TRACE TOOLKIT

GUIDELINES AND RECOMMENDATIONS ON TRACKING WALKING & CYCLING FOR MOBILITY PLANNING AND BEHAVIOUR CHANGE

CIVITAS
Cleaner and better transport in cities

THE CIVITAS INITIATIVE IS CO-FINANCED BY THE EUROPEAN UNION

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 635266

TRACE
WALKING AND CYCLING TRACKING SERVICES

Contents

Imprint

Editor: TRACE Consortium, 2018

Main authors: Giacomo Lozzi, Chloé Mispelon, Francesco Ripa, Pasquale Cancellara (POLIS), Jan Christiaens, Evelien Bossuyt, Elke Franchois (M21), João Bernardino, André Ramos (TIS), Stephanie Keßler (LuxMobility)

Contributors: All projects partners

Suggested citation: TRACE Consortium (editor) (2018) The TRACE Toolkit. Guidelines and recommendations on tracking walking & cycling for mobility planning and behaviour change Deliverable 8.6 Brussels. Available at www.h2020-trace.eu[1]

Date: May 2018

Layout: Peak Sourcing, Belgium (www.peak-sourcing.com)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 635266.

[1] The TRACE project website will run at least until May 2021. Key TRACE documentation and material will be permanently available on the Polis network website www.polisnetwork.eu

Purpose of the TRACE Toolkit

This Toolkit presents practical recommendations and guidelines to using the approach developed by TRACE, which aims to improve urban mobility planning by tracking walking and cycling movements in cities.

The primary target audience of the TRACE Toolkit are **decision makers, urban planners and practitioners in the fields of urban and transport planning**, working at local authorities, who are interested in introducing policies and measures that promote a shift towards more sustainable and healthy modes of transport. **Local stakeholders, citizens and advocacy groups, and ICT developers and transport consultancies and researchers**, are also addressed in this document.

TRACE innovation consists of introducing a tracking element in local mobility campaigns and planning. Tracking applications have been used to improve the effectiveness of behaviour change campaigns and to collect tracking data useful for urban planning.

This Toolkit explains how local authorities can benefit from tracking movements in their city, and how the derived data provide information for a better identification of priorities both on the infrastructure and communication side. It also provides some background information about the essential components of a tracking campaign and detailed and practical guidance for its implementation and evaluation, built on the experience of 17 campaigns carried out during the project. Finally, tailored recommendations are provided to different types of stakeholders, on how to exploit the results of the TRACE project and the potential of tracking for planning in urban areas.

The TRACE Toolkit is structured as follows:

- **Section 1** introduces the TRACE project and the TRACE tracking apps and tools, developed during the project and tested in eight pilot sites.
- **Section 2** presents the potential benefits of tracking travel movements, informs about the functions of tracking data on cycling and walking in the urban planning and decision-making process, considers how data should be translated into meaningful information and reviews gaps in data relevant for transport planning for traditional data collection methods.
- **Section 3** goes through all the concrete steps to design, prepare and implement a tracking mobility campaign, explains how to evaluate it, and provides some first-hand, practical tips deriving from the real implementation of the TRACE campaigns.
- **Section 4** illustrates the innovative features of TAToo, which can be used by local planners and decision makers to support better informed planning and decision-making processes based on the analysis of mobility tracking data, previously collected during the tracking campaigns.
- **Section 5** describes the actual 17 campaigns of the eight TRACE pilot sites: Agueda (PT), Belgrade (RS), Bologna (IT), Breda (NL), Hasselt (BE), Luxembourg (LU), Plovdiv (BG) and Southend on Sea Borough (UK).
- **Section 6** provides tailored recommendations to different types of stakeholders.
- The **Annex** presents the business models for the commercial exploitation of the TRACE tools.

1

About TRACE

The TRACE mission is to assess the potential of movement tracking services to better plan and promote walking and cycling in cities, and develop tracking tools to encourage the take up of walking and cycling measures.

The project targeted established measures to promote cycling and walking to the workplace, to school, for shopping purposes or simply for leisure. These measures have been enhanced with dedicated TRACE tracking-based tools to promote behaviour change (Biklio, Positive Drive, Traffic Snake Game) and to support mobility planning (TAToo).

These dedicated TRACE tracking based tools have been tested in eight pilot sites: Agueda (PT), Belgrade (RS), Bologna (IT), Breda (NL), Hasselt (BE), Luxembourg (LU), Plovdiv (BG) and Southend on Sea Borough (UK), and evaluated in terms of impacts, success factors and benefits.

Users, policy makers, and walking and cycling practitioners have been closely involved in all stages of the project. The TRACE project has developed:

- An open knowledge base on cycling and walking tracking possibilities, challenges, solutions and benefits intended for city practitioners, Information and Communication Technologies' (ICT) product developers and walking and cycling practitioners.
- An open access tool addressing fundamental ICT challenges to be used by market-oriented application developers.
- Market-oriented tools to be used in the TRACE sites and elsewhere.

The TRACE Toolkit summarises the project outputs into practical recommendations and guidelines on using tracking data for behaviour change initiatives and mobility planning.

1.1. The TRACE tools and apps

TRAFFIC SNAKE GAME – TRACKING VERSION

The Traffic Snake Game (TSG) is a fun campaign to promote walking and cycling to school for children aged 4 to 12, their parents, and their teachers.

During the campaign week(s), children put dots on a snake banner every day they walk, cycle, use public transport, or carpool to school. Children receive a reward when the end of the traffic snake banner is reached. Examples of rewards are 15-minutes additional playtime, no homework for a day, ice cream, a new bicycle shed, or a walking or cycling tour. In the 'deluxe' version of the TSG campaign, schools include additional activities, such as a car free day or a cycle training at school.

In 2015, TSG 2.0 was launched allowing a school to play the Traffic Snake Game online via a Smartboard (a digital schoolboard) or a standard computer. In the digital version of TSG, there are no stickers or a banner, but a drawing of the cityscape appears on the smartboard: it starts out ugly and grey, but becomes brighter and more beautiful when more sustainable trips are logged.

To date, 18 European countries have played the game and took advantage of the successful strategy which encourages parents to try alternatives to the car for home-to-school trips. In School Year 2014-2015, the international campaign increased the use of sustainable transport modes by 15% during the campaign and by 14% three weeks after the campaign compared to the 'before' situation.

So far, the impact of the campaign has been measured using a hands-up survey or via the TSG website. Within TRACE, mobility tracking is added to the TSG campaign. Children have carried a GPS tracking device when coming to school. The device has registered their travel mode, travel speed, and travel route. The tracking data are used within the classroom for measuring the number of sustainable home-to-school trips in the TSG campaign. Additionally, the tracking results allow schools and municipalities to visualise home-school trips and help them increase traffic safety for children travelling to the school.

POSITIVE DRIVE – A GAMIFICATION TRACKING TOOL

Positive Drive is the first gamification tracking platform and app of its kind that positively rewards good/preferred behaviour in traffic.

POSITIVE DRIVE

With fact-based accurate information combined with state of the art algorithms, it gives users the right nudges to try to solve problems like congestion, increasing CO2 emissions and road safety.

Positive Drive tracks and registers travelled routes using GPS, and rewards users, when shown the desired behaviour, with points: (s)miles. These (s)miles can be used in the *gameroom*, a playful lottery-like game filled with prizes and interesting discounts. The prizes can be local (offered by local retails) or can be financial incentives (for example from a government), or a mix. Furthermore, users receive intrinsic feedback, such as burned calories, saved CO2 emission or money. All very shareable information, just a click away from sharing it through Facebook, Twitter, Whatsapp, or almost any other social media.

(Local) authorities, large employers or universities can use Positive Drive to influence citizens' mobility behaviour to reduce congestion, improve the modal split and make people aware of the negative effects of behaviour, while obtaining valuable data and insights for transport planning. They can adjust the rules – what users are rewarded for – in their city (their gamezone) according to their needs and goals. The platform is extremely flexible and can easily (and cost-effectively) be customised to the local situation and standards and can offer a sustainable collaboration between municipalities, local businesses, employers and travellers.

Within TRACE, Positive Drive is transformed into a platform that can run several campaigns for all kinds of mobility challenges. The app is very easy to customize for every country, region, city or neighbourhood. Positive Drive is multi-lingual, and it has already been used in the Netherlands, Belgium, UK, Luxembourg, Serbia, Portugal, Bulgaria and Canada. It is suitable for campaigns like cycling promotion, baseline measurements, Park & Ride promotion, employers approach, university challenges and much more. Positive Drive can be customised to every target group with its campaign strategy, rewards and in-app communication.

BIKLIO – BIKE WITH BENEFITS

Biklio is a mobile application that creates a network of recognition and benefits to bicycle users, linking them to local businesses and the cycling community for the good of their city.

People who cycle are recognised with benefits from Biklio spots at the destination of their trips. The mobile app detects when the user is using the bicycle, and when s/he arrives at a Biklio spot, a notification will announce a benefit. The user then shows the "spot keeper" a claim panel from the app that proves eligibility to a benefit.

Users can see in the app map where and what are the spots, what benefit they offer and what are the existing cycling facilities. Even if they do not proactively engage with the app, the benefit notification will always warn them if they enter a Biklio spot, so the user does not have to use or even remember about the app to get advantage of its benefits. The app also involves the community of users to cycle for their city and for their own good, informing each user on his individual and the community's contribution to a more healthy, sustainable and pleasant city.

Any type of consumer-oriented business can participate: may this be a café, a restaurant, a store, a clothing shop, a museum, an ice-cream shop or a pharmacy. To join the network, the Spot keeper only has to fill in a simple online form stating their location and benefits given to the Biklio community. Their Spot page may also inform users on any supplied bike facilities (like parking).

To add to this, the local campaigner (like the city administration) or other sponsors can create extra cycling challenges with special benefits for the users who quest them. These challenges provide additional incentives and opportunities to promote cycling as a mode of transport.

TATOO – TRACKING FOR PLANNING TOOL

GPS data of the trajectories that travellers do when cycling or walking can be much valuable for planning and policy making, but raw data should be transformed into information that is comprehensive and easy to interpret.

TATOO

TATOo - the Tracking Analysis Tool - transforms GPS cycling and walking data into meaningful indicators on the local mobility network.

The TATOo tool targets mobility planners and decision makers who want to understand better what is the cycling and walking demand and what is the performance of the existing infrastructure.

TATOo builds indicators, like volumes, speed, waiting time and level of service, in the elements of the mobility network – links, nodes and zones – and in origin-destination (OD) pairs. It is able to use an OpenStreetMap[2] – thus not being necessary to have a specific map of the city – and delivers output data that can be visualised in GIS tools. It also calculates other general indicators and rankings that support in the analysis and prioritisation of interventions in the infrastructure or on improving communication to mobility users.

More specifications about TATOo are available in section 4.

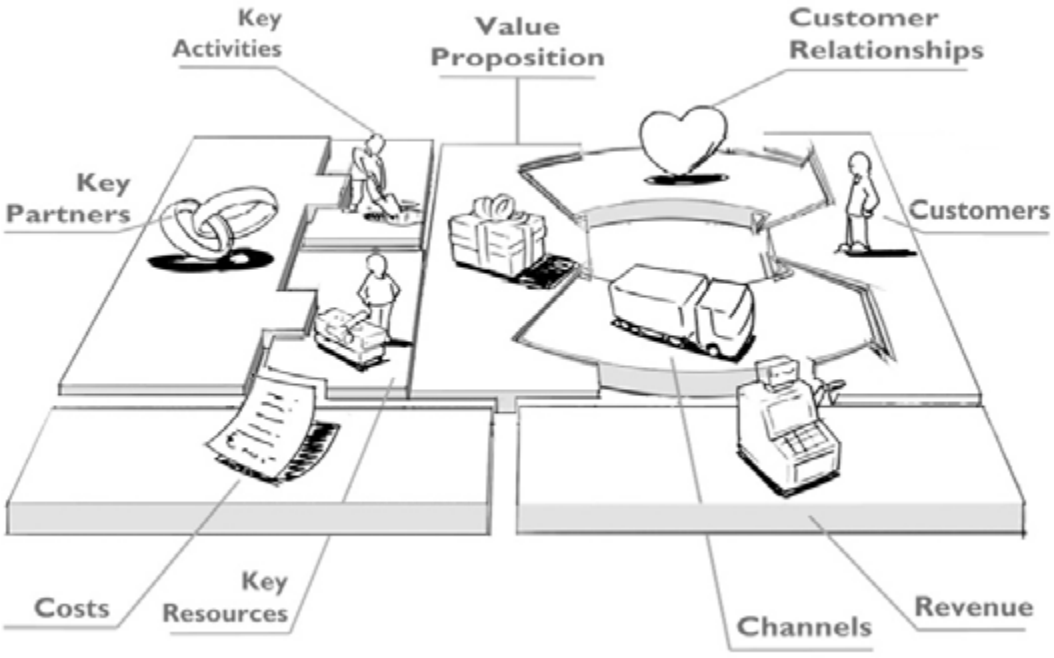
[2] https://www.openstreetmap.org/

About TRACE

BUSINESS MODELS FOR COMMERCIAL EXPLOITATION OF THE TOOLS

The tools developed are meant to be spread in the market beyond the lifetime of TRACE. The partners and other entities involved in their development have commercial interests in making them profitable. The partners involved in the development of tools have elaborated a specific business model canvas for each tool, reported in the Annex.

Scheme of business model canvas



2

How cities can benefit from tracking mobility

Local planners and policy makers can benefit in various ways from tracking travel movements. First, automated tracking may increase the efficiency of a behaviour change campaign: by registering travel movements without laborious input from target individuals or manual counting procedures, one can efficiently reward sustainable travel behaviour or efficiently measure the effect of particular behaviour change messages. Second, tracking allows to collect data for urban mobility planning. Urban planners may learn about the type of roads and routes that are preferred by cyclists and walkers, and identify the bottlenecks that cyclists and walkers encounter, providing them with input for walk and bicycle plans. By further optimising the environment for cycling and walking, these sustainable modes of transport are likely to increase.

