Empowering Women to Cycle:

Group model building workshop

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Structure of the document

This document reports the plans, activities, and outputs associated with the Group Model Building workshop conducted as part of the Empowering Women to Cycle project.

Problem of interest guiding the workshop

What does make or would make cycling attractive and easy for women in Ireland, for all trip purposes?

Objectives of the workshop

1. Bring diverse stakeholders to reflect and discuss how to increase cycling among women in Ireland.
2. Learn about and expand mental models of stakeholders on what shapes cycling levels among women.
3. Build shared understanding of the complex system that can make cycling attractive and easy for women in Ireland.
4. Inform future discussions on priorities, opportunities, and actions to make cycling attractive and easy for women in Ireland, and what is of value to stakeholders.

Outputs of the workshop

A diagram, created by the workshop participants, of the complex system shaping and sustaining cycling patterns among women in Ireland. This diagram is a visual representation of the factors, and the interdependencies between these factors, that make or can make cycling attractive and easy for women in Ireland.

Facilitation team roles

- Workshop convener/closer: Primary responsibility for starting the session, introducing participants to the exercise, making sure that participants understand the purpose of the exercise within the context of their organisation or community, and introducing the facilitators. Closer has primary responsibility for bringing the session to close and thanking participants for their time.
- Facilitator: Primary responsibility for system dynamics modelling and group model building process. This is a person who is trained in systems thinking/system dynamics model with expertise teaching and leading groups in the use of systems/thinking/system dynamics. The person should also have experience facilitating groups and leading group model building sessions.

- Modeller: The modeller's primary responsibility is to build the system dynamics causal map. This is a person with expertise in system dynamics modelling and software.
- Wall builders: The primary responsibility of the wall builder is to organize products from an exercise into thematic clusters, as well as to explain the clusters to the participants in order to elicit their feedback.
- Note taker and timekeeper: Primary responsibility for taking notes about what is said in the workshop and notifying the facilitation team when time is short. It is overall very important to start and end on time as much as possible.
- Logistic support: Primary responsibility is to be available to solve logistical problems as they emerge – including technical assistance, materials, etc. These people can also be on hand to support with wall building.

Workshop Structure

Activity	Description
Introduction to systems thinking	Presentation with introduction to systems thinking.
Presentation and discussion of the reference mode	The facilitator presents evidence on cycling trends for women in Ireland and instructions on the task. The facilitator asks groups to draw possible future scenarios (no change, worst case scenario and ideal scenario). Groups share and discuss their charts with others, with facilitator drawing the agreed scenarios in the main reference mode together with the participants.
Identification of factors	The facilitator explains how to identify factors (determinants and consequences) related to the problem of interest. Groups discuss and write down on sticky notes factors (determinants and consequences). Finally, groups place their sticky notes on the flipchart of determinants or consequences, which will be at the front of the room. Wall builders will help to organize the sticky notes thematically and ensure that they are clear and follow expected format. The last 5 minutes will consist of a walk of all participants to observe the identified factors.
Introduction to causal loop diagrams	Presentation explaining what causal loop diagrams are and instructions for the next activity.
Initiation of the causal loop diagram	Each group will work on its own causal loop diagram. Participants will be given the following instruction: *Based on the reference problem, the determinants and consequences identified and the presentations seen so far, construct a causal loop diagram that describes a hypothesis about the factors that lead to the adoption or not of cycling by women in Ireland.* Facilitators will circulate, providing guidance in case of difficulty.
Presentation of diagrams	Instructions from the facilitator. The first minutes will consist of a walk of all participants to observe the diagrams constructed by each group. Next, the facilitator will ask each group to present its diagram, focusing on: hypothesis considered, feedback loops found, and aspects they found surprising or non-intuitive. After the presentation of each group, the facilitator will open the conversation to questions and request observations, challenges or questions. During the presentations, the modeller begins to create a synthesis diagram from the diagrams of all the groups.
Interval and consolidation of diagrams into one version	During the break, the modeller, with the help of the facilitator and the annotation team, finalizes the synthesis diagram.
Revision of the synthesis diagram	The modeller will present the synthesis diagram. The facilitator will then start a conversation to review and refine the diagram and clarify doubts with the participants. The modeller will implement the changes suggested during the discussion, sharing his screen with the participants.
Discussion of important points of the system	Participants will be invited to discuss which factors, relationships and feedback loops are most important in the system.
Discussion about the workshop and use of the diagram	Participants will be invited (a) to share the experience and insights they had with the event, and (b) to discuss ideas for using and disseminating the diagram.

