6TH ANNUAL CYCLING RESEARCH BOARD

AMSTERDAM

2022

5 - 7 OCTOBER

UNIVERSITY OF AMSTERDAM

OCTOBER 5

MAIN PROGRAM

UvA Atrium - Grand Hall

09:00	Coffee
09:30	Opening: Prof. Marco te Brömmelstroet
10:00	VIP Guest Speaker: Alderman, City of Amsterdam
10:15	VIP Guest Speaker: David Gelauff, City of Amsterdam
10:30	Breakout Sessions A – see Page 2
12:00	Lunch
13:00	Workshops X – see Page 3
14:30	Coffee
15:00	Breakout Sessions B – see Page 4
16:30	End of Day
18:00	Conference Dinner

BREAKOUT SESSIONS A

10:30

SESSION A1

What are the links between cycling education at school and children's cycling practices?
– *Aurélie Schmassmann*

"Intelligent" intersection control for connected bicycles and cars
– *Jan van der Spaa*

Comfort guidelines for pop-up cycle paths
– *Maria Salomons*

Introducing a comprehensive cycling toolkit for planning purposes
– *Lucas Mayer de Freitas*

SESSION A2

Assembling Dutch Cycling: the tension between coloniality and mobility on the fietspad
– *Michael Tahmoressi*

Digital Modal Split: Potentials, challenges, and trade-offs for cycling policy
– *Bernhard Weiser*

Electric scooters and where to find them – A spacio-temporal analysis on the utilization of shared e-scooters in Munich
– *Michaela Teißler*

The importance of the Citizen Science approach in cycling research in supporting a transition towards a sustainable mobility system
– *Elke Franchois*

SESSION A3

Demand-driven design of bicycle infrastructure networks for improved urban bikeability
– *Christoph Steinacker*

An analysis of cycling characteristics on network boundary of bicycles
– *Mio Suzuki*

Cycling Mobilities of Care in a Cross-Cultural Context
– *Lucas Snaije*

Rebuilding streets for sustainable transport: The E-Bike City?
– *Lukas Ballo*

WORKSHOPS X

13:00

WORKSHOP X1
Kids and Cycle Design Project Workshop
— Jonne Silonsaari

WORKSHOP X2
Cycling fairly and prioritising for climate-neutral and smart cities by 2030
— Manfred Neun

WORKSHOP X3
Cycling is in the Eye of the Beholder: A guided activity on how place and identity contextualizes our experiences of cycling
— Rebecca Mayers

BREAKOUT SESSIONS B

15:00

SESSION B1

Social characterization of bike sharing in Brazil: an analysis of users and travel in five capitals
– Victor Callil

Subjective Safety of Bicycle Infrastructure at Intersections and Roundabouts
– Sina Wachholz

Intra-trip cycling speed variation: the spatial and temporal heterogeneityin weather's effects
– Hong Yan

Route Choice Modelling of Cyclists in Zurich
– Adrian Meister

SESSION B2

E-Bike City: Research for a new starting point of the transport policy discussion
– Kay Axhausen

A power-based approach to model the impact of gradient in bicycle traffic simularion
– Guillermo Perez Castro

Making sense of Cycling: Effects of Socio-cultural Contexts and Spatial Factors on Cycling Experience
– Ran Zhang

Micro-e-mobility: Just another urban e-gadget or sustainable addition to public transit?
– Nicolas Schüte

SESSION B3

Policy transfer for urban biking: How Bordeaux got a leg up from Amsterdam and the Handshake Program
– Joe Dickmann

Direct or doomed to detour? Disentangling new aspects of bicycle accessibility from crowdsourced GPS data
– Kuan-Yeh Chou

Disability and Cycling – A Literature Review
– Anna Niska

How inclusive are our models? The danger of using unbalanced datasets for modelling bicycle route choice behaviour
– Miroslawa Lukawska

OCTOBER 6

MAIN PROGRAM

UvA Atrium - Grand Hall

08:30	Meditation Session – Vikas Bagde
09:00	Coffee
09:30	Policy Questions: Fishbowl – David Gelauff, City of Amsterdam
10:30	Breakout Sessions C – see Page 6
12:00	Lunch
13:00	Breakout Sessions D – see Page 7
14:30	Coffee
15:00	Outdoor Activity
17:00	End of Day
19:00	Movie Night

BREAKOUT SESSIONS C

10:30

SESSION C1

Imagine – Cyclists' High Lane
– John Gade

Criteria for Recreational Cycling
– Marco Berends

Reproducible Quality Assessment of OSM Data for Cycling Applications & Prioritizing Links in Bicycle Network Plans with Greedy Network Optimization
– Ane Vierø

Overtaking of Cyclists – Facts and Feelings
– Katja Kircher

SESSION C2

Evaluating Experiences with Smart Connected Bicycles: A Systematic Review and Conceptual Framework
– Mario Boot

E-Bikes in Transport Models: A Review of Current Practice and Literature
– Leonard Arning

INFRASense: Data-Driven Labeling of Bike Paths to Support Municipalities in Cycling Promotion Measures
– Johannes Schering

"Google Maps Doesn't Know Shit": Platforms and the Agency of Movement in the New Era of Bicycle Couriers
– Jarvis Susłowicz

SESSION C3

Cycling (In)equalities and (In)equal Cycling
– Rita Jankowski

Auto-Ethnography of the Lived Experience of Urban Cycling
– Mohammad Nazarpoor

How good are we at planning bicycle infrastructure? On the performance gap between actual and optimal investments
– Mads Paulsen

The goal with the goal – A system thinking approach to create a national goal for bicycling in Sweden
– Jones Karlström

BREAKOUT SESSIONS D

13:00

SESSION D1

The Cycle Node Network Planner: A data-driven decision support tool
– Anastassia Vybornova

Rewriting the Swiss Cycling Infrastructure Norms: Review, Analysis, Critique
– Clarissa Virginia Livingston

Cycling in Asia: Worlding Cycling Research with Anthropology
– Sanderien Verstappen

Analysis of the Location of Public Bicycle Stations in Cuenca, Ecuador
– Juan Diego Cordero

SESSION D2

Isn't it slippery? A take on wood as a pavement of choice for cycling infrastructure
– Jean Huvelle

A social and longitudinal comparison of Dutch and Danish cycling behavior: Uptake, Infrastructure, Safety, and Bicycle Technology
– Kira Janstrup

VeloLAB: The innovation platform for the whole cycling sector
– Isabell Eberlein

Multi-dimensional accessibility metrics for evaluating investments in cycling infrastructure
– Lucas Van der Meer

SESSION D3

Socio-Cycle: Exploring the Socio-Cultural Significance of Cycling in an Irish Regional City
– Eileen Hogan

How narratives influence the bottom-up innovation process? a case study of Electric rickshaws in India
– Vikas Bagde

How well do we know our route? An analysis of cyclists' local detours in Copenhagen Area
– Laurent Cazor

How diverse is the Flemish cyclist?
– Sam Delespaul

OCTOBER 7

MAIN PROGRAM

UvA Atrium - Grand Hall

08:30	Coffee
09:00	Keynote: Marco te Brömmelstroet
09:45	Extended Workshops Y – see Page 9
12:00	Lunch & Board Meeting
13:30	Closing session
15:00	End

EXTENDED WORKSHOPS Y

09:45

WORKSHOP Y1
Flow hunting workshop

WORKSHOP Y2
Perspectives on bicycle repair and bike kitchens

WORKSHOP Y3A
Building knowledge for cycling futures

WORKSHOP Y3B
Research Questions for City of Amsterdam's Cycling Future

WORKSHOP Y4
Cycle Logistics Workship with Cycloon

BOOK OF ABSTRACTS

Presented in order of appearance.

A1: What are the links between cycling education at school and children's cycling practices?

Aurélie Schmassmann & Daniel Baehler

Mobility habits and practices developing during adolescence are anchored for the years to come and often define practices as adults (Delmelle & Delmelle, 2012). Promoting and reinforcing cycling from an early age is therefore a key issue in the mobility transition. However, cycling among children and young people has declined in most Western countries (McDonald et al., 2021). Important variations can be observed betweenbcountries, but also within countries, e.g., in Switzerland between the German- and the French or Italian-speaking parts of the country. Not much is known about the inks and explanations of these differences.

Through a survey of more than 1,300 young people aged 12 to 20 in Switzerland, we observed that more and more young people are abandoning cycling as they get older (Schmassmann et al., forthcoming). Cycling often has a positive image among young people, but it is rarely considered a means of transport. The challenge emerging from this study is to succeed in shifting young people's cycling practices from a playful and recreational/sportive practice to a utilitarian practice.

In Switzerland, several tools are available to promote cycling among children and adolescents. First, children receive traffic education, and generally cycling education as well, at school. The interventions, offered by the local police – which does not always give a very positive image of cycling –, vary greatly between regions, both in terms of content and frequency. An analysis on behalf of the Federal Roads Office showed that regions with low cycling practices have less cycling education lessons at school and more often no «cycling exam»1 (Baehler & Badan, forthcoming). Secondly, the cycling advocacy association PRO VELO proposes various promotional actions to encourage cycling among young people. The Bike2school action encourages children to go to school by bike, with prizes for counting the kilometers they ride. The association also organizes cycling courses in each region for all ages, skill levels and audiences (beginners, first time in traffic, family, teenagers, e-bikes, etc.).

While many actions are aimed at children, very little is done for adolescents. This is the objective of the DEFI VELO action which is aimed primarily at young people aged 15 to 20 and offers activities in the classroom to develop both mechanical and traffic skills (van Hoef et al., 2022). The recently opened VELO LAB (velolab.org) provides communication tools on cycling for teachers. However, participating in these promotional actions is not very common and often depends on the commitment of teachers. Moreover, young people are reluctant to cycle. The biographical interviews conducted as part of Aurélie Schmassmann's thesis show that most young people do not consider cycling to be an attractive way to travel. These results also show the importance of not neglecting structural barriers to cycling. The hosting potential of the territory and the existing standards (see velomobility, Rérat, 2020) play an essential role in promoting cycling among children. These issues relate to the debates on childhood cycling promotion launched by Silonsaari et al. (2022) and Justin Spinney during the Children's Mobility lunchtime seminar in June 2022, and particularly the importance of tailoring the discourse around needs and expectations of children.

Therefore, the following questions remain open on our side: Do cycling education at school and the existence of a theory and practical cycling exam, thus, represent a potential for cycling promotion among children? How is cycling education organised in other countries and does it also match with the level of cycling practices?

We propose to organise a workshop in which we will shortly present the Swiss case study and then mainly discuss with participants about how children's cycling education and practices are organised in their countries. We will prepare a method that can be adopted depending on the number of persons attending the workshop and the different countries they are from. If the question appears relevant, it could be the starting point of a paper or a research project proposal to investigate these links more in detail.

A1: 'Intelligent' intersection control for connected bicycles and cars

Jan van der Spaa, A. Maria Salomons, Yufei Yuan, Bilge Atasoy, Victor L. Knoop

Introduction

Bicycles have an important role to play in the transition towards a more sustainable mobility. In order to achieve the modal shift towards bicycles, more must be done to accommodate cyclists. Although controlled intersections do help in increasing the (perceived) safety of crossings with motorized vehicles, they are seen as major obstacles, and cyclists tend to avoid them when possible. New methods of intersection control, where the controller can communicate with the traffic, may be able to reduce the negative effects of controlled intersections for cyclists.

Structure-Free Genetic Algorithm controller

A new intersection controller, taking into account passenger cars and cyclists, is designed which combines the concept of the connected environment and a structure-free control that uses the 'Genetic Algorithm' approach, hereafter named SFGA controller. A traffic system model is set up, based on validated models found in literature and a structure-free controller is constructed. Solutions for the order of the signals, and the duration of the green times, are generated and evaluated by means of a Genetic Algorithm. Weights can be varied to achieve different extents of cyclist prioritization. A maximum waiting time is enforced in order to prevent prioritization of cyclists to result in unreasonable delays for car drivers.

The performance of the SFGA controller is evaluated for undersaturated traffic flows by means of a simulation based case study. In the first part, the performance of the controller is benchmarked to vehicle actuated control (VA), the state of the art intersection control method in the Netherlands. Contrary to SFGA, the VA controller has a fixed control structure in which movements that do not conflict are grouped together in blocks, that are the same for every cycle. The green times of the movement are flexible, depending on the queue size that has to be served. The release of this queue is measured by detectors. SFGA is benchmarked against VA with an equal weight for the delay of cyclist and car drivers, and no weight is included for the number of stops.

The second part of research entails the evaluation SFGA with different weights that prioritize the desires of cyclists over those of car drivers, and the balance between bicycle delay and car delay is determined. The performance is measured by means of four performance metrics: average delay, average delay for cyclists, average delay for car drivers and the average number of stops made by a cyclist.

Results

Three levels of saturation (defined as percentage of the intersection capacity) are analysed, and the SFGA controller outperforms VA in all performance metrics, for all levels of saturation. For a saturation level of 15%, 30%, 45%, the delay for VA is 1.8, 3.1 and 6.0 times larger than when the SFGA controller is applied, 1.9, 2.3 and 3.1 times more stops.

Evaluation of the SFGA controller using different weights, as a way to introduce more priority for cyclists, results in even lower average delays and number of stops for cyclists. A relative weight of the cyclists of 1.7x, 3.3x and 5.0x the car weight is tested. The largest delay reduction is found for the highest saturation level, about a factor 2 less delay for cyclists. As is to be expected, this results in additional delays for car drivers, also especially for higher saturation about a factor 1.5 more delay for a relative weight of cyclists of 5.0.

Discussion

The better performance of the SFGA is attributed to two main differences between the controllers. First of all, the SFGA controller has a larger degree of freedom to choose more effective combinations of traffic signals to show green at the same time instead of following the fixed sequence of VA controller. Additionally, in contrast to using VA detector occupancy, the SFGA controller will allow traffic that otherwise would have the largest delays to cross first, even if this means delaying some travellers in close proximity of the traffic signal.

Without inclusion of weights that specifically prioritize the desires of cyclist over cars, the controller already tends towards prioritization of the cyclists. This is caused by the controller considering the number of travellers that are influenced by its control decisions, combined with the higher traffic densities that can be expected on bicycle paths within urban areas.

This work implicates that, in order to better serve the desires of cyclists, it is not explicitly required to prioritize cyclists over cars. In areas with large volumes of cyclists, considering the number of travellers and their proximity to the traffic light can already result in cyclists being served much better. This work could be used as a starting point or inspiration to design and eventually implement improved intersection controllers for vulnerable road users.

Recommendations and further research

The SFGA controller is a suitable method to improve the comfort of cyclists at an isolated intersection by reducing their delay and stops, without causing unreasonable delays for cars, provided that the delay of cyclists is weighted equally or marginally heavier than the car delay.

Further research is recommended on the controller design in a connected environment for cars and active modes. The first recommendation is to make the solution generation more effective by increasing the share of feasible solutions. Secondly, the determination of green times by the mutation algorithm can be optimized further, by random extension and reduction of green times, instead of incremental. Thirdly, the objective function should include a weight for total green time, orders of magnitude smaller than other weights, to avoid unused green time. Finally, the controller design should be evaluated and improved to function under non-perfect data and prediction quality.

Before practical implantation, the scope of the controller should be enlarged to accommodate other traffic modalities and more heterogeneity in personal characteristics, for isolated intersections and in networks.

A1: Comfort guidelines for pop-up cycle paths

Yvar de Waaij, Alexandra Gavriilidou, Maria Salomons

Introduction

During the COVID-19 pandemic, several cities around the world took measures to encourage people to walk and cycle more, while maintaining sufficient distance. This meant that more space needed to be created on the streets for pedestrians and cyclists. And that led to the concept of "pop-up cycle paths": bicycle paths that are constructed in a very short period of time and which, in a later stage, are either permanently realised or removed from the street scene.

Since it is a new concept, no global guidelines exist concerning how the pop-up cycle paths should be designed. This study aims to inventorise different implementations of pop-up cycle paths and investigate the perception of users regarding the safety and comfort of these various designs. The latter is done with a survey that was distributed in Germany, France and the Netherlands to determine the user experience with pop-up cycle paths. The findings of the survey lead to a starting point on guidelines on how the cycle paths should be designed to ensure a good user experience. This is the main contribution of this research.

Design Characteristics

In order to give more space to cyclists, space provided for motorised traffic is in most cases sacrificed. The most extreme implementation is to prohibit motorised traffic from further using a street, while less obtrusive measures just narrow the lane width provided to motorised traffic or convert an existing (driving, parking or bus) lane into cycling infrastructure. Depending on the degree of separation, this can then be a cycle lane or a cycle path. Moreover, the space that is made available determines the layout of the street: whether a one- or a two-way cycling infrastructure can be implemented, and whether that is located on one side, on both sides or in the middle of the street.

Regarding the degree of separation, there are types that fully block access to cars or bigger vehicles, thereby creating a cycle path, and types that discourage but do not fully prevent cars from using that space too, which leads to a cycle lane. Complete separation is achieved by adding barriers made from plastic or concrete, by introducing a parking lane between the cyclists and the driving vehicles, or by adding poles that are fixed in the ground or can be moved. The less enforced separators are wheel stoppers and lane marking. Some examples of each of these separation types are provided in Table 1.

Barriers	Movable Poles	Fixed Poles	Wheel Stoppers	Lane Marking	Parking Lane
					

Table 1. Example of different types of separation of pop-up cycle paths.

Survey Design

A survey was designed to derive the user preference for different layouts and separation types. In the first part of the survey, demographics of the respondents are collected to ensure that citizens of different countries have been reached, as well as to determine the frequency with which they use pop-up cycle paths and which other modes they use next to the bicycle.

The next part asks respondents to rank the different layouts from most to least comfortable based on photos taken in Berlin and Paris. The options they are given are a one-way and a two-way cycle path on the side of the road and a two-way cycle path in the middle of the road. The latter is commonly used in Paris, while the Friedrichshain-Kreuzberg guidelines that are used in Berlin explicitly forbid two-directional cycle paths. It is thus interesting to test how different populations perceive this.

A similar ranking question is provided also for the separation types. Photos are provided there as well and respondents are asked to focus only on that and ignore other information in the photos. To check the validity of this ranking, multiple trade-offs are also provided in the next part of the survey. There, the respondents are asked to choose between two situations which one they find most comfortable to cycle on. The situations are visualised in photos taken from real-life pop-up cycle paths. The trade-offs for the same underlying variable levels are provided three times using different photos to correct, if necessary, for any bias due to irrelevant details present in a specific photo.

Results and Recommendation

The survey received around 300 responses, almost equally spread among people living in France, Germany and the Netherlands. It is remarkable that in all samples the walking and public transport modes are frequently used by about 70% and 80% of the respondents, respectively, while the use of a car is much more pronounced in the German sample with a share of 70% that is almost double that of the French and Dutch samples.

The majority of the respondents ranks the two-way cycle path layouts the highest, with a higher preference to have it on the side of the road instead of in the middle. Especially for users that also frequently drive a car, placing a two-way cycle path in the middle of the road is experienced as very unpleasant. Based on the comments left by the respondents, a choice diagram (Figure 1) is made to advise which layout should be selected. This depends on the intensity of the bicycle flow and whether their destination is next to the road or further away.

Regarding the type of separation, solid methods like the barriers and the parked cars are the most preferable, while lane marking is at the bottom of the list. However, these methods are either expensive or require a lot of space. To make a choice for an optimal lane separation another choice diagram is proposed (Figure 2) which is based on vehicle speed and available space.

Further research is needed to define the boundaries between the choices more concretely and also explore how the transition between different layouts or separation methods can best be implemented.

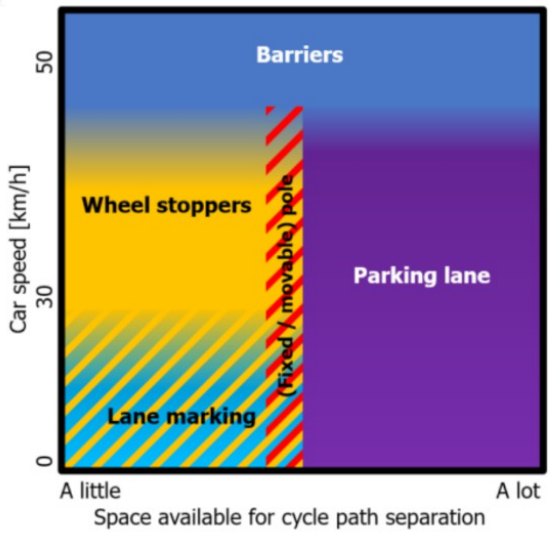


Figure 1: Choice diagram regarding layout of pop-up cycle paths.

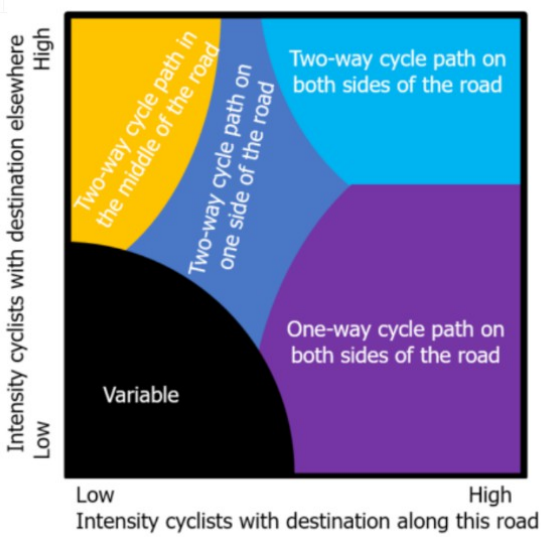


Figure 2: Choice diagram regarding the type of separation of pop-up cycle paths.

A1: Introducing a comprehensive cycling potential toolkit for planning purposes

Lucas Meyer de Freitas

The present work presents an R-based cycling potential toolkit for cycling infrastructure planning purposes. The toolkit builds upon the open-source brouter. It allows for maximum flexibility by allowing the user to input cyclist power (therefore accounting for the fitness of individuals) as well as the power of the bike itself (therefore account for different types of e-bikes and pedelecs). Presets are also made available. This in combination with the elevation-aware brouter shows how these factors can take into account personal determinants of cycling. The brouter is applied for Switzerland by combining it with data from the Swiss Health Survey and of the Mobility Microcensus to produce aggregate cycling potential accounts on the one hand, and microscopic street level potentials by combining it with the betweenness-accessibility metric on the other hand.

Besides providing a comprehensive planning framework for cities, another contribution of the present work lies in showing the importance of individual physical capabilities for cycling in Switzerland. This is made obvious by binary regression results on the daily cycling habits using the Swiss Health Data. It is found that the frequency of exercise explains the most variability concerning the choice to cycle or not. Since previous work in the literature has shown a clear link between exercise frequency and cycling power, one valid, although so far not directly observed observable hypothesis in microcensus data, is the simple one, that more physical power leads to faster speeds and more competitiveness of bicycles with cars. Although obvious in sign, there are no direct observations in place to quantify mode-shift potentials that account for such factors for Switzerland so far.

The cycling potentials were estimated for three bicycle types: conventional bicycles, pedelecs (25 km/h) and s-pedelecs (45 km/h). S-pedelecs clearly show the highest potentials, being able to substitute car trips of an average of 6km and transit trips of an average of 16km. When looking solely at travel times, up to 76% or trips could be substituted by s-pedelecs today. On the other hand, this only accounts for 33% of pkm's in Switzerland, thus showing that a true transformation towards net-zero transport systems also requires a reduction in the few but long trips we undertake.

Concerning cycling potentials on a link level, the results the tool is tested for the city of Zurich and the betweenness-accessibility metric is compared to actual count data to evaluate the suitability of the tool. An advantage of the brouter in this regard is that it allows for choosing different routing profiles, that weight existing cycling infrastructure differently. By for example, removing cycling infrastructure preferences it allows planners to locate best locations for placing cycling infrastructure or to strictly route through bicycle paths to evaluate changes in accessibility of new cycling infrastructure.

A2: Assembling Dutch Cycling: the tension between coloniality and mobility on the fietspad

Michael Auria Tahmoressi

This presentation will demonstrate how cycling infrastructure is assembled by ideologies and material practices. Cycling is a normative transportation behavior in the Netherlands. Kuipers (2012) articulated that cycling is the Dutch national habitus. Dutch people choose to cycle because it is a readily available method to transport oneself. This ease of access to a transportation mode has created a connection between the Dutch national identity and the bicycle. My project explores how this relationship is communicated as a material process. One way the communication manifests in the Netherlands is through the existence of safe and reliable infrastructure to cycle on. This presentation will attempt to answer the question, How does communication produces relationships between infrastructure, transportation modes, and users? Specifically, how the production of these relationships impacts the way individuals interact with their lived environments?

The first part of this presentation will argue how the Netherlands transportation system is an assemblage that communicates and relates with transportation users. Assemblages act through arranging people, institutions, and in science, matter, and particles. They produce alternative logics to philosophical and social unities, it is a multiplicity not a part which makes a whole (Nail, 2015). They are defined by "their external relations of composition mixture and aggregation" (p, 24). The relationality between the parts that are assembled determines how the assemblage is organized. Unities in contrast can develop themselves but they cannot fundamentally change how they are (Nail, 2015).

I will examine how the Netherlands transportation system as an assemblage is racialized. Whiteness is normalized on the fietspad because white middle class people make up the majority of cyclists. The constitutive parts of this racialized assemblage include the infrastructure, the urban planning professionals and advocates who produce discourse about that infrastructure, and the users of the infrastructure. The main implication for viewing the Netherlands transportation system as an assemblage is it demonstrates that transportation infrastructure is not just a background setting for action, but a vital agent which communicates how people should conduct their daily life.