How cities can benefit from tracking mobility

Heatmap of Sofia (BG)

2.1. Plan your city using tracking data

The emergence of technological devices that allow the tracking of trips by people who travel, particularly smartphones, is unveiling a window of opportunities for planning and policies based on data.

While the idea that all forms of data will bring great value seems to find overall agreement in the mobility and 'smart cities' planning and policy community, it is not always clear how this new data can be translated into practice for useful and viable changes.

WHAT IS TRACKING DATA FOR?

TRACE partners interviewed practitioners related to urban active mobility policy and planning. According to these preliminary findings, potential functions of tracking data on cycling and walking can be divided in the following categories:

- **Linking the interests of users and stakeholders.** This enables stakeholders to reward walkers and cyclists for their behaviour, be it a shop owner who wants to give discounts to arriving cyclists, an employer who wishes to subsidise active commuters, a health insurance company providing better premia to healthy people or a municipality wishing to reward people who choose sustainable transport. Tracking data creates multiple opportunities to incentivise active mobility[3].
- **Data analysis.** The location and time data provided by tracking allows for a variety of analyses, for instance about the level of service of the infrastructure or knowledge about the demand and its preferences, at a micro or macro level, per type of user, schedule, weather or location.
- **Monitoring of measures.** Tracking data allows to see in detail what has changed with users whenever a measure is introduced in the local mobility system. Be it a new link, simply a new sign or construction work, or temporary experiment, maybe based on behaviour

[3] See TRACE Deliverable 3.2 Specifications for the development of tracking tools.

change tracking applications, it is possible to see how users are reacting to it.

- **A simple tool for communication.** A potential of tracking data is its powerful communication ability. Because it makes cyclists and walkers visible to the decision maker or to the general public, using tracking visualisations seems to have the ability to influence opinions and decisions, at least in the short term.

According to the TRACE survey[4], practitioners consider the communication potential as the most useful application of tracking walking and cycling movements in the city.

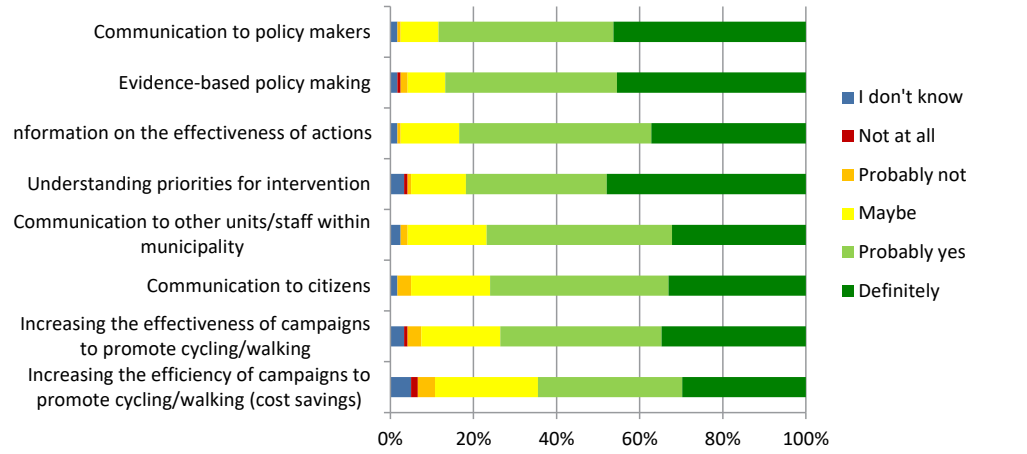


Figure 1 – Survey to planners and decision makers: applications of tracking information (TRACE D3.1)

TRACKING DATA: A LEVERAGE TO INFLUENCE OTHER ACTORS

Stakeholders may use or be influenced by tracking information in several ways. TRACE describes the potential role of tracking in the system of interrelations between different actors in the planning and decision-making process.

The system is constituted by planners in the field of walking and cycling, planners from other fields (sometimes with opposing objectives), decision makers (including politicians) the public the general public and user activists.

Walking and cycling planners may use tracking information to **develop better analysis and properly defining priorities for action**. But they can also use tracking information to **communicate and sometimes influence other actors**. That might be the case in the communication with other technicians within the organisation who might have different objectives or distinct languages: the visual and quantitative power of tracking data consists of showing that people exist, have movement needs or lose time in traffic lights. This might serve as the decisive evidence to advocate for certain priorities.

The same goes for the planners' relation with decision makers. Here, the influence might happen not only on operational decisions but also at a higher level of the definition of a strategic vision. Showing the evidence on the presence of walking, or the choices of cyclists towards safer or quicker paths, may trigger the decision maker's appetite for giving priority to improving the conditions for walkers or cyclists.

Tracking information will also give decision makers the assurance that they will have a tool **to communicate with the public**, through which they will be able to describe with numbers what is the problem, and what will be the effects of the solution. The ability to argue based on empirical

[4] TRACE Deliverable 3.1 (D3.1) – Information and guidelines on using tracking data for planning

How cities can benefit from tracking mobility

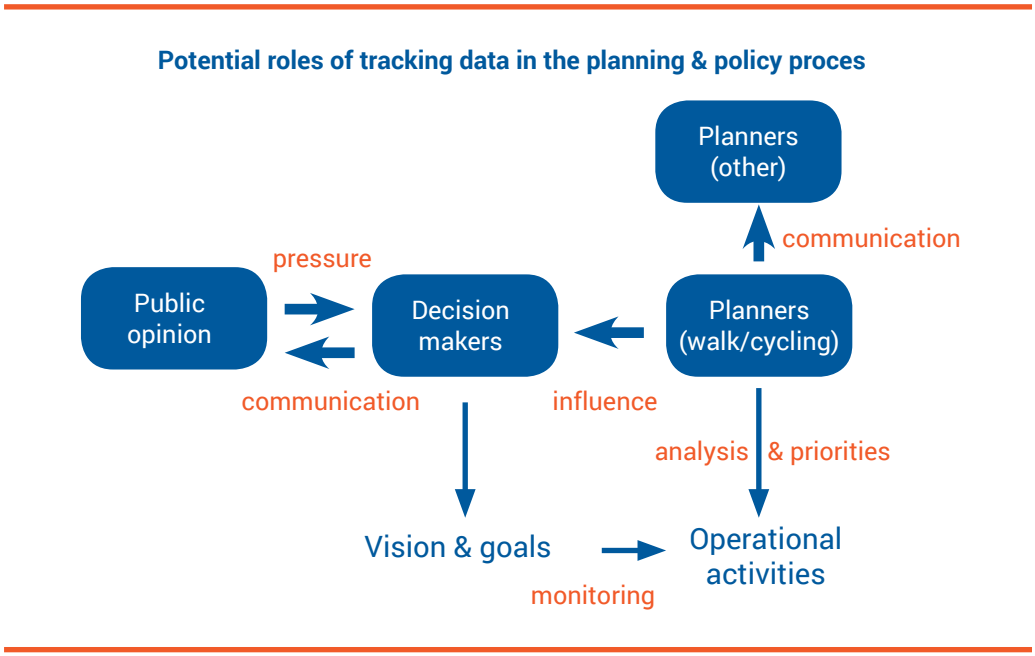


Figure 2 - Roles of tracking data in the planning process

evidence provides decision makers with powerful arguments to convince the public.

The communication between decision makers and public also occurs in the opposite direction. Activism towards walking or cycling can in the same way find in tracking data a powerful tool to argue for the improvement of their conditions: activists can prove the existence of a critical mass and **describe their problems through data**. Another form of communication involving citizens which may be enhanced by tracking data may refer to the latest planning processes based on co-creation, co-production and experimental and 'slow' designs..

Planning and policy processes are not necessarily rational and their course depends on complex political and organisational phenomena. A data analysis culture in general, and in particular with regard to active mobility tracking data, may take time to develop just the same way as traffic models took some decades to become established in standard planning practices.

MIND THE DATA GAP

While GPS data offer an unprecedent potential to deliver better mobility planning and policy practices, it is not yet clear how that can happen in practice. A first step is to translate that data into more meaningful information that can be related to answering actual problems in cities. The data that is made available must be converted to useful information, but what does make sense in relation to cycling and walking tracking data?

This must be necessarily assessed in relation to the data that is already accessible to cities, particularly from counting points and surveys that are already currently being done. Table 1 reviews **gaps in data relevant for transport planning for traditional data collection methods**. Surveying as data collection method lacks network and travel data. On the other hand, counting only gives network data, while socioeconomic and travel information are absent. These deficiencies can be mitigated by combining traditional methods with state-of-art technologies.

Table 1 - Identification of gaps in data relevant for transport planning and potential of tracking data to fulfil those gaps

Input data for transport planning	Traditional data collection methods		Advanced data collection methods			
	Surveying	Counting	GPS logs	GPS logs + GIS	GPS logs + SMS/app	GPS logs + GIS + SMS/ app
Socioeconomic						
Gender	✓	✗	✗	✗	✓	✓
Age	✓	✗	✗	✗	✓	✓
Household data	✓	✗	✗	✗	✓	✓
Occupation	✓	✗	✗	✗	✓	✓
Home address	✓	✗	✗	✓	✓	✓
Work school address	✓	✗	✗	✓	✓	✓
Travel data - individual						
Origin	✓	✗	✓	✓	✓	✓
Destination	✓	✗	✓	✓	✓	✓
Journey start time	✓	✗	✓	✓	✓	✓
Journey end time	✓	✗	✓	✓	✓	✓
Exact routes	✗	✗	✓	✓	✓	✓
Transport mode(s)	✓	✓	✗	✓	✓	✓
Travel purpose	✓	✗	✗	✓	✓	✓
Transfer nodes	✓	✗	✗	✓	✓	✓
Transfer time	✗	✗	✗	✓	✓	✓
Network data						
Road data (type and condition)	✓	✗	✗	✓	✗	✓
Nodes data (Volumes, Bottlenecks, Delays, etc.)	✗	✓	✗	✗	✗	✓
Links data (Link Speeds, Volumes, Bottlenecks, Delays)	✗	✓	✗	✓	✗	✓
Public Transport data (stops, lines, routes, etc.)	✗	✓	✗	✓ By PT vehicle tracking	✗	✓
Parking data (location, quantity)	✓	✓	✗	✗	✗	✓
Zones data	✓	✗	✗	✗	✗	✓

2.2. Behaviour change campaigns using tracking elements

As far as it specifically concerns the use of tracking for behaviour change campaigns, the tracking element entitles campaign creators to go deeper in the specifications of the campaign and its behaviour change aspects.

- **Target the campaign.** Tracking data allow to describe and analyse the travel behaviour of a target audience. This information can be used to segment the audience and build tailor-made behaviour change campaigns. However, consider that the everyday travel behaviour will be influenced by the campaign, set up to convince people to be tracked. Therefore, it is recommended to have a control group or at least take notice of this probable bias.
- **Monitor the impact.** Tracking data can be considered of importance for planning, which is increasingly striving for more evidence-based methods and policies. Tracking data allow to visualise travel behaviour in space and time and to evaluate the effect of (changes to) the environment on it.
- **Evaluate the campaign.** Tracking has the potential of delivering reliable, fraud-proof and objective data on the degree to which the goal to change behaviour has been accomplished. Mobility tracking, therefore, offers new opportunities for evaluating behaviour change campaigns. Most reliable evaluation will be obtained with a baseline measurement before the tracking campaign.
- **Reinforce the change.** Tracking data can be fed to the user to change his or her travel behaviour. For instance, informing a user on the calories burned while cycling is likely to encourage the change.

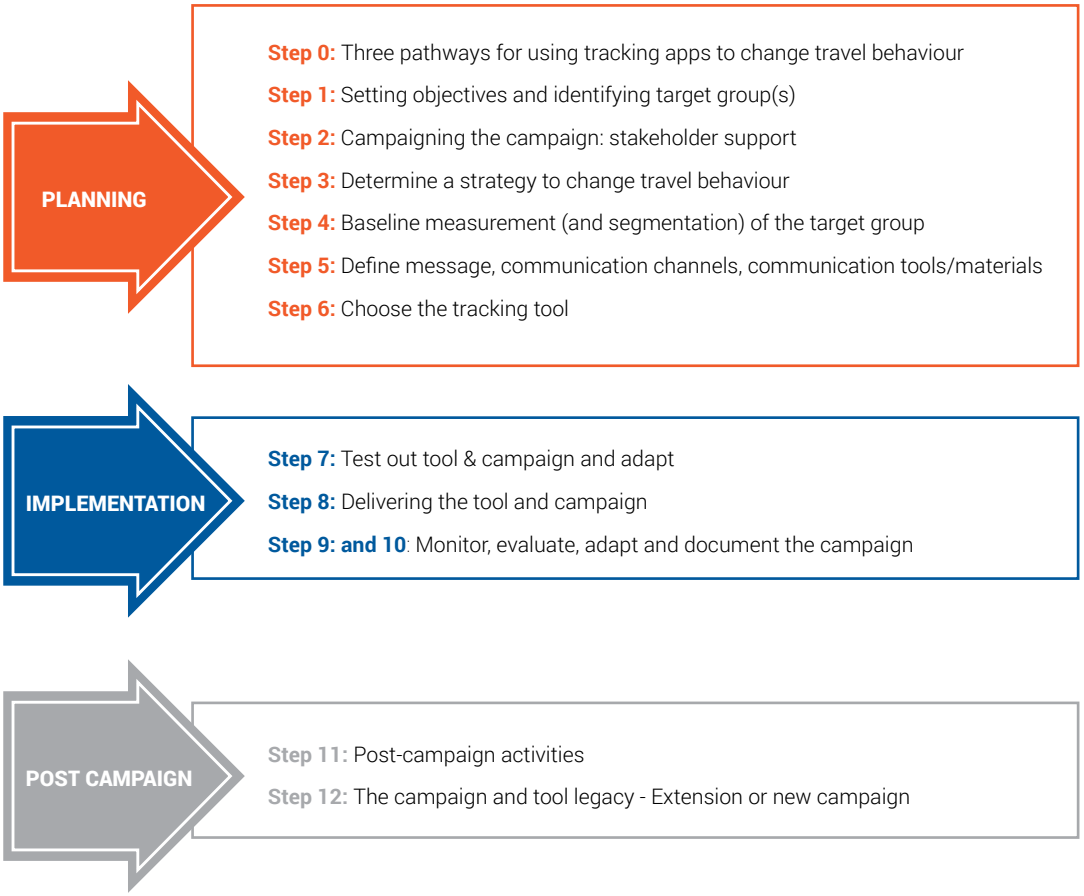
3

Your tracking campaign

A behaviour change campaign can be defined as a series of interconnected actions aimed to achieve a specific behaviour change objective. For TRACE, this objective is a modal shift from car use to active modes of transport, like walking and cycling, or the reinforcement of already existing desirable behaviour (cf Biklio).This section presents the steps to design, prepare, implement and evaluate a tracking campaign, based on the experience of the 17 TRACE campaigns.

