



# PROJECT FINAL REPORT

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## **The SUNSET project**

SUNSET (<http://www.sunset-project.eu>) is a three-year research & development project part of the European Commission's Seventh Framework programme Smart Cities & Sustainability under DG Connect (<http://ec.europa.eu/dgs/connect/en/content/smart-cities>). SUNSET started in February 2011 and has ended February 2014.

SUNSET develops and evaluates a set of innovative services that use Smartphone technology, social networks and incentives to encourage people to travel more sustainably in urban environments. The project's objective is to increase personal mobility and at the same time reduce congestion, increase safety, and protect the environment.

The SUNSET project uses a human-centred approach to achieve its objectives stimulating people to change their individual travelling behaviour. To influence behaviour, we developed and exploited a Smartphone application named tripzoom featuring challenges and rewards to move smarter. Moreover, we tailor and personalise these incentives by means of automatically measuring actual travel behaviour of the Smartphone user.. This is a personalised, multimodal coaching approach to traffic and mobility management, based on rewarding good behaviour.

SUNSET is an initiative of a consortium of nine public and private partners from four different European countries with a total budget of 4.1 million euro. SUNSET combines technical with social research creating new services for sustainable travel and evaluation of these services in real life settings of the cities Enschede (NL), Gothenburg (SE) and Leeds (UK).

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# Part I - Final publishable summary report

## 1 Executive summary

The yearly growth of person mobility in the EU results in increasing concerns with respect to safety, economic and environmental issues. With more than 80% of the EU population living in cities, one of the biggest challenges facing European cities and its citizens is to find solutions that create win-win situations on sustainable, safe and efficient ways of travel. This calls for a people-centric vision on urban mobility management that puts users at the heart of the transport system in terms of needs, priorities, information flows and dynamic responses.

An approach focussed on the mobility behaviour on an individual level can be used to motivate and incentivise citizens to make their contribution to improve urban mobility for all. With a fast increasing percentage of people carrying a Smartphone in their pockets, a promising way to implement this strategy is to provide a mobile App that records personal-level mobility patterns while people are on the move. This gives personalised incentives for mobility improvements and can include social community features to make people move better. At the same time, yet only with user consent, personal profile information, or an anonymised part of that, provides a valuable new data source ('floating traveller data') for longitudinal monitoring and mobility management purposes that allow governments and road authorities to fine-tune their transport policies. This approach, implemented via an **integrated software system** and deployed as personal and social mobility services in an App called tripzoom, is the main technological achievement of SUNSET.

Tripzoom supports different **incentive schemes** that have been designed with the purpose to make the mobility system of urban environments more efficient and sustainable. An incentive is effective if individual travellers adopt different behaviour resulting in positive impacts on the policy goals. The SUNSET research focused on defining the relationships between individual objectives and system objectives using behaviour modelling and network modelling methodologies. The outcome is used to design of a set of feasible and potentially successful incentives that are applied via tripzoom and assessed in the SUNSET Living Labs.

Within SUNSET three Living Labs in Enschede, Gothenburg and Leeds have been designed, organised and maintained for nearly a year. In these Living labs tripzoom has been put to the test. The Living Labs used a newly developed **Living Lab operational model** that incorporates good practice to create and maintain a successful Living Lab featuring innovative mobility services.

Finally, tripzoom and the incentive schemes delivered via tripzoom are evaluated in the Living Labs on the basis of a comprehensive **evaluation methodology**. This evaluation methodology has been developed in two stages, the first stage covering a) key indicators for the evaluation of operational success and b) an analysis approach for the effectiveness of incentives in the SUNSET system. The second stage produced a final set of indicators (a Cost Benefit Analysis, Safety indicators, Sustainability and Wider Impacts), delivered a unified framework and finally provides specific recommendations on how to evaluate mobility behaviour in practice within Living Labs.

Using a range of experiments during the Living lab operation with several hundreds of users, SUNSET has showcased via tripzoom that individual behavioural change can be achieved in terms of change in travel times (time shifting out of rush hour) and change in modality (shift towards sustainable bike alternatives). In the evaluation a unique combination of, both, quantitative personal-level travel data analysis and qualitative user assessment was performed.

Despite promotional activities, the tripzoom App did not create broad take-up beyond the Living Lab experiments as a commercial level value-adding service to end-users. As a result, SUNSET was not able to create the envisioned city level effects on congestion reduction, increased safety, sustainable travel and personal well-being. In that respect, the project has not been able to create attractive end-user services with the tripzoom software system beyond the Living Lab scope.

Nevertheless, SUNSET did deliver a personal mobility measurement core service and engine on which public or private stakeholders like local or regional public authorities, employers, transport companies, local retailers, service providers and event organisers can couple, integrate or build their own (cross-sectoral) services, Apps and campaigns on a scale of their choice to incentivise travellers (commuters, local citizens, visitors, tourists). This creates a fast growing market as tripzoom type of services are flexible and cost-effective opposed to more traditional traffic- and mobility management solutions and allow for new business models– for example in information exchange and incentive distribution between third parties, city authorities, transport suppliers, employers and end-users.

Already from the SUNSET results, a start-up company has been created, which brings second generation SUNSET-like personal and social mobility services to the commercial market. Therefore the SUNSET innovations and results have contributed significantly to a further market development featuring integration of a ‘user led’ and individualized approach with wider societal (‘top down’) objectives benefiting current sustainability, health and well-being, safety and economic concerns in transport. Here, two main emerging markets can be distinguished:

- a market for monitoring and mobility research services. Here the SUNSET automated tracking functionality via a ‘measurement App’ is positioned as a service in itself. The service is then either used in panel-based research studies for specific mobility and traffic evaluation and policy development (customers: local authorities, transport companies and consultancy firms on topics like social safety, city center accessibility and sustainability) or is used as a trip registration tool in business settings. In the latter context, we see currently a market developing of full-service mobility management service providers that support employers in mobility management and use automated tracing as a component in their service offerings. Main selling point here is to reduce administrative overhead for employees and costs for employers.

- A market for sustainable, smart travel. Here lesson learnt is that seducing specific target groups of travellers requires a well-thought and consequent behavioural change strategy and approach. Only strongly tailored incentives leveraging on the personal preferences and context of the traveller can effectively influence individual and group-based travel behaviour in a sustainable way. Common lesson learnt regarding these next-generation service examples is that opposed to the more broader scope of tripzoom with its research elements, these Apps/services should be more tailored towards specific stakeholders (employers, mobility management consultants, transport companies) associated target groups (employees/commuters, cyclists, city visitors) seamlessly integrated with lifestyle-compliant look, feel and preferences. Focus should always be on value creation to the end-user as in a traveller-centred paradigm sustainable and substantial end-user take-up is key.

## 2 Summary of the project context and its objectives

With more than 80% of the EU population living in cities, managing urban mobility is a high priority theme across Europe. Managing urban mobility, however, means dealing with conflicting interests. The question of how to enhance mobility while at the same time reducing congestion, accidents and pollution is a common challenge to all major cities in Europe. People want to travel throughout the day in the most comfortable, fast, cost-effective or easy way depending on their personal context, goals and role. On the other hand, local and regional governments and road authorities want to reduce traffic to enhance accessibility and promote sustainable ways of travel. How to deal with these conflicting personal and system objectives?

### Impact level objectives

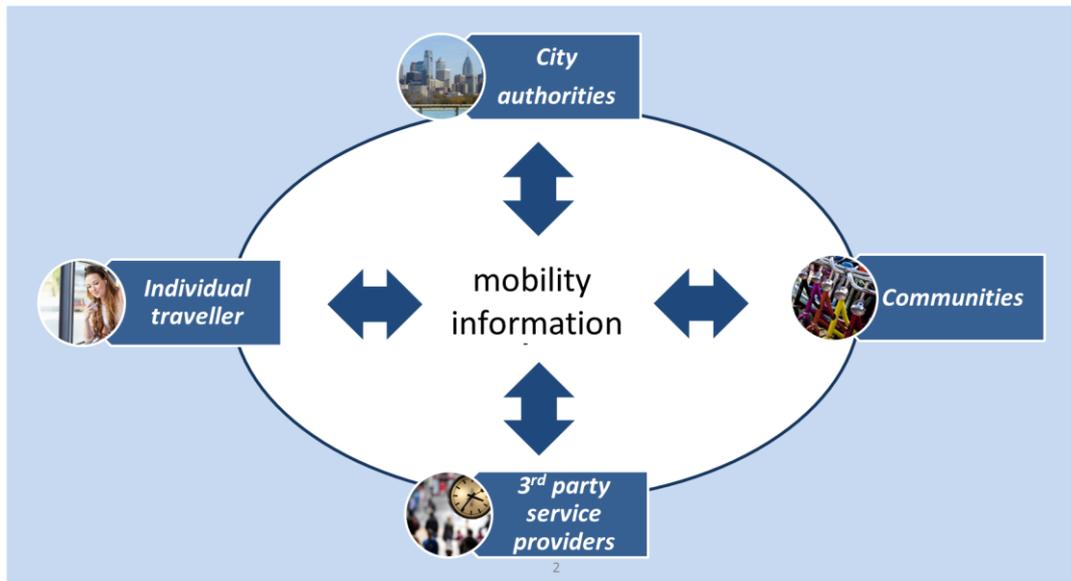
Currently, a variety of measures are taken ranging from restricting access to urban areas up to developing advanced technological cooperative systems. However, changing urban mobility patterns basically means changing the behaviour of people, i.e., replacing the one habit by another habit or motivating people to change. The SUNSET project uses a people-centric approach and aspires to achieve system-level goals by influencing personal goals in terms of stimulating people to change their individual travelling behaviour. To influence behaviour, SUNSET makes use of incentives, rather than restrictions. This is a personal, coaching approach to traffic management and transport, based on rewarding good behaviour.

Four impact-level objectives are covered by the project. SUNSET wants to achieve the following system-level goals:

- Congestion reduction: traffic-jams are an increasing problem to tackle. The average travelling times should be reduced. Our objective is 5% less traffic (measured in car kilometres in a specific area) during the rush hours for users of the SUNSET system.
- Safety: people must be able to optimize their route, to avoid roads with many cyclists for car drivers, to report local road and weather conditions within community, to detect unusual conditions, or to avoid waiting times on dark and silent railway stations.
- Environment protection: for a liveable climate we need reduced CO2 emissions, improved air quality management and reduced noise pollution.
- Personal wellbeing of citizens: the system allows individuals to set and monitor personal objectives, like increase individual safety, reduce travel times, reduce costs, improve comfort, and increase health.

### SUNSET approach

The central approach of the project is to achieve these system-level goals by collaboration and information exchange with travellers as shown in Figure 2-1. Road authorities and city governments have objectives and policies and system-level (traffic) information. Based on this, they may provide incentives to individuals or groups. Additionally, these individuals or groups may also share their mobility patterns or help each other by exchanging information about traffic jams, preferences etc. A social networking service environment arises, which is likely to make use of all kind of information and allows for a personalised approach. In this way road authorities and city governments can tailor their incentives for example on actual behaviour. Third party service providers may come in and provide services or incentives as well.