Second, I will present data from a comparative analysis of immigrants cycling in the Netherlands to white bakfiets parents. This comparison will demonstrate how the assemblage (the transportation system) produces relational links between, transportation infrastructure, national identity, and the practice of everyday life. Specifically, the bicycle as a mode of transportation in the Netherlands. I will analyze examples from English speaking journalism and Dutch academic urban planning literature in which both identities have been produced. This portion will explore whether cycling allows immigrants to integrate into Dutch society, and what impact those immigrants have on Dutch identity through their adoption of cycling for a transportation mode. Van der Kloof (2015) articulated that cycling is not gender neutral in the Netherlands for non western immigrants. Non western women are poorly represented on the overall bike share for the country even in urban areas compared to men. These immigrants experienced will be contrasted an examination of the young heterosexual white couples who are gentrifying working class neighborhoods like De Pjip in Amsterdam. The major reason these people can move into these neighborhoods is because of the economic mobility granted by their social class status. The main reason these white couples choose these urban neighborhoods is to safely transport their children with bakfiets. This section of my presentation will problematize the adage that if you build the safe cycling infrastructure the mode share will increase. I will demonstrate, there is a need for cycling planners and advocates to create serious justice-based solutions to ensure that safe cycling infrastructure is available for all people who live in the Netherlands and countries who are modeling dutch cycling infrastructure. The implication of this discussion will explore the need to provide different communicative tools to facilitate non western women cycling.

Finally, I will discuss how viewing the transportation network as an assemblage can re-frame the benefits of cycling to include multiple cultural paradigms. This view of infrastructure constructs it as a place of cultural production. My perspective expands the understanding of cycling infrastructure as simply as material space. I argue that transportation infrastructure is an agent which interacts with human subjects who utilize the infrastructure. Infrastructure communicates to humans by enticing them to adopt modes of transportation. Just as people must learn languages to communicate to each other, learning to ride a bicycle can become a way enter communication with a material space that is a roadway. Critical urban planning scholarship has analyzed the role that ideologies, material systems and political choices influence the way infrastructure is produced and how people will utilize it. This presentation will build on this research through examining a roadway as assembled, through discourses, by ideologies and people, as well as material space. I will argue that understanding the transportation system as assembled can increase the communicative strategies to entice users to adopt the sustainable transportation choice of cycling. A practical implication of viewing infrastructure as assembled is it demonstrates a need to create culturally specific programs to entice non westerners to adopt cycling in the Netherlands.

I want to present at CBRAM to network with people interested in the Netherlands and cycling and hopefully immigrants experience with cycling. My family immigrated to the United States from Iran and Mexico. I feel a deep connection to studying immigrant populations because its how i experienced life growing up. I specifically want to figure out how I can work with a cycling school that teaches immigrants in the Netherlands. I also want to work with primary school student who are taking the cycling examine. With both cases I want to interview the new cyclists about how learning to cycle impacts how they view their communities and their place in them.

I would like to be considered for a scholarship to attend the conference as I am going to be traveling from the United States and I am a phd student so I don't have a lot of money. At the University of Minnesota I teach video production and I feel like I could help y'all through being a photographer. I also have experience moderating panels because I used to work as a debate and speech coach which part of my responsibility was to make sure that the debate rounds, and speech panels moved forward in a timely manner. I am also an accomplished qualitative methods researcher. I could use these skills to create interview questions and conduct and film unscripted interviews with conference participants. I would be willing to make this into promotional material for the next CBRAM conference. I have worked at large events in the past like the South by Southwest festival in Austin, Texas as a sound technician setting up stages. I could provide assistance to help set up any microphone and PA equipment the conference will use.

A2: Digital Modal Split: Potentials, Challenges and Trade-offs for Cycling Policy

Bernhard Wieser, Roman Luka Prunc, Markus Buchsteiner

In this paper we discuss aspects of technical feasibility and privacy protection of a digital modal split. More specifically, we ask about new uses of modal split data determined by digital means and inquire into possible trade-offs of such a novel way of obtaining traffic data. Against this background, it is possible to assess the added value of a digital modal split in relation to a modal split determined by classical methods.

The significance of the modal split

The modal split is "the" central indicator for assessing urban mobility behaviour (Ungvarai 2019: 1). In particular, modal split data are used to characterize the bicycle-friendliness of a city (Kahlmeier et al. 2021). The modal split serves as a benchmark for comparisons between cycling cities (Gerike et al. 2020), as justification for transport policy measures (Kahlmeier 2021, Leth 2019) and it is used as evidence for demonstrating achieved impact (Randelhoff 2018).

Classical data collection methods

Traditional modal split studies draw on a number of survey instruments. However, conventional modal split studies give rise to considerable doubts regarding the accuracy and completeness of the given information. It is a recognised methodological problem of modal split surveys that "sample sizes, sampling and survey type can differ greatly, which has a significant impact on the quality of the data" (Leth 2019; Gerike et al. 2020). It was furthermore noted, that conventional modal split data insufficiently capture multimodal mobility behaviour (Ungvarai 2019).

Validity, Reliability and Comparability

Existing literature points to reliability problems of modal split studies carried out with conventional methods (Becker & Sönke 2016; Ungvarai 2019). Validity issues are also recognised (Leth 2019; Kahlmeier et al. 2021). Comparability is especially problematic. It is questionable whether modal split figures are comparable at all to one another (Randelhoff 2018). Gerike et al. (2020) emphasise that proper comparisons are only meaningful with knowledge of the local boundary conditions of the compared cities. Against the backdrop of these methodological difficulties we ask if digital technologies could help to overcome the described shortcomings of classical methods.

A digital modal split

Two technologies need to be distinguished: global positioning system (GPS) and mobile phone positioning (MPP). Both have their respective methodological weaknesses and strength. The obvious advantage of digital methods is their comprehensiveness (Brändle 2021). The vast majority of all traffic users own a smartphone, which they carry along at all times (Lee et al. 2017). This fact promises a substantial reliability gain. However, new reliability deficits occur if data collection require smartphone apps (GPS function) to be turned on. By comparison, an MPP approach does not suffer from such involuntary data variabilities and thus presents higher levels of reliability. However, the downside of MPP is their lack of precision (Lee & Sener, 2017). MPP technology is not capable of capturing cycling movements in urban environments. For this validity deficit MPP is not a viable option for a digital modal split. GPS data are much more precise and thus imply a much higher validity of modal split data obtained by such means. Precision is a requirement for a valid distinction between different modes of transport (Zhu et al. 2016). In addition, GPS technology may hold the solution to another shortcoming of classical modal split data. Commuters from the surrounding areas can now be accounted for their contribution to urban traffic. Nevertheless, there remains another as yet unresolved validity drawback resulting from the indistinguishability of business-related traffic. Existing definitions of the modal split do not account for business related traffic, notable leaving aside the growing sector of courier, express and parcel services (CEP). Against this backdrop the question arises as to whether a digital modal split is at all comparable with older mobility studies based on classical methods.

We conclude with an important, however, often ignored aspect of digital data collection. Although there is a considerable body of literature on this matter (e.g. Hauf 2007; Giannotti et al. 2012; Qardaji et al. 2013 and Haydari et al. 2021), linkages to the modal split are rare. Strong privacy protection implies drawbacks on the explanatory power of digital data (Niebuhr 2021). A discussion on how this impact on the usefulness of a digital modal split is as yet absent.

In the final analysis, there is a trade-off between new opportunities made possible through digital technologies and the explanatory power of mobility studies carried out with classical survey-based methods. To maximise the benefits of both, these methodologies may play a complementary role rather than a mutually exclusive. The role of the modal split for promoting pro-cycling policies remains undisputed. Its effectiveness however depends on the reliability and validity of the data. Ensuring comparability is especially important when using the cycling share in the modal split as a key benchmark towards sustainable pro-cycling transition.

A2: Electric Scooters and Where to Find Them – A Spatio-Temporal Analysis on the Utilization of Shared E-Scooters in Munich

Michaela Teissler

Since June 2019, electric scooters are permitted in German road traffic. (Federal Ministry for Digital and Transport, 2021) With this permission, multiple providers started to implement sharing systems in German cities to complement the urban transportation portfolio. One of those cities is Munich. In the context of the evaluation of the shared e-scooter (SES) in Munich, the backend data of six providers was analyzed. (Schreier, et al., 2020) With more than 8 million trips in the period from June 2019 to September 2021, e-scooter sharing seems to be far more attractive than the bike sharing service from the local public transportation provider. The contribution focuses on the spacio-temporal aspects of the evaluation, especially on hotspots for pick up and drop off, origin-destination (OD) relations, and interaction with the public transportation system. The investigation aims to better understand the users' mobility demands and patterns for planning future multimodal transportation systems.

Similar studies were conducted in cities like Washington D.C., Austin, and Puerto Rico. In Washington D.C., researchers analyzed snapshots of SES availability. They concluded that the share of trips that start or end in recreational areas is higher than in commercial and the residual regions. (McKenzie, 2019) Other investigations noted high SEM traffic in downtown areas and university campuses. (Bai & Jiao, 2020; Rodriguez-Roman et al., 2022) In Berlin, the results over nine months of e-scooter operation suggest that the point of interest categories characterize the usage. (Heumann, Kraschewski, Brauner, Tilch, & Breitner, 2021)

To elaborate on the spacio-temporal aspects of the SES systems, time and locations from the trips are extracted and analyzed in terms of hotspots, origin-destination relation, and in context of distance to public transportation.

The hotspot analysis is based on heatmaps that visualize the absolute and relative number of trips on a honeycomb structure with 330 meters distance between the centers. Those heatmaps picture the pick-up and drop-off locations for different temporal slices. Most trips take place close to the city center. Notably, in the areas surrounding the central station, many trips start or end. Several patterns of use can be observed that confirm the use of SES for leisure activities, like the increasing number of trips in the evening hours in areas with a high density of bars, especially on Fridays and Saturdays. An increased SES activity outside the central area can be observed in cells with public transportation hubs connecting two or more lines of suburban trains or light-rail.

In general, SES in Munich are used for short distances. The median trip length is 0.87 kilometers. The short distance of trips is also notable in the matrices by the high number of trips that start and end within the same district. Trips that end in another district as they start often are parallel to important axes of individual and public transportation like the main light rail course that is used by all light rail trains in the public transit network of Munich.

Taking all public transportation stops into consideration, more than 90 percent of all trips start or end within a 100-meter radius of the closest public transportation stop. Due to congested roads that lead to a lack of reliability and low attractivity of busses, we can assume that SES are instead used to reach the station of a rail-bound system than a bus stop. Therefore, only those stations are taken into consideration for deeper investigation. Most trips start and end within a 50-100-meter radius of the next station. An increased number of trips can be noted within a 50–150-meter radius of stations. The geometry of the station can explain this radius. For each station, one point on the map is given. Most suburban train and light-rail stations have entrances at the front and rear of the station. Since suburban trains in Munich have a length of approximately 115 meters, the doors are by default at least 60 meters from the center.

Most trips start or end close to the city center. The further from the center, the fewer trips take place. Attracting points outside the center are mainly suburban train, and light-rail stations with more than one line are higher frequented. SES are primarily used for short distances. The median is 0.87 kilometers. A high share of trips starts and ends within the same district. Trips that end at a district other than they start, are likely to move parallel to significant private and public transportation axes. In the future, we aim to take a closer look at the trajectories and investigate whether the existing data can be used to assess the infrastructure used by various micro mobility vehicles.

A2: The importance of the Citizen Science approach in cycling research in supporting a transition towards a sustainable mobility system

Elke Franchois

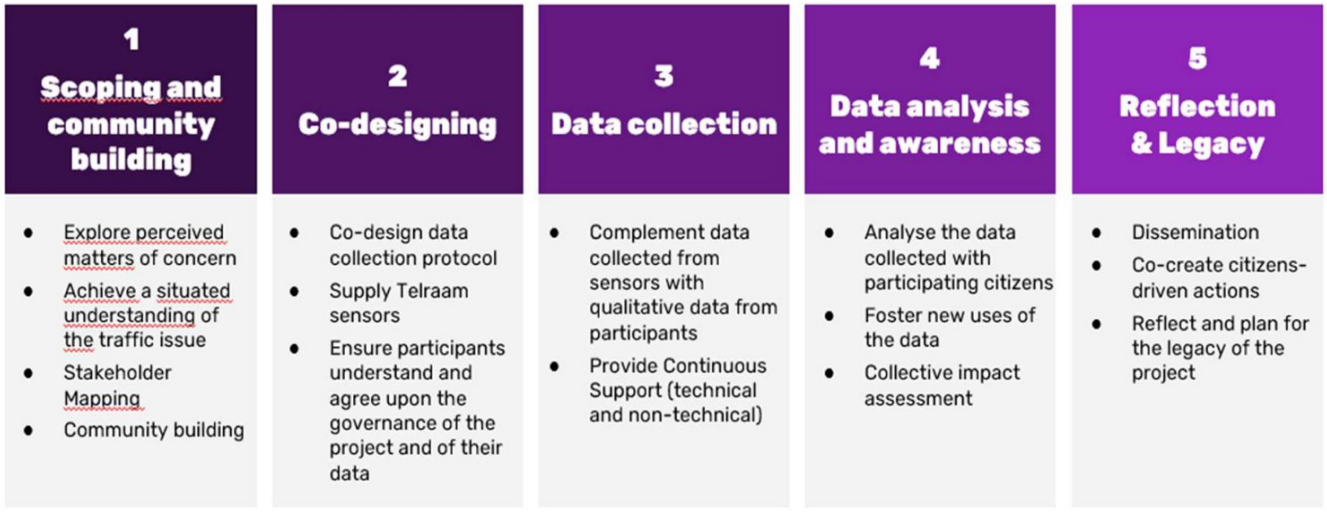
The European Citizen Science Association definition of Citizen Science reads as follows: "An umbrella term describing a variety of ways in which the public participates in science." With Citizen Science, you empower citizens and support policymakers on the transition towards sustainable mobility.

Every citizen has his or her own experiences with mobility. Every citizen is a mobility expert. Every cyclist is a bicycle expert. Yet, most mobility research is conducted in formal settings: from universities to municipal mobility departments in cities and towns. Such research leads to mobility strategies and policies that might be effective, but are not always supported or understood by the citizens they affect and work towards the desired transition.

Another approach is possible. Citizen Science allows citizens to actively participate in mobility research. Not as study objects or survey respondents, but as real researchers. This active citizen participation brings some major benefits: (1) it enables citizens to more easily embrace the strategies and policies that flow from mobility research and (2) it empowers policymakers to be bolder in moving towards more sustainable mobility, without fear of public resistance or backlash.

It is common knowledge that the average participant in a Citizen Science project is a highly educated man from a higher income bracket. In order to move towards the desired transition to more sustainable mobility, the policy formed on the basis of a study must be supported by many more people than just the highly educated male.

Who participates in your Citizen Science project depends on what you ask of whom and when. Not everyone is interested in the data analysis, others can prefer to think about how to bring the data out into the open and make it a conversation starter in the street, or someone is willing to develop a tactical urbanism or guerrilla urbanism campaign, based on the collected and analysed data.
Who to involve, how to involve and when to involve the citizens as scientists in a Citizen Science project? Mobiel 21 uses the Citizen Science Framework developed and tested within the WeCount project. This framework helps determine in which project phases citizens can participate and how. Crucially, the framework shows that Citizen Science can cover so much more research aspects than just data collection. It's a journey that can span from community building to post-project reflection.



Why investing in a Citizen Science project? There are several benefits from a Citizen Science project that makes it easier to work on a transition towards more sustainable mobility. Citizen Science in mobility research and mobility policy brings the following benefits:

- more participation in a research domain (traffic) that concerns everyone;
- research on a larger scale with more and other data;
- new sources of information, knowledge and perspectives: the citizens' perspective, the cyclist perspective;
- stronger links between citizens and scientists: a policy based on Citizen Science data, is a more strongly supported policy;
- improvement of the openness and reliability of research and an increase in citizens' confidence in research;
- citizens understand better scientific research in mobility, which ensures that they better understand the difficult mobility context, and avoid the problematic NIMBY effect.
- scientists and knowledge institutions understand better current issues in society thanks to citizens' perspective in the Citizen Science research

How to use the Citizen Science approach in cycling research? PING and Telraam are two proven technologies that promote Citizen Science so everyone can be a part of the sustainable mobility movement.

With PING, cyclists become cycle scientists. PING is an innovative and data-driven tool that locates and visualises bottlenecks in urban cycling traffic. Cyclists track their ride via a smartphone app, collecting data on cycling conditions and give feedback via the Bluetooth PING button, and categorize their data digitally via a standard list of categories. These data are not only collected with the cyclists, but also analysed together with them. Based on these data and analysis, also recommendations are developed together.

Telraam is an automatic traffic counter that enables citizens to count the number of cars, heavy vehicles, cyclists and pedestrians in their own street. A front window, Telraam sensor, power outlet and Wi-Fi connection are all your citizen scientists need to start counting. All Telraam data are made available to the public so everyone gets a full picture of traffic volumes and cities and towns can finetune mobility policies based on reliable data. Telraam encourages and supports interaction between citizens and gives them the tools to engage in professional data analysis via an online exchange platform, to build bridges between data, citizens, professional scientists and policymaker, to improve public understanding of mobility research and in the end make the citizen a scientist in the Citizen Science project.

A3: Demand-driven design of bicycle infrastructure networks for improved urban bikeability

Christoph Steinacker et al

Cycling is a crucial part of sustainable urban transportation. Promoting cycling critically relies on a sufficiently developed bicycle infrastructure. However, designing efficient bike path networks constitutes a complex problem that requires balancing multiple constraints while still supporting all cycling demand. Here, we propose a framework to create families of efficient bike path networks by explicitly taking into account the demand distribution and cyclists' route choices based on safety preferences [1]. By reversing the network formation process and iteratively removing bike paths from an initially complete bike path network and continually updating cyclists' route choices, we create a sequence of networks that is always adapted to the current cycling demand. We illustrate the applicability of this demand-driven planning scheme for two cities. A comparison of the resulting bike path networks with those created for homogenized demand enables us to quantify the importance of the demand distribution for network planning. The proposed framework may thus enable quantitative evaluation of the structure of current and planned bike path networks and support the demand-driven design of efficient infrastructures.

A3: An analysis of cycling characteristics on network boundary of bicycles

Mio Suzuki

In Japan, most people had been riding bicycles on sidewalks for around 30 years, therefore the traffic accidents during cycling or walking had been the one of serious problems. Then in 2012, by the establishment of the guideline for developing bicycle facilities on roadways from the MLITT and the NPA, and the development of bicycle facilities especially for bicycle network have started in Japan. In the current situation, we have many boundary points of bicycle network, in other words, the network terminations or the points of discontinuity, because many designs of bicycle facilities have developed rapidly and they had been developed mainly at the midblocks. So in this study, we analyzed the cycling behavior in the boundary points of the bicycle network by the video observation.

I conducted the video survey on Route 17, in the central area of Tokyo. the bicycle lane is developed at the midblock and near the intersection and the "Navi-Line (a pictogram that, shows bicycle's keeping left " is developed at the intersection. But the rate of bicycles which is on the bicycle lane at the midblock and the one which is on the "Navi-Line" at the intersection are different between the directions. The continuous length of bicycle lane in the northwest-bound is longer than that in the southeast-bound, but the rate of utilization is higher in the southeast-bound. It's thought to be due to the structure of intersection (cross section of Hakusan Street and Route 17) which is hard to pass for cyclists, the distribution of the bus stops, and the parked vehicles. On the other hand, the relationship between the position of cycling on the roadway at the midblock and the intersection is almost same. It is revealed that around 60% of cyclists on the bicycle lane pass on the "Navi-Line" at the intersection.

The possibility is shown that whether people ride bicycles on roadways at the midblock is more affected to the utilization of "Navi-Line" at the intersections.
We conclude that the possibility is shown that whether people ride bicycles on roadways at the midblock is more affected to the utilization of "Navi-Line"or other pictograms at the intersections.

A3: Cycling Mobilities of Care in a Cross-Cultural Context

Lucas Snaije

To date, there has been limited research conducted regarding the potentially positive connections between cycling, caregiver journeys, and early childhood development, leading to cities struggling to accommodate these groups' needs as they embrace cycling agendas.

Shaping more inclusive transport systems, programs, and policies to support the mobility of caregivers is critical for their well-being and equal participation in society, and if the right conditions are provided for uptake, cycling could play an important role by providing cheap, independent, reliable, and energy efficient mobility. In order to achieve this, caregivers, and women caregivers in particular, need better urban environments to cycle safely, as well as supportive awareness, access, and educational programs to feel confident and comfortable cycling in the city for care journeys.

BYCS is a small international NGO based in Amsterdam that seeks to support community-led urban change through cycling. In partnership with the Bernard van Leer Foundation, we have been exploring the positive connections between cycling, early childhood development, and caregiver wellbeing. Following a first brief report "Cycling Cities for Infants Toddlers and Caregivers" (presented virtually during the cycling research board conference in 2020) we are now embarking on a new, global initiative, to develop cycling awareness, education & access pilot programs and gain new insights on the experiences of women caregivers cycling.

BYCS will coordinate pilot projects in 3 cities - Bengaluru (India), Istanbul (Turkey), and Mexico City (Mexico) - working with local community partners and cities to develop and test different types of pilot programs, and gather data on the experiences of women caregivers cycling, in order to develop new knowledge products for city decision makers and advocacy groups, and increase the uptake of cycling amongst the target groups.

The pilot programs will be offered to women caregivers for a number of key reasons. Firstly, women are more likely to be undertaking such journeys, meaning that greater consideration for caregiver mobilities must be addressed with a gender equity lens. Women also face more barriers than men to start cycling, from social norms to skills, awareness and self-efficacy. Directly supporting uptake through training and behaviour change programs can reduce the gender gap in cycling modal share, while supporting the creation of safe and comfortable spaces for women to learn how to cycle.

In 2009, Ines Sanchez de Madariaga coined the term "mobility of care", to underscore the aggregate importance of travel associated with care work, defined as "unpaid labour performed by adults for children and other dependents, including labour related to the upkeep of a household". A decade later, Sanchez de Madariaga has noted that the travel associated with such care tasks is still not well described in the transport literature and is still less considered by transport policy agendas.

This gap in literature is felt even more acutely in regards to cycling and mobility of care. The knowledge gap in this field has also only recently been highlighted by academics such as Lea Ravensbergen or Stephanie Sersli (2020), who have commented that the few studies on the topic have predominantly focused on the barriers and challenges of household-serving travel by bicycle rather than providing a detailed account of people's experiences completing this type of travel.

During this session, we would like to explore the initial learnings from the pilot programs (with qualitative data gained from focus groups held locally, and a global survey which will be launched in the summer of 2022), as well as ignite a conversation among researchers and practitioners on the importance of centring mobilities of care in the cycling policy, planning, and research conversation. If our urban environments their socio-cultural fabric enable caregivers to cycle, then they will be enable most other users to cycle too. Lastly, this session will explore approaches in 3 majority world countries across 3 continents, so could also fall in the topic area "cycling policies and approaches in majority world countries". It will serve to continue amplifying and improving the year long initiative that is being launched in July 2022.

A3: Rebuilding streets for sustainable transport: The E-Bike City?

Lukas Ballo

Transport Policy in cities is facing urgent and difficult challenges. On one hand, traffic must rapidly decarbonize (IPCC, 2022) and reduce its negative externalities such as noise, pollution, and accidents. On the other hand, growing urban populations, together with economic growth and infrastructure investments drive an ever-growing demand for individual travel (Steffen et al., 2015). And in addition, growing attention to discrimination and exclusion demand that transport planning also addresses social issues to a larger extent (Martens, 2016).

We argue that today's course of transport policy is unlikely to address these challenges sufficiently. Its overreliance on technical and incremental improvements will likely fail to mitigate climate change, negative externalities, and social equity problems. Electric cars (Wang et al., 2021) and autonomous driving (Bösch et al., 2018) will reduce the generalized cost of driving, likely compensating much of the efficiency gains with added travel demand. On the other hand, mobility pricing (Jakobsson et al., 2000; Gu et al., 2018; Lichtin et al., 2022) and non-household carpooling (Shaheen, 2018; Becker, 2020) as possibilities to reduce traffic lack widespread support. Finally, public transport as a traditionally sustainable mode is missing in many places and can only be implemented over a longer time period – and even then, its rigid routes and schedules are not suitable for serving the needs of all population groups.

Rather than only providing more efficient solutions for present behaviors, future transport policy must include substantial behavioral changes toward lifestyles and modes of travel that are inherently sustainable, efficient, and equitable (de Blas et al., 2020; Grubler et al., 2018; Moriarty and Honnery, 2013). A possible path of such changes is a massive mode shift from private cars to cycling, induced by a radical reallocation of road space in cities. Recent mass availability of e-bikes makes cycling attractive for wide population groups and despite unfavorable topography (Rérat, 2021). However, besides addressing the urgent sustainability issues, such changes will also have strong effects on accessibility and the social nature of a city. It will change existing patterns of exclusion, shape social networks, and enable new lifestyles while discouraging others. Understanding and discussing these effects may be key to designing paths toward sustainable transport in a way that is effective but also socially desirable.