3.1. Guidelines for campaign design using tracking services

The aim of the **Guidelines for campaign design using tracking services** is to develop a strategy for building tracking-based behaviour change campaigns. It describes a general framework of steps for designing and carrying out a behaviour change campaign that involves tracking. This framework identifies the different steps that need to be undertaken (e.g., setting objectives, seeking stakeholder support, developing a communication strategy) and highlights the specifics for building a tracking-based campaign. The full version of the Guidelines is available in *TRACE Deliverable 2.2 - Guidelines for campaign design using tracking services*.



STEP 0: THREE PATHWAYS FOR USING TRACKING APPS TO CHANGE TRAVEL BEHAVIOUR

TRACE outlined three promising pathways for using tracking apps to facilitate behaviour change.

1. **Direct pathway:** Tracking is used in a **behaviour change app**: the tracking data is immediately fed back to a user to influence the behaviour of the user
   a. Outcome: Behaviour change on the short term
   b. Method: **Encouraging the desired behaviour**, for instance by rewarding the behaviour → campaign efforts focus on getting a specific audience that does not yet exhibit the desired attitude, to enrol in a dedicated program and reward them if they change their behaviour
2. **Indirect pathway 1:** Tracking for measuring user needs: the tracking data are used to **measure user needs** (e.g., streets that are avoided by cyclists). Tracking data are fed to policy makers in order to make evidence-based decisions on infrastructure and other policy measures (e.g., better infrastructure and other measures to encourage for cycling/walking)
   a. Outcome: Behaviour change on the mid-long term (i.e., better policy by learning what users need to safely and comfortably cycle and walk in a city)
   b. Method: **Getting as much information as possible from as much users as possible** → campaign efforts focus on **app downloads** and **participation rate** by all relevant users
3. **Indirect pathway 2:** Tracking for **learning and evaluating other initiatives** such as another behaviour change campaign or changes to the built environment
   a. Outcome: Behaviour change on the long-term (i.e., by thoroughly evaluating behaviour change initiatives. It is possible to make other behaviour change initiatives better).
   b. Method: Before/during/after the behaviour change initiative/infrastructural change, **planners may use mobility tracking to measure how mobility behaviour has changed.** Ideally, they should compare the behaviour of the target group with a control group that is not exposed to the initiative.

Visualisation of the three pathways for using tracking apps to change travel behaviour

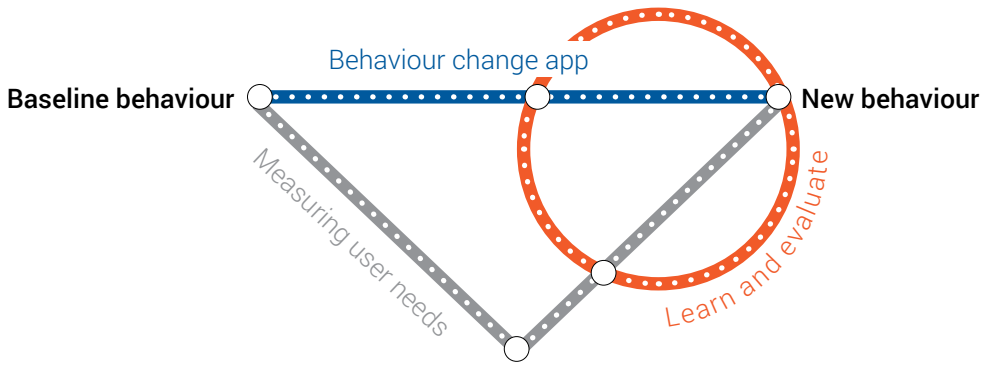


Figure 3 – Visualisation of the three pathways for using tracking apps to change

Your tracking campaign

It is important to choose the pathway you want to take **before** the project, based on your objective:

A. **Measuring user needs:** To learn about user needs, you need to measure **typical** mobility behaviour instead of those exceptional trips in which users take a bike to cycle 7.5 km to work because of **car free day**. For this reason, it is difficult to combine tracking for user needs (Indirect pathway 1) with tracking in a behaviour change app (Direct pathway). As soon as users install a behaviour change app, they start to change their behaviour and there is no way to discriminate typical behaviour from potential (new) behaviour.

B. **Using tracking for learning and evaluation** (Indirect pathway 2) requires a design in which the tracking is initiated **before** the behaviour change initiative. Hence for learning and evaluation, the tracking part needs to be separated from the behaviour change campaign. For instance, the TSG trackers could be used to measure the effect of the new sidewalk that will be installed at one of our TRACE schools. By measuring home-school travels before, during and after the sidewalk installation its effect on the home-school travels can be evaluated.

To sum up, the more a tracking app is good at changing travel behaviour (i.e., suitable for behaviour change via the direct pathway), the less the tracking app is suitable for measuring user needs or for learning and evaluation (i.e., suitable for the implementation in the two indirect pathways).

Example: TRACE TSG campaign
– why the organisers chose Indirect pathway 1 instead of the direct pathway

1. **Stakeholder consultation**

For TSG, all schools wanted to start a dialogue with the city about the traffic situation in the school environment. Hence it was clear that stakeholders wanted to use tracking to understand user needs and make those needs visible for their city.

2. **Target group**

For schools, behaviour change campaigns (as well as other projects you want to deploy at a primary school) cannot get too complicated. Tracking children complicates a campaign to a large degree because you need the consent of the parent before you can track a child. Hence the cost-benefit analysis for using tracking in a behaviour change campaign (Direct pathway) is not positive: the additional administrative burden of getting parent consent and making sure to distribute the trackers to the children of which you have consent does not justify the benefit of a better campaign when adding tracking. The TSG campaign works just fine without the tracking. Fraud (i.e., people that claim they have been cycling but actually they drove a car) is not a huge concern for schools and therefore it is fine for the TSG campaign to rely on self-report. The only reason why schools were interested in going through all this effort is because they wanted to use the data: in this case, setting up a tracking campaign is considered worth.

STEP 1: SETTING OBJECTIVES AND IDENTIFYING TARGET GROUP(S)

The main task in Step 1 is to determine the objectives of the campaign. This includes determining the final aim of the campaign (e.g., 5% modal shift towards cycling and walking) and intermediary or process objectives (e.g., number of people that should use the tracking tool accompanying the campaign). Objectives may differ for the different target groups envisioned within the broader campaign. Hence the step of identifying target groups cannot be separated from the step of setting objectives. The main questions at this point are:

- What is (/are) your target group(s)? (e.g., employers, schools)
- What kind of change in travel behaviour is desired?
- Do you have specific objectives for each target group?
- How many people do you want to reach?
- What is the role of tracking in the campaign?
- Will your campaign stand alone or be embedded in a larger project?

Important: *if the campaign is part of a wider cycling policy, then the objectives need to be related to the core objectives of the national or regional cycling policy.*

STEP 2: CAMPAIGNING THE CAMPAIGN: STAKEHOLDER SUPPORT

Step 2 highlights the need to generate (political) support for a campaign and, in parallel, to develop strong links with the stakeholders and communities one wishes to collaborate with during the campaign. It is important to determine who benefits from the campaign (and also who might not benefit) and why.

Table 2 - Overview of stakeholders and their respective targets

Stakeholder group	Intermediary targets	Global Targets
Local authorities	- Increase modal share of cycling and walking	- Increase liveability in municipality
Local businesses	- Increase customer satisfaction - Increase number of customers - Increase brand awareness - Social Responsibility Image - Increase accessibility of the business	- Increase profit - Create value
Schools	- Decrease car traffic around the school - Increase adherence to traffic rules around the school - Increase awareness of pupils about sustainable mobility	- Increase traffic safety around the school
Marketing professionals	- Increase brand awareness - Social Responsibility Image	- Increase profit for client
Insurance companies	- Healthy customers - Social Responsibility Image - Increase brand awareness	- Increase profit
Companies/ Employers	- Increase employee satisfaction - Reduce time loss in traffic	- Increase profit - Create value

Table 2 provides an overview of possible stakeholder groups and their respective targets. Note that, although the benefits for stakeholders may be crystal clear in the eyes of the campaigner, the stakeholder might be reluctant to cooperate with the campaign if they do not see the benefits themselves. The objectives of the campaign are therefore preferably determined in **close collaboration with specific stakeholders.** Questions at this point are:

- Who are the stakeholders of this campaign?
- What are the objectives of your stakeholder groups?
- What are stakeholders willing to contribute to the campaign?
- What are the expectations of stakeholders towards a tracking tool?
- When would you like to involve the stakeholders?

Important: *within a tracking-based behaviour change campaign, local authorities are likely to be relevant stakeholders, both in terms of active campaigning and in benefiting from the tracking data.*

STEP 3: DETERMINE A STRATEGY TO CHANGE TRAVEL BEHAVIOUR

After determining the objectives of the campaign (Step 1) together with the relevant stakeholders (Step 2), the next step is to determine the strategy to change travel behaviour. A short list of scientifically validated principles that can be used to change travel behaviour is presented below. The best shot at changing travel behaviour is combining these principles[5]:

1. Exposure to bikes and/or people that cycle/walk ('Mere exposure' and 'Observational learning')
2. Administer rewards and/or punishments ('Operant conditioning')
3. Associate cycling and walking with positive words and pictures ('Classical conditioning')
4. Use persuasive messages brought by persuasive people (i.e., attractive people, liked people, experts, authorities)
5. Measure who is ready for change ('Stages of change' models)
6. Increase the intrinsic motivation to cycle/walk ('Self-determination' theory)
7. Change social norms (Theory of 'planned behaviour')
8. Eliminate uncertainty: Formulate a clear call-to-action
9. Experiment with the infrastructure or environment

For tracking-based campaigns, one needs to additionally determine whether the tracking tool can support the behaviour change strategy.[6]

[5] For detailed information on how to implement these principles and examples of existing behaviour change campaigns that have implemented them, refer to TRACE Deliverable 2.1 (D2.1) - Assessment of the potential and conditions for use in behaviour change initiatives

[6] Section 5 of D2.1 details on how this can be done in a variety of ways

STEP 4: BASELINE MEASUREMENT (AND SEGMENTATION) OF THE TARGET GROUP

Most campaigns use some form of baseline measurement of travel behaviour. An initial assessment of the **current travel behaviour of the target group** is typically based on one of the following information sources:

- **Existing data** (e.g., an employer has data on the home-work travels of employees, a city has data on modal split or event tracking data)
- **Stakeholder consultation** (e.g., a school estimates that 90% of the children come to school by car and reports on traffic safety issues)
- **Observations** (e.g., a city's mobility officer observes a traffic jam every Saturday to a shopping mall just outside the city)

The travel behaviour of the target group can be measured more in detail using surveys (face-to-face, by telephone, or online) or pre-existing tracking data. **Clear data on the current travel behaviour of the target audience is necessary to evaluate the effectiveness of the campaign** (see also section 3.3). Hence, when no existing data on travel behaviour are available, developing a strategy to obtain reliable data before the start of the behaviour change campaign is crucial. It may be noted that since measuring travel behaviour can be time-consuming, especially when aiming for a representative sample of the target population, many campaigners do not invest heavily in measurements at the start of the campaign. For those campaigns it is typically unclear whether the travel behaviour has actually changed or not.

To influence the behaviour of one or several target group(s), one needs to understand their travel behaviour, aspirations, values, and constraints. Hence, many campaigns invest in some kind of assessment of the **characteristics of the target group.** This assessment aims to answer the following questions:

- What are the characteristics of the target group (e.g. age, sex, education, vehicle ownership, etc.)?
- Is behaviour change possible for this target group?
- Is the target group willing to participate in the campaign?
- Is the target group willing to change?
- What are the norms and values of the target group?
- What is the life stage of the target group? Did it recently change?
- Where is it possible to find the target group?
- Who are influential persons for the target group (e.g., celebrities, authority figures)?
- What is the technical background / ownership rate of a smartphone (with data, Bluetooth, specific operating system) of your target

STEP 5: DEFINE MESSAGE, COMMUNICATION CHANNELS, COMMUNICATION TOOLS/MATERIALS

Communication efforts should take into account:

- The selected objectives
- The selected target group(s)
- The selected behaviour change strategy
- The tracking tool and its technical aspects

The communication plan should consist of a clear script, including separate scripts for the different target groups when applicable[7] .

