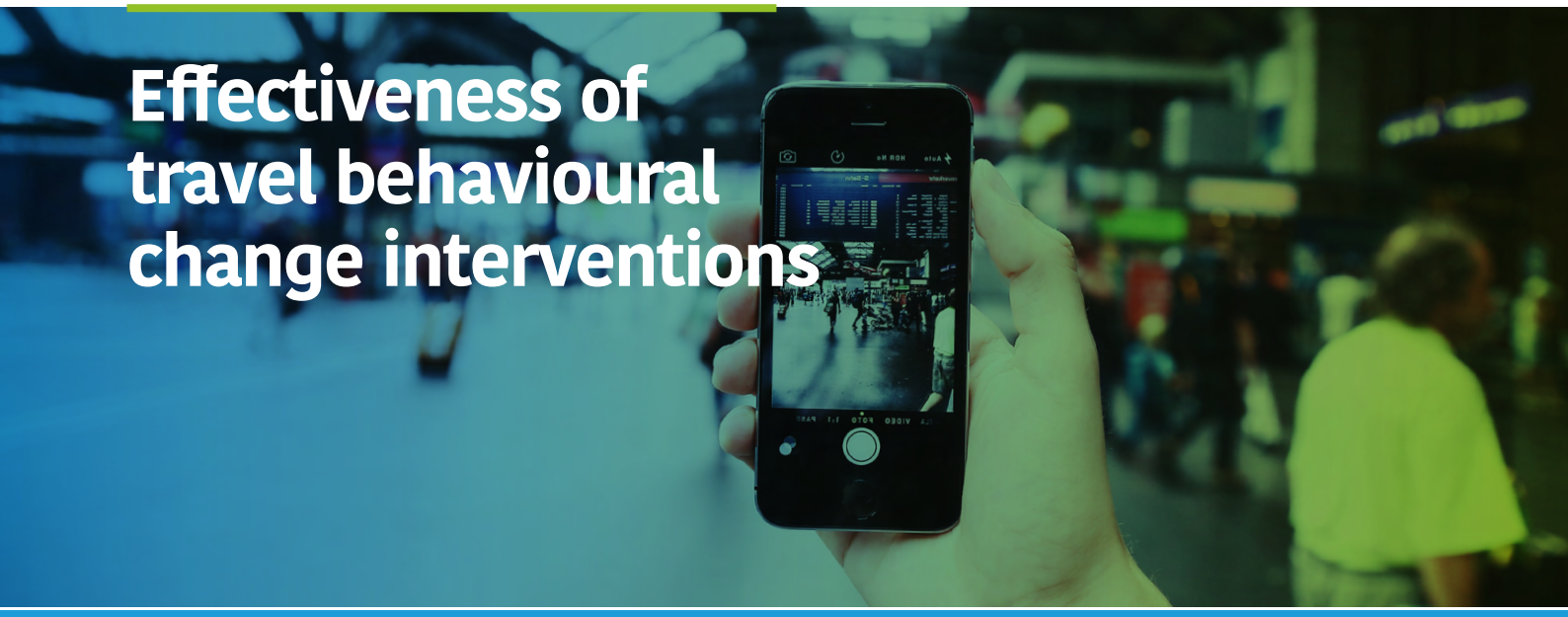
Smart Control of Air Pollution

Policy Briefs from the **iSCAPE** project funded by the European Union's Horizon 2020 Research and Innovation Programme

Effectiveness of travel behavioural change interventions



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Key Take-Aways

A continuous increase in the motorized vehicles moving on the roads has led to a significant threat for healthy living due to the increase in air pollution and climate change related impacts. Transport is primarily responsible for urban air pollutants, with 60% of cities in Europe having particulate matter levels above the World Health Organization (WHO) air quality thresholds (WHO 2016 report). It is therefore essential to adopt sustainable and pro-environmental travel and especially urban commuting behaviour, in order to limit global carbon dioxide emissions and their environmental effects.

However, travel behaviour and the personal habits related to it are hard to influence, and often require strategic interventions to guide individual actions.

Informational strategies can play an important role in supporting interventions aimed at achieving more optimal and desirable changes in individual commuting behaviour.

