Report

Evaluation methodology in work package 5

11/12/2019

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1. Introduction

This guide brings an overview of the methodology that will be used in work package 5 of the BITS project. This document is written at the end of month 12 in the project (December 2019). The goal of this guide is to give more background information on the methods (that will be) used in order to attain the objectives of work package 5 concerning the evaluations and the recommendations in the BITS project. In order to ensure reliable, valid and transferable results it is important to use methodologies according to scientific standards in both quantitative and qualitative evaluation.

After taking a look on the project objectives, the methodology of the general survey is described. Afterwards, we'll go more into detail in the common methodology of the different ITS implementations.

2. Objectives

The **three main overall objectives** of the Bicycles and Intelligent Transport Systems project are:

- Implementing ITS solutions that directly increase the take-up of cycling (+10%) and reduce CO_2 emission (-9%) within target groups
- Sharing cycling data and building a CyclingDataHub to share, analyse and visualize the data (>100 data sets)
- Use collected data to get better insight in the needs of cyclists to drastically improve cycling policies. Integrate the ITS methodologies and datasets into broader multimodality, thus anchoring cycling in broader mobility policies and share this data for a multimodal future.

This report concerns mainly the first objective, i.e. how ITS implementations contribute to a 10% increase in the uptake of cycling and a 9% decrease of CO_2 emission within target groups. This document will give an overview of the evaluation methodology which will ensure reliable, valid and transferable results. On the one hand evaluation methodology regarding the different ITS pilots will be described and on the other hand evaluation methodology with regard to the general survey will be described. In this report, it is described how the pilots and the general survey can contribute to the objective.

Moreover, the different ITS interventions will be located on the **bicycle pyramid**:
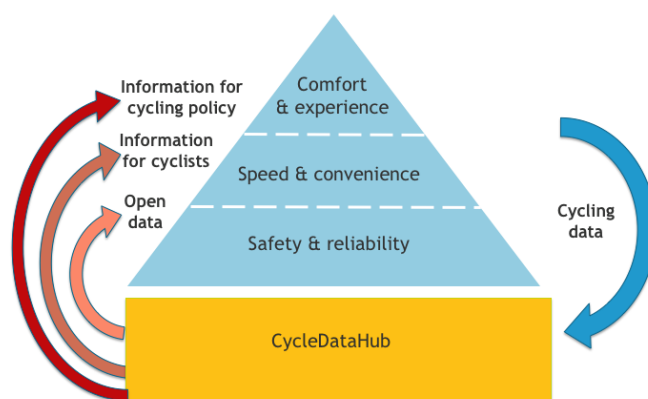

Figure 1: Bicycle pyramid and CycleDataHub

Three categories can be distinguished in the bicycle pyramid: safety and reliability; speed and convenience; comfort and experience. ITS interventions can improve one or more groups of the pyramid. To give an example: a smart lightning system in a new cycle path contributes on the one hand to safety and reliability, since cyclists have light along the cycle path when its dark. On the other hand, it contributes to comfort and experience, since the different colours of the lights can give information (about the temperature of the cycle path, about the direction of the road etc.) to the cyclists.

Work package 5, the **work package on evaluation and recommendations** has four main objectives:

- Create knowledge on specific ITS implementations to stimulate further rollout of ITS in cycling in the pilot cities and in other cities

- Create knowledge on the effects of cycling in ITS to substantiate the uptake of ITS in cycling policy and therefore increase capacity of organizations to stimulate uptake of cycling as a green transport mode
- Create knowledge on collecting, storing, analysing and sharing cycling data to serve policymakers and businesses that want to use cycling data
- Use the knowledge to provide useful and easily transferable recommendations for both policymakers and businesses through workshops with stakeholders

This document describes the evaluation methodology (that will be) used in the different aspects of the project.

3. Survey

The evaluation in the BITS project can be split up in two main parts. On the one hand, the different ITS interventions are evaluated on their effectiveness and their degree of transferability to other situations. On the other hand, a general survey which will be rolled out in all participating cities and regions was developed. In this part of the common evaluation methodology guide, the methodology concerning the general survey will be discussed. The survey is included in the Annex of this report.