Reference mode

The key variable that encapsulates the problem of interest is *cycling by women in Ireland*. To create the reference mode – i.e., a graph showing the behaviour of the key variable over time –, we used the results from the National Travel Survey, provided by the Central Statistics Office in Ireland. We used 2009 to 2021 as the observed period, and a time horizon of 20 years from the date of the workshop, i.e., until 2043. Figure 1 shows the reference mode as presented to the workshop participants. The facilitator presented the evidence on cycling trends for women in Ireland and give instructions on the task. The facilitator asked groups to draw possible future scenarios (no change, worst case scenario and ideal scenario. Groups shared and discussed their charts with others, with the facilitator drawing the agreed scenarios in the main reference mode together with the participants Figure 2 shows the final reference mode as reflected and agreed with the participants, with the expected, feared and desired future trajectories, developed during the activity.

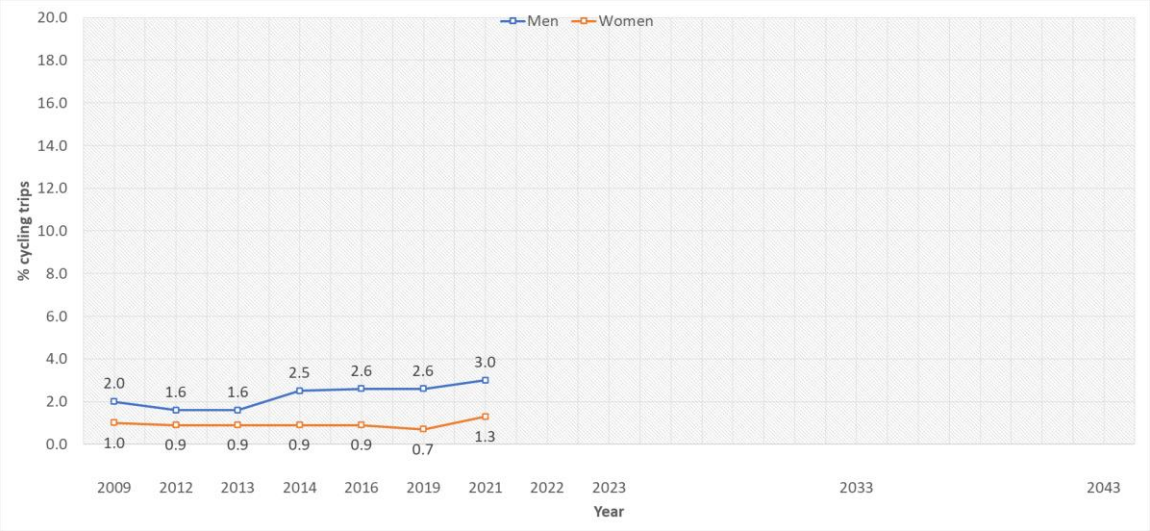


Figure 1. Reference mode presented to the workshop participants. Source: Central Statistics Office, Ireland. National Travel Survey.

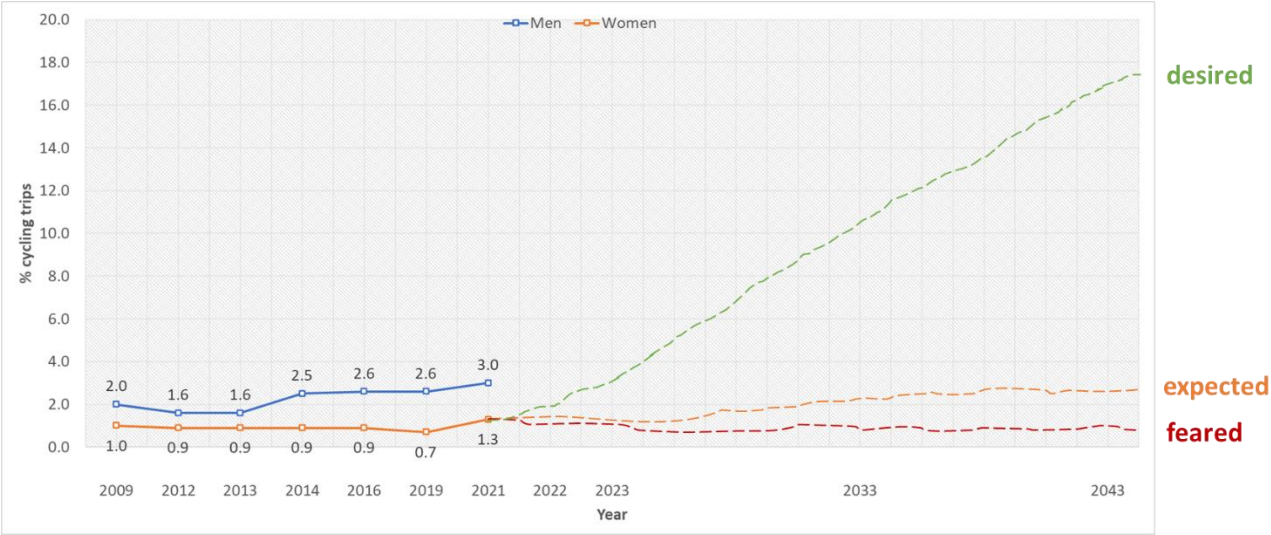


Figure 2. Reference mode after reflection and agreement with workshop participants. Source: Central Statistics Office, Ireland. National Travel Survey.

