Year Report 2020
TRAIL Research School

TRAIL Research School, February 2021

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Contents

Selected Highlights TRAIL Research School 2020

- 21 PhD-students received their PhD-degree

- 20 new PhD-students started at TRAIL

- 5 TRAIL PhD courses and 5 PhD seminars

- 7 GP-OML courses

- An international PhD Summer school on Automated Driving

- 5 Masterclasses for I and W policymakers

- 1 PhD Theses session and 2 special topics sessions for I and W policymakers

- [3 video lectures and a MOOC](#) have been published on our website
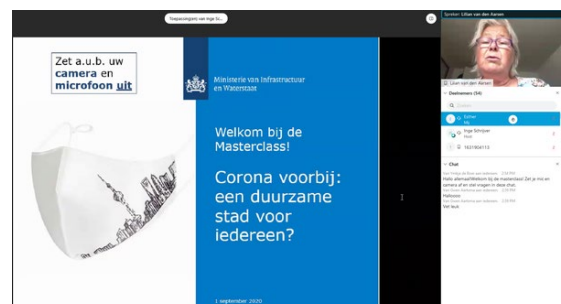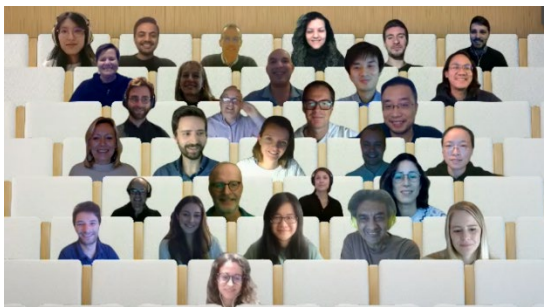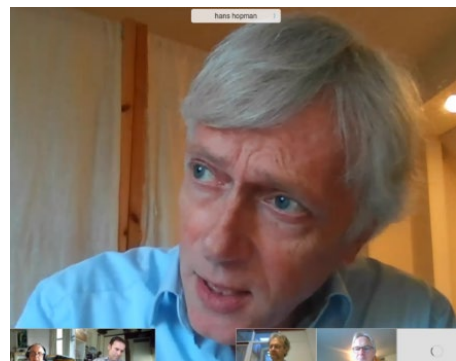
1. What is TRAIL Research School?

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 31-12-2020 TRAIL counted 66 Staff members, 4 associated staff members, and 134 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 2021 and further is presented.

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[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 2020 TRAIL performed the following activities:

- The organization of 5 PhD courses and 5 seminars
- The organization of the 7 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 2020

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 considered to be 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 sufficient flexibility for students with various backgrounds and needs. Therefore, TRAIL applies the following principles/rules:

- TRAIL welcomes all PhD students (TRAIL and non-TRAIL[2] PhD students) for following courses.
- At a minimum, PhD students who follow only 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.

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[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 (June 2020)

	By	Part [1]	ECTS [2]	TUD GS credits [3]	TUD GS category
Introduction to TRAIL and the PhD student process (0.5d) *(Marchau & Van Wee)*	TRAIL	S	0.25	0.5	discipline/ research[4]

I TRAIL Basic Courses [5]	By	Part [1]	ECTS [2]	TUD GS credits[3]	TUD GS category
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	By	Part [1]	ECTS [2]	TUD GS credits[3]	TUD GS category
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 & Wiegmans)*	TRAIL	D	1 - 2	1 - 3	discipline

III TRAIL Specialisation Courses	By	Part [7]	ECTS [2]	TUD GS credits [3]	TUD GS category
Traffic Flow Phenomena (3d) *(Hoogendoorn/Van Lint)*	TRAIL	I	1 - 3	3 - 5	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]   Mandatory courses for the TRAIL Diploma

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

Table 2: TRAIL courses 2020

Introduction to TRAIL and the PhD Students Process *(Marchau/Van Wee)*	3 February
Writing a Literature Review in the TIL-domain *(Van Wee)*	13 Feb., 16 Apr. & 22 June
Discrete Choice Analysis *(Chorus/Van Cranenburgh)*	8, 10 & 11 Sept.
TRAIL Theories & Methods *(Marchau and others)*	5, 8 & 26 October
Behavioral Aspects in Transport *(De Waard)*	8 December

Table 3: GP-OML courses 2020

Passenger Transport Systems (Cats/Smits)	5 & 19 Feb., 4 March, 1 Apr.
Transport Logistics Modelling (Tavasszy/Zuidwijk)	12 & 26 Feb.,25 March, 15 Apr.
Capita selecta: Periodic Review Inventory Management (Feinberg)	11 & 18 March
Capita selecta: Behavioral OM *(Van Wezel/Buijs)*	9 & 13 September
Quantitative Modelling and Analysis of Supply Chains *(De Kok)*	30 Sept., 21 Oct., 28 Oct., 16 Dec.
Fundamental Knowledge on Transport, Infrastructure & Logistics *(Annema/ Van Wee)*	7 & 14 October, 4 & 25 November
Machine Learning *(Almeida/Van Nieuwenhuyse)*	11 & 12, 18 & 19 November
Capita selecta: Empirical Research in SCM *(Udenio)*	2 & 9 December

Legend to table 2 & 3: COVID-19 implications

On site
Started on site – later online
Hybrid: on site + online at the same time
Online
Postponed till Spring 2021

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 promotion committee. Also, seminars are organized on visiting leading academics (see Table 5).

Table 4: TRAIL seminars associated with PhD defenses in 2020

Modelling Passenger Behaviour and Managing Public Transport Operations under Disturbances	26 Feb.
Applications of Data and network Science in Transportation	27 Feb.
Safety Assessment of Automated Driving and Intelligent Transportation Systems*	16 March
New Generation Mobility Services *	2 Apr.
Internet access, automation and COVID-19: On the impacts of new and persistent determinants of travel behaviour	16 Jul.
Planning and Operations of Mobility On-Demand	22 Oct.
Driver Behaviour and Traffic Operations with Automated Vehicles	2 dec.

Table 5: TRAIL seminars associated with visiting researchers in 2020

The Impact of Public Transport Investment of Property Prices	Mulley	1 Apr.

Legend to table 4 & 5: COVID-19 implications

On site
Cancelled
Online

In summary, despite COVID-19, TRAIL has been able to continue most education activities (online or hybrid).

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 since 2020 ERIM 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.

