P., *Should I Stop or Should I Cross? Interactions between vulnerable road users and automated vehicles*, T2021/15, May 2021, TRAIL Thesis Series, the Netherlands
16. Zomer, L.-B., *Unravelling Urban Wayfinding: Studies on the development of spatial knowledge, activity patterns, and route dynamics of cyclists*, T2021/16, May 2021, TRAIL Thesis Series, the Netherlands
17. Landman, R., *Operational Control Solutions for Traffic Management on a Network Level*, T2021/17, June 2021, TRAIL Thesis Series, the Netherlands
18. Coevering, P. van de, *The Interplay between Land Use, Travel Behaviour and Attitudes: a quest for causality*, T2021/18, June 2021, TRAIL Thesis Series, the Netherlands
19. Wang, Y., *Modeling Human Spatial Behavior through Big Mobility Data*, T2021/19, June 2021, TRAIL Thesis Series, the Netherlands
20. Gent, P. van, *Your Car Knows Best*, T2021/20, July 2021, TRAIL Thesis Series, the Netherlands
21. Pudāne, B., *Time Use and Travel Behaviour with Automated Vehicles*, T2021/21, July 2021, TRAIL Thesis Series, the Netherlands
22. Nguyen, T.T., *Highway Traffic Congestion Patterns: Feature Extraction and Pattern Retrieval*, T2021/22, July 2021, TRAIL Thesis Series, the Netherlands
23. Qu, W., *Synchronization Control of Perturbed Passenger and Freight Operations*, T2021/23, July 2021, TRAIL Thesis Series, the Netherlands
24. Wierbos, M.J., *Macroscopic Characteristics of Bicycle Traffic Flow: a bird's-eye view of cycling*, T2021/24, September 2021, TRAIL Thesis Series, the Netherlands
25. Khakdaman, M., *On the Demand for Flexible and Responsive Freight Transportation Services*, T2021/25, September 2021, TRAIL Thesis Series, the Netherlands
26. Los, J., *Solving Large-Scale Dynamic Collaborative Vehicle Routing Problems: an Auction-Based Multi-Agent Approach*, T2021/26, November 2021, TRAIL Thesis Series, the Netherlands
27. Olde Kalter, M.-J. T., *Dynamics in Mode Choice Behaviour*, T2021/27, November 2021, TRAIL Thesis Series, the Netherlands
28. Onstein, A.T.C., *Factors influencing Physical Distribution Structure Design*, T2021/28, December 2021, TRAIL Thesis Series, the Netherlands
29. Chen, N., *Coordination Strategies of Connected and Automated Vehicles near On-ramp Bottlenecks on Motorways*, T2021/29, December 2021, TRAIL Thesis Series, the Netherlands
30. Azadeh, K., *Robotized Warehouses: design and performance analysis*, T2021/30, TRAIL Thesis Series, the Netherlands

In 2021, 20 PhD students started at TRAIL. Table 7 gives an overview of these new projects.

Table 7: Newly started PhD students at TRAIL in 2021

Title Research	PhD	Name	Univ.	Faculty	Finance source
Developing Adaptive Sustainable Urban Mobility Plans (ASUMPs)	Maha	Attia	RUN	NSM	NWO
Design and Evaluation of Interfaces for Smart Connected Bikes	Mario	Boot	UT	CTW	
Operationalisation of 'Broad Welfare/Well-being into a Transport Policy Context	Marco	Van Burgsteden	UT	ET	
Behavioural Aspects of Hyper-connectivity in Urban Last-mile Logistics	Merve	Cebeci	TUD	CiTG	
The Impacts of Shared Mobility on Multimodal and Inclusive Traffic Accessibility	Luqi	Dong	UT	ET	China Scholarship Council
Optimization of resource positioning in networks with uncertain and limited real-time data	Irene	Van Droffelaar	TUD	TBM	Politie
Discrete Element Modelling to enable Optimal Blast Furnace Charging (DEM-OC)	Ahmed	Hadi	TUD	3ME	
Designing Sustainable Attended Home Delivery Services in E-Grocery	Liana	Van der Hagen	EUR	RSM	CILOLAB
Dynamic and Stochastic Models for Optimization of Transport Operations over Water	Cigdem	Karademir	TUD	3ME	NWO
Scalable, Modular and Fault Tolerant Control for Intelligent Marine Vessels	Nikolaos	Kougiatsos	TUD	3ME	NWO
Improving Travel Demand Model ALBATROSS: a learning-based transportation oriented simulation system	Pim	Labee	TUE	BE	NWO
Development of and Optimized Operation and Maintenance Strategy of Offshore Wind Farms	Mingxin	Li	TUD	3ME	
Methodological Development and Modelling of Human Cognitive Interactions in Traffic Simulation for Automated Driving	Kexin	Liang	TUD	CiTG	China Scholarship Council
Modelling and Distributed Control for the Integration of Railway Traffic Management and Train Control	Xiaoyu	Liu	TUD	3ME	China Scholarship Council
Collaboration for a Resilient and Decarbonized Maritime Industry 4.0	Xiaohuan	Lyu	TUD	3ME	
Development and Applications of Swarm Intelligence for Tradable Mobility Rights and Planning of New Mobility Services	Jesper	Provoost	TUD	CITG	EU H2020
Anxiety Disorders and Transport Problems	Christian	Ratering	RUN	NSM	
AI Decision Support for Designing Next-Gen Cities	Lucas	Spierenburg	TUD	CiTG	
Optimal Real-Time Traffic Management of Train-Centric Railway Operations	Nina	Versluis	TUD	CiTG	EU
Optimizing Performance of Automatic Train Operation on Railway Networks	Ziyulong	Wang	TUD	CiTG	ProRail

*DUT – Delft University of Technology: CEG – Civil Engineering and Geosciences / TPM – Technology, Policy and Management / 3ME – Mechanical, Maritime and Materials Engineering
 EUR – Erasmus University Rotterdam: RSM – Rotterdam School of Management
 EUT – Eindhoven University of Technology – Building Environment
 UT – University of Twente: ET – Engineering Technology
 RU – Radboud University: NSM – Nijmegen School of Management
 RUG – University of Groningen – Economics & Business*

3.2 Future developments in research

As regular funding of PhD research by Universities has almost completely disappeared, other sources for funding interdisciplinary research need to be found and developed. TRAIL will continue to play a role in finding and developing new funding opportunities if applicable, and we will provide input for the development of new large NWO-funded programs if applicable. More specifically, the SURF program ended in 2021. TRAIL was interviewed by persons taking the lead in a possible follow-up scientific program, and gave a lot of input/suggestions. In addition we offered to contribute in follow-up actions. The organizers will contact TRAIL in the near future, when they will contact multiple external academic partners.