- The 'desired' line in Figure 2 expressed the participants most desired outcome and reflected rates close to those of country where cycling is well established, e.g. the Netherlands. Participants saw this as a 'dream' outcome but not unachievable with the correct conditions.
- The 'expected' line reflected what participants felt would happen if nothing changed in policy or investment and the current trend continued.
- The 'feared' line represented what participants felt would happen in a worst-case scenario, e.g. where investment ceased. They noted that the cycling rate would never be zero but would remain very low. Variable elicitation

The facilitator explained how to identify factors (determinants and consequences) related to the problem of interest. The groups discussed and wrote down on sticky notes factors (determinants and consequences). Finally, groups placed their sticky notes on the flipchart of determinants or consequences and discussed.

Identification of factors

Table 1 displays the factors elicited by the workshop participants as key causes or consequences of the observed and discussed future trajectories in levels of cycling by women in Ireland. These factors were elicited during the "Identification of factors" activity.

Table 1. Variables elicited by the participants of the workshop as key causes or consequences of cycling levels by women in Ireland.

Causes	**Consequences**
Quality of and access to cycling network (connected, safe, inclusive, etc.)	Perception of safety
Quality of and access to ancillary infrastructure (storage, safe, inclusive, affordable, etc.)	Objective safety of roads
Investment in cycling infrastructure	Convenience of cycling
Space for cycling infrastructure (taken from space for cars)	Cycling as normalised behaviour (culture change)
Provision and access to multi-modal infrastructure	Cost of travel
Multi-modal trips	Cycling for social connection
Passive surveillance	Independence for children
Distance to school (particularly in rural areas)	Regenerating town centres
Access to different bicycle types (different trips and stages of life)	Vibrance of neighbourhood
Access to bicycle share schemes	Health of communities
Women-led, inclusive cycling training (to improve awareness and confidence)	Mental wellbeing
Cycling training at school	Nature connections
Access to affordable bicycle repair	Climate resilience
Women-owned bicycle shops	Air quality
Communication around barriers and incentives for women cycling	Economic benefit
Cycling equipment designed for women's needs	Driver behaviour towards cyclists
Lightning	Speed limits
Access to cycling to school/work schemes	Policies for cycling
Affordability and access to cycling accessories for children	
Safe routes to school	
Congestion charges	
Cycle culture at work	
Consulting with women about cycling	
Car-centric culture	
Inclusivity of women cycling	
Representation of women in the transport/policy sector	
Peer support	
Visibility of role models	
Affordability of bicycles	