Table 6: GP-OML Program January 2020 – December 2022

January – June 2020
Passenger Transport Systems *(Cats/Smits)*
Transport Logistics Modelling *(Tavasszy/Zuidwijk)*
Capita selecta: Periodic Review Inventory Management *(Feinberg)*
Machine Learning *(Van Hoesel)*

September – December 2020
Quantitative Modelling and Analysis of Supply Chains *(De Kok)*
TRAIL Fundamental Domain Knowledge *(Van Wee/Annema)* *
Machine Learning *(Almeida/Van Nieuwenhuyse)* *
Capita selecta: Behavioral OM *(Van Wezel/Buijs)*
Capita selecta: Empirical Research in SCM*(Udenio)*

January – June 2021
Machine Learning (Almeida/Van Nieuwenhuyse)
Freight Transport Management (Vis)
Facility Logistics Management (De Koster/Adan)
Capita selecta: Periodic Review Inventory Management (Feinberg)

September – December 2021
Advanced Inventory Theory *(Dekker/Van Houtum)*
TRAIL Fundamental Domain Knowledge *(Van Wee/Annema)*
Capita selecta: Emergency Service Logistics *(Van der Mei/Van den Berg)*
Capita selecta: Sustainable OM *(Tan)*

January – June 2022
Machine Learning *(Almeida/Van Nieuwenhuyse))*
Transport Logistics Modelling *(Tavasszy/Zuidwijk)*
Passenger Transport Systems *(Cats/Smits)*

September – December 2022
Quantitative Modelling and Analysis of Supply Chains (De Kok)
TRAIL Fundamental Domain Knowledge (Van Wee/Annema)
Capita selecta: Behavioral OM (Van Wezel/Buijs)
Capita selecta: Empirical Research in SCM (Udenio)

* These courses are given every year

2.3   Evaluation results

A recent evaluation of the TRAIL T&E program over the period 2014-2020 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 2020 no courses have been cancelled; some re-scheduling due to the COVID-19 developments was done.
- Most courses have about 10 or more participants; in total 1200 participants followed a TRAIL courses (incl. GP-OML courses). The average number per course is 14 participants.
- Most courses are graded highly by the students (between 7.5 and 8.5). Masterclasses on specific topics are very well attended.

The emphasis has moved to increasing the quality of courses given. 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 7: 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

2.4   Other educational activities by TRAIL

In addition, two Video Clips were be developed, one on "TRAIL-Theories and Methods" and one on "How to review a TIL paper". In addition, together with Bart van Arem and Goncalo Correia, TRAIL organized an International Summer School for PhD students on Automated Driving. **(October 28-30, 2020)**
This School was postponed to the Autumn, because of Covid-19 restrictions. Later, we decided to make it an online event. In total 25 persons attended, 11 from TRAIL and 14 outside from TRAIL (15 from The Netherlands, 3 from Sweden, 2 from Finland, 2 from Israel, 2 from USA, and 1 from Italy). The Autumn School was evaluated very high (average mark: 8.8). Both participants and lecturers were very positive. The software used for online lecturing (MS Teams) worked well.
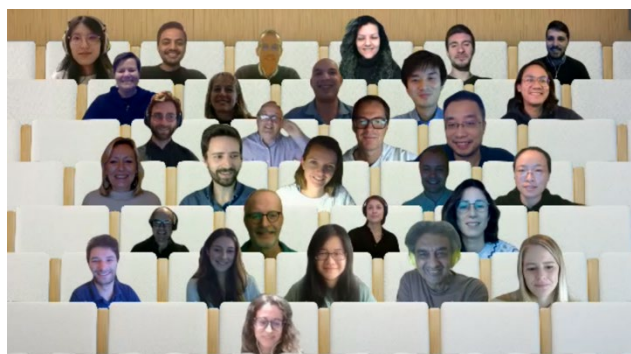
2.5   Origins of PhD students

The Table below indicates the origin of starting TRAIL PhD students within the period of 2010-2020. The figures show that after strong increases in TRAIL PhD students in 2015 and 2016, 2020 marked again an average year of inflow. This is related to varying research funding opportunities over different years (e.g. NWO).

Table 8 Origins of PhD students

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

2.6   TRAIL Training and Education outlook

The education activities mentioned in section 2.1-2.3 will be continued in 2021 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 students. 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 2020, 21 TRAIL PhD students received a PhD degree (see Table 5). In Appendix 1 the summaries of these theses are given.

Table 9: TRAIL PhD theses 2020

2020	Family name	First name	Univ.	Month
Potential of Increasing Road Vehicle Automation for Traffic Management Application	Erp, van	Paul	TUD	Feb.
Short-term Traffic Prediction	Luo	Ding	TUD	Feb.
Measuring, Modelling and Improving Reliability and Robustness of Urban Public Transport in a Multi-Level Context: a passenger perspective	Yap	Menno	TUD	Feb.
Automatic Multiscale Graph Generation from Geographical Data	Krishnakumari	Panchamy	TUD	Feb.
Evaluating Electric Vehicle Charging Infrastructure Policies	Wolbertus	Rick	TUD	Feb.
Impacts of Automated Driving on Traffic Flow	Mullakkal Babu	Freddy	TUD	Mar.
Urban Parking Management in the Times of Shared (Automated) Mobility	Winter	Konstanze	TUD	Apr.
Design and Control of Autonomous Vehicle Storage and Retrieval Systems	Mirzaei	Masoud	EUR	Apr.
Composite Indicators of Company Performance for Truck Manufacturers	Zeng	Qinqin	TUD	May
Synthesis of Machine Learning and Choice Modeling	Alwosheel	Ahmad	TUD	July
Mobility Forecasting and Evaluation of Responsive Intelligent Public Transport Systems	Alonso Gonzalez	Maria	TUD	July

Sustainable Logistics in Fresh Food (SLIFF)	Post	Roel	RUG	Aug.
Sustainable Logistics in Fresh Food	Rijal	Arpan	EUR	Sep.
Active Mode Research Based on Social Media Data	Gong	Xun	TUD	Sep.
Demand Responsive Transport Systems in SCRIPTS project	Sreekantan Nair	Jishnu Narayan	TUD	Sep.
Dynamic Contracting in Infrastructures	Scharpff	Joris	TUD	Nov.
Synchromodal Transportation in Multinational Cold Chains	Guo	Wenjing	TUD	Nov.
EMPOWER People to Reduce Car Traffic	Huang	Bingyuan	UT	Dec.
Line Plan Evaluation and Timetabling	Polinder	Gert-Jaap	EUR	Dec.
Using Cooperative ACC to form High-performance Vehicle Streams	Xiao	Lin	TUD	Dec.
The Next Frontier in Random Regret Minimization Modeling	Huang	Bing	TUD	Dec.

Cum Laude
Not published in TRAIL Thesis series

[1] DUT – Delft University of Technology
 UT – University of Twente
 RU – Radboud University Nijmegen

In 2020, 20 PhD students started at TRAIL. Table 10 gives an overview of these new projects.

Table 10: Newly started PhD students at TRAIL in 2020

Family Name	First name	Research subject	Univ.	Fac.	Finance source
Akse	Ruben	Supporting Sustainable Mobility Transition by Analysing Government - Mobility Provider Interaction	RU	NSM	NWO
Berge	Siri Hegna	Human-machine Interfaces on Bicycles Promoting Transparent Interactions with Automated Vehicles	TUD	CITG	EU
Bronsvoort	Kristel	Predicting Travellers' Choices for Mobility Innovations in a Different Future	TUD	TBM	NWO
Datta	Leonid	Perception of the City & the City as Driver of Behaviour	TUD	TBM	
Durand	Anne	Digital divide in transport services and transport disadvantage	TUD	CITG	KIM
Fan	Qiaochu	Planning and Operation of Future Taxi System: Routing Model of Heterogeneous Vehicles in Mixed Autonomous and Non-autonomous Zone Networks	TUD	EWI	China Scholarship Council
Farhani	Mahsa	Data-driven Optimization Models for Transportation Problems	TUD	TBM	
Fuehrer	Karoline	Participative Exploratory Modelling of Mobility System Transitions	TUD	TBM	
Jamili	Negin	The Impacts of Collaboration on Resource Utilization in Warehouses	EUR	RSM	
Jongqi	Dong	Automated Vehicles Operational Design Domain	TUD	CITG	NWO
Kapousizis	Georgios	Smart Connected Bikes	UT	ET	
Li	Shangqi	Incorporating Stochastic Demand Forecasting Model into Model of Optimal Demand Responsive Transport Services Operations	TUE	BE	Self-funded
Mengru	Shao	Companies' Adoption of Autonomous Trucks	TUE	BE	
Nicolet	Adrien	Logistics Models for Improving the Efficiency of Ports and Inland Waterways	TUD	3ME	EU - H2020
Ren	Xueting	Advancing Smart and Healthy City Trough New Mobility Choices: exploring individual's preferences between e-bikes, shared mobility, and Mobility as a Service (MaaS)	TUE	BE	China Scholarship Council