4. Knowledge Transfer

4.1 Ktrans highlights 2021

TRAIL PhD Congress 2021

The yearly TRAIL Congress of 2020 has been postponed, as the Covid-19 developments did not allow an onsite meeting. The congress has been rescheduled to April 1st, 2021 (online). During this conference, PhD students discussed their research, met colleagues and relations, and explored future working opportunities. The conference was again open to different types of contributions varying from presenting initial research ideas, work in progress to finalized work.

TRAIL/Ministry of Infrastructure and Water management cooperation

As part of the collaboration between the Ministry of Infrastructure and Water management and TRAIL, 1 online meeting was organized in which policy relevant PhD theses were presented and discussed:

- 7 April, Prof. Serge Hoogendoorn (TU Delft / TRAIL). Dit jaar met de focus op de resultaten van het ALLEGRO project (online)
- 9 September, Bert van Wee: Beleidsrelevante inzichten uit proefschriften vanuit het TRAIL netwerk (Online)

1 meeting was organized on specific, relevant topics in the TIL-domain (in Dutch):

- 1 meeting was organized on a topic relevant for the Ministry, transport and climate change, but cancelled because of the low number of participants.

TRAIL/TUD-lenW Masterclasses

Since 2013, TRAIL is organising Master classes (about 6 to 8 per year) for the Ministry of Infrastructure and Water Management. These Master classes are part of an agreement between the Ministry and the TU Delft about knowledge exchange, education, cooperation, etc. During these Master classes, scientists of the TU Delft and other (often TRAIL) universities present and discuss the latest scientific insights on specific topics with policymakers. In 2021, the following 7 Master classes were organized by TRAIL (all in Dutch):

Kennis is de sleutel tot klimaatactie

Deze Jaarlezing KIS/Masterclass stond in het teken van een verlaat afscheid van Lilian van den Aarsen als directeur Kennis, Innovatie en Strategie van het Ministerie van IenW. Zij is per 1 december 2020 gestart als directeur staf Deltacommissaris. Het thema van deze Masterclass was voor heel IenW relevant met het oog op de komende verkiezingen en de majeure transitie waar we het verschil willen maken. De komende jaren zijn cruciaal voor het slagen van het klimaatbeleid, niet alleen in Nederland. Belangrijke zorg is het behoud van draagvlak voor de noodzakelijke maatregelen. Het halen van de klimaatdoelen zal ongetwijfeld één van de grote dilemma's op de onderhandelingstafels voor het nieuwe kabinet zijn. Dit thema vormt de verbinding tussen het werken aan het Deltaprogramma en het werk van KIS dat Lilian zes jaar lang met verve heeft geleid.

Investeren in waterstof

Wat is de betekenis en het strategisch belang van klimaatneutrale waterstof als grondstof, brandstof en als energiedrager in een duurzame Nederlandse economie? Onlangs bracht de Raad voor de leefomgeving en infrastructuur hierover een advies uit met zes aanbevelingen. Wat betekent dit advies voor IenW en welke rol kan IenW spelen in het verder bevorderen van de toepassing van waterstof?

Door: Ad van Wijk (TU Delft) en Coby van der Linde (CIEP)

De mens tussen de algoritmen

Met de verdere opkomst van Artificial Intelligence (AI) gaan processen steeds vaker automatisch en zonder tussenkomst van menselijke professionals. Denk aan allerlei vormen van robotisering, (semi-)automatische voertuigen en de inzet van algoritmen bij overheidsbesluitvorming. In de toekomst wordt misschien ook een substantieel deel van het werk van de vergunningverlenende ambtenaar, de huisarts en de rechter door AI overgenomen.

Hoe houden gebruikers en burgers inzicht in en grip op de processen en de uitkomsten ervan? Hoe voorkom je bedrijfsongelukken in de digitale systemen en bij wie ligt de verantwoordelijkheid als die ongelukken toch gebeuren? En zou er voor burgers niet eigenlijk een fundamenteel recht moeten bestaan op 'zinvolle menselijke tussenkomst'? En wat betekenen deze ontwikkelingen voor lenW?

Door: Inald Lagendijk (TUD) en Jurgen Goossens (UvT)

Klimaat, droogte en stad

De laatste jaren is het in Nederland steeds droger geworden. Iedereen krijgt direct of indirect met de consequenties hiervan te maken: denk aan verzakkingen van huizen en dijken, zoetwatertekorten, en toenemende schade aan de natuur met ook weer alle gevolgen van dien. Wat is er precies aan de hand, hoe raakt het onze bebouwde omgeving en wat doet lenW – en kan lenW nog meer doen – om de droogteproblematiek te lijf te gaan?

Door: Niko Wanders (UU) Frans van de Ven (TUD / Deltares)

Hoe houden we het democratisch in transities?

De grote transities waar Nederland voor staat, zijn al niet eenvoudig te realiseren. Daar komt bij dat niet alle burgers meteen staan te juichen. Niet iedereen voelt zich betrokken of serieus genomen. Sommige burgers zien vooral verlies en gaan met de hakken in het zand. Hoe kunnen we ervoor zorgen dat de grote duurzaamheidstransities toch zo democratisch mogelijk verlopen? En hoe kun je bijvoorbeeld (waarden)conflicten inzetten om een stap verder te komen met elkaar? Welke lessen kan lenW trekken uit experimenten en theorievorming op dit terrein?

Door: Tamara Metze (WUR) en Udo Pesch (TUD)

Fietskennis: met een U-bocht naar de toekomst

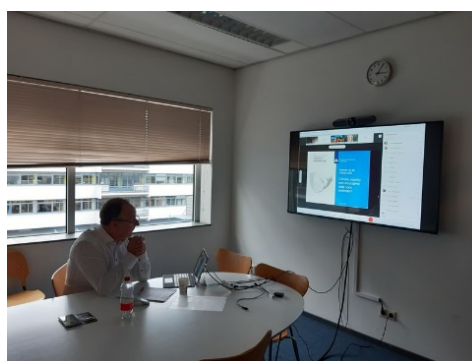
Soms liggen de innovaties voor een duurzame toekomst al achter ons. De fiets is zo'n geval. Maar wisten we niet al alles over fietsen in Nederland Fietsland? Nee, er valt nog veel te leren uit de recente geschiedenis voor ons mobiliteitssysteem. 'En laten we ook niet vergeten dat de fietscultuur in Nederland kwetsbaar is en onderhoud nodig heeft', aldus Ruth Oldenziel, hoogleraar in de geschiedenis van de techniek aan de Technische Universiteit Eindhoven (TUE) tijdens de masterclass waar maar liefst drie proefschriften werden gepresenteerd.