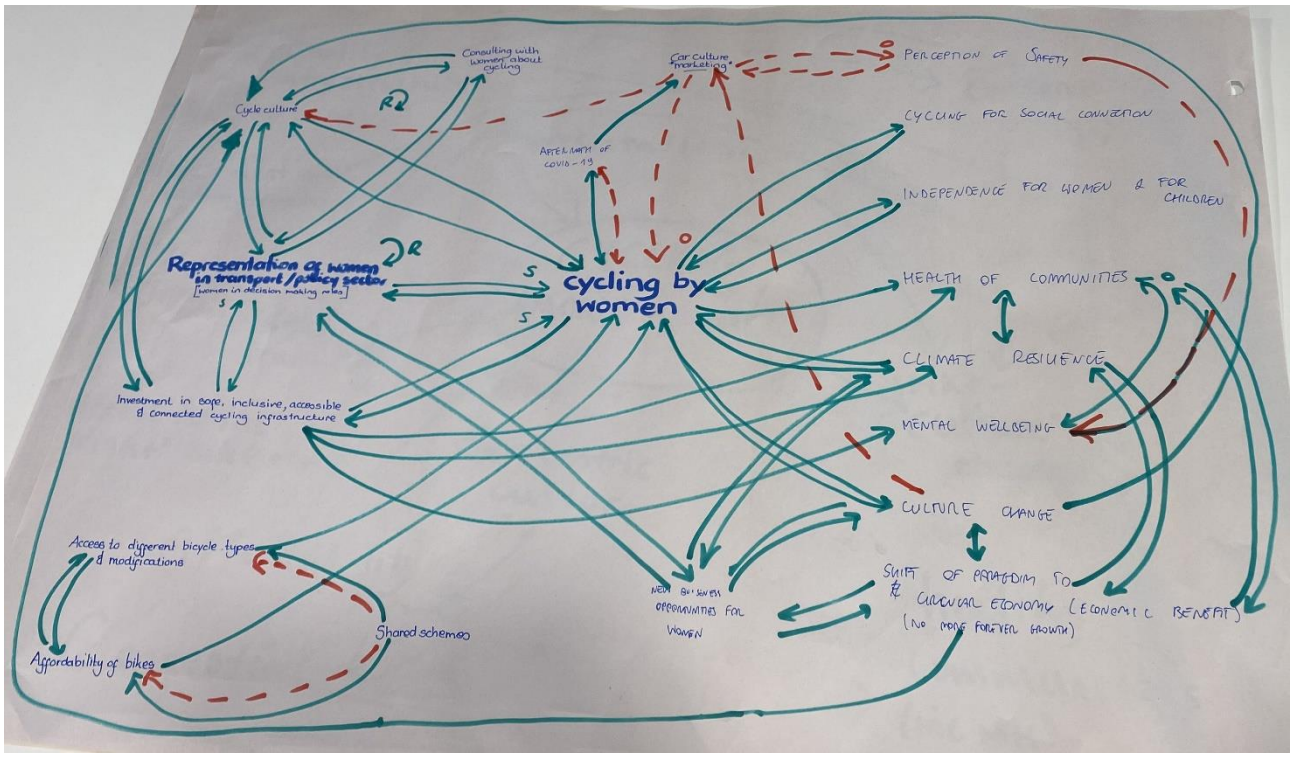
Diagrams developed by groups

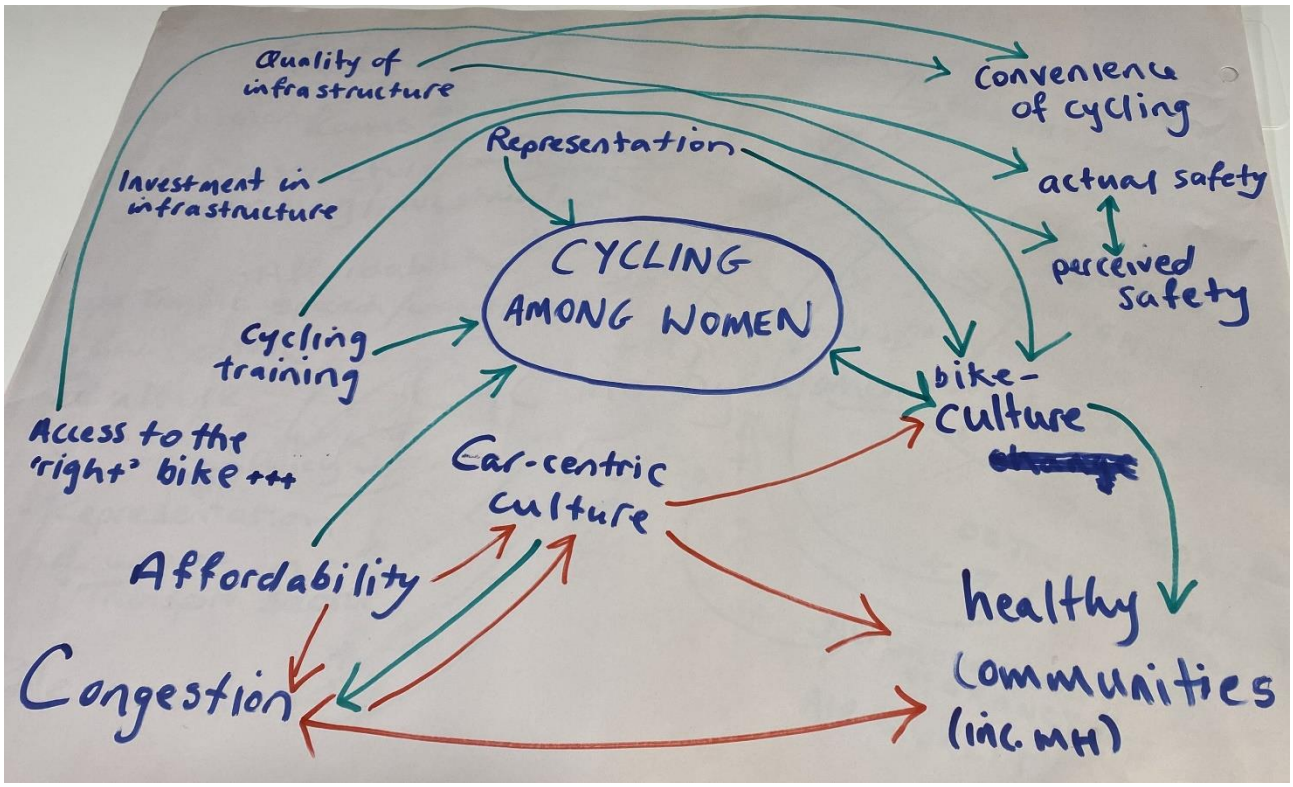
The participants were given a presentation explaining causal loop diagrams and instructions for the activity. Each group developed its own causal loop diagram. Participants were given the following instruction:
Based on the reference problem, the determinants and consequences identified, and the presentations seen so far, construct a causal loop diagram that describes a hypothesis about the factors that lead to the adoption or not of cycling by women in Ireland.