Schaik, van	Lucia	Studying the Impact of Crowd Management Measures in Crowded Pedestrian Spaces using Field Studies	TUD	CITG	
Schilt, van	Isabelle	Supply Chain Visibility with Sparse Data	TUD	TBM	Indirect government (Police)
Waerden, van der	Jaap	Consumers on the Move - Investigating the Interaction between Government and Consumers Regarding Innovations in Sustainable Mobility	RU	NSM	NWO
Zattoni Scroccaro	Pedro	Artificial Intelligence for Sustainable Real-Time Transportation Systems	TUD	3ME	
Zhu	Le	Evaluating Equity and Accessibility Based on Ethical Theories and Accessibility-based Approaches	TUD	TBM	China Scholarship Council

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 will end next year. TRAIL has had contact with one of the two persons in charge for a (possible) follow-up scientific program. We offered to provide input and/or discuss options. The organizers will contact TRAIL in the near future, when they will contact multiple external academic partners.

4. Knowledge Transfer

4.1 Ktrans highlights 2020

TRAIL PhD Congress 2020
The yearly TRAIL Congress of 2019 has been postponed, as the Covid-19 developments did not allow an onsite meeting last November. The congress has been rescheduled to April 1st, 2021 (onsite or online). During this conference, PhD students can discuss their research, meet colleagues and relations, and explore future working opportunities. The conference will again be open to different types of contributions varying from presenting initial research ideas, work in progress to finalized work.

2nd National conference on Operations Management and Logistics (Beta, TRAIL and ERIM)
On October 16, 2020 the Graduate Program OML organized the second Netherlands Operations Management and Logistics Conference. After having to cancel the regular conference in March due to the COVID-19 situation, the conference committee decided to organize an online version. The virtual conference brought together researchers within the operations management and logistics community in the research schools of Beta, Trail and ERIM.

During the conference, the keynote speakers and workshop leaders delivered lively and interactive presentations. Professor Iris Vis provided an interesting talk on how Physical Internet affects logistics innovations and Dr. Julian Pachon shared Amazon's success story on last mile operations. During their workshops, Professor Jan Fransoo enlightened the participants on how to make themselves and their research more visible and Professor Caspar Chorus gave tips and critical advices to increase the chances of getting personal grants. In between the talks, the participants got the opportunity meet and greet in randomly composed breakout sessions.

GP-OML looks back on a successful edition of the conference, enabled by inspiring speakers, networking sessions and enthusiastic participants. It looks forward to welcoming you at the next edition Netherlands OML Conference!

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 meetings were organized in which policy relevant PhD theses were presented and discussed:
* 20/05/2020, Bert van Wee: PhD thesis meeting (about 50 participants)

2 meetings were organized on specific, relevant topics in the TIL-domain (in Dutch):
* 09/09/2020, Prof. Prof. Bert van Wee, Dr. Mr. Niek Mouter, Prof. Serge Hoogendoorn, Prof. Erik Verhoef, Dr. Mark Lijesen: TRAIL lecture on COVID-19, transport measures and effects (about 120 participants)

* 29/09/2020, Prof. Bert van Wee on session on car sharing

TRAIL/TUD-IenW Masterclasses
Since 2013, TRAIL is organising Master classes (about 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 2020, the following 5 Master classes were organized by TRAIL (all in Dutch)

1. <u>Smart mobility hypes: what is really useful?</u>
Hypes rond (slimme) mobiliteit: wat kun je er nu echt mee?
Autonoom vervoer, MaaS/deelmobiliteit, elektricifering: hoe realistisch is deze toekomst en is er niet veel meer sprake van mediahypes – al dan niet inmiddels over hun toppunt heen? Hoe en waarom komen dit soort hypes tot stand? Wat zijn ze werkelijk waard? Welke rol speelt de politiek? En hoe kun je er als IenW omgaan met hypes rond mobiliteit en wat valt er te leren uit de casus rond automatische voertuigen?)
Sprekers: Bart van Arem (TUD), Hans Jeekel (TUE)

2. <u>Beyond COVID-19: a sustainable city for everybody?</u>
Corona voorbij: een duurzame stad voor iedereen?
Wat willen we met de publieke ruimte en onze mobiliteit nu we gezien hebben wat een coronacrisis ermee doet? Kunnen we meer ruimte geven aan wandelaars, fietsers en bijvoorbeeld ook spelende kinderen? Hoe moet het met de auto in de stad? En het OV? Alle plannen aanpassen aan een nieuwe werkelijkheid? En welke werkelijkheid is dit dan? Wat betekent deze nieuwe werkelijkheid en de kans op radicale verandering voor IenW?
Sprekers: Ellen van Bueren (TUD), Marco te Brömmelstroet (UvA)

3. <u>Policies for quality of life and happiness</u>
Sturen op Geluk en Brede Welvaart
Liever geluk en welzijn als doel van beleid dan bijvoorbeeld economische voorspoed. Hoe zit met de Nederlandse bevolking: het gelukkige en het minder gelukkige deel? Hoe kunnen we met IenW-beleid een bijdrage aan geluk leveren? Relatie leggen met herontdekking van belangrijke waarden in het dagelijkse leven tijdens corona + het advies van de planbureaus over brede welvaart.
Sprekers: Akshaya de Groot (ex-EUR, zelfstandig), Jeroen Boelhouwer (SCP)

4. <u>Smart and green shipping</u>
Slimme en groene scheepvaart
Het doel van de International Maritime Organization (IMO, een agentschap van de Verenigde Naties) is een duurzame internationale zeescheepvaart in 2050: minstens 50% reductie van broeikasgassen en 100% indien mogelijk. Hoe kan dit? De technieken zijn er, er ligt een masterplan van de sector, er zijn Green Deals en er zijn verschillende mogelijkheden voor beleid. Maar is het genoeg? Hoe zou IenW groene scheepvaart een boost kunnen geven?
Sprekers: Hans Hopman of een collega (TUD), Jasper Faber (CE Delft)