Door diverse sprekers

De Water-Energy-Food Environment Nexus: kansen voor lenW?

De Verenigde Naties heeft zeventien Sustainable Development Goals (SDGs) opgesteld die de basis vormen voor duurzame ontwikkeling. De samenhang tussen welzijn, economische welvaart en een gezond milieu speelt hierin een belangrijke rol. Twaalf van de SDGs zijn gerelateerd aan het duurzaam gebruik van grondstoffen voor productie, distributie en gebruik water, voedsel en energie en hebben grote implicaties voor het functioneren van het land-water-lucht ecosysteem. Met de Water-Energy-Food Environment Nexus aanpak kunnen we de impact van het gebruik en de competitie voor deze grondstoffen analyseren en kunnen we de onderlinge afhankelijkheden slim benutten voor integrale beleidsvorming. Op verschillende plekken ter wereld wordt er al nagedacht en geëxperimenteerd met samenhangende acties rond voedsel, water en energie. De Nederlandse inzending voor de Wereldtentoonstelling Expo Dubai 2020 heeft zelfs uniting water-energy-food als thema. Wat houdt het concept precies in, welke meerwaarde kan het hebben en biedt het lenW ook kansen bij grote transitievraagstukken?

Door: Detlef van Vuuren (PBL en UU) en Joop de Kraker (UM en OU)



4.2 Outlook

Important activities in 2022 on Knowledge Transfer will be:

- TRAIL Internal PhD Congress (September 20th, 2022).
- Various TRAIL/DIMI/Ministry of Infrastructure and Water Management Masterclasses.

5 Concluding remarks

In 2021, the Covid-19 pandemic still continued and urged us to implement significant changes in the way PhD courses are given, conferences were planned, and professional activities were done, in short:

- No PhD courses were cancelled (for one course an alternative was offered) ~~some were rescheduled~~, most courses were given fully online or hybrid. It is expected that this will (partly) continue in the future.
- Master classes (Ministry) and seminars (TRAIL) were hosted online.
- The International PhD Summer school (re-scheduled to the autumn) on cycling was offered in a hybrid way.
- The Annual PhD conference was held online.
- The collaboration with the Ministry of Infrastructure and Water Management will not be continued as off 2022, despite very positive experiences of both the Ministry and TRAIL, because the Ministry prefers to extend collaboration with universities beyond those included in TRAIL.

Appendix 1: Overview of TRAIL Theses in 2021

Accommodating Cold Logistics Chains in Seaport Clusters: The development of the reefer container market and its implications for logistics and policy

Bob Castelein

The global market for conditioned container transport - in refrigerated or 'reefer' containers - is growing rapidly, but also poses significant challenges related to logistics processes and sustainability. This dissertation addresses the question how seaport-related actors can effectively accommodate these logistics chains in seaport clusters. The research findings show how dynamics within actor networks influence a seaport's performance and competitiveness, and how actors can respond to challenges and opportunities in a changing environment.

Tradable Credits for Congestion Management: support/reject?

Lizet Krabbenborg

The concept of tradable peak credits (TPC) is a drastically different alternative in the longstanding search for an effective, yet sufficiently supported, policy instrument to abate the negative effects of car use. This thesis enhances the understanding of opinions regarding this innovative instrument and compares public support for TPC to support for conventional road pricing instruments. This is done using a wide range of qualitative and quantitative methods.

Design and Optimization of Road Networks for Automated Vehicles

Bahman Madadi

Relying on driving automation technology alone without infrastructure support might compromise the potential safety and efficiency of automated vehicles. Therefore, this thesis proposes a road network design method that can cope with the uncertain development path of automated vehicles in the future. Using a modular approach, a comprehensive model is developed to assess the impacts of network infrastructure decisions in presence of automated vehicles on travel behavior and network performance.

Spatial Activity-travel Patterns of Cyclists

Florian Schneider

Knowledge about the way how the bicycle is used for activity participation is still scarce. This thesis provides empirical insights into typical activity travel behaviour of cyclists. A special focus is put on the spatial dimension of activity-travelling by bicycle and its determinants. The findings can be used to design more bicycle-friendly urban environments.

To Trust or Not to Trust? Assessment and calibration of driver trust in automated vehicles

Francesco Walker

Trust predicts the disuse and misuse of automated vehicles. While a lack of trust may induce drivers to not use the automated vehicle's functionalities, excessive trust can lead to dangerous outcomes, with drivers using the system in ways that were not originally intended by its designers. This dissertation explores new ways through which trust can be reliably measured and aligned with the true capabilities of the automated driving system.

Exploring the Pedestrians Realm: An overview of insights needed for developing a generative system approach to walkability

Rob Methorst

Walking is an essential form of human mobility. In policy making, however, pedestrians are largely neglected. This dissertation explores how the system for pedestrians works and what steps authorities can take to improve conditions for pedestrians, walking and sojourning in public space. It outlines an effective and fair approach by redefining the domain. Methorst combines, triangulates and advances available information, data and statistics.

Cyclists in Motion: From data collection to behavioural models

Alexandra Gavriilidou

In this dissertation, a modelling framework is developed to capture operational cycling behaviour, i.e. decisions and movements cyclists make while cycling and interacting with other cyclists and with the infrastructure. Moreover, a large-scale data collection is performed to obtain cyclist trajectories in different types of interactions. Based on the developed framework and collected trajectories, discrete choice models are estimated. These reveal valuable behavioural insights used to make recommendations for the design of cycling infrastructure.

Surface Crack Growth in Metallic Pipes Reinforced with Composite Repair System

Zongchen Li

Surface cracks are serious threats to the structural integrity of offshore metallic pipes. This dissertation proposes a protocol of composite reinforced system (CRS), aiming to decrease the crack growth rate. To determine the crack growth behaviour and possible failure modes, a series of investigations were conducted through numerical, experimental, and analytical approaches. The proposed reinforcement and evaluation method contribute to the applications of CRS and pipe repairing, and corresponded standards.