**Figure 2-1: SUNSET ecosystem overview**

With respect to the services and the incentives to provide, the project aims to:

- Optimise personal mobility through the careful use of personal, mobile ICT services via the Smartphone, enhanced by providing mechanisms to distribute personalised incentives to adopt new ways of travel. The focus of the project is on urban mobility with a fine grained maze of roads (as opposed to long-distance highways) and on commuters with good static knowledge of the environment but with limited overview over the dynamic situation.
- Optimise social-induced mobility, in which travellers inform and help each other using ICT-enabled social networks, such as Twitter, Facebook and mobile applications on the Smartphone. Exchange and sharing of information on the individual level will take place and in that process individuals have the chance to respond to common challenges and collect rewards that encourage them to change their travel towards more sustainable choices.

With shared knowledge about the mobility patterns of travellers (e.g. frequent routes taken), personal preferences and objectives (e.g. minimize travel time) and what kind of incentives (e.g. a travel offer) an individual is interested in, personalised meaningful incentives can be created in three ways: firstly, incentives provided by road authorities and city governments, secondly via 3rd party service providers like public transport companies or employers and thirdly by other travellers who share experiences, create group-based challenges and provide meaningful information to other travellers. In this way, the project tries to create an environment that allows for community building, new service provisioning and effective behavioural change.

With SUNSET mobility management becomes personal and real-time, management is bottom-up / inside-out, service-based and across multiple transport modalities.

### **Scientific & Technological objectives**

SUNSET has set the following Scientific & Technological objectives in order to reach the goals outlined in the previous paragraphs:

- Create social services that motivate people to travel more sustainably in urban areas.
- Advance the State of the Art in measuring personal travel from mobile sensors and develop algorithms for deducing personal mobility profiles from this data.

- Implement intelligent, personalised distribution of incentives (rewards) to balance system and personal goals.
- Validate the SUNSET results in real-life settings, Living Labs, and develop evaluation methodologies to perform impact analysis.

The Living Labs are a means to introduce and evaluate our concepts, but we state them as an objective because by using Living Labs, we aim at introducing a continuously growing and developing initiative in the cities involved, which does not necessarily stop when the project ends.

The project will aim at combining social research and transport studies with work on ubiquitous computing and human-computer interaction to investigate and assess what incentives are most effective, under what conditions incentives can be provided and how personal and social mobility services leveraging incentives can be exploited. The Scientific and Technical objectives of SUNSET can be elaborated to specific objectives per area of work, as summarised in the following table.

**Table 2-1: Detailed SUNSET project objectives.**

<b>Scenarios and the user and system requirements specification analysis</b>
- Specify and analyse user scenarios and requirements
- Specify and analyse system requirements
- Map user requirements into system requirements
<b>Personal mobility profiling infrastructure</b>
- Architect mobility monitoring and representation
- Develop mobility pattern detection, profiling and visualisation services
- Develop privacy management services
- Implement infrastructure and interfaces
<b>Mobile application implementation</b>
- Advance algorithms for 24x7 automated displacement sensing
- Develop incentive distribution services
- Develop social network connectors
- Implement a showcase App to be assessed in the Living Labs
<b>Incentive services and goal management</b>
- Define the set of system and individual objectives
- Research the relationship between individual and system objectives
- Investigate key factors that influence the use of information messages
- Develop a set of feasible and effective incentives to change mobility
<b>Social mobility services</b>
- Integrate components, methods, and software
- Incorporate additional (3rd party) services
- Develop tools and support facilities for monitoring
- Investigate new business models and cases for preparing the exploitation of SUNSET results

to targeted markets
<b>Evaluation methodology</b>
- Provide a set of key indicators that allow evaluation of the implementation and operational success of the social mobility service
- Outline a general framework to evaluate the SUNSET system in against broad EU objectives
- Provide specific recommendations to the living lab experiments on the indicators and measurement approach
- Outline an analysis approach for the effectiveness of the use of incentives in the SUNSET technical system
<b>Living lab operation and experimental evaluation</b>
- Set-up and maintain three Living Labs in project partner cities of Enschede, Gothenburg and Leeds
- Evaluate the operational success and effectiveness of incentives
<b>Other objectives</b>
- Provide support for internal project collaboration, communication and exchange of information within the project consortium
- Disseminate the results of the project
- Contribute to standardisation activities

SUNSET has the demanding target to develop new urban, community-driven mobility concepts based on co-creation, social networks, and incentives to change behaviour and test these in real life with real users in three local ecosystems. In order to achieve the objectives set previously, SUNSET has been progressing through the following activities:

- State-of-the-Art Analysis in the addressed research areas, as well as the project’s research aims for progress beyond the State-of-the-Art;
- User-centred design and careful specification of functional and non-functional requirements to stakeholders;
- Commercial level distributed software component development;
- Integration of components and functionalities into social mobility software applications;
- Development and assessment of feasible and effective incentives to change mobility;
- Deployment and maintenance of a Software-as-a-Service infrastructure;
- Living lab design, organisation. Operation and evaluation;
- Development and application of evaluation metrics and indicators and monitoring of, both, the end-user base and the evaluation process.

Through these activities, SUNSET is able to fulfil its ambitions and deliver the SUNSET Scientific & Technical results, which are presented later in this document.

## 3 Main S&T results/foregrounds

### 3.1 Introduction to the SUNSET achievements

The SUNSET approach to target system level problems caused by the increase of urban mobility is to improve the mobility behaviour of individuals. By assessing mobility behaviour on an individual level, personalized directions can be derived and used to motivate and incentivise citizens to make their contribution to improve urban mobility for all. With a fast increasing percentage of people carrying a Smartphone in their pockets, a promising way to implement this strategy is to provide a mobile App that records personal-level mobility patterns while people are on the move and gives incentives for mobility improvements.

In this context SUNSET delivers four main S&T results:

1. The main technological innovation of SUNSET is the **tripzoom software system**, which is an integrated client/server solution consisting of a Smartphone App as front-end and a flexible component-based software platform as back-end. The tripzoom system introduces advanced ICT components to deliver personal travel behaviour measurement capabilities (mobile sensing), cutting-edge trip recognition, pattern mining and profiling functionality, state-of-the-art incentive distribution management and social community features to make people move better. Both the integrated solution as the individual components can be considered as S&T results of the project.
2. Tripzoom supports different **incentive schemes** that have been designed with the purpose to make the mobility system of urban environments more efficient and sustainable. An incentive is effective if motivating individual travellers to adapt different behaviour can bring positive impacts on the policy goals. The SUNSET research has focused on establishing the relationship between individual objectives and system objectives using behaviour modelling and network modelling methodologies. The outcome is used into a design of a set of feasible and potentially successful incentives that is applied via tripzoom and assessed in the SUNSET Living Labs.
3. Within SUNSET three Living Labs in Enschede, Gothenburg and Leeds have been designed, organised and maintained for nearly a year. The Living Labs have used a newly developed **Living Lab operational model** that provides guidance for other projects and incorporates good practice to create and maintain a successful Living Lab featuring innovative mobility services.
4. Finally, tripzoom and the incentive schemes delivered via tripzoom are evaluated in the Living Labs using a comprehensive **evaluation methodology**. The evaluation methodology has been developed in two stages, the first stage covering a) key indicators for the evaluation of operational success and b) an analysis approach for the effectiveness of incentives in the SUNSET system. The second stage has derived a final set of indicators (a Cost Benefit Analysis, Safety indicators, Sustainability and Wider Impacts), describes a unified framework and finally provides specific recommendations on measurement in practice within Living Labs.

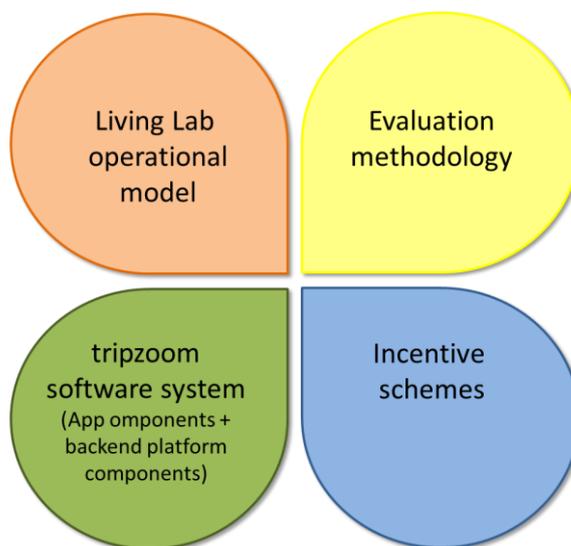
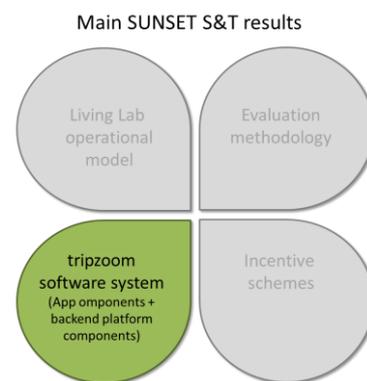


Figure 3-1: SUNSET main S&T results

## 3.2 Tripzoom software system

The main technological result is the design and implementation of the tripzoom software system that provides functionality to end-users (travellers) to become aware of their mobility behaviour and get stimulated to travel more sustainable and to professionals that want to stimulate more sustainable travel (road authorities and city governments).

Travellers can use the tripzoom App and a supportive web portal ([www.tripzoom.eu](http://www.tripzoom.eu)). The App is available for Android devices via Google Play and for iOS devices via the Apple AppStore. To registered professionals, tripzoom provides management functionality via a web-based city dashboard. The next section outlines what different users can see and do using the tripzoom system. Section 3.2.2 outlines the different reusable and exploitable components and services of the tripzoom software system.



### 3.2.1 User perspective

#### 3.2.1.1 The tripzoom App

At first launch, after downloading and installing the App, the user can choose to login with an existing account (either created through the tripzoom web portal or using existing Facebook credentials) or to create a new account directly on the Smartphone. During the registration process, user-consent is asked and access credentials are generated (to automate next session login) that will be used in all subsequent interaction. Next tripzoom:

- Records, automatically and 24x7, personal trips of the end-user in the background irrespective of modality used and without any needed user trigger (like start-stop);
- it provides a subsequent overview of end-user mobility in terms of trips, frequent trips, places visited and a mobility footprint;
- it provides incentives and rewards earned from their factual travel behaviour;
- it provides a means to invite friends and to get information about the travel behaviour of friends (in terms of last trip, total costs, total CO2 emission, and time and distance travelled);
- it notifies the user when someone invites them to become a friend, if a new incentive ('challenge') has been made available to them, if they earned a reward based on their travel behaviour or there is a new experience sampling question available for them to answer.

Within the App four main user interface sections are visible to the user in the form of four tabs: Community, Friends, Me, and Settings. These cover the most important aspects of the app: comparison of the users' own behaviour to that of the all tripzoom users (the tripzoom community), social connections to specific tripzoom users invited by the users as 'friends', information about the users themselves, and the possibility of editing settings such as profile information or privacy directives. This provides direct control over what information others can see of this user, when they become friends with the user.

Figure 3-2 shows the main pages of these sections implemented as tabs in the mobile UI.

