

ThinkBike Workshop Fort Collins, Colorado 18 - 19 - 20 April 2023





Colophon

Margot Daris, Dutch Cycling Embassy Lennart Nout, Mobycon Richard ter Avest, Goudappel Utrecht, August 2023

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Introduction

When people think about the future of urban mobility, they often think about autonomous and electric motor vehicles or even flying ones. However, these solutions do not offer an equitable answer to the true questions of sustainable urban mobility in the 21st century. The biggest challenge for sustainable urban mobility is often space, which is very limited in cities. Therefore, the Dutch Cycling Embassy (DCE) and its member organizations plead for cycling as a sustainable, healthy, liveable, affordable, age-friendly, and safe solution for the many challenges that cities are currently facing.

Over the past five decades, Dutch engineers and planners have learned from many mistakes and mis-steps, and established an effective set of best practices which they are now able to share with global cities looking to follow in their footsteps. These include the successful design of infrastructure, networks, parking, protected intersections and roundabouts, traffic calming and circulation, combining cycling and public transport, traffic education, and incentivizing sustainable travel habits.

There is no need to reinvent the wheel: the very same Dutch cycling experts who realized the transformational change in the Netherlands over the past fifty years are eager to help cities and regions around the world to make cycling an option for everyone, regardless of age, ability, or income. So, let's face the challenges ahead together, and allow everyone to enjoy the benefits of cycling!

With transport making up a major portion of global carbon emissions, there is a growing urgency to decrease the number of cars and increase the usage of more sustainable means such as cycling, especially in urban areas. A recent study found if everyone in the world cycles as much as the Dutch (2.6km per day), it would lead to nearly 700 million tons fewer carbon emissions, which is equivalent to the entire carbon footprints of countries such as the UK, Canada, Saudi Arabia, and Australia.

The Netherlands is the only country in the world with more bicycles than people: 23 million bicycles for 17 million inhabitants. More impressive is the number of annual kilometers collectively travelled by bicycle: 17.6 billion (that's over 1,000 per capita). But it wasn't always that way. Converging road safety and oil supply crises in the 1970s set their nation on a different path, and they have since built 37,000 kilometers of separated cycle paths and 55,000 kilometers of traffic-calmed streets.

Many cities and regions across the globe have identified improving Active Mobility as part of climate action, COVID-19 pandemic response or general sustainable development. In Europe alone, over 2 200 kilometers of pop-up cycleway has been built in response to the COVID pandemic, with continued investment programs being launched as we speak. However, many cities, particularly in low- to medium income countries do not have enough professional and financial capacity to plan, design, build, maintain, operate and promote Active Mobility infrastructure at the scale required. In several jurisdictions, the lack of skilled staff to deliver the active mobility program is hindering the investment program or resulting in diminishing quality standards.

At the same time, cities and regions that already have high pedestrian and bicycle modal shares are struggling to maintain those rates due to unsafe conditions for pedestrians and cyclists combined with high rates of motorization. It is of utmost importance that walking and cycling conditions are improved in these countries to reduce traffic fatalities and keep the carbon footprint of the transportation sector low. Specialist knowledge of pedestrian and bicycle safety is required to maintain these cities' lead in the active mobility space.

ThinkBike Workshop

ThinkBike Workshops address all areas that can help communities become more cycle friendly. An integrated cycling policy is based on effective hardware, software and orgware. Building hardware (infrastructure and the built environment) is only one part of a comprehensive, sustainable strategy. Cycling also needs to be encouraged through software (the human side of mobility e.g., campaigning and traffic education). Meanwhile, orgware (the cooperation process between actors e.g., capacity building of institutions) is needed to strengthen the strategy on a broader, more long-term basis.

Every country and region is different. ThinkBike Workshops do not impose Dutch solutions onto communities but help them to learn from Dutch experience and best practice in local geographic, political, and cultural contexts.

The aim of a ThinkBike Workshop is to build a cycling network that, as in the Netherlands, is safe and suitable for people of all ages, abilities, and for different types of bicycles. As a result, cycling as a mode of transport becomes accessible to everyone.