3.1 Goals

Our intention is to attain different goals with this general survey.

Firstly, we wanted to bring **coherence in the evaluation of the project**. A large part of the evaluation consists of the evaluation of all the small different ITS pilots, but with these different pilots we cannot make general statements about cycling and ITS in the different cities and regions. With this survey, it will be possible to make comparisons over and across the different implementing partners about cycling and ITS.

Secondly, the results of the survey will also be very **informative for all the different partners in the project**. They will receive a lot of information on cyclists, non-cyclists, cycle use, infrastructure and the perception against ITS in their city or region. Since the survey will be rolled out rather in the beginning of the project, the different partners can use the information in the second part of the project. They will have more information on which ITS interventions they should work or what the interests of their inhabitants are. Moreover, the survey also contains a part reserved for questions of one specific partner. In this part, the different partners can add specific questions they want to ask their citizens.

Thirdly, the survey will also contribute to measuring the **first overall project objective**, i.e. a 10% increase in cyclists and a 9% reduction in CO_2 emission due to ITS within target groups. It will be possible to make statements with regard to this objective using the survey results. In '3.6 contribution to project goals' more information on this goal will be given.

3.2 Content

The survey consists of **eight main parts**: socio-demographic information, modes of transport, bicycle use, motivations for cycling, barriers to cycling, cycling infrastructure and (ITS) interventions. The eighth part that can be added to the survey is the specific part with questions from each implementing partner only proposed to the inhabitants of that participating city or region.

In the first part, the respondents are asked some **socio-demographic information**. To give some examples: gender, year of birth, living situation. With this general information, we want to receive some background information of the respondent, without getting to much private, useless information. However, the age, gender, living and working situation gives interesting background information which can explain a lot of the answers given by the respondent later in the survey.

In the second part, respondents are given two questions regarding the **modes of transport** they use most often. Before proposing them a lot of bicycle questions, they are asked how often they use different transport modes. We also ask them what type of bicycle(s) they own.

In the third part, the **bicycle use** of the respondents is questioned. With different questions, we ask them how often they currently cycle for different reasons and how often they would like to cycle in the future. With these questions, we want to get insight in their current bicycle use and their willingness to cycle in the future.

In the following part, **motivations for cycling** are shown to the respondent and he/she needs to indicate to which extent he agrees with the statements. Statements concerning safety, health, pleasure, environment, practical arguments, financial and social issues were added. On a scale from strongly disagree to strongly agree people can indicate what motivates them to cycle. To give some examples: cycling is good for my health, cycling is a cheap mode of transport, cycling reduces CO_2 emissions. With the responses on these statements, we intend to distinguish different types of cyclists.

In the fifth part, respondents are asked for **barriers to cycle**. Different elements that could prevent them from cycling (more) are given (distance, safety, practical issues etc.) and they are asked to indicate whether or not it is a barrier for them to cycle. Respondents that indicated in the beginning of the survey they were (almost) never cycling are also asked what could convince them to cycle in the future.

The following part concerns the **cycling infrastructure**. Respondents are asked about their satisfaction on infrastructure in their environment. Infrastructure includes safe cycle paths, illuminated cycle paths, parking, safe crossings etc. With this question, we want to collect information on their opinions of the bicycle infrastructure in the different participating regions.

The eighth part concerns the **ITS interventions**. In this block, different ITS interventions were explained to the respondents and it was asked whether these interventions would convince them to cycle more often. Most pilots being rolled out in the first phase of the BITS project were integrated in this list. Some examples: an app offering you the safest route to your destination, an app giving you rewards when cycling, a sensor that detects your approach and makes the traffic light turn green faster etc. Moreover, some questions about apps were proposed to the respondents: concerning privacy, their current app use, etc. With this part of the survey, we want to grasp the overlap between cycling and ITS. What are people's perception of ITS? Do they think it is a value added? What kind of interventions do they prefer? Do they want to invest time and effort in ITS? Do they already use different apps when cycling?