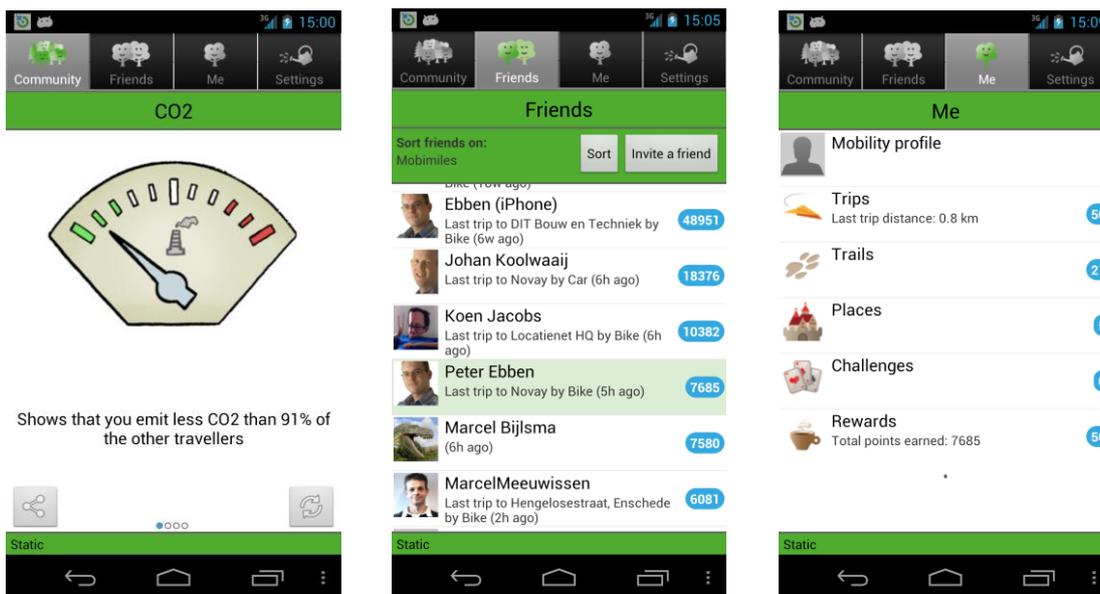


Figure 3-2: tripzoom App interface: Community, Friends, Me (Android version)

Additionally, tripzoom uses the notification mechanisms of the mobile platform to push real-time information to the users and catch their immediate attention:

- another user has invited the current user as friend;
- an experience sampling question is sent to the user;
- the system has detected that the user has managed to achieve a challenge and has sent a reward to the user.

The notifications are used as entry points into the app whenever an interesting event has occurred.

## Community

One of the mechanisms employed within tripzoom to motivate people to change their mobility behaviour towards a more sustainable way of transport is to compare the users' mobility behaviour with that of others. This comparison was implemented in two ways. First, the users are informed of the travelling behaviour of other users that they have explicitly invited as tripzoom 'friends'. Second, the app provides an attractive and quick overview of how the user compares with respect to the whole tripzoom community.



The performance comparison with the community is visualized within the Community tab. To provide the user with a quick way of checking their performance relative to the tripzoom community, the app offers corresponding graphical visualizations. Figure 3-3 depicts the icons assigned to four different metrics used by the community comparison feature.

- visualizing travel cost with a sad to smiling piggy bank in 11 steps; a smiling piggy bank indicates that the user spends less money on travelling than the average community user
- visualizing CO2 emission with a green to red gauge in 11 steps; an arrow in the green area indicates that the user emits less CO2 by travelling than the average community user

- visualizing health with one to five rowers in a rowing boat; more than 5 oars indicate that the user improved in healthy behaviour
- visualizing earned points with a notebook with 0-10 stamps; the more green items appear, the more points the user has earned with respect to the average community user

In addition to the graphics, an accompanying text is displayed providing some explanations and a numeric representation of the user's current standing within the community according to the specific metric.

Moreover users are able – via a share button – to share their relative user performance on the tripzoom web portal or in Facebook to their friends.

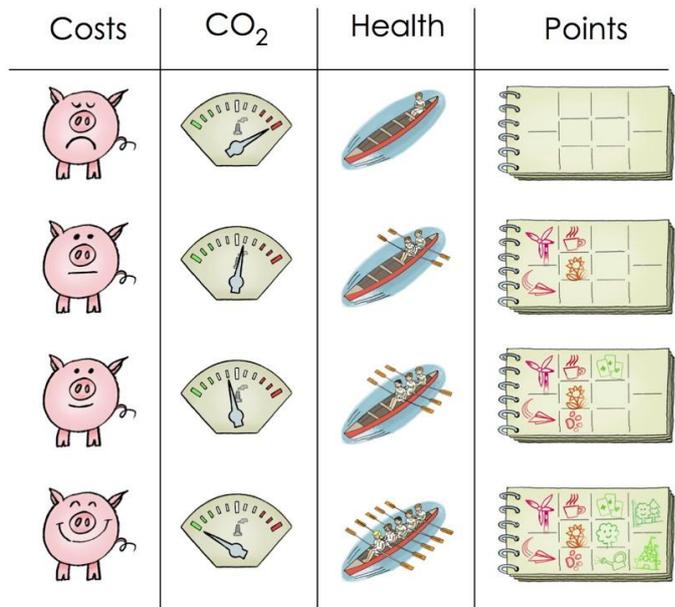


Figure 3-3: visualisation of relative user performance

## Friends

Important functionality of tripzoom is that users can track, compare, and share their progress in travel behaviour with other users. In addition to the whole community (for which only anonymized, aggregated data is made available), users can also access data of specific other people. As is customary in today's social networking applications, people can invite other users as 'friends', see Figure 3-4, left panel. The result is that each user has a list of users displayed in the Friends tab. Several actions can be performed on this list (Figure 3-4, centre) such as sorting according to CO<sub>2</sub> emission or achieved points. Users who have accepted the friend request – and allowed the current user to see their live location – can also be displayed on a world map.

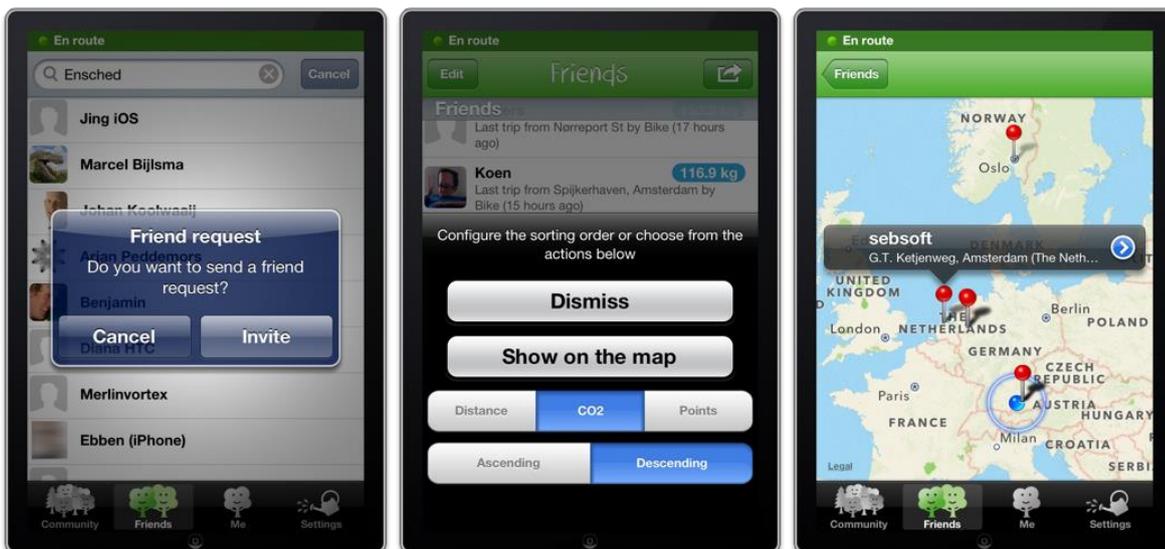


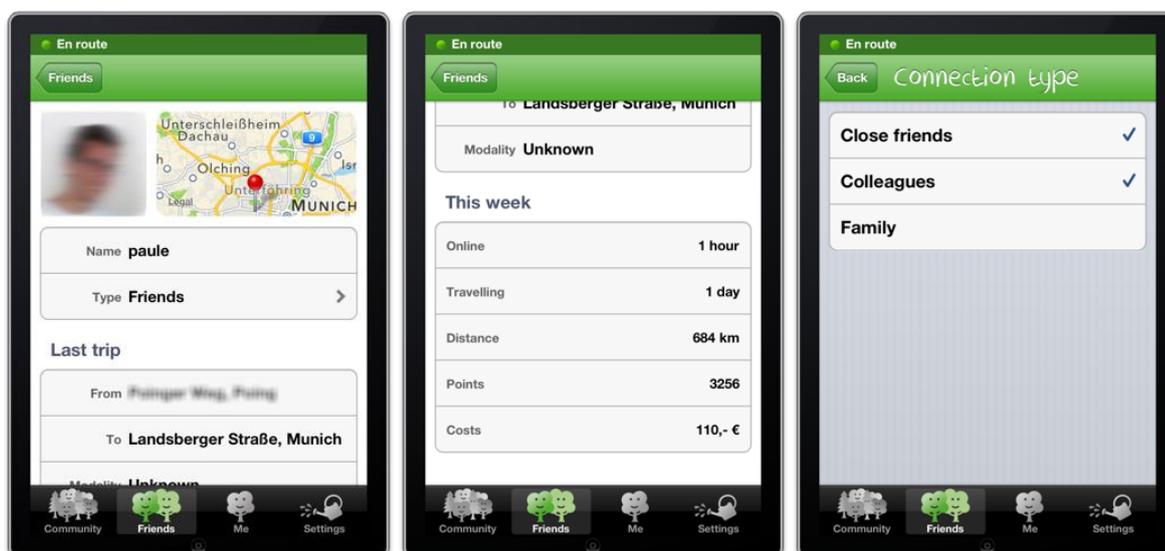
Figure 3-4: tripzoom user interface: Friend Invite, Sorting, Map (iOS version)

A user can easily add friends by first searching for them (according to display name and other public profile fields such as home town), and then inviting them. However, friendship within tripzoom is symmetric, i.e. it has to be accepted by both parties.

For that reason, the friends list also shows a section of invited friends (people the user has invited) and unconfirmed friends (people who have invited the user). Users receiving a friendship request are notified by email and using the mobile app’s notification mechanism as explained earlier.

It is of course possible to revoke an invitation (by deleting the invited friend) or rejecting an invitation (by deleting the unconfirmed friend). Accepting friend requests gives immediate access to the mobility data that the persons have granted their friends.

A principal feature of the friend list is that the enlisted people can grant the user access to their own travelling behaviour on a fine-grained level (see Section 2.1.5 on privacy settings). Thus, in contrast to the community views, users can check and compare concrete mobility data of their friends (Figure 3-5). Example data contain information about last trips, total distance travelled, overall money spent, and points achieved within the last week.



**Figure 3-5: tripzoom user interface: Friend Details and Relations (iOS version)**

As this data is highly personal and users might want to share these items more selectively, a mechanism has been implemented that lets users classify their friends in a unidirectional way into different categories (Figure 3-5, right panel). Each of those represents a subgroup of ‘friends’ and specific settings for sharing can be applied to each of them.