- Draw arrow between pairs of variables
    - Only **causal** and **critical** connections
    - Add polarity to the arrows
    - If it is a bi-directional connections, you can (a) draw two opposite arrows, or (b) check whether there is an indirect pathway connecting the two variables
    - If an arrow can have both polarities, draw two arrows, one for each polarity
    - Consider how the consequences also contribute to shape the problem (cyclic nature of the problem)
    - You do not need to use all variables
    - As you build the diagram, new variables can be added

Each group to presented its diagram, focusing on: hypothesis considered, feedback loops found, and aspects they found surprising or non-intuitive. After the presentation of each group, the facilitator opened the conversation to questions and requested observations, challenges or questions.

Figure 3 below shows the causal loop diagrams developed by each of the three groups during the "Initiation of the causal loop diagram" activity.





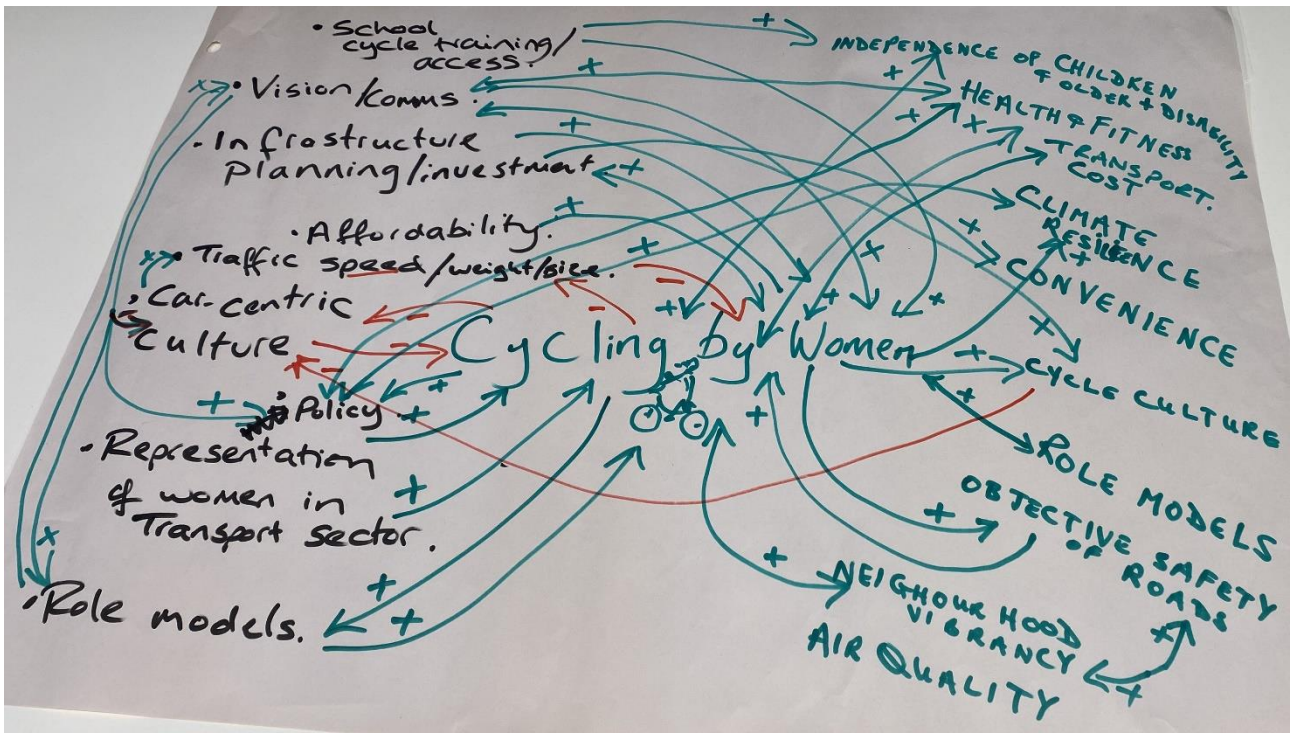


Figure 3. Causal loop diagrams developed by the three groups.