Finally, partners were given the option to add some **case-specific questions** which would only be added to the survey rolled out in their city/region. Some partners wanted to add general questions about cycling while others wanted to add some specific questions regarding their ITS intervention(s).

With the fourth part of the survey, we get insight into different types of cyclists using the motivations for cycling. In the other parts, we can distinguish the answers on the survey according to the different types of cyclists. According to cycle use, infrastructure and certainly ITS interventions: what do different types of cyclists think about it? Do they have different needs and wishes and what are they? To give an example: a motivation for a young mother with two toddlers not to cycle can be safety. She thinks the infrastructure in her environment is not safe enough to bring her children by bike to school. However, she is interested in ITS interventions improving safety and she believes that with certain interventions she

would cycle more with her children. This information can then be used by policymakers and mobility experts to put extra efforts on certain interventions.

We will be able to make comparisons between different types of cyclists, but also between people of different ages, different gender, different living or working situations, believers and non-believers in cycling etc.

It will also be possible to make comparisons over and between different cities and regions. Possibly certain ITS interventions are more or less preferred in the cycle country The Netherlands compared to East Riding of Yorkshire where the council has the ambition to increase bicycle use among their citizens.

3.3 Practical organisation

The survey will be rolled out in Spring 2020. VIVES will set up the survey, take care of the necessary links to distribute the survey, but a market research company will have the responsibility to distribute the survey as widely as possible among the inhabitants of the participating cities and regions and to collect a sufficient amount of respondents.

The survey will be prepared in a Dutch and an English version for Belgium, The Netherlands and the United Kingdom. Since the researchers in VIVES do not fluently speak German and Danish, another institution will take care of the translation of the survey to Danish and German.

This survey will be rolled out only once in the scope of the BITS project. It is not the intention to do a repetition of the survey at the end of the project. However, partners in the project will have the possibility to repeat the survey in their city or region when the BITS project is finished. The survey will be easily accessible and analysable for non-experienced researchers.

The survey will only be launched online, so it will only be possible to fill out the survey online. We believe that many people have access to the internet these days and an online survey makes the processing of the answers -certainly since five different countries are involved- a lot less complicated.

3.4 Target group

With this survey, our intention was to reach as many inhabitants in the participating cities and regions as possible. We wanted to reach both cyclists and non-cyclists: people cycling 200 kilometres a week, for leisure or as commute, but also recreational cyclists cycling very often or persistent car drivers who do not cycle at all.

3.5 Method

The survey contains two different types of questions.

Only two questions are open ended questions. These questions require a number (e.g. in which year were you born and how many kilometres do you cycle each week).

The other questions in the survey are multiple choice questions. Most frequently, the multiple choice questions have varying answering options depending on the question, e.g. what type of bicycle do you own; how often do you use these modes of transport; which type of apps do you use. The second largest

part of multiple choice questions were rated on a 5 or 7-point Likert scale ranging from strongly disagree to strongly agree or not at all satisfied to really satisfied. Finally, one question requires a yes or no answer.

For comparability reasons, most questions are proposed to all respondents. Only a few questions are only asked to a specific group of people. Two groups of respondents are in this case distinguished: the people indicating they cycle rarely or never and the people not indicating they cycle rarely or never. This different track for non-cyclists was used to get more in depth information on why they rarely or never cycle and what could convince them to cycle (more).

The responses on the survey will be analysed using SurveyMonkey and SPSS since it will all be quantitative data.

3.6 Contribution to project goals

Within work package 5 about the evaluation and recommendations, we can contribute to the first overall project goal, i.e. 'implementing ITS solutions that directly increase the take-up of cycling (+10%) and reduce CO_2 emission (-9%) within target groups'. The survey also contributes to this project goal.