[7] More detail on how to set up a communication plan can be found in TRACE deliverable 2.2 - Guidelines for campaign design using tracking services

STEP 6: CHOOSE OR DESIGN THE TRACKING TOOL

The tracking tool includes all hardware and software for (a) tracking users and (b) providing stakeholders with insightful mobility data. It includes the calculations required to turn the tracked data into interpretable numbers or visualisations. The choice or the design of the tracking tool will strongly depend on (a) the role of tracking within the campaign and (b) the stakeholders that will be involved in the campaign and their expectations about the tracking tool. Important decisions at this point are:

- **Multi- vs. unimodal tracking**

Unimodal tracking involves tracking one mode of transportation only. This is typically the case when the tracking device is attached to a vehicle (e.g., a GPS in a car or bike), but several mobile phone applications are also tailored to track one travel mode (e.g., Biklio, but also Love to Ride, Bicycle Counting app). Multimodal tracking involves tracking various modes of transportation. Table 3 details on the pros and cons of each choice.

Table 3 - Advantage and disadvantage of unimodal vs. multimodal tracking

Unimodal tracking e.g., step counter, cycling application, car GPS	(Full) multimodal tracking e.g., multimodal smartphone tracking application
- • Only some individuals can use it • Partial information on travel movements of a user / area • Low potential to change modal choice	+ • All/most individuals can use it • Complete information on travel movements of a user • High potential to change modal choice
+ • Simple architecture • Lower cost	- • Potentially technical issues with determining modal choice , if it is not declared by the user (passive multimodal tracking) • Higher cost

- **Tool focused on mobility behaviour or keep track of green/health behaviour in general**

Mobility tracking can be part of a larger narrative of stimulating healthy or green behaviour or it can stand alone. When other behaviour is involved, the application will typically require other functionality than merely mobility tracking (e.g., a barcode scanner to determine how "green" the products that you buy are).

- **Other functionality to be included in the tool**

All required functionality needs to be defined at this point. Examples are user input that needs to be collected using a questionnaire or map, feedback screens that are essential for the campaign, etc.

The following sections describe the building blocks of a tracking tool that can be used in a behaviour change campaign. The design of a specific tool will always entail selecting and combining these building blocks. For instance, a tracking tool for children playing TSG will include different building blocks than a tracking tool for adults in the Positive Drive campaign.

STEP 7: TEST TOOL & CAMPAIGN AND ADAPT

A **demo-campaign** and a **demo-version** of the tracking tool is tested in this phase. Note that the branding of the campaign and the usability of the tool should already have been tested in Step 5 and 6. In this step, the campaign design is fine-tuned in all its aspects: how materials are used, how the helpdesk works, how the message is perceived, etc. When done properly, this test phase will strengthen the actual campaign and the tracking tool.

STEP 8: DELIVERING THE TOOL AND CAMPAIGN

When the demo tools and campaigns have been tested and closely scrutinised, the **actual campaign** can start. At the end of Step 7 or at the beginning of Step 8, stakeholder support for the final tool and campaign should be ensured before you start.

At this point, ensure that the (TRACE) helpdesk, website – with a FAQ page – and back end for campaigners are up and running properly, to make sure you can monitor and change both the tool and the campaign where needed (see also Step 9).

As mentioned in Step 5, a press conference for the **launch of the campaign** can be organised. This launch event can be the first step in recruiting users. If there are already active users of the tool (more than just a test group), one should think whether a launch event is still appropriate. This should be specified in the communication plan in Step 5.

STEP 9 AND 10: MONITOR, EVALUATE, ADAPT AND DOCUMENT THE CAMPAIGN

During the three stages of the campaign, the overall work should be **thoroughly documented** and archived. This could be in the form of quantitative 'hard data' (e.g., user ratings), or in the form of qualitative data such as helpdesk questions or written feedback on the Play Store, Apple Store, or Windows store. Internal and external communication can also be documented (e.g., meeting journals, mailings, deliverables). For more detail on the evaluation of the campaign, refer to section 3.3.

STEP 11: POST-CAMPAIGN ACTIVITIES

After the campaign, the information collected in Step 9 should be evaluated. This step is key to understanding why and how the campaign has been successful or has failed. The evaluation should involve both the impact on travel behaviour as well as the process or intermediate goals that have been defined. These **post-campaign evaluation activities may concern the surveys, the tracking data and other data collection strategies.**

STEP 12: THE CAMPAIGN AND TOOL LEGACY - EXTENSION OR NEW CAMPAIGN

After all the hard work in Steps 1 to 11, it is recommended to think about a follow-up on the campaign. Step 12 is therefore **developing a strategy for creating a legacy beyond the project**, securing the chances of having the (TRACE) tools taken up by important target groups and having a long-lasting impact. Within TRACE, for instance, the TSG campaign has become part of several small and local campaigns in which tracking is used for home-to-school traffic plans. The evaluation activities of Step 9 to 11 provide ample inspiration for rethinking and renewing the campaign for future use.

A second way in which the campaign or tool can leave a legacy is by instigating **novel collaborations and partnerships.** For example, imagine that several local businesses have come into contact with local authorities during the Biklio focus groups or campaign. New ideas and networks can be formed that potentially fuel new initiatives on their own.

A third way in which the campaign can have a legacy is in the form of **dissemination, lectures, or papers** communicating about the campaign and its results to the community. This communication could concern the direct effects of the campaign (e.g., has the modal share of bicyclists increased?), the indirect effects of the campaign (e.g., several companies have adopted a new bicycle plan), or the campaign process (e.g., dissemination activities). For example, stakeholders could read about the TRACE tools in a **newsletter** and become interested to develop a behaviour change campaign on their own. All communication activities may bring about new ideas that may fuel new behaviour change campaigns.

3.2. Tips from our TRACE experience

CAMPAIGN PREPARATION AND ANTICIPATION

Defining the campaign **objectives** and identifying **the target group** (e.g. based on mode use, age, work type or location etc.), identifying **potential partners**, contact persons among the partners' institutions and organising information sessions for partners: these are all examples of time-consuming tasks that should not be neglected to achieve good results. Try outs or **pilots** are a good way to prevent failures and fine-tune the processes.

TIMING AND DURATION

When deciding the timing of a campaign, it is important **not to compete with other similar campaigns.** If there are existing campaigns, it could be good to consider merging the initiatives.

Some lessons can also be learned regarding the **duration of the campaign**. The implementation of the Biklio campaign in Plovdiv lasted four days, which very short considering the preparation time. Even in Luxembourg, however, where the campaign lasted two months, there were also some complaints regarding the short duration of the campaign.

Once the preparation and organisation work have been done and the campaign is beginning to run smoothly, the biggest part of the work is done. Consequently, the minimum running time should be at least four weeks, and the maximum should be around two or three months, to avoid user and partners' fatigue. However, there is **no consistent interpretation regarding the ideal duration of a campaign**, which is very tool and

user-related: some partners, interested in tracking the movement of citizens and using the related data to improve infrastructure, argue that a longer period is necessary to have a reliable and significant set of data.

COMMUNICATION AND MARKETING

The communication and marketing of the campaign and the tool need to be tailored to the audience and the objectives of the campaign. A **multi-channel** approach is to be preferred. Relying on social media only is probably not sufficient. In some TRACE cities, a simple **face-to-face discussion** was very efficient. Yet the possibility for participants to **share achievement or activity on social media** is of added value for both the dissemination and as an incentive for the participants.

Example of Bologna: the success of the infopoint at the cinemas

The implementation of the Biklio concept in Bologna has been done through the campaign called "Biklio – Al cinema in bicicletta!" ("Biklio – Let's ride to cinema!"). The Biklio App in the pilot case of Bologna has been focussed in connecting cyclists with the cinemas, that rewarded their customers who reach them cycling (i.e., discounts on the price of tickets).

Other shops (e.g., bars, pubs, restaurants) have been involved, preferably in the nearby of the participating cinemas, in order to increase (in number and variety) the benefits available for people using the Biklio app, then making the campaign more appealing for more potential end-users.

In terms of communication, while the effort has been really intense (Facebook, twitter, local media, public events) and sometimes costly, it seems that the info point arranged within the cinema was the most successful. This indicates that, in Bologna, face-to-face communication is more efficient than any other (sometimes-costly) alternative channel. The focus on the trip to go to the cinema is specific and targeted but it seems that queues for buying cinema tickets were an ideal place to discuss with potential Biklio app users. On the other hand, social media (and Facebook especially), represented a suitable channel to collect some feedback and impressions by participants.

USER EXPERIENCE

While the adherence of people and even the media to initiatives based on incentives for active mobility are rather positive, and in some cases there is a reasonably impressive number of people downloading the applications, the engagement of users throughout the lifetime of the initiative may be considered low. **Users forget about the application**, or do not find the value it provides high enough to keep them engaged. There are several dimensions to this issue.

One of those dimensions is user experience. In the app market, apps are either helping the user address a particular issue, so then s/he will keep using it anyway; but if the app is promoting a more intangible value, it must be very simple and intuitive to use, otherwise users will be discouraged and will stop using the app soon. While engaging users in a rewards and information scheme may prove effective, it can only work if the user experience of the app, and the gaming dimension if envisaged, are well designed. TRACE

literature review and pilots show that a strong and compelling narrative can help to on-board users. For example, in Routecoach[8] most users indicated they participated in the campaign because they wanted to share their data with policy makers in order to change policies in their favour.

ADDING VALUE FOR USERS

The way to build better, valuable incentive-based applications to users may not solely pass by focusing on the benefit and gaming scheme alone. It may also offer **valuable features to users**, that help them overcome barriers to cycling. Many users adhere for the first time to such an app dedicated to active commuters, and this may be also a hook to show users that apps can also provide **options to help active travellers improve their travel conditions**, in terms of infrastructure and services. For cycling in particular, apps can, beyond offering benefits, help the user choose the best path, deal with the weather uncertainty, or supply information about relevant local services for the user. Another possibility is to **integrate the benefits system with other systems**, like bike sharing systems for example. Like in other areas, integration may be a key to engagement.

Additional features could be therefore included in tracking campaigns, to improve the added value offered and keep users engaged:

- **Integration with additional services:** the most successful apps will not just track and reward good behaviour, additional services will convince people to download an app (e.g., MaaS[9] -app in which you can buy different services).
- **Proper citizen science and co-creation**: adding the possibility to provide in-app feedback on the travelled routes increases engagement of users[10]

.INCENTIVE AND REWARD

Another critical aspect for an effective and long-term engagement is the value of the benefits offered to the users. Unless there is public funding available (or the government promotes rewarding cyclists with fiscal benefits, such as in Belgium where employers pay employees up to 22 cents per kilometre to cycle to work), the **scheme of benefits involving local stakeholders must be strong enough** to gather a sufficiently attractive benefit system. Supermarket loyalty cards are successful because they offer real benefits to users. Sustainable mobility reward schemes must do the same if they are to cause a significant impact. Scaling this network of benefits seems to be possible, but requires some investment and a proper value proposition to connected businesses.

The reward given to the participants need to be in line with the campaign objectives. Prizes shall be of value high enough to trigger the initial use of the app. **A prize should rather be given when people actually use the app rather than when they download it**: this can help discourage the undesired attitude of some users, who downloaded the app to get the reward but never used it afterwards. A lottery can be an option as it allows for very attractive prizes, although organisers must take into account the national legislation on games of chance, which can restrict the use of such an incentive. It is important to consider that **rewards and prizes are good for short-term extrinsic motivation** (to download the app or to track users' first route). As mentioned above, users need a compelling narrative or strong agreement with the purpose of the app to trigger their intrinsic motivation to keep using the app for a longer period of time.

The campaign shall be designed as a win-win project. For the local authority, the participants but also for the potential partners (schools, local shops etc.).

PARTNERS

Concerning the local shops and their characteristics, some cautions can also be taken to avoid time loss during the campaigns. **Local brands** rather than big multinational stores should be favoured. Communication will be easier and the impact

[8] http://www.routecoach.be/

[9] "MaaS, short for Mobility as a Service, brings all means of travel together. It combines options from different transport providers into a single mobile service, removing the hassle of planning and one-off payments" (from https://maas.global/).

[10] http://pingifyoucare.brussels

on the local community will be more visible. The type of shop taking part in the campaign is very important. An organic local food shop is certainly better, in terms of 'sustainability image', than a company providing taxi services.

When starting to work with new partners, reaching the **appropriate contact** within an institution or corporation is essential. The motivation of one person can make a real difference. Thus, it is an asset to build on an existing community or network.

DATA & PRIVACY

Access to data: during the campaign, the availability of the data of the participants is an important element of motivation for the local partners, i.e. the ones providing discounts or services. But data shall also be available to campaign managers, to adapt the communications or the incentives for instance.

An important issue within all apps is the **accuracy of data** and the **stability of the app**. This seems to be an issue that will determine in an extensive way if users will keep on using the app.

Data privacy requirements need to be taken into account. The recent **General Data Protection Regulation** (GDPR)[11], which was not yet defined when TRACE started, places new responsibilities and challenges on the way tracking-based applications need to be programmed. This requires a clear understanding of the GDPR and its consequences on the functionalities of tracking-based applications. Furthermore, the GDPR requires new features, such as the right for a user to request that its data are erased.

3.3. Evaluating your tracking campaign and use of tools

Monitoring and evaluation of results is an essential part of the campaign. TRACE evaluated the organisation, implementation and impact of its 17 campaigns. This section provides an overview of the methodology used in TRACE, readapted to provide guidelines for future tracking campaigns by other organisations.

The first step is to set up the evaluation framework, i.e. defining the goal and objectives of the campaign, formulating the evaluation questions, choosing appropriate methods for data collection and analysis and writing up the evaluation plan (what, who and when).