Chapter 1: Cycling in Fort Collins

The City Plan is the comprehensive and transportation master plan for Fort Collins. It articulates the community's vision and core values; guides how the community will grow and travel in the future; and provides highlevel policy direction used by the City organization, local and regional partners, and the community at large to achieve our vision and priorities.

Transportation and mobility options impact how and when people travel and, therefore, the ability of residents to access jobs, obtain services or accomplish daily needs. City Plan principles and policies seek to reduce VMT per person and the number of trips made by vehicles with only one occupant. This will be accomplished through strategies that encourage walking, carpooling, cycling and transit use, and through the implementation of solutions that minimize travel times between key destinations within Fort Collins and to/from other parts of the region. Fort Collins is a nationally recognized city for biking and walking; however, gaps and deficiencies in the low-stress, multimodal network remain.

As written in the City Plan, Fort Collins wants to promote bicycling and walking through infrastructure and programs. The city and region have facilities and services for biking and walking, and these amenities should be enhanced and expanded. Biking and walking should be easy, convenient, comfortable, and safe activities or modes of transportation that are appropriate for all ages and abilities. Infrastructure should be paired with programs to provide the necessary information for residents, visitors, and employees to choose transportation options that support a healthy and economically sustainable lifestyle.

Paragraph 1.1 ThinkBike Workshop Experts

Lennart Nout

Lennart is an urban mobility specialist with over twelve years of experience in infrastructure design, transport and land-use planning and traffic safety projects in a wide range of countries including the US, Canada, Europe, New Zealand and Australia. Lennart specializes in the design and planning of bicycle networks and infrastructure in urban areas. In his work he focuses a lot on strategic implementation, capacity building and engagement, whether with local transportation professionals, elected officials or the general public.



Richard ter Avest

Richard is professionalized in mobility planning and desian. His expertise lies in organizing a city in a bike- and pedestrian-friendly way by also taking into account public transit, car infrastructure and public open spaces. Richard has introduced innovative and sustainable solutions in the range of traffic safety and bicyclehighways to improve livability and accessibility in cities and regions. Moreover, he teaches at some renowned universities and institutions like the research organization CROW. During workshops, he uses tools like the MOVE-meter to illustrate the chances and challenges that urban areas are facing on their way to become smart cities. For visitors from abroad, Richard likes to organize excursions 'to see and believe' and to inspire.



Margot Daris

As Project Manager at the Dutch Cycling Embassy, Margot matches questions from abroad regarding cycling mobility with Dutch knowledge and expertise. She works on several topics connected to cycling, such as behavior change, inclusivity, infrastructure, and policy. Margot believes it is important to keep a pleasant living environment and sustainability as a starting point for mobility policies. With the idea of 'Think Big, Think Bike', we put cycling on the international agenda to create healthy, climate neutral, reachable, and livable regions. With a background in Political Science and Human Geography, Margot always approaches mobility projects with a holistic view. At the Dutch Cycling Embassy, we do this with our broad network of Dutch cycling experts. Cooperation and connecting are always at the center of this process.



Paragraph 1.2 Program

The aim of a ThinkBike Workshop is to build a cycling network that, as in the Netherlands, is safe and suitable for people of all ages, abilities, and for different types of bicycles. As a result, cycling as a mode of transport becomes accessible to everyone.

The first day is a warm welcome and introduction by the hosting City of Fort Collins. Jeni Arndt, the Mayor of Fort Collins, opened up the workshop and voiced her support. The goal was also to get to know each other better (City, State, organizations, Dutch consultants) by playing a game, organized by Margot, and for the entire group to experience cycling in Fort Collins first hand.