With the question 'To what extent would these technologies encourage you to cycle (more often)?', followed by a list of ITS interventions, we will be able to make statements on the increase of cyclists and the reduction of CO_2 emission due to ITS. People will indicate whether they would cycle more given these interventions. We thus investigate the willingness to cycle with this question. Some other questions also contribute to this same goal: when we ask how often people would like to cycle in the future compared to today or which elements would convince them to cycle. Using statistical analyses, it will be possible to deduct the responses on this question to a percentage in cycle uptake. Within the target group, we can calculate how many more people would cycle and we can make statements linked to the project goals of 10% increase in cycling and 9% decrease in CO_2 emission.

The different questions in the survey will also give information on the importance for respondents of safety, speed, comfort and other elements of the bicycle pyramid, so we will also be able to use the survey results to make statements about the Bicycle Pyramid.

4. ITS implementations

In this part of the document, the methodology concerning the different ITS implementations of the partners is discussed. This methodology is described together across the different pilots.

4.1 Goals

Within the scope of the BITS project, it is the responsibility of the six implementing partners to implement together 24 ITS solutions in cycling. These implementations can be situated on all levels of the Bicycle Pyramid. The pilots will be implemented in two rounds. In the first round, an implementation is tested by one partner, where in the second round some implementations are scaled up and the lessons learnt in the first round are taken into account when (possibly) implementing the pilot in another city. In the second round also new implementations will be tested.

These ITS implementations contribute to the first overall objective, i.e. implementing ITS solutions that directly increase the take-up of cycling (+10%) and reduce CO_2 emission (-9%) within target groups. With the implementation of certain ITS interventions, the participating partners aim to see an increase in cycle up-take and consequently a decrease in CO_2 emission.

What will exactly be evaluated? First of all, the ITS intervention itself will be evaluated: did it reach its goals? What is its effectiveness? Is it useful and an added value? What are possible conditions and barriers? Besides the intervention specific evaluation, several general topics will also be taken into account in the evaluation: what is the impact on a modal shift, on safety, on experience of the users etc.?

4.2 Types of evaluation

Over the different ITS implementations different types of evaluation can be distinguished.

Before the different types of evaluation are discussed, it is important to mention that the data collection for the evaluation can take place before, during and/or after the implementation of the pilot. This is the case for a lot of types of evaluation. This helps the implementing partners and us to make an evaluation of the pilot and to make conclusions on the intervention.

A first type of evaluation is **interviewing**. Cyclists and non-cyclists can be interviewed before and/or after the implementation. They can be interviewed to hear their experiences, their concerns, their ideas. Both for us and for the implementing partners these interviews can give a lot of interesting information on the pilot. This will help us to evaluate the pilot and to give recommendations to other organisations or governments wanting to implement the same ITS intervention.

> In Zwolle, for instance, they want to interview the users of the Sniffer bikes to ask them why they participate, what barriers there were for them and what the impact of the Sniffer bike was on them. The city of Aarhus will use interviews to ask cyclist on an intersection how they experience the extended green at the traffic lights.

Secondly, next to interviews, sometimes **surveys** were chosen to collect information from people. Surveys were chosen for the same reason as the interviews: people's opinions on interventions can be asked. The surveys can be used before, during and/or after the intervention.

In Oldenburg, a survey will be added to their app. Once in a while, users of the app will get a pop-up and will be asked some questions about their experience with the app and whether they cycle more compared to before.

Thirdly, a **group discussion** with experts is another type of evaluation. This discussion on an intervention, on practical issues before or after implementation, on opinions on results etc. can produce several interesting research results. These experts can bring in other views and relevant elements in the discussion.

In the Province of Antwerp, group discussions were used. On the one hand with professionals concerning cycling policy working at the Province, thinking about the implementation and the (possible) results. On the other hand, the results of the cameras were discussed with involved parties (such as the government, people from the schools and companies in the neighbourhood, concerned neighbours etc.).

Another type of evaluation is analysing **camera recordings**. In some cases, the implementing partners want to use a camera to film for example the behaviour of cyclists before and after an intervention to see the differences made by the intervention.

In the city of Aarhus, they want to use a camera at the traffic lights where they want to install the sensor detecting cyclists coming downhill and extending the green light or the inter-green-time. With the camera, they will be able to observe the behaviour of the cyclists at the intersection before and after the implementation of the sensor.