## Me

Next to comparing one’s own data to other users or the community, the appropriate display of a user’s own automatically collected travel data is of major importance within the App and one of the key innovations of the project. Thus, in the Me tab, various visualizations are available to display, browse through, and also correct automatically collected data or provide additional information. The most important types of information in use are the following.



Trips (Figure 3-6): a trip is a continuous movement from a starting point to a target point; for the user, trips are characterized and represented by

- a starting and an ending point (often but not necessarily one of the user's places)
- two timestamps, one at the beginning and one at the end of the trip
- the duration and distance
- a modality (i.e. mode of transport such as bike or train, automatically inferred); can be corrected by the user
- additional fields such as objective (e.g. business trip, commuting), role (e.g. driver, passenger), and detection quality (visualized by the colour of the modality flag); automatically inferred, can be corrected by the user



Figure 3-6: tripzoom user interface: Collected personal trips (iOS version)

Places (Figure 3-7, left and middle): a place is a location of some dimension that was automatically detected to be of importance by the user (mostly because of continuous longer stays at that location); for the user, places are characterized and represented by

- a specific location on the map
- a name (retrieved from external services such as Foursquare); can be changed by the user
- a type (automatically detected, e.g. 'home' or 'office'); can be changed by the user
- a duration of stay at that location, both absolute and relative with respect to all places of a user

Trails (Figure 3-7, right): a trail is recurring trip, i.e. a trip a user has travelled several times; for the user, a trail is characterized and represented by

- a starting and an ending point (often but not necessarily one of the user's places)
- the number of recurrences
- the average and fastest trip duration, measured over a long-term, configurable time interval

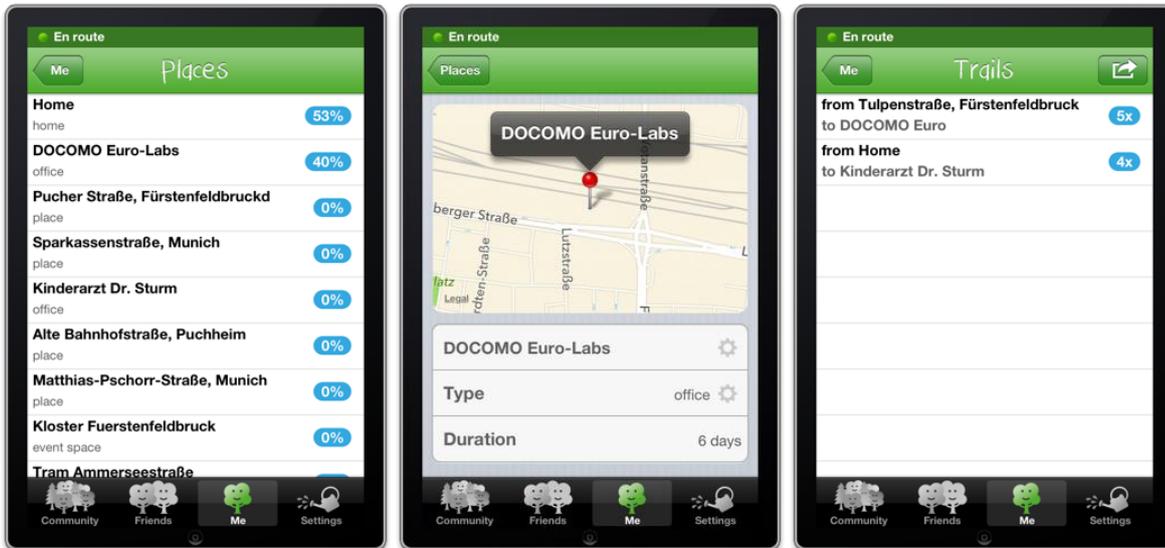


Figure 3-7: tripzoom user interface: Personal Places and Trails (iOS version)

Mobility Overview (Figure 3-8): the mobility overview maps the detected travel modalities to a user selectable set of parameters such as time or distance; for the user the mobility overview is presented as

- a list of modalities sorted according to a chosen parameter (modal split)
- an interface to choose a main parameter (time, distance, cost, emission, lost time)
- an interface to choose the time interval (2 weeks, 2 months, 6 months)
- an interface for a second level parameter according to which the data is split, e.g. into data during rush hour or not

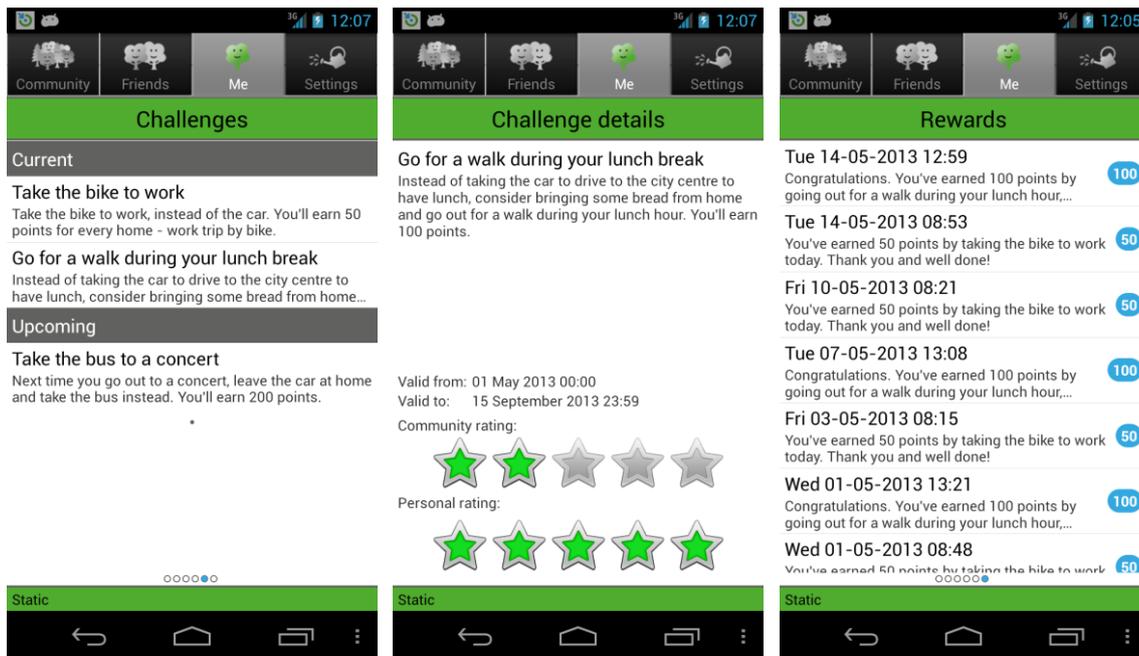


Figure 3-8: tripzoom user interface: Mobility overview (iOS version)

Challenges (Figure 3-9, left and middle): incentives represent a central tool for city controllers to initiate changes in mobility behaviour of individuals or groups of users; an incentive consists of a challenge that describes the task that a user needs to do, and a reward that will be given to users who

manage to succeed with the given challenge; for the user, the dynamic set of challenges is characterized and represented by

- a title and a description providing details about how to achieve the task set by the challenge
- a time period in which the challenge is open
- 0-5 stars showing the average rating that this challenge was given by the community; each user who received the challenge can rate it



**Figure 3-9: tripzoom user interface: Challenges and rewards (Android version)**

Rewards (Figure 3-9, right): as soon as a challenge has been accomplished, the user is given a reward; for the user, a reward is characterized and represented by

- the date/time it has been received
- an explanation as to why it has been received
- a value representing the number of points the user has been awarded with this reward

## Settings

The last tab collects settings that control what data is stored about the user, how it is shared with other users, and some general settings for the app. The two most important pages within this tab represent the user profile and the privacy settings. The first (Figure 3-10, left) enables the user to specify additional personal information (next to email, username, and a display name required during registration) such as real name, birthday, and gender. This is currently a subset of the existing profile fields and the Web portal offers additional possibilities, e.g. to upload, crop, and store a profile image. Additional information can be added about the user’s mobility situation important for the incentive marketplace to best target



incentives. This includes the home town of the users and whether or not they have access to a car, bike, or public transport system.

As this explicitly entered information as well as the implicitly collected data (such as location and trips) are highly personal, tripzoom places considerable power about what data is shared with whom into the hands of the users themselves. Privacy settings (Figure 3-10, centre and right) allow for fine-grained control over several categories of data.

As these data are quite diverse and sharing of these might depend on a more particular type of connection with other users, tripzoom offers additional specific connection types: colleagues, close friends, and family. Each user can independently and without the other party's knowledge add or remove other people to or from these specific lists. As such, tripzoom offers an implementation of the circles concept found in other social networks such as, e.g., Google+, with a restriction to three pre-defined circles to keep the number of privacy settings manageable.



Figure 3-10: tripzoom user interface: Personal Profile and Privacy Settings (iOS version)

### 3.2.1.2 The tripzoom web portal

Main goal of the tripzoom web portal ([www.tripzoom.eu](http://www.tripzoom.eu)) is to advertise Tripzoom to interested visitors and potential future users. For that purpose, the landing page of the web portal (Figure 3-11) is designed to highlight core aspects of tripzoom such as personal mobility, sustainability or community. In order to get more information about these and other aspects of tripzoom, users can access a more detailed information page from the landing page.

The landing page also features different connections to social networks: The most prominent social networking features are Facebook- and Twitter-boxes that link to the respective Tripzoom -pages on these social networks and provide a preview of latest updates. Additional links to Tripzoom-pages on Facebook, Twitter, Google+ and Foursquare can be found in the footer of the landing page which also includes links to terms & conditions, contact and privacy information. Finally, the landing page includes two links that allow users to download the mobile Tripzoom app for iOS and Android from the App Store, respectively from Google Play.



Figure 3-11: tripzoom web portal: landing page (www.tripzoom.eu)

## Login and Registration

From the landing page, users can either log in to an existing tripzoom account or register to create a new one. Users can login and register with dedicated credentials or an existing Facebook-account. However, users who log in or register with Facebook automatically have access to its social networking features. Other users have to log in to Facebook later in order to use the same features.

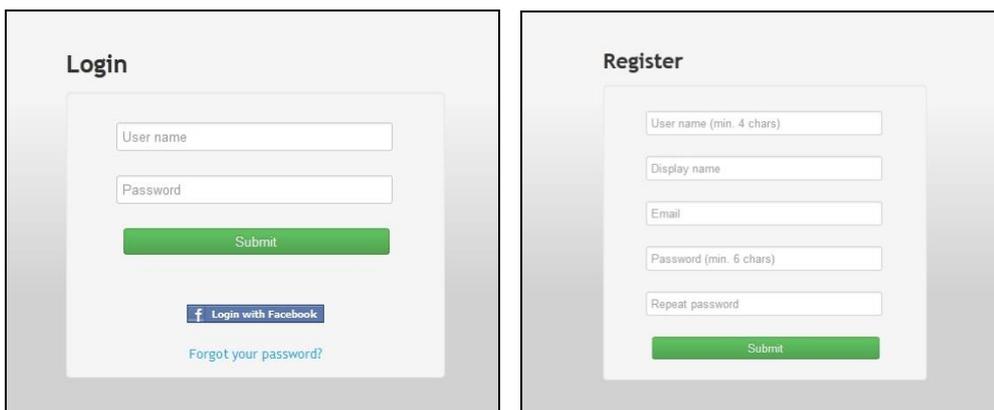


Figure 3-12: tripzoom web portal: pages for login (left) and registration (right)

The design of the login and registration pages (Figure 3-12) is kept simple in order to be reused for the mobile App login process.