Tuesday April 18			
9:00 AM	Introduction Fort Collins	Cortney	
9:20 AM	Introduction ThinkBike Workshop	Margot	
9:50 AM	Introduction participants of the workshop	All	
10:10 AM	Recap of Goudappel and Mobycon projects in Fort Collins	Richard, Lennart	
10:30 AM	Presentation FHWA nation-wide projects and initiatives	Brooke	
11:00 AM	Presentation 1: Network design and principles	Richard, Lennart	
12:30 PM	Lunch break		
2:00 PM	Bike ride, visit locations for case studies organized by Fort Collins	All	
3:30 PM	Break out session 1: Goal setting	All	
5:00 PM	End of program		

Table 1.1: Program Tuesday April 18



Wednesday April 19			
9:00 AM	Presentation 2A: Cross section and corridor design	Richard	
9:45 AM	Presentation 2B: Traffic calming at arterial roads	Lennart	
10:30 AM	Break out session 2: Start with the designs	All	
12:00 PM	Lunch Break		
1:30 PM	Presentation 3A: Intersection design principles	Lennart	
2:00 PM	Presentation 3B: Protected intersections	Richard	
2:30 PM	Break out session 3: Intersection design	All	
4:30 PM	End of program		

 Table 1.2: Program Wednesday April 19

Thursday April 20			
9:00 AM	Presentation 4A: Signalization	Richard	
9:45 AM	Presentation 4B: Roundabouts	Lennart	
10:30 AM	Break out session 4:	All	
12:00 PM	Lunch Break		
2:30 PM	Finalize posters and presentations	All	
3:00 PM	Presentations	All	
4:30 PM	End of workshop		
6:00 PM	Public event: screening "Together We Cycle"		
6:05 PM	Introduction documentary and panel	Margot	
6:10 PM	Screening "Together We Cycle"		
6:40 PM	Panel discussion, show results of workshop	Richard, Lennart, Cortney	
7:15 PM	End of program		

Table 1.3: Program Thursday April 20

Chapter 2: Day 1

Paragraph 2.1 Network Principles

After the introduction everybody got distributed into groups and worked on network principles. How to work from the big picture (day 1) to more details (day 3)

Richard ter Avest from the Dutch company Goudappel had a presentation about "what city do you want?".

The City is already one of the US-cities with the highest use of bicycles: *Able to cycle*. But some parts have already the quality of *Invite to cycle* (University area and downtown). If you want to make a city for all ages and abilities you need a basic network with the level *Able to cycle* and some high quality non stop long distance-connections (or trails) with *Invite to cycle*. There is work to be done, because some parts of the bike network are dangerous: *dare to cycle*.



We have asked the groups to:

- Draw all the important destinations like schools, shops, medical centers (like the 15 minutes-city) and
- Connect the destinations with a comprehensive bike network.
- What are the main car connections and what is the area where it's important to have slow driving and low volume car-traffic, depending of the daily trips by bikers and walkers.

The best approach is to design network where there are minimal number of conflicts. A good bike plan is a car plan.



Below a result of a group.



Paragraph 2.2 Bicycle Network Design

After introductions, the first presentation by Lennart Nout from Mobycon focused on network design and planning principles. He introduced the concept of Sustainable Safety and its limited number of road categories, resulting in clear expectations on all road users with regards to yielding conditions, speed limits and mixing.

Then he introduced the concept of Flow Theory and how it pertains to bicycle network planning, in relation to the five principles of bicycle network design.



He discussed wayfinding (both recreational and utilitarian) and the design of coherent cycleways, creating a more obvious network for cyclists. He talked about the relative directness of the bicycle network in relation to the car, transit and pedestrian networks. Under attractiveness, he discussed how attractiveness is a difficult principle to achieve, as it may mean different things to different people, but it can be very important when it comes to mode choice and route choice. Safety can come from both network and infrastructure decisions. Reducing traffic volumes is a very effective tool to improve safety, but when volumes and speeds are high, separation is vital. Comfort is created through good build quality, limited stops and comfortable turning radii. No network can achieve all of the principles, so it is important to balance these principles based on your local context, target user group and ensure there is variation to allow for people to ride on routes that match their expectations and values. This was used as background for the bicycle ride with the participants.





Paragraph 2.3 Goal Setting

The City of Fort Collins has the following 5 Goals or Big Moves

- A Complete and Connected Network (CCN)
- Comprehensive Access to Destinations (CAD)
- Safe and Comfortable Travel (SCT)
- A Healthy and Equitable Community (HEC)
- A Supportive and Inclusive Culture (SIC)

In the Active Modes plan there is already a network for bikes. This connects al destinations for all the people biking or rolling. But how to design these cross sections?