Another often used type of evaluation is **counting**. Using bike counters, different partners want to get a view on the amount of people cycling in their city/region or on a certain (dangerous) location. With this type of evaluation, they get an idea of the overall number of cyclists and/or they get indications on the impact of an intervention on the number of cyclists.

Counters will be used in Withernsea to count the number of cyclists in the region and to get information on their cycle behaviour. These counters will be used before, during and after an intervention to measure the effects. In Aarhus, before and after the implementation of the LED lights on the cycle highways, counters will also be put in place to be able to follow the evolution in the number of cyclists, amongst others due to the lightning.

A sixth type of evaluation is all the (quantitative) **data** collected before and after the implementation of the pilots. A lot of different kinds of data will be used to give more input to evaluate the ITS intervention. This information can be very diverse, from different sources and with different goals, but all helping the evaluation of the intervention.

In Aarhus information on travel time will be collected via Bluetooth tags on bikes. In Oldenburg, Baron Mobility has a lot of data on their leased bikes, the bike commuters, the frequency of biking etc. They will collect information on the weather conditions each day, possibly explaining an increase or decrease in the number of cyclists. The Province of Antwerp will have data available on the amount of accidents on the crossing they are investigating.

These different sources of data will be put together for each case and will be bundled in order to make an evaluation and recommendations for each case. All the data will be used to make a case-specific evaluation.

4.3 Measuring impact

Analysis

The collected data will be analysed in several ways, contributing to the measuring of impact on the project goals. Before analysing the data, the data will be checked on its quality and usefulness for the evaluation.

Qualitative data from the interviews and the group discussions will be analysed according to scientific standards. The interviews will be transcribed and first a horizontal analysis of each interview will be made. Afterwards, if more interviews are available in one case, a vertical analysis over the interviews will be made. Conclusions within and over interviews will be made.

The camera recordings will be watched and reports will be made of these recordings in order to analyse the (changed) behaviour.

Quantitative data will be analysed using different statistical methods depending on the data set. Different scientific analysis techniques will be used to get insight in the data. From calculating averages and statistical significances to making conclusions on large data sets of e.g. bicycle counters.

During month 11 in the project, the partners were asked to write down their main hypotheses and aims with their interventions in pilot reports. These reports will be used to decide which data collections and which analyses will be needed in order to measure impact and make conclusions concerning the intervention goals.

Baseline measurements

It was the intention in the project proposal to have a baseline measurement for each ITS intervention. However, in many cases there was no baseline or there is not yet a baseline measurement. The cases of the ITS interventions are very diverse and in some cases a baseline measurement is not applicable, not desirable and/or not possible. In some cases, the implementing partners want to wait with the baseline measurement until right before the intervention and since some interventions are still in the tendering and developing phase, these baseline measurements could not be accomplished before the end of month 12 of the project. To give some examples concerning the lacking baseline measurements (at this moment) within the project:

- In the Province of Antwerp, a baseline measurement is not valuable. They will use 3D cameras to measure traffic and to investigate the traffic and the traffic problems at a certain crossroad. Since the installation of the cameras is not an immediate intervention in the traffic situation, a baseline measurement is not valuable. Even more, the recordings of the cameras can also be seen as a baseline measurement, so another baseline measurement would not really be of added value.

- The city of Aarhus wants to implement smart lightning systems in cycle highways. To measure the number of cyclists before and after the implementation, counters will be installed on the cycle highway before the lightning system will be installed. However, this counting system will only be installed shortly before the implementation of the lights, which will be in 2021.
- In Oldenburg, Baron Mobility is developing an app with the intention to motivate more people to cycle to work. At the moment, they have no intentions to do a baseline measurement before the implementation of the app.

Overall impact

Conclusions of the different data types will be put together to make on the one hand conclusions per pilot. The analyses of the data will also help us to formulate recommendations in order to optimize effects of the interventions for policy-makers and businesses wanting to implement the interventions. On the other hand, the conclusions will be used to make general projections to the overall project objectives. Using the pre and post measurements, the counting of cyclists, the many data sets, it will be possible to draw conclusions on the aim to reach a 10% increase in cyclists and a 9% reduction of CO_2 emission within target groups, due to ITS.