5. <u>Biodiversity: possible roles of the Ministry of IenW?</u>
Biodiversiteit: wat kan, moet en wil IenW ermee
De biodiversiteit staat ernstig onder druk. De afname van de rijkdom aan dieren en planten gaat niet alleen wereldwijd, maar ook in Nederland snel. En dat terwijl biodiversiteit gerust de basis onder ons bestaan mag heten: essentieel voor het in stand houden van ecosystemen en daarmee een gezonde leefomgeving. Hoe kunnen we biodiversiteit weer versterken en we zijn daarvoor aan zet? En hoe kunnen we Nederlands verder ontwikkelen met meer oog voor biodiversiteit? Wat kan daarbij de rol van IenW zijn?
Sprekers: Louise Vet (ex-NIOO|WUR, nu met emeritaat), Fransje Hooimeijer (TUD)
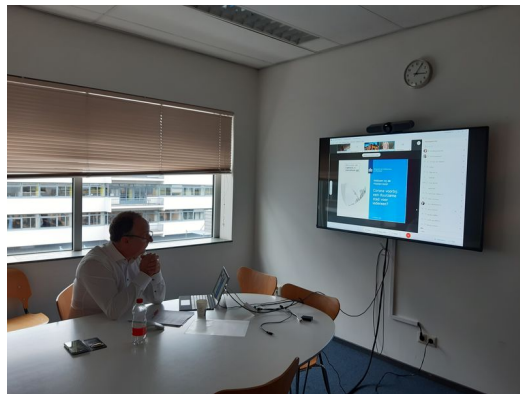
4.2 Outlook

Important activities in 2021 on Knowledge Transfer will be:

- TRAIL Internal PhD Congress (April 1st, 2021).

- TRAIL and TU Delft organize the next bi-annual conference of the BIVEC, a Benelux transport researchers network (May 27-28, 2021).

- BIVEC Reseach days 2021 (organized by TRAIL and TU Delft).

  - TRAIL Ministry of Infrastructure and Water Management cooperation:
  - Policy Relevance of TRAIL PhD Theses
  - Special Topics sessions
  - In house courses for Ministry employees if on site will be possible.

  - Various TRAIL/DIMI/Ministry of Infrastructure and Water Management Masterclasses.

5 Concluding remarks

In 2020, the Covid-19 pandemic 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 (some were rescheduled), most courses were given fully online or hybrid. It is expected that this will (partly) continue in the future.
Some on-site master classes (Ministry) and seminars (TRAIL) were cancelled at the beginning of the COVID-19 pandemic. Later on we hosed master classes and seminars online.
- The International PhD Summer school was also held fully online.
- The Annual PhD conference has been postponed to April 2021 and might be also online
- The collaboration with the Ministry of Infrastructure and Water Management will be continued and might be intensified including offering additional, in-house courses based on TRAIL-courses developed for PhD students as well as 'courses on request'.

Appendix 1: Overview of TRAIL Theses in 2020

Relative Flow Data: New opportunities for traffic state estimation,
Paul van Erp

Traffic state estimation is crucial for different applications, e.g., in dynamic traffic management and in navigation services. This thesis shows that relative flow data have preferable cl1aracteristics for traffic state estimation compared to other traffic sensing data. Relative flow data describe the change in cumulative flow with respect to observers. These observers can be stationary (e.g., loop-detectors) or moving (e.g., automated and/or other connected and equipped vehicles).

Data-driven Analysis and Modeling of Passenger Flows and Service Networks for Public Transport Systems
Ding Luo

Public transport plays an increasingly important role in solving mobility challenges. Despite the considerable amount of data currently being generated and collected for public transport systems, our capability of using these data for improving planning and operations is still limited. To this end, this thesis is dedicated to developing methods and models for translating high-volume data from various sources into novel knowledge and insights that can be used to improve public transport planning and operations.

Measuring, Predicting and Controlling Disruption Impacts for Urban Public Transport
Menno Yap

Disruptions in public transport have a negative impact on passengers. The main objective of this book is to improve methods to *measure*, *predict* and *control* passenger disruption impacts for urban public transport systems. For this objective, this research uses empirical data analysis, choice modelling, simulation, optimisation and machine learning techniques, resulting in generic methods and tools for the public transport sector.

Evaluating Electric Vehicle Charging Infrastructure Policies
Rick Wolbertus

This thesis evaluates policies for the roll-out and utilisation of public charging infrastructure for electric vehicles. Using a multi-method approach it examines the effect of policies on the effective utilisation of charging infrastructure and on the purchase intention of prospective electric vehicle owners. This information is used to model and examine pathways to scale charging infrastructure in the future.

Multiscale Pattern Recognition of Transport Network Dynamics and its Applications: A bird's eye view on transport
Panchamy Krishnakumari

Cities are complex, dynamic and ever-evolving. We need to understand how these cities work in order to predict, control or optimize its operations. We have identified some open issues that need to be solved to build feasible methods for this purposes. To this end, this thesis develops a series of data driven methods for extracting the mobility patterns of large-scale metropolitan networks and explore some of their applications.

Modelling Safety Impacts of Automated Driving Systems in Multi-Lane Traffic
Freddy Mullakkal-Babu
The past three decades have witnessed the emergence of several automotive applications that take over the task of vehicle driving on a sustained basis. The most advanced class of such applications is known as Automated Driving Systems (ADSs). ADS can autonomously operate the vehicle on road stretches that fall under its operational design domain. Industry and governments expect that such systems will be technologically feasible shortly and the traffic will be mixed with system-driven and human-driven vehicles. Even though ADSequipped vehicles will have an impact on traffic safety, there is no clarity on if they would enhance or detriment traffic safety and at what conditions and magnitude. A human and an ADS apply fundamentally different processes to acquire information, make decisions, and operate the vehicle. Therefore, our current insights on the relationship between driving behaviour

and safety may not be sufficient to predict the possible impacts of ADS systems. Hence there is an urgent need to study the impacts of ADS functionalities and design factors on traffic safety.

Providing Public Transport by Self-Driving Vehicles: User preferences, fleet operation, and parking management
Konstanze Winter

Self-driving vehicles could make the operation of public transport services in a more flexible manner more affordable. Introducing shared automated vehicles would allow operating a fleet of smaller vehicles in a demand responsive manner. This could potentially impact the way we use and operate public transport services, which could eventually trigger changes in car ownership and land use. The main objective of this dissertation is to understand better what it means to deploy shared automated vehicles for on-demand public transport services. This is analysed from the perspective of three main stakeholders: (1) the user preferences of potential users, (2) the fleet operation supervised by the fleet manager, (3) and potential parking management strategies issued by a transport authority concerned with the introduction of shared automated vehicles.

User Acceptance of Automated Vehicles in Public Transport
Sina Nordhof (no TRAIL PhD student)

The acceptance of automated vehicles is a necessary condition to realise the benefits of road vehicle automation. The present thesis obtained knowledge from potential users who physically experienced automated shuttle vehicles by questionnaires, interviews and accompanied test rides. The factors of acceptance were organized in a comprehensive multi-level model on automated vehicle acceptance (MAVA) to measure, explain and predict acceptance. The interactions with pedestrians and cyclists were also examined.

Advanced Storage and Retrieval Policies in Automated Warehouses
Masoud Mirzaei

Warehouses are key components in supply chain. They facilitate the product flow from production to distribution. Automation technology and robotics help warehouses to be efficient and responsive. Storage and retrieval policies determine the performance of a warehouse. Conventional storage and retrieval policies are not applicable to automated storage and retrieval system due to operational and technological disparities. This thesis studies several new storage and retrieval polices in automated warehouses. Puzzle-based storage systems are high-density storage systems that store loads on autonomous shuttles. Such systems have low throughput capacity due to lack of transport aisles. Chapter 2 studies an efficient multiple-load retrieval method that brings the loads together at an optimal joining location and then retrieves them simultaneously. This leads to shorter retrieval time compared to sequential sing-load retrievals. In another group of compact storage and retrieval systems, automated cranes transport storage bins using narrow aisles. The assignment of products to the bins and bins to the shelves are important choices that affect system's performance. Chapter 3 proposes a correlated assignment that groups products, that are frequently order together in historical customer demand, to the same product cluster. Each cluster is then assigned to a storage bin. The correlated assignment reduces the total retrieval time compared to turnover frequency-based assignment. Chapter 4 further investigates the impact of splitting the inventory of a product and dispersing it over multiple storage pod. Each pod is transported using autonomous robots and carries several dozens of correlated products.