Development of an Integrity Analytical Model to Predict the Wet Collapse Pressure of Flexible Risers

Xiao Li

Flexible risers used for deep-water production have to withstand huge hydro-static pressure without collapse. Mostly, the collapse calculations are performed through FEA, which is less efficient for the design stage. In view of this, this thesis presents an integrated analytical model, which addresses three challenges in the wet collapse analysis of flexible risers: the interlocked layer profiles, the geometric imperfections and the pipe curvature.

Exploring, Developing and Evaluating In-Car HMI to Support Appropriate use of Automated Cars

Anika Boelhouwer

Commercial cars are increasingly equipped with automated functions to increase traffic safety and driver comfort. However, in order for these benefits to arise, the automation must be used appropriately. This research explores how drivers are currently supported in understanding and using automated car functions, and how this may be improved. Additionally, an adaptive Digital In-Car Tutor is developed and evaluated to support driver's understanding and appropriate use of car automation.

Taking Back the Wheel: Transition of control from automated cars and trucks to manual driving

Bo Zhang

Until automated driving systems are capable of performing all driving tasks under all road conditions, drivers will have to take over control when the automation fails or reaches its operational limits. This thesis tackles challenging Human Factors issues related to control transitions to manual, particularly in automated truck platooning scenarios. The research findings contribute to a better understanding of driver take-over process and the variability between and within drivers.

Dynamic Fleet Management for Autonomous Vehicles: Learning- and optimization-based strategies

Breno Beirigo

Autonomous vehicles (AVs) have been heralded as the key to unlock a shared mobility future where transportation is more efficient, convenient, and cheaper. However, the AV utopia can only come to fruition if most users trust that autonomous mobility-on-demand (AMoD) systems are on a par with owning a vehicle in terms of service quality. This thesis presents a series of learning- and optimization-based AV fleet management strategies to meet user service quality expectations throughout the timeline of vehicle automation technology deployment.

Lane-Specific Traffic Flow Control

Hari Hara Nagalur Subraveti

Traffic control applications have mostly been limited to the roadway level regardless of how the traffic is divided over the lanes. This thesis aims at making the step to lane-specific traffic control to mitigate the negative effects of lane changing on traffic flow on motorways. The impact of lateral control measures on traffic performance are evaluated for both homogenous traffic and mixed traffic of human driven and intelligent vehicles.

Speed Up to Safe Interactions: The effects of intersection design and road users' behaviour on the interaction between cyclists and car drivers

Kristin Duivenvoorden

It is a disquieting development that globally the number of casualties among vulnerable road users when interacting with motorised traffic is increasing. Although a vast and fast growing amount of research addresses cycling safety, the majority of studies address cycling in urban area. Little attention has been paid so far to cycling safety in rural area and in particular the interaction between cyclists and car drivers at rural intersections. This thesis aims to provide information to make these interactions safer by examining how the factors road users' behaviour and intersection design play a role in the interaction between cyclists and car drivers at rural intersections.

Should I Stop or Should I Cross? Interactions between vulnerable road users and automated vehicles

Juan Pablo Núñez Velasco

This dissertation aims to understand the behavior of pedestrians and cyclists when interacting with automated vehicles (AVs). The role of AVs' characteristics such as their physical appearance, whether a driver is present, the presence of external communication interfaces, and factors pertaining to the behavior of the vehicle were investigated using virtual reality road crossing experiments. In addition, psychological factors that could be affected by the presence of AVs were included.

Unravelling Urban Wayfinding: Studies on the development of spatial knowledge, activity patterns, and route dynamics of cyclists

Lara-Britt Zomer

Every day residents and visitors find their way through the complex urban network to go to work or get education, or go sightseeing. This thesis contains studies on the development of spatial knowledge, activity patterns, and route dynamics of cyclists. The contributions and findings narrowed the gap between research on travel behaviour research and research on urban spatial knowledge.

Operational Control Solutions for Traffic Management on a Network Level

Ramon Landman

This thesis aims at designing new traffic control strategies and algorithms that can be combined into a framework, such that traffic problems are solved from a network perspective. The framework opens up the possibility to integrate traffic measures, policy objectives and user interests.

The Interplay between Land Use, Travel Behaviour and Attitudes: a quest for causality

Peter van de Coevering

Governments increasingly embrace land-use policies to promote sustainable travel behaviour. However, the causality of this relationship, and in particular the role of travel-related attitudes, is not clear. This thesis takes a longitudinal approach and explores the directions of causality. It shows that the built environment influences travel behaviour and that travel-related attitudes play an important intervening role. Implications for land-use policies and alignment with accompanying measures are discussed.

Modeling Human Spatial Behavior through Big Mobility Data

Yihong Wang

This thesis reports a set of methods that can help estimate and understand human spatial behavior using big mobility data, such as mobile phone traces and public transport smart card data. Urban authorities, mobility companies and retail companies can learn from the results and implement these methods with their own data to improve transportation services, planning, and policies.

Your Car Knows Best

Paul van Gent

A major cause of congestion is uneven lane usage. As traffic on motorways gets denser, relatively more people start driving in the leftmost lane. This creates an unstable traffic distribution where small disturbances such as a lane change or braking action can result in congestion. This thesis develops a framework, models and algorithms to help reduce congestion through lane-specific advice.

Time Use and Travel Behaviour with Automated Vehicles

Baiba Pudāne

It is widely expected that travellers will enjoy an unprecedented selection of on-board activities in future automated vehicles. This thesis investigates how this new availability may affect travellers' daily time use and travel behaviour. It analyses qualitative and quantitative data, and develops microeconomic models. The models include on-board activities in daily time-use planning, in departure time choice and congestion prediction, and in theoretical analysis of the value of travel time.

Highway Traffic Congestion Patterns: Feature Extraction and Pattern Retrieval

Tin Nguyen

Traffic congestion occurs daily and has negative effects on the quality of mobility as well as other important aspects of life. Vast amounts of data are collected daily to gain insights into the dynamics of traffic. This dissertation is dedicated to developing methodologies and tools to advance the utilisation of traffic data. In general, it comprises the collection, feature extraction and retrieval of patterns describing spatiotemporal evolutions of congestion in highway traffic networks.

Synchronization Control of Perturbed Passenger and Freight Operations

Wenhua Qu

This thesis adopts modeling and optimization approaches to handle perturbations that often occur in transportation and logistics networks. The aim of this work is to improve the service level and to decrease the operating cost via synchronizing the vehicle flows and the client flows. Rescheduling techniques are applied to various modalities of vehicles, whereas re-routing strategies are adopted for the heterogenous passenger and freight flows.