5. Annex

5.1 BITS Survey

The present survey is organised within the scope of the BITS project. This multi stakeholder project on Bicycle and ITS (Intelligent Transport Systems) aims at reducing CO_2 emissions by 9% and increasing bicycle use by 10% within target groups. This survey aims at improving our understanding of peoples' choices for different transport modes, peoples' bicycle use, motivations and barriers for taking the bicycle and peoples' perceptions against ITS.

Please read each question carefully and answer it to the best of your ability. There are no correct or incorrect responses; we are interested in your personal point of view. Note that all responses to this survey are completely confidential.

Thank you for your participation in this study.

Socio-demographic information

1. In which **year** were you **born**?

    …
2. What is your **gender**
    - o   Male
    - o   Female
    - o   Other
3. Where do you **live**?
    - o   I live in the centre of a city
    - o   I live in the suburbs of a city
    - o   I live in a village
    - o   I live in the countryside
4. Which description best describes your current **living situation**?
    - o   I live alone
    - o   I live without partner, with children
    - o   I live with my partner
    - o   I live with my partner and children
    - o   I share a house with friends
    - o   I live with my parents
    - o   Other: …
5. What is the **highest qualification or educational certificate** you have obtained?
    - o   None
    - o   Primary education
    - o   Lower secondary education (ca. age 12-15)
    - o   Upper secondary education (ca. age 15-18)
    - o   Bachelor's degree or similar
    - o   Master's degree or higher
6. Which description best describes your **current working situation**?
    - o   I am a pupil, student, or in further training
    - o   I work full-time
    - o   I work part-time

o I am temporarily not working (e.g. for health or personal reasons)
o I run a household full-time
o I am in retirement
o I am unemployed

Modes of transport

7. How **often** do you use these **modes of transport**?

	(almost) daily	Several times a week	Once a week	Several times a month	Once a month	Less than once a month	Rarely or never
Non electrical bicycle							
Electrical bicycle							
Motorbike							
Car, as a driver							
Car, as a passenger							
Bus, tram or metro							
Train							

8. Indicate what **type of bicycle** you own for personal use
   o I do not own a bicycle
   o (non electrical) city or urban bicycle
   o (non electrical) mountain bicycle
   o (non electrical) race or road bicycle
   o Electrical bicycle with support up to 25 km/h
   o Electrical bicycle with support up to 45 km/h (speed pedelec)
   o Tandem bicycle
   o Cargo bicycle
   o Folding bicycle
   o Recumbent bicycle
   o Tricycle or wheelchair bicycle
   o Swapfiets

Bicycle use

9. How often do you cycle to go **shopping or to travel to leisure activities, day care centre or to see family or friends**?
   o (almost) daily
   o Several times a week
   o Once a week
   o Several times a month
   o Once a month
   o Less than once a month
   o Rarely or never

10. Thinking about your **commute to work or to your school** (if you're a student), how often do you cycle?
   o (almost) daily
   o Several times a week
   o Once a week

- o Several times a month
- o Once a month
- o Less than once a month
- o Rarely or never

11. How often do you cycle as **a sport or leisure activity in itself**?
    - o (almost) daily
    - o Several times a week
    - o Once a week
    - o Several times a month
    - o Once a month
    - o Less than once a month
    - o Rarely or never

12. Compared to today, how often would you like to cycle to go **shopping or to travel to leisure activities, day care centre or to see family or friends**?
    - o A lot more
    - o More
    - o About the same
    - o Less
    - o A lot less

13. Compared to today, how often would you like to **commute to work or to your school** (if you're a student)?
    - o A lot more
    - o More
    - o About the same
    - o Less
    - o A lot less

14. Compared to today, how often would you like to cycle as **a sport or leisure activity in itself**?
    - o A lot more
    - o More
    - o About the same
    - o Less
    - o A lot less

15. **How many kilometers** do you cycle each week? (Think about an average week.)
    - o …

Cycling motivations

16. Indicate to what extent you **agree** with the following statements.
    Please note that these questions concern cycling in the area that you live.