The evaluation in TRACE assessed the **potential of the tracking applications to improve the effectiveness of behaviour change campaigns**. It further aimed at identifying ICT challenges, how they can be overcome and further need for innovative solutions in order to make full use of the new technologies for promoting active modes of transport. Moreover, TRACE evaluated the **usability of tracking data for urban planning**. While car flow movements are already well known due to a wide availability of planning resources, better information on cycling and walking and a clear identification and quantification of constraints and their negative effects could contribute to a shift in priorities towards cycling and walking and to an enhancement of the related decisions and their effectiveness. This would, over time, result in more convenient conditions for cycling and walking, and ultimately an increase in numbers of cyclists and pedestrians (see section 2). The results of the TRACE evaluation are available in TRACE Deliverable 7.2 (D7.2) - Evaluation report

[11] https://ec.europa.eu/info/law/law-topic/data-protection/data-protection-eu_en

GENERAL EVALUATION DESIGN[12]

Planning the evaluation scheme starts early and ideally with sufficient financial and personnel resources. The framework defines the objective(s) of the campaign or use of tools, which automatically lead to defining suitable indicators and data collection methods to measure the impact. Various evaluation methods can be applied, suitable for the respective object to be evaluated (app, campaign, data processing etc.) and the data collection method chosen (surveys, interviews, focus groups etc.).

Example of evaluation questions for general tracking campaigns

Here we provide some examples of evaluation questions as they would be likely for a general tracking campaign:

1. In what way has the campaign influenced the mobility behaviour of the participants?
2. How satisfied were the users with the mobile app?
3. What impact did the campaign have towards achieving our objectives?

The evaluation approach in TRACE was **both quantitative and qualitative**. The evaluation of the pilot applications and campaigns should look at their implementation and possible multifaceted impacts (on performance, behaviour change, urban planning etc.). In TRACE, the sources for the evaluation were **quantitative online surveys** conducted after the campaigns with users of the apps and stakeholders of the individual campaigns. In relation to tracking movements, there are usually the **back-end data** to be analysed and to be taken into account too. In addition, **focus groups or interviews** serve to collect quantitative data.

DESCRIPTION OF EVALUATION ELEMENTS

Evaluation elements are the **means of data collection** being applied within the evaluation activities. These are:

- Surveys (online/hands-up) for different target groups (end users/stakeholders)
- Focus groups & stakeholder interviews
- Context data
- Back-end data

In the following section these means of data collection are described.

Surveys

Users of the mobile apps such as Biklio and Positive Drive should provide their e-mail address during the registration process. After the campaign, they are contacted by e-mail and invited to fill in an online questionnaire. In this you can ask them about their **mobility behaviour as well as their experience with the app** and the campaign in general. In addition, they can be asked for some **socio-demographic information** in order to categorise the users by gender, age or professional occupation.

The local evaluation strategy should aim at **receiving feedback from users and stakeholders**

[12] Further reading: CIVITAS HAndbook on evaluation. Dziekan et al. (2013), Evaluation matters. A practitioners' guide to sound evaluation for urban mobility measures. Available at: http://civitas.eu/sites/default/files/Evaluation_Matters.pdf

that provides a balanced view of the experiences and impacts (e.g. avoiding that only the very happy users respond, or very unhappy users express their opinions). It is up to each campaign manager to make use of tailored incentives to increase the response rate.

There is no online user survey for the Traffic Snake Game Tracker. Information on mobility behaviour will be collected through a **hands-up survey in class**. For more in-depth information, parents (as users) can be involved in the focus group discussions or be interviewed (see below).

The stakeholders involved in the various local campaigns are an important source of information regarding the acceptance of the apps and the satisfaction with the campaigns. Therefore, **online surveys should be conducted with the stakeholders too**, asking them about their motives for participation, their original aim and whether their targets have been met.

With regards to **privacy issues**, the local partners are advised to check the respective national legislation and the GDPR on potentially limiting regulations for using e-mail addresses of users to send them an invitation for a research survey (e.g. if an explicit user agreement is needed, such as a double opt-in procedure).

Focus groups & stakeholder interviews

A **focus group** is a group interview which intends to collect the opinions and reactions of a group of people on a certain topic or product. Focus groups are a primary format for qualitative research and evaluation. In TRACE, this was applied to better understand the acceptability of the TRACE products (Biklio, Positive Drive and Traffic Snake Game Tracker), the stakeholders' willingness to support the campaigns, their opinions and suggestions about the exploitation and business potential of the apps and their expectations, especially by addressing specific issues that are difficult to cover by questionnaires.

The disadvantage of focus groups is that they are difficult to arrange. For this reason, it could be more convenient to shift towards **stakeholder interviews**. Interviews are costly, since they are being done in a one-by-one situation and should ideally be recorded and transcribed, but they can be carried out on the phone.

Focus groups can be set up for ex ante evaluation and to support the development of the apps and campaigns. After the campaign is over, focus groups should be set up again where possible, and come together to jointly discuss the campaign and the experience with the apps. Focus groups should be made up of stakeholders of the campaigns (shop owner/sponsors, teachers, parents, city staff etc.) and should not be larger than 6-10 persons.

Context data

Local partners are asked to consider and collect some context data on the setting and circumstances of the campaign, such as real-world constraints and individual characteristics of the sites. These are important pieces of information to consider, since they may be critical influencing factors for the success of the pilots.

Back-end data

In addition to the surveys and focus groups, back-end data should be collected through the apps. They deliver information about the users and their movements, enabling calculations and the drawing of conclusions on mobility behaviour.

ROADMAP TO SETTING UP A CAMPAIGN

Four months before the start of the campaign

- Identify/define high-level and campaign-specific objectives
- Identify/define achievable/measurable objectives at campaign level
- Reflect on cause-and-effect relations
- Select relevant indicators
- Select/formulate relevant questions for the questionnaire (user survey)
- Select/formulate relevant questions for the questionnaire (stakeholder survey)
- Set a time for the online survey
- Think about incentives for users for taking part in the survey, to improve the return rate.
- Keep track of your interaction with stakeholders – you will be asked to describe the process later for the process evaluation

After start of campaign

- Continue to promote the campaign to (hopefully) get a bigger sample

After the end of the campaign

- Carry out the online survey
- Carry out the focus group interviews or individual stakeholder interviews
- Prepare the process evaluation, i.e. what went well and what did not and why.

RISKS TO THE EVALUATION AND REMEDIAL MEASURES

In evaluation, theory and practice and practice do not always coincide. The definition of an evaluation plan can deviate considerably from its implementation. Although this is a recurring issue and it does not represent a crucial limitation, it is important to identify and anticipate potential risks and put in place remedial measures to mitigate the undesired effects of such a deviation, in order to still receive sound evaluation results at the end.

Two remedial measures are:

1. Making the evaluation plan a living document that allows to make changes.
2. Having a mixture of quantitative and qualitative data in order to back up one with the other.

If any kind of deviation occurs, it is a good idea to at least define a minimal set of indicators you want to measure.

Finally, campaign managers should consider that evaluation is not about measuring success, but about learning from failure and improving.

4

Using TAToo to analyse your tracked data

In TRACE, 17 campaigns have been run, using one or more of the mobile apps and tools developed during the project (Biklio, Positive Drive, Traffic Snake Game). The datasets collected by Biklio and Positive Drive have been used to test the Tracking Analysis Tool **TAToo,** developed in the TRACE project. The creation of the TAToo tool is a fundamental part of the project, since it relies on the data generated from the different campaigns and transforms them into useful information.

Using TAToo to analyse your tracked data

This section illustrates the innovative features of TAToo, which can be used by local planners and decision makers to support better informed planning and decision-making processes based on the analysis of mobility tracking data. For more information and to access the tool, it is possible to consult the TRACE website[13].

Several mobile applications are generating data on cycling and walking movements in urban areas. These data can be valuable to urban planners and policy makers if they are translated into useful indicators and analyses on issues like the characterisation of demand, the performance of the mobility system or users' preferences. TAToo applies tracking data from any compatible source to produce indicators, visualizations and analyses.

TAToo is the first tool claiming to allow an independent use by any interested party: all data runs necessary to obtain the output datasets can be carried out **independently of the tool owner providing data**. Coupled with GIS analysis capabilities, GPS data and its derived indicators have shown the possibility to answer very concrete questions related to urban mobility-related infrastructure performance and needs. As an **interoperable and multi-purpose information tool**, it can be coupled with any existing commercial or open source transport planning and/or GIS tool.

The TAToo tool is targeted at mobility planners and decision makers who want to understand better what is the cycling and walking demand and what is the performance of the existing infrastructure. TAToo builds **indicators**, like flow volumes, speed, waiting time and level of service, **in the elements of the mobility network** - links, nodes and zones – and in the origin-destination (OD) pairs. It is able to use an OpenStreetMap - thus not being necessary to have a specific map of the city - and delivers output data that can be visualised in GIS tools. It also calculates other general indicators and rankings that support in the analysis and prioritization of interventions in the infrastructure or on improving communication to mobility users.

The analytical potential of indicators may be extended by crossing them with other indicators in a GIS workspace. Some non-exhaustive examples of analyses applying TAToo tool indicators with other data are given below.

Unrealised latent demand

If existing early demand is an indicator of the demand growth potential in a given area, a low demand may also mean that there is an unrealised potential if there the local land use conditions suggest that the demand could be higher than observed. For example, two residential city zones with a similar population and similar distance to the working activity central area of the city would have a similar latent potential for walking or cycling. If the TAToo indicators reveal that one of the residential zones has a lower number of walking or cycling trips to the centre, this may mean that there is unrealised potential. The explanation for this unrealised potential could be poor infrastructure, which would call for an intervention to improve the quality of the infrastructure, or other reasons like high quality of alternative mode connections.

The Unrealised potential indicator could be obtained by the difference between observed demand in the zone and the demand that would be estimated for the zone based on aggregate demand behaviour, considering the residential or working population of the zone and the distances of that zone to other zones.

Influence of quality infrastructure

By crossing the information on volumes and speeds provided by TAToo with the location of bicycle friendly links, it is possible to assess the impact of the presence of such bicycle friendly infrastructure on demand. The same applies to pedestrian links which provide better comparable conditions in relation to the rest of the network.

Influence of land use

This indicator estimates to what extent land use, and the related motives of travel, influence different modes' adoption. This influence may be assessed

[13] http://h2020-trace.eu/trace-tools/tatoo-tracking-for-planning-tool/

by crossing information of multimodal volumes with land use information. For instance, how is cycling adoption influenced if the destination zone is a commercial area, or a university? To control for the total amount of trips, this analysis could include the consideration of full OD matrices.

Type of users and behaviour

Data on type of users does not actually need to be obtained externally, but can be incorporated in TAToo through the trajectory data. For different user segments, specific user behaviour could consider age, gender, occupation or any other characteristics for which there is availability of information from the original trajectories. Different user groups could have different behaviour in elements like trip distance, speed, time of day of trips (related to trip purpose), origin and destination, and route choice.

Absolute flow volumes

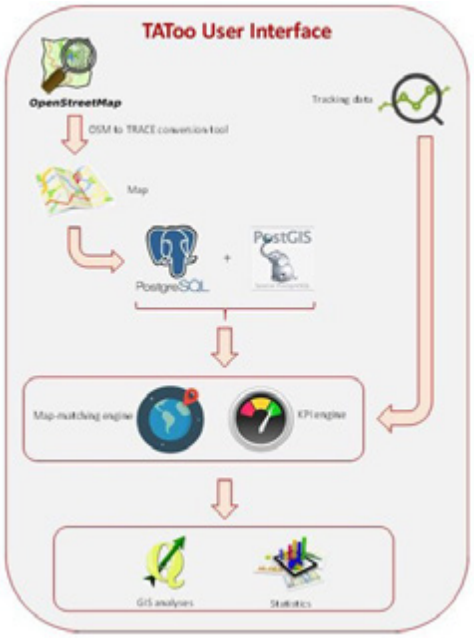
Since TAToo does not have data from the whole population of users - but only of those who actually record and supply data of their trips - it does not provide information about the absolute numbers of trips. However, as long as the sample is representative enough, it can be assumed that it gives accurate relative volumes between links, between week days and between day schedules. Crossing this information with available data on countings of the absolute number of trips in specific links (through local counting devices or actions) makes possible to extrapolate the absolute number of trips in all elements of the network for which the TAToo sample is representative.

Density of users

Density of users is an important indicator for the level of service as perceived by users, both pedestrians and cyclists. Density is given by the space available to each user by dividing the amount of space by the number of users. For links for which there is data about the available space (e.g. sidewalk width), and considering absolute volumes (that can be obtained in the way described above), it is possible to calculate density in the links.

Influence of specific infrastructure features (traffic lights, parking racks, ...)

Infrastructural elements (like traffic lights or parking racks) not only have an influence on travel time, but also have known psychological effects on the perceived attractiveness of the path to users. Crossing data on the presence of traffic lights and the volumes of users in concurrent paths is another possible analysis.



5

Stories from the TRACE pilot sites

This section presents all the campaigns organised and implemented by the eight pilot sites of TRACE, based on the Guidelines presented in section 3. Each of them presents the activities as they have been declined in the project taking into account the local context, the difficulties encountered, the results, and some considerations useful to elaborate the recommendations to set up more effective campaigns and make the most of the tracking element's potential.

5.1. Traffic Snake Game

ÁGUEDA

In June 2017, 180 children from 4 schools participated in the digital version of the Traffic Snake Game. This project has been implemented in Portugal, in its traditional version, since 2014. This was the first time the Traffic Snake Boxes tracked the routes and means of transport used by the participating students using GPS technology.

Information about the project was distributed among parents and teachers from the classes and schools involved. All students were enthusiastic to partake in the project. However, the number of parent content letters received was around 65% of the total number of students.

The Municipality of Águeda took advantage of the opportunity provided by the game, a gamification of reality, to highlight the importance of sustainable mobility for the quality of life of the inhabitants of the municipality. Interventions with participating classes have been made to change negative perceptions about cycling so that it is valued as a valid and desirable means of transport for short distances.