A New Composite Indicator of Company Performance Measurement from Economic and Environmental Perspectives for Motor Vehicle Manufacturers
Qinqin Zeng

This dissertation develops a composite indicator for measuring company performance of motor vehicle manufacturers. The indicator is developed from economic and environmental perspectives. It is mathematically constructed with transparency in generating time series data of historical performances as well as future performances. Case studies indicate the potential of the developed composite indicator.

Trustworthy and Explainable Artificial Neural Networks for choice Behaviour Analysis
Ahmad Alwosheel

This thesis aims to explore the potentials and limitations of using Artificial Neural Networks (ANNs) for analysing choice behaviour. Using methods developed in classical ANN application fields (particularly computer vision), this work investigates how ANN-based methods can be improved to increase their usefulness in analysing human choice behaviour.

Demand for Urban Pooled On-Demand Services: Attitudes, preferences and usage
Maria Alonso González

A new range of tailored, on-demand mobility alternatives are emerging worldwide; amongst these are pooled on-demand services, i.e., shared
ride-hailing services such as UberPOOL or ViaVan. Simulation studies have shown the potential benefits of these services in urban areas, yet their ridership is still very limited. This thesis examines the behavioural reasons underlying the adoption of such services. To this end, it includes a series of quantitative studies and suggests a series of policy implications based on the performed analyses. In this thesis, pooled on-demand services are also analysed in the broader context of Mobility as a Service (MaaS).

Managing External Temporal Constraints in Manual Warehouses
Arpan Rijal

Most of the warehouse operations are still performed manually despite the increasing development and adoption of automated warehouse solutions. Planning human workers in a warehouse is a complex task because managers have to consider issues such as start and end times of shifts, breaks, and incentive payment schemes. When warehouses have temporal restrictions
on the processing time of inbound trucks or when they have deadlines for outbound orders, these constraints impact the schedules and cost of employing human workers. In this environment, warehouse management has to consider the temporal restrictions from external entities as well as the limited resources available at the warehouse. In this thesis, we study the impact of external temporal constraints in three operational planning problems at manual warehouses. We develop mathematical models for the problems, propose solution approaches for them and conduct computational experiments to derive insights.
The first study in the dissertation explores integrated scheduling and assignment of trucks to dock doors in unit-load cross-dock facilities with mixed mode dock doors. The processing time of both inbound and outbound trucks at the cross-dock are constrained by time windows. In the second study, we investigate order picker scheduling problem in distribution centers where order picking operations are constrained temporally by predefined time windows for delivery of orders to the staging area of the warehouse. In the final study, we consider the impact of delivery time windows at customers on the capacity requirements of three warehouse processes – order picking, staging and loading.

Using Social Media to Characterise Crowds in City Events for Crowd Management
Xun Gong

This thesis investigates to what extent social media data, such as Twitter and Instagram posts, are able to provide information about crowds for crowd management in city events. It identifies relevant information, develops data models, estimates and analyses crowds' characteristics in terms of demographic, city role composition, Spatial-temporal distribution, sentiment estimation, Points of Interest preferences, word use, crowd size and density estimation, which support crowd managers in their decision making.

Design and Analysis of On-Demand Mobility Systems
Jishnu Narayan

The past decade has seen vast advancements in various ICT platforms that enabled the rise of innovative mobility solutions (on-demand transport services). Increasing evidence from the literature points at the potentially disruptive effects of such innovative mobility solutions on urban mobility. Modelling tools for the design and assessment of such on-demand transport services therefore needs to account for its implications for urban mobility by considering its interaction with other travel modes. Existing studies that have looked into the design and analysis of on-demand services largely overlooked the impact of these services on other travel modes and vice-versa. This study attempts to fill this research gap by developing an approach to the design and analysis of on-demand services in an urban mobility context.

Optimization of Synchromodal Matching Platforms under Uncertainties
Wenjing Guo

The trend towards containerization, integration, and digitalization in global freight transportation gives rise to synchromodal matching platforms that provide real-time matches between shipment requests and transport services. This thesis develops methodologies to support the decisionmaking processes of synchromodal matching platforms under dynamic, stochastic, and distributed environments. With the proposed methods, decision-makers can achieve a better performance of transport plans in terms of logistics costs, delays, and carbon emissions.

Collective Decision Making trough Self-regulation
Joris Scharpff

This thesis explores the potential of self-regulation in collective decision making to align interests and optimise joint performance. Demonstrated in the domain of road maintenance planning, this research contributes novel incentive mechanisms and algorithmic techniques to incite self-regulation and coordinate agent interactions, paired with a practical validation of the concept through serious gaming. The learnings of this work guide the design and implementation of future performance-based partnerships and advance the current state-of-the-art in sequential decision making.

New Models and Applications for Railway Timetabling
Gert-Jaap Polinder

The design of a railway timetable is an extremely complex puzzle, as there are many aspects that have to be taken into account. In the first part of this dissertation, methods are developed that can support the long-term design of a timetable. Timetables are computed that match with travel demand as good as possible, without taking infrastructure capacity into account. This can answer the question whether regular departure patterns are useful or not and where transfer options have to be realized. A second method finds a timetable that is as similar as the previously computed timetable, but that now can be operated on a given infrastructure network. The second part of this thesis is oriented towards short-term timetabling. A method is developed that deals with over-constrained timetabling problems. It finds relaxations to these restrictions, such that a feasible timetable can exist. Another approach aims at designing a timetable that is robust against minor disturbances that can occur in the real-life operation. This helps in deciding where to add time supplements in the network to absorb delays.

Cooperative Adaptive Cruise Control Vehicles on Highways: Modelling and Traffic Flow Characteristics
Lin Xiao

Cooperative Adaptive Cruise Control (CACC) is an emerging vehicle technology could be available in the market in near future. This thesis addresses the challenges of modelling complex CACC vehicle behaviour in a microscopic simulation environment and examines the traffic flow characteristics in relation to CACC vehicle market penetration rates. This results give insights into the impacts of CACC vehicles on traffic flow efficiency.

The Influence of Positive Interventions on Cycling
Bingyuan Huang

Reducing car use by positive interventions with the aid of smartphone technology can be a potential policy measure. Stated choice experiment and a real-world experiment based on a smartphone app provide insights into the interventions design and travel behavioural change. Results show that cycling challenges and rewards can nudge travellers away from cars to bikes in a short-term and have the potential for the sustained behavioural change over a longer-term.