	Strongly disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Strongly agree
I think cycling is dangerous and/or scary					
I think cycling is relaxing					
Cycling is good for the environment					
Cycling helps me arrive at my destination faster compared to other modes of transportation					

Cycling is too expensive					
I like cycling to be alone					
Cycling allows me to discover new places					
Cycling is a fast and efficient way to reach my work place					
Cycling is not possible for me practically					
As a cyclist, you are too much dependent of the weather and other environmental factors (e.g. rain, temperature, wind, hours of daylight)					
Cycling helps me to reduce stress					
I think cycling is safe					
Cycling reduces CO2 emissions					

17. Indicate to what extent you **agree** with the following statements.
Please note that these questions concern cycling in the area that you live.

	Strongly disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Strongly agree
Cycling helps me sleep better					
I think cycling is a cheap mode of transport					
I like cycling with others					
Cycling is good for my health					
I like cycling					
Cycling instead of using motorized transport helps against climate change					
I think cycling is complicated (e.g. time, organisation)					
I think cycling is unhealthy (e.g. due to air pollution)					
I think cycling is a waste of time					
I think cycling is exhausting					
Cycling keeps me fit					
I think cycling is boring					

Barriers to cycle

18. **FILTER:**
People who indicated they rarely or never use an (electrical) bicycle in question 7: To what extent do the following elements **prevent you from cycling**?
All others: To what extent do the following elements **prevent you from cycling more**?

	Not at all	Not really	Doesn't make a difference	A bit	To a large extent	No opinion

No safe route (e.g. dangerous crossings or bicycle paths, not enough visibility or lightning)					
The route is too remote and there is no social control					
Distance					
Weather conditions					
Lack of (secured) bicycle parking					
Practical arrangements (e.g. situation at home, child care arrangements, the need to transport heavy items)					
No appropriate bicycle					
No cycle buddy					
My work schedule					
Available car and/or car parking					
Other transportation mode is faster or cheaper					
Air pollution					
Health reasons					
Timing (e.g. at night in the dark)					
I don't like cycling					
Cost of cycling					
Lack of cycling proficiency or experience					
My employer does not promote cycling to work (e.g. no parking facilities, no company bicycle available, no shower available)					

19. **FILTER:**

only for people who indicated in question 7 they rarely or never use an (electrical) bicycle:
Which elements are the **three main reasons that prevent you from cycling**?
- o No safe route (e.g. dangerous crossings or bicycle paths, not enough visibility or lightning)
- o Weather conditions
- o Health reasons
- o I don't like cycling
- o Distance
- o Practical issues (e.g. situation at home, child care arrangements, the need to transport heavy items, work schedule, available car)
- o No appropriate bicycle
- o No cycle buddy
- o Cost of cycling
- o Lack of appropriate cycling infrastructure (e.g. parking, cycle friendly roads, road signs, illumination)

20. **FILTER**:

only for people who indicated in question 7 they rarely or never use an (electrical) bicycle:

Which elements would be the most **important reasons that would convince you to cycle in the future**? Indicate the three most important reasons.

- o Safer cycle routes
- o Since it is good for my health
- o If I would have an appropriate bicycle
- o Since it contributes to a healthier environment
- o If the distance would be less
- o If my situation at home would allow me to
- o If my employer would promote it (e.g. cycle fee, lease bicycles, shower at work)
- o If renting or buying a bicycle would be cheaper
- o If I would have a cycle buddy
- o If there would be appropriate cycling infrastructure (e.g. parking, cycle friendly roads, road signs, illumination)
- o Absolutely nothing