## User Profile Management and Social Networking

After users have successfully registered or logged in, they get to the “inner” part of the portal (Figure 3-13). It allows users via a menu to manage their user profile and settings for their Tripzoom

account, to invite and manage friends, to create blogs and to post activities to an activity feed. The Web portal offers some complementary functionality to the mobile App such as inviting people who are not yet part of the tripzoom community by entering their email addresses, selecting a set of people in the user's address book or by granting tripzoom access to a user's external accounts such as Gmail or Facebook.

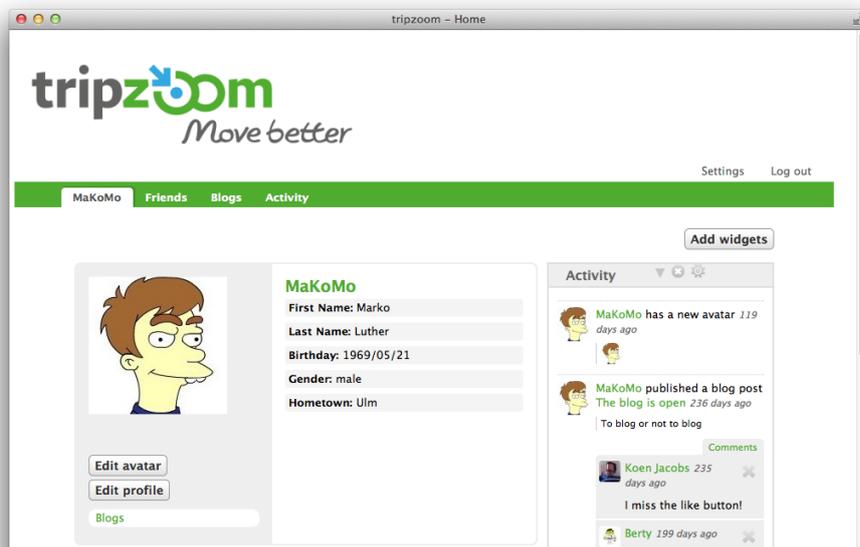


Figure 3-13: tripzoom web portal

### 3.2.1.3 City Dashboard (Management Web Portal)

The City Dashboard provides a management and operation platform for City government representatives and road authorities to coordinate tripzoom system application in the course of the project. Apart from user Administration the core functions in the City Dashboard are Incentive Management and Experience Sampling Management. The City Dashboard can be accessed by registered administrators using the following URL: <http://www.tripzoom.eu/portal>

#### Incentive Management

To manage incentives, the City Dashboard is able first of all to define, register, retrieve, and modify incentives in the form of challenges in a database (Figure 3-14). The process of incentive registration is supported by help pages explaining the steps to be taken. In addition, in the City Dashboard Administrators can define and manage issuing conditions.

For example, three Traveller Conditions for an incentive might be:

- If you go by foot and walk more than 5 km, you will receive 100 points as a reward;
- If you take a bus during rush hours, you will receive 50 points as a reward;
- If you take a car today, but emit less than 20 kg CO<sub>2</sub> you will receive 20 points as reward.

Tripzoom then maps actual user travel behaviour on these conditions and automatically manages rewarding when challenges are met.

In the City dashboard functionality is present to monitor the status of incentive management, for example how many users received a new incentive notification or how many users received a reward

in period X. To facilitate the operation, Administrators can page, sort, filter and search the incentive and reward list.

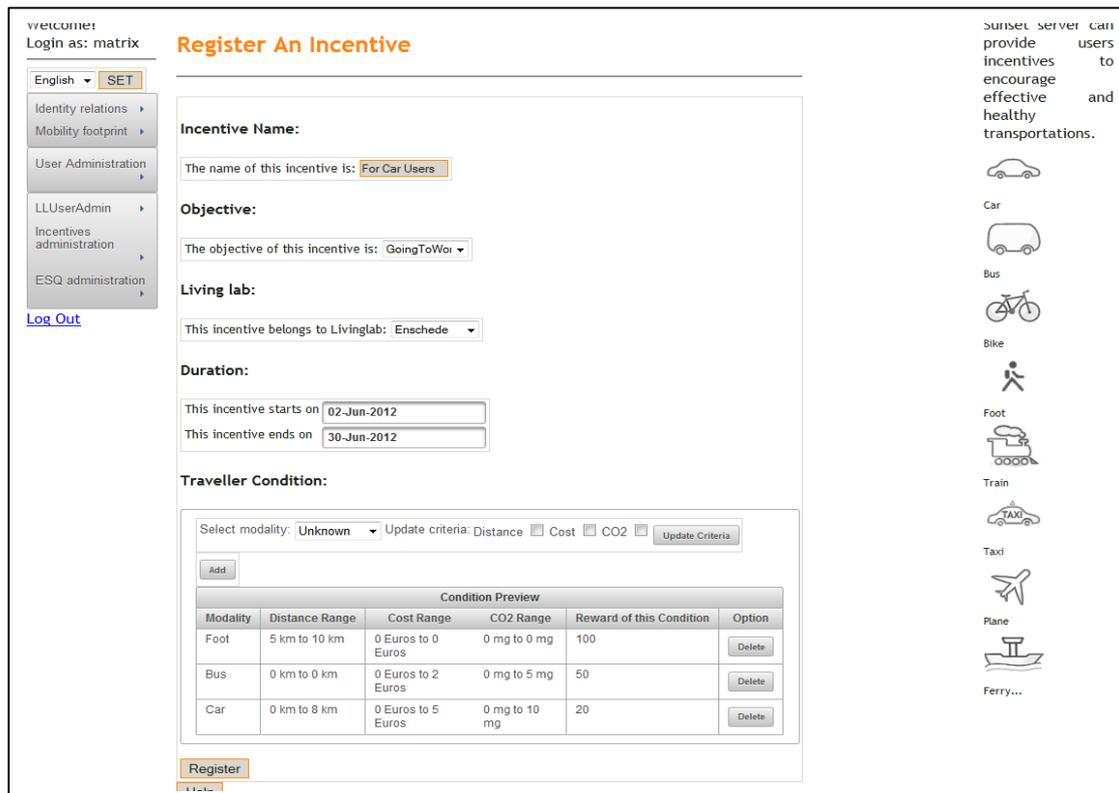


Figure 3-14: tripzoom City dashboard: Incentive definition

## Experience Sampling Question Management

Experience Sampling Questions (ESQ's) can be used by Administrators to get qualitative feedback on experiences of end-users in a context-sensitive way by exposing users in the tripzoom App with a short question, which pops up according conditions set in the City Dashboard.

To manage Experience Sampling Questions (ESQ's), the City Dashboard provides functionality to define, register, retrieve, and modify an ESQ in part or in all. In addition, in the City Dashboard Administrators can define and manage issuing conditions.

For example, three issuing Conditions for an ESQ might be:

- On trip end, if a certain modality is used by the traveller;
- At a certain time or time interval;
- At a certain weather condition

Finally, the City Dashboard supports monitoring of users' answers to the questions. To facilitate the operation, Administrators can page, sort, filter and search the ESQ list.