Appendix 2: TRAIL Staff Members on 31-12-2020

Name				University
Dr. ir.	N.A.H.		Agatz	Erasmus University Rotterdam -RSM
Dr.	J.A.		Annema	Delft University of Technology-Faculty TPM
Prof. dr. ir.	B.	van	Arem	Delft University of Technology-Faculty CEG
Dr.	B.		Atasoy	Delft University of Technology-Faculty 3ME
Prof. dr. ir.	E.C.	van	Berkum	University of Twente-Fac. Engineering Technology
Dr. ir.	A.J.J.	van den	Boom	Delft University of Technology-Faculty 3ME
Dr. ir.	P.		Buijs	Groningen University-Fac. Economics and Business
Dr.	O.		Cats	Delft University of Technology-Faculty CEG
Prof. dr. ir.	C.G.		Chorus	Delft University of Technology-Faculty TPM
Dr. ir.	F.		Corman	Delft University of Technology-Faculty 3ME
Dr. ir.	G.		Correia	Delft University of Technology-Faculty CEG
Dr. ir.	W.		Daamen	Delft University of Technology-Faculty CEG
Dr.	A.		Dabiri	Delft University of Technology-Faculty CEG
Prof. dr. ir.	B.		De Schutter	Delft University of Technology-Faculty 3ME
Prof. dr. ir.	R.		Dekker	Erasmus University Rotterdam – Fac. Economic Science
Dr.	H.F.		Farah	Delft University of Technology-Faculty CEG
Dr.	M.S.	van	Geenhuizen	Delft University of Technology-Faculty TPM
Prof. dr.	H.		Geerlings	Erasmus University Rotterdam – Faculty Social Science
Prof. dr. ir.	K.T.		Geurs	University of Twente-Fac. Engineering Technology
Prof. dr.	R.M.P.		Goverde	Delft University of Technology-Faculty CEG
Prof. dr.	M.P.		Hagenzieker	Delft University of Technology-Faculty CEG
Dr. ir.	A.		Hegyi	Delft University of Technology-Faculty CEG
Prof. dr. ir.	R.E.C.M.	van der	Heijden	Radboud Universiteit Nijmegen - Nijmegen School of Management
Prof. dr. ir.	J.		Hellendoorn	Delft University of Technology-Faculty 3ME
Prof. dr. ir.	S.P.		Hoogendoorn	Delft University of Technology-Faculty CEG
Dr.	M.		Janic	Delft University of Technology-Faculty CEG

Dr.	X.		Jiang	Delft University of Technology-Faculty 3ME
MEng, Dr. techn	P.		Jittrapirom	Radboud Universiteit Nijmegen - Nijmegen School of Management
Dr.	V.L.		Knoop	Delft University of Technology-Faculty CEG
Prof. dr.	M.B.M.	de	Koster	Erasmus University Rotterdam -RSM
Dr. ir.	M.		Kroesen	Delft University of Technology-Faculty TPM
Dr. ir.	F.A.		Kuipers	Delft University of Technology – Faculty EEMS
Dr. ir.	J.H.		Kwakkel	Delft University of Technology-Faculty TPM
Prof. ir.	H.		Ligteringen	Delft University of Technology-Faculty CEG
Prof. dr. ir.	J.W.C.	van	Lint	Delft University of Technology-Faculty CEG
Dr .	C.		Maat	Delft University of Technology-Faculty CEG
Prof. dr. ir.	V.A.W.J.		Marchau	TRAIL Research School
Dr.	K.		Martens	Radboud Universiteit Nijmegen - Nijmegen School of Management
Prof. dr.	M.H.		Martens	Eindhoven University of Technology – Faculty Architecture Building and Planning
Prof.dr.	H.J.		Meurs	Radboud Universiteit Nijmegen - Nijmegen School of Management
Dr.	E.J.E.		Molin	Delft University of Technology-Faculty TPM
Prof. dr.	R.R.		Negenborn	Delft University of Technology-Faculty 3ME
Dr. ir.	R.	van	Nes	Delft University of Technology-Faculty CEG
Dr.	S.		Rasouli	Eindhoven University of Technology – Faculty Architecture Building and Planning
Dr.	J.		Rezaei	Delft University of Technology-Faculty TPM
Dr.	J.		Riezebos	Groningen University-Fac. Economics and Business
Prof. dr.	K.J.		Roodbergen	Groningen University-Fac. Economics and Business
Dr. rer. Nat.	M.E.		Schmidt	Erasmus University Rotterdam –RSM
Dr. ir.	D.L.		Schott	Delft University of Technology-Faculty 3ME
Dr.	S.		Sharif Azadeh	Erasmus University Rotterdam – Fac. Economic Science
Dr.	F.		Sharmeen	Radboud Universiteit Nijmegen - Nijmegen School of Management
Prof. dr. ir.	L.A.		Tavasszy	Delft University of Technology-Faculty TPM
Prof. dr.	R.H.		Teunter	Groningen University-Fac. Economics and Business
Prof. dr.	H.J.P.		Timmermans	Eindhoven University of Technology – Faculty Architecture Building and Planning
Dr.	A.B.		Unal	Groningen University - Faculty of Behavioural and Social Sciences

Dr.	E.		Ursavas	Groningen University – Fac. Economics and Business
Dr.	W.W.		Veeneman	Delft University of Technology - Fac. TPM
Dr.	J.		Veldman	Groningen University-Fac. Economics and Business
Prof. dr. ir.	A.		Verbraeck	Delft University of Technology - Fac. TPM
Prof. dr.	I.F.A.		Vis	Groningen University-Fac. Economics and Business
Prof. dr.	D.	de	Waard	Groningen University - Faculty of Behavioural and Social Sciences
Dr.	M.		Wang	Delft University of Technology-Faculty CEG
Prof. dr.	G.P.	van	Wee	Delft University of Technology - Fac. TPM
Dr.	M.M.	de	Weerdt	Delft University of Technology- Faculty EEMC
Prof. ir.	F.C.M.		Wegman	Delft University of Technology-Faculty CEG
Dr.	B.		Wiegmans	Delft University of Technology-Faculty CEG
Prof. dr.	C.		Witteveen	Delft University of Technology- Faculty EEMC
Prof. dr. ir.	J.C.		Wortmann	Groningen University - Fac. Economics and Business
Dr.	S.X.		Zhu	Groningen University - Fac. Economics and Business
Prof. dr.	R.A.		Zuidwijk	Erasmus University Rotterdam -RSM