Synthesis causal loop diagram

Figure 4 shows the causal loop diagram that synthesises the diagrams developed by the 3 groups. The most up-to-date version (if any changes are made to the diagram after the workshop) of this causal loop diagram can be found at https://kumu.io/empowering-women-cycle/cld. The URL also has features (e.g., zoom in and out) that facilitate the navigation and visualization of the diagram.

In the causal loop diagram, we can see how cycling by women has a lot of different determinants and effects, and how they are interrelated. Each arrow represents a causal relationship between two factors. Blue arrows, with a "+" sign in the arrowhead, indicate that the two factors connected by the arrow move in the same direction, i.e., if Factor A (cause) increases, Factor B (effect) increases as well, and if Factor A decreases, Factor B decreases too. Red arrows, with a "-" sign in the arrowhead, indicate that the two factors connected by the arrow move in the opposite direction, i.e., if Factor A increases, Factor B decreases, and if Factor A decreases, Factor B increases.

Below we describe some of the insights learned through the diagram.

Regarding to direct determinants, we can see how an increase in convenience of cycling, in objective and perceived safety of roads, and in independence of all to cycle (including children) directly increases cycling by women. First, to increase convenience of cycling, we need to increase affordability of bicycles, access to different bicycle types and modifications, and access to good quality, safe, inclusive, connected cycling infrastructure. Access to different bicycle types and modifications, and affordability of bicycles reinforce each other and are both increased by access to shared schemes. An increase of access to different

bicycle types and modifications is also a result of an increase of economic benefits from services around cycling, which at the same time is increased by the increase in cycling by women. Second, to increase objective and perceived safety of roads we need to increase access to good quality, safe, inclusive, connected cycling infrastructure; decrease speed limits; and increase access to cycle training (including at schools). At the same time, to increase access to good quality, safe, inclusive, connected cycling infrastructure, we need to reduce urban sprawl and increase cycling infrastructure investment. An increase of objective and perceived safety of roads also has other positive effects in the system like increasing neighbourhood vibrancy and the health and wellbeing of people and communities, which are also direct effects of cycling by women. Finally, to increase independence of all to cycle (including children), we need to increase access to cycle training (including at schools), reduce urban sprawl; and increase role models.

Regarding to direct effects, we can see how an increase in cycling by women increases economic benefits from services around cycling, neighbourhood vibrancy, health and wellbeing of people and communities, air quality and climate resilience, and decreases transport costs. An increase in air quality also increases health and wellbeing of people and communities, which at the same time increases climate resilience, which will reinforce the health and wellbeing of people and communities. Climate resilience can also be increased by an increase of a shift towards circular economy.

Cycling by women has reinforcing feedback loops with availability of women-led services around cycling, cycling culture, and role models. First, an increase in availability of women-led services around cycling also increases representation of women in the transport sector, which increases policy that support women to cycle (including targets). An increase in policy that supports women to cycle can also be driven by increasing consulting with women about cycling and increasing vision and communication promoting cycling. Increasing policy that supports women to cycle increases cycling infrastructure investment and reinforces vision and communication promoting cycling. An increase in vision and communication promoting cycling could decrease car-centric culture. Second, an increase in cycling culture increases a shift towards circular economy, policy that supports women to cycle and decreases car-centric culture. Finally, an increase in role models, increases independence of all to cycle (including children), which at the same time increases cycling by women. An increase in role models also increases vision and communication promoting cycling, which increases cycling culture.

Car-centric culture is a high-level determinant which decreases cycling infrastructure investment, helps to increase speed limits, urban sprawl, and traffic congestion. Car-centric culture and urban sprawl reinforce each other. Urban sprawl, among other effects already described, also increases transport costs. Traffic congestion can reduce car-centric culture, but at the same time decreases air quality and health and wellbeing of people and communities.