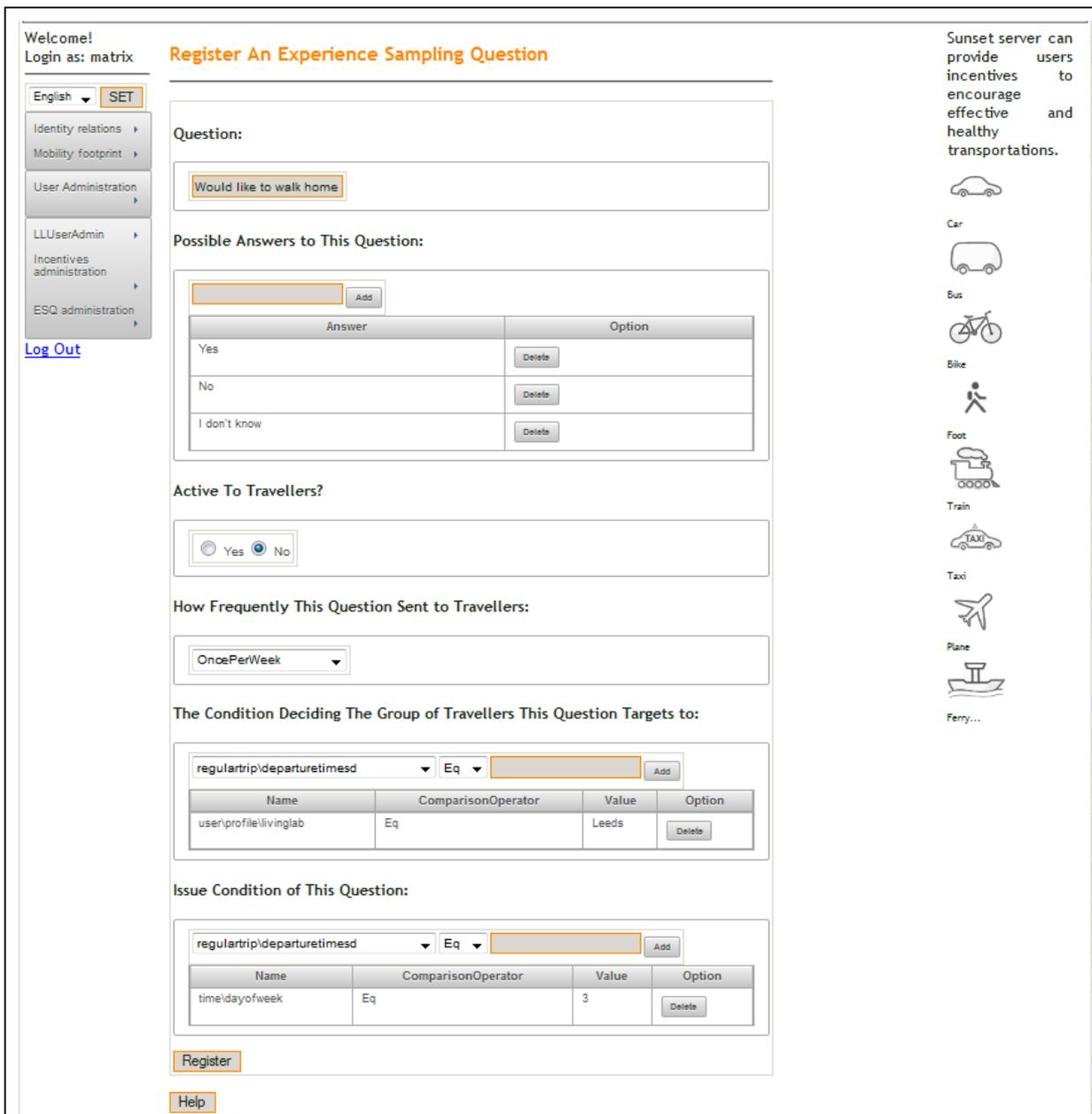


Figure 3-15: tripzoom City dashboard: Experience Sampling definition

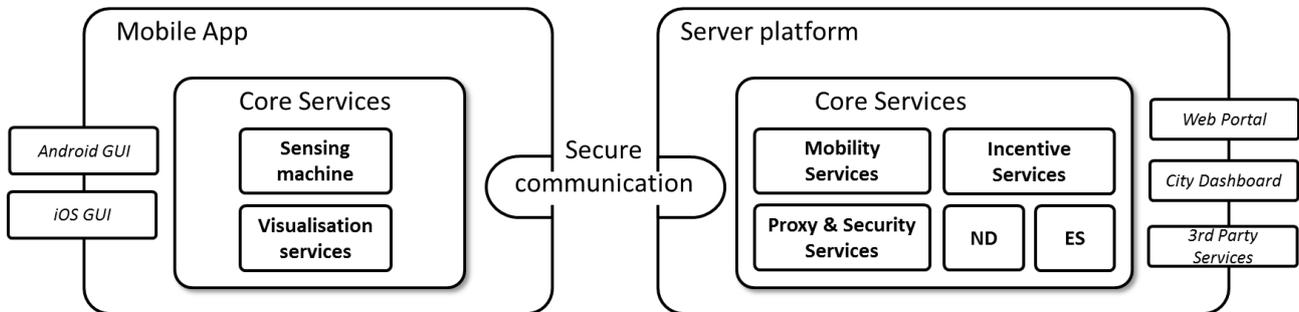
### 3.2.2 Building block perspective

This section provides an overview of the tripzoom software system in terms of re-usable system components and their architecture. Next to the state-of-the-art that has been applied in the development, a number of components feature some key technological innovations.

The SUNSET system consists of a set of heterogeneous components, working together in a distributed configuration. Tripzoom follows a classical client-server architecture offering a service infrastructure that provides a set of core mobility and social networking services guarded by a security layer (Figure 3-16). A component can be a service component, residing in the SUNSET service environment, or a client component running on the Smartphone of SUNSET user. A service component is either a front end component serving requests from clients, or a back end component delivering functionality to other service components. Additionally, the SUNSET system uses

resources offered by external or 3rd party components that are not themselves part of the SUNSET system, e.g., sensors and services to monitor weather conditions.

A hybrid distributed system interaction style is used by SUNSET to support loose-coupling between system components. SUNSET combines the use of Representation State Transfer (REST) Models, Shared Data Repository (SDR) and Event-Driven Architectures (EDA) for different parts of the system.

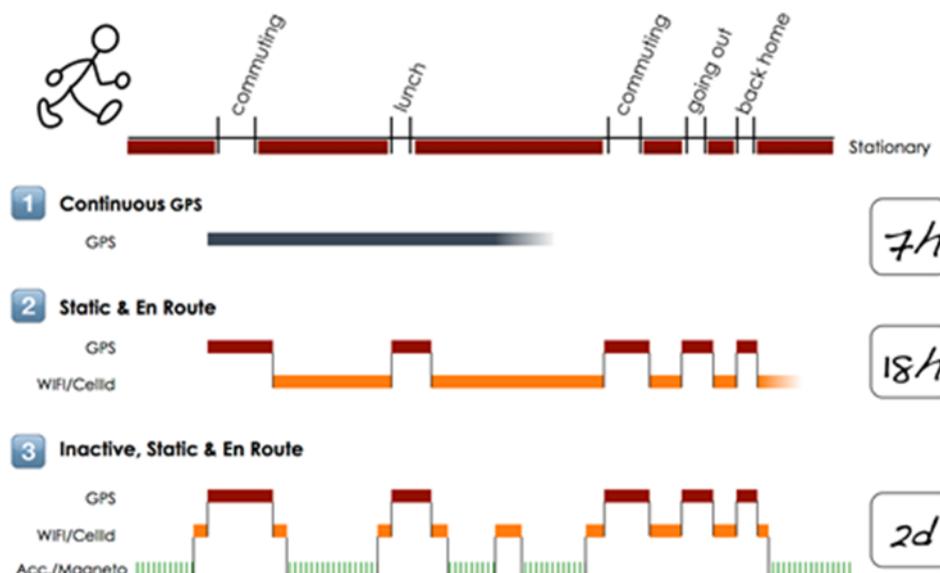


**Figure 3-16: tripzoom high level component architecture**

Users mainly interact with one of the Smartphone clients as described in the previous section. Additionally, the tripzoom server provides a Web Portal for the mobile users to view their profiles online. City controllers can make use of a City Dashboard view that provides access to citywide mobility information and incentive control. Finally, 3rd party services such as the social networking applications Facebook and Twitter expand the reach of tripzoom information and allow for personalized sharing of mobility information

### 3.2.2.1 Mobile App sensing machine

One of the key innovations of the SUNSET project is the energy-efficient Sensing Machine component. The sensing subsystem of tripzoom is responsible for collecting mobility data from mobile phone sensors. These sensors include the GPS sensor, WiFi sensor, GSM sensor, magnetometer and the accelerometer. To control and minimise battery usage while optimising trip recording quality, the Sensing Machine uses algorithms to configure and switch between these sensors. As mobility sensing is an energy intensive process in general, the sensing strategy has to be dynamically adjusted based on the user’s activities. Therefore within tripzoom an innovative three state machine is researched, developed and implemented, which uses a Working, a Standby and a Sleep state that manages optimal use of the sensors while the user is inactive, static or on the move.



**Figure 3-17: tripzoom Sensing machine: Energy efficient continuous sensing innovation**

Moreover, as data communication is also energy intensive, the high amount of data resulting from sensing is pre-processed to eliminate noise and redundancy before sending it to the server and is cached to wait for the best data communication opportunity. The implementations of the Sensing Machine vary per platform and OS version, as the different platforms have different limitations on the use of these sensors in fore- and background and the degree to which they are configurable and the way they can be accessed, and while different OS versions offer different functionality to configure those sensors.

### **3.2.2.2 Mobile App visualisation services**

A number of different App components have been implemented to take care of visualisation, information presentation and notifications to the user.

#### **Mobile Mobility Profile Visualisation (MMPV)**

The Mobile Mobility Profile Visualisation (MMPV) component provides the mobile front end to the MPV (Mobility Pattern Visualizer, section 3.2.2.4) to allow the user to inspect relevant mobility patterns that are detected. In addition, the MMPV provides direct feedback of the gathered mobility data in the form of traces and place indicators on a map to the user.

#### **Mobile Incentive Presenter (MIP)**

The Mobile Incentive Presenter (MIP) provides the mobile interface of the IMP (Incentive Market Place, section 3.2.2.5). It presents incentives to the user and sends the users responses and acceptances back to the IMP. The communication between the MIP and the IMP utilises the Mobile Notifications mechanism (MN, section 3.2.2.7).

#### **Mobile Buddy List (MBL)**

The Mobile Buddy List (MBL) collects and displays profiles, status and performance summaries of a user's buddies (such as their frequent places, current travel status and activities, CO2 performance, incentive status) identified by the Relation and Identity Manager (RIM, section 3.2.2.3) that are authorised by the Privacy Manager (PM, section 3.2.2.3) from the PMS (Personal Mobility Store, section 3.2.2.4), MPD (Mobility Pattern Detector, section 3.2.2.4) and IMP (Incentives Market Place, section 3.2.2.5).

#### **Mobile Experience Sampler (MES)**

The Mobile Experience Sampler (MES) retrieves questions posed by system operators from the ES (Evaluation Support, section 3.2.2.6) components to mobile users. It presents these questions at appropriate times to users based on the currently sensed and interpreted situation, e.g. stationary or traveling and sends the answer back to the platform.

#### **Mobile Notifications (MN)**

The Mobile Notifications component receives notifications from the SUNSET platform coming from the Experience Sampling Store (ESS, section 3.2.2.6), Incentives Market Place (IMP, section 3.2.2.5) or Mobility Pattern Detector (MPD, section 3.2.2.4) and dispatches them to the mobile client component responsible for processing a given type of notification. As such this component allows the platform to send messages to the mobile users or the mobile application for example to influence the location-sampling rate based on historical information computed on the server-side.

### **3.2.2.3 Proxy & security Services**

This subsection describes the Proxy & Security Services-specific server-side components of the SUNSET system.

### **Privacy Manager (PM)**

The PM manages the privacy directives of users and provides the system's unique privacy decision point. The privacy enforcement point is implemented, distributed and realized in each component that manages user data (such as the PMS described below). Privacy directives can be established per context category (such as Location, Trip, ...) and type (such as Live, History, ...) For each combination of category and type, a user can specify if a certain group of buddies (such as family or colleagues) will have access to the collected data or not. Those policies are formulated based on social relations managed by the Relation and Identity Manager (RIM).

### **Relation and Identity Manager (RIM)**

The Relation and Identity Manager (RIM) provides its own social network implementation based on ELGG<sup>1</sup> that links to the social network data from existing social networks like Facebook. The data is imported through a component that is responsible for importing and exporting social network data.

### **Proxy & Authentication (PA)**

The Proxy & Authentication (PA) component is responsible for connecting the SUNSET core platform to external resources and applications in a secure way. It ensures proper authentication according to user and application credentials and encrypted communication with remote components. It provides caching and load balancing services to improve the overall system performance.

## **3.2.2.4 Mobility services**

This subsection describes the Mobility Services-specific server-side components of the SUNSET system.

### **Personal Mobility Store (PMS)**

The PMS has three main tasks:

- To collect sensed mobility information from the Smartphone;
- To clean, smooth and enrich this data;
- To provide this data to other components, such as the mobility pattern detector (MPD, to detect personal and community patterns), the incentive marketplace (IMP, to monitor the applicability of incentives given the user's context), or the experience sample store (ESS, again to monitor the applicability of a micro-questionnaire based on the target user's context).

The PMS also provides feedback to the client (in terms of recommended changes in sensor settings) based on the analysis of the raw measurements.

Several innovative algorithms are developed to enrich these measurements, with a natural focus on location and trips:

- To perform outlier detection and smoothing for location measurements;
- To cut and stitch trips;
- To automatically detect modality of trips based on Bayesian probability algorithms taking into account trip information like speed patterns, but also learning information from previous user behaviour;
- To map the trip route on the infrastructure network;
- To detect frequently visited places, and attach those to trips as origin and destination.

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<sup>1</sup> ELGG: Open source social networking engine <http://www.elgg.org>

### Mobility Pattern Detector (MPD)

The Mobility Pattern Detector (MPD) receives data from the mobility monitoring components, such as the PMS (Personal Mobility Store) plus external sources, and uses newly developed sophisticated algorithms to detect and deduce patterns for individuals, groups, places, regions, routes or vehicles such as bus lines or a taxi. The MPD offers intelligent cross sections of the mobility data of the individual, based on derived data. This component works incrementally, adding and deriving new pieces of mobility data to the persistent mobility data set while re-using existing data to improve the results.