Appendix 3: Overview of TRAIL PhD projects on 31-12-2020

A. Transport & Mobility				
Title Research	Name	PhD	Univ.	Fac.
Supporting Sustainable Mobility Transition by Analysing Government - Mobility Providor Interaction	Ruben	Akse	RUN	NSM
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
Societal Costs and Benefits of Public Participation in Transportation and Planning	Sander	Barneveld, van	TUD	TBM
New Discrete Choice Theory for Understanding Moral Decision Making Behavior	Tom	Berg, van den	TUD	TBM
Interface Design for Transitions between Manual and Automated Driving	Anika	Boelhouwer	UT	CTW
Activity Based Model of Travel Demand	Valeria	Caiati	TUE	BE
Activity-Based Travel Demand Modeling under Uncertainty	Eleni	Charoniti	TUE	BE
The Impact of Time on the Relationship between Travel Behaviour and the Built Environment	Paul	Coevering, van de	TUD	BK
Perception of the City & the City as Driver of Behaviour	Leonid	Datta	TUD	TBM
Port Development Studies in Archipelo Country (case study Indonesia)	Arry	Destyanto	TUD	TBM
The Relationship between Road Safety, Infrastructure and Driving Behaviour on 80 km/h Roads	Kirsten	Duivenvoorden	TUD	CiTG
Planning and Operation of Future Taxi System: Routing Model of Heterogeneous Vehicles in Mixed Autonomous and Non-autonomous Zone Networks	Qiaochu	Fan	TUD	EWI
Data-driven Optimization Models for Transportation Problems	Mahsa	Farhani	TUD	TBM
SCRIPTS: A New Generation of Activity-based Models of Travel Demand	Anna-Maria	Feneri	TUE	BE
Participative Exploratory Modelling of Mobility System Transitions	Karoline	Fuehrer	TUD	TBM
Analysis of Transportation Mode Between central City and New Towns using Activity-Based Approach	Jia	Guo	TUE	BE
Integrating Realistic Demand Models in Public Transport Optimization	Johann	Hartleb	EUR	RSM
Participatory Value Evaluation for Renawable Energy Projects	Ignacio	Hernandez	TUD	TBM
Making Rail Freight Fit for the Future	Anuradha	Jain	RUN	NSM
Improving Sustainability of Regional Railway Services	Marko	Kapetanovic	TUD	CiTG
Smart Connected Bikes	Georgios	Kapousizis	UT	ET
Automated Driving in Freight Transport Truck Platooning	Anirudh	Kishore Bhoopalam	EUR	RSM
Cycling, Gender and Transport Poverty	Angela	Kloof, van der	RUN	NSM

Uncertainty and Cost-Effectiveness of Policy Measures to Reduce CO2 Emissions from Transport	Robert	Kok	TUD	TBM
Transportation for Self-Organization trough Network Integration and Collaboration	Anique	Kuijpers	TUD	TBM
Surface Crack Growth in Rigid Pipe Reinforced with FRP	Zongchen	Li	TUD	3ME
Incorporating Stochastic Demand Forecasting Model into Model of Optimal Demand Responsive Transport Services Operations	Shangqi	Li	TUE	BE
An Integrated Analytical Moel for Predicting the Collapse Pressure of Flexible Risers in Ultra-Deep Water	Xiao	Li	TUD	3ME
The Influence of Built Environment on Pedestrian and Cyclist Behavior around Metro/Railway Station	Yanan	Liu	TUE	BE
Infrastructure Service Network Design for Automated Vehicles	Bahman	Madadi	TUD	CiTG
Exploring Ways to Incorporate Ethics in Artificial Moral Beings	Andreia	Martins Martinho Bessa	TUD	TBM
Effectiveness and Acceptability of a Peak Pricing Scheme on Passenger Rail	Andrike	Mastebroek	TUD	TBM
Companies' Adoption of Autonomous Trucks	Shao	Mengru	TUE	BE
Travel and Location Choice Behaviour of Prospective Automated Vehicle Users	Baiba	Pudane	TUD	TBM
Advancing Smart and healthy City Trough New Mobility Choices: exploring individual's preferences between e-bikes, shared mobility, and Mobility as a Service (MaaS)	Xueting	Ren	TUE	BE
Moral Discrete Choice Theory	Teodora	Szep	TUD	TBM
Policy Implications of Travel Time Budgets	Maarten	t Hoen	TUD	TBM
Agent-based Modelling of Moral Equilibria	Tanzhe	Tang	TUD	TBM
Road Safety for Cyclists in Dutch Cities	Teun	Uijtdewilligen	UT	CTW
Real-time Synchro-modal Planning	Jeroen	Vester	EUR	ESE
Driver Expectations in Freeway Curve Driving	Johan	Vos	TUD	CiTG
Consumers on the Move - Investigating the Interaction between Government and Consumers Regarding Innovations in Sustainable Mobility	Jaap	Waerden, van der	RUN	NSM
A New Approach to Transport Modelling by Using Ubiquitos Data: the activity-space model	Yihong	Wang	TUD	CiTG
Exploring Impacts of Operations of a Fleet of Shared Autonomous Vehicles: agent-based simulation model	Senlei	Wang	TUD	EWI
Parking Policy, Land Use and Sustainable Urban Transport: the case of the shopping trip	Jan-Jelle	Witte	EUR	ESE
Quantifying the Impact of Aviation CO2 Abatement Measures on Accessibility of International Passenger Air Transport	Sihyun	Yoo	TUD	TBM
Artificial Intelligence for Sustainable Real-Time Transportation Systems	Pedro	Zattoni Scroccaro	TUD	3ME
Smart Incentives for Sustainable Travel Behaviour	Nadja	Zeiske	RUG	GMW
Automated Shuttles as Part of a Public Transport Network	Irene	Zubin	TUD	CiTG

B. Infrastructure & Traffic Management				
Title Research	Name	PhD	Univ.	Fac.
Accessibility and Road safety: Integration of road safety indicators into accessibility analysis and planning	Merhnaz	Asadi	UT	ET
Human-machine Interfaces on Bicylces Promoting Transparent Interactions with Automated Vehicles	Siri Hegna	Berge	TUD	CiTG
STAQ: Static Traffic Assignment with Queuing	Luuk	Brederode	TUD	CiTG
Predicting Travellers' Choices for Mobility Innovations in a Different Future	Kristel	Bronsvoort	TUD	TBM
Scenario-based Multi-objective Automated Driving Strategies for Safe and Efficient Traffic	Na	Chen	TUD	CiTG
Impact of North-South Metro Line in Amsterdam on public Transport Ridership & Quality	Malvika	Dixit	TUD	CiTG
Digital divide in tranport services and transport disadvantage	Anne	Durand	TUD	CiTG
Multi-scale Demand Estimation/Prediction	Zahra	Eftekhar	TUD	CiTG
Online Route Planning in Response to Non-Recurrent Traffic Disruptions	Oskar	Eikenbroek	UT	CTW
The Use of VR/AR to Determine Pedestrian Walking and Travel Choice Behaviour	Yan	Feng	TUD	CiTG
Theory and Microscopic Modelling of Active Traffic Behaviour	Alexandra	Gavriilidou	TUD	CiTG
The Human Factors (User Acceptance/Safety) Side of a Change Assistant System	Paul	Gent, van	TUD	CiTG
Traveller Preferences and Behavioural Dynamics in the Era of MAAS	Nejc	Gerzinic	TUD	CiTG
Designing and Managing the Transfer Function of Train Stations	Jeroen	Heuvel, van den	TUD	CiTG
Automated Vehicles Operational Design Domain	Dong	Jongqi	TUD	CiTG
Travel Behaviour and Traffic Operations in Case of Exceptional Events	Mahtab	Joueiai	TUD	CiTG
Crowd Behaviour under Exceptional Conditions	Erica	Kinkel	TUD	CiTG
Stakeholder Acceptability of Smart Pricing Measures	Lizet	Krabbenborg	TUD	TBM
Improvement of the Utrecht Public Transport system by the Integration of Modes	Roy	Kuijk, van	TUD	CiTG
Design of Network Wide Traffic Management System	Ramon	Landman	TUD	CiTG
Multi-scale Estimation and Prediction of Traffic Dynamics	Guopeng	Li	TUD	CiTG
Airline/ATM Network Performance and Optimization	Yalin	Li	TUD	L&R
Cross Project Learning by an International Project Base of Large Infrastructure Projects	Yan	Liu	TUD	CiTG
Modelling Traffic Operations and Capacity Considering Driving Behaviours and Cooperative Driving at Signalized intersections	Meiqi	Liu	TUD	CiTG
Connected Driver Assistance and Traffic Management	Niharika	Mahajan	TUD	CiTG
Data-driven Integrated Model for Joint Traffic and Logistics Management	Ali	Nadi Najafabadi	TUD	CiTG