Macroscopic Characteristics of Bicycle Traffic Flow: a bird's-eye view of cycling

Marie Jette Wierbos

To reverse the worrying long-term trends of growing mobility, such as congestion and CO₂ emissions, policy makers try to encourage mode shifts from car use to public transport, cycling and walking. Panel data analyses provide insights into the dynamics in mode choice behaviour. Results show that behavioural changes often precede changes in attitudes and preferences. Therefore, policy makers should focus on interventions aimed directly at the desired behavioural changes.

On the Demand for Flexible and Responsive Freight Transportation Services

Masoud Khakdaman

Several recent innovations have impacted freight transportation services. This thesis aims to measure the role of innovative logistics-related service attributes in the demand for freight transportation services. Through the analysis of qualitative and quantitative data and the development of microeconomic models, this thesis sheds lights on the role new service attributes, such as modal control delegation, transportation flexibility, and value-added services, play in the adoption of innovative freight transportation services.

Solving Large-Scale Dynamic Collaborative Vehicle Routing Problems: an Auction-Based Multi-Agent Approach

Johan Los

Carrier collaboration is essential to increase transportation efficiency and reduce emissions. Current cooperation approaches, however, are limited in their assumptions. This dissertation proposes a method that takes carriers' privacy and autonomy concerns into account, and still enables large-scale cooperation. Besides showing that the potential benefits are huge (collaboration gains of up to 77% are found), this dissertation tackles the key problems of collaborative vehicle routing (related to information sharing, potential fraud, and individual preferences) and provides valuable insights for transportation platform providers.

Dynamics in Mode Choice Behaviour

Marie-José Olde Kalter

To reverse the worrying long-term trends of growing mobility, such as congestion and CO₂ emissions, policy makers try to encourage mode shifts from car use to public transport, cycling and walking. Panel data analyses provide insights into the dynamics in mode choice behaviour. Results show that behavioural changes often precede changes in attitudes and preferences. Therefore, policy makers should focus on interventions aimed directly at the desired behavioural changes.

Factors influencing Physical Distribution Structure Design

Sander Onstein

This thesis studies the factors that influence physical distribution structure design. Distribution structure Design (DSD) concerns the spatial layout of the distribution channel as well as the location(s) of logistics facilities. Despite the frequent treatment of DSD in supply chain handbooks, an empirically validated conceptual framework of factors is still lacking. This thesis studies DSD in multiple industry sectors (Fashion, Consumer Electronics, Online Retail) and proposes a conceptual framework.

Coordination Strategies of Connected and Automated Vehicles near On-ramp Bottlenecks on Motorways

Na Chen

This thesis deals with coordination strategies for connected automated vehicles near on-ramps considering controller performance, safe lane changing conditions, maneuver planning, and trajectory control. Their performance, impacts on traffic operations, and flexibility to adapt to mixed traffic are examined via numerical simulations. Both scientific and practical contributions are summarized.

Robotized Warehouses: design and performance analysis

Kaveh Azadeh

Warehouse automation requires considerable scale and a long-term vision, as the investments can be earned back only in the medium and longer term. Furthermore, there is no one-size-fits-all solution for warehouse automation. Depending on the type of the warehouse and its position within the supply chain, different automation should be considered. In this thesis, we first structure the latest automated technologies and then focus on two systems in more detail. Particularly, we study systems in which robots collaborate with a human picker to pick the orders efficiently.

Appendix 2: TRAIL Staff Members on 31-12-2021

Name			University
Dr. ir.	N.A.H.	Agatz	Erasmus Universiteit Rotterdam -RSM
Dr.	J.A.	Annema	Technische Universiteit Delft-Fac. Techniek, Bestuur en Management
Prof. dr. ir.	B.	van Arem	Technische Universiteit Delft-Fac. Civiele Techniek en Geowetenschappen
Dr.	B.	Atasoy	TU Delft- Fac. Werktuigbouwkunde, Maritieme Techniek & Technische Materiaalwetenschappen
Prof. dr. ir.	E.C.	van Berkum	University of Twente-Fac. Engineering Technology
Dr. ir.	A.J.J.	van den Boom	TU Delft- Fac. Werktuigbouwkunde, Maritieme Techniek & Technische Materiaalwetenschappen
Dr. ir.	P.	Buijs	Rijksuniversiteit Groningen-Fac. Economie en Bedrijfskunde
Dr.	O.	Cats	Technische Universiteit Delft-Fac. Civiele Techniek en Geowetenschappen
Prof. dr. ir.	C.G.	Chorus	Technische Universiteit Delft-Fac. Techniek, Bestuur en Management
Dr. ir.	G.	Correia	Technische Universiteit Delft-Fac. Civiele Techniek en Geowetenschappen
Dr. ir.	W.	Daamen	Technische Universiteit Delft-Fac. Civiele Techniek en Geowetenschappen
Dr.	A.	Dabiri	Technische Universiteit Delft-Fac. Civiele Techniek en Geowetenschappen
Prof. dr. ir.	B.	De Schutter	TU Delft- Fac. Werktuigbouwkunde, Maritieme Techniek & Technische Materiaalwetenschappen
Prof. dr. ir.	R.	Dekker	Erasmus Universiteit Rotterdam - Faculteit der Economische Wetenschappen
Dr.	H.F.	Farah	Technische Universiteit Delft-Fac. Civiele Techniek en Geowetenschappen
Prof. dr.	H.	Geerlings	Erasmus Universiteit Rotterdam - Faculteit der Sociale Wetenschappen
Prof. dr. ir.	K.T.	Geurs	University of Twente-Fac. Engineering Technology
Prof. dr.	R.M.P.	Goverde	Technische Universiteit Delft-Fac. Civiele Techniek en Geowetenschappen
Prof. dr.	M.P.	Hagenzieker	Technische Universiteit Delft-Fac. Civiele Techniek en Geowetenschappen
Dr. ir.	A.	Hegyí	Technische Universiteit Delft-Fac. Civiele Techniek en Geowetenschappen
Prof. dr. ir.	R.E.C.M.	van der Heijden	Radboud Universiteit Nijmegen - Faculteit der Managementwetenschappen
Prof. dr. ir.	J.	Hellendoorn	TU Delft- Fac. Werktuigbouwkunde, Maritieme Techniek & Technische Materiaalwetenschappen
Prof. dr. ir.	S.P.	Hoogendoorn	Technische Universiteit Delft-Fac. Civiele Techniek en Geowetenschappen
Dr.	M.	Janic	Technische Universiteit Delft-Fac. Civiele Techniek en Geowetenschappen
Dr.	X.	Jiang	TU Delft- Fac. Werktuigbouwkunde, Maritieme Techniek & Technische Materiaalwetenschappen

MEng, Dr. techn	P.		Jittrapirom	Radboud Universiteit Nijmegen - Faculteit der Managementwetenschappen
Dr.	V.L.		Knoop	Technische Universiteit Delft-Fac. Civiele Techniek en Geowetenschappen
Prof. dr.	M.B.M.	de	Koster	Erasmus Universiteit Rotterdam -RSM
Dr. ir.	M.		Kroesen	Technische Universiteit Delft-Fac. Techniek, Bestuur en Management
Dr. ir.	F.A.		Kuipers	Technische Universiteit Delft - Faculteit Electrotechniek, Wiskunde & Informatica
Dr. ir.	J.H.		Kwakkel	Technische Universiteit Delft-Fac. Techniek, Bestuur en Management
Prof. dr. ir.	J.W.C.	van	Lint	Technische Universiteit Delft-Fac. Civiele Techniek en Geowetenschappen
Dr .	C.		Maat	Technische Universiteit Delft-Fac. Civiele Techniek en Geowetenschappen
Prof. dr. ir.	V.A.W.J.		Marchau	TRAIL Research School
Prof. dr.	M.H.		Martens	Technische Universiteit Eindhoven
Prof.dr.	H.J.		Meurs	Radboud Universiteit Nijmegen - Faculteit der Managementwetenschappen
Dr.	E.J.E.		Molin	Technische Universiteit Delft-Fac. Techniek, Bestuur en Management
Prof. dr.	R.R.		Negenborn	TU Delft- Fac. Werktuigbouwkunde, Maritieme Techniek & Technische Materiaalwetenschappen
Prof. dr.	S.		Rasouli	Technische Universiteit Eindhoven
Dr.	J.		Rezaei	Technische Universiteit Delft-Fac. Techniek, Bestuur en Management
Prof. dr.	K.J.		Roodbergen	Rijksuniversiteit Groningen-Fac. Economie en Bedrijfskunde
Dr. rer. Nat.	M.E.		Schmidt	Erasmus Universiteit Rotterdam -RSM
Dr. ir.	D.L.		Schott	TU Delft- Fac. Werktuigbouwkunde, Maritieme Techniek & Technische Materiaalwetenschappen
Dr.	S.		Sharif Azadeh	Erasmus Universiteit Rotterdam - Faculteit der Economische Wetenschappen
Prof. dr. ir.	L.A.		Tavasszy	Technische Universiteit Delft-Fac. Techniek, Bestuur en Management
Prof. dr.	R.H.		Teunter	Rijksuniversiteit Groningen-Fac. Economie en Bedrijfskunde
Prof. dr.	H.J.P.		Timmermans	Technische Universiteit Eindhoven
Dr.	A.B.		Unal	Rijksuniversiteit Groningen - Faculteit der Gedrags- en Maatschappijwetenschappen
Dr.	E.		Ursavas	Rijksuniversiteit Groningen - Faculteit Bedrijfskunde
Dr.	W.W.		Veeneman	Technische Universiteit Delft-Fac. Techniek, Bestuur en Management
Dr.	J.		Veldman	Rijksuniversiteit Groningen-Fac. Economie en Bedrijfskunde
Prof. dr. ir.	A.		Verbraeck	Technische Universiteit Delft-Fac. Techniek, Bestuur en Management
Prof. dr.	I.F.A.		Vis	Rijksuniversiteit Groningen-Fac. Economie en Bedrijfskunde
Prof. dr.	D.	de	Waard	Rijksuniversiteit Groningen - Faculteit der Gedrags- en Maatschappijwetenschappen
Dr.	M.		Wang	Technische Universiteit Delft-Fac. Civiele Techniek en Geowetenschappen

Prof. dr.	G.P.	van	Wee	Technische Universiteit Delft-Fac. Techniek, Bestuur en Management
Dr.	M.M.	de	Weerd	Technische Universiteit Delft - Faculteit Electrotechniek, Wiskunde & Informatica
Dr.	B.		Wiegman	Technische Universiteit Delft-Fac. Civiele Techniek en Geowetenschappen
Dr.	S.X.		Zhu	Rijksuniversiteit Groningen-Fac. Economie en Bedrijfskunde
Prof. dr.	R.A.		Zuidwijk	Erasmus Universiteit Rotterdam -RSM

Appendix 3: Overview of TRAIL PhD projects on 31-12-2021

A. Transport & Mobility				
Uncertainty and Cost-Effectiveness of Policy Measures to Reduce CO2 Emissions from Transport	Robert	Kok	TUD	TBM
Activity-Based Travel Demand Modeling under Uncertainty	Eleni	Charoniti	TUE	BE
Analysis of Transportation Mode Between central City and New Towns using Activity-Based Approach	Jia	Guo	TUE	BE
SCRIPTS: A New Generation of Activity-based Models of Travel Demand	Anna-Maria	Feneri	TUE	BE
Policy Implications of Travel Time Budgets	Maarten	t Hoen	TUD	TBM
Activity Based Model of Travel Demand	Valeria	Caiati	TUE	BE
Automated Driving in Freight Transport Truck Platooning	Anirudh	Kishore Bhoopalam	EUR	RSM
Smart Incentives for Sustainable Travel Behaviour	Nadja	Zeiske	RUG	GM W
Moral Discrete Choice Theory	Teodora	Szep	TUD	TBM
New Discrete Choice Theory for Understanding Moral Decision Making Behavior	Tom	Berg, van den	TUD	TBM
The Influence of Built Environment on Pedestrian and Cyclist Behavior around Metro/Railway Station	Yanan	Liu	TUE	BE
Exploring Ways to Incorporate Ethics in Artificial Moral Beings	Andreia	Martins Martinho Bessa	TUD	TBM
Transportation for Self-Organization through Network Integration and Collaboration	Anique	Kuijpers	TUD	TBM
Agent-based Modelling of Moral Equilibria	Tanzhe	Tang	TUD	TBM
Exploring Impacts of Operations of a Fleet of Shared Autonomous Vehicles: agent-based simulation model	Senlei	Wang	TUD	EWI
Improving Sustainability of Regional Railway Services	Marko	Kapetanovic	TUD	CiTG
Parking Policy, Land Use and Sustainable Urban Transport: the case of the shopping trip	Jan-Jelle	Witte	EUR	ESE
Making Rail Freight Fit for the Future	Anuradh a	Jain	RUN	NSM
Effectiveness and Acceptability of a Peak Pricing Scheme on Passenger Rail	Andrike	Mastebroek	TUD	TBM
Quantifying the Impact of Aviation CO2 Abatement Measures on Accessibility of International Passenger Air Transport	Sihyun	Yoo	TUD	TBM
Driver Expectations in Freeway Curve Driving	Johan	Vos	TUD	CiTG
Methods, Operations and Assessment of TRAIN-Centric Railway Signaling Systems	Joelle	Aoun	TUD	CiTG