For example, the regular trips are those routes that a user frequently takes for a given origin-destination pair, such as home-office or office-supermarket. The example below shows all regular trips for a specific user from home to office. All regular trips have detailed information about the used modality, usage statistics, average and shortest travel time, et cetera, providing input for tailored incentive design.

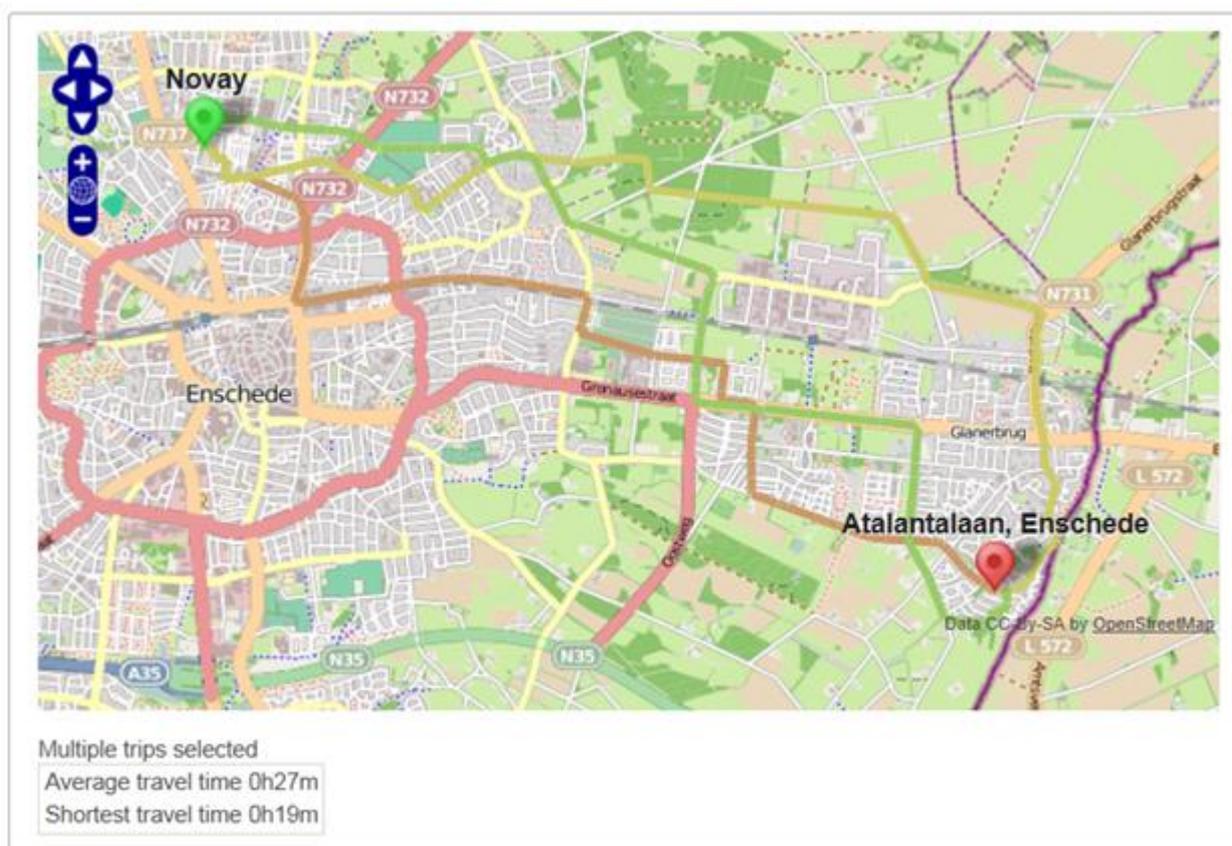


Figure 3-18: Mobility Services: Example of regular trip visualisation service

### Mobility Pattern Visualizer (MPV)

The Mobility Pattern Visualizer (MPV) takes the patterns derived by the Mobility Pattern Detector (MPD) and turns them into interpretable and easily accessible visualisations. Those visualisations include: long-term perspectives (e.g., over the past year) together with the personal or ecological consequences that would have resulted if other mobility choices would have been made; trend watching that allows to detect trends and changes in mobility behaviour, as well as visualisations that indicates the personal, city-wide or place oriented performance on goals. The visualisations provided by this component are made available via the SUNSET portal, also via social networks, in order to reach people outside the SUNSET community.

### **Infrastructure Network Manager (INM)**

The Infrastructure Network Manager (INM) provides a collection of services allowing access to road networks and their characteristics, transport routing services and other geographical data, such that personal mobility information can be mapped to these information sources. The INM uses OpenStreetMap (OSM)<sup>2</sup> data and stores this in a PostgreSQL database.

#### **3.2.2.5 Incentive services**

This subsection describes the Incentive Services -specific server-side components of the SUNSET system.

##### **Incentives Market Place (IMP)**

The Incentives Market Place (IMP) provides a platform to offer incentives in the form of reward, recognition and real-time feedback to users to encourage travellers to improve their travel behaviour with respect to the system's and an individual's travel objectives. The IMP implements algorithms that match available incentives with mobility information from the MPD (section 3.2.2.4), individual user preferences and general transport information. It identifies users whose travel behaviour ought to be changed and the segments of the journey that could be optimised as well as users who are likely to react more positively on being offered incentives and thus are more likely to change their behaviour. It is responsible for offering the most appropriate incentive at the most appropriate moment to users via a mobile client (section 2.3.2). The IMP also records a users' response to the incentive offers and calculates the overall participation rates. Via APIs, incentive providers can register and publish incentives via the IMP.

Several new algorithms are implemented to ensure the validity of incentives sent to target travellers:

- To generate potential incentives for target travellers
- To cluster target traveller groups in terms of preferences of travelling behaviours
- To tailor incentives to target travellers according to their travelling behaviours.

##### **Incentive Simulation Environment (ISE)**

The Incentive Simulation Environment (ISE) provides an environment to test the effectiveness of incentives on historic data in the SUNSET system. In such a way, both stakeholders and developers can investigate how the conditions defining an incentive can be optimised to target the users they wish to address without introducing them to the system just yet.

#### **3.2.2.6 Experience sampling services**

This subsection describes the Experience Sampling -specific server-side components of the SUNSET system.

##### **Experience Sampling Store (ESS)**

The Experience Sampling Store (ESS) allows researchers to register questions for a specific target group in certain context conditions. It provides the web portal with a set of possible constraints and provides the PMS with rules constructed by researchers. The ESS triggers the presentation of questions towards users via the Mobile Experience Sampler component (MES, section 3.2.2.2) in case the corresponding conditions are fulfilled.

##### **Evaluation Support (ES)**

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<sup>2</sup> <http://www.openstreetmap.org>

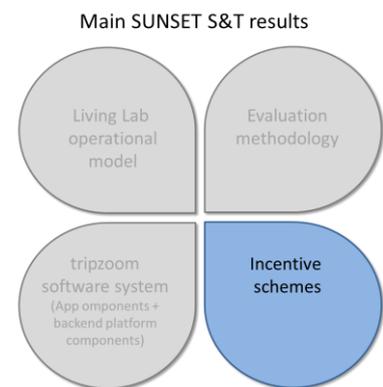
The Evaluation Support (ES) component collects and collates information from other system components for the preparation of performance evaluation of the overall system. It processes the gathered data according to pre-defined indicators and formats, to be presented via the Living Lab City Dashboard to the operators.

### 3.2.2.7 Notification dispatcher (ND)

Finally, data push notification is a core enabling technology in SUNSET to inform Smartphone users that a new event requiring their attention (e.g. a new friendship request) or new data (e.g. a new experience sampling question has been issued to the user) are available on the server. The Notification Dispatcher receives push messages from server side components and forwards these messages to iOS and Android devices. Its task is therefore to ensure that the messages received from server side components are correctly formatted, maintain the list of registered devices and handle the communication to Apple / Google notification servers.

## 3.3 SUNSET incentive schemes

The second main type of Scientific & Technological result of SUNSET concerns different **incentive schemes** that have been designed with the purpose to make the mobility system of urban environments more efficient and sustainable. An incentive is effective if motivating individual travellers to adapt different behaviour can bring positive impacts on the policy goals. The SUNSET research has focused on establishing the relationship between individual objectives and system objectives using behaviour modelling and network modelling methodologies. The outcome is used into a design of a set of feasible and potentially successful incentives of which a part has been implemented in tripzoom. The set is categorised in four different groups: real-time travel information, feedback and self-monitoring, rewards and points and social networks.



### 3.3.1 Overview of incentive categories

#### Real-time travel information

This main aim of this category of incentives is to provide users with real-time information on the conditions of the transport network such as delays information, planned or emergency road works, park availability and traffic alerts and hazards (e.g. a road accident or a train cancellation). Information on these conditions can be coupled with personal habitual travel patterns to deliver information that are personalised to individual users. In addition, real-time road conditions can be applied to generate intelligent travel suggestions, such as an alternative route and/or modality in the event one's usual way to work is found to be currently congested. Other information, such as weather, is found to be also relevant, as weather which affects the way people travel greatly.

The responses from the numerous SUNSET focus groups have indicated the true usefulness and attractiveness of this feature, and opinions vary from one location of the Living Lab to another. Reliability or trustworthiness of the information has been emphasised as the key to this type of incentive. The source of information should be authenticated by transport system authorities. Much attention should be paid to the delivery of the information as it can delay sensitive information. This is particularly the case with news on traffic accidents that users need to be informed very shortly after the accident has taken place. The distribution of information should also be well managed so as to avoid users experiencing an information overload. Finally, there is a concern about the conflict between road users and use of mobile devices; the application should be designed in such a way that

it should not disturb road users while they are actually on the road e.g. driving or cycling, and allow users to opt in as it suits them.

## **Feedback and self-monitoring**

Providing personalised feedback on individual travel behaviours aims to provide travellers with tangible evidence in a comprehensive manner, so as to raise their awareness on impact caused by the way they travel. Metrics used are often relatively simple, such as cost, time, calories, distance and carbon footprint, and this aims to help users to identify an area (or areas) for improvement. This functionality, in other words, provide a way for users to monitoring their own behaviour. Recommendations can also be suggested to users based on their performance and by identifying suitable alternatives.

The overall response towards this type of incentive is positive as it provides a tool to allow users to check their behaviour and progress by simply referring to their mobile device. However, it has been raised that while self-monitoring provides a means to see and understand one's travel habit, such a function on its own may not be adequate in changing people's behaviour in anyway. It is perhaps effective for the most motivated individuals who are keen to change their behaviour in the first place. As for SUNSET, it has been suggested self-monitoring should be combined with other types of information, such as environmental or financial feedback or social influence so as to achieve the system's goals. The choice of metrics should be selected with care, for instance, people would be only interested in cutting their carbon footprints should be presented with measurements related to the environment such as CO<sub>2</sub> emission; presenting them with a cost breakdown may not be useful and effective. Nevertheless, accuracy must be maintained to the highest level. Timing of notifications, either in the form of rewards or feedback, can also be key to the successful use of this type of incentive.

## **Rewards and points**

There is a large number of computer and smartphone games that use a points based system to motivate players to stay "online". The rationale of using points as a form of reward can be explained by Fogg's work (2010). He argues that an activity that is easy to do (such as playing games) will require only a low motivation for a person to finally commit to it. Thus, triggers such as points, may be enough for driving him/her to play a game. However, when an activity is hard to do, it will require much stronger triggers. Changing people's travel behaviour can be a difficult task especially when there are many factors which influence one's behaviour, such as constraints in daily activity scheduling. Therefore, linking bonus points to different awards may be a necessary step so as to provide the extra 'push' required.

Rewards can be in many forms, ranging from simple recognition of achievement within the community or tangible ones with a monetary value. The notion of points provides a common currency which may help motivate user participation. It can also mimic the operation of a reward scheme in which users can "spend" their points. Combinational and accumulative incentives can be coupled with target or challenge settings in the design of a scheme or game framework.

## **Social networks**

The key incentive of social networks to users is to provide them with a means to communicate, share their experience and information with each other. There is strong evidence that allowing users to share their performance is a way to: boost their achievement and trigger competition; help promote group behaviour; increase trust among users and reduce social ambiguity. Thus, providing such an incentives-based platform allows users to interact with each other to help promote peer influence as well as loyalty to the system, which in turn helps attract more users.

Privacy is a main concern for social networks and affects the way in which data are stored and for what period of time. Anonymity and disclosure of data must be treated with the greatest care.

### 3.3.2 SUNSET incentive schemes

The examination of the four categories on incentives has led numerous possibilities with which how they can be offered in tripzoom. A substantial effort has been put in place within SUNSET to define specific incentive schemes that would be the basis of offering incentives in tripzoom. With reference to users responses, existing literature, latest trends in smartphone application development, gaming and social networking, innovative aspects and end-user surveys carried out within SUNSET, nine specific incentive schemes have been defined. These nine schemes are summarised in the table below with the bold numbered items actually implemented in tripzoom on basis of a behavioural and system impact analysis.

**Table 3-1: SUNSET incentive schemes**

Type of incentive	Description of incentive	Characteristics of incentive
<b>Real-time travel information</b>		
1. Real-time travel information provided by the system	<ul style="list-style-type: none"> <li>• The system gives information about the most recent conditions on the road networks.</li> <li>• The system gives alerts to users whenever there is a relevant event (either expected or unexpected) that may influence their travel behaviours. In addition:               <ol style="list-style-type: none"> <li>a) Users should be able to enable/disable the incentive;</li> <li>b) When enabled, alerts can only be given based on regular activity-travel patterns (i.e. related to the spatial parameter). Therefore, when a traveller uses a new route for the first time, alerts related to that route will not be available.</li> </ol> </li> </ul>	<ul style="list-style-type: none"> <li>• Duration of incentive: It should be made available 24/7.</li> <li>• Time and frequency to offer/remind user about the incentive:               <ol style="list-style-type: none"> <li>a) Regarding the real-time information on a map, users should be able to set the reminder manually.</li> <li>b) Regarding alerts on expected sporadic events (e.g. road works), an alert should be given to users 1-2 days before the event. Users should be able set manually how often they want to be reminded.</li> <li>c) Regarding alerts on unexpected events (e.g. traffic congestion &amp; accidents), an alert should be sent immediately whenever the event occurs.</li> </ol> </li> </ul>
2. Social networks for peer-to-peer travel information/messages	<p>The system provides an infrastructure for users to exchange messages among each other. In general, there are two types of messages:</p> <ul style="list-style-type: none"> <li>• Alerts related to the conditions on the road or infrastructure</li> <li>• Tips/advice on travel</li> </ul>	<ul style="list-style-type: none"> <li>• Duration of incentive: It should be made available 24/7. This means users can post messages at any time and can read old posted messages.</li> <li>• Time and frequency to offer/remind the user about the incentive:               <ol style="list-style-type: none"> <li>a) Alerts related to the conditions on the road or infrastructure should be given to users who may be affected by a message. Based on the results of the empirical work in D3.3, users prefer only relevant information. Therefore, the user should specify the spatial and temporal parameters and the category of the information to share (i.e. alerts on road condition and tips/advice) in every message. This way, messages containing alerts can be sent to users who are likely to be affected by the information.</li> <li>b) Tips/advice on travel should be offered to all users whenever a message containing new tips/advice appears.</li> </ol> </li> </ul>

Type of incentive	Description of incentive	Characteristics of incentive
<b>Feedback and self-monitoring</b>		
<b>3. Feedback based on self-monitoring of own travel behaviour</b>	The system records users' daily activity-travel patterns and present the recorded information to users. This is the basic incentive and feature of tripzoom app.	<ul style="list-style-type: none"> <li>• Duration of incentive: It should be made available 24/7.</li> <li>• Time and frequency to offer/remind the user about the incentive: Users should be able set manually how often they want to be reminded to check their recorded patterns.</li> </ul>
4. Feedback based on setting targets	The system allows users to set their own travel targets.	<ul style="list-style-type: none"> <li>• Duration of incentive: Users should be able to set their targets for a definite time period (e.g. 1 week).</li> <li>• Time and frequency to offer/remind user about the incentive: When a target is set, the user can get a daily reminder in the morning of their performance in relation to their target.</li> </ul>
<b>Rewards and points</b>		
<b>5. Challenges (using points without an exchange value)</b>	Every user who exhibits certain travel behaviours (e.g. cycling or walking) will be awarded points. This can be related to a competition with other users based on points (akin to on-line games)	<ul style="list-style-type: none"> <li>• Duration of incentive: It should be made available 24/7.</li> <li>• Time and frequency to offer/remind user about the incentive: Not applicable. User should be able to find the information related to how points can be collected in the help menu.</li> </ul>
<b>6. Challenges (using points with an exchange value)</b>	<p>This category is related to:</p> <ul style="list-style-type: none"> <li>• Challenges set by the system or by the 3<sup>rd</sup> parties.</li> <li>• Periodic offers akin to a loyalty card. For instance, once a user reaches 100 points, he or she can redeem the points to a tangible reward.</li> </ul>	<ul style="list-style-type: none"> <li>• Duration of incentive: <ul style="list-style-type: none"> <li>a) A challenge should last for a period of time (e.g. 1 week).</li> <li>b) The loyalty scheme should be offered for a longer period (e.g. 6 months or 1 year).</li> </ul> </li> <li>• Time and frequency to offer/remind user about the incentive: <ul style="list-style-type: none"> <li>a) Users should get news about a new challenge whenever it is introduced. Users should be able set manually how often they want to be reminded.</li> <li>b) The loyalty scheme should be offered for a longer period (e.g. during the whole LL period). Users should be able set manually how often they want to be reminded.</li> </ul> </li> </ul>
<b>Social networks</b>		
<b>7. Social networks for sharing location and/or mobility profile</b>	Every user can share their current location to selected users.	<ul style="list-style-type: none"> <li>• Duration of incentive: Depending on users: users should be able to choose to turn on/off their location sharing.</li> <li>• Time and frequency to offer/remind user about the incentive: Not applicable.</li> </ul>
<b>8. Social networks for finding a buddy</b>	Every user can use find a buddy to find a travel companion.	<ul style="list-style-type: none"> <li>• Duration of incentive: Depending on users: users should be able to choose to turn on/off find a buddy.</li> <li>• Time and frequency to offer/remind user about the incentive: Not applicable.</li> </ul>

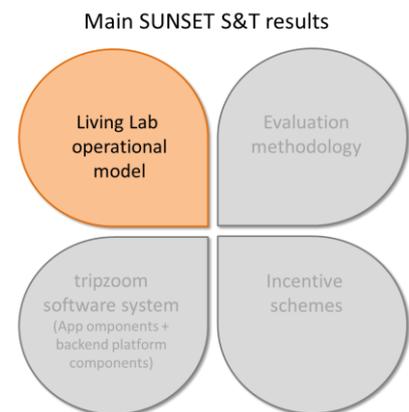
Type of incentive	Description of incentive	Characteristics of incentive
9. Social networks for treasure hunt	This is also another type of challenges. For example, treasure (in the form of points) can be hidden in a specific coordinate and can only be unlocked whenever users cycle pass the coordinate.	<ul style="list-style-type: none"> <li>• Duration of incentive: Depending on users: users should be able to choose to turn on/off treasure hunts. When it is enabled, users should be able to detect treasures within his or her proximity.</li> <li>• Time and frequency to offer/remind user about the incentive: Not applicable.</li> </ul>

A further innovation of SUNSET utilising the incentive schemes is the design of tripzoom such that it tightly integrates personal feedback and point rewarding schemes with social community features. This improves the performance of the incentive scheme by applying the social power of communities and increases the self-awareness of users regarding their mobility behaviour.

Overall, it has been possible to define a set of incentive schemes that addresses the design criteria and is sufficiently focused to allow practical application. The schemes have been outlined in such a way that other social media transport projects will be able to adopt the approach or readily adapt it for local use, resulting in added value to the EC and other stakeholders.

### 3.4 SUNSET Living Lab operational model

The third main type of Scientific & Technological result of SUNSET concerns the **Living Lab operational model**. Within SUNSET three Living Labs in Enschede, Gothenburg and Leeds have been designed, organised and maintained for nearly a year. The Living Labs have used a newly developed Living Lab operational model that provides guidance for other projects and incorporates good practice to create and maintain a successful Living Lab featuring innovative mobility services.



#### 3.4.1 Living Lab approach

There is wide recognition that especially for implementation and case oriented multidisciplinary innovation SUNSET aims at, traditional models of user involvement entailing formal requirement analysis, demonstrations and concept tests do not provide the immersion necessary for developing new ideas and validating solutions. SUNSET therefore implements an Experience and Application Research approach within three living lab settings.

The SUNSET Living Labs are defined as the combination of

- users willing to use new technology and ways of travelling in their real-life context;
- a technical and supportive infrastructure that allows users to access and experience the new concepts and applications in their full real-life setting;
- a methodology for engaging with the users (including training, experiment designs, workshop designs, evaluation methodologies).

The SUNSET Living labs were realised using the following design choices:

- **Open Living Lab with Experiments**

The first choice made was to work with an open Living Lab (the App was available for everyone in the App stores), combined with targeted experiments with a shorter time line. With each of the experiments, different aspects of the SUNSET concept are evaluated.

- **Integrated approach**

With the choices made within the Operational Stage, an integrated approach was taken. Operations were strongly interlinked with the technical development, the SUNSET goals and the evaluation framework. This way, the most effective experiments could be designed.

- **Adaptive planning**

As there was a fragile basis of trust with the users, an adaptive planning was used. This ensured that lessons learned in one Lab could quickly be addressed in the others. Also, based on local circumstances, risk aversion strategies could be applied as soon as possible.

- **Mixed recruitment strategies**

Both, recruitment as an on-going action during the entire Operational Phase and recruitment actions taken per experiment were utilized in the different Living Labs.

- **Mixed experiments**

In operation, different ways to involve users were used to explore the broadness of the SUNSET concept. In Enschede and Gothenburg, experiments were carried out with a user base using the tripzoom application. After limited recruitment results in Leeds, it was chosen to go the more effective way and rely on focus groups as main research tool.

### 3.4.2 Management model for Living Lab operation

The actual Living Lab research will be conducted in three sub-phases. As such a management model was developed that consists of three sequential phases through which the SUNSET experiments are performed.