On this basis, behavioural interventions were designed and piloted within three of six European city pilots of the iSCAPE project (Bologna-IT, Guildford-UK and Hasselt-BE) to show the consequences of individual travel behaviour and how it can be improved. Another pilot study regarding route to school exposure reduction was conducted in Antwerp-BE with similar design principles.

All communication with the individuals was managed remotely. Commuters were provided information to influence their behaviour in aspects such as how to reduce non-mandatory outdoor activities, replace car trips with

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active modes and use public transport. Results show that interventions targeting an easy travel behavioural change are more effective, provided they are equipped with tailored feedback that mention benefits of change.

"I had an opportunity to learn the daily CO2 emissions related to my travel and how much I am exposed to air pollutants."

Feedback of Hasselt pilot study participant.

Pilots Overview

The focus of the pilots undertaken in Bologna, Guildford and Hasselt was based on the analysis of the activity-travel data of individual commuters in four different dimensions, namely: 1) Exposure to air pollutants, 2) GHG emissions, 3) Involvement in physical activities and 4) Hot and cold starts of car engines. This helped to shape informational-based behavioural interventions for the participants.

The fourth pilot in Antwerp was focused on the "route to school" to reduce escorting parents / school kids' exposure to air pollutants. Customised information was provided to each participant about feasible school route alternatives where air quality was better compared to their current route. The process is depicted in Figure 1. The individual school travel route was captured using a smartphone application.

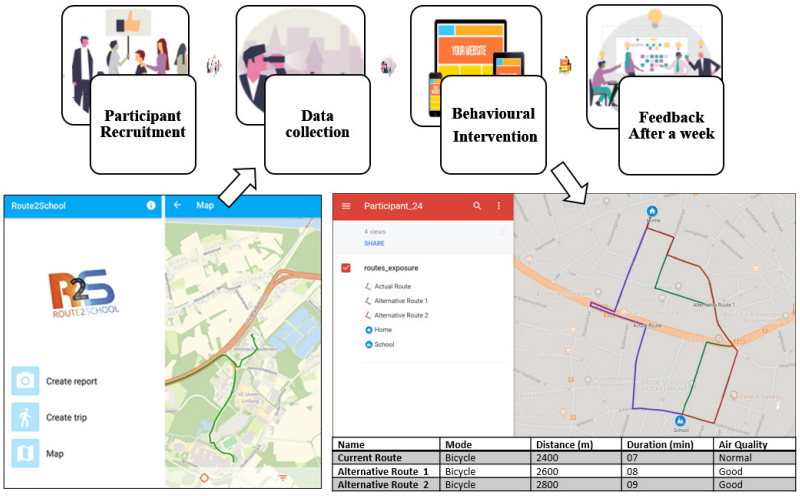

Figure 1: Process of customised information about feasible school route alternatives.

The fourth pilot seemed to be more effective based on the feedback from participants of pilots, which has led to the following evidence:

Customised information about behaviour (e.g. information that is relevant to the individual) is a key component of the information package, as it provides a context to the information and also individuals perceive the intervention as personal advice and value it as such. This could be considered similar to the advice they usually receive from their doctor on health issues/matters.

The intervention should have a relevance to the region where it is being studied and/or implemented. For example, one of the major reasons for success of the fourth pilot was that the Antwerp region has been considered polluted due to the significant flows of port traffic. Therefore residents were already concerned about their health (even more with their kids, as they are more vulnerable to diseases caused by traffic pollution).

The intervention needs to be simplistic. It should target a specific behaviour (e.g. just a change of route) with the easiest of compromises an individual would need to make (e.g. an alternative route should not be too long) and it should have more benefits compared to the previous choice. All information should be given in a structured representation that is easy to understand.

A useful combination of methodologies such as (customised) feedback, justification (benefits/relevance) and peer information (behaviour of individual in relation to others) worked well, even if individuals were not given any monetary incentives to change their behaviour.

With the help of technological tools such as apps (see Figure 2), web-tools and the like, such interventions can be managed remotely. No direct face to face connection is required with participants and the researchers/scientists/staff involved in implementation. However, this should be decided carefully based on the target audience.

The organisation processing the data and developing/implementing the informational intervention **should have a good reputation**. Participants have asked this question while giving their consent to provide personalized data.