To develop a better understanding of such effects, we propose to test a radical transformation of streets encouraging the use of sustainable modes - the E-Bike City. Its central assumption is that ~50% of road space will be dedicated to infrastructure for e-bikes and similar small vehicles, making their use safe and attractive, while discouraging car travel. The E-Bike City concept addresses key challenges under which cycling commonly suffers: Fragmented infrastructure with unequal access and high attractiveness of driving. It provides a well-connected and visible network of cycling paths with fair access for residents of all neighborhoods, while at the same time reducing the attractiveness of driving.

The following six principles describe the concept (see the appendix for visual illustrations):

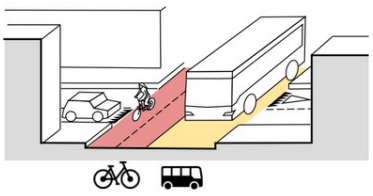
1. Absolute priority for cyclists and public transport.
2. Removing capacity and connectivity from motorized traffic.
3. Special arrangements for emergency and utility vehicles ensuring a proper access for them.
4. Consistent quality of the cycling infrastructure, with ~50% of road space allocated throughout the entire city
5. Infrastructure designed for a massive use of various e-bikes (pedelecs, s-pedelecs, scooter-style) and other diverse electric and human-powered vehicles with large differences in speed and size.
6. Testing the potential of technologies (dynamic lanes, autonomous driving, etc.) for safer and better use of road space.

The changes in generalized cost of driving and cycling will necessarily drive a mode shift and change structures of accessibility, with large social consequences. Likely, the strongest beneficiaries will be urban residents without a car, gaining the capability of safe cycling, which is in many cases faster and more flexible than public transport, while at the same time benefiting from less negative traffic externalities. Especially those in cities with a weak public transport system may enjoy a massive increase of accessibility. On the other hand, car users will suffer accessibility losses. In particular, those commuting from suburbs will be negatively affected, while having few alternatives and no benefits from lower negative externalities in the city.

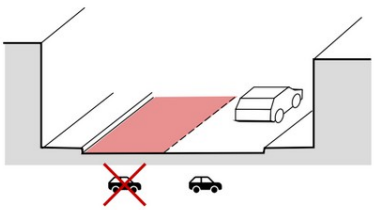
The consequences on social equity may be highly controversial. Some groups will be able to conduct new lifestyles and form new social networks. For example, giving virtually everyone the possibility to travel independently on an e-bike will allow an emancipation of people whose out-of-home activities currently depend on others. However, the concentration of benefits in the city may also translate into gentrification, forcing low-income residents out of the city. Accessibility losses in car-oriented suburbs may isolate their residents' social networks and activities from those in the city. Such effects may even coincide with divides along gender, ethnic, nationalist, or racial lines, reinforcing existing patterns of discrimination.
While the effects on sustainability can be easily understood, tackling the social effects triggered by the E-Bike City will be a key challenge in making such transformation equitable, desirable, and politically feasible. Further work applying the transformation to individual cities will require a precise optimization of its design, including compromises and countermeasures aimed at compensating the accessibility losses where necessary.

In this contribution, we are introducing a radical sustainability-oriented transformation of transport infrastructure in cities and elaborate its potential effects. Further research is necessary to quantify the expected outcomes and understand how they will impact individual population groups in real cities. Finding an acceptable balance of the proposed measures would give policymakers a tool for rapidly improving the sustainability of urban transport. If such balance is not possible, we hope that our work will inspire other researchers in creating and testing other, competing urban visions helping to address the pressing challenges faced by today's transport policy.

APPENDIX: SIX PRINCIPLES OF THE E-BIKE CITY TRANSFORMATION

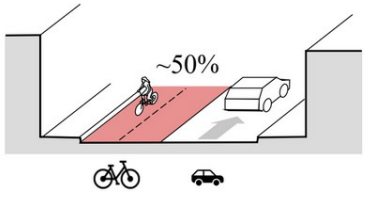


1. Absolute priority for cyclists and public transport.

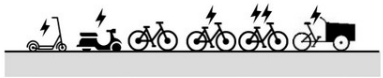


2. Removing capacity and connectivity from cars

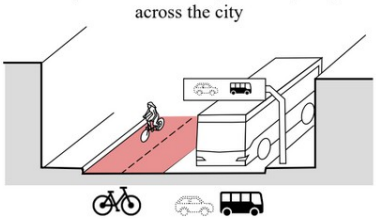
3. Maintaining access for emergency and utility vehicles



4. Equal share of road space for cycling across the city



5. Infrastructure for mass use and great variability of small electric vehicles



6. Testing technologies for optimal use of road space

B1: Social characterization of bike sharing in Brazil: an analysis of users and travel in five capitals

Victor Callil

One of the most useful tools to improve bicycle use in cities is the bike sharing system (BSS). But how inclusive is this kind of service in terms of being used by vulnerable populations in Brazil (particularly elderly people, women, and Black people)? This research tried to understand how inclusive five Brazilian bike-sharing systems are. The BSSs considered in this paper are located in five different state capitals: São Paulo, Rio de Janeiro, Salvador, Recife, and Porto Alegre.
Our research involved conducting a representative survey of the systems' users. In total, we carried out 1,665 interviews and the margin of error varied between 4.5% and 5.6% among the samples. The interviews were conducted between July 25th and August 10th of 2021. Cyclists were interviewed when returning the bicycles to the stations. To guarantee sample representativeness, stations were divided into regions and interviewers were allowed to approach a limited number of cyclists in each region. The interview quota of each region was defined by the number of trips and users in the station group. The questionnaire took about 10 minutes to complete.
Another important aspect of the data collected was the fact that it only represented users who cycled with the shared bicycles between Monday and Saturday and who were making a trip to get somewhere. In other words, we did not include those who were using the bike sharing systems for leisure activities or delivery trips in our sample as the patterns observed in these user groups of the population are quite different from those observed in daily users for transport or commuting (the major part of the users). Furthermore, urban mobility on Sundays in Brazilian cities, especially in the capitals, tends to have a completely different operating pattern.
In order to understand how inclusive systems are and taking into consideration the reality of the cities where they are located, we used an index called the Location Quotient (LQ). This index, well known in urban economy studies (Haddad 1989), was very useful in achieving this goal as it allowed us to understand how BSS features behaved in comparison with city features. Even though the calculation of the index is very simple, it can be useful in identifying what groups have been left out of the BSS and allows operators and public authorities to discuss measures needed to make shared cycling more inclusive.

$$LQ_{\text{Location Quotient of variable i and system j}} = \frac{\dfrac{E_{ij}}{E_{\bullet j}}}{\dfrac{E_{i\bullet}}{E_{\bullet\bullet}}}$$

E_{ij} — Frequency of the analysis category of variable i in the system j

$E_{\bullet j}$ — Total frequency of all categories of variable i in system j

$E_{i\bullet}$ — Category value frequency analysis of variable i in the municipality

$E_{\bullet\bullet}$ — Category value frequency analysis of variable i in the municipality

As a result, we discovered:

Women are usually underrepresented in the systems, with two exceptions: Recife and Porto Alegre. This data reinforced the picture that bicycle and gender literature has been drawing over the last few years in Brazil (Lemos et al. 2017). It has less to do with the bike sharing system itself, and more with the fact that women tend to feel uncomfortable cycling in Brazilian cities, particularly in terms of public security.

Another interesting highlight is that systems in Brazil are used by Black people. The LQ in all five cities studied showed that this population is representative among those who use shared bicycles as means of transportation.
Some Brazilian researchers (Lemos 2018) suggest that bike sharing systems are used, for the most part of the time, by the richest populations in the cities. If we consider their use for transportation, this does not hold true. The data points to having a very similar proportion of people with family income up to two minimum salaries when looking at city population and BSS users.

When we look at the age of those who using BSSs in these five cities, we saw that there is an underrepresentation - in all the cities studied, those more than 40 years old are less represented in the systems when compared with city populations. The literature shows that physical activity encouraged by cycling habits is a powerful tool to prevent a series of diseases from occurring in people (Carlson et al. 2015; Carlson et al. 2015; Bueno et al. 2016; Js et al. 2015).

This research project also collected data regarding the distance of the house from the system, the reason for the trips, what means of transportation BSSs were substituting as well as intermodality. Moreover, we tried to calculate the impact of these BSSs on the environment (in terms of CO2 avoided per year), health (contribution towards the user becoming a physically active person) and economy (how much users could save weekly and annually).

This research project was conducted by the Brazilian Center of Analysis and Planning (CEBRAP) and sponsored by Itaú Unibanco. The partnership of these two institutions goes back more than ten years and there has been an extensive production of literature regarding urban mobility by bicycle produced during this time.

B1: Subjective Safety of Bicycle Infrastructure at Intersections and Roundabouts

Sina Wachholz et al

INTRODUCTION

Cycling provides individual and societal benefits, such as improved health [1], faster intra-urban commuting[2], lower CO2 emissions [3] and all in all lower societal costs [4] compared to most other traffic modes. However, the national average of the cycling mode share was only around 10% in 2008 and has not increased remarkably ever since [5].

Several studies indicate that the lack of subjective safety may be a crucial reason to refuse using the bicycle[6, 7]. While there is evidence on how to improve subjective safety through infrastructure on road sections [8], there is none concerning intersections or roundabouts yet. To close that gap, we investigate subjective safety at junctions depending on different infrastructure designs.

METHOD

Participants (N=48, 54,17% female, Mage=44, SDage=16,5) were asked to pass differently designed and simulated junctions followed by focused interviews.

Junction Design

For the analysis, we selected four different junction designs to be presented to our participants (see Figure 1):

- intersection with cycle lane without offset and without physical separation (German: "Radfahrstreifen"; RFS)
- intersection with cycle lanes between car lanes (German: "Radfahrstreifen in Mittellage"; RiM)
- intersection with cycle path with offset and physical separation (so-called protected intersection; PI)
- roundabout with cycle path with offset and physical separation (German: "Kreisverkehr"; KV).

The designs correspond to current technical regulations [8, 9]. Some parameters represent best practices that are not (yet) part of official infrastructure guidelines, such as the continuously coloured bike lanes [10].

Presentation mode

The junction designs were presented in a bicycle simulator that operates in a 360°CAVE (Cave Automatic Virtual Environment). The technical setup of the bicycle simulator comprises measuring the steering angle and rear wheel speed of a stationary bicycle and transferring them via an Arduino to Unity to navigate the participant in the virtual city traffic scene.

Figure 1: The four junction designs as shown in the simulation (top left: RFS, top right: RiM, bottom left: PI, bottom right: KV)

Participants' task

Participants were asked to ride through four different simulated cities. Each city consists of three subsequent identical junctions separated by 75 metres of straight road with a protected bike lane. Participants had to turn right on the first junction, pass straight through the second one and turn left on the third one. After each ride, we conducted a focused interview on this specific junction design.

RESULTS

In general, most participants felt safest cycling through the PI design, followed by KV, RFS and RiM. Nevertheless, a few participants preferred RiM to the other designs.
Apart from this general assessment, we will analyse our data in the next months to identify positive and negative aspects for each design. We will present these results at the conference.

DISCUSSION

Overall, our results indicate that most cyclists and non-cyclists feel safer and thus prefer to ride with physical separation from motorized traffic on junctions. However, since some cyclists feel uncomfortable with the physical separation, a differentiated approach is needed to design junctions that fit all cyclists.

PROSPECTS

To respect this subjective nature of safety perception we will structure and interpret our recent findings, taking into account established cyclist typologies. We already conducted detailed interviews on mobility socialization and cycling behavior that will build the foundation of this analysis.

Furthermore, we will create and test new designs based on the statements of our participants. A multi-disciplinary advisory board will evaluate these designs in the end.

FUNDING

The project is funded by the German Federal Ministry for Digital and Transport (BMDV) with resources from the National Cycling Plan 2020.

B1: Intra-trip cycling speed variation: the spatial and temporal heterogeneity in weather's effects

Hong Yan

Weather significantly influences cycling, such as bicycle trip generation, since cycling is an active transport mode and cyclists are exposed to the air. This influence tends to increase with climate change as daily weather conditions become extreme, and this can be a big challenge in promoting bicycle usage. Therefore, some studies examined how weather affects people's bicycle trip generation and cycling for commuting. Generally, they adopted the average or maximum daily weather conditions and found that cold, rainy and windy weather conditions decrease cycling usage (Böcker et al., 2013; Helbich et al., 2014). However, they cannot reveal the detailed influence of weather conditions and the variation of this influence during cycling. The reason is twofold. First, weather conditions vary during a day and even during a trip. It means that the average daily weather value does not perfectly reflect the conditions during cycling or reasons for choosing cycling or not. Second, mode choice and trip generation do not tell cycling behaviour changes during a ride. Understanding the detailed influence is important, since it can help efficiently formulate policies to mitigate negative influences and provide better cycling environments, especially considering possible climate change.

By linking the cycling speed and weather conditions at different places and times, it is possible to detect the detailed influence of different weather on cycling. Cycling speed partially reflects the magnitude of resistance that cyclists encounter during a trip, and normally cycling speed decreases with the increase in resistance. Meanwhile, weather conditions are a source of resistance (assistance), which influences cycling speed. It says that we can understand the insightful effects of weather by testing its influence on cycling speed variation during a trip after controlling for other influential factors. However, this topic receives less attention.

Weather's influence on cycling speed is not immutable but changes across seasons and places. Regarding seasons, weather conditions have large season contrasts, and cyclists' feelings towards and their responses to these conditions may vary during different seasons. Regarding places, different places have varied land covers, and some types of land-use can serve as shelters to mitigate the influence of weather on cycling. Although seasonal and spatial differences provide more insights into the relationship between weather and cycling behaviour, only a few studies tested them (Helbich et al., 2014).

Besides telling detailed influence of weather on cycling, cycling speed is related to mode choice. Smooth cycling reduces travel time and therefore improves the competitiveness of cycling. To find factors influencing smooth cycling and allow cyclists to maintain the speed levels they prefer, it is necessary to know how speeds vary during trips and what influence this variation.

Therefore, this study aims to test the influence of weather conditions on cycling speed variation, considering weather's different effects across seasons and places. To this end, we use a whole year-round cycling dataset collected by GPS devices in Utrecht province and its surrounding areas. About 500 cyclists made more than 56,000 trips in 2020. GPS devices record a tracking point with positions and timestamps every 13 seconds, and cycling speed is calculated at every tracking point to show variation. The whole year-round data reflect cycling speed changes at different seasons. Weather conditions, such as temperature, humidity, precipitation and wind, are recorded every 10 minutes by KNMI with eight weather stations around the Utrecht province. Every tracking point is matched with weather data at the closest station and time slot. Land-use types at every tracking point are used to represent the spatial difference. This dataset has a nested structure, namely that tracking points are nested into trips which are nested into cyclists, so observations in a group are not independent. To overcome this problem, we estimate three-level mixed effect models to account for the unobserved common attributes of tracking points from one trip as well as trips from one cyclist. Interaction terms between weathers and seasons as well as between weathers and land-use types are included to examine how weather's influences vary at different seasons and places, namely the spatial and temporal heterogeneity.

Our models show that weather, seasons and land-use significantly influence cycling speed. Temperature and heavy precipitation negatively affect cycling speed, and humidity positively influences cycling speed. Tailwind increases cycling speed, while side wind and headwind decrease speed; in addition, the influence of strong wind is greater than light wind. Cycling speed also has clear season differences, with the highest in summer and the lowest in autumn and winter. Land-use types affect cycling speed as expected; built-up areas decrease, and forest areas and other natural areas increase cycling speed. Besides the direct effect, weather's influence on cycling speed depends on seasons and land use, showing temporal and spatial heterogeneity. The temperature's negative influence tends to be stronger in summer and smaller in autumn and winter. The negative effect of the heavy rain also becomes smaller in summer. Some land-use types can mitigate the negative influence of the weather. Natural areas decrease the negative influence of temperature, while cyclists are less affected by headwinds in forest and built-up areas.

In conclusion, high temperatures (practically in summer), heavy rain and strong headwind decrease cycling speed and can be a big challenge for cycling, especially considering that climate change may bring more heat waves and rainfalls. A possible solution is to provide more forest and green areas along cycling routes, which can serve as a shelter to partially protect cyclists from high temperatures and headwinds.

B1: Route choice modelling of cyclists in Zurich

Adrian Meister

Cycling is becoming an increasingly popular mode of transport in many regions of the world. For Switzerland, and similar to other countries, the COVID-19 pandemic has boosted cycling (Molloy et al., 2020; Meister et al., 2021b) on top of a general trend of increased bike usage (BfS, 2010, 2015). Apart from their positive effects on health and low land-use requirements, private (e)-bikes have very low life-cycle emissions and hence make them ideal to quickly decarbonize a substantial share of urban transport (Cazzola and Crist, 2020). The urgency of the climate crisis justifies additional research into cycling to generate up-to-date insights for policy makers. A central element is the design of urban cycling networks, which requires sophisticated route choice models. The route choice of cyclists has been subject to previous revealed-preference studies, see e.g. Casello and Usyukov (2014), Hood et al. (2011) or Broach et al. (2012). More recent works use GPS-measured trajectory data and large-scale networks with increasing levels of detail, e.g. Prato et al. (2018). They typically apply so-called Path-Size Logit (PSL) models and report similar results, with factors like length, cycling infrastructure, gradient, surface and traffic volumes being found to have significant impact on route choice. Notable work includes Menghini et al. (2010) which was the first cycling route choice study using GPS-data collected in Zurich. Only limited studies have focused on bike-sharing systems like e.g. Scott et al. (2021) and González et al. (2016) and even fewer on e-bikes, e.g. Dane et al. (2019). The impact of e-bikes on route choice is of specific relevance due to their large substitution potential, especially in regions with distinct topological conditions like e.g. Switzerland.

This paper presents the results of route choice models for cyclists in the city of Zurich. The data includes approx. 4500 cycling trajectories, thereof approx. 850 from e-bikes. These trajectories were recorded through a GPS-tracking app within the MOBIS-COVID study (Molloy et al., 2020), and include socio-demographic characteristics. The network is sourced from OSM and enriched with several cycling relevant attributes, including gradients, type of existing cycling infrastructure, speed limits and traffic lights, as well as traffic counts. It includes 230.000 links covering a surface of approx. 350 km2, making it specifically dense compared to other studies. The raw trajectory data is map-matched to the network using a common Hidden-Markov-Model approach (Meister et al., 2021a). The choice set generation is based on the BFSLE algorithm as described in Felder et al. (2022). We present descriptive statistics as well as the model results which specifically point out the difference between regular and e-bikes. From a methodological perspective, we provide valuable insights in how to deal with the varying degrees of accuracy within the raw trajectory and network data, as well as the matching and choice-set generation processes. Finally, this work is part of greater efforts to incorporate a corresponding route choice model into the agent-based simulation framework MATSim (Horni et al., 2016) to perform detailed network evaluation.

B2: e-Bike City: Research for a new starting point of the transport policy discussion

Kay Axhausen et al

Transport policy is in a near-deadlock as the currently proposed solutions to the key issues have well known downsides reducing their viability and acceptance. The key issues are the need to reduce the CO2 emissions radically in the next years, or by 2050 the latest; the inequities in the provision of accessibility among the different population groups and finally congestion decreasing travel speeds and reliability below socially acceptable values. The resulting accessibilities of business as usual endanger the social and economic productivity of our cities and regions.

The current suggested solutions are infrastructure expansion, the shift to e-vehicles, the adoption of autonomous vehicles (AV) and mobility pricing. The first three will all lower the cost of travel and will therefore increase the levels of accessibility, which in turn will increase the vehicle miles travelled in the medium term, thereby negating all or a large share of any gains, especially for growing cities and areas. The e-vehicles alone, unless combined with a reduction in their fleet size and their amount of travel, will not allow us to reach the Paris goals due to the CO2 embedded in to their production. Electric vehicles only generate marginal reductions in life-cycle emissions, and their benefits are dependent on the decarbonization of the production and energy sector, both still far ahead and not aligned with the Paris agreement goals. The same is true for AVs, but even more so given the expected large reductions of their generalized costs of travel. While mobility pricing would provide the tools to reduce and manage road use of moving and parked vehicles sustainably and efficiently, so far its political acceptance requires special local circumstances, which are not generally available.

In this context many cities are adopting cycling-friendly policies, but are generally reluctant to discuss a vision of a cycle, or better e-bike, based urban transportation system. While, for example, Amsterdam, Kopenhavn, Münster, New York or London have improved cycling infrastructures and have seen increased cycling usage, the local VMT of car-based travel has not fallen dramatically. This is the starting point of the project we want to present. The e-bike-city project aims at verifying, if a city dedicating 50% of its current road space for the active modes, including the e-bike, can deliver comparable levels of accessibility to its population while reaching the agreed CO2 targets. It is clear that the e-bike-city is also a public transport city able to cope with the demand variations and peaks of an active-mode based system.

The paper will present a project funded by ETH's Department of Civil, Environmental and Geomatic Engineering to explore and verify this vision. It is an open project hoping for further academic partners, but also partners among the cities and regional governments of Switzerland and abroad.

The paper will discuss the various elements of the project and how they fit together to allow us a first assessment of an e-bike-city. At this stage we will discuss the changes necessary in the design norms to allow its implementation. The design of one-way-street-networks will be required and new optimisation tools for them. The same is true for the design of the public transport systems, so that the required capacities can be delivered at reasonable costs and with a reasonable number of vehicles. The current behaviour of cyclists, but also of e-bike users will be captured and analysed to inform an agent-based model of the daily schedules and travel (MATSim) to give us an idea of resulting changes in daily behaviour due to the restructured networks and timetables. The political acceptance of such a plan will be addressed with focus groups, RCTs and other survey work and experiments. The project will be embedded in the policy environment with suitable mechanisms to engage the stakeholders.

The related submitted abstracts will discuss first results, which are part of the project work.

B2: A power-based approach to model the impact of gradient in bicycle traffic simulation

Guillermo Perez-Castro

To develop sustainable transport systems, cities around the world aim to increase the share of trips made by bicycle. For example, Eriksson et al. (2022) suggest that bicycling trips should represent at least 20 percent of all trips made in Sweden by 2030. If these plans are successful, bicycling infrastructure need to be designed such that it ensures efficient bicycle traffic even when the travel demand is high.

Microscopic traffic simulation is a useful tool in the planning of an efficient traffic system. To simulate bicycle traffic accurately, it is essential to capture cyclists' interactions with the infrastructure. The gradient of a bicycle path has a significant impact in bicycle traffic. Parkin & Rotheram (2010) found a clear linear correlation between speed and the gradient, in both uphills and downhills. More recent studies, e.g. by Ryeng et al. (2016) and Flügel et al. (2019), confirmed the same finding for uphills but did not find a linear correlation for downhills. Therefore, the impact of gradient in bicycle traffic should be captured in microscopic traffic simulation.

In motorized traffic simulation, acceleration-based models are commonly used to simulate interactions between motor vehicles and the infrastructure. However, acceleration-based models may not be sufficient to simulate the impact of gradient in bicycle traffic (P erez Castro et al. 2022). Bicycling requires human-powered motion, and the power that cyclists supply differ significantly in a population of cyclists due to physical capabilities and preferences to ride. Thus, power-based models seem to be a promising alternative for simulating bicycle traffic as they consider power as one of the main input that propels a bicycle. For instance, Rothh amel (2022) implemented a power-based model to determine the speed of a cyclist, in which the pedaling power is assumed to remain constant on uphills, but reduced on downhills due to coasting possibilities.

The objective of this paper is to investigate the connection between the gradient of a bicycle path and the power supply in a population of cyclists, with the purpose of developing a model that considers the impact of gradient in bicycle traffic simulation. To do so, we analyze video-based data collected with a drone on a 140-meter-long bi-directional bicycle path segment, with a maximum gradient of approximately five percent. The bicycle path is completely separated from motorized traffic, and separated from pedestrians by a solid painted line. For the purpose of this study, we focus on investigating free-riding cyclists, i.e., under no influence of other cyclists nearby. We consider as free-riding cyclists those who at no point have headways shorter than two seconds. By analyzing 113 trajectories of free-riding cyclists (69 travelling uphill, and 44 travelling downhill), we investigate changes in the speed and pedaling power as a function of the gradient.

Based on bicycle dynamics, i.e., considering the physical forces acting on a bicycle, described by Martin et al. (1998), we estimate the power that cyclist supply. To compute the power, we assume equal properties for all cyclists regarding cyclists' weight, aerodynamics, rolling resistance, and mechanical properties of the bicycle. Nonetheless, the computed relative power is sufficient to identify cyclists' reactions to the gradient.

Results indicate a clear change in the speed due to the gradient as expected, and that modelling the power as a linear function of the gradient fits the data surprisingly well for both the uphill and the downhill. For the uphill, cyclists increase the pedaling power as the uphill gets steeper. For the downhill, cyclists decrease the power supply as the downhill gets steeper. We interpret the linear model parameters, p0 and p1, as the power necessary to maintain the desired speed at zero gradient, and the desire (or ability) to compensate for the gradient, respectively. Both model parameters vary significantly among the population of cyclists, and both parameters are correlated to each other. While we find a negative correlation between p0 and p1 for the uphill, we find a positive correlation instead for the downhill. Therefore, we observe that cyclists compensate for the gradient significantly different on an uphill than on a downhill, i.e., the magnitude of p1 is different between the uphill and the downhill.

We conclude that the pedaling power is not maintained constant in non-flat paths, i.e., cyclists adapt their power supply to compensate for the gradient and its associated change in speed, and that the impact of gradient vary greatly among cyclists. Based on individual parameters, p0 and p1, for each cyclist, we conclude that the simulation captures fairly well the gradient impacts in a population of cyclists as it reproduces similar speed profiles to the ones observed. Therefore, we conclude that power-based modelling of free-riding cyclists is an attractive alternative to investigate further.