Supply-side Operations and Behavioural Dynamics of the Ride-sourcing Systems in the Era of Mobility-as-a-Service (MaaS)	Peyman	Ashkrof	TUD	CiTG
Road Safety for Cyclists in Dutch Cities	Teun	Uijtdewilligen	UT	CTW
Participatory Value Evaluation for Renewable Energy Projects	Ignacio	Hernandez	TUD	TBM
Societal Costs and Benefits of Public Participation in Transportation and Planning	Sander	Barneveld, van	TUD	TBM
Port Development Studies in Archipelago Country (case study Indonesia)	Arry	Destyanto	TUD	TBM
Automated Shuttles as Part of a Public Transport Network	Irene	Zubin	TUD	CiTG
Data-driven Optimization Models for Transportation Problems	Mahsa	Farhani	TUD	TBM
Planning and Operation of Future Taxi System: Routing Model of Heterogeneous Vehicles in Mixed Autonomous and Non-autonomous Zone Networks	Qiaochu	Fan	TUD	EWI
Advancing Smart and Healthy City Through New Mobility Choices: exploring individual's preferences between e-bikes, shared mobility, and Mobility as a Service (MaaS)	Xueting	Ren	TUE	BE
Companies' Adoption of Autonomous Trucks	Shao	Mengru	TUE	BE
Incorporating Stochastic Demand Forecasting Model into Model of Optimal Demand Responsive Transport Services Operations	Shangqi	Li	TUE	BE
Smart Connected Bikes	Georgios	Kapousizis	UT	ET
Supporting Sustainable Mobility Transition by Analysing Government - Mobility Provider Interaction	Ruben	Akse	RUN	NSM
Participative Exploratory Modelling of Mobility System Transitions	Karoline	Fuehrer	TUD	TBM
Consumers on the Move - Investigating the Interaction between Government and Consumers Regarding Innovations in Sustainable Mobility	Jaap	Waerden, van der	RUN	NSM
Perception of the City & the City as Driver of Behaviour	Leonid	Datta	TUD	TBM
Artificial Intelligence for Sustainable Real-Time Transportation Systems	Pedro	Zattoni Scroccaro	TUD	3ME
Optimizing Performance of Automatic Train Operation on Railway Networks	Ziyulong	Wang	TUD	CiTG
Scalable, Modular and Fault Tolerant Control for Intelligent Marine Vessels	Nikolaos	Kougiatsos	TUD	3ME
Design and Evaluation of Interfaces for Smart Connected Bikes	Mario	Boot	UT	CTW
Optimal Real-Time Traffic Management of Train-Centric Railway Operations	Nina	Verlsuis	TUD	CiTG
Developing Adaptive Sustainable Urban Mobility Plans (ASUMPs)	Maha	Attia	RUN	NSM
Development and Applications of Swarm Intelligence for Tradable Mobility Rights and Planning of New Mobility Services	Jesper	Provoost	TUD	CITG
Discrete Element Modelling to enable Optimal Blast Furnace Charging (DEM-OC)	Ahmed	Hadi	TUD	3ME
Anxiety Disorders and Transport Problems	Christian	Ratering	RUN	NSM

B. Infrastructure & Traffic Management				
Travel Behaviour and Traffic Operations in Case of Exceptional Events	Mahtab	Joueiai	TUD	CiTG
STAQ: Static Traffic Assignment with Queuing	Luuk	Brederode	TUD	CiTG
Designing and Managing the Transfer Function of Train Stations	Jeroen	Heuvel, van den	TUD	CiTG
Crowd Behaviour under Exceptional Conditions	Erica	Kinkel	TUD	CiTG
Nautical Traffic Modelling for Safe and Efficient Ports	Yang	Zhou	TUD	CiTG
The Design of High-Speed Railway Passenger Service Plans from a Multimodal Transport Perspective	Fei	Yan	TUD	CiTG
Energy-Efficient Timetable Design	Gerben	Scheepmaker	TUD	CiTG
Airline/ATM Network Performance and Optimization	Yalin	Li	TUD	L&R
Connected Driver Assistance and Traffic Management	Niharika	Mahajan	TUD	CiTG
Using a Network Approach on Modelling Traffic Flow: applying the model to cases in Amsterdam and Rotterdam	Boudewijn	Zwaal	TUD	CiTG
Usage of Recorded Actual Travel Data for Long-term Demand Prediction	Jord	Vliet, van der	TUD	CiTG
Cross Project Learning by an International Project Base of Large Infrastructure Projects	Yan	Liu	TUD	CiTG
Online Route Planning in Response to Non-Recurrent Traffic Disruptions	Oskar	Eikenbroek	UT	CTW
Creative Re-Designing of Urban Public Space in the Era of Automated Driving, Vehicle Sharing and Electrification	Maryna	Ozturker	TUD	CiTG
Sensing Platform: monitoring, modeling and forecasting urban mobility through interactions of connected autonomous vehicles and active modes	Alphonse	Vial	TUD	CiTG
The Use of VR/AR to Determine Pedestrian Walking and Travel Choice Behaviour	Yan	Feng	TUD	CiTG
Modelling Traffic Operations and Capacity Considering Driving Behaviours and Cooperative Driving at Signalized intersections	Meiqi	Liu	TUD	CiTG
Managing Cyclist Flows in Urban Areas	Giulia	Reggiani	TUD	CiTG
Understanding Traveller Behaviour under Choices in the Context of Public Transportation using a Combination of Data Sources	Sanmay	Shelat	TUD	CiTG
Impact of North-South Metro Line in Amsterdam on public Transport Ridership & Quality	Malvika	Dixit	TUD	CiTG
Advanced Traffic Management Strategies to Improve the Reliability of Port-to-Hinterland Freight Operations	Salil	Sharma	TUD	CiTG
Data-driven Integrated Model for Joint Traffic and Logistics Management	Ali	Nadi Najafabadi	TUD	CiTG
Real-time Forecasting of Large-scale Crowd Movements	Martijn	Sparnaaij	TUD	CiTG