In the scope of the game, the association "Os Pioneiros" promoted making the journey between the institution and school on foot. This journey, which is usually made by bus, allowed the organisers to take approximately 40 children between the ages of 6 and 11 years, as well as the users of after-school care, on an adventure of discovery in their own village under the vigilant eye of the "Safe School" police force. The children and supporting staff involved offered a very positive evaluation. It was possible to locate the more problematic points in the walk, to improve the route, to recognise existing difficulties, with the perspective of continuing to perform these actions, not only to reduce emissions, but also to assist the health and well-being of each one of the participants.

There is still lot of work to do in this matter, yet the message shone through: walking is easy, biking is fun and everyone wins with active mobility!

BELGRADE

More than 500 pupils in Belgrade played with "Gruja-Saobraćajna Guja", the Serbian version of the Traffic Snake Game managed by Faculty of Transport and Traffic Engineering (FTTE) and coordinated by Mobiel 21. Traffic Snake Game Pilot took place in four Belgrade schools from 13th till 24th of November 2017. The implementation of the Traffic Snake Game pilot in Belgrade was generally very successful. After some initial difficulties, the

pupils and the teachers welcomed and carried on the initiative with enthusiasm.

In each school, a local coordinator from FTTE team was appointed to manage all the activities. During the two weeks of the campaign, children were rewarded several times with symbolic prizes. After the campaign, some celebrations took place in all schools. The final ceremony of the completion of the campaign was held in one of participating schools, in the attendance of the headmasters and teachers of all participating schools and pupils.

The behaviour change campaign was explicitly appreciated. After initial problems were overcome, the tracking campaign was accepted as well. The positive results obtained during the campaign were substantially confirmed by the survey made after the campaign. Sustainable modalities all together increased by 18%, passing from the 69% registered before the campaign to the 88% during the campaign. Walking modality increased most significantly in all schools, during and after the campaign. Car use registered before the campaign decreased in all schools during the campaign and after the campaign. Splitting the sustainable modalities, data shows that the heavier reduction of cars was largely captured by the walking modality. Significant use of public transport mode was noticed in suburban school (33%). Cycling is registered in a significant percentage only in one school (about 7%), while in other schools there is negligible participation of these movements (below 1%).

BOLOGNA

More than 700 pupils in Bologna are playing "Annibale, il Serpente Sostenibile", the Italian version of the Traffic Snake Game. They learned that their choices have an impact on the environment. Pupils are committed to the campaign, and comments such as the one below from a 7-year-old participant capture the spirit of the game:

"Then I'll get up and have breakfast in a hurry, so my dad can take me to school by bicycle!"

The purpose of the campaign was to encourage pupils to walk a part of their journey to school or to travel by bicycle. This helps children be more careful about the environment around them, do healthy physical activity, be smarter and more focused at school. Overall, such behaviour help the city be more sustainable.

With the aim of increasing the awareness of children and their parents about sustainable mobility, SRM has implemented "Annibale, il Serpente Sostenibile" along with over 700 pupils (aged 6 to 11) of 32 classes in 6 primary schools in Bologna. Pupils and teachers really appreciated the initiative, in particular the behaviour change campaign that was a success. After an initial difficulty due to the novelty and to the complete understanding of the operation of the game, the pupils and the teachers welcomed and carried on the initiative with enthusiasm. And many of them even asked to repeat it during the next school year. A virtuous message has been acknowledged in

Stories from the TRACE pilot sites

terms of sustainable mobility, the results obtained in terms of behaviour change were remarkable. Based on data collected at schools by the teachers, the modal split changed during the implementation of the campaign in all schools concerned, dramatically in some of them, in favour of less polluting modes of transport. And the positive results were maintained even after the end of the game. This could be interpreted as a sign that children and their families felt responsible with their travel to school choices.

FLANDERS

In March 2017, the first pilot of the Traffic Snake Game with trackers was run in Torhout (a small town of 20,000 inhabitants). The school has played the classic TSG campaign with a snake banner and stickers for several years. Hence, they were familiar with the basic concept of the campaign. After a meeting with the responsible teacher and with the IT expert of the school, information letters were sent to the parents, who were asked if they consent with their child participating in the project. More than half of the parents signed the informed consent and 100 pupils were successfully tracked.

Two weeks later, two further Belgian schools successfully participated in the tracking project in Oudenaarde (30,000 inhabitants) and in Zoerle-Parwijs (a small village of 2,258 inhabitants). The total number of participating children in the project was 309.

The motivation of the schools to participate in the project mainly was to gain access to mobility data. Two schools wanted to use the data to ask their city to change the traffic situation around the school (i.e., either asking for infrastructural changes or for avoiding heavy traffic around the school when the school starts and ends). Because of the interest in reliable data, the schools preferred not to run the behaviour change campaign simultaneously with the tracking week, but to run it afterwards.

In a follow-up meeting with the involved teachers and school board members, all schools were excited about the results of the tracking campaign. The work load was not considered too heavy for the responsible teacher and all schools wanted to participate in similar projects in the future.

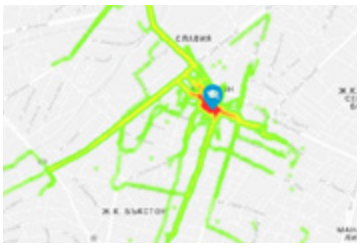
SOFIA

The Traffic Snake Game, as part of the TRACE project, joined the initiative "Walk to School" in Sofia Municipality, encouraging primary school pupils and their parents to exercise and travel more sustainably from/to school. The campaign addressed traffic safety, children's health and air quality issues and introduced game-based approaches to teaching energy and environmental concepts.

During the campaign, TSG was presented to 16 classes in three schools covering more than 400 pupils and 30 teachers. The TRACE trackers' testing and validation was conducted among 147 pupils, and routes for 94 pupils were acquired. Their data showed and overall reduction of the car use and an increase of sustainable mobility trips – walking, bus and metro. TSG was an emotional experience for the pupils, triggering their positive behavioral change.

The "Walk to School" campaign proved to be a win-win collaboration between local authorities, schools, and energy agencies. The data acquired from the tracking will be used by the schools to lobby for infrastructural changes and safety regulations to reduce traffic congestion and air pollution and increase traffic awareness. Also, the tracking maps will be compiled as evidence for informed decision-making on behalf of the local authorities when prioritizing infrastructural improvements around the schools. Data from the modality split for the home/school trips gathered during the TRACE project tracker testing proved that motorized transport significantly pollute the air around the school with NOx, NO2 and particulate matter that slowly dissolves over the school. This results in increased respiratory complaints and diseases among young pupils and teachers. Thus, the use of trackers in the campaign not only provided data for infrastructural changes in support of traffic safety, but also data to raise awareness among parents on the impact that private, motorised transport has on their children's health.

Enforcing safety through school volunteers



Evidence-based infrastructural decision making

Emotional and existing way to change behaviour

SOUTHEND-ON-SEA

Southend piloted Traffic Snake Game during two weeks in July 2017 in two schools: Chalkwell Hall and Sacred Heart. Both schools were very supportive and accommodating and showed great enthusiasm for the project. They were happy to send out the consent forms and collect them back in and supply the Borough with list of the children that were taking part.

In Chalkwell Hall, out of a potential 108 pupils, 42 parents consented that their child could take place in the pilot. In Sacred Heart, a total of 69 pupils took part in the pilot.

Before handing the trackers to the pupils at both schools, the organisers gave a short talk about the project, what sustainable travel meant to them and the benefits there were for themselves and the environment. The pupils had many great intelligent questions which were answered before noting the mode of transport each of them had used to get to school that morning which could be used as a base line assessment. The children were initially excited about receiving a tracker, but were disappointed that they could not switch them on or see any evidence that it was actually working and tracking them. When the children returned the tracker the next day, they did not show any enthusiasm at all regarding the mode of transport they had used that morning for evaluation purposes.

Although not many routes have appeared on the website, because of some technical problems, it has been a good opportunity to talk to pupils about sustainable travel and to raise their awareness of the impact their journeys to school have on their health, mental wellbeing as well as the environment.

5.2. Positive Drive

ÁGUEDA

The initiative was promoted by the Municipality of Águeda and took place in November 2017. The campaign aimed at increasing the practice of pedestrianism, the use of bicycle and public transport, the multimodality and rational and responsible use of the car. These sustainable forms of transport, in addition to improving the quality of life of the practitioner, improve the environmental quality of urban spaces, reducing the traffic and demand of space needed to manage the vehicle presence in the city and its surrounding areas.

With this perspective, the Municipality of Águeda implemented the Positive Drive pilot to highlight the advantages of smooth mobility and overcome some prejudices regarding the use of active mobility. The pilot was advertised through various channels and means of dissemination. The motto adopted for the campaign was, "Águeda + sustentável... a pé ou de bicicleta!" (Águeda more

sustainable ... walking or cycling!). The distribution of flyers, as well as the application of posters in the city, publication of press notes in several channels of communication and posts on the municipal Facebook eased the access to the general public. The target audience was reached through the realization of sessions that were scheduled with interested parties, allowing participants to be informed and clarify about the functioning of the apps and its benefits. The autumn weather did not prevent participants to collect (s)miles and get rewards for moving in a more sustainable way around Águeda!

BELGRADE

In Belgrade, public transport share in modal spilt is 53%, while for cars is 21%. Share of walking is very high (24%), while cycling is very low (0,55%). The main reasons for this, beside poor topography, are the lack of cycling infrastructure and the lack of a cycling culture among inhabitants. Therefore, within TRACE project, FTTE held a campaign called "Promeni trag", fully supported by the Municipality of Belgrade, targeting students in the city.

The campaign kicked-off on 22 May 2017, in the biggest student campus "Studentski grad", and it ended on 21 July 2017. More than 300 students in Belgrade actively used Positive Drive app within the "Promeni trag" campaign.

The marketing strategy of the campaign was designed to overcome two main challenges: getting students to join campaign and download Positive Drive, and getting them to continue using it. The initiative was announced in national newspapers, on students' TV and radio, as well as on various internet portals. However, marketing strategy was mainly focused on social networks and other internet communication channels. At the beginning of May 2017, Facebook and Instagram – campaign pages (@promenitrag, #promenitrag) were created and used for posting images and videos, but also to inform general public about events. Positive Drive users and page followers were invited to give their contribution and actively influence the page design.

Nine companies sponsored the campaign with more than 1,300 prizes for the users reaching predefined achievements. The final event was held on 14 July 2017 at FTTE. Three main prizes were given to the users with highest achievements: an action camera and two bicycles.

Anonymous GPS data was then processed in the TAToo tool. Results gave some insight on students

travel behaviour and mobility patterns during the campaign, but sample was not representative to draw decisive conclusion for complete city area. The "Promeni trag" campaign has shown that one of the main challenges is to effectively reach users. Similar campaign in the futures should count on more budget to increase the effectiveness of the marketing actions on social networks and other channels.. However, an important result has been achieved: the interest shown by students, their enthusiastic participation in the game and willingness to change their mode of travel.

BREDA

Initially, the Positive Drive campaign targeted the "Community Claudius Prinsenlaan", a collective of five large employers and 9,000 employees working together to reduce car commutes during rush hours. After an initial study of the target mobility behaviours and several meetings with representatives of the Community, the project partners decided to enlarge the scope of the campaign to the whole city of Breda. The new city-wide campaign was linked with the municipality's spatial planning ambitions in the North of the city. The campaign's new objective was to use Positive Drive for multimodal tracking of the whole city to get more insight in the relations, delays and routes of the network. A strong focus was put on the Northern Ringroad area, where the traffic is particularly intense and there is a need to shift more travels towards cycling. The "Meetweken" (or Counting-Weeks, CW), a six-weeks period where routes in the city are tracked, was introduced. The main objective was to keep Breda permanently accessible and thereby improve the quality of life and traffic safety in the city.

The campaign's main message was "Leave your traces for Breda", with a reference to the project title. The citizens targeted were from different groups, such as the businesses around the Northern Ringroad, primary schools, shopping center employees and the inhabitants of Oosterhout, a small neighbouring town. Different kinds of incentives were used to encourage the participation in the campaign: unexpected bouquets of flowers were sent at the end of the Counting-Weeks, and participants were offered the chance to win a sport watch. They also received a personalized chocolate bar by post as a reward for their effort. The communication campaign was based on a combination of sponsored posts on social media and the presence in the traditional local press. The Counting-Weeks have run for 81 days in total: 39 days in April-May 2017 and 42 days in October-November 2017.

During the campaign, the Positive Drive app was downloaded 985 times during the campaign (51% on iOS, 49% on Android). In total, 583 people registered for the CWs (around 60% of total downloads). A high share of the registered users – 74% – registered one or more routes during the campaign. After the campaign, all the participants were contacted to provide feedback on the implementation and the results of the campaign, even by telephone. 42% of the respondents valued positively the campaign, and the concept of mapping and visualizing mobility, thus supporting the campaign's objective to track mobility data for better planning. However, some respondents have highlighted some issues regarding the use of the app (technical flaws, high battery consumption, etc.). Concerning the possible improvements, respondents indicated that a better promotion to spread information on the campaign would be beneficial to future similar campaigns. Overall, the satisfaction regarding the campaign that was implemented in Breda was relatively high, and 81% of the respondents are willing to take part again to a future campaign shows their interest and satisfaction.

HASSELT

The Positive Drive Hasselt Campaign was launched on the 26th of September 2017 and lasted until the 30th of November (66 days, with one week of autumn break in this period). The main target groups were the students and staff of the educational institutions of PXL and UHasselt.

The group of students of PXL is heterogeneous. The PXL offers a kaleidoscope of fields of study and therefore attracts a wide variety of candidates.

The students of UHasselt, which are in the city center, are law students. Renting a room is not so common for students at PXL, so many students choose to commute to school every day. Because of the poor offer in public transportation in the Province of Limburg, this commute has a high share of car trips. This results in high parking pressure in and around the campuses.