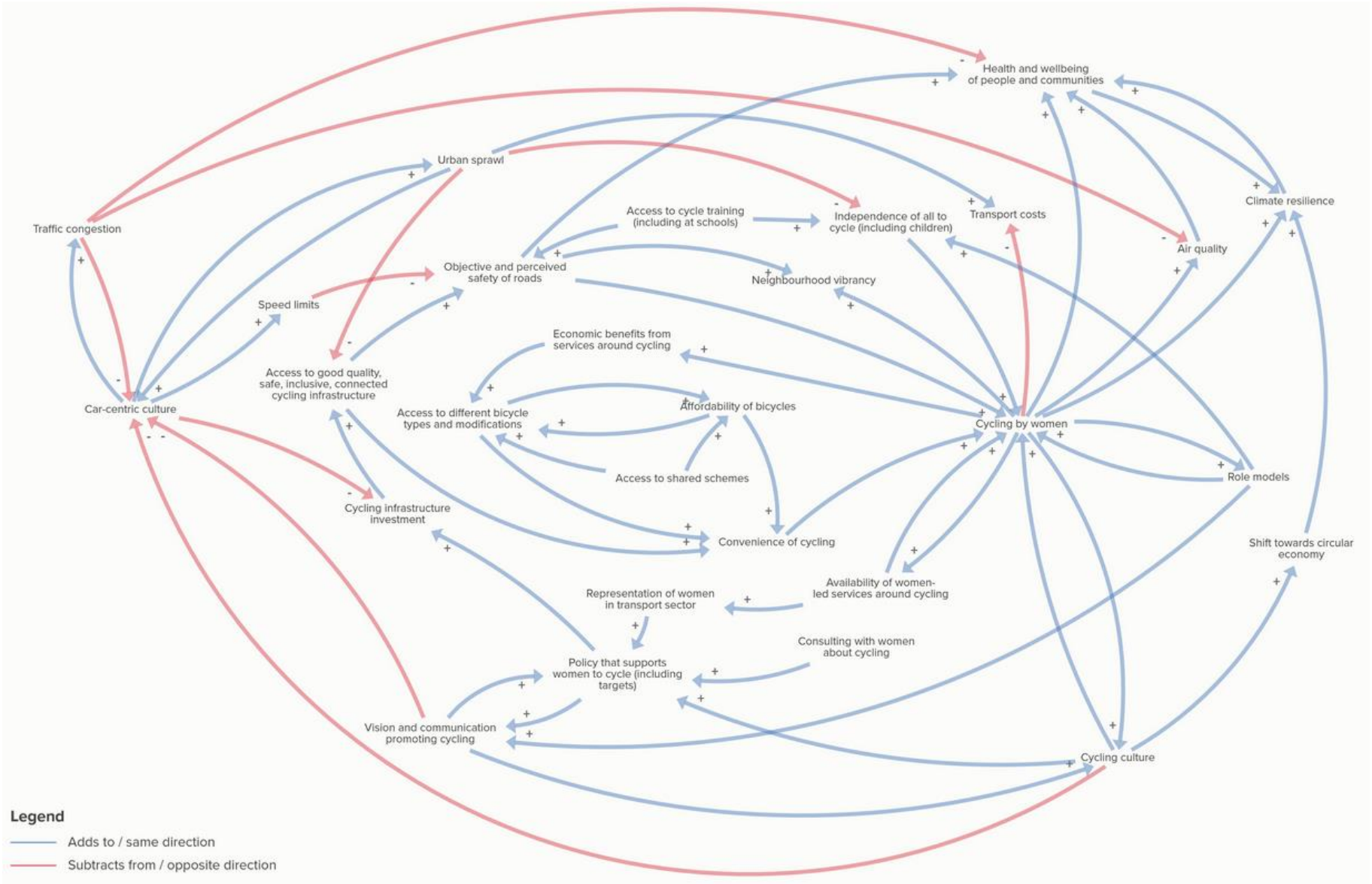


Figure 4. Causal loop diagram as of 18 September 2023. https://kumu.io/empowering-women-cycle/cld.

Comments and insights from participants

During the development of the diagram, participants were encouraged to share their views and insights. In the sections below, we share the comments captured by the notetakers. Many of the comments below were incorporated in the diagram at some extent. However, the comments add nuance and details beyond what sometimes is possible to capture through causal loop diagram. Hence, the comments below should be viewed as a valuable source of information too.

Notes from diagrams presentations

In this activity, each group presented the causal loop diagram they built, and all the participants were encouraged to share their views, questions, and insights. Below are our notes on what was discussed:

- Visualisation and communication of cycling (if they can see people cycling, they can be stimulated to cycle).
- Safe cycling environment for vulnerable groups of women (elderly and disability)
- Multidirectional relationship between the variables in the system.
- "Culture eats policy for breakfast" – targeting culture and normalization of behaviour. Culture is a massive point to be considered.
- Variables can be positive or negative depending on how well run they are (i.e., bicycle schemes) – so they have the same effect on cycling behaviour (if positively run, this can have a positive impact, but if negatively run can have a negative effect).
- Cycling culture and women in cycling representation: representation of women at both levels, that is, cycling, and also in consultation at local and national levels.
- The difference between objective and subjective safety: the false perspective of safety.
- A lot of variables related to health culture and health communities (encompassing social and psychological factors)
- Effects of cycling on mental wellbeing.
- More direct lines from causes to consequences.
- Culture of cycling can be very stressful daily.
- Flexibility of bicycle.
- Relationship with cycling and congestion.
- How specific were the variables to women?
- How these differ in comparison to just all people (this is important).
- Having children influences safety? Or the woman's own safety?
- Risk aversion of women being different to men: Women perceive safety and risk differently, which may make them 'question' things (i.e., routes, going down hills).