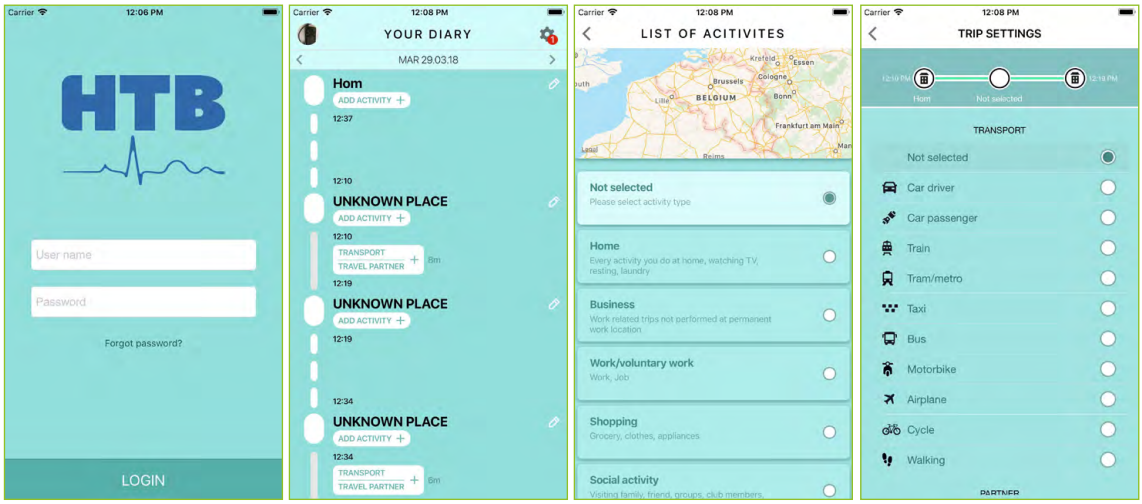

Figure 2: iSCAPE Hasselt Living Lab: GPS based smartphone application for recording activity-travel behaviour.

"Small changes in my daily pattern can have a big impact on the battle against the warming of the beautiful blue planet! Provided that a larger number of cohabitants want to participate. Every little effort counts."

Participant of iSCAPE Living Lab Hasselt.

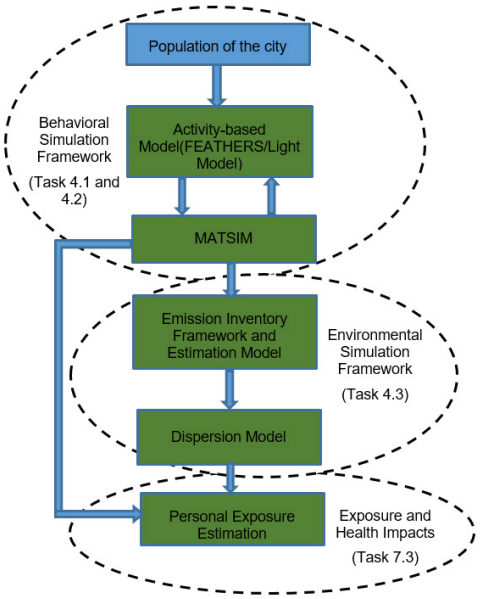

Figure 3: Activity-based microsimulation approach applied in iSCAPE.

Another research component was to assess the effects and impacts of structural strategies for urban mobility management (for definitions see "Keywords to remember" below). To that end, an activity-based microsimulation approach based on an integrated simulation platform was adopted (see Figure 3).

The platform generated entire population activity-travel schedules. A traffic simulation model executed those schedules on a given road network of a city such that at each point in time the individual travellers in the simulation could be tracked.

The platform was calibrated with data from the three iSCAPE cities Bologna, Hasselt and Vantaa, leading to several mobility-oriented interventions to be examined in consultation with the city authorities. These included car access restrictions on specific roads, increase in bus frequency on a few routes, and change in facilities opening times.

Overall, car related interventions (e.g. applying restrictions to access certain areas) were found more effective in influencing changes in behaviour such as modal shifts, changes of routes, departure times, choosing location of activities away from congested areas. Moreover, comparing the results of this simulation exercise with existing empirical studies in relation to such policies elsewhere resulted in similar changes in behaviour in aggregate terms, which reflects the appropriateness and reliability of the selected platform.