Lane-specific Traffic Flow Control Models	Hari Hara Sharan	Nagalur Subraveti	TUD	CiTG
Hybrid Model for freeway Traffic State Estimation and Prediction using Traffic Flow Theory and Historical Data	Tin	Nguyen	TUD	CiTG
Interactions of Automated Driving and Vulnerable Road Users, and Implications of Automated Driving on Traffic Safety and Urban Design	Juan Pablo	Núñez Velasco	TUD	CiTG
Dynamics in Mode Choice Behavior	Marie-José	Olde Kalter	UT	CTW
Creative Re-Designing of Urban Public Space in the Era of Automated Driving, Vehicle Sharing and Electrification	Maryna	Ozturker	TUD	CiTG
Mobility and Perceptions of Accessibility in Peripheral Rural Areas	Felix	Pot	RUG	SS
Performance and Safety Evaluation of Dedicated Lanes for Automated and Connected Vehicles	Solmaz	Razmi Rad	TUD	CiTG
Human Drivers Behaviour and Modelling in Mixed Traffic	Nagarjun	Reddy	TUD	CiTG
Managing Cyclist Flows in Urban Areas	Giulia	Reggiani	TUD	CiTG
Transition Phases and Tipping Points in MaaS Provision	Arjan	Ruijter, de	TUD	CiTG
Studying the Impact of Crowd Management Measures in Crowded Pedestrian Spaces using Field Studies	Lucia	Schaik, van	TUD	CiTG
Energy-Efficient Timetable Design	Gerben	Scheepmaker	TUD	CiTG
Establishing which Factors Determine the Route and Activity Choices for Active Mode Travelers in an Urban Environment based on Empirical Data	Florian	Schneider	TUD	CiTG
Advanced Traffic Management Strategies to Improve the Reliability of Port-to-Hinterland Freight Operations	Salil	Sharma	TUD	CiTG
Understanding Traveller Behaviour under Choices in the Context of Public Transportation using a Combination of Data Sources	Sanmay	Shelat	TUD	CiTG
Real-time Forecasting of Large-scale Crowd Movements	Martijn	Sparnaaij	TUD	CiTG
Urban Traffic Estimation and Prediction Methods: the added value for urban traffic control	Muriel	Verkaik-Poelman	TUD	CiTG
Optimizing Blended Learning in Higher Education from a carbon Footprint Perspective	Marieke	Versteijlen	TUD	TBM
Sensing Platform: monitoring, modeling and forecasting urban mobility trough interactions of connected autonomous vehicles and active modes	Alphonse	Vial	TUD	CiTG
Usage of Recorded Actual Travel Data for Long-term Demand Prediction	Jord	Vliet, van der	TUD	CiTG
Human Factors in Self-Driving Cars	Francesco	Walker	UT	CTW
Macroscopic Modelling of Active Mode Traffic	Marie-Jette	Wierbos	TUD	CiTG
The Design of High-Speed Railway Passenger Service Plans from a Multimodal Transport Perspective	Fei	Yan	TUD	CiTG
The Impact of Built Environment on Individual Health, with Weight Status as the Indicator	Hong	Yan	TUD	TBM

Driver Behavior in the Transition of Control between Manual and Automated Driving	Bo	Zhang	UT	CTW
Nautical Traffic Modelling for Safe and Efficient Ports	Yang	Zhou	TUD	CiTG
Evaluating equity and accessibility based on ethical theories and accessibility-based approaches	Le	Zhu	TUD	TBM
Theory and Modelling of Acquiring, Processing and Storing Spatial Knowledge	Lara-Britt	Zomer	TUD	CiTG
Using a Network Approach on Modelling Traffic Flow: applying the model to cases in Amsterdam and Rotterdam	Boudewijn	Zwaal	TUD	CiTG

C. Logistics and Transport Organisation

Title Research	Name	PhD	Univ.	Fac.
Dynamic Fleet Management of Automated Vehicles	Breno	Alves Beirigo	TUD	3ME
Analysis of Autonomous Vehicle Storage and Retrieval Systems (AVSRS)	Kaveh	Azadeh	EUR	RSM
Revenue Management and complexity in Public Transport	Paul	Bouman	EUR	RSM
Effective Use of Reefer Containers trough the Port of Rotterdam: a transitions oriented approach	Bob	Castelein	EUR	FSW
Multi-channel Inventory Control	Arjan	Dijkstra	RUG	FEB
Sustainable City Logistics and Urban Consolodation Centres	Anna	Dreischerf	RUG	E&B
Cooperative Control for Autonomous Ship	Zhe	Du	TUD	3ME
Physical Internet	Patrick	Fahim	TUD	TBM
Synchromodal Transport	Alberto	Giudici	EUR	RSM
Network Performance under Emergent Behaviour in Hinterland Container Shipping: a complex network perspective	Camill	Harter	EUR	RSM
Modelling and Optimization on Local Traffic Networks	Yu	Hu	TUD	3ME
The Impacts of Collaboration on Resource Utilization in Warehouses	Negin	Jamili	EUR	RSM
Integrated Synchromodal Transport System Analysis	Masoud	Khakdaman	TUD	TBM
Predictive Synchromodality for more Efficient Container Transportation	Rie	Larsen	TUD	3ME
Incentives for Renewable Energy	Jose Alejandro	Lopez	RUG	FEB
Developing Efficient Methods for the Robust Management of Fleets of Cooperative (Automated) Vehicles	Johan	Los	TUD	3ME
Logistics Models for Improving the Efficiency of Ports and Inland Waterways	Adrien	Nicolet	TUD	3ME
The Structure of Power and Decision-Making in Dyadic Supply Chains	Kartika	Nurhayati	TUD	TBM
Decision Making on Distribution Structures and Distribution Centre Locations	Sander	Onstein	TUD	TBM
Consolidation of Transportation Flows in Multi-Channel Retail	Joydeep	Paul	EUR	RSM

Assessing the Gain of Sharing Demand Forecast in FMCG Supply Chains	Clint	Pennings	EUR	RSM
Simultaneous Management of Transfers on Railway Networks for Passengers and Freight Flows	Wenhua	Qu	TUD	3ME
Supply Chain Visibility with Sparse Data	Isabelle	Schilt, van	TUD	TBM
Performance Interaction Model	Alf	Smolders	TUD	CiTG
Incentive Design in Socially Responsible Supply Chain Management	Hamed	Vafa Arani	EUR	RSM
The Development of Multi-Level Capacity Control Mechanisms in Synchromodal Transport	Hobbs	White	EUR	RSM
Collaboration Mechanisms Design for Green Supply Chain	Kailan	Wu	TUD	TBM
Multi-Level Control of Large-Scale Logistic Systems	Yashar	Zeinaly	TUD	3ME
Multi-Objective Optimization for Maritime and Hinterland Transportation	Yimeng	Zhang	TUD	3ME
Supply Chain Disruption Management	Bahareh	Zohoori	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