21. Indicate to what extent you agree with the following statements:

	Strongly disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Strongly agree	No opinion
I would be willing to cycle more in the future as a more sustainable way to travel and for environmental reasons						
I am willing to cycle more often, assuming that driving a car becomes less beneficial in the future (e.g. no more company cars, increasing cost of driving a car, increasing traffic jams)						
I would like to make more use of multimodal transport (e.g. combining train and bicycle to go to work)						
I am satisfied with the investments and initiatives of the government concerning bicycle policy in my region						

Cycling infrastructure

22. To what extent are you **satisfied** with **cycling infrastructure** in your local area?

	Not at all satisfied	Not really satisfied	Neither satisfied nor unsatisfied	Rather satisfied	Really satisfied	No opinion (since I don't cycle)
Sufficient bicycle paths						
Condition and maintenance of the bicycle paths						
Safe bicycle paths						
Safe (bicycle) crossings						
Sufficiently wide bicycle paths						
Cycle friendly roads						
Illuminated bicycle paths						
Availability of bicycle highways						
Sufficient bicycle parking						
Availability of bicycle sharing systems						
Safe or secured bicycle parking						
Government investments and initiatives to make cycling more attractive						

Interventions

The term 'app' is used often below. An app, or application, is a computer program that can be used on a mobile device (e.g. smart phone). Please note that apps can be used for a range of purposes relating to cycling, for example monitoring your speed, finding the best route and tracking safety statistics.

23. **FILTER**:

People who indicated they rarely or never use an (electrical) bicycle in question 7: To what extent would these **technologies** encourage you to **cycle**?

All others: To what extent would these **technologies** encourage you to **cycle more often**?

	Definitely not	Probably not	I don't know	Probably yes	Definitely yes
An app offering you the safest route to your destination					
LED lights on bicycle paths indicating when there is a risk of slipping and skidding					
An app giving you information about your health while cycling (e.g. how many calories you have burned, what your heartbeat was etc.)					
An app giving you rewards when cycling (e.g. points or vouchers) and stimulating competition with other cyclists					

An app offering you the most scenic route to your destination				
An app showing you how many emissions you saved by riding a bicycle instead of a car				
A sensor that detects your approach and makes the traffic light turn green faster				
An app showing you the fastest route to your destination				
An app or road signs showing you the real cycle time from A to B				
An app that can prevent cycle theft and/or can help you locate your bicycle after theft				
Sensor in bicycle parking facilities that indicate where free parking spaces are available				
An app that brings you together with other people looking for cycle buddies				

24. What type of **apps** with regard to cycling do you currently use?
    FILTER: all, except people who indicated they rarely or never use an (electrical) bicycle in question 7
    - o Apps tracking and/or containing a game element (e.g. Strava, Human, Komoot, Map my ride, Ring-Ring, GoAbout)
    - o Apps giving information about cycling conditions (e.g. a meteo app, rain radar)
    - o Apps concerning cycle routes (e.g. Google maps, Routenet, Bike citizens)
    - o Apps concerning cycle infrastructure/efficiency (e.g. Ping, Schwung, Donkey)
    - o None

25. If you were to use an app for cycling, would you prefer…
    FILTER: all, except people who indicated they rarely or never use an (electrical) bicycle in question 7
    - o starting the app yourself
    - o having the app open in the background automatically

26. To what extent do you **agree** with the following statements?
    FILTER: all, except people who indicated they rarely or never use an (electrical) bicycle in question 7

	Strongly disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Strongly agree
I am worried about my privacy when using apps					
I think using apps is time consuming					
I don't know how these apps work					
I think using apps is complicated					

Apps can give me a lot of useful information					
An app can distract me when cycling and can cause unsafe traffic situations					

27. Would you be **willing** to …

	yes	no
contribute to optimisation of cycling infrastructure or policy by connecting a sensor to your bicycle which collects road condition information and sends this to public authorities?		
connect a sensor to your bicycle which collects environmental data? (e.g. air pressure, temperature, humidity, air quality)		

Thank you for completing this survey.

For more information about the BITS project, please check these links:

https://northsearegion.eu/bits/

https://twitter.com/BicyclesB

https://www.linkedin.com/company/bicycles-and-its-bits/