On the other hand, there were some uncertainties associated with the simulation results when these were visualised at a finer grained resolution (e.g. when results are represented in combination with three or more variables, e.g. mode shares classified in age categories and gender). The extents of such uncertainties were well documented and therefore, when interpreting the results, these must be taken into account.

Overall, the framework depicted in Figure 3 above allows for estimating

dynamic exposure to pollutants as opposed to static exposure where the population is considered static at their residential locations (e.g. their movement with respect to time is not incorporated). This results in an estimation of the health impacts in a more appropriate manner.

Lessons Learned

To sum up, the various experiments in relation to informational interventions (customised feedback on travel behaviour) as well as structural interventions (mobility-related policies tested by using the integrated simulation platform) implemented as part of the iSCAPE project have provided a holistic framework for their design and implementation at a pilot scale, which can be easily replicated in additional urban contexts.

To that end, the following lessons learned can be of interest for urban decision-makers and new pilot owners:

1. Behavioural change strategies are indeed effective to influence commuters' and more generally travellers' attitudes and actions in our cities. However, contextual factors are rather important and may help determine some outcomes with more or less intensity in different cities.

2. It is key to provide users with continuous information and feedback in simple and personalised ways. Otherwise, the mere showcasing of environmental or health benefits may not ensure long lasting transformative impacts.

3. Thanks to information and communication technologies, there is no need to connect and interact face-to-face with pilot users to collect the required data and provide information that influences behaviour - under the condition, of course, that the quality and timeliness / persistence of the information remain adequate.

4. To ensure stronger impacts, structural interventions should be added to informational ones and among the former, car related restrictions are usually the most powerful in influencing collective behavioural changes.

Keywords to remember

Behavioural Change Interventions:
Actions and initiatives taken to influence individual behaviour in a specific domain such as mobility, energy conservation, recycling, pollutant exposure reduction.

Informational Strategies:
Approaches to change perceptions, motivations, knowledge and norms, without modifying the external context in which decisions are made. Examples include information campaigns, use of social support and role models.

Structural Strategies:
Approaches to behavioural change directly linked with modifying the external context, e.g. creating circumstances under which adoption of pro-environmental behaviour is relatively more attractive. Examples include congestion charging schemes and reduction of public transport fares.

Read More

The content presented herein is based on the following key project deliverables: **D1.3** 'Report on Behavioural Interventions' (February 2017), **D4.1** 'Environmental Effects of Behavioural Actions' (September 2017), **D4.4** 'Prototype of a Fully Integrated Behavioural (Data-Driven) Simulator' (February 2019) and **D7.3** 'Behavioral Recommendations for Urban Anthropogenic activities to population exposure and human health' (November 2019).

All reports are available on the iSCAPE project website: www.iscapeproject.eu

Impressum

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Policy brief coordination by: Ms Ines Vaittinen ENoLL - European Network of Living Labs; final editing and design by: T6 Ecosystems S.r.l.

For further information regarding this document, please contact: francesco.pilla@ucd.ie.

The iSCAPE project

iSCAPE aimed to reduce urban air pollution and the negative impacts of climate change by leveraging sustainable passive control systems, behavioural change initiatives and the Living Lab approach.

For more information: www.iscapeproject.eu.

iSCAPE partners:

- University College Dublin
- University of Bologna
- University of Surrey
- Finnish Meteorological Institute
- Hasselt University
- TU Dortmund University
- JRC - Joint Research Centre - European Commission - Institute for Environment & Sustainability
- Institute for Advanced Architecture of Catalonia - FabLab Barcelona
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- Future Cities Catapult Ltd.
- Dublin City Council
- Regional Agency for Prevention, Environment and Energy of Emilia-Romagna
- European Network of Living Labs
- Trinity College Dublin

Smart Control of Air Pollution - Policy Briefs

The Smart Control of Air Pollution - Policy Briefs series summarises key outcomes of the iSCAPE project with a clear policy orientation, to provide practical information to EU local decision-makers and other urban stakeholders. They cover the following topics: