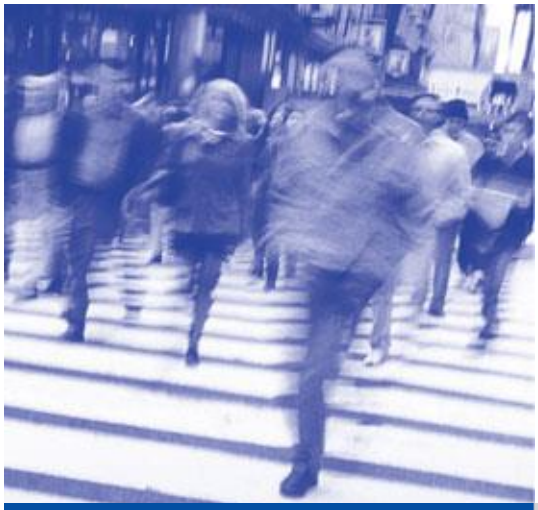

2020 CiViTAS
Cleaner and better transport in cities

SATELLITE

CIVITAS Research and Innovation Action projects funded 2015-2018

A summary of lessons learned

Deliverable No.:	D5.10
Project Acronym:	SATELLITE
Full Title:	
Support Action Towards Evaluation, Learning, Local Innovation, Transfer & Excellence	
Grant Agreement No.:	713813
Work package/Measure No.:	WP5
Work package/ Measure Title:	
Communication and dissemination	
Responsible Author(s):	
Richard Adams, Robert Morrow & Helen Franzen	
Responsible Co-Author(s):	
Date:	28.06.2019
Status:	Draft / Final
Dissemination level:	Public/ Confidential

2020 CiViTAS
Cleaner and better transport in cities
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Abstract

This summary of lessons learned from the first ten CIVITAS Research and Innovation Action (RIA) projects – CITYLAB, NOVELOG, SUCCESS, U-TURN, CREATE, ELIPTIC, EMPOWER, FLOW, CIPTEC and TRACE – has been put together based on CIVITAS SATELLITE's D2.12a "Lessons learned from the CIVITAS RIA projects funded 2015-2018", prepared within the evaluation work package, and written in a way that is accessible and relevant to key target audiences, namely mobility planners working in local authorities, other transport professionals, and in certain cases policymakers. .

In the run up to the CIVITAS Forum conference 2019, and to link in with the session held on 'Deployment of Horizon 2020 Results', these will be shared online and promoted as individual documents.

Project Partners

Organisation	Country	Abbreviation
ICLEI – Local Governments for Sustainability	DE	ICLEI EURO

Document History

Date	Person	Action	Status	Diss. Level
18.06.19	Richard Adams	Prepared draft	Draft	PM
26.06.19	Marcel Braun	Review of draft	Draft	WPL
27.06.19	Dirk Engels	Review of draft	Draft	WPL
27.06.19	Luana Bidasca	Review of draft	Draft	PC
28.06.19	Richard Adams	Preparation of final draft	Final	PO

Status: Draft, Final, Approved, and Submitted (to European Commission).

Dissemination Level: WPL = Work Package Leader, PM = Project Manager, PC = Project Coordinator, PO = Project Officer

Legal disclaimer

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Introduction

This summary of lessons learned from the first ten CIVITAS Research and Innovation Action (RIA) projects (D5.10), has been put together based on CIVITAS SATELLITE's D2.12a "Lessons learned from the CIVITAS RIA projects funded 2015-2018", prepared within the evaluation work package, and written in a way that is accessible and relevant to the key target audiences, namely mobility planners working in local authorities, other transport professionals, and mobility-related policymakers.

The CIVITAS RIA projects funded between 2015 and 2018 were: CITYLAB, NOVELOG, SUCCESS, U-TURN, CREATE, ELIPTIC, EMPOWER, FLOW, CIPTEC and TRACE.

In the run up to the CIVITAS Forum conference 2019, and to link in with the session held on 'Deployment of Horizon 2020 Results', these will be shared online and promoted as individual documents. For the purposes of this deliverable, the summaries have been presented in the order used in Deliverable D2.12a – see below.

Figure 1: Overview 'Urban freight logistics' projects

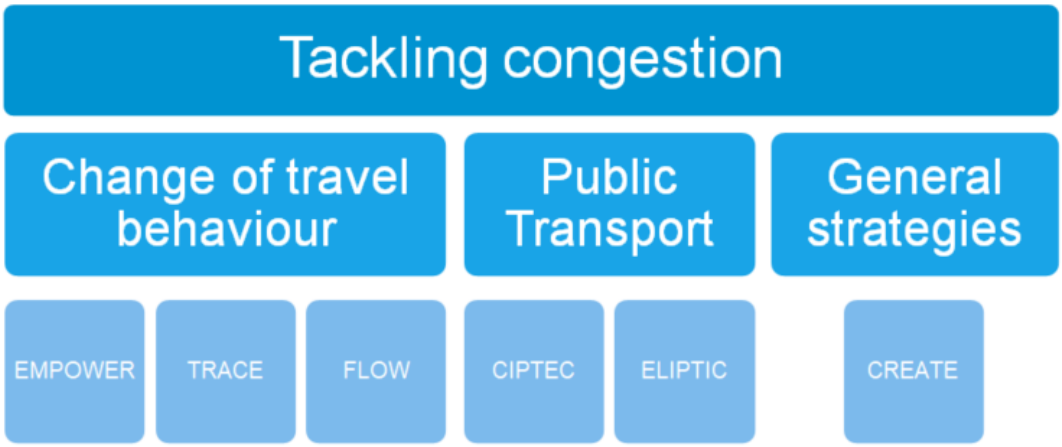

Figure 2: Overview 'Tackling congestion' projects

CityLab lessons learned: Incubating zero-emission logistics in living laboratories

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Project Overview

The objective of the CITYLAB project was to develop knowledge and solutions that result in the roll-out, scaling up and further uptake of cost-effective strategies, measures and tools for zero-emission city logistics.

In a set of Living Laboratories (“Living Labs”), promising logistics concepts were implemented, tested and evaluated, and the potential for further roll-out and up-scaling of the solutions was investigated and explained. The Living Labs brought together citizens, governments, industry and research partners, allowing them to co-design and co-create new policies, regulations and actions through a shared long-term goal.

CITYLAB focused on four axes for intervention (Highly fragmented last-mile deliveries in city centres, inefficient deliveries to large freight attractors and public administrations, urban waste, return trips and recycling, logistics sprawl) that call for improvement and intervention.

Within these axes, the project supported implementations in the Living Labs of seven cities that were tested, evaluated and rolled out. These four axes for intervention were chosen because it was anticipated that if they are not explicitly tackled in the EU, the rising populations and densities of cities may produce such an increase in freight transportation that the economic and environmental sustainability can no longer be guaranteed.

Implementation

Each participating city implemented one or more freight measures during the project:

- Amsterdam: City centre micro-hubs and cycle freight deliveries
- Brussels: Increasing vehicle loading by utilising spare capacity
- London: Growth of consolidation and electric vehicle use
- Oslo: Common logistics functions for shopping centres
- Paris: Logistics hotels to counter logistics sprawl
- Rome: Integration of direct and reverse logistics flows
- Southampton: Joint procurement and consolidation for large public institutions

More information about each implementation (poster – factsheet – cartoon – dashboard) can be found on the CITYLAB website.

Recruitment and uptake

The following factors were found to be key to implement successfully the type of measures found in CITYLAB: to the success of the project:

- Stakeholder collaboration
- The ability to make small adjustments to the business models as needed
- A clear political will and support from the local government
- Public sector involvement
- The ability and willingness of local authorities to implement policy measures to positively drive forward sustainable logistics practice
- Pilot and field surveys/ studies to gain acceptance of and interest by end-users

Evaluation methods

The indicators and evaluation methods used within the project can be structured into four fields of evaluation: (i) adoption, (ii) process, (iii) context and (iv) impact.

Adoption: 'Adoption' detects to what extent stakeholders that did not initiate the solution are willing to pay for the solution or to change their behaviour in order to perpetuate the solution. A solution's success does not only depend on characteristics of the solution itself but also on how and where it was implemented.

In existing project evaluation frameworks (e.g. STRAIGHTSOL, CIVITAS PLUS II, SMARTFUSION) adoption is not a separate field of evaluation. However, some impact indicators of these frameworks relate to adoption and adoption willingness. CITYLAB covers this aspect through a range of adoption indicators evaluating users' feedback on the solution and assessing to what extent the solution is adopted by the target group. The two evaluation methods that fit this evaluation field are Business Model Analysis (BMA) and ex-post behavioural analysis.

Process: "Process' relates to the Living Lab methodology and attempts to determine how successfully the implementation followed the implementation plan as stipulated during the planning phase. It allows evaluators to make the important distinction between implementation failure/ success and theory failure/success.

Although some aspects of process evaluation were mentioned, the freight transport evaluation frameworks of STRAIGHTSOL and SMARTFUSION did not really focus on process evaluation. The evaluation method that fits this evaluation field is the transferability analysis which will build on insights into how impacts were achieved.

Context: 'Context' describes important characteristics of the setting in which the solution was implemented. More than any other field of evaluation, it makes the connection between the implemented solution and a possible transfer to another city.

The context indicators, together with the process indicators, provide input for the transferability analysis which is the evaluation method that fits this field of evaluation.

Impact: 'Impact' assesses and quantifies the changes that can be attributed to implementing the new urban freight transport solution. It concerns changes in the well-being of all stakeholders. Following STRAIGHTSOL, CITYLAB incorporates the multi stakeholder perspective in its evaluation framework by evaluating progress towards stakeholder's criteria in the evaluation field 'impact'. The two evaluation methods that fit this evaluation field analyse the overall impact of the solution from the perspective of commercial stakeholders through the CBA and combine that with the perspective of public stakeholders through the SCBA.

Tools and resources:

Find more information on an sources related to the projects here:

- Website: http://www.citylab-project.eu
- Practical guidelines for establishing & running a city logistics living lab – link here
- Definition of necessary indicators for evaluation – link here
- CITYLAB dashboards – link here
- Impact & process assessment of the seven CITYLAB implementations – link here
- Sustainability analysis of the CITYLAB solutions – link here
- Evaluation of the willingness to pay – link here
- Assessment of roll-out potential of CITYLAB solutions – link here
- CITYLAB transferability leaflet - link here.
- City Logistics Living Lab Handbook - link here.

Contact details

CITYLAB Project Coordinator, Jardar Andersen, jan@toi.no

NOVELOG lessons learned: Four steps and tools to make urban freight sustainable

Project overview

NOVELOG (New Cooperative Business Models and Guidance for Sustainable City Logistics) focused on gaining insight into urban freight transport (UFT) and giving guidance for implementing effective and sustainable policies and measures.

This guidance was given through a four step – four tool approach:

- to help cities **"understand"** their UFT environment,
- **"focus"** on the most suitable measures and policies,
- **"assess"** these measures,
- and **"guide"** cities in their effective implementation.

12 cities and regions from across Europe were involved. Although they had varied needs, maturity levels, and measure combinations, they had the same objective: to be more sustainable and liveable.

Implementation

A huge variety of city logistics solutions were implemented under NOVELOG.

Each developed a pilot or case study and the main objectives of these were to:

- Devise and implement cost-effective and green, measures and business models;
- Increase load factors and reduce vehicle movements;

- Optimise governance and stakeholder cooperation in urban distribution through a more powerful, consensus-oriented Decision Support System (DSS); and,
- Strengthen capacity of local authorities and public and private stakeholders to engage in sustainable policy-making and mobility planning (using SUMPs).

The pilots ranged from micro-distribution platforms in Barcelona (Spain) and an urban distribution centre for bike services and parcel lockers system in Mechelen (Belgium) to the development of a freight plan in the London Borough of Barking and Dagenham.

The project's **factsheets** give detailed descriptions of the results, challenges, opportunities and the transferability of measures from each of the 12 project sites.

NOVELOG also looked into how to go about planning and developing a Sustainable Urban Logistics Plans (SULPs. NOVELOG broke this down into six key steps:

1. Determine the city's potential for a successful urban freight planning process.
2. Define the development process and scope of the plan.
3. Analysis of the city's current UFT situation, problems and opportunities
4. Development of a common vision & future improvement scenarios
5. Setting priorities and measurable targets
6. Development of effective package of measure

Find more information on each of these steps in NOVELOG's **SULP Guidelines**.

The **NOVELOG toolkit** helps cities identify and select the most appropriate measures based on their own unique situations.

Business cases

Many sustainable UFT solutions turn out to be economically unviable. This is mainly due to a lack of critical mass and the additional mode change required by some measures In this context, cooperating with private stakeholders to increase load factors and reduce the amount of freight vehicles entering city centres is important.

Similarly, potential cooperation schemes between public and private stakeholders need to be examined to enhance the long-term sustainability of measures like lockers, micro-consolidation, bike logistics, and urban consolidation centres.

NOVELOG used the Business Model Canvas (BMC) to develop business models for its pilots. The project's Guidance Tool assists cities with using a city logistics BMC to map the value of cooperation with different stakeholders, as well as business model evaluation to assess the economic viability of UFT measures.

Encouraging uptake

The first step to help cities move towards implementing long-term solutions to their urban freight problems is to facilitate the necessary cooperation, consensus building and common understanding among city stakeholders. To aid this process, NOVELOG developed its "Understanding the Cities" tool.

Each NOVELOG city utilised it to reach agreement on the main factors affecting UFT and the most important characteristics defining the UFT environment in each city. Based on this, the future form of the city logistics environment was determined.

The NOVELOG Toolkit also helps cities identify measures implemented in other similar cities, and facilitates the selection of the most suitable measure or combination of measures for implementation. Through this, cities can pick out the specific measures that will be of greatest benefit in their specific context.

Evaluation methods

NOVELOG produced also its own **evaluation tool***, which facilitates multi-criteria, multi-stakeholder decisions. Stakeholders can run their own evaluation scenario based on their own interests.

Users firstly select indicators appropriate to their context, including objectives, stakeholder type, and measure(s) desired. The tool then performs an holistic assessment based on a number of impact areas and stages in the logistics life-cycle.

Finally, the user sees how the measure(s) improves their logistics-related sustainability based on a Logistics Sustainability Index (LSI) value. More specific results can be generated using three embedded modules: 1) Social Cost-Benefit-Analysis 2) Transferability and Adaptability 3) Risk Analysis.

Tools and resources:

The four main tools produced by NOVELOG's four main assist with managing the “implementation chain” of a UFT measure, that is problem capture – decision – planning – testing – assessment – adjustment – implementation. These are:

- Understanding the Cities tool - link here.
- NOVELOG Toolkit - helps cities identify and select UFT measures - link here.
- Evaluation Tool - link here
- Impact Assessment Guidance Tool - link here.

Other key resources are:

- NOVELOG Cities & Regions Factsheets - link here.
- NOVELOG Roadmap for greener and efficient UFT - link here

- NOVELOG Yellow Pages - a series of FAQs on UFT - link here.
- NOVELOG Guidelines for the Planning & Development of SULPs - link here.

*To use the Evaluation Tool, it is first necessary to apply for a license via the website.

Contact details

NOVELOF Project Coordinator, Dr. Georgia Ayfantopoulou, Hellenic Institute of Transport, gea@certh.gr

SUCCESS lessons learned: Sustainable logistics in the construction industry

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Project overview

SUCCESS (Sustainable Urban Consolidation CentrES for conStruction Projects) focused on the construction industry and its relationship with logistics. It saw potential to improve the efficiency of goods and waste movement and service trips in EU cities.

The project aimed to explore and test green and efficient solutions covering various issues in the construction supply chain and material freight logistics in urban areas.

To test those solutions, SUCCESS developed simulation tools to play out several scenarios focusing on the implementation of Construction Consolidation Centres (CCCs) at four pilot sites; Luxembourg, Paris (France), Valencia (Spain) and Verona (Italy).

Eight scenarios were defined: two without a CCC and six with one or more CCCs. These scenarios were then played out, evaluated and finally compared to identify the best solutions for each type of construction projects represented by the pilot sites.

Implementation

The CCC was highlighted as the key solution for the reducing negative impacts of construction-related logistics. For local authorities and residents, they reduce air and noise pollution and obstructions caused by construction vehicles.

For construction companies, CCCs encompass a series of benefits:

- Materials being available from a location close to (or on) the construction site(s);
- Prompt delivery of the necessary quantities for daily activities;
- Reduction of delays in the delivery of materials; and,

- Easier and more flexible organisation and management of supplies and stock.

This increases productivity and means fewer materials are wasted. Working conditions also become safer for those (un)loading and transferring materials between vehicles.

These impacts are captured in the table below.

Expected benefits	Indicators	Average quantified impacts in the pilot sites	Luxembourg	Paris	Valencia	Verona
Reduction of congestion	Daily number of freight vehicles both for direct and reverse logistics	-40%	Up to 48%	Up to 42%	Up to 48%	Up to 54%
Reduction of transport related pollutant emissions	CO_2 emissions NOx emissions PMx emissions	-40%	Up to 33% Up to 41% Up to 30%	Up to 13% Up to 8% Up to 23%	Up to 31% Up to 39% Up to 26%	Up to 19% Up to 22% Up to 19%
Vehicle use & route optimisation	Kilometres / day travelled by vehicles	-20%	Up to 42%	Up to 20%	Up to 34%	Up to 23%
	Small deliveries (fewer than 4 pallets)	-50%	100%	Up to 100%	Up to 100%	Up to 100%
Maximise load factor	% Increase load factor	30%	Up to 41%	Up to 52%	Up to 44%	Up to 220%
Economic savings	Payback		Year 1*	Year 1	Year 1	Year 1

Average impact of a CCC on the four project sites cities

Yet a CCC alone is insufficient: it must form part of a new construction supply chain. This requires major changes in the construction value chain and for construction companies to:

Refocus on their core activities, i.e. building;

- Consider logistics activities as a full support service that requires new skills and the development of new partnerships.
- Reconsider the contractual relationship between all actors in the construction sector to improve collaboration.
- Other construction logistics and supply chain management good practices can be found in the SUCCESS handbook.

Business cases

SUCCESS followed these steps to define the business models applied on pilot sites:

- Identify characteristics that have an influence on urban and construction logistics.
- Conduct a SWOT analysis to determine opportunities and risks linked to CCC implementation.
- Develop at least two different scenarios where a CCC is used.

- Define the most suitable business model for each scenario using the Business Model CANVAS methodology.

The four business models employed were a fully private CCC operated by the construction company; a public-private partnership; a privately owned CCC managed by an external logistics operator; and a virtual/digital CCC.

Find more on the CANVAS methodology and the advantages and disadvantages of each business model in this SUCCESS introduction to the topic.

Evaluation methods

To assess the potential impact of an optimised supply chain, SUCCESS used 20 Key Performance Indicators across three categories - economic, environmental and social indicators. These cover the main logistics steps involved in a construction project. Six of these can be simulated using digital tools. Find the full set of KPI descriptions here.

Tools and resources

- Business Models Development and Analysis - link here.
- Report on good practices in the EU and USA in construction logistics in urban area - link here.
- Business models for construction logistics optimisation and CCC introduction - link here.
- Good practices in construction logistics and supply chain management - link here.

Contact details

SUCCESS Project Coordinator, Jean-Marie Grellier, Communauté d'Agglomération de La Rochelle, Jean-marie.grellier@agglo-larochelle.fr.

U-TURN lessons learned: New models for urban food transportation

Pilot 1

Distribution of packaged goods from food manufacturers to retail outlets located in urban areas

Pilot 2

Distribution of fresh food from local producers and online retailers to consumers in urban areas

Pilot 3

Food delivery from online retailers to consumers in urban areas

Project overview

The U-TURN project identified new models for urban food transportation.

The challenges to the urban logistics of food come from population growth, congestion and environmental damage alongside, increased use of convenience stores and the home delivery of internet purchased groceries.

The U-TURN project addressed the challenges mentioned above and showcased what logistics sharing in an urban context can deliver in terms of supply chain efficiency and environmental performance.

U-TURN is designed to contribute to the understanding of freight distribution in urban areas, addressing the special requirements of food transportation. It has developed and proposed innovative business models from a new focused toolkit to achieve more efficient operations – both environmentally and economically.

By analysing existing freight urban flows and identifying synergies that can be exploited by logistics sharing and collaboration strategies, the work has brought forward practical options for communities and operators.

Implementation

The U-TURN project consisted of three type of activities:

(1) Comparative analysis based on actual market data
(2) Simulation experimentation
(3) Pilot execution in three different cities: Athens (Greece) Milan (Italy) and London (UK).

The three pilots were complementary, addressing different aspects of food distribution in an effort to cover the key requirements and main trends of food distribution in urban areas.

Pilot 1:	Pilot 2:	Pilot 3:
Location: Athens	Location: Milan	Location: London
Focus: Distribution of packaged goods from food manufacturers to retail outlets located in urban areas	Focus: Distribution of fresh food from local producers and online retailers to consumers in urban areas	Focus: Food delivery from online retailers to consumers in urban areas

Recruitment and uptake

The uptake of the project was aided through the use of the 'U-TURN Platform'.

Information sharing is one of the key challenges in the implementation of collaborative logistics projects, especially when the involved stakeholders are competitors.

In order to overcome this problem, the project used the 'U-TURN platform' which embedded a Smart Matching Algorithm that identifies logistics sharing matches either between different food suppliers supplying retail outlets or between different food producers. In this way potential synergies and consolidation flows opportunities are developed.

Evaluation methods

In order to ensure uniformity of assessment across the pilots, the results were compared by using distance reduction. The key findings are as follows:

- In Pilot 1, it is possible to achieve 9- 48% distance reduction. The reason for such a wide range is due to the variety of scenarios investigated.
- In Pilot 2, figures for distance reduction from collaboration ranged from 25% in access distance, 6% in in-route distance, and 20% in total distance. In this Pilot, the concept of 'access distance' is relevant as it refers to the distance from the rural area to the border of Milan. In-route distance as can be anticipated is the distance travelled within the municipality of Milan. The operating conditions differ on both distance categories in terms of speed limits and engine utilisation, which in turn affect vehicle emissions.
- Finally, in Pilot 3, collaboration benefits are estimated at 8- 35% in Business Model 1, 9-10% in Business Model 2 and 7-14% in Business Model 3. The reason for the wide range of benefits from collaboration in Business Model 1 is due to the last mile delivery aspect, where collaboration has the greatest impact on sparsely distributed consumer orders over 18 time-windows.

Tools and resources

The U-TURN project has developed several tools and prototypes that can be useful for other projects:

- A **collaboration platform** for supporting information sharing and the creation of appropriate logistics sharing partnerships between food companies and retailers with respect to their transportation needs
- A **matching tool** based on the stable allocation theory, enabling the identification of logistics sharing matches either between different food suppliers supplying retail outlets or between different food producers or online food retailers supplying consumers directly.
- A **simulation tool** to quantify the impact of alternative logistics sharing choices from both an efficiency (cost), effectiveness (service level) and environmental perspective.
- An **economic assessment model** to evaluate the operational and economic impact of a consolidated supply chain.

Find these tools on the website here.

Contact details

U-TURN Project Coordinator, Eleni Zampou, Eleni.Zampou@intrasoft-intl.co

EMPOWER lessons learned: Rewarding change in travel behaviour

Project overview

EMPOWER researched how positive incentives can encourage members of the public to reconsider their travel choices and reduce the extent to which they travel using conventionally fuelled vehicles.

For this, EMPOWER tested various apps across Europe, including five living lab locations; Enschede (the Netherlands); Gothenburg (Sweden); Helsinki (Finland); Milton Keynes (UK) and parts of Scotland (UK).

They utilised incentives such as information, points, discounts, rewards, community support and games. Whilst such schemes are not a magic wand for instigating fundamental mobility behavioural change, they can help attract new users to use sustainable modes.

Aside from implementation, EMPOWER also examined businesses cases for the creation and methodologies for the evaluation of such schemes.

Implementation

- Choose champions in selected target groups to promote measures or products. They act as both initial catalysts and drivers of change, boosting longevity and sustainability of measures or products through their commitment to it.
- Communicate clearly the benefits of using such apps to each user - what is in it for them? Refer to associated economic, environmental, and health benefits.

- Personalise incentives by tailoring them to a user's preferences, personal goals and needs at time of use. The most effective incentivisation models are:
    - **User-driven** challenges that give people the flexibility to choose their own objectives and help keep the change process relatable to the own behaviour. However, people might not be ambitious in the goals they set.
    - An app-driven approach, where it suggests challenges based **on previous user travel behaviour**. Whilst technically more complex, it creates personalised, achievable objectives.
- Fixed rewards upon challenge completion is more effective for incentive schemes.
- When users start using sustainable transport, continuous challenges with rewards are advised. Once they do so regularly, adopt partial rewarding, but give higher rewards.
- To embed change, have users learn about sustainable travel and its benefits.
- In general, goods are just as effective if not more effective than money when the reward is presented as a gift and/or when people can choose between goods.
- Companies can easily deploy monetary incentives as financial schemes for employees.
- For monetary awards, contino rewards should be in the range of a few euro per commute (back and forth). When promoting active transport, this should depend on distance as longer trips take more effort and should be rewarded accordingly.

Design

The following functionalities were popular among users:

- Traffic information;
- Travel statistics based on tracked trips;
- Basis incentive schemes like the points per kilometre for charity and points per kilometre for active modes

Ensure the product is technically sound - bugs and malfunctioning trip detection deter users. It must also compete with commercial apps, of which users have high expectations.

Business cases

EMPOWER created a four-step approach for developing business models related to incentive-based public transport schemes:

1. **Strategic alignment** – Ensure all organisations in your coalition share a vision for sustainable transportation driven by an incentive-based scheme.
2. **Governing principles** – Develop principles for implementing and operating your scheme.
3. **Business modelling** – Models vary according to lead beneficiary. Examples are transport operators, cities, trade organisations, private companies, or public organisation.
4. **Implementation and operation** – Following deployment.

A guidance note and EMPOWER Toolkit section give more advice, including example business models.

Recruitment and uptake

- Promote on social media and online network, and consider targeted advertising.
- Use employers as a proxy to provide apps to the end user. Such formalised structures help bring your app into with potential users.
- Take advantage of informal word-of-mouth networks. Presence at community events can raise awareness of within a specific location.
- Reward those who recruit for you as well. EMPOWER found that people who liked the system inspired their friends to join as well, so reward them for it!
- Have a proof of concept, like a demo version or working system in another location. This reduces the perception of risk among stakeholders. Ideally, involve test users in your proof.
- Get trustworthy partners with strong reputations on board: this builds trust around the product (even if not technically proven) and differentiates it in the market.
- Make it easy for users and providers to understand the added value of participating and easy for them to do so. For stakeholders like shopkeepers or public transport operators, incentive schemes are not their core business.

Evaluation methods

Some key tips for in-app data collection and evaluation are:

- Due to the wide variety of different and data collection and evaluation methods that exist, it can be hard to establish general trends. A unified typology is required.
- Integrate data systems and input into a single platform, i.e. questionnaires and tracking functions.

A vulnerability index and definition were formulated based on transport accessibility. These could be useful for other projects working on transport inclusion.

EMPOWER also produced **short guidance** on evaluating incentive measure with tips:

- Be aware of the privacy risks when coupling data sources.
- Agree on data collection early on and formulate distinct cases and boundaries.
- Record when and how the scheme is altered (e.g. incentive change) - new questionnaires may be needed.
- The evidence provided by the evaluation is only as good as the data upon which it is based The definition of the before, after and control cases

Tools and resources:

- EMPOWER Toolkit - link here.
- EMPOWER Guidance Note - Tips for Building Viable Business Models - link here.
- Advice on designing positive incentives - link here.
- These apps can be found on www.mobility-apps.eu.

Contact details

EMPOWER Project Coordinator, Prof. Susan Grant-Muller, University of Leeds, s.m.grant-muller@its.leeds.ac.uk

TRACE lessons learned: Using tracking tools to encourage active mobility

© TRACE

Project Overview

The TRACE project assessed the potential of movement tracking services to better plan and promote walking and cycling in cities, and developed tracking tools that fuel the up-take 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. More particularly, TRACE assessed the potential of ICT-based tracking services to optimise the planning and implementation of such measures and enhance their attractiveness and potential impact. Issues such as data privacy, cost, interoperability, financial/ tax incentives, infrastructure planning and service concepts were also addressed.

Dedicated TRACE tracking-based tools to promote behaviour change and support mobility planning were tested in eight pilot sites: Breda (The Netherlands), Agueda (Portugal), Southend-on-Sea Borough (United Kingdom), Bologna (Italy), Esch (Luxembourg), Belgrade (Serbia), Plovdiv (Bulgaria) and Flanders (Belgium), and evaluated in terms of impacts, success factors and benefits, while preparing for their full commercial exploitation.

To that end, common, flexible and open access tools were developed, which address related ICT challenges and enable the development of products based on tracking services tailored to the requirements of specific measures by market-oriented application developers.

Implementation

Alongside testing tracking-based tools, the participating cities also received a toolkit. The TRACE toolkit presented practical recommendations and guidelines to using the approach developed by TRACE.

The toolkit explained how local authorities can benefit from tracking movements in their city, and how the derived data provides information for a better identification of priorities both on the infrastructure and communication side.

The toolkit can be used by decision makers, urban planners and practitioners in the fields of urban and transport planning who are interested in introducing policies and measures that promote a shift towards more sustainable and healthy modes of transport.

Business cases

In order for the rewards function of some of the apps to be successful, namely the Biklio (Cycle2Shop – C2S) app, local businesses need to participate.

The target for the Biklio app is to engage 20-100 shops/cafés (20 businesses per 100,000 inhabitants) and to involve at least the equivalent of 3% of the cycling population, i.e. number of persons engaged = population * mode share * 3%.

Another crucial target is the users' engagement to be enduring, having 50% of the users still having the app after six months from the download.

Design

The following tools were implemented through the project: Traffic Snake Game Tracking, Positive Drive and Biklio.

Traffic Snake Game (TSG) – This game is used to encourage primary school children to travel more sustainably to school. Each student was given a tracker to carry, which recorded their home to school journey. The trackers were shock and water resistant, they had a long battery life (20 hours) and the system was plug-and-play

Positive Drive (PD) – This is an existing mobility behaviour change tool. PD is based on "doing and rewarding the right transport choice", with participants only getting rewarded if they show the "right behaviour". For example, cycling instead of using a car.

Biklio (Cycle2Shop – C2S) – This is an app which detects if customers travel to businesses by bicycle and if they do, they get a reward for doing so.

Recruitment and uptake

Users were encouraged to use the tool through rewards:

Traffic Snake Game (TSG) – During the campaign week(s), children who travelled sustainably to school received a small sticker in the form of a dot. All children who received a sticker pasted it onto a large green rectangular sticker and all rectangular stickers were pasted onto the school banner. At the end of the campaign period, the children were rewarded for their efforts to travel sustainably to school with a day without homework, extra play time or free ice cream.

Positive Drive (PD) – The app measured and rewarded good behaviour and gave direct feedback. The user could see all rewards and achievements, share this through social media and play for prizes in the apps game room.

Biklio (Cycle2Shop – C2S) – The app detects if a citizen is cycling. If they cycle to a business, they receive a notification, which gives them a reward. They can then show this notification to the local business and in turn get some kind of discount as their reward.

Evaluation methods

The specific objectives of the evaluation in TRACE were to:

- **Evaluate the tools as products**: Performance (incl. reliability and accuracy), usability, user satisfaction, stakeholder satisfaction etc.
- **Evaluate the impact of the tools on behaviour change (increase in walking and cycling)**: Assess user behaviour with regard to travel choices and how these have potentially influenced by the campaign (qualitative evaluation)
- **Evaluate the benefit for urban planning**: In what respect can the tracking-for-planning tool support planning? Build on ex-ante evaluation. Qualitative expert interviews with municipal technicians.
- **Learn lessons, identify and disseminate**: From the developers' perspective: what went well and what was difficult, what still needs to be solved?

Based on the evaluation work in the project, the following observations and recommendations are of importance for other projects:

- Running a campaign for behaviour change towards more sustainable modes, using incentives, and at the same time collecting tracking data for planning to optimise infrastructure according to user needs means that the tracked data is biased and does not necessarily represent average behaviour.

- For seriously measuring behaviour change the approach was not suitable. It is generally questionable whether or not short-term campaigns can induce behaviour change. Moreover, the survey data collection would have to be sounder, i.e. reliable baseline and ex-post data.
- Focus groups are difficult to set up and may need some incentive too. Interviews are easier to carry out (e.g. via telephone), but are more expensive if they are to be transcribed and lack the element of group discussion.

Tools and resources:

- Evaluation plan – link here
- Guidelines and recommendations on tracking walking & cycling for mobility planning and behaviour change – link here
- Biklio app - link here.
- Positive Drive app - link here.
- TaToo Tracking Planning Tool - link here.
- TRACE Toolkit - link here.
- Traffic Snake Game Tracking Device - link here.

Contact details

TRACE Project Coordinators, Paulo Ferreira, paulo.ferreira@inesc-id.pt, João Barreto joao.barreto@tecnico.ulisboa.pt

FLOW lessons learned: Walking and cycling as tools to take on congestion

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Project overview

FLOW project aimed to put walking and cycling on an equal footing with motorised transport modes as a solution to tackle urban congestion. It developed a user-friendly methodology, involving transport modelling, to assess the effectiveness of walking and cycling measures.

The project was guided by the following objectives:

- Define the role of walking and cycling in congestion reduction;
- Develop and apply tools for assessing the congestion-reducing potential of various walking and cycling measures;
- Increase awareness of the congestion reduction potential of walking and cycling;
- Actively support take-up of congestion reducing walking and cycling measures by public administrations;
- Foster the market for new walking and cycling products and services for congestion reduction;
- Communicate congestion reduction facts of walking and cycling.

The project worked with six partner cities: Budapest (Hungary), Dublin (Ireland), Gdynia (Poland), Lisbon (Portugal), Munich (Germany) and Sofia (Bulgaria).

Implementation

Each of the partner cities employed the tools and methodology produced by the project to assess the role of walking and/or cycling in congestion reduction in their cities. Within this context, each city prepared a local implementation scenario to plan their activities.

The cities of Dublin, Gdynia, Lisbon and Munich undertook microscopic modelling using PTV VISSIM/ VISWALK to test and visualise options to improve conditions for pedestrians and cyclists and measure impact on congestion.

The cities of Budapest and Gdynia developed a macroscopic cycling modelling capability within the FLOW project. Both cities had existing macroscopic highway and public transport models in PTV VISUM into which they wanted to integrate cycling to assess mode shift for congestion management.

All of the cities which undertook modelling then tested the FLOW Multimodal Transport Analysis Tool (MTAT).

All of the FLOW cities assisted in testing the assessment methods contained within the FLOW Impact Assessment Tool (IAT; see above). The case studies range from city-wide packages of measures to schemes at individual intersections and to non-infrastructure projects (Sofia). Few of the cities had sufficient data to complete all parts of the Impact Assessment Tool.

Local Forum

Each of the FLOW partner cities had the opportunity to organise and host an interactive Local Forum in the context of the project. These allowed the cities to:

- share the overall FLOW project goals of putting walking and cycling on an equal level with motorised modes with regard to congestion reduction
- describe and share their local FLOW activities
- directly address and interact with important local stakeholder groups
- gain feedback from the targeted groups which can be taken into consideration in the further development and potential upscaling of their local FLOW activities.

The format and audience of the Local Forums were left open to allow the cities to invite the groups that were most important for them in their local contexts. While it was the shared goal of all six cities to discuss with participants the role of walking and cycling as means of addressing urban congestion, each city had its own specific target audience and goals.

Evaluation methods

FLOW used the following tools for evaluation:

FLOW's Multimodal Transport Analysis Methodology of Urban Road Transport Network Performance (MTAT) is a tool for evaluating the impacts of cycling and walking measures on transport network performance and congestion.

The FLOW Multimodal Transport Analysis Methodology uses key performance indicators to operationalise its multimodal definition of transport network performance and congestion in terms of travel time and the relationship between the demand for and supply

of road space. The KPIs describe the state of traffic flow for all traffic participants, thereby enabling the analysis of transport network performance for all modes. The KPIs are (based on FGSV 2015 – German Road and Transport Research Association):

- Delay: the additional travel time experienced by a traffic participant compared to the minimum travel time from origin to destination.
- Density: a measure of the number of persons or vehicles using a given space.
- Level of service (LOS): a measure reflecting the quality of service experienced by traffic participants at different levels of infrastructure use (i.e. more or fewer people travelling).

These indicators can be used for local (e.g. a road segment or a junction) or network level analysis and can be calculated for each transport mode separately.

The **FLOW Impact Assessment Tool (IAT)** reflects the mobility impacts, the environmental, societal and economic effects of a measure, and the impacts of the measure on public financing. The first column represents the focus area, while the second represents the scope of what is to be assessed and the third shows the indicator and the unit which is measured.

Currently, transport project assessments vary from city to city and many cities have no predefined guidelines or regulations at all. Qualitative data that arises from measures is often neglected due to the difficulties in assessing it. However, such data could significantly influence the value of some policies and measures – particularly walking and/ or cycling measures. Depending on local political objectives and data accessibility, FLOW offers different approaches to analyse socio-economic impact indicators.

In this context FLOW offers different multimodal approaches for aggregating the impacts of walking and cycling measures. A city can thereby select which approaches/tools best suit its priorities: Multi-criteria analysis (MCA); Weighted benefit analysis (WBA); Cost-benefit analysis (CBA) and Qualitative appraisal (only as add-on to CBA)

Tools and resources:

- Walking and Cycling: A Multimodal Approach to Congestion Management - FLOW project summary and recommendations – link here
- Guide to Using the FLOW Tools for Multimodal Assessments – link here
- Congestion Impact Assessment Tool Walking & Cycling – link here
- FLOW Quick facts – link here

Contact details

FLOW Project Coordinator, Kristin Tovaas, k.tovaas@rupprecht-consult.eu

CIPTEC lessons learned: Using collective innovation to improve public transport

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Project overview

CIPTEC sought to increase the modal share of public transport (PT) by being able to better understand and attract new users at as low a cost as possible. In doing so, it sought to utilise modern marketing techniques, promoting creativity and innovation to encourage the desired modal shift. Two main processes sat behind this:

1. **Market research of user groups**
2. **Collective innovation**

CIPTEC also examined PT from the supply perspective, shedding light on the challenges faced by PT providers. To tackle these, it produced the CIPTEC Toolbox for Public Transport Innovation. This helped operators and policymakers understand their situation, identify applicable solutions, and implement these.

Implementation

Market research of user groups: looked to ascertain what constitutes a good PT offer, such as the services to include, whom to target, and how to promote it. This revealed seven 'hidden' user groups (more details here) who have different public transport requirements. Introducing complementary packages of innovations can have a multiplier effect on increasing PT's modal share when tailored to user needs found to be more effective than introducing measures that are *assumed* to be the right ones often.

Collective innovation: gathering and choosing ideas via crowdsourcing and co-creation workshops. CIPTEC developed an online platform used in **five campaigns** (open-source version **available**): 486 ideas were submitted and 8863 visitors recorded in total.

The CIPTEC crowdsourcing campaigns followed a six-step process:

1. Describe the campaign: Clearly outline what campaign objectives are. Crowdsourcing also comes in several forms, e.g. contests, voting, creation, and funding - make sure the chosen form (or combination) fulfils your aims.
2. Define campaign rules: Who can participate? What should 'the crowd' do? What is the timeline? Who will evaluate the winners? Who has IP rights for submissions?
3. Release the campaign online: Ensure you have a professional, user- and mobile-friendly interface. See more information on platform design in the 'Design' section.
4. Advertise the campaign: Use a mixture of online and offline methods to maximise user outreach. See more information in 'Recruitment and uptake'.
5. Gather contributions: It is important that the campaign organiser is active in supporting platform users with any issues as they arise.
6. Evaluate and reward: Be transparent and publish documentation on the evaluation process. Ensure also that your reward conveys the right message about your campaign. See 'Recruitment and Uptake' for award ideas.

The nudge method: A field experiment in Rotterdam (Netherlands) showed how 'social labelling' nudges can be cost-effective interventions. New, free travel card holders were distributed that labelled their carriers as sustainable. Pre and post-intervention bus use was 0.89% higher within the group using new travel cardholders compared to those with standard ones.

Recruitment and uptake

Use both online and offline methods for collecting ideas. Frequent website and social media updates signify an active campaign; newsletters can reach diverse target groups; and short videos are effective at creating interest in contests. For offline awareness raising, communicate via local media and take part in community events. Also consider organising a consultation event with the local municipality.

Irrespective of method, make use of multipliers, such as civil society groups, committed politicians, trade unions, and local businesses. That includes employers or organisations promoting campaigns to their staff or members.

Rewards for campaigns

Possible prizes for a winning idea might be a monetary, a material reward, free travel on PT services, and even a trial of the idea if funds are available.

Evaluation methods

CIPTEC used co-creation workshops as the next step to validate and evaluate ideas gathering from crowdsourcing. Such workshops should not constrain participants by promoting certain types of behaviours or ideas, whilst participants should reflect the demographics of the PT user base.

Combining such workshops input from an expert board or jury ensures that both users and experts are involved in the evaluation process.

Tools and resources:

- CIPTEC crowdsourcing platform - link here.
- CIPTEC online toolbox - link here.
- CIPTEC collective intelligence guidelines - link here.
- CIPTEC advanced marketing research presentation - link here.

Contact details

CIPTEC Project Coordinator - Prof. Dr. Aristotelis Naniopoulos, Transport Systems Research Group, Aristotle University of Thessaloniki - naniopou@civil.auth.gr

ELIPTIC lessons learned: Using electric public transport to power future e-mobility

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Project overview

ELIPTIC developed a series new concepts and business cases related to the optimisation of existing electric public transport (PT) infrastructure and rolling stock. With these, it set out to show that current electric PT infrastructure – such as metros, trams, light rail, and trolleybuses - could support the next wave of transport electrification for both public and private users.

Through 20 use cases in 11 European cities, it showed that encouraging electric vehicle uptake can be done cost-efficiently and has major environmental benefits.

These spanned three main thematic areas:

1. Safe integration of e-buses into existing electric public transport infrastructure;
2. Utilising energy storage systems to use recuperated energy, for example from trolley or trams braking; and,
3. The multi-purpose use of electric PT infrastructure, such as for (re)charging of commercial vehicles, private vehicles and taxis.

ELIPTIC also foresaw that reaching full electrification will require the integration of public electricity grids and those used by public transport operators. Various guidelines and tools are available that advise on upgrading and regenerating electric public transport systems.

Implementation

ELIPTIC implemented a wide variety of new concepts, which led to a wide variety of interesting results:

When **procuring charging systems**, it is best to demand interoperable solutions with open standards and the exact specification of technical details.

New models: Hybrid trolleybuses can drive 'off-wire' (without a catenary), as seen in Eberswalde (Germany), Gdynia (Poland) and Szeged (Hungary). Public transport companies can thus enlarge trolleybus networks without the high outlay needed for catenaries. Such vehicles are also quieter and emit fewer fossil fuels.

Auxiliary consumption: In Brussels tests showed how braking systems now recuperate a significant amount of energy. Instead, the main focus to improve tram network energy efficiency has to be on the vehicle's auxiliary consumption. As using battery energy for heating reduces driving range, consider continue using diesel heaters if necessary during the transition to electrification. Some hybrid vehicles are better than new electric ones!

In terms of charging:

- In Barcelona, on-street charging points supplied by the metro power grid were found to be more energy efficient compared to those supplied by the public distribution grid.
- If accessible, charging infrastructure is easier to manage when not located in a public space, as there are fewer regulations and statutory provisions to take into account.
- Combine overnight depot charging with short-interval 'opportunity charging' using other infrastructure at the end of bus routes. This enables hybrid and electric vehicles to service more routes, and worked successfully in ELIPTIC's trial in London (UK).
- Letting other vehicles access to transport authority grids lowers emissions. Allowing its support fleet do so, Transport for London will reduce yearly CO_2 emissions by 13 tonnes.

Business cases

With high upfront costs, investment in electric buses can seemingly make little economic sense, particularly if significant infrastructure is built for a small number of vehicles. Yet this picture changes when entire routes are electrified. Infrastructure costs are reduced, whilst compared with diesel buses there are lower energy costs (higher system efficiency) and lower costs, especially when linking to an existing public transport grid.

Electric buses fare even better if a cost-benefit analysis (CBA) is conducted, which take into accounts environmental costs resulting from emissions of pollutants and noise. In terms of charging costs, Warsaw (Poland) is an example of how using the municipal tram power supply to charge buses can be cheaper than using the public grid. Read about ELIPTIC business cases here.

Encouraging uptake

To enable a greater use of electricity from existing public transport grids to power multimodal charging, coherent regulatory frameworks are needed for the interface between the transport and (electrical) energy sectors. These can help clarify legal uncertainties on the sale of electricity.

ELIPTIC's Factor 100 campaign showed the impact statistics and concise messaging can have. Its slogan was: *"...It takes 100 electric cars to achieve the impact of one electric bus (€18m)... but there is not 100 times the funding for electric buses".* After the campaign, €100m national funding programme was launched for electric buses in Germany.

Ensure to test new solutions extensively and train all staff properly, be they control centre operators, maintenance staff, or drivers. This increases their trust in the new measures and ensures their ability to operate and look after new vehicles properly.

Evaluation methods

ELIPTIC showed that evaluators of such electrification measures must be ready to revise plans and be flexible with their methodologies, as (sometimes major) changes are often necessitated due to technical issues.

For analyses that include a comparison of before and during measure implementation, include a Cost-Benefit-Analysis to evidence the wider cost-effectiveness of measures.

To assess the technological viability of measures, using a SWOT analysis is recommended to map the drivers and prospects of and barriers to innovative concepts.

Tools and resources

- ELIPTIC Policy Recommendations - read here.
- ELIPTIC Use Cases Brochure – read here.
- ELIPTIC D4.2 - Final Business Cases – read here.
- Electrification of Public Transport Toolbox - access here.

Contact details

Project Coordinators – Michael Glotz-Richter and Hendrick Koch, City of Bremen,
hendrik.koch@umwelt.bremen.de, michael.glotz-richter@umwelt.bremen.de

CREATE lessons learned: Reducing congestion to create place-based cities

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Project overview

CREATE (Congestion Reduction in Europe: Advancing Transport Efficiency**)** studied how five cities in Western Europe tackled growing car use and congestion over 50-60 years. Their lessons learned were then used to support five city centres in Eastern Europe and on the Mediterranean to reduce congestion and move towards sustainable modes.

Research was based on the CREATE model (diagram here), which outlines three stages of transport policy development in cities:

- **Stage 1 Cities**: Car-oriented - prioritise major road building and new car parking
- **Stage 2 Cities**: Sustainable mobility focus - introduce policies to provide better public transport (PT) alternatives and limit car access to city centres.
- **Stage 3 Cities**: Cities of places that seek to become 'liveable' - encourage street activities, relocating road space to public transport, and promoting active mobility.

CREATE's research led to a better understanding of measuring congestion and network performance; changing urban transport policy priorities and their consequences; and triggers for change and consequences of car use. Furthermore, the project analysed quantitative trends in car use, scheme funding, modelling and appraisal issues.

Implementation

The project provides stakeholders with concrete guidelines which can be used by mobility practitioners: “CREATE guidelines: pathways to tackling current congestion and reducing levels of car use in European cities”.

Certain conditions can help stage 1 cities jump straight to stage 3: achieve a minimum level of land use density and activity concentration to make PT more attractive; find an

'equilibrium' between average door-to-door speeds for cars and PT or walking/cycling; and impose strict limits on car use.

Congestion should also not always be *the* defining progress indicator - most economically vibrant cities experience it. Yet good alternatives (which are more competitive at lower speeds) mean fewer travellers experience delays. Indeed, cities are more disadvantaged by unreliable network performance than low speeds, as the latter is easier to tackle.

Looking to the future, CREATE advised that the SUMP concept place a greater emphasis on 'Cities as Places' and look towards stage 4 - the integrated city. Early signs of this are Mobility as a Service (MaaS), accessibility planning, and the sharing economy.

On a technical level, CREATE recommended to:

- Ensure key professional and technical groups are in planning and delivery teams.
- Integrate transport and land-use planning processes.
- Introduce policies as packages, e.g. reducing parking and road space when opening a metro line.
- Push for stakeholder and citizen engagement in policy development and delivery.
- Prioritise data collection and regular monitoring of system performance.
- Measure key place-based indicators to assess the wider success of policies.
- Use models to support strategy development designed to achieve the city vision.
- Ensure that business cases reflect the full benefits of transport investment – not just the transport benefits – and take a balanced approach.

City politicians are recommended to.

- Develop a wider city vision, in which sustainable transport plays a key role
- City shaping needs full integration of transport and land use planning at metropolitan level.
- Foster cross-sector, multi-level governance for better policymaking and delivery.
- For effective policy delivery and stronger evidence base, invest in institutional capacity and enhanced data collection and data analytics.
- Be bold: today's radical policy can become tomorrow's orthodoxy, but only with strong leadership.
- Introduce trials and demonstrations – 'seeing is believing'.
- Run awareness raising, marketing and behaviour change campaigns.

Evaluation methods

The indicators for measuring success were originally developed to design and justify car-based (stage 1) and sustainable urban mobility based (stage 2) policies, and are not yet well adapted to the needs of cities taking a place-based (stage 3) policy perspective.

Having existed for less time than stage 1 and 2, success indicators for stage 3 policies are broader. This means that currently there can be a gap between what cities want to do –

their vision for the future – and being able to make a clear economic case to funders to support place-based measures.

CREATE also developed its own framework (p.17 of this document) to quantitatively analyse travel trends. It explains travel behaviour at traveller and trip level and system effects resulting from this individual behaviour. Measures for promoting alternative modes are classified under four Es: engineering, enforcement, economy, and education.

Read the CREATE Report of Cross-City Comparison for interesting evaluation concepts.

Tools and resources:

- CREATE Project Summary and Recommendations for Cities - link here.
- Urban Governance Leaflet - link here.
- Cross-City Comparison for CREATE Stage 3 Cities - link here.
- CREATE Technical Notes - link here.
- Urban Congestion and Network Operation: Towards a Broader Set of Metrics for Assessing Performance - link here.

Contact details

Create Project Coordinator, Peter Jones, University College London, P.J.Jones@ucl.ac.uk