Further research includes identifying the maximum pedaling power that cyclists can apply on uphills, investigating how the power supply relates to effort and energy expenditure of the cyclists, and investigating tactical behaviors in connection to the gradient, e.g., changes in behavior due to immediate transitions from a downhill to an uphill, and vice-versa.

B2: Making sense of Cycling: Effects of Socio-cultural Contexts and Spatial Factors on Cycling Experience

Ran Zhang

Although the rise of cycling in the urban policy agenda has led to the rapid growth of cycling research in recent years, most studies have focused their attention on quantifiable indicators - cycling rates and the efficiency of bringing people from A to B. Despite the value of these studies, they can tell us little about the quality of cycling – the sensory, affective, and cognitive potential of cycling, which can help transform mobility goals from efficient movement toward happy road trips, human connection, and well-being. How can cycling help us to better understand and improve the meaning of being on the move? Which processes and dimensions of the cycling experience are affected by the environment? And how? Through studying cyclists' dynamic experiences in Amsterdam and Shanghai city center, my research aims to advance the understanding of the relationship between sociocultural-spatial contexts, spatial factors and cycling experience. A central premise of my study is that understanding what truly affects cyclists' experience requires us to move beyond a narrow focus on isolated "static" individuals. Instead, I argue that we must pay attention to cyclists' interactions with their surroundings and others, with the goal of more diverse cycling systems. My research design follows a mixed-methods approach: the first and second sub-questions are qualitative explorations of academic articles and study cases. The third research design contains a methodology innovation that overlays the spatial, sensory, and emotional mappings, which create a combined visual and discursive process of analysis and interpretation. The last one is a statistical study of cyclists' interactions and identities.

Hereafter a literature review that theorized cycling experiences, a foundational question related to the process of experience is generated: what is cycling experience in nature exactly? (G. Liu et al., 2021). When people are pedaling forward, all senses and reflection are highly awakened from both inside and outside of the body (Wild & Woodward, 2019). This experience combines sensory stimulation from the landscape- seeing, smelling, hearing, touching, kinesthetic, with the internal emotional process – happiness, safety, relaxation, stress, etc. and cognitive influence- attitude and identity (Fig 1). These plentiful feelings of experience may arise from "tangible" spatial factors, such as an attractive building, or "intangible" social-cultural contexts, such as social stigma or interactions with strangers (van Duppen & Spierings, 2013). The stimulation and cognition process keep interacting and developing while people cycle through the city, resulting in personal and dynamic "sensescapes" along the way (van Duppen & Spierings, 2013). Precisely because of this, cycling should be valued not only for its role in time optimization, system efficiency and sustainability, but also insofar as it induces as many "mappings" of the city

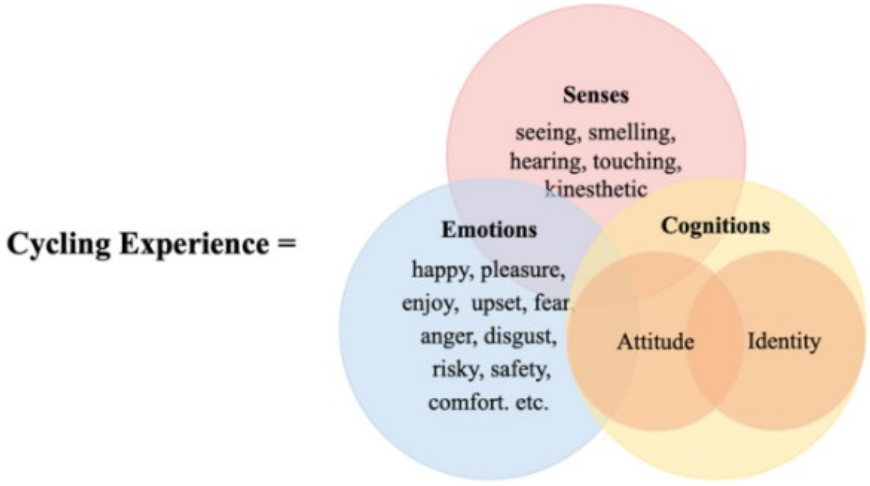


Fig.1 The dimensions of Cycling Experience

Based on this conceptualization of cycling experience, this research presents four focuses to answer the main question (Fig.2). During the unpacking of experience, two categories of influences are presented: Social-cultural context, in my research, is related to the specific society in which individuals are raised and how the culture affects behavior. It incorporates two distinguished aspects:(a) values (including beliefs, meanings, customs, ideas, language, and norms) that are learned and shared among groups of people. (b) actual events (in other words, interactions) that occurred around cyclists. Spatial factors are categorized into (a) infrastructural elements (b) environmental elements, and (c) other traffic. Besides, this research sees Amsterdam and Shanghai city center as representative cases of urban cycling environments. Because they have a similar scale and achieved high cycling rates, but respectively as mature and emerging cycling cities with big social and spatial variation.

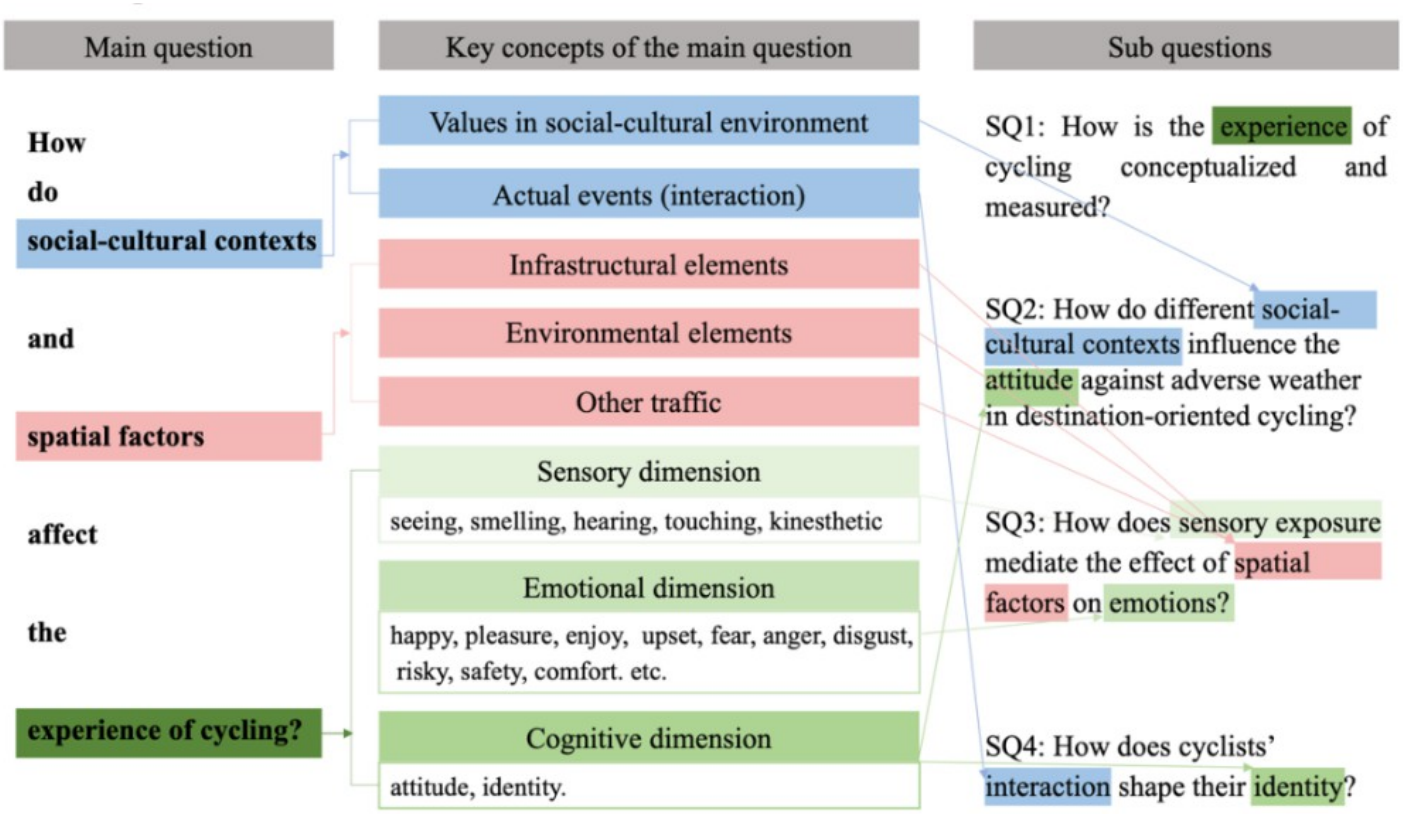


Fig 2. Research questions and key concepts

Fathoming interactive mobility experiences among cyclists in Amsterdam and Shanghai provides valuable insights to academics interested in - reaching a better understanding of the relationship between cycling environment and experiences, and policymakers interested in - enhancing the quality of cycling journeys.

Self-introduction

As a beginner researcher in the cycling field, or even in urban planning field, I just conducted a PhD proposal. After my master majoring in Landscape Architecture in China, I'm attracted by the advanced cycling system and delicate urban planning in the Netherlands. But after I live here for a while with huge enthusiasm, I found some underappreciated cry from a perspective of social science. At the same time, I'm developing a social science mindset rather than just a utilitarian. I see this conference as a great opportunity to share my exploratory observation and collect intercultural opinions.

B2: Micro-e-mobility: just another urban e-gadget or sustainable addition to public transit?

Nicolas Schüte

Introduction

Electrically assisted micromobility conquers cities around the globe: Electric mopeds, scooters , and bicycles are available through sharing schemes in nearly all major cities all over Europe, North America, Asia, and Australia (Reck et al., 2022). Scientific evidence proves that free float sharing micromobility systems cannibalize other sustainable means of transport, i.e. bicycle, public transit, and trips by foot (Laa & Leth, 2020; Hardt and Bogenberger, 2019). Laa and Leth (2020) conclude that an e-scooter, when privately owned, can replace private trips previously made by car. Zuniga-Garcia et al. (2022) state that "e-scooters hardly contribute to a mode shift towards sustainable modes". And Li et al. (2022) find out that the number of provided scooters must correlate with the population density to be not a waste of resources or not being used at all. Nevertheless, for Germany there is a high potential for car trips to be replaced by the use of e-scooters, a potential substitution rate of 10-15 percent could be identified (Gebhardt et al., 2021).

In Berlin only, over 40,000 e-scooters are publicly available (June 2022). Since most of the sharing schemes are operated in free float mode, this number of vehicles increases the likelihood of vehicles carelessly positioned on the sidewalk and blocking the passage for pedestrians (Maiti et al., 2022). Especially, for handicapped people or people pushing a stroller or a walker these vehicles are a nuisance and a risk to health (Sikka et al., 2019). Compared to bicycles, both parking and driving e-scooters can reduce pedestrians' safety (James et al., 2019). Furthermore, there is scientific evidence that e-scooter users often use the existing bicycle infrastructure, which leads to additional conflicts in the allocation of public space and especially transport infrastructure. (Laa & Leth, 2020). Due to its silence and weak stability (due to the small wheels) e-scooters drivers are exposed to serious accidents (Bascones et al., 2022).

Thus, city authorities are confronted with many problems related to e-scooters, which - if not solved - may outweigh the potential benefits in terms of a sustainable addition to public transit. This conflict is particularly crucial in city centers, where traffic is dense. But, e-scooter sharing services are mainly limited to inner-city areas until now. Initial pilot projects have already implied that the provision of e-scooters in outer districts can unlock potential as a feeder to public transit (Gebhardt et al., 2021).

Research Questions

In this paper we investigate, how tariffs, pick-up locations, and communication towards the users must be designed that a) sharing schemes of micromobility provide a sustainable addition to public transit (as a feeder) and b) how these schemes can work, especially in the outskirts of cities where the availability of public transport is scarce.
Potential differences in the use and acceptance of e-bicycles and e-scooters will also be examined to assess and compare the potential of each vehicle as a new form of mobility in outer districts. The acceptance and perception of local authorities will also be observed. In addition, we investigate the extent to which the use of e-scooters and e-bicycles in outer districts can replace passenger car trips.

Methodology

By implementing three all-new operating areas, two in the south of Berlin and one in a small city of the neighboring federal state Brandenburg, we run a period of about nine months with different designs of pick-up locations (geofencing, free float), tariffs, and incentives to combine e-scooter trips with transit. In parallel, we conduct in-app surveys amongst the users via their cell phone. The paper shows the first insight into the ongoing project.
To assess how sustainable e-bicycle and e-scooter sharing can be designed across the entire city area, the usage within the new operating areas is compared with existing data in inner city locations regarding crucial parameters, such as duration of use and route length. The perception and acceptance by the local authorities will be assessed through interviews after the implementation of the new operational areas.

B3: Policy transfer for urban biking: How Bordeaux got a leg up from Amsterdam and the Handshake Program

Joe Dickmann

Demand for urban biking presents opportunities and challenges that have led many cities into new and uncertain territory. This paper explores the potential for cities to guide each other toward becoming bike-friendly. It is a case study of Bordeaux's collaboration with Amsterdam as part of the Civitas Handshake mentoring program for European cities. The Handshake program coincided with a period of intense recruitment in Bordeaux's Active Modes team and the leadup to the release of the city's latest bike plan, unveiled in late 2021. This paper thus asks the question: How has Bordeaux's participation in the Handshake program influenced its approach to biking in terms of policies, processes and practices?

Dolowitz and Marsh (2000) famously defined policy transfer as "the process by which knowledge about policies, administrative arrangements, institutions and ideas in one political system (past or present) is used in the development of policies, administrative arrangements, institutions and ideas in another political system." Much has been written about best practices in urban cycling policy (e.g. Pucher & Buehler 2008). Yet policy transfer literature suggests that policies themselves do not transfer as readily as the other elements in Dolowitz and Marsh's definition. The results of policy transfer are often intangible, for example "strategic capacity" as argued by Glaser et al. (2019). This paper builds on these ideas, examining in what ways Bordeaux's path forward has been influenced by Amsterdam's mentorship as part of the Handshake program.

Semi-structured interviews were conducted with members of Bordeaux's Handshake delegation (n=8), including policymakers, the Active Modes team and cycling advocates. Data collection took place in spring 2022, during the final months of the 3-year Handshake program. Interviews focused on identifying the benefits Bordeaux has drawn from its mentor city and Handshake, and to what degree these outcomes match with the city's goals and expectations. Information from the interviews was triangulated with policy documents, reports and news articles.

The paper analyzes the policy transfer process, including mitigating factors such as lockins, path dependency and unique local characteristics. The collaboration between Bordeaux and Amsterdam is shown to have had limited influence on policy content or infrastructure design in Bordeaux. It did, however, boost local enthusiasm and credibility surrounding the French city's biking initiatives, both among biking proponents and the policymaking community at large. Handshake also connected key players in Bordeaux to counterparts and allies abroad, allowing for ongoing collaboration and knowledge sharing.

This case study also highlights the impact of timing, since Bordeaux had to coordinate the growth of their team and the development of a 5-year bike plan at the same time as they were exchanging with Amsterdam. The overlap between these three simultaneous developments may offer insights to other cities trying to lay out a road map to transition to biking. This analysis of the process of Bordeaux's biking transformation is a key contribution of the paper.

The paper concludes by advocating for a stronger focus on how a city can become bike friendly, rather than what characterizes a bike-friendly city. If it were possible to copy the policies of a city like Amsterdam and achieve similar success, then that would indeed be a tempting blueprint for aspiring cycling cities. But since policy transfer is more about processes and practices, then Bordeaux's rapid and recent shift to bikes makes a compelling story of how to become bike friendly in the 2020s. In addition, the Handshake program itself demonstrates the potential for inter-city collaboration to help identify and spread "best processes" among the cycling capitals of the future.

B3: Direct or doomed to detour? Disentangling new aspects of bicycle accessibility from crowdsourced GPS data

Kuan-Yeh Chou et al

Given rising awareness of public health, sustainability, and efficient urban land use, bicycling is gaining increased attention as a sustainable transport mode. During the COVID pandemic, an increasing number of cities have invested in refurbishing existing or building new bicycle infrastructures for improving bicycle accessibility (ECF, 2020; Moran, 2022; Schwarz et al., 2022). Accessibility measures for bicyclists are crucial since they can potentially guide decision-makers toward more efficient and effective investments in bicycle infrastructures (Arellana et al., 2020; Reggiani, 2022).

Most studies exploring bicycle accessibility have focused primarily on the supply side. For instance, accessibility to bicycle networks, shared-bicycle stations, and the number of reachable services within a particular time or distance (Reggiani, 2022). However, few studies have investigated bicycle accessibility emphasizing the behavioral aspect by analyzing bicyclists' actual trips and trajectories. Even when such data has been used, these studies mainly focused on shared bicycles that trips and routes are more trackable than private bicycles (Lin et al., 2019; Song et al., 2020; Brown et al., 2022).

With bicyclists' actual trips and trajectories, accessibility to bicyclists' destinations can be measured by detour measures, capturing not only supply insights (e.g., network performance) but also behavioral insights. Nevertheless, few studies have assessed bicycle accessibility with detour measures. Most of them focused merely on network performance without using trajectories of actual trips (Yang et al., 2020; Costa et al., 2021; Yen et al., 2021). Although only Park & Akar (2019) used actual bicyclists' trajectories to capture behavioral detour, the insufficiency of detailed trajectory data prevented it from providing in-depth spatial insights. Therefore, studies investigating bicycle detours due to behavioral factors remain scarce, partially owing to the availability of sufficient actual bicyclists' trajectories.

This study closes this gap by assessing bicycle accessibility from a detour perspective, using large-scale bicycle trajectory data (287,978 bicycle trips) to identify areas where bicyclists are forced to - or choose to - ride detours in the City of Copenhagen. It does so by calculating detour ratio indicators also known as circuity or detour factors.

The contribution of the study is threefold. First, the study uses large-scale bicycle trajectory data of unprecedented size for bicyclists' detour analysis. Second, the study investigates both realized and behavioral detours of bicyclists with detailed spatial resolution, making it possible to distinguish between detours that are made voluntarily and detours that are inevitable due to the lack of direct alternatives in the network. Third, the study incorporates various infrastructures, land-use, socio-demographic, and administrative area data to explore how these features influence bicycle detour ratios.

B3: Disability and cycling – a literature review

Jonna Nyberg & Anna Niska

Cycling contributes positively to many areas of sustainability, regarding environmental, social, and health-related aspects. The benefits of cycling are emphasized in several international organizations, such as the United Nations (UN). Also, in the United Nations Convention on the Rights of Persons with Disabilities, it is stated that people with disabilities should be given the opportunity to participate in society on the equal basis with others, for instance regarding use of transportation.

People with disabilities generally have less access to transport and make fewer trips compared to people without disabilities, which impairs their opportunities for participation in society. They are also at greater risk of developing serious health risks, related to, e.g., obesity due to sedentary life. Regarding people with disabilities, cycling can counteract a negative development of physical health, and increase independence and opportunity for social participation. Furthermore, some people with disabilities find it easier to cycle than to walk or get around in a wheelchair. Despite the described positive effects, few people with disabilities cycle: in Sweden, people without disabilities make twice as many trips by bicycle compared to people with disabilities.

Related to this background, a literature review has been conducted to map the state of art regarding barriers and possibilities for people with disabilities to cycle. Searches for international literature have been performed in several scientific databases (TRID, PubMed, Scopus, Web of Science). So-called grey literature has also been included, for example the Swedish national policy for cycling. Regarding the grey literature, this is intended to give examples, and not to give a comprehensive picture.

The results show several barriers for people with disabilities to cycle, such as barriers in infrastructure and cost of adapted bicycles. Also, the low proportion of cyclists with disabilities can be related to cycling and transport strategy, as these often lack descriptions and accounts for cyclists with disabilities; they are not represented. Hence, people with disabilities may not consider themselves cyclists, or potential cyclists. It can also mean that measures to make it easier for cyclists with disabilities are not implemented. Further, many people with disabilities have never learned to ride a bicycle, thus bicycle training is an important issue for this group. The literature review reveals several examples of different forms of cycling training for people with disabilities.

However, studies have shown that there may be no transition between the step of learning to ride a bike and being able to ride independently. Parents of children with disabilities may also, despite the programs, be unsure about letting their children cycle on their own after training. Studies also show that road safety is rarely included in the programs, and that cycling training programs for people with disabilities can be unstructured, more having the form of activity than training.

Altogether, the study shows the importance of a community planning with a holistic perspective on infrastructure and users, thus the pursuit of universal design. More research is needed on how municipalities work in an integrated way with bicycle issues and disability issues – knowledge about these issues can identify both good examples and reasons for shortcomings in the work concerning cyclists with disabilities. Related, there is a lack of research on norms related to cycling, as well as on power and influence, linked to people with disabilities. Research is also needed regarding the opportunity for people with disabilities to participate in cycling training, and whether participants continue to cycle after such training. Finally, more research is needed concerning people with disabilities and their own perceptions and experiences of cycling.

B3: How inclusive are our models? The danger of using unbalanced datasets for modelling bicycle route choice behaviour

Miroslawa Lukawska

The increasing number of large crowd-sourced datasets for analysing bicycle traffic brings researchers new opportunities and overcomes some of the existing limitations related to the stated preference data or small sample sizes (Lee & Sener, 2021; Nelson et al., 2021). However, due to their crowd-sourced opt-in nature, such datasets may suffer from having a large proportion of the data being collected by few very active users. This may constitute a problem, particularly if the models estimated on these datasets are used for policy implications or forecasting purposes.

Fortunately, when it comes to modelling behaviour with this data, researchers have the liberty to influence which part of the dataset to use to ensure that the model describes the underlying reality in the most consistent way. According to Y a nez et al. (2011) and Rose et al. (2009), including correlation among user-repeated observations lead to the largest model improvements, while including multiple repeated observations per individual improves the model only because of the increased sample dimension, and it does not aid to retrieving the true model parameters.

Our study utilises a large dataset of GPS trajectories to understand how different subsampling approaches, accounting for user-repeated observations, influence the final model results. We aim to determine a panel setting for a bicycle route choice model that corrects the inherent bias caused by the unbalanced number of observations per cyclist. The goal is to find a model that describes cyclists' population best, so that it can be reliably applied for forecasting and policy implications, in addition to its explanatory purpose. More specifically, we try to understand to which point it is beneficial to include multiple (possibly identical) trips per cyclist, and how diverse the included trips should be to appropriately capture the variety of preferences.

C1: Imagine – Cyclists' High Lane

John Gade

Imagine all the people - not in bed with a bike in a Dutch hotel in the sixties - but on their bikes, independent of car traffic, safe from car killing, riding silently through urban areas in a cyclists highway, no rain, no traffic lights, always wind from behind, less flat tires, swift and easy, superior to car driving speaking of time consumption.

How come? It's impossible, this is not Paradise!

Well, take a look at the proposal below. But first my credentials: this is not a scientific paper, I'm not an ingeneer, I'm not traffic researcher. I am a physician, a general surgeon as a matter of fact, but also an every day cyclist riding in total 35 kilometers aaaalmost every weekday all year round. So what I present is a vision, not an ingeneers or achitects project, construction and strength calculations have not been made, materials have not been chosen, security and emergency exit is not accounted for, the price is completely unknown: It's a vision. A cyclists vision.

Introduction

All major cities in the world are haunted by traffic jam associated with car driving, costly and time consuming. Nevertheless, people stick to their cars, with Holland and partly Denmark as exceptions, although bike riding is an obvious alternative, but not chosen for a number of reasons: prestige, comfort, laziness and a false believe that cars are faster. So the question is how to overcome these reasons, how to make a car driver become a bike rider. My proposal could be one solution, and other solutions are cyclist's 'highways' on ground, e.g. the Utrecht and Groningen experience.

Proposal

The high lanes should be in a tube hanging in cables 5-6 m above ground level like a suspension bridge. There should be 2 to 3 lanes in each direction separated with a transparent wall. The upper half of the tube should also be transparent and the roof be able to open in warm periods. The separation wall allows wind from behind in each direction, either mechanically generated or by redirecting ambient wind. Every 500 to 700 meters it should be possible to enter or leave the tunnel, either by means of escalators or by means of closed approach lanes with a climb no more than 5-6 %. It should alle be carriec by bowed pillars each 50-100 meters.
Architecturally the project should take inspiration from e.g. Goudi to make it seem liveable and a contribution to urban space and architecture rather than the opposite.
Please see figures below.

Discussion

Although the exact prize is unknown, this is undoubtably expensive. It is a question, if such lanes are sufficient motivation to leave the car and enter a bike. On the other hand, it adresses numerous of questions related to cars in urban traffic: congestion, pollution, microplastic, CO2 emission reduction, obesity reduction, riders safety etc. It protects riders against rain and wind and allows many riders to be faster than cars. On the top of it, there is society benefit of around 1 euro pr kilometer for a car driver changing to bike riding, according to official Danish calculation.
Some would argue that we could as well place such priority bike lanes on ground with less costs and more rapidly. A couple of Dutch cities, Groningen and Utrecht, would support that.
However, it has taken these two cities around 50 years to reach this level. In another cyclists' city, Copenhagen, cycling has diminished. In Paris and other European major cities new cycle lanes are constructed, but at least in Paris too narrow and mingling with cars as well pedestrians to be attractive to the average car driver. In addition, an economicbenefit may be added: cyclists should be rewarded 10-20 cent pr kilometer using the lanes in the rush hour. Technically it should be quite simple. This is in contrast to Norman Fosters idea of sky cycling, where cyclists should pay for use.

C1: Criteria for recreational cycling

Marco Berends

Denmark's future recreational cycle node network contains 13 criteria, currently being developed with local and international experts.

Denmark is currently developing a cycle node network, based on the running experiences from the project 'Denmarks future recreational network'. The project sets the foundation for a new nation-wide cycling network for locals and tourists in rural and urban areas.

Recreational cyclists have different needs and are more demanding than commuters. Leisure trips are expected be comfortable and attractive, but more is necessary to provide recreational cyclists with a positive experience. Therefore we are developing criteria to set standards for a new recreational network (Berends & Pørksen).

Denmark's current cycle network consist of a variety of routes, lacking coordination and decayed signposting. The lack of criteria risk inefficient investments, leaving cyclists and authorities estranged or dissatisfied.

With the radical new project, local experiences are combined with international experts to set up 13 universal criteria, grouped in four categories:

- Organisation: anchored, cohesive, up-to-date and connected
- Infrastructure: safe, recreational, accessible and nearby
- Support: serviced, communicated and signposted
- Experience: interesting and varying

Each of the criteria is subdivided in multiple requirements, totalling 50+ and still counting. All requirements need to be addressed, but may differ in importancy. A 'safe road segment' is of higher importance than a 'connection with a transfer hub', since the latter is strictly speaking not necessary to start building a network.

The criteria are comparable with the dissatisfiers in the 'Pyramid with levels of cycling' (Van Hagen and Govers) and can be ordered by a prioritisation of investment decisions. However, we address all satifiers to create loyalty amid the users (Jonas & Sasser).

The project is subsidised by the Danish Outdoor Council. The model is developed by the Danish Cycling Tourism, discussed by an advisory board with experts from five countries. Besides, we encourage input from other cycling experts.

C1: Reproducible Quality Assessment of OSM Data for Cycling Applications

Ane Vierø

In this study, we present a workflow that enables the cycling community to quickly assess the fitness for use of OSM data for a given area. At the same time, the study supports and motivates the use of open and crowdsourced geospatial data in cycling planning and research.

Motivation & addressed knowledge gap: We need better cycling data!

Getting more people to commute by bike is increasingly understood as powerful lever for a sustainability shift of the transport system. However, in most cities across the globe, a modal shift towards more cycling requires vastly better cycling conditions. Recent promising growth in data-driven cycling research can help evaluate current conditions, identify needed improvements, and prioritize resources. However, despite of OpenStreetMap (OSM) being the primary data source for many cycling research projects and cyclist routing applications, as of now there has been very little research specifically on the quality of cycling data in OSM. Our study addresses this knowledge gap by outlining an easily reproducible, systematically structured workflow for quality assessment of OSM cycling data, relevant for use cases such as bicycle routing, connectivity analysis, network quality assessment and accessibility studies.

Background: Data quality assessment in OSM

The quality of OSM and other types of volunteered geographic information (VGI) data is fairly well-studied, and most OSM data is shown to be of high quality. However, errors and lower data quality are not randomly distributed in OSM, but vary from place to place (Haklay, 2010; Ferster et al, 2020). When it comes to cycling infrastructure in particular, lanes and dedicated cycling paths often are among the later features to be mapped. Moreover, the topological quality relevant for bicycle routing is lagging behind the quality of other road network data (Barron et al., 2013; Neis et al., 2012). Even though these tendencies have profound implications for when and where OSM data is an appropriate data source for cycling related purposes, to date only few studies looked specifically at the quality of cycling infrastructure mappings in OSM. Existing studies have mainly compared the length of the mapped cycling infrastructure to a reference dataset. This, however, says little about the topological quality of the data and often presupposes that the reference data represents a sort of 'ground truth'.

Methodology: A flexible, user-friendly workflow for cycling data quality assessment

In this study, we set up a reproducible, extensively documented workflow for quality assessment of OSM data for cycling research and planning. The methodological concepts stem primarily from network analysis, such as variations in granularity, connectivity, and network structure. Our method is therefore particularly useful for studies with a holistic approach to analyze the entirety of the cycling network at a city or regional scale.

All metrics and data quality indicators are computed on study area level as well as on user-defined grid cell level, thus simultaneously providing a general overview and a fine-grained analysis. The workflow includes both intrinsic and extrinsic methods, i.e., both a standalone evaluation of characteristics of the OSM data and a comparison with another reference dataset.

In the intrinsic part of the workflow, the user is guided through the analysis of OSM data in terms of data coverage, missing tags/attributes, and network topology metrics such as unconnected components and over- and undershoots. In the extrinsic part of the workflow, all aforementioned metrics are computed for the reference data set and contrasted with the OSM data set. In addition, the extrinsic part of the workflow also covers a comparative analysis of the degree of overlapping features between the two data sets. Importantly, and contrary to many other evaluations of VGI quality, our approach does not require or assume the reference dataset to be of higher quality but is rather focused on identifying where and how OSM and the reference data differ.

Our workflow can thus be used for extrinsic data quality assessment even when there is no other high-quality data on cycling infrastructure available. After completing the data analysis workflow, the user obtains a summary of all results, including indications on possible interpretations of results. The workflow and all corresponding code are made available online under an open-source license, accompanied by detailed documentation for easier reproducibility.

OSM is an invaluable resource, but we must be conscious of inconsistencies and spatial variations in data quality. Going through a simple but rigorous analysis can help users make an informed decision about whether the available data is suitable for their needs.

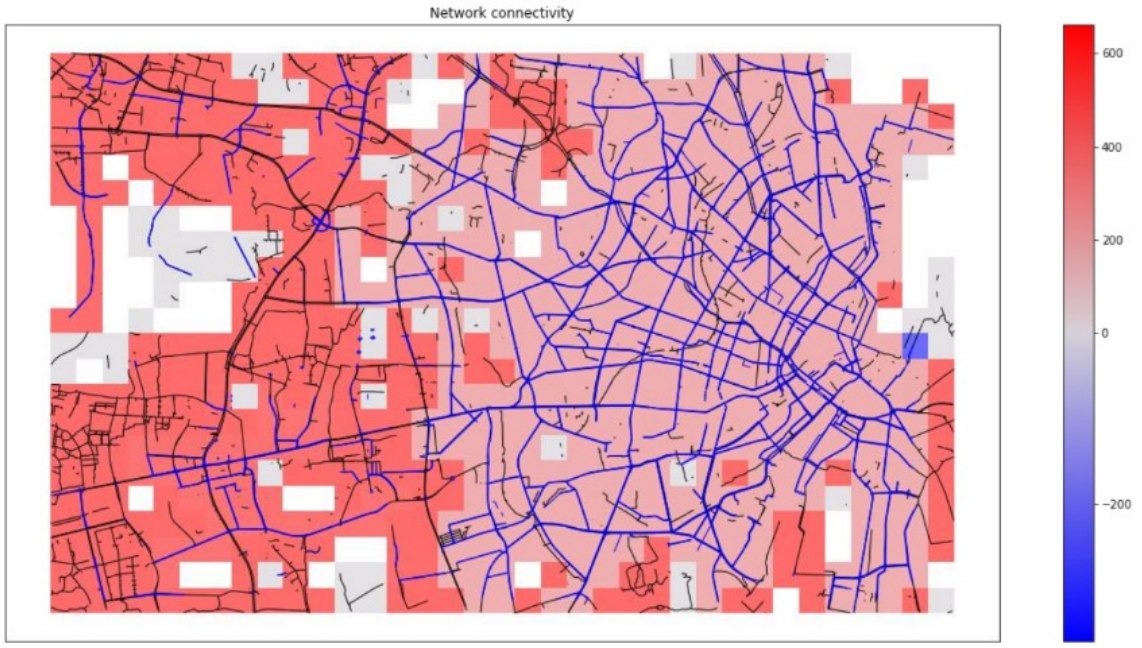


Fig. 1: *The analysis can for example identify cycling connectivity differences between OSM and a reference data set. The map shows local differences in how many other cells can be reached moving exclusively on designated cycling infrastructure, using respectively OSM (black) and the official Danish road network data (purple). Red cells indicate higher connectivity using the OSM network, while blue cells indicate higher connectivity using the reference dataset.*

C1: Overtaking of cyclists – facts and feelings

Katja Kircher

For cyclists in mixed traffic it is a very common occurrence to be overtaken by motor vehicles. The overtaking manoeuvre happens at the discretion of the motorist, with the cyclist having little say in the timing in relation to oncoming traffic and other external circumstances, the overtaking clearance or the overtaking speed.

Traffic laws in different countries vary in how they regulate cyclists' positioning on the road and how cyclists should be overtaken. While in right-hand traffic all vehicles are required to keep to the right, cyclists often have the additional duty to keep to the right edge of their lane. Cycling abreast is the norm in some countries, allowed when other traffic is not hindered in others, and in some countries cyclists must ride in single file at all times. In recent years, several countries have introduced so-called "compliance-based" minimum passing distance laws prescribing a minimum clearance the size of which varies between countries, and in some cases also within country, depending on the circumstances. Other countries regulate overtaking with "performance-based" laws, which are more flexible. They can include phrasings like a cyclist should be given so much room that she can fall over without being run over, or a cyclist should be overtaken like a car, but also that the overtaking manoeuvre should be done in an "adequate" manner.

During the last decade the number of studies investigating overtaking has increased immensely. A common approach is to measure the absolute passing distance by way of an instrumented bicycle, and then investigate a number of situational, vehicle and cyclist related factors for their contribution to the explained variance. Apart from showing that rather small lateral clearances occur anywhere in the world where such studies have been conducted, some factors turned out to be consistently related to smaller clearances. Examples are oncoming traffic and milled central rumble strips, larger vehicles and not slowing down before overtaking. Some factors are typically not investigated, however. Prominently, this is the consistency within drivers, as the driver is not identified. Questionnaires and the rare simulator study show, however, that a negative attitude towards cyclists expresses itself in reported or measured smaller overtaking clearances. When the cyclists' attitude is considered, it turns out that higher speeds, smaller clearances and not slowing down before overtaking are associated with feeling less comfortable. Questionnaires show that close overtaking is a prominent stress inducer for cyclists, to the extent that people refrain from cycling at all.

It is uncommon to compare the cyclist's and the motorist's perception of the same overtaking manoeuvre. A questionnaire study indicates that cyclists are, on the whole, less satisfied with the situation than it is described by drivers, and that multiple factors play a role in how an overtaking manoeuvre is judged. Also, drivers were found to overestimate the clearance they provide for cyclists. The findings show that a compliance-based regulation does not really reflect the cyclists' feeling of comfort, in addition to more practical problems, on the other hand a loose performance-based phrasing like keeping an "adequate distance" is not likely to be interpreted by drivers such that cyclists are satisfied.

Current circumstances require us to increase and enable active, fossil-free and inclusive transport. To provide a connected and accessible road network for cycling it is necessary to make cyclists feel and be safe on roads with mixed traffic. While a pleasurable cycling environment requires more than the absence of perceived and actual danger, this should be a minimum requirement. Cyclists should be able to feel that they are respected on the road, part of which is that overtaking manoeuvres are conducted in a manner that corresponds to cyclists' needs, and another part of it is accepting the social component of cycling together, ultimately meaning that "softer" qualities should take precedence over "saved time". Likely, a combination of several factors is necessary to achieve this, with the overarching necessity to create a cycling-benevolent attitude in society. One step in that direction can be a clear communication on how overtaking manoeuvres shall be conducted, which should be supported by a corresponding regulation that can easily be understood and complied with by motorists and at the same time considers the needs of existing and prospective cyclists.

Potential factors to be considered are that the cyclist should be able to influence the overtaking manoeuvre, for example by preventing it via lateral positioning and/or riding abreast if this is experienced as necessary for safety. Cyclists should be able to predict the manoeuvre, and the prediction should coincide with the manoeuvre feeling comfortable for the cyclist. In the short run requiring motorists to overtake cyclists as if they were cars, enabling cyclists to ride abreast within their lane, and letting cyclists choose their lateral position freely within their lane could be a starting point. Further research can then establish how cyclists and motorists feel about the same manoeuvre, whether this depends on their respective role, and how a common denominator can be found. While still embedded in the transport system of today that inherently accepts speed as an asset, other values are highlighted. The goal is to discuss overtaking of cyclists depending on different viewpoints and stressing the importance of respecting the cyclist in the equation if cycling is meant to increase.

C2: Evaluating experiences with smart connected bicycles: a systematic review and conceptual framework

Mario Boot

Intelligent transport systems (ITS) are more and more often integrated with bicycles, forming "smart connected bicycles" (SCBs). The idea behind the internet of things- and artificial intelligence-based applications in such bicycles support cyclists in their behavior and experience. Smart bikes contain interface- and interaction designs, which are the membranes via which cyclists engage with themselves, their bicycles, other road users, and their environment.

Cycling experiences are increasingly being affected by interfaces in and interactions with smart bicycles. If for example a new intelligent speed adaptation is tested for speed pedelecs, how can we know whether bicyclists feel more safe due to lower speeds or feel more frustrated due to bad designs?

Experiences are defined as the internal, subjective, and emotional response of bicyclists to the sensory stimulation that they receive during their interactions with smart bicycles. Despite the increasing popularity of smart bicycles, little is known about the impact of interfaces and interactions on bicycling experiences. Also, little is known about how that impact can be measured, quantified, and evaluated.

In this context, the aims for the current review and conceptualization are 1) to provide a critical analysis of state of the art methods for quantitative evaluation of cycling experience and 2) to propose a framework for causal analysis of effects that interface- and interaction designs in bicycles have on cycling experience. The evaluation framework that was derived from the literature is a common way of thinking and talking about how SCBs influence experiences. Also, it prescribes the variables that should be examined when evaluating impacts on experiences.

A systematic literature review led to the inclusion of papers that provide valuable insights in methods for determining causality in bicycling experiences. Selected papers comprise both peer-reviewed and grey literature. Reviewed literature shows that experiences are often not well conceptualized. The review also shows that there is significant interest in physiological and neurological variables, measured real-time via wearable on-body sensors, because these can capture elements of bicycling experience while reducing bias. Isolating the effects of SCBs from other effects such as road and weather conditions remains challenging and deserves more attention.

Future researchers and practitioners can use this framework for understanding how designs, applications, systems, etc. for SCBs influence what cyclists experience. Insight about this influence can optimize the fit between customer needs and solutions, and can lead to data-driven insights for design, roadmaps and policy about how smart connected bicycles can make cycling more safe, comfortable, and attractive.

C2: E-Bikes in Transport Models: A Review of Current Practice and Literature

Leonard Arning

Introduction

Due to their higher speeds and lower physical effort required, electrically-power assisted cycles (EPAC, also known as e-bikes) make cycling a more attractive mode of transport for different user groups, trip purposes, trip lengths or topographically challenging areas. When changes in the transportation system affect the choices its users can make, it is necessary to consider including such new modal options in transport models to ensure that their outcomes continue to be accurate. The share of e-bikes is rising, most prominently in Europe and Asia, however it is unclear whether and how e-bike use should be included in macroscopic transport models. Modelling e-bikes in more detail might also create new analytical possibilities in model application, for example evaluating the impact of e-bike subsidies or dedicated infrastructure. Only bicycle-style e-bikes are considered in this review, despite scooter-style e-bikes powered by a gas handle being particularly popular in Asia. This is because in the context of transport modelling, scooter-style e-bikes are more akin to motorized private transport.

In current transport modelling practice, e-bikes are often neglected or treated as an afterthought. We demonstrate this by investigating exemplary existing models from contexts where e-bike modelling techniques would be expected to be the most advanced. Exploring new ways of representing e-bikes in transport models will shed light on appropriate model structures and their usefulness. Because there is very little research explicitly into differentiating conventional bicycles and e-bikes in transport models, we consider evidence from related research fields.

Systematic Literature Review

The systematic literature review is structured along five fields of research that can provide input into formulating and estimating e-bike purchase, mode and route choice models. Namely, they are:

1. The impacts of infrastructure on e-bike use
2. The impacts of topography and user demographics on e-bike use
3. The impacts of rebates and other incentives on e-bike use
4. The impacts of e-bikes on mode choice
5. The impacts of e-bikes on route choice.

We queried three databases for peer-reviewed publications from 2015 or later in June 2022 with five search strings, which together with three additional sources from a preliminary literature review result in a total of 30 relevant sources. Most studies take place in a Dutch or Northern European context and either evaluate various types of e-bike trial schemes or analyse data from national mobility surveys.

Results

The results of the review inform future research about how to represent e-bikes in transport models. Regarding research field 1, differences in the utility of e-bikes by different kinds of infrastructure and person groups highlight that travel costs, such as travel time and comfort, should be differentiated not just by bicycle type but also infrastructure and person group. Evidence for the relevance of differentiating between person groups is further strengthened in research field 2, where avoiding physical extortion is identified as the main motivation for purchasing and using e-bikes. While some demographic attributes appear to always have either a positive or negative correlation with e-bike use, others (such as prior cycling habits, gender and education) do so differently in North America and Europe. Exploring possible reasons for these differences provides further insights into factors that should be considered in modelling approaches that aim to be applicable in different regional contexts.

Research field 3 highlights the importance of both the purchasing price (and hence subsidies), but also of an initial stimulus for behaviour change. Modelling e-bike purchase choice will have to face the issue that e-bike acquisition is, especially during the stage of early-adopters, not a purely utilitarian decision. We outline possible modelling approaches. Research field 4 yields the largest number of relevant sources. E-bikes lead to a mode shift predominantly from conventional bicycles and private cars. The degree to which those two modes are substituted by e-bikes – a question highly relevant for modelling their environmental impact – strongly depends on the previous travel behaviour of the person group they are introduced to. Pointedly, introducing e-bikes to car users decreases car usage, while people who already cycle tend to substitute their conventional bicycle travel. We highlight strengths and shortcomings of reviewed study designs that inform mode and purchase choice models. Lastly, sources reviewed in research field 5 point towards speed characteristics of e-bikes, infrastructure and ambient factors and once again the segmentation of person groups being relevant to cyclists' route choice.

Overall, this systematic literature review demonstrates that while there are only few scientific publications explicitly about e-bikes in transport models, there is a large body of research that investigates factors influencing e-bike ownership and how e-bikes affect travel behaviour. These findings can be used as a starting point for developing dedicated modelling approaches.

Future Research

Modelling approaches that could be informed by findings from this systematic literature review include modelling cycling as two separate modes for conventional bicycle and e-bike as well as an e-bike purchase choice model. These modelling approaches could be applied to different modelling techniques, such as agent-based, mesoscopic or four-step-models. Overall, representing e-bikes in transport models might not only enhance model quality: their application to practical transportation planning tasks, such as evaluating cycle superhighways or subsidy measures, could reveal new analytical possibilities brought about by differentiating between different types of bicycles.

C2: INFRASense: Data-driven Labeling of Bike Paths to Support Municipalities in Cycling Promotion Measures

Johannes Schering

In the past few years many people prefer to use individual means of transport instead of public service transport systems. Although this leads to more car driving it is also a chance to motivate commuters and other target groups to test the bicycle as an attractive mobility alternative. The quality of the bicycle infrastructure network is a key factor in this decision process. If the bike ride to work takes much more time compared to the car what would be the benefit of bike usage? As often discussed before, we need a tight cycling network with direct connections. Space should be sufficient to enable overtaking of other cyclists with lower speed levels. Especially in peak hours when many people moving to work or school by car, bicycle or other means of transport this is very relevant to save travel time. This is the reason why bicycle high speed connections have a width of 3 meters and more to enable to cycle as fast as possible. A red light interrupts the cycling flow on a bike trip. If you have to stop at five out of six intersections on your way to work or school this makes people feel that cycling is not a good alternative. Similar conclusions can be done regarding bad surface conditions. This belongs to the surface type (e.g. cubble stone, asphalt) but also to the construction state of the bike path (e.g. root damage, pothole).

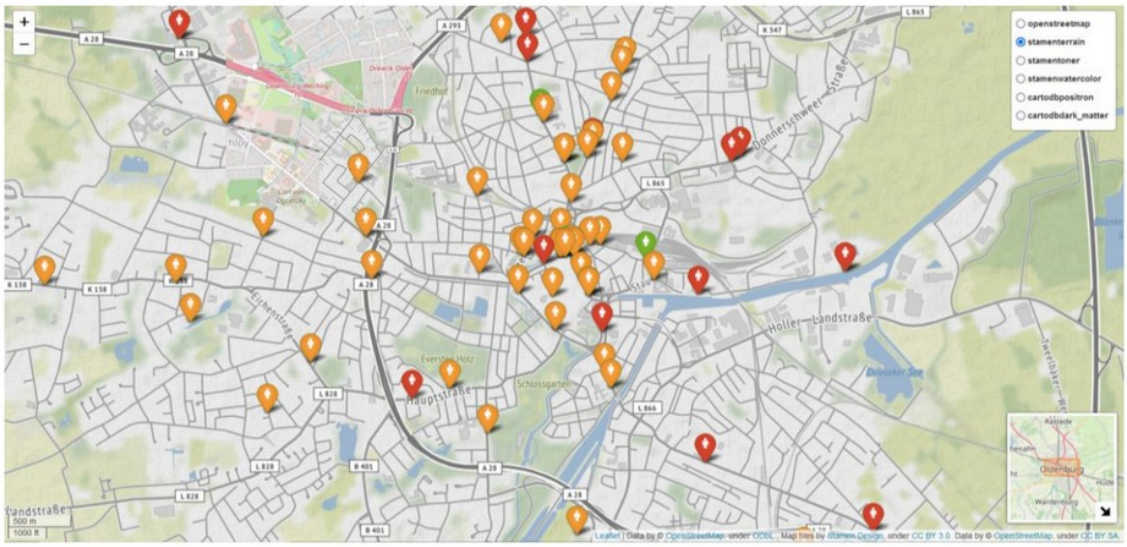
Bicycle accidents can occur where space is not sufficient, where sight view for car drivers and cyclists is not sufficient, where the number of vehicles is too high etc. This kind of information may provide further information about potential shortcomings and problems in the bike path network. Citizen reportings may give some more information how people in a city perceiving the bicycle infrastructure. It reflects the cyclists' perspective. The alignment of the bike path, the signalization of traffic lights or temporary (seasonal) events such as ice or leafs on the road, puddles or growing branches on the bike path may be relevant factors that are contributing to make cycling less attractive.

Many people already switched to the bicycle (and especially the pedelec) as an alternative on short trip destination what is also supported by new business models as business bicycle leasing. To convince more people that cycling is good for them – the benefits are well known (e.g. health, money) – investments in the bike path network have to be made by the city administration. Knowledge about all these criteria that are discussed above can provide information to support quality assessment. If the administration knows about a very frequently used bicycle connection with too little space (compared to others) an investment can be made. Besides the fact that relevant data is missing there is also the question which criteria are more relevant than others for the bike path planning process: Is space more important than good surface conditions? What does that mean for the quality assessment? Compararble criteria are missing.

In this context a new smart cycling project was initiated. INFRASense (https://www.bmvi.de/SharedDocs/DE/Artikel/DG/mfund-projekte/infrasense.html) is working on a holistic data driven quality assessment that considers the cyclists' perspective to support decision making in the cycling promotion process. There are quite a lot of data sources available that are part of this research: Traffic amount to know about the number of vehicles on a specific road section or intersection, bike counting data to learn demand and usage of bike path or weather data to get information about what role wind or rain play in bike use. As mentioned earlier, the bicycle accident data can provide some information about potential problems in the infrastructure. A very important factor is the user perspective. More than 200 bike sensors will be provided to cyclists in the cities of Oldenburg and Osnabrueck beginning from 2023 to gathering relevant data about waiting times, stop frequencies, route choice or surface conditions. The sensing of real bike trips is an objective measurement which do not collect information about the perceivings of the surrounding area. Therefore, citizen reportings from municipal reporting platforms are also included in our so called data lake.

All these data sources are time series data that can be connected by a time stamp. As our goal is to label the quality of the bike path like school marks (from A = very good to F = very bad) we are also using data about construction criteria. Bike path alignments, the wideness of the cycle lane and the length of a road in combination with time series data can provide relevant information. Many municipalities are using Geo Information Systems (GIS) in their planning processes. Therefore, we are also going to use geo referenced Shape files as bus stops and lines, inclines of road sections or cycling networks. These data sets may support the visualization and the understanding of the results. After the definition of the relevance of all quality assessment criteria and during the data collection, bike path quality levels will be determined and displayed on a website. This gives the general public the opportunity to give feedback about what is a suitable grade for each bike path.

In our conference talk we would like to present what steps have been done so far in the project. A huge amount of data has to be handled. For this purpose, a bicycle infrastructure data lake was implemented for data storage and processing. The data analysis shows first interesting results on the bicycle accidents, citizen reporting and bicycle use. The accidents can be subdivided into different types (e.g. alone accidents, turning accidents), degree of injury or involved vehicle types. The majority of the accidents are related to cars. The reportings also show that cars are a key problem (parking violators). Hotspots at specific intersections or road sections can be already identified. The quality criteria on bike path assessment, how the preliminary results can support a realistic labeling and further steps in the project will be discussed with the audience.



Bicycle Accidents with Pedestrians in Oldenburg, Germany (University of Oldenburg).

C2: "Google Maps Doesn't Know Shit": Platforms and the Agency of Movement in the New Era of Bicycle Couriers

Jarvis Susłowicz

The technologies and organisational techniques associated with the platform economy have radically altered how labour is performed in various areas of the service sector. Perhaps most visible and emblematic within this are bicycle couriers, now delivering an increasingly diverse range of goods within cities globally.

Bike messengers of the pre-platform were characterised by the particular – oftentimes controversial – skillset they employ to get from A-to-B (and then on to C) in timeframes impossible for other travellers. The domain of the messenger, then, has traditionally been the downtown areas of cities where congestion amplifies the value of couriers who can weave through traffic and create spontaneous solutions to a constantly shifting set of puzzles. Ethnographic works of the time by the likes of Kidder (2009, 2011) and Fincham (2008) describe messenger work as a particular alternative lifestyle forged through the informal, illegal and subversive ways messengers fit into the streetscape.

However, this image no longer accurately describes the state of the bicycle courier population. Since the mid-2010s, meal-delivery platforms such as Deliveroo, Foodora and Uber Eats have served to catalyse the role of the bicycle courier into an increasingly diverse set of logistical uses. This has not occurred in a vacuum. Simultaneously, the development of electric-assist bicycles lowers the physical barrier to entry into bike courier work, while real-time, GPS-orchestrated navigation apps allow users to find their way in unfamiliar environments and algorithms to always track and quantify their workers.

Recently, interest in platform- and gig-labour has seen valuable contributions to understanding the livelihoods of modern bicycle couriers, largely in the area of labour struggle and solidarity networks established between independent workers. What has been neglected is the nature of the mobility itself: the movement from which the value of the job is derived.

The main question of this research is an exploratory one, aiming to gather an overview of the changes that occur in the job as a result of platform intervention: how has the nature of journey-making altered with influence from platforms? It mobilises concepts developed in reference to messengers, including the act of mobile spatial appropriation, to understand commonalities in behaviour. The concept of digital appropriation is also introduced in response to the tactics described by couriers to improve their experience using the very apps which control their behaviour.

Through comparative fieldwork in Amsterdam and Oslo and a mixed-methods approach incorporating participatory GIS (PGIS) and (auto)ethnography. Using PGIS to map the area preferences of couriers in both cities, I find ultimately that contemporary couriers share a preference for working in the inner-suburbs where there is a dense residential consumer base of courier services. Contrary to earlier messenger geographies, the inner-city is viewed negatively due to various forms of congestion and their associated dangers. This links to the results of the (auto)ethnographic portion, which finds great variation in the spatial skills of couriers, dependent on the type of delivery work undertaken, the equipment used, and the courier's professional relationship to the job. Some retain messenger skills as a means of adding challenge and play to otherwise menial labour or as a means of improving comfort and earnings.

For cargo cyclists, a knowledge of the city beyond Google Maps is still viewed as necessary to completing tasks, as they must be able to anticipate routes navigable with large, heavy loads. However, for others in a highly saturated market of courier jobs, as in Amsterdam, a distance is maintained between the courier and the labour. Such distance results in reliance on app-technologies and a disinterest in finding creative solutions and spatial tactics.

As an exploratory study, this work raises questions for further research within the area of commercial cyclist mobility, including the place of commercial cyclists within planning the cycling city. In terms of cargo cycling, the issues which arise as a result of non-inclusion have been outlined as a blog for further reading.

C3: Cycling (in)equalities and (in)equal cycling

Rita Jankowski

Interactive part with participants

1. Ask participants to allocate themselves as a cycling persona, based on their "cycling tolerance" and choose a notepad color based on that (e.g. persona usually cycling with children, fearless cyclist)

2. Ask participants to think about a neighborhood in their city, which is considered as a "bad neighborhood" (e.g., lower subjective/objective security)

3. Ask participants to think about the cycling experience in this neighborhood

4. Ask participants to allocate this experience in relation to the general cycling experience in the city and stick the notepad on a scale (much worse – worse – same – better – much better)

5. Discuss the experience in what sense it is different (If there are to many participants create a fishbowl where representatives of different experiences talks about it)

6. Discuss about possible solutions

Research Results

The global Covid-19 pandemic and the current geopolitical developments with the consequence of increasing energy prices posed major challenges for the transport sector, proving its fragility and the demand for greener modes. The shift towards more sustainable forms of mobility requires a serious inclusion of active transport modes in transport planning, especially in urban areas. Safe, comprehensive, and inclusive cycling infrastructure is one the building blocks in this undertaking. However, what was once considered a mean of transport for different socio-economic groups today it is often described as an elitist entertainment of the upper middle class and also misused by some political groups . This not only hinders a shift towards sustainable mobility forms, but (perhaps more importantly) widens the gap between different socio-economic groups and adds additional fuel to the already heated mobility debates. Fair and reasonable distribution of safe cycling infrastructure and a pleasant cycling experience across the city are essential.

One pillar of my research is therefore to examine the spatial distribution of the cycling network in Milan and Berlin and put them in relation with socio-economic characteristics of the neighbourhoods. With this I would like to find out whether people living in more deprived neighbourhoods have the same access to cycling infrastructure as people in more affluent areas. To capture the degree of deprivation in Milan, I have created a socio-economic index (SES-index) based on principal component analysis (PCA) using census, income and real estate data. For Berlin I used an index developed with the same PCA-method by the Senate Department for Higher Education and Research, Health, Long-Term Care and Gender Equality and similarly to Milan also looked at the real estate and income. To describe the bikeability in different neighbourhoods I looked at the share of cycling lanes in relation to the road network, the accessible bikelanes within a 200- meter zone and a bikeability index that was created by the US association "peopleforbikes". Preliminary results show a statistically significant positive correlation between socio-economic level and the bikeability for Milan, meaning that neighbourhoods with a higher socio-economic status have higher bikeability. For Berlin the results indicate the opposite: we see a negative correlation, indicating that neighbourhoods with a lower socio-economic status are more bikeable.

But the cycling experience does not only depend on the condition of cycling infrastructure and relevant destinations close by but is also influenced by cycling environment/cycling culture. Therefore, my second pillar is to capture the bicycle experience/environment in neighbourhoods with a different socio-economic level and compare them with the data analysis. For this I use customized versions of BUX-methods . After selecting sample routes non-randomly in different neighbourhoods (different in the sense of their socio-economic status) I observe cycling conditions (accessibility, consistency), cycling environment (green spaces vs. main roads) and the mobility culture (attitude of drivers and pedestrians towards cyclists, number of cyclists).

C3: Auto-Ethnography of the Lived Experience of Urban Cycling

Mohammad Nazarpoor

Our Everyday mobility is an embodied, affective and emotional practice that creates diverse perspectives for understanding the city. According to this perspective, Urban Cycling, as an embodied spatial practice, brings about a different experience in comparison with pedestrians, car drivers, and other ways of moving, due to its variable speed and immediate embodied relationship with urban spaces. From this perspective, how can we capture a holistic understanding of the cycling experience? How can we come to know and interpret a cyclist's practice within a specific cultural experience?

My research aims to understand the lived experience of urban cyclists in two different urban contexts (Amsterdam as a bike-friendly city and Tehran as a car-dominated one) by applying auto-ethnography. I have already published auto-ethnographic research about cycling lived experience in Tehran, and I attended the Planning the Cycling City course (1-21 July) to gather data on the auto-ethnographic research about cycling in Amsterdam.

This research will be a comparative study that the main research questions are:

1. What features does this experience incorporate in the context of Tehran and Amsterdam?

2. Why do these differences and similarities exist between the lived experiences within the contexts of these two cities?

When it comes to cycling experience, Autoethnography can denaturalize cycling routines by describing our own experience. It provides an insider perspective on cycling lived experiences within urban fabrics. Auto-ethnography is a qualitative interpretive ethnographic approach to research that seeks to describe the personal experience to understand cultural experience. Personal stories are the main core and storytelling is the best way to understand the subjective experiences of the researcher that provide a useful way of knowing about the collective experiences by creating a specific meaningful relationship between researcher and participants. Auto-ethnography has close ties to phenomenology and the mobilities paradigm and provides an insider view of the lifeworlds of mobilities practices.

My research is basic research that is concerned with producing knowledge for understanding different aspects of urban cycling practice which are key to improving the planning, facilities, and general conditions for daily urban cycling. Employing a phenomenological framework, the purpose of this study is to investigate the lived experience of urban cycling within the "New Mobilities Paradigm". The research concepts will be elicited from auto-ethnographical essays by implementing four existential lifeworlds: lived space (spatiality), lived body (corporeality), lived time (temporality), and lived relations (relationally).

C3: How good are we at planning bicycle infrastructure? On the performance gap between actual and optimal investments

Mads Paulsen

The development of bicycle infrastructure can increase the bicycle share can ease the life of travelers and lead to enormous socioeconomic benefits (Haunert & Budig, 2012; Rich et al., 2021). However, when suggesting large bicycle infrastructure projects developed over a long period of time, there may be additional gains by considering which parts of the project to build when. Generally speaking, by investing in the best projects early on, investments will accumulate larger benefits over time and generate spillover effects to the remaining parts of the network once they are opened.

Finding out which projects to invest in and and in which order they should follow is a non-trivial task. The former (the bicycle network design problem) has been studied with different methodologies in the literature, including graph theory (Guillermo et al., 2020) and operations research (Smith & Haghani, 2012; Mesbah, Thompson & Moridpour, 2012; Lin & Yu, 2013; Mauttone et al., 2017; H. Liu, Szeto & Long, 2019; Duthie & Unnikrishnan, 2014; Lim et al., 2021; Ospina et al., 2022; S. Liu, Siddiq & Zhang, 2022). However, existing approaches did not connect their planning to socioeconomic key performance measures commonly used by decision makers. Secondly, previous literature has not tackled the problem in a sequential fashion, which is a requirement for large network expansions.

In this study, we suggest heuristics for expanding the cycle superhighway network for Copenhagen in a sequential manner and evaluate the socio-economic performance of different strategies. Specifically, we measure the socioeconomic benefits of using one of our heuristics, and show that the added benefit is equivalent to several hundred millions of euros.

C3: The with with the goal – A system thinking approach to create a national goal for bicycling in Sweden

Jones Karlström

In the fall of 2021, the Swedish Road and Transport Research Institute (VTI), where the Swedish Cycling Research Centre is based, received a governmental assignment to define a specific national target level regarding increased bicycling in Sweden. The assignment also included to define a target structure, a suggestion of indicators as well as a system for monitoring. Further, the study should consider the socio-economic effects of cycling and focus on promoting increased cycling within all ages and socio-economic groups throughout the country. Finally, the instruction was also to increase cycling in such a way that it contributes to increased accessibility, increased public health and that climate and environmental quality goals are achieved.

The current goal of the modal share, in which cycling is included on a national level, has a combined target level for walking, cycling and public transport. The aim for the three modes of travel is to make up for 25 percent of the total transport system work in Sweden. However, the way the current goal is formulated it is possible to decrease the modal share of cycling while still reaching the target level.

With the instructions from the government in mind we needed to create an instrumental goal. To achieve that, we gathered information through literature studies on the impacts of the transport system on: environmental health, the state of public health measured in physical activity, transport equality as well as travel and cycling at different ages in life. We also gathered information about the socio-economic impacts of increased cycling.

A few examples of our findings: 8 000 people die a premature death due to air pollution every year and 3 000 of those as a direct effect of the motorized transport system. Every year 1 000 people suffer from a heart attack due to noise pollution from traffic and 1 000 people suffer from a stroke, also caused by noise pollution from motorized traffic. 500 of those 2 000 dies. To decrease the emissions from traffic the increased modal share of bicycles needs to come from the major polluter, car traffic.

Looking at public health and physical activity, we found that only 13 percent of the children between the age 11-15 indicate that they reach the WHO recommended level of physical activity (60 minutes) a day, which puts Sweden among the worst countries in Europe. Between 1995 and 2014, on an average day bicycling dropped from 24 to 15 percent among primary school children. Only about 50 percent of the children in Sweden walk or bicycle to school. In comparison, Finland and Denmark have about 80 percent active commuting to school. Literature also showed that 25 percent of the children commuted to school by car. Based on that information we concluded that focus on children's bicycling within the goal structure where needed.

What we found in literature made it possible to formulate an instrumental goal for cycling that will support a transition towards a sustainable transport system and address the most pressing matters. To define the target levels, we gathered information from a workshop, a survey, regional studies on cycling potential, as well as through our own analyses of data from national travel surveys. The regional studies showed that the potential for commuting to work by bicycle was high both over short distances up to 15 minutes and longer up to 30 minutes. The analysis of the national travel surveys showed that 35 precent of the trips up to 10 km were done by car. Apart from this we also gathered information about other nations' target levels for bicycling as well as their target structure.

Based on our data analysis of and previous studies we came to the following conclusions on goal structure and target levels.

Simply speaking, the rate of bicycling should double by 2035 and, more specifically, we suggest the following targets:

- Overall objectives: Cycling in Sweden should increase to improve accessibility, strengthen public health, and decrease the climate and environmental impact.
- Intermediate target 1: The bicycle share of the total number of travels in Sweden should increase to 20 percent by 2030 and to 26 percent by 2035, without reducing the share of pedestrians or public passenger transports.
- Intermediate target 2: The bicycle share of the total transport system work in Sweden should increase to 3 percent until 2035, without reducing pedestrians or public passenger transports.
- Milestone 1: The total share of bicycle travel in Sweden, shorter than 10 km, should increase to 30 percent by 2030 and to 45 percent by 2035, without reducing the share of pedestrians or public passenger transports.
- Milestone 2: The total share of bicycle travel for primary schoolchildren in Sweden should increase to 40 percent by 2030 and to 50 percent by 2035, without reducing the share of pedestrians.

In addition, we have suggested seven indicators with associated measures, linked to the targets suggested above. The national travel survey could be used to monitor the targets and the annual report from the National Council of Bicycling could preferably be used for monitoring the indicators.

Sweden is known for our traffic safety work within Vision Zero, zero deaths and seriously injured in traffic. That strategic work has had a very positive effect on traffic safety for car users. For bicyclists however, there has been no significant decrease in accidents. With the current goal of 25 percent walking, bicycling and public transport, one possible solution to reach the intermediate target for Vision Zero was to not increase bicycling or even decrease bicycling. But with the new suggested goal we can use Vision Zero to improve bicyclist safety and even move beyond zero and start saving lives through a more sustainable transport system that contributes to public health, decreases pollution, increases accessibility (for all) and takes us closer to the national goal of 70 precent reduction of CO2 emissions from the transport system by 2030.

D1: The Cycle Node Network Planner: A data-driven decision support tool

Anastassua Vybornova

Cycle node networks for recreational cycling have been first introduced in Belgium in the 1970s, and have since been popularized in several other European countries, such as France, Germany, Switzerland, and the Netherlands (DKNT, 2020). Implementing a cycle node network promotes rural cycling, in particular recreational cycling and cycling tourism. However, the concept is not well-known to the broader public yet, and current planning approaches to cycle node networks rely heavily on manual processes (Scappini et al., 2022). Here, we present our work in progress on a computational, data-driven workflow, the "Cycle Node Network Planner". The Planner is a decision support tool for cycle node network development that aims to support the popularization and cost-efficient implementation of cycle node networks across the globe.

What is a cycle node network – and what makes it so great?

A cycle node network is essentially a navigation system tailored to cyclist needs. Displayed on a map, the network consists of a set of numbered cycle nodes that are connected by paths (network edges), as shown in Figure 1a. Seen from a bicycle, the cycle node network consists of signposts placed at each of the network nodes, as shown in Figure 1b. The signposts directs the cyclists towards the next nodes on the network. Such a network layout enables cyclists to plan their routes with maximum flexibility according to individual preferences. In contrast to many traditional long-haul cycle tourism routes that only go from A to B, it allows for a variety of round trips and adjustable trip length.

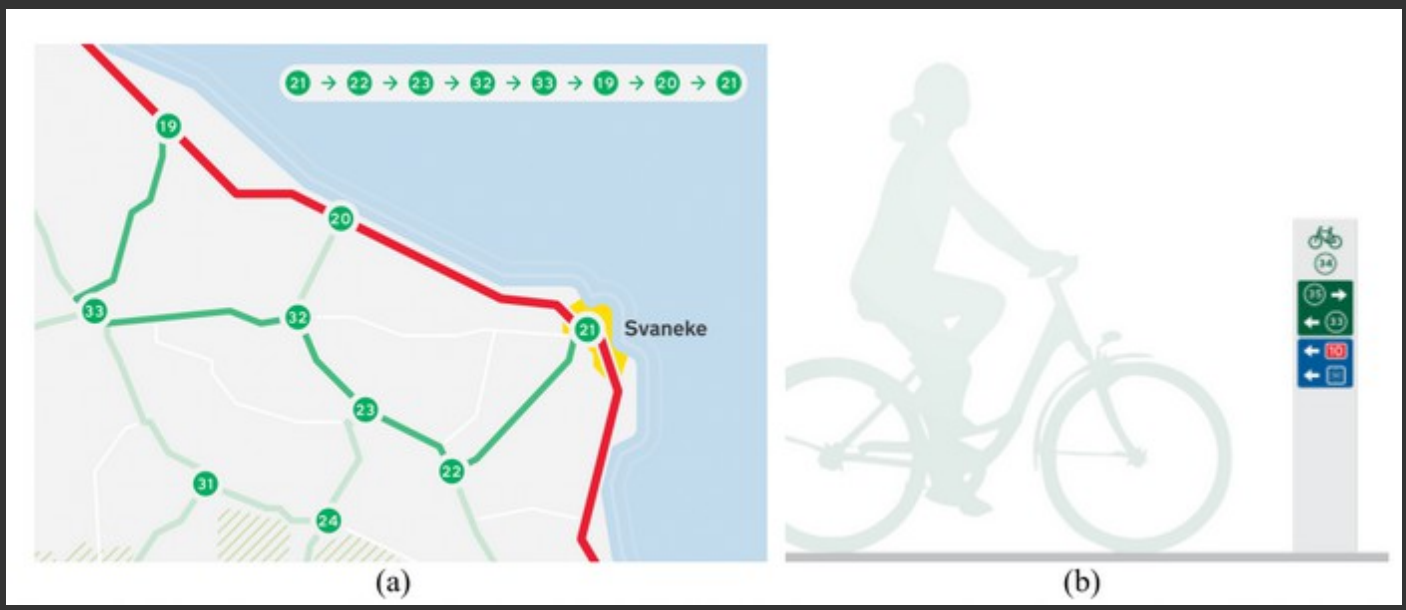


Figure 1: What does a cycling node network look like? (a) A close-up map view of an already established cycle node network on the island of Bornholm, Denmark. The node sequence in the upper right corner shows a possible roundtrip route around the town of Svaneke, with a total length of approximately 20 km. (b) A design example for a sign post at a cycle node, indicating directions to the nearest nodes on the network. Both images: courtesy of Dansk Cykelturisme, available online at: https://cykelturisme.dk/knudepunkter-nu/, accessed: 2022-06-28

Establishing a cycle node network in a given area does not require the construction of new bicycle infrastructure (other than the signpost placement). Instead, the cycle node network can be simply designed as a subnetwork of the already existing infrastructure in a given area. If successfully implemented, a cycle node network can therefore significantly and cost-efficiently promote rural cycling.

Computational support for cycle node network planning

The Cycle Node Network Planner is an open-access, open-source decision support tool for cycle node network design. The user input consists of the geospatial data of a specific area where the network should be implemented. Further, the user can specify:

- ratings for each street segment on a user-defined scale – e.g. "cycling comfort from 1 to 5 on each segment";
- must-have elements of the network – e.g. "must lead to the beach"; "has to include train station X";
- network design constraints – e.g. "must have a node at least every 5 km"; "cannot have more than 50 nodes in total";
- optimization parameters – e.g. "maximize the number of possible roundtrips"; "maximize the average cycling comfort on each possible roundtrip"

We implement a workflow for spatial network optimization with constraints based on the user input described above. For each optimization parameter, the Cycle Node Network Planner shows the user several options for the final cycle node network and displays the corresponding metrics (total node number, total length, average rating, etc.) The user is then prompted to evaluate the proposed options and choose between them based on local planning knowledge. Crucially, our tool does not provide one presumably perfect solution. We acknowledge the relevance of local, non-quantifiable knowledge within the planning process and leverage it by letting the user choose between a variety of possible options.

Denmark's future recreational cycle node network: A transdisciplinary collaboration

This study is the result of an ongoing collaboration. Our team of cycling researchers from the IT University of Copenhagen works together with Dansk Kyst- og Naturturisme (DKNT – Danish Coastal and Rural Tourism), Foreningen Dansk Cykelturisme (DCT– Danish Cycling Tourism), several Danish municipalities where case studies will be rolled out, and several companies from the private sector. Together, we are working towards a blueprint for a nation-wide implementation of a cycle node network in Denmark.

The transdisciplinary nature of our collaboration is highly beneficial to the project, allowing us to incorporate considerations at the intersection of computational theory and planning practice. We are testing the Cycle Node Network Planner in several case study areas across Denmark in collaboration with the corresponding municipalities, demonstrating the high practical relevance and potential future applications of our project.

Cycle node networks: Do-It-Yourself!

Our main goal is to support cost-efficient implementation of cycle node networks across the globe. Therefore, our entire computational workflow is modular, fully reproducible and provided as open-access, open-source code. The Cycle Node Network Planner is designed as a Do-It-Yourself kit for the planning and implementation of cycle node networks by the entire cycling community – planning practitioners, academic researchers and cycling activists alike.

D1: Rewriting the Swiss Cycling Infrastructure Norms: Review, Analysis, Critique

Clarissa Virginia Livingston

In the context of a new project that aims to rethink how cycling planning and policy are approached in Switzerland (The e-Bike City), the Swiss norms for cycling infrastructure will be scrutinized. The hypotheses is that Swiss cycling infrastructure, as it is understood and codified in Swiss norms, does not address the needs of the majority of current and potential cyclists. Recently accepted political initiatives (Aargauer Zeitung, 2020) (Kuenzi, 2018) imply that the public is indeed increasingly dissatisfied with Swiss cycling infrastructure and policy, and that there is a growing desire to improve it. Why the dissatisfaction? The hypotheses of the authors is that the designs used by Swiss cycling infrastructure as they are understood and codified in Swiss norms do not address the needs of the majority of current and potential cyclists.

The most common form of cycling infrastructure is a «Radstreifen», which provides little to no separation from motorized traffic, since a Radstreifen is simply a narrow lane marked with a broken yellow line on the rightmost side of the roadway. Motorized vehicles are permitted to use these non-exclusive cycle lanes when they do not hinder cycling traffic. When this style of cycle infrastructure is combined – in urban environments - with intersection designs that force cyclists to merge between several lanes of motor vehicle traffic and a prevalence of tram tracks inside intersections and even on recommended cycling routes, it becomes obvious that the current (urban) Swiss style of cycling infrastructure leaves the «Interested but Concerned» (Geller, 2006) (Dill & McNiel, 2013) (Dill & McNeil, 2016) as well as those who could be typified as "path-using cyclists" or "fair weather utilitarians" (Damant-Sirois, Grimsrud, & El-Geneidy, 2014) with few viable routes for their daily trips. In both cited studies, the mentioned groups of cyclists represent the majority of those surveyed, and thus represent the largest potential for inducing modal shifts from motorized modes to cycling.

One important question is why the Swiss norms of the last decade have persisted in using designs that are increasingly acknowledged as less than ideal for the majority of current and potential cyclists. A recent thesis (Löffel, 2022) suggested the reason: the categorizations of cyclist themselves used by the various norms and guidelines (VSS-Kommission 173, Projektierung, 1994) (Kugelmeier, et al., 2021) have tended to focus on cyclist characteristics that do not directly relate to how cyclists perceive their own safety and comfort while riding: instead, most categorizations grouped cyclists based upon their usage frequency or trip purpose. This tends to focus design efforts on the groups that already cycle and not on the groups of (potential) cyclists that do not cycle or cycle rarely because they do not feel safe. Even in recent reports that aim to update Swiss norms (Dörnenburg, et al., 2016), the authors focus more on other cyclist characteristics, such as the characteristics of the type of bicycle, than on how cyclists perceive their safety while using the infrastructure.

Which leads to the issue of interest: the Swiss cycling norms are undergoing revisions at all levels: for example, adjustments were made to the federal norms in 2019 (VSS-Normierungs- und Forschungskommission (NFK) 2.4, Fuss- und Veloverkehr, 2019) and the canton of Zurich started revisions in 2021 (asa Arbeitsgruppe für Siedlungsplanung und Architektur AG, 2021). The question is thus: are these revisions making the same decision of focusing on cycling user groups characterized by their use-frequency and not by how they perceive their own safety? Which new designs are being considered – and how do these compare to design norms of countries in which cycling has truly become a transport mode for all, such as the Netherlands or Denmark? How do all these design norms compare to studies that show what kinds of infrastructure and roadway conditions are preferred, and more importantly, perceived as safe and comfortable, and by whom? Examples of studies of this type are (Dill & McNiel, 2013) (Dill & McNeil, 2016) (Damant-Sirois, Grimsrud, & El-Geneidy, 2014) (Francke, et al., 2019) (Aldred, Elliott, Woodcock, & Goodman, 2017).

In this paper, the authors aim to analyze the current Swiss cycling infrastructure norms, recent and ongoing revisions to the norms, the currently built infrastructure, and planned infrastructure. In particular, this analysis aims to contrast the Swiss norms with research on reasons why people do not cycle despite wanting to and with best practices for creating cycling infrastructure that currently underrepresented and/or vulnerable groups – such as women, the elderly, children, disabled, or even just inexperienced cyclists or "late bloomers" – will feel comfortable using for their daily trips. The objective as well as subjective safety of different designs will be evaluated based upon the literature on this topic. Finally, this paper will provide a synthesis of its findings to determine if the designs recommended or required by the Swiss norms can provide an objectively and subjectively safe, comfortable environment for utilitarian daily cycling for all groups, what kind of changes might be necessary, and whether or not recent and ongoing revisions are making such changes.

It should be noted that the norms, the network coverage and continuity, and type of cycling infrastructure can vary between urban and rural regions, from Canton to Canton, and even city to city, in Switzerland. This paper attempts to address this diversity of norms and practices, but will focus on the federal norms, as these set the stage for the regional and local ones.

The design norms of a country (or region, or city) define its infrastructure for decades, so it is only when the norms allow (or force) the use of designs that are safe and attractive for all types of cyclists that cycling will become a viable mode of transport for all.

D1: Cycling in Asia: Worlding cycling research with anthropology

Sanderien Verstappen

Cities in Europe and Asia are currently witnessing a transformation in mobility patterns, in opposite directions. In Europe, as well as North America, cycling is going through a notable come-back after having been marginalized by the development of car-centric infrastructure since the 1950s. In many Asian cities, in contrast, a very recent explosion of car and motorbike ownership since the turn of the millennium is only recently pushing cyclists and other non-motorized forms of transport off the road. If cycling is Europe's future, then what might it learn from the past and present experiences of cyclists in Asia?

Scholars of cycling have recently critiqued their own narrow focus on the established "cycling utopias" of Kopenhagen and Amsterdam (e.g., Zuev et al. 2021, 3) and have gained interest in other kinds of cycling practices - in Europe, the Americas, Asia and Africa. Problematic, indeed, is the relation assumed between the cycling utopias and the other places where people cycle: a relation of unilinear development, in which legal, spatial, and social arrangements found in cycling utopias are deemed ideal models for other cities to follow. For example, when scholars turn to China and India, their attention is focussed on those aspects that are deemed crucial to cycling in Europe – and when they find little evidence of these aspects, their recommendation is implementing the European ideals (e.g., in Pucher et al 2021). What might cycle scholars and advocates learn if they stop measuring the frequency of pre-established norms and instead take time to look: how do people actually cycle in the cities and villages of Asia?

Cautioning against the danger of universalising European experiences, the geographer Paola Castañeda has recently proposed to start "worlding cycling research". By turning to the cities of the global South, cycling researchers can advance new pathways of thought "that take seriously the complex political challenges faced by cities of the global South, as well as the particular desires, aspirations and innovations of their inhabitants" (Castañeda 2021, 1). This geographic shift of perspective has broader implications for social science theory: it is a decentralizing strategy to move away from Eurocentric visions in social sciences and to promote a vision of "knowledge as partial and incomplete whilst leveraging the ambitions, lessons, and innovations of diverse sites and people" (Castañeda 2021, 3).

Anthropologists have a lot to contribute to the project of "worlding" cycle research. A long lineage of thought in the discipline has aimed to globalize the social sciences and thereby to "provincialize" Eurocentric assumptions in social theory (Chakrabati 2007; Wolf 1982). Methodologically, anthropologists have developed a robust body of participatory research strategies (Gubrium et al. 2015) and multimodal approaches (Collins, Durington, and Gill 2017) that have sought to "decolonize" academic structures of knowledge exchange, employing visual and digital communication technologies as supportive tools in the development of non-hierarchical and non-extractive modes of research and knowledge exchange (Alvarez Astacio, Dattratreyan, and Shankar 2021). Empirically, anthropologists have developed a keen interest in the study of roads and infrastructure development (Harvey and Knox 2015; Heslop and Murton 2021), even if their interest in the bicycle is still limited in comparison with other disciplines (Vivanco; Sur 2021).

My project, preliminary titled Cycling in Asia, yokes these traditions of thought together to question established assumptions about where expertise knowledge about cycling might be found. It treats the cycling expertise of ordinary people in Asia as an original pathway towards knowing cities, which has potential to alter some of the most well-established assumptions underlying traffic planning in Europe and North America. Based on preliminary interviews with cycling advocates and mobility researchers in India, Indonesia, and the Philippines, I am currently developing this new line of research at the crossroads of three academic fields: the anthropology of Asia, the anthropology of mobility, and visual anthropology. I have long worked in these three fields, yet cycling and cycling advocacy is a relatively new fieldwork site for me. Participation in CRBAM would be a unique opportunity to test my ideas-in-development on experts in this field.

D1: Analysis of the location of public bicycle stations in Cuenca - Ecuador

Juan Diego Cordero

The location of the public bicycle stations in Cuenca present some deficiencies that limit the efficient operation of the system, according to a public oversight carried out in the city, it can be verified that this could work in a better way, for which it was suggested that new stations should be added apart from the existing 20 and at the same time it was suggested that some of the existing stations be relocated.

The present investigation analyzed the areas with the greatest potential to relocate the current stations and at the same time propose the incorporation of new ones. The QGIS program was used where the most relevant maps for the study were combined, giving greater relevance to Spatial Syntax and Urban Intermodality. The results showed that some stations could be relocated in areas closer to the bikeway, in the same way strategic points were found to add new stations and thus provide coverage to the entire city in a second stage, within the approaches importance was given to the banks of the river that could function as a new layout for the bikeways and in the same way the topography of the city was considered to establish a maximum distance between public bicycle stations so that users feel comfortable in this way.

It was concluded with certain recommendations for the public bicycle system of the city among them the most relevant is that it should be allowed to transport the bicycle inside the bus or the tram, since this would support a better intermodality in the use of public transport, another important aspect is that the methodology that was used was created during the process it considered a lot of different aspects that are important for urban design and this methodology could be implemented and use with different planing of public transport.

D2: Isn't it slippery? A take on wood as a pavement of choice for cycling infrastructure

Jean Huvelle

Any time I stand up and introduce our wooden cycling infrastructure concept, the same question shoots up: isn't wood slippery?

Born from a desire to facilitate cycling in dense urban environments by lifting it above the motorized traffic without an expensive bill to foot, our modular solutions do trigger some functional interrogations from engineers and transport planners alike. Wood is so slippery, unsafe for high standard infrastructure!

We endeavoured to provide a solid answer to what felt like a stereotype fed by poorly maintained patios and remote trails cheaply patched with chicken nets.

A lot of research has gone into determining safe levels of friction for motor vehicles, and, to a lesser extent, bicycles. Complex models have been evolved of the rubber wheel's interaction with an asphalted surface, and advanced measurement methods produced to qualify a certain pavement's affinity to slipperiness. But while wood has been used long before asphalt for road infrastructure and cycling speed records are still getting beaten on wooden surfaces, no clear scientific information on the friction coefficient between rubber and wood under controlled conditions has been found in the literature. Only some old papers from the 60' did mention some valuable hints, but their focus was on milling and woodworking quality, not road safety.

All the while, there was a wealth of anecdotal and more serious information available online, addressing the key aspects required to keep a wooden surfaces safe in the outdoor.

With the financial support of the Swedish road safety fund (Skyltfonden), we used a well-established method, the British Pendulum Test, to investigate friction between wood and rubber under a variety of conditions.

The most obvious and expected result regarded the effect of water, dry wood being always safe even when slightly contaminated.

The effect of wood species, while harder to single out, seemed to be secondary to a range of other features, such as surface preparation. The species elastic modulus, however, could be playing an important role, but this couldn't be isolated from our data.

Rough surfaces did provide some increase in friction, but not under all conditions considered, indicating further research being needed on that parameter. In particular, longitudinal grooving commonly found in boarding products could improve friction in a single direction, but led to an overall decrease over 360 degrees, probably because of the decrease in contact surface area between the rubber and the wood.

Probably the most interesting result of the study related to the effect the angle between the wood fibre direction and the direction of movement of the rubber pad. It is widely considered that friction is higher when travelling transversely to the fibres direction, while travelling along the fibres would provide for depressed frictional properties. Our measurements actually indicate that the two most relevant directions for friction on wood in a cycling context (0 and 90 degrees to the fibres) deliver the least amount of friction, sometimes with a major margin. There are therefore some traffic safety benefits to be had by orienting wooden planks used as rolling surface for cycling infrastructure by between 30 to 60 degrees to the direction of travel.

Finally, we investigated the effect of moisture content (MC), the key hygroscopic property making wood such a special construction material to handle. Preliminary results indicate that the amount of water contained in a wooden decking is likely to influence largely its frictional properties. Dry wood demonstrates much improved figures, and the commonly found range of 20% to 30% MC shows a steep gradient indicating strong sensitivity that can be key to the perceived safety of wooden pavements. Limited measurements above 30% MC do not indicate that this steep decreasing trend continues further, while at such moisture levels, the wood is expected to degrade quickly making it unsuitable to infrastructure usage.

All in all, we scratched the surface of frictional interactions between wood and rubber. While a lot remains untold, the provided data is sufficient to deliver some key takeaways to help design safe wooden infrastructure. Design details such has choice of species, surface preparation, board orientation, humidity management and maintenance are all important to consider when elaborating a wooden cycling track.

D2: A social and longitudinal comparison of Dutch and Danish cycling behavior: Uptake, Infrastructure, Safety, and Bicycle Technology

Kira Janstrup

Abstract

The Netherlands and Denmark are amongst the most successful cycle nations worldwide measured according to the share of bicycle trips and the mileage they represent. However, recent research suggests (Rich et al. 2022) that while younger generations in Denmark cycle less, the same pattern cannot be observed in The Netherlands. For Denmark the pattern is particularly alarming in rural areas where the bicycle up-take between the age of 10-20 has declined between 20-40% between 2006-2019.

Motivated by this alarming trend and previous research that looked at the welfare impacts of bicycling (Rich et al. 2021; Hallberg et al. 2021), this paper investigates the social and longitudinal aspects of bicycling in the two countries. Specifically, we intent to look into explanations for the bicycle uptake that cover aspects related to infrastructure, safety, and technology. By comparing the two countries systematically side-by-side we will be able to pinpoint areas of under- and over-performance and provide explanations.

The paper will use data from the Danish and Dutch national travel surveys and use time-series analysis and pseudo-panels to investigate the behavioral trends over time.

Background

Despite continued efforts to increase the cycling trip share in Denmark, the demand for cycling in Denmark is declining (Nielsen, 2016; Rich et al. 2022). With Denmark being the second largest cycling population in the EU relative to its population (ECF, 2017) and one of the historical forerunners in promoting bicycling, it is of international interest to understand why this decline is happening, for whom and to what extent? In particular, it is interesting to compare with The Netherlands which is the largest bicycle population in Europe. In The Netherlands a similar drop in the cycling uptake has not been observed and of interest to examine why we observed this difference. Is it due to external factors such as;

- Car ownership propensity or income growth?
- The way the infrastructure is developed and the quality of the cycling infrastructure?
- Safety concerns or traffic accidents?
- School decentralization or school centralization? (Kroesen and Van Wee, 2022)
- Parking for bicycles and theft?
- Congestion of cars?
- Urban sprawl or urban density?
- The ability to combine public transport and bicycle

The aim of the paper is to present a systematic benchmark of the two cycle nations in order to compare the effect of external factors on bicycle uptake, cycle distance, recreative bicycling vs everyday bicycling, and choice of mode-choice.

The relevance of the study is underlined by the fact that The Netherlands and Denmark in many dimensions are very comparable. This related to level of income, the country being mostly flat, comparable weather conditions around the year, and a developed cycling culture. Hence, the identification of areas where either Denmark or The Netherlands is lagging behind can be of interest to the wider research community. Mainly because it may allow us to foresee trends in countries with a less developed cycling culture and potentially lead to preventive measures for mitigating such developments.

Methods and results

In the paper we will apply large-scale national travel surveys in combination with other data sources. In both countries, these unique data sources exist over a long time and enable us to identify longitudinal effects across different social groups.

For Denmark, the motivation for the study is presented below in Figure 1.

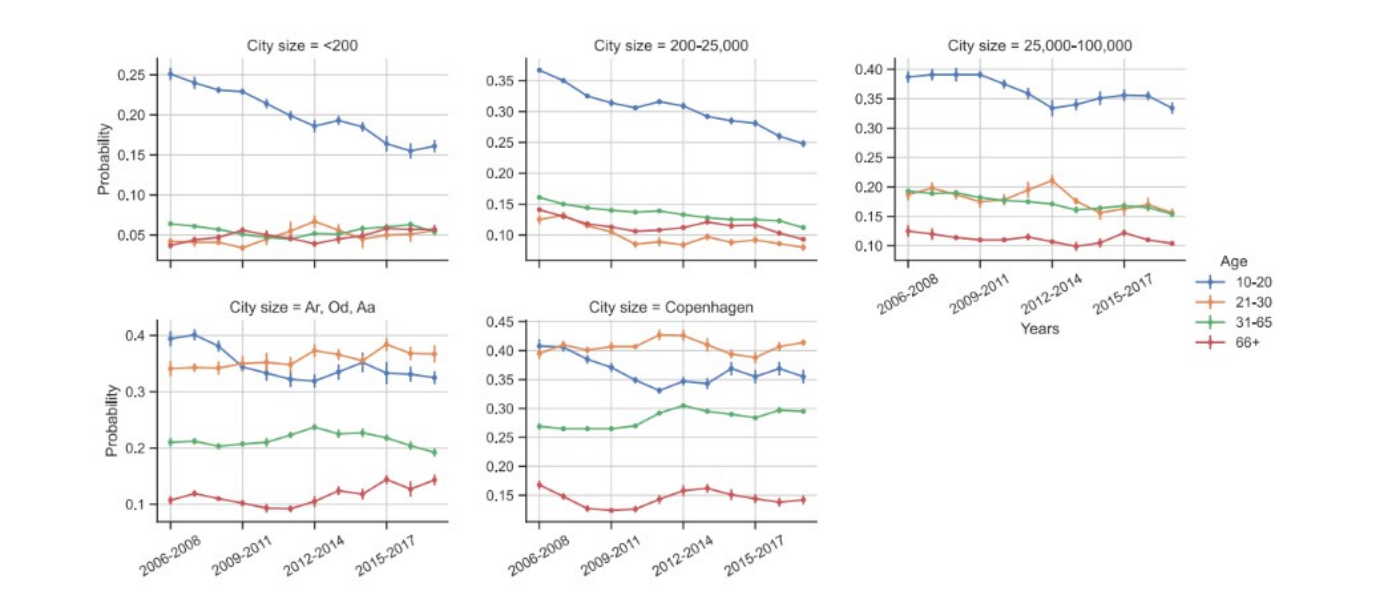


Figure 1: Empirical probability of cycling, conditional on city-size and age cohort over rolling three-year time windows after 2006 (Source: Rich et al. 2022)

Here we see a very significant decline (blue line) of the cycle up-take for younger generations. The decline is affected by the level of urbanization and it is relevant to see if similar patterns can be identified for The Netherlands.

Logit models with main effects as well as interaction terms between main effects will be used to analyze the use of cycle in the two countries. Finally, the results of the two estimated models, one for each Country, will be compared.

The study extent previous research that looked at cycling culture and socialization for migrants in a comparison of Denmark and the Netherlands (Haustein et al. 2019). Thereby, new knowledge on changes in cycling behavior will be identified, which can be used to reverse the cycle up-take trend in Denmark and also in other countries with similar trends.

D2: VeloLAB: The innovation platform for the whole cycling sector

Isabell Eberlein

*Please see **www.velolab.de***

D2: Multi-dimensional accessibility metrics for evaluating investments in cycling infrastructure

Lucas van der Meer

Numerical indicators play a big role in the evaluation of proposals for political interventions in our living environment. Decision makers love to see numbers that can easily be understood and compared, in order to define which alternative is best. In the big data era, this form of planning is known as evidence-based planning. Each decision needs to be supported by objective, quantitative information, usually produced by models that process data from various sources.

For a long time, and still today, mobility-based indicators have been the most common type of indicators used in transport planning. These indicators are focused on the efficiency of the transport network itself. The further and faster people can move, the better it is, according to this paradigm. Over the years, critiques of this approach have advocated the usage of accessibility-based indicators. These indicators represent the idea that it is not necessarily the movement itself that is important, but the opportunities that you can reach by the act of moving.

Although various types of accessibility-based indicators exist, most of them are the result of a focus on the same thought: reaching more opportunities within a shorter amount of time leads to a higher accessibility. That is, using accessibility-based indicators still promotes the speed of movement as a key measure to be optimized. This is especially true in transport infrastructure interventions, that do not affect the land-use component. Given a fixed land-use, you can reach more opportunities (or at least the same amount) within less time if you move faster, thus improving accessibility. This favors investments focused on the fastest mode of transport. In most cases this is the car, especially on larger scales, and when routing algorithms do not account for congestion or time spent looking for a parking spot. This makes it complicated for investments in cycling infrastructure, as well as investments in any infrastructure intervention that actually slows down the speed of movement (e.g. shared-space or car-free streets), to be prioritized.

To promote cycling, and a people-centered living environment as a whole, we need to redefine what accessibility actually means to people. The term accessibility is still rather vaguely defined in the academic literature, often something along the lines of "the ease with which you can reach opportunities". Automatically, this seems to be translated into "the speed at which you can reach opportunities". But should it be that way? Is a place more accessible when you can get there faster? Or is it maybe more accessible when you can get there happier? Or healthier? Or safer? Accessibility is a multi-dimensional concept, and we need metrics that reflect that. Some of its dimensions may be hard to quantify, especially since they are valued differently by different people. However, with the increasing amount of available data and tools, spatial data science techniques may be able to at least approximate them.

In our presentation, we'd like to discuss the concept of people-centered, multi-dimensional accessibility, and its implications for cycling-oriented planning, in an interactive way. We will bring in our own views on the topic, and hope to gather ideas, experiences, and critical feedback. What are the dimensions of accessibility, and what are the changes that we can actually quantify them in a way that remains transparent and understandable? Or, should we drop the focus on numerical indicators and evidence-based planning altogether?

D3: Socio-Cycle: Exploring the socio-cultural significance of cycling in an Irish regional city

Eileen Hogan

In current policy and planning discourse, there is great interest in reimagining and redesigning cities as more cycling-friendly spaces. In Ireland, Government and local councils have recently announced significant investment in long-awaited cycling infrastructure. While positive, it remains to be seen how effective these interventions will be in promoting and sustaining cycling for transport and leisure. Ireland currently has a low cycling uptake in comparison to other European countries with a strong cycling culture, such as the Netherlands, Denmark and Germany. The most commonly-cited barrier to cycling is road safety and therefore improved cycling infrastructure is key to promoting bike use. However, research indicates that investments in the built environment are not enough to increase cycling rates. Research highlights, for example, the significance of contextual/life events in influencing travel behaviour (Chatterjee et al, 2013); the importance of local cultural identity for how cycling is perceived – as 'cool', 'exotic' or 'mundane' (Aldred and Jungnickel, 2014); and the symbolic capital of the bicycle as an expression of lifestyle and status, which influences cycling's popularity positively and negatively (Hoor, 2020). Social and cultural factors are therefore significant in determining the strength of a city's cycling culture but are complex, poorly understood, and inadequately researched in policy-making contexts (Willis et al, 2015; Sottile et al, 2021). Our research addresses this research gap in the Irish context.

This paper presents preliminary finding from "Socio-Cycle", a research project based in Cork city. Cork is typical of Ireland's regional cities in size and transport options. This research is designed by researchers in University College Cork's Institute for the Social Sciences in the 21st Century (ISS21) in partnership with the Cork Environmental Forum, which was established as an instrument for applying the principles of Local Agenda 2030/Sustainable Development Goals and the Cork Cycling Campaign, which is the main cycling advocacy voluntary group in the Cork city metropolitan region. The group engages in cycling advocacy and research with a primary focus on everyday cycling. Given the urban setting, our study focuses on utility and leisure cycling (and exclude road and competitive cycling). The study considers: how local cycling practices are shaped by social differences including age, gender, ethnicity, class/social location, and (dis)ability; how people think about cycling identities, including how cyclists perceive themselves and how others (non- cyclists and potential cyclists) perceive cyclists; how cycling identities vis-á-vis other transport-mediated identities and the social status of cycling have changed over time; and, how people connect cycling practices with contemporary policy discourses around individual and collective well-being, healthy and playful cities, and environmental sustainability.

The research comprises three key elements, including (1) a short online questionnaire, (2) in-depth interviews people who cycle and people who do not cycle, exploring their attitudes towards and experiences of cycling (Insight into how people identify with walking and other modes of transport is also anticipated); and (3) narrated journeys as a mobile method of research (Spinney, 2015), which aim to capture the cycling experience using a storytelling, autobiographical approach. Social practice theory guides the data analysis, focusing attention on how cultures enable certain practices while also allowing space for individual agency. This is a promising approach for understanding social change in a policy context and for unpacking the low uptake of cycling despite its many health, economic and environmental benefits (Spotswood et al, 2015). The 'thick description' of cycling identities, attitudes, behaviours, and practices enables insight into people's relationship to the city and their sense of social connectedness, the symbolic meanings of bicycles, the meaning-making people engage in around cycling practices, and how cycling is interrelated with people's sense of well-being or ill-being.

The presenters are both cycling research neophytes. We each have expertise in social practice theory, but Hogan's previous research focuses on music-making, well-being and cultural policy and Jeffers' research focuses on young people's activism. We are both cycling enthusiasts, which informs our interest in cycling research. We would be delighted to get the opportunity to participate in this event, to learn from others, and to share ideas and experiences.

D3: How well do we know our route? An analysis of cyclists' local detours in Copenhagen Area

Laurent Cazor

When cycling, finding ones way on dense networks means dealing with a number of routes that the human brain (or a computer) cannot process. According to Golledge (1999), people have a mental representation of the transport network they use, which is incomplete and contains many - and sometimes unobserved (e.g. human mistakes, different preferences) – attributes.

Numerous studies have found that few cyclists use the shortest distance path (e.g. Winters et al., 2010, Rupi & Schweizer, 2018). Therefore, in this paper, we explore to what extent cyclists detour on subparts of their trips. We empirically analyse these local detours using a revealed preference dataset collected from Høvding helmets in the Copenhagen area, consisting of more than 170,000 trips made by more than 8,000 cyclists, giving a major opportunity to fill this gap.

Rather than using a basic distance attribute as the only trip characteristic, this work uses generalized costs, resulting from the estimation of a calibrated route choice model (estimated by Lukawska et al., 2021), including 26 attributes on bicycle infrastructure type, land use, elevation gain, wrong way. This allows observing detours linked to unobserved properties of cyclists and their trips, rather than the known factors such as the built environment.

[...]

Exploring people's detours allows extending our understanding on people's behaviour when it comes to finding ones way. The main takeaways from this analysis are that cyclists deviate from the cheapest route on subparts of their trip, and that this deviation grows with distance. This growth seems linear for the maximum absolute detour, while logarithmic for the maximum relative detour. The relation between the number of deviations from the cheapest route and the trip cost also seems linear.

Those findings are useful for route choice modelling. Selecting the universal set of realistic routes between an origin and a destination is challenging. Indeed, the classic discrete choice model rely on probability distributions that are not bounded, i.e. that give a non-zero probability to any alternative. For route choice, where the number of alternatives is very high, this poses computational and realism issues. The existence of a bound on people's local detour allows developing more robust and computationally tractable route choice models (e.g. Watling et al., 2018).

D3: How narratives influence the bottom-up innovation process: a case study of electric rickshaws in India

Vikas Bagde

The dominant model of mobility innovation is top-down, technocentric, and resource intensive. It is also the major contributor to traffic congestion, pollution and resultant adverse health impacts, climate change and resultant environmental calamities, and spending of billions on the infrastructure which eventually lead to worsen the problem and more exclusionary. Any challenge presented by dominant mobility regime is approached with technocentric and top-down approach, which may be able to address that challenge but introduce another plethora of challenges. For example, to reduce the environmental impact of mobility regime, electrification is seen as an alternative, it's been incentivized and subsidized. Prima facie, it reduces the tailpipe emission and noise pollution, but it does not challenge the human behavior pattern, don't reduce traffic congestion, demand additional infrastructure development, shifting burden to others (shifting pollution in form of mining of rare earth minerals, battery manufacturing and recycling, pollution during the power generation) and persistent energy crisis. Therefore, we can safely say that dominant top-down mobility innovations are often naive (at best) about their impacts on the full system.

I am presenting my 8-month paper (research proposal), which I will be submitting for evaluation in November. Through this research project, I want to understand, how learnings from bottom-up innovation in global south can be used to address mobility challenges? Bottom-up Innovation emerges from the interaction of less powerful actors and meets regulatory, institutional and resource barriers that its primary stakeholders have less ability to overcome. The hypothesis is that bottom-up ways of innovation offer the conditions to include much more 'narratives' and as such potentially leads to less naive innovations, empirical evidence will offer us more insights into it. I will be using the combination of Multi Level Perspective (MLP) and Bottom-up innovation framework, to understand role of narratives in the process of bottom up innovation.

Brief about Electric Rickshaw

Manually pulled and peddled cycle rickshaw can be traced as one of the predecessors of the electric rickshaw. The design of manually pulled rickshaw remained virtually unchanged for the decades. First major design change happened around 1930's with peddles and chain was introduced to help rider go relatively faster and lesser efforts. Still some cities like Kolkata, have manually pulled rickshaws. Similarly, manually peddled rickshaw design remains unchanged for decades and there is no significant change in the design even today. Different actors keep experimenting, especially on the power aspect of rickshaw. There are multiple examples across India of using different available power sources such as diesel generator, bike engine, modified bikes and so forth. One version has managed to succeed and evolve in "much better" product. Which is called autorickshaw, which uses the same design philosophy, semi open and minimalistic design, was evolved, but instead of replacing cycle rickshaw it has created its own ecosystem, as an option for shared intermediate mobility. Over the period autorickshaw has evolved significantly on design, efficiency, and engine front but cycle rickshaw remained unchanged. Experiments still continue across the retrofitting cycle rickshaw with some sort of small capacity engine or battery is experimented. Meanwhile, there have been many attempts to keep body frame design similar but to mechanise it to assist riders. India being large country, there is significant variation in the weather and geopolitical conditions. Therefore, different design variations can be seen in the design of Electric rickshaws.

Present version of ER has managed to induce significant changes while sticking to fundamental philosophy but bringing significant changes to operation and function. Therefore, understanding process of innovation and influence of narratives will help to address the global mobility challenges.

D3: How diverse is the Flemish cyclist?

Sam Delespaul

The Flemish government organises a monitor about every municipality in Flanders. This monitor is a collection of more than 300 indicators and statistics on the municipal level and is available for everyone to consult. Data is collected on various themes, such as mobility, housing, demography, environment, and economy. An important data source for these indicators is a large-scale survey called "Burgerbevraging Gemeente- en Stadsmonitor". This survey is conducted every three years among inhabitants aged 17 and over in every of the 300 Flemish cities and municipalities. The sample is representative on a municipal level. The most recent edition of this survey took place in 2020, with over 150.000 respondents.

One of the main topics in this survey is mobility, where respondents got questions on vehicle ownership and travel behaviour. This data allows us to research the diversity of cyclists in Flanders, by analysing which groups cycle more than others. We compared socio-demographic characteristics (household income, origin, car ownership, education level, age, gender) and context data on the municipal level with data on bicycle ownership (bicycle type and number of bikes in the household) and bicycle use (type of movement, short distance/long distance). The main goal is to have an idea who cycles in Flanders, and how diverse this group of cyclists is.

This question of who cycles and who doesn't is very relevant for local and regional bicycle policy. Our results can feed local policy and campaigning towards a modal shift. By creating an overview of the cyclists in Flanders, we have a better idea about which groups to target in policy or further research. When we have more information about those who need to be supported (bicycle ownership) and/or convinced (bicycle use) to make the modal shift to cycling, we can adjust policy accordingly. This large scale, representative survey provides us with an opportunity to deepen our understanding of the diversity among cyclists in Flanders.

One of our results presented in the figure below shows that household income is clearly linked with bicycle ownership on the household level. The lower the household income, the higher the percentage of households that does not own a bicycle. These differences between income scales are significant.

This lower bicycle ownership translates in lower bicycle use. The second figure shows the frequency of cycling in leisure time by the monthly household income. Here we see that household income is also significantly linked to cycling in leisure time. The higher the income, the higher the chances to use the bike in leisure time.

Another indicator on bicycle use from the survey is the frequency of taking the bike for short distances. The figure below shows that gender, educational level and origin also seem to be linked to bicycle use, in this case for shorter distances.

These descriptive results seem to indicate that socio-demographic characteristics do play a role in bicycle ownership and use. Different groups use the bicycle to different extent. As explained above, these are relevant insights to inform both policy as future research.

X1: Kids and Cycle Design Project Workshop

Jonne Silonsaari

Buoyed by its rising importance in the UN Child friendly cities agenda (https://childfriendlycities.org/), the issue of children's mobility is gaining increased visibility in policy and planning. At CRBAM 2021 in Copenhagen we organised a workshop which asked participants to think through what we might gain from a focus on children's mobility; how it could be framed differently from current policy agendas; what kinds of methods could be used to research these questions; and how children fit into policy architectures. The results of this workshop are available on a dedicated MS Teams website, and all those who expressed an interest have access to that resource.

This year's workshop seeks to build upon 2021 in a more focused and instrumental way by inviting those interested to help refine a project proposal for funding. The goal of the workshop is to create a draft project proposal for funding, and define a group of researchers serious about taking the proposal forward and submitting it to a major funder in the next 6 months. Prior to the workshop, an outline (unsuccessful) proposal previously submitted by one of the authors will be circulated to attendees, alongside the notes from the 2021 Workshop. During the workshop, participants will work in groups to critically redevelop key areas of the proposal into something new. The main lines of discussion and enquiry will be:

Rationale: What are the shortcomings of current studies on children's independent mobility? Current literature is focused in improving children's health (doesn't speak to why children value mobility) – how do we break out of functional narratives and unlock children's imaginations?; focused on access to play spaces (keeping children in their place); little sense of findings being translated into policy and design guidance (lack of voice); little sense of how different cities and countries are dealing with the issues (siloed).

Scope: Do we include just cycling, or do we focus more broadly on children's active travel including walking, scooting, skating etc? Where should the geographical focus be and why? Should the focus be European? Global North? Global South? Are there existing projects and initiatives (e.g Van Leer Urban 95) that we should either avoid overlapping with, or which this project could complement? Should we focus on one larger proposal or a series of smaller ones?

Aims and Objectives: What should our 4/5 primary objectives be?
Methods and participants: What methods are best suited to gather the data we require to answer our research questions/ meet our objectives? Who should our participants be? (ages of children; parents; policy makers; engineers; bike manufacturers; organisations with children at their centre...).

Stakeholders/ partners: What contacts do we have who would be interested in taking part and whose support could maximise chances of funding success?

Impact and Engagement: How can we maximise the uptake of our findings?

Funding bodies & Calls: Which funding bodies will finance a large pan-European/ pan-global proposal (eg Van Leer Foundation Urban 95 programme).

X2: Cycling fairly and prioritising – for climate-neutral and smart cities by 2030

Manfred Neun

This abstract is following the conference's overall theme of the role of cycling in supporting a transition towards a sustainable mobility system combined with the politically new situation on the way to tackle climate change: besides the dominating priorities due to the Russian aggression, the Brussels Commission published 112 cities accepted for the "EU Mission: 100 Carbon Neutral and Smart Cities".2 For cycling improvement this offers incredible opportunities, but challenges as well.

Baseline assumed:

(1) Those currently 112 cities chosen from 377 applicants are well committed, ambitious and even best prepared to reach the goals (for with reasons ever);

(2) They will be supported by one ore more consultancies, will use living labs, innovative participation formats, academic support from (regional) universities and so forth;

(3) Cycling measures? Can be in, more or less. Doubts arise when reading, among examples of Research and Innovation actions suggested in the Info kit for cities3 and for Living Labs "public transport as a backbone for sustainable mobility" was addressed, not so cycling.

The systemic role of cycling was discussed in a panel at CRB 2021 in Copenhagen alongside the Fusion Mobility (FM) concept4, when future SUMP improvement towards the European Green Deal (EGD) was targeted and beyond with examples from five European countries. It was revealed that:

- The two subsystems "Active Mobility" (#1) and "Sustainability" (#4) are lacking seriously behind.

- The "digital and smart" subsystem (#6) is quite often just represented by some tools, but mostly not systemically linked to all the others.

- To reach the ambitious goals of the EGD and related, the established SUMP tools need serious improvement.

The above offers an excellent starting point to continue into the direction of "Prioritizing Active Mobility" and links to the "Carbon Neutral and Smart Cities (CSN-Cities)" demand; it questions:

- Which roles will cycling play in the transformation of those CNSCs selected? How are they defining sustainable mobilities?

- Will energy sufficiency and independence (next to efficiency) give cycling additional awareness and priority?

- Is cycling on the agenda of these cities by existing SUMPs and other Masterplans?
- And in particular, what will be smart with cycling?

At the end of last year, the role of cycling was strengthened by the Commission in the New EU Urban Mobility Framework 5 by outlining: "A clear priority should be placed at national and local level on the development of public transport, walking and cycling, as well as connected, shared mobility services." This is a nice idea. However, the CNS-Cities must realize it to meet their ultimate, far-reaching targets of climate-neutrality.

Hence, let us start a one-year project, from CRB 2022 until 2023, with a workshop session this year, organised by the provisional, transdisciplinary team that collaborated 2021 already towards SUMP improvement:

(1) With two introductions to frame subject and work-in-progress;

(2) With CNS-City examples to be assessed and discussed from the same five contrives we had, maybe even some more;

(3) With the invitation to all participants of the workshop to participate in a proper evaluation in CNS-Cities of interest alongside the FM concept and the criteria and exchange procedures we will adopt in the workshop.

In the wording of the CRB call: Let us start in a "campground", and let us deliver one year later by far not a "5-star hotel", but some "stilt-houses" to draft opportunities and serve the demand for systemic cycling implementation.

Workshop intention:

- Strengthening cycling in the development of the EU Mission '100 Carbon Neutral and Smart Cities (CNS-Cities)' by systemic implementation alongside Fusion Mobility criteria.

- Giving access for everybody to Fusion Mobility basics and tools (analytical, creative, participatory & smart-digital), in particular on prioritising Active Mobility and enabling fair access for people to interacting, sustainable mobility subsystems.

- Open invitation at CRB 2022 for research in selected CNS-Cities as outlined there, to be achieved within one year and presented at CRB 2023. With this we are following the CRB's intention of "a unique gathering built around interdisciplinary networking opportunities for both academics and practitioners … to strengthen alliances and facilitate the transfer of knowledge to action."

This workshop is designed to meet many of the subthemes drafted in the call (health, gender, equity, justice and inclusion, starter cities, children, bicycle traffic modelling etc.). Also, this proposed workshop and conjoined action in the follow-up can become a demonstration of cycling transformative power to the outside world, in particular for CNS-Cities and their observing body, the European Commission.

For the CRB community there are promising perspectives, if we can assure that cycling will play an explicit role in this European CNSC mission:

- The CNSC Mission is part of the Horizon Europe programme and has a dedicated funding of €360 m for Research and Innovation actions (2021-2023) addressing mobility, energy efficiency and urban planning.

- The 100 Cities will be supported with funding and financial opportunities and activities via a dedicated Mission Platform, where administrations collaborate with advisors and consultancies, universities and research organizations, etc.

The CNSC Mission is already becoming a vital part of the EU Green Deal. Let us do our part to make cycling a transformative part of it.

X3: Cycling is in the Eye of the Beholder: A guided activity on how place and identity contextualizes our experiences of cycling

Rebecca Mayers

Cities around the world have spent the last decade trying to implement Dutch-inspired cycling policies and infrastructure, with decision-makers inevitably proclaiming "We are not Europe!" (Bruntlett & Bruntlett, 2018). Despite the good intentions, planning for cycling has become a multifaceted and complex problem, with decision-makers unsure of the best approach in creating a cycle-friendly environment. Cycling is not only about getting from point A to point B; it is a sensory experience (Spinney, 2006) that exposes one to new forms of diversity (te Brömmelstroet et al., 2017). Yet, many cities disregardthe sensorial nature of cycling when building and planning infrastructure, leading to poor experiences and potential conflicts with other road users (Mayers & Glover, 2019; Sheller & Urry, 2000).

Our experiences of cycling are therefore also dependent on the broader ways in which our intersectional identities shape how we experience urban space (Butler, 2020).Therefore, even when infrastructure is safe, connected and ubiquitous, a lack of emphasis towards social equity issues can deny access to cycling for many equity-seeking groups (e.g. low-income, Black, Indigenous, People of Colour (BIPOC), immigrant, elderly, children, gender non-conforming people, and women), who are rendered unable to fully participate in the spatial practices, while others flourish (Angyeman & Doran, 2021).
As a result, the cycling experience varies from both person to person, and place to place. These varying experiences need to be part of social equity considerations made when planning for cycling and are central to how we encourage cycling within our own communities and learn from other places around the world (Butler, 2020; Doucet and Mazumder, 2020; Pelzer, 2010).

The purpose of this presentation is to engage audience members in a policy-oriented discussion about equitable cycling and how, as researchers, we often fail to fully appreciate the lived experience of cycling within the planning context. We plan to conduct a facilitated outdoor group activity entitled Cycling is in the Eye of the Beholder, focused on researching and understanding the experiential nature of cycling. Drawing upon the audience members' own personal experiences and keen observations in Amsterdam, we will draw up a set of findings as a group and discuss the implications of conducting this experiential research methodology in any cycling context. A detailed explanation of the group activity is outlined below.

Outdoor Group Activity: *Cycling is in the Eye of the Beholder*

In line with the themes of cycling policy approaches to starter cycling cities and the role of gender, equity, justice, and inclusion, we have planned an outdoor group activity to facilitate learning and discussion. We will take audience members through a facilitated walking tour, emphasizing the connection between the lived experiences of equity-seeking groups, and how the intersection of this knowledge can strengthen c ycling policy and infrastructure planning. The tour will reconceptualize cycling research and move away from the primary way in which cycling is conceived by planners: how it looks on a map.

As a group, our activity will focus on how people use the space to meet their needs (te Brömmelstroet et al., 2017; Mayers & Glover, 2021) and how this can vary according to our intersectional identities. To begin the tour, audience members will be given a debrief of fieldwork and observation techniques used to assess the cycling culture and environment. Prompts will be given to guide the observations and discussions. For example: *Describe the needs that are being met via bike; what are cyclists carrying; how do they interact with their surroundings; identify the factors that make this a good cycling environment; how does this environment vary based on intersectional identities and is this an equitable cycling environment?* Next, members will be paired to work in various sections of a streetscape to conduct unofficial fieldwork. Where possible, we will pair Dutch participants with non-Dutch participants. Upon completing their fieldwork, we will discuss our observations as a collective, recordingour findings and the unique nature of the social cycling environment in the area. Furthermore, we plan to discuss how these findings can be relevant in other cycling contexts and the questions necessary to create safe, enjoyable, and equitable cycling environments. We will emphasize that not only are lived experiences of cycling (infrastructure) integral to helping people thrive, but these experiences need to incorporate a range of different intersectional identities when planning a cycling city that is truly safe and accessible for all.

Y1: Flow hunting workshop

Gheysa Prado

The climate crisis is not in the future tense, being a very present situation that can only be tackled with urgent approaches, that includes a massive reduction in the number of cars on the streets. Even though electrification, automation and shared mobility can play a part in it, active mobility like walking and cycling are some of the most prominent solutions. Especially cycling, considering the full range of benefits regarding physical and mental health, through physical activity, but also indirectly through better air quality, less noise and reduction in commuting time.

For cycling to be inviting to more people, infrastructure must be safe and convenient, as well as provide cyclists with a sense of flow. Many cities have some infrastructure in place, but they can lack the notion of continuity aspects that could help making cycling more pleasant, giving a superior user experience and, therefore, enhancing the changes of increasing the number of cyclists, making cycling more coherent and easier to predict. As previously mentioned, and as shown in previous research results, the sense of flow is important for people that use bicycle for everyday cycling. The aim of this abstract is to propose a workshop of 2 hours and 15 minutes for up to 12 people, for discussing and eliciting different forms and means of flow in the city.

The workshop will start with a brief explanation of its purpose and activities, followed by a short introduction to our project. The main activity will then use a participatory and exploratory approach, beginning with a street adventure on flow hunting (in pairs or groups of maximum 4 people, depending on how many people participate). The main goal of the outdoor activity is to collect images using their own cell phones, on what they consider to be spectacular, and where they can perceive flow and "unflow" (of people in general - being pedestrians, cyclists, users of electric scooters, drivers on cars etc. -, and other 'things' that can have a flow – like water, air, birds etc.) in the city and why.

After the street adventure, the participants will gather again and share their pictures and reflections about the flow hunting. The expected outcome from the workshop is a contribution of compiled insights on what cycling experts consider and perceive as flows, or 'unflows', in order to build a path to increase knowledge on how to design and adapt existing cycling infrastructures to provide cyclist with an enjoyable experience flowing through the city. The insights may also be used to nudge bicyclists towards behaviours that are easier to predict and co-exist with, creating an overall more coherent and positive experience for cyclists and non-cyclists alike. Participants are expected to be able to meet, connect and interact, fostering new networks of researchers and practitioners with likeminded interests in a fun way, while exploring the preconditions for good cycling. For that, the authors seek to create a welcoming atmosphere to promote a safe and inclusive space for discussing and reflecting on what makes a desirable cycling experience and how this relates to big and small features on infrastructure.

The knowledge gained through this workshop, together with other data collected through video-recording everyday cycling in Gothenburg, Sweden and Curitiba, Brazil and interviewing the cyclists on their perceptions, and other hands-on workshop will be developed into a set of practical guidelines on the topic to educate practitioners in the process of this type of design work to contribute to a more sustainable mobility in the future.

- 5 minutes – welcome and brief description of the workshop
- 10 minutes – presentation of the participants
- 10-15 minutes – introductory presentation
- 5-10 minutes – set up for the street adventure
- 40-50 minutes – flow hunting in Amsterdam - street adventure
- 20-30 minutes – reflections on street adventure
- 10 minutes – compiling the flows
- 10 minutes – final discussions

Y2: Perspectives on bicycle repair and bike kitchens

Jonne Silonsaari

Bicycle self-repair workshops, community bike workshops, or Bike Kitchens gain popularity in urban settings. These spaces allow people to access a workspace with tools, spare parts, and volunteer assistants often free of charge, or in exchange for minimal contributions. Recently, scientific scholarship began investigating the connection between bike repair and cycling practices (e.g. Abord de Chatillon 2021 & 2022). Importantly, this work has drawn explicit links between cycle repair and cycling practices overall.

The session highlights this line of research and bicycle advocacy through a workshop session and a hands-on activity facilitated by local service providers, bike kitchens and other relevant stakeholders. It discusses different rationalities and narratives connected to bike repair through real-life case/business examples. No previous research has explicitly explored the complete ecosystem of bicycle maintenance and repair, or the co-existence of diverse spaces where cyclists can repair their cycles and the session seeks to address this gap.

Y3A: Building knowledge for cycling futures

Cat Silva

Background

Cycling is a sustainable, efficient, and comparably inexpensive mobility solution that helps cities to meet the climate goals of the Paris Agreement, the UN Framework Convention on Climate Change, and the Climate Neutral and Smart Cities Mission of the European Commission. Moreover, cycling contributes to people-friendly, safe, economically resilient urban and rural environments, and increased public health. Despite this potential, few cities and countries have taken the necessary steps to provide safe and attractive spaces to accommodate and encourage cycling. One reason for this is an unmet need, yet growing demand, for knowledge related to how to integrate cycling into contemporary urban and transportation planning offered by higher education programmes.

To foster this unmet need, Germany's Federal Ministry for Transport and Digital Infrastructure invested 11.6 million Euros to fund new professorships on cycling at seven institutions of higher education. Along with an objective to advance interdisciplinary research on cycling, each professorship is tasked with developing master's courses to fill the gap in knowledge on how to create and maintain sustainable mobility systems leveraging the benefits of and addressing the hindrances to cycling. As one of these newly endowed professorships, the Chair of Bicycle Traffic at the Bergische University of Wuppertal is presently developing a new master's programme. Our goal is to develop and launch an unprecedented international Master of Science programme on "Cycling Futures" with an inter- and trans-disciplinary approach, including the domains of urban planning, infrastructure design and engineering, architecture, social sciences and humanities, technical fields as well as law and policy.

We aim to teach talented students from around the world concepts of sustainable transportation and mobility while exposing them to different cities, cultures, and expertise on cycling. To meet this aim, we are building a consortium with international partners to develop a joint degree programme, which includes Lund University and the University of Amsterdam. Through this consortium, students will have opportunities to study at our partner universities to experience the local cycling practices and learn a variety of perspectives on how to conceive, promote, create, and manage the cycling cities of tomorrow.

Workshop Focus

With the purpose of gaining new insights on topics, methods, or partners that could be included in our study programme, the Cycling Futures team has organized a workshop focused around this question: *What training and knowledge do future cycling experts need?*

This workshop is for any person who is:

- interested in helping to shape the focus and content included in educational opportunities for future cycling experts;
- currently offering cycling-related coursework or workshops who wish to share their experiential knowledge and advice while gaining new insights;
- interested in joining our mission and partnership;
- or aiming to hire cycling experts that can inform us about what skills and knowledge are important to them.

We will apply Liberating Structures-inspired approaches to stimulate interactive and lively discussions around key questions our team has asked ourselves along our path toward developing a preliminary plan for the Cycling Futures study programme. After presenting our tentative programme, we ask our participants to apply the collective answers to the key questions to reflect on what we are doing right and what missing pieces we need to bring into our curriculum to foster the expertise future cycling experts with the ability to promote and create transformative shifts toward cycling.

Agenda

1. Brainstorming Session: What do future cycling experts need to know? (30 min)

The workshop will begin with a brainstorming session. Participants will work in small groups to answer one of the key questions below, then we will discuss and refine the answers to all of the questions with the larger group.

- Do we need cycling-specific educational programmes?
- What topics and knowledge must be included in a cycling-related coursework?
- What skills do cycling experts need to have (or have access to)?
- Is there anything that is unnecessary, irrelevant, or simply uninteresting for future cycling experts?

2. Presentation: Overview of the M.Sc. Cycling Futures (15 min)

The preliminary curriculum planned for the M.Sc. Cycling Futures study programme is introduced to the participants through a short presentation, including an overview of the programme aims, semester plan and proposed list of courses.

3. Discussion and Feedback Session (30 min)

The participants are asked to critically assess the proposed study programme and offer their feedback to help the Cycling Futures team build an educational programme meeting the wants and needs defined through the brainstorming session. What are the strengths of the proposed programme? What is missing in the curriculum?

4. Reflection (15 min)

The workshop will conclude with a group reflection on why, how, and for whom we should develop and offer study programmes focused on cycling-related topics and expertise.

Outcome

Following this workshop, the Cycling Futures team will apply the input and feedback to finalize the framework of the new study programme.

Y3B: Special Parallel Session: Research Questions for City of Amsterdam's Cycling Future

Lead by Prof. Marco te Brömmelstroet – no abstract

Y4: Creating a Manifesto for Sustainable Urban Logistics

Jarvis Susłowicz & Lucas Hullegie (Cycloon)

Background

The COVID-19 pandemic shed a light on the integral role of transportation of goods within cities, though the question has been a common theme for specialists as the flow of goods increases and their mobility becomes more problematic (Macharis et al. 2014).Interest in logistics to cycling researchers has primarily centred around 'last-mile' solutions, but these only form one part of the vast network of transportation services. Indeed, it's the scale and complexity of logistics systemsand their actors whichmakes this such a difficult problem to solve(Schwilaet al. 2015).

Workshop Focus

This workshop is for anyone with an interest or stake in the transportation of goods within cities and the wider consumption system it forms a part of. We hope to draw from a wide range of understandings and experiences of sustainabilityas a concept in order to form a manifesto that is encompassing, rather thancompartmentalising.The aim is to use the differentstakes andperspectives of participants to find solutions to the problems involved in urban logistics. We will then work towardscreating a set of principles that will be finalised asa complete manifesto.

Here we take the use of bikes and active forms of goods-movement as central, while recognising the linkages to other parts of the processto avoid compartmentalising the 'urban' within the network.Involved is Lucas Hullegiefrom Cycloon, a cargo-bike delivery company active in more than 60 cities across the Netherlands, which will give us a look into one example of making sustainable logistics an economical solution that is broadly replicable.

The first half of the session establishes the groundwork for our discussion –outliningwhat is meant by sustainability and some of the associated problems with the logistics industry. We then start the discussion by thinking big –conceptualising the sustainability and how deliveries fit into that vision. After the break, the focus turns to asking "how?": workshopping what must be in place to ensure a just transition to our vision, while learning the business side from Cycloon. We finish with an open discussion to summariseand organise as a manifesto.

Agenda

<u>Introductory Presentations (15 mins)</u>

- Host introductions.
- Discussing sustainabilityand concerns for urban logistics.
- Outlining the issues with the current paradigm/why tangible change has been minimal.

<u>Breakout 1: What does/should a sustainable city look like? (20 mins)</u>

- Conceptualising the vision of the future sustainable city.
- Participants are encouraged to think big and think creatively to establish what the eventual goal really is. What should/should not be included? Who is it for?

Breakout 2: How does the transportation of goods fit into this vision? (20 mins)

- Bringing in the role of delivery work to visions of future cities.
- What footprint does it have on the city?
- How does it extend beyond city limits?

Break (15 mins)

Presentation from Cycloon

- Considering how logistics companies can be active in urban sustainability transformations.
- Current work being done to challenge current paradigms from the perspective of a growing logistics business which utilises cargo bikes.

Breakout 3: What responsibilities do stakeholders need to take on for this vision to be possible? (20 mins)

- Which actors play a role in the improvement of the delivery regime?
- What responsibilities should different interests take on?

Breakout 4: How do consumption patterns need to change to ensure sustainability? (20 mins)

- How should the types of deliveries being made be altered in the sustainable city?
- How can we ensure a just transition?
- How do the kinds of goods being delivered impact the way they are transported?

Reflection(15 mins)

- Open discussion summarising themainpoints raised in the session.
- Discussion to assemblethe points of the manifesto.

Outcome

The outcome of this session will eventually bea summarised manifesto ofthe goals and necessities discussed and put forward during this session, inspired by work such as the Manifesto for Transformative Social Innovation.

References

Macharis, C., Milan, L. & Verlinde,S. (2014) A stakeholder-based multicriteria evaluation framework for city distribution, Research in Transportation Business & Management 11, pp. 75-84.Schwila, G., Armitage,

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