Chapter 3: Day 2

Paragraph 3.1 Cross Section and Corridor Design

In his presentation Richard speaks about designing networks for bike and for cars. If you don't have the space to make good cycling infrastructure and the goal is to ships short car trips to bike trips you need to design:

- A highlevel bike network for the local trips;
- A car network for the longer trips.

The conflicts between both network are minimal in a sustainable safe system. For example the city of Enschede in the Netherlands.



Source: Richard ter Avest, Goudappel

The car system has no conflicts with the bike network. It is like a hair comb-structure with the highway (in Enschede nr A35, in Fort Collins nr 25) as a main-connection, and pins to parts of the city like the University and the City center.

The second inspiration from the Dutch is to look at the number of short cartrips.

For example, Shield street:

- The volume is 29.250 veh/day (in 2018); and
- Almost 40% of this car-traffic is shorter than 3 miles, which is a nice bike-distance.
- So if you have a road without the short car trips (less than 18.000 cars/day) you can design a road with two separate bike lanes and two car lanes (with a green median) instead of four car lanes and no bike lanes or narrow painted unprotected bike lanes.



Source: Richard ter Averst



Figure 3.1: Profile with 2 bike lanes, 2 car lanes and green/trees-zones



Figure 3.2: Bike network of Fort Collins









Paragraph 3.2 Traffic Calming at Arterial Roads

Ensuring safe and efficient operation of arterial roads is vital for good traffic circulation. Good traffic circulation allows us to create space on the road for separated cycling facilities on busier roads. The current paradigm on arterial roadway design focuses on speed and capacity, and relies on traffic signals for each intersection. Reducing the number of lanes while retaining roadway capacity can be achieved through a new design paradigm for arterial roads.

Width is a crucial factor in designing roadways, narrower roadways result in slower speeds. Secondly, the type of materials used for paving also influences speed, as bricks provide tactile feedback to drivers when they drive too fast.

For arterial roads however, The Netherlands has implemented an alternative roadway configuration for arterials. These roadways have one (9 or 10ft) lane in each direction, separated by a planted median, and with separated cycleways on each side. This configuration allows up to 15,000 vehicles a day to use the road without much delay. This is mostly achieved through full priority (no stop or yield signs on the arterial) and no traffic signals. Side streets yield to the arterial, and at larger intersections additional left turning capacity is provided through a so-called kidney bean intersection.



This type of facility ensures a safe and efficient operation of vehicles at a relatively low speed, as no overtaking is possible.

Key considerations are whether to provide bicycle and pedestrian priority for crossing the road, as this reduces vehicle capacity but improves comfort and directness for active modes. Emergency services are vital, in case of a traffic jam, they should be able to use either the bicycle lane or roll over onto the median using two wheels. Downsides of this design are that the default design does not have bicycle and pedestrian priority and that the intersections may use a little more space. However this can be reduced by limiting the left turn bay or omitting the island all together. This design also requires good upstream management of flow through tight signal phasing. This allows for pelotons of cars to drive through, reducing wait time for pedestrians and bicycles.

Paragraph 3.3 Intersection Design Principles

During the presentation about intersection design principles, Lennart Nout elaborated on the various types of intersections and where they are applied. At slow speed, intersections rely on eye contact and general yielding conditions. At higher speeds, more elaborate engineering is required. Roundabouts are the preferred option for intersections of two arterials, while traffic signals are a back-up option (due to their lower safety performance).

Lennart explained the characteristics of various protected intersections in The Netherlands, showing a range of different configurations.

Paragraph 3.4 Protected Intersections

- Website www.dutchcycling.nl
- Junction design the Dutch cycle friendy way
- And pedestrians have their own crossing
- https://youtu.be/FIApbxLz6pA

Below a typical Dutch intersection with protected and signalized elements.