- Perception of safety and risk in sports is different from women to men.
- Quality of infrastructure can impact the perception of safety.
- Cycling as part of physical activity (in primary schools): this also speaks to cycling culture and normalising cycling behaviour early on. Cycling being taught at schools (need qualified instructors and there is not a lot of them available to handle all schools.
- Cyclists as villains:
    - Perceptions of cyclists (by non-cyclists).
    - Culture of cyclists vilified (i.e., one bad cycler gives the rest a reputation).
    - Bad examples are more visible (again, gives a bad reputation).
    - Can you train etiquette? (i.e., waiting at lights to create better cyclists).
    - Perception of the pedestrian related to the cyclist: sometimes people cycling do not respect the pedestrian, they do not respect streetlights, they cycle on the pathway – it is not all of them, but they give cyclists a bad reputation.
- Environment that we are forced to share is very aggressive (pedestrian, cyclists, drivers).
- Perceptions about children cycling and elderly people cycling.

Notes from causal loop diagram discussion

In this part of the workshop, the participants were invited to stand and come closer to the screen where the modeller was projecting the result of the synthesis diagram (joining the diagrams provided by the three groups). They pointed out and suggested modifications to the diagram. The topics raised during the discussion are described below:

- Benefits of the low cost of cycling (as opposed to car ownership/tax etc.).
- Women locked out of tax schemes incentivising bicycle sharing schemes.
- Economic benefit of women cycling: the more women cycling increases economic benefits related to bikes selling, fixing, accessories (services related to bikes: second-hand, business opportunities, accessories etc.).
- Service for the maintenance of bikes: bikes getting more complicated (inaccessible / harder to 'fix') - this is the case for e-bikes (owning a bike should be sustainable).
    - Disadvantages of having e-bikes: we need to be careful, they need to be sustainable, they need to work well, otherwise if the battery dies, for instance, you need to buy a new bike. A new battery is very expensive.
    - Suitably of e-bike schemes (linked with the above and sustainability / economic effect of owning an e-bike).
- Untapped market for second-hand bicycles (again linked with economic benefit).
- Broader amenities (i.e., bicycle stops for coffee shops, encouraging social connection).

- Availability of the services would increase cycling by women and the other way around too.
- Promoting cycling early: lack of schools and young women cycling – promoting training starting with early years in school, like young people.
- Women cycling influences children to cycle (mothers as role models): women cycling influence kids cycling because they see them cycling (like taking them to school by cycling) – cycling to school with your mom when you are a kid (more specific than role models, so they think it should be a different point to be added) – in general.
- Independence of children vs. independence of women (are these separate factors? Women vs. children as a subgroup of the population?).
- Planning is separate from investment (actually planning the land use) – something more strategic at a higher level.
- Land use and planning, so they want it to be more specific (renovating land use) – infrastructure planning and investment – urban sprawl increases car centric culture and decreases independence of cycling. Urban sprawl covers rural and urban areas (as a concept).
- Investment in safe, inclusive, accessible and connected cycling infrastructure (these aren't covered in quality).
- Quality and connectivity – are these different things?
- Air quality: connected to the health and wellbeing of people (educating parents about dropping children at school gates).
- Target improvements for cycling levels – to hold accountable and also something to aim for.
- Parking and cycling (is this included in infrastructure?).

Impressions of the session and insights

Finally, the participants were invited to share their thoughts and experiences from the workshop. Those are listed below:

- Changing from linear thinking to a more dynamic approach makes sense (especially considering reference points for perceiving the unforeseen consequences).
- When you look at one at a time it can be a reference point to the design process.
- They liked the visual aspects (of reference points and the CLD).
- Force us to think analytically about very specific things, what works and what does not – what leads to what (beyond casual relationships to how they are linked).
- Feedback to policymakers about this is what we (cyclers) want: for policy and planning this all goes back up into our future planning and we need to be clear about what we meant from this. A good question going forward is how do we prioritise the aspects of the system?
- Interesting to see and realise the overlap of sectors (TII and policy sectors).

- Highlights how nuanced the topic is.
- Move away from traditional approaches (linear).
- Women from different areas participating – mixed room with different perspectives.