The local stakeholders (the City of Hasselt and both institutes) agreed on the following strategic objectives:

- Relieve parking pressure
- Promote parking on designated car parks, further away from the campus area
- Promote sustainable alternatives (walking, cycling, public transport)

More than 1,000 people in Hasselt downloaded the Positive Drive app. The Positive Drive pilot generated valuable insights in the mobility situation and mobility patterns of students towards both campuses. We also evaluated the potential of the app for behaviour change. Half of the users of the app were intensive car users, suggesting that the app and the campaign were successful in reaching those students and staff that were causing the parking pressure around the campus. One of the success factors is that the app is multimodal so that car users feel that the campaign is also relevant to them. The Positive Drive app then gently nudges car users to use other modes of transport by rewarding cycling and walking more than car use.

LUXEMBOURG - CLOCHE D'OR AREA

The South of Luxembourg is considered as one of the most active regions in terms of economy and population. Most of the approximately 600 thousand residents live in this part of the country. The demographic outlook predicts that by 2050 Luxembourg will have 1 million residents. Almost 60% of the country's workforce commutes daily between the south of Luxembourg and the neighbouring regions in Belgium, France and Germany. This is about 181,000 cross-border commuters in average per day. Only 7% of that daily cross-border commuting is done by public transport (i.e. bus and train). As a result, large congestion is occurring on the cross-border highways, especially during peak hours.

In order to solve these mobility changes, the government put in place the ambitious infrastructure and mobility strategy called MODU2020[14]. More and more companies recognize that the Luxembourg government cannot solve the present deteriorating mobility situation on its own.

It is therefore that LuxMobility, IMS (Inspiring More Sustainability) and seven large employers in the Cloche D'Or area joint to uncover synergies in the mobility behaviour of their 7,800 employees in the district and to work together to develop improved mobility concepts for the area using the Luxembourgish Positive Drive test within the TRACE project.

The application provides a gamification layer to

[14] https://luxtimes.lu/archives/17351-a-modern-tram-from-findel-to-cloche-d-or-by-2020

provide incentives to users. Rewards in Positive Drive are based on a geographical location called gamezone. A campaign can be created within this gamezone and consists of multiple elements that involve local stakeholders and sponsors. Using Positive Drive, the campaign collected dense mobility data of a local area that is heavily impacted by cross-border commutes and are able to better plan mobility based on the actual mobility behaviour of the employees.

750 employees from the participating companies downloaded the Positive Drive App and used it in five consecutive weeks between May and June 2017. Over 18 million data points were collected, covering a total distance of more than 1.5 million travelled kilometres and a total of above 19 thousand trips. The data provided useful insight for the identification of the main congestion hotspots and the areas and time zones in which carpooling initiatives would be most effective.

The dialogue with the participating partner companies and the public authorities continues even after the campaign. Based on the results of the project, the companies have agreed to keep working on concrete measures to improve mobility in Cloche d'Or, such as the development of shared shuttles schemes covering the most important congestion hotspots, the implementation of carpooling policies and the depenalisation of employees' delays due to the malfunction of the public transport system. The Positive Drive pilot in Luxembourg can be considered as a successful campaign that lead the major employers in the Cloche d'Or district to rethink their role in contributing to a better mobility in the area.

SOUTHEND-ON-SEA

The TRACE team in Southend-on-Sea targeted over 3,000 Southend-on-Sea employees to encourage use of Positive Drive. The advertising took the form of posters, displays, leaflets, employer's digital newsletters and intranet as well as one-to-one contact on open day events based in two large employer's offices. Organisers have offered portable phone chargers as incentives to anyone who provided their email address and agreed to download the app, emailed people with prompts to action at the start of the live campaign, attended wider sustainable active travel workshops and conferences organised in Southend-on-Sea to reach people with an interest already in sustainable travel. Finally, they ran individual workshops where they asked people to download the app and went on a walk with them to see the app in action and win (s)miles. This type of one-to-one engagement was most effective in user uptake.

Findings show that people in Southend are attracted to the app due to the prize draw options rather than that of an interest in tracking and health statistics, indeed with many apps already in use for these purposes it was the gamification element of the app that sets it apart.

Messages through the app with prompts to encourage use would have been useful as enthusiasm wanes the more time the app runs.

Since prizes have started to be distributed, it was found that word of mouth is a far more effective marketing tool than any of the above. The Positive Drive pilot in Southend-on-Sea has shown that the role of the contact person in the target institution is a key element. The success of a campaign depends partially on the motivation and efficiency of this "local contact".

It has proved to be difficult to recruit local partners (shops, coffee, etc.). This may be due to non-optimal communication or a lack of interest by local partners. Some shops owners do not always see the benefit of the Positive Drive campaign. An idea might be to work on communication towards potential partners or even to find an incentive scheme for them. .

5.3. Biklio

BOLOGNA

Launched during the European Mobility Week (18-22 September 2017)[15], in October 2017 the fourth behaviour change campaign in a row managed by SRM started in Bologna.

Bologna is a city full of cultural events and cinemas are as well very often visited by students and citizens. The Biklio campaign was targeted to customers of cinemas in the city, to encourage them to use the bicycle as much as possible in going around the city and especially in going to the cinema. There were special discounts for Biklio users in cinema as well as in restaurants and bars around the movie houses.

Some special challenges were arranged to test all the features of the Biklio app and to involve users as much as possible. About 300 participants were registered to the campaign and some of them took part to the final aperitif evening party arranged at the end of November where other discounts and Biklio gadgets were distributed among users.

Some potential campaign local partners (shops in this case) didn't participate because the Biklio campaign was seen as too short (61 days); the simultaneous existence of other event or campaign; the limited reliability of the Biklio app in the Beta test phase. In terms of communication, while the effort has been intense (Facebook, twitter, local media, public events) and sometimes costly (Facebook add, promotional video, roll-up, sail banner) it seems that the info point arranged within the cinema. This indicates that, in Bologna, direct communication (face to face) is more efficient than any other (sometimes-costly) alternative channel. The focus on the trip to go to the cinema is specific and targeted but it seems that queues for buying cinema tickets were an ideal place to discuss with potential Biklio app users. Consequently, queuing, waiting can be seen as good opportunities to approach potential users.

As indicated by SRM in their Biklio Bologna activity report, "The effectiveness of the used social media is not so clear actually". On the other hand, social media (and Facebook especially), represented a suitable channel to collect some feedback and impressions by (few) participants: in some cases, users used this channel to explain their complaints, and to report technical problems they were having using the Biklio app.

BREDA

Biklio in Breda was introduced in the Boschstraat, a cosy street in the city centre. It exudes life and people visiting cafes, shops and moving through the street on foot, riding bikes and in cars. In the evening, it changes its hue becoming more colourful and festive since many young people use the street's varied assortment of bars (KAMU, Beyerd) and coffeeshops. The city decided to transform Boschstraat in the first cycling street in the city. Next to the necessary adjustment of the street, a change in behaviour was also needed. Biklio was seen as the right way to reward cyclists and get some positive attention for them.

The campaign was introduced in cooperation with three shopkeepers on the 9th of October 2017. The shops were selected because they are all bike-related and have a large community on social media. The shopkeepers were all provided with some rewards, so they didn't have to put money or presents by themselves in Biklio. The presents/rewards were: a '076 (code of Breda) bike-bag', '076 tissues' and 'Sjees', the bicycle magazine in Breda. Social media was the main communication channel for the campaign in Breda, and more particularly through the page '076fietst'. Moreover, posters and leaflets were disseminated and were welcomed by users for their design.

Due to the low number of participants, a more personalised approach was preferred, and two participants were invited to provide a feedback

[15] http://www.mobilityweek.eu/

on the campaign. They suggested to add a functionality to the app, to make possible to share their results with other users. The shop owners involved in the initiative encourage a higher effort in communication and dissemination to achieve a greater engagement in future campaigns.

LUXEMBOURG

Biklio Luxembourg took place in October and November 2017 in Luxembourg City, and it was supported by the Luxembourg Cycling Initiative (LVI). The campaign motivated around 346 cyclists to cycle to participating shops, which in return offered free or reduced-price items or services. The partnering spots, including the MUDAM, a local bike shop (S-Cape), a deluxe bakery (Tartefine), a wine & cheese gourmet shop (Cave a Fromage) a wine bar and shop (Vinotheca) provided incentives for users to participate in the cycling campaign through the use of the Biklio application.

On the 29th of November 2017, LuxMobility invited cycling enthusiasts and users interested in soft mobility to the closing event of their Biklio Luxembourg campaign in the auditorium of the Grand Duke Jean Museum of Modern Art (MUDAM), with the participation of the Luxembourgish Minister of Sustainable Development and Infrastructure François Bausch. He presented the new bike infrastructure in the Kirchberg, a quarter in north-eastern Luxembourg City, which will be inaugurated in December 2017. The cycle lanes along the tram lines are designed to offer more cyclists direct and safe connections to the Kirchberg and to the City centre, respectively.

Afterwards, the participants moved to the MUDAM café, where Minister Bausch handed over a brand new Specialized Bike to Romain Mayer, the very happy winner of the Biklio Luxembourg Campaign.

The results of the Biklio Luxembourg campaign show the routes that cyclists take in the city, as well as potential problem spots for bike use. The results are valuable for urban planning, and their implications as well as the campaign were lively discussed at the closing event with the audience, who expressed their interest and support for such cycling initiatives. LuxMobility announced that in 2018 a follow up campaign of Biklio will take place in Luxembourg.

PLOVDIV

The Biklio campaign in Plovdiv (Bulgaria) was implemented during the European Mobility Week. During the campaign, the cyclists could exchange their biked kilometres for rewards at Biklio spots, spread around Plovdiv. The campaign involved local businesses as checkpoint providers, making it more appealing to join for both the participating citizens and the local businesses.

In Plovdiv the "Come by bike!" campaign coupled the city slogan "Plovdiv: city of the cyclist", with the Biklio application involving more than 20 shops into the rewarding scheme. It rewards cyclists in two challenges: to come by bike to a spot or to bike for a reward. Not only the 50 downloads of the Biklio app during the campaign, but also the continuous use of the application outside of the campaign, show the involvement of the citizens with this innovative approach to collect data and

help improve the city cycling infrastructure. Routes acquired through the application will be used for improving the cycling infrastructure and services.

The evaluation of the campaign was aimed at all stakeholders participating in the campaign and was conducted through surveys, interviews with shops and internal experts' focus group.

Even though expectations on behalf of the EAP team were moderate, the campaign gained success among the users. EAP learned important specifics of this format of a campaign that could be further developed and replicated. As a short campaign worked so well, there is a good indication that an extended campaign could have a long-term impact on the urban cycling behaviour. Intensive communication with the local businesses needs to be kept with well-defined responsibilities on behalf of the businesses and the Campaign Manager. Selection of campaign spots is also essential, because spots that are green-oriented, young businesses that struggle to get on the local market "stage" understand better the positive value of participation in such campaigns. Finally, communication towards the end-users needs to be done through the social media channels and through the spots – i.e. the spot managers giving away flyers and asking their customers to join in; this has a great impact on the end-users and their willingness to cooperate.

SOUTHEND-ON-SEA

The Biklio campaign in Southend-On-Sea lasted for one month, between the 30th of October and the 30th of November, and targeted mainly café owners and their customers. The areas of Leigh on Sea Broadway and Southend High Street were targeted, as they have a busy café culture. The local project partners preferred to engage with independent and small cafes, to give them the chance to get involved in a community project. Two cafés accepted to take part to the campaign. Regarding the communication, the campaign was promoted mainly using social media such as twitter and Facebook via existing pages.

The campaign lasted 33 days and the application has been downloaded 77 times. Out of those, 45 people have successfully used the application.

A lottery was launched to achieve a higher participation rate to the ex-post survey. In total, 15 respondents provided valuable data. In Southend-On-Sea, the average respondent is a middle age woman professionally active and with at least one child at the primary school. Only 26% of the respondents heard about the campaign via the social media, while 40% at their workplace. The application incentive was for a clear majority of the users (6 out of 7) the main reason for using the Biklio app. Thus, it seems that providing an incentive to people to foster a behavioural change has some potential.

Regarding the use of the app itself, the application was judged easy to use, but not particularly entertaining. The possibility of the Biklio participants to monitor their trips was not seen as an interesting asset. Participant didn't change their mobility habits. Biklio users were already cycling. Thus, for this implementation, Biklio was rather re-enforcing and give visibility sustainable behaviour.

TRACE recommendations

6.1. General recommendations – walking and cycling to reduce congestion

MAKE ALL MODES COUNT – JOINT ACTIONS TO PROMOTE WALKING AND CYCLING

The growing importance of promoting and improving conditions for walking and cycling is evident in today's planning practice. However, walking and cycling are often left behind in terms of dedicated or adapted infrastructure. The EU Commission has declared **2018 the "Year of Multimodality"**[16]. The TRACE and FLOW[17] projects promote a **declaration to put walking and cycling on an equal footing with other transport modes to reduce the impacts of congestion**[18], already signed by high level decision makers during the projects' final conference in March 2018. The EU Commission, national authorities, city networks and NGOs should engage and motivate local authorities to join this and other initiatives to create a critical mass facilitating the shift towards cleaner and more sustainable transport.

IMPROVE AND INCREASE DATA COLLECTION FOR WALKING AND CYCLING

The TRACE review of the literature and surveys results[19] shows that both public authorities and users have high awareness of the potential of tracking data, although this data is rarely used in everyday planning process, especially for walking. As demonstrated by TRACE, **data is essential to understand travel behaviour and to make informed choices in urban and mobility planning**. Greater emphasis is needed to develop a clearer and stronger strategy regarding research on new indicators, methods and practices for data collection and modelling for walking and cycling. All levels of public authorities should collect appropriate data, combining tracking with more traditional methods, and coordinating the effort in a multi-level, complementary approach. Transport consultancies and ICT developers should develop a clear understanding of new trends and technologies, to support the public sector in the transition.