Important are:

- Curb islands, reduce turning speed of cars, create a safe waiting space for left turning and straightforward cyclists, separate parallel traffic with a safe distance.
- Stop bar placed far into the intersection: Very short signalled crossing. less clearing time needed! Potential conflict zone minimized
- Free right-turn for cyclists
- Waiting island for pedestrians. Must be at least 2meter (7 feet) wide in USA for combining a zebra across the bikelane with traffic lights across the car lanes.
- Need to create a safe space for impaired people with e.g. Wheelchairs, etc.

Intersection	System
Huge intersection	2 x per cyclus green Separate lanes Coordination Tunnel/bridge
Small intersection	All Directions Simultaneously Green (ADSG) Expanded stacking lane

Table 3.1: Preferred systems of signalizing and design on huge and small intersections



Chapter 4: Day 3

Paragraph 4.1: Signalization

During the session on signalization, Lennart Nout presented a video by his colleague Narayan Donaldson on the differences between North American and Dutch signalization principles through a case study of a newly constructed protected intersection in Canmore, Alberta.

https://www.youtube.com/watch?v=2rdVsKwPvmc

Paragraph 4.2 Roundabout Design

In the final session, Lennart Nout presented the design principles of protected roundabouts. Dutch roundabouts look very different from North American ones. Instead of focusing on throughput and reducing delay, they focus on slowing down cars and enabling social interaction between drivers, pedestrians and cyclists. By designing the roundabout for an operating speed of no more than 20 miles per hour, including separated cycleways (with a 15 ft buffer), bicycle and pedestrian priority features, the roundabout becomes a safety feature, more than a traffic management feature.

During the session, we reviewed a Dutch roundabout in operation, investigated materials used, geometric dimensions and other features that distinguish a Dutch roundabout and make it such a safe intersection option. The standard Dutch roundabout was compared with the proposed roundabout in Montava, Fort Collins.



Figure 4.1: less conflicts on a roundabout, compared with traditional intersections





Chapter 5: Final Session and Certificate



Chapter 6: Action List

During the final day, an action list was created with a wide range of action items to be pursued by the city of Fort Collins at different time frames.

1 Year to-do list:

- Organize a Critical/Kidical Mass bike ride
- Update the Master Street Plan
- Maximize the existing infrastructure
- Improve public transportation
- Implement Safe Streets For All plans
- Update traffic modelling
- Organize a ThinkBike reunion in April 2024
- Update the street design standards
- Create an Excessive Pavement Eradication Team
- Celebrate Park(ing) Day.

10 Year to-do list:

- Expand the active mobility infrastructure
- Review the 287 vision
- Start a cycling incentive program (via app?)
- Eliminate as many traffic signals as possible
- Reduce on-street parking
- Re-think car parking areas
- Convert 5 signalized intersections to roundabouts
- Implement a bike buddy system
- · On-going holistic discussions with city staff
- Review land use codes.

Appendix 1: Participants

Here is the list of participants of the three days in Fort Collins.

Aaron Fodge	CSU
Aaron Iverson	FC Moves
Alisa Babler	Traffic Operations
Bill Bethurum	Transfort
Brooke Struve	FHWA
Cortney Geary	FC Moves
Dana Hornkohl	Engineering
Dave "DK" Kemp	Park Planning & Development
Dave Betley	Engineering
Dave Dixon	Bike Fort Collins
Dillon Willet	Engineering
Florian Fieberg	Engineering
Hamideh Etemadnia	ESTinc - Goudappel Colorado
Jerome Rouser	NFRMPO
Kim Koivuniemi	Olsson
Cory Schmitt	NFRMPO
Marc Virata	Engineering
Nancy Nichols	FC Moves
Pete Mercier	Transfort
Rachel Ruhlen	FC Moves
Stephen Bartels	Olsson
Tom Knostman	Streets
Tyler Stamey	Traffic Operations
David Hansen	CSU
Sarah Carter	PFA
Sophie Buckingham	Engineering
Spencer Smith	Engineering
Rich Brewbaker	Traffic Operations
Britney Sorensen	Traffic Operations
Steve Gilchrist	Traffic Operations