Accessibility and Road safety: Integration of road safety indicators into accessibility analysis and planning	Merhna Z	Asadi	UT	ET
Improvement of the Utrecht Public Transport system by the Integration of Modes	Roy	Kuijk, van	TUD	CiTG
Performance and Safety Evaluation of Dedicated Lanes for Automated and Connected Vehicles	Solmaz	Razmi Rad	TUD	CiTG
Optimizing Blended Learning in Higher Education from a carbon Footprint Perspective	Marieke	Versteijlen	TUD	TBM
Urban Traffic Estimation and Prediction Methods: the added value for urban traffic control	Muriel	Verkaik-Poelman	TUD	CiTG
The Impact of Built Environment on Individual Health, with Weight Status as the Indicator	Hong	Yan	TUD	TBM
Traveller Preferences and Behavioural Dynamics in the Era of MAAS	Nejc	Gerzinic	TUD	CiTG
Multi-scale Demand Estimation/Prediction	Zahra	Eftekhar	TUD	CiTG
Transition Phases and Tipping Points in MaaS Provision	Arjan	Ruijter, de	TUD	CiTG
Multi-scale Estimation and Prediction of Traffic Dynamics	Guopen g	Li	TUD	CiTG
Mobility and Perceptions of Accessibility in Peripheral Rural Areas	Felix	Pot	RUG	SS
Human Drivers Behaviour and Modelling in Mixed Traffic	Nagarjun	Reddy	TUD	CiTG
Digital divide in transport services and transport disadvantage	Anne	Durand	TUD	CiTG
Automated Vehicles Operational Design Domain	Dong	Jongqi	TUD	CiTG
Evaluating Equity and Accessibility Based on Ethical Theories and Accessibility-based Approaches	Le	Zhu	TUD	TBM
Human-machine Interfaces on Bicycles Promoting Transparent Interactions with Automated Vehicles	Siri Hegna	Berge	TUD	CiTG
Predicting Travellers' Choices for Mobility Innovations in a Different Future	Kristel	Bronsvort	TUD	TBM
Studying the Impact of Crowd Management Measures in Crowded Pedestrian Spaces using Field Studies	Lucia	Schaik, van	TUD	CiTG
Improving Travel Demand Model ALBATROSS: a learning-based transportation oriented simulation system	Pim	Labee	TUE	BE
AI Decision Support for Designing Next-Gen Cities	Lucas	Spierenburg	TUD	CiTG
Modelling and Distributed Control for the Integration of Railway Traffic Management and Train Control	Xiaoyu	Liu	TUD	3ME
Methodological Development and Modelling of Human Cognitive Interactions in Traffic Simulation for Automated Driving	Kexin	Liang	TUD	CiTG
The Impacts of Shared Mobility on Multimodal and Inclusive Traffic Accessibility	Luqi	Dong	UT	ET
Operationalisation of 'Broad Welfare/Well-being into a Transport Policy Context	Marco	Burgsteden, van	UT	ET
Behavioural Aspects of Hyper-connectivity in Urban Last-mile Logistics	Merve	Cebeci	TUD	CiTG

C. Logistics and Transport Organisation				
Multi-Level Control of Large-Scale Logistic Systems	Yashar	Zeinaly	TUD	3ME
Modelling and Optimization on Local Traffic Networks	Yu	Hu	TUD	3ME
Performance Interaction Model	Alf	Smolders	TUD	CiTG
Consolidation of Transportation Flows in Multi-Channel Retail	Joydeep	Paul	EUR	RSM
The Development of Multi-Level Capacity Control Mechanisms in Sychromodal Transport	Hobbs	White	EUR	RSM
Sychromodal Transport	Alberto	Giudici	EUR	RSM
Physical Internet	Patrick	Fahim	TUD	TBM
Supply Chain Disruption Management	Bahareh	Zohoori	TUD	TBM
Collaboration Mechanisms Design for Green Supply Chain	Kailan	Wu	TUD	TBM
Predictive Sychromodality for more Efficient Container Transportation	Rie	Larsen	TUD	3ME
Sustainable City Logistics and Urban Consolodation Centres	Anna	Dreischerf	RUG	E&B
Cooperative Control for Autonomous Ship	Zhe	Du	TUD	3ME
Incentive Design in Socially Responsible Supply Chain Management	Hamed	Vafa Arani	EUR	RSM
Network Performance under Emergent Behaviour in Hinterland Container Shipping: a complex network perspective	Camill	Harter	EUR	RSM
The Structure of Power and Decision-Making in Dyadic Supply Chains	Kartika	Nurhayati	TUD	TBM
Multi-Objective Optimization for Maritime and Hinterland Transportation	Yimeng	Zhang	TUD	3ME
The Impacts of Collaboration on Resource Utilization in Warehouses	Negin	Jamili	EUR	RSM
Supply Chain Visibility with Sparse Data	Isabelle	Schilt, van	TUD	TBM
Logistics Models for Improving the Efficiency of Ports and Inland Waterways	Adrien	Nicolet	TUD	3ME
Designing Sustainable Attended Home Delivery Services in E-Grocery	Liana	Hagen, van der	EUR	RSM
Collaboration for a Resillient and Decarbonized Maratime Industry 4.0	Xiaohuan	Lyu	TUD	3ME
Development of and Optimized Operation and Maintenance Strategy of Offshore Wind Farms	Mingxin	Li	TUD	3ME
Dynamic and Stochastic Models for Optimization of Transport Operations over Water	Cigdem	Karademir	TUD	3ME
Optimization of resource positioning in networks with uncertain and limited real-time data	Irene	Droffelaar, van	TUD	TBM

*** Themes**

1. *Transport & Mobility*
2. *Infrastructure & Traffic*
3. *Logistics*

**** Abbreviations**

TUD	Delft University of Technology
EUR	Erasmus University Rotterdam
RU	Radboud University Nijmegen
UT	University of Twente
TUE	Eindhoven University of Technology
RUG	University of Groningen