INCORPORATE DATA COLLECTION AND ANALYSIS IN THE SUSTAINABLE URBAN MOBILITY PLAN

In addition to the general planning aspects, TRACE has analysed the SUMP Guidelines[20] regarding the way data collection and analysis should be incorporated in the planning process. Findings show that **data plays a key role during all the planning phases of a SUMP**: the setting of the objectives, the preparation of a package of measures, the elaboration of the plan as well as the monitoring processes which, again, lead to new action. **Data should be used to analyse the current mobility situation and develop alternative scenarios**, that might result from different policies and measures. In this

[16] Multimodality refers to "the use of different modes (or means) of transport during the same journey", taking advantage of the strengths of each mode. More detail here: https://ec.europa.eu/transport/themes/logistics-and-multimodal-transport/2018-year-multimodality_en

[17] www.h2020-flow.eu

[18] http://h2020-trace.eu/news/news-detail/press-release-how-cities-across-europe-beat-road-congestion/

[19] For more detail, see Deliverable D3.1 - Information and guidelines on using tracking data for mobility planning

[20] http://www.eltis.org/it/guidelines/sump-guidelines

sense, tracking information can be used by local policy-makers and planners as an evidence-based argument to assign the right priority to walking and cycling in the planning process. European policy makers, in the current revision of the European SUMP Guidelines, should take the opportunity to mention tracking and other technology-based systems as useful tools for planning.

CLEARLY SET AND COMMUNICATE THE OBJECTIVES

The story behind a tracking campaign should be clear: if there is a strong awareness of what the campaign is tackling, it is more likely that the campaign will have an impact on travel behaviour. Public interest around hot topics, such air quality, traffic congestions, road safety, can be used as leverage to obtain public support for the campaign. If the campaign tackles a hot topic, it will be more successful. **The narrative behind the campaign is one of the most important success factors**, and should support a clear vision and long-term objectives, in line with the planning framework in place (e.g. SUMP). The first step of a tracking project is making sure that participants use the trackers and/or the apps. A **good communication strategy** is therefore essential, as well as the utilisation of **reliable and user-friendly tools and apps**.

ENCOURAGE AND STEER STAKEHOLDER PARTICIPATION

TRACE organised and implemented 17 tracking campaigns in 8 European cities, belonging to 8 different countries. Although it is possible to provide some general recommendations, **there is no one-fits-all solution**, since each local environment has specific characteristics that must be considered in the planning stage. Therefore, the **set-up of local stakeholder cooperation and engagement mechanisms** is strongly recommended to spread and reinforce the introduction of walking and cycling provisions at local level. **Participation produces a sense of decision ownership**, creating a sense of responsibility not only among politicians and planners, but also among citizens and stakeholders. As successfully done in TRACE with the focus groups, local authorities should listen to and make a synthesis between different, and sometimes conflicting, needs and views – both for developing a vision and for implementing the campaigns.

6.2. Practical recommendations – get the best out of tracking campaigns

FOR LOCAL AUTHORITIES

- Tracking projects are expensive, so implement them in a smart way: with a **specific goal** and **measurable outcome** in mind. Decide if you want to use mobility tracking in a behaviour change app (e.g., a reward app) or if you want to use it for measuring user needs. These are two completely different goals and completely different projects (see p. 21).
- Behaviour change campaigns that use tracking can be very powerful, but – as in any behaviour change project – the psychological principles that are implemented in your campaign will determine its success at changing travel behaviour. Hence, any behaviour change campaign using tracking should involve a psychologist or other **behaviour change expert.**

TRACE recommendations

- **Multimodal tracking** is possible: based on GPS coordinates it is possible to distinguish **walking, cycling and motorized transport** with an acceptable degree of accuracy. However, distinguishing car travels from public transport is much more difficult and requires that public transport timetables and maps are used in the data-analysis. Most tracking apps that are currently on the market cannot reliably discriminate car travels from public transport. TRACE partners will continue working to overcome this shortcoming.
- One of the most important aspects for users is that a tracking app or device is providing accurate tracking data in a user-friendly and bug-free environment. It is recommended to implement an **extensive testing phase** with different devices and different travel trajectories in the local environment to test if a tracking app meets these requirements before launching it.
- Evidence-based urban planning supported by tracking data is only possible when a **representative sample** (of your municipality / workplace / school) has used the tracking device. It is often difficult to obtain such a sample with a smartphone application that only runs on the most recent devices. Think about how to involve **vulnerable groups** into the tracking project in order to obtain a balanced sample for the project.
- It is often more realistic to obtain a representative sample of a **specific user group** (e.g., pupils of a specific school, public servants, employers working in large offices, hospitals, etc.) instead of obtaining a representative sample of the population of the whole city or municipality. Segmented data are valuable for microscopic planning and improvement of the transport network in a specific area (e.g. school/campus/office). As far as pupils and students are concerned, it shall be clear that a **minimum age is necessary to download the app** and give consent to tracking.
- Citizens are prepared to use tracking apps if they believe that they will get better cycling and walking infrastructure in return. **Tracking for shorter periods in time is more acceptable for users** with regard to **privacy**. To reach as much users as possible, you can reduce the workload of the campaign and ask users to track their travel route only once or twice. Usually people use the same travel route over and over.
- The analysis of the tracking data is one of the most important aspects of the project and the **data-analytical strategy** should be determined before the tracking project. Choose your **level of analysis** well, a heatmap with the number of cyclists or with the number of cycling trips might give completely different results and the latter is often less relevant.

FOR ICT DEVELOPERS AND PRIVATE SECTOR

- The TRACE project integrated successfully campaigns with tracking tools. Still, an upgrade to the TRACE concept would be **real-time walking and cycling traffic data** (i.e. integration of the apps with TAToo), involvement of open data or data from other applications, and strong data modelling and mobility scenario development.
- One of the most difficult elements of the tracking campaigns is how to get people to use a tracking app and **how to keep them motivated to use it.** Technical issues lead to drop-out and research shows that people are not willing to reinstall an app they have removed for technical issues.
- **Integrate the tracking element with other services**: the most successful apps will not just track and reward good behaviour, additional services should be included to convince people to download an app (e.g., MaaS-app in which you can buy different services).
- Proper citizen science: adding the **possibility to provide in-app feedback on the travelled routes** increases user engagement (cfr. http://pingifyoucare.brussels).
- **Define minimal requirements on data quality parameters** (frequency of data collection and location accuracy). These minimal requirements should guarantee

a satisfactory level of accuracy of the information produced by the tool.

- **Identify the right stakeholders who are the clients** and translate the data into valuable findings for them.
- To facilitate automatic travel mode detection for public transport, **developers need access to the data of bus and train providers** to learn about bus and train stops and routes.

FOR NATIONAL AUTHORITIES & EUROPEAN INSTITUTIONS

- National and local governments should **support the campaigns**, rather than the apps and tools. In some countries, Serbia for example, Traffic safety funds could be an interesting way to **finance app usage**, as part of different projects and campaigns.
- Schools cannot afford a tracking campaign themselves, it is an option to have **small 'citizen science' grants for schools** that feel the need to address their traffic situation but do not have the means for setting up a campaign themselves. When a sufficient amount of data is available, it become relevant at the national and European level.
- When revising the European SUMP Guidelines, it could be given guidance about how to **integrate tracking tools into traditional planning methods** and how to use this data for planning purposes.
- Successful and European campaigns already exist, such as **European Mobility Week**[21]. Tracking tools could be more prominent and being presented to the National Coordinators during their annual gathering in Spring to get inspiration and advice how to build campaigns locally.
- **Tracking tools could largely benefit from data collection standards** (what do we measure and why do we measure it?) as these are being discussed at the EU level.
- Data availability allows **comparability between local/regional/national levels**. European Institution shall encourage data and information sharing as these can feed in to EU sustainable mobility datasets and are therefore very valuable.

[21] www.mobilityweek.eu

ANNEX
Business models canvas of TRACE tools

ANNEX – Business models canvas of TRACE tools

Traffic Snake Game

The Business Model Canvas | **Responsible partner:** Mobiel 21 | **Date:** 10/04/18

<table>
<tr>
<td rowspan="2">Key Partners

• DTV Consultants (software developer, host of TSG website)
• eCarConnect
• LocatieNet (map matcher, modality recognition)
• Schools
• Municipalities
• National focal points</td>
<td>Key Activities

• Campaign leader recruits schools and explains campaign
• Schools distribute the trackers among pupils & run the campaign
• Schools get a school webpage on which they can consult results of the campaign</td>
<td rowspan="2">Value Proposition

The TSG Tracking Service gives an accurate image (modality, distance, speed, route) of traffic patterns of pupils towards elementary schools, fully integrated with the TSG Campaign

Channels
• National Focal Points
• TSG Website</td>
<td>Customer Relationships

• Operational excellence / customer intimate</td>
<td rowspan="2">Customer Segments

• Individual schools
• Municipalities (traffic planners, mobility officials)</td>
</tr>
<tr>
<td>Key Resources
• Trackers
• Software
• Campaign materials
• Staff</td>
<td></td>
</tr>
<tr>
<td colspan="3">Cost Structure

• Hosting, maintenance of the website
• Transport costs for the trackers
• Staff costs (school visits, recruitment, evaluation)</td>
<td colspan="2">Revenue Streams

• Municipalities could be willing to pay for the service
• Currently, the service is provided with a sponsorship, free of charge for schools
• NFP's pay a membership fee to the TSG International Network. Part of this fee could be used for the tracking service (maybe to be increased or transformed into a Premium version)</td>
</tr>
</table>

Adapted from: www.businessmodelgeneration.com

Positive Drive

The Business Model Canvas

Responsible partner: IJsberg

Date: 19/04/2018

Key Partners

- Regions, cities, neighborhoods.
- Employers
- Consumers
- Research companies

Key Activities

- Build marketing and communication strategies for campaigns to obtain user groups.
- Maintenance and improvement of Positive Drive
- Research for scale up opportunities

Key Resources

- Product Manager
- MarCom Manager
- Data Manager
- Developer(s)

Value Proposition

- Positive Drive tracks, analyses and changes mobility behavior
- Obtain GPS data for urban planning and data mining

Channels

- Website and (social) media

Customer Relationships

- Positive Drive is a fun and easy tool. Users can play and win all kind of cool prizes.
- The more sustainable you travel, the more you can win.

Customer Segments

- Consumers, employees, schools, students.

Cost Structure

- HR
- Software & data storage

Revenue Streams

- Software license
- Setup campaign
- Setup rewards
- Project Management
- Data Research

Adapted from: www.businessmodelgeneration.com

ANNEX – Business models canvas of TRACE tools

Biklio

The Business Model Canvas	Responsible partner:	Date:
	TIS	19/04/2018

<table>
<tr>
<td rowspan="2">Key Partners

• Local campaign development partner (ONG, mobility consultancy, Commercial ops, municipality)
• Suppliers of user features (e.g. route planner, anti-steal, …)
• Bike sharing providers (Biklio API connects BS users to Biklio benefits)</td>
<td>Key Activities

Develop & maintain the Biklio app and backoffice
The app must include a network of benefits to cycling as well as features that help the user in the cycling journey (weather coach, route planner, bike service info, anti-steal system.
Create benefit networks in cities involving consumer businesses and employers.
User relationships.</td>
<td rowspan="2">Value Proposition

Users
An app that gives you benefits for cycling and helps you with your whole bike journey

Businesses
Increase sales and improve your CSR profile

Employers
Increase productivity through healthy and happy employees

Cities
Create a new incentive system for cycling and collect data on the way

Channels
Users: Social media & media
Businesses: Local campaign developers</td>
<td>Customer Relationships

The Biklio brand conveys a message of friendliness, social bonds and cycling as a great experience.</td>
<td rowspan="2">Customer Segments

Users – in-app sales and/or premium services
Businesses – presence in Spot network and Challenges
Employers – connection of company to app and engagement of employers
Cities – data sales</td>
</tr>
<tr>
<td>Key Resources

• IT HR
• Business development and operation HR</td>
<td></td>
</tr>
<tr>
<td colspan="3">Cost Structure

• HR
• Software & data storage</td>
<td colspan="2">Revenue Streams

Sales to users (in-app purchases and premium services)
Businesses and employers pay for presence in app
Cities pay for data</td>
</tr>
</table>

Adapted from: www.businessmodelgeneration.com

TATOO

The Business Model Canvas | **Responsible partner:** TIS | **Date:** 16/04/2018

Key Partners

IT company (developers) – e.g., PTV SISTeMA, INESC-ID, …

- Data suppliers – e.g., Biklio, Positive Drive, BetterPoints …

Key Activities

- Maintenance, improvement and support of a software tool
- Data analyses (GIS)

Key Resources

- HR Software development and maintenance (specialized on map matching)
- HR urban mobility planning
- HR GIS software
- High level CPU's
- GPS input data from apps

Value Proposition

- Transforming data into valuable information
- Provide help to take supported decisions
- Give the clients organized and systematic results
- Communication tool for policy making
- Possibility to create information autonomously

Channels

- Conferences (presentations)
- Contacts with existing clients & urban mobility projects
- GPS Data collection solution providers

Customer Relationships

- Frequent contact flow to answer to clients' requests and curiosities
- Relationship based

Customer Segments

- Municipalities & transport Authorities
- Consultants
- Mobility operators
- Researchers

Cost Structure

- Manpower
- IT equipment
- Subcontracting IT developments

Revenue Streams

- Several available options:
  - Payment for required analyses (desirable)
  - Software selling
  - Included in larger projects with existing clients (reasonable)

Adapted from: www.businessmodelgeneration.com

For more information:

For further information contact the project coordinator at INESC ID:
Paulo Ferreira
Phone: +351 21 3100230
Email: paulo.ferreira@inesc-id.pt

Or the project communication manager at Polis:
Giacomo Lozzi
Phone: +32 2 500 56 86
Email: glozzi@polisnetwork.eu

www.h2020-trace.eu

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WALKING AND CYCLING TRACKING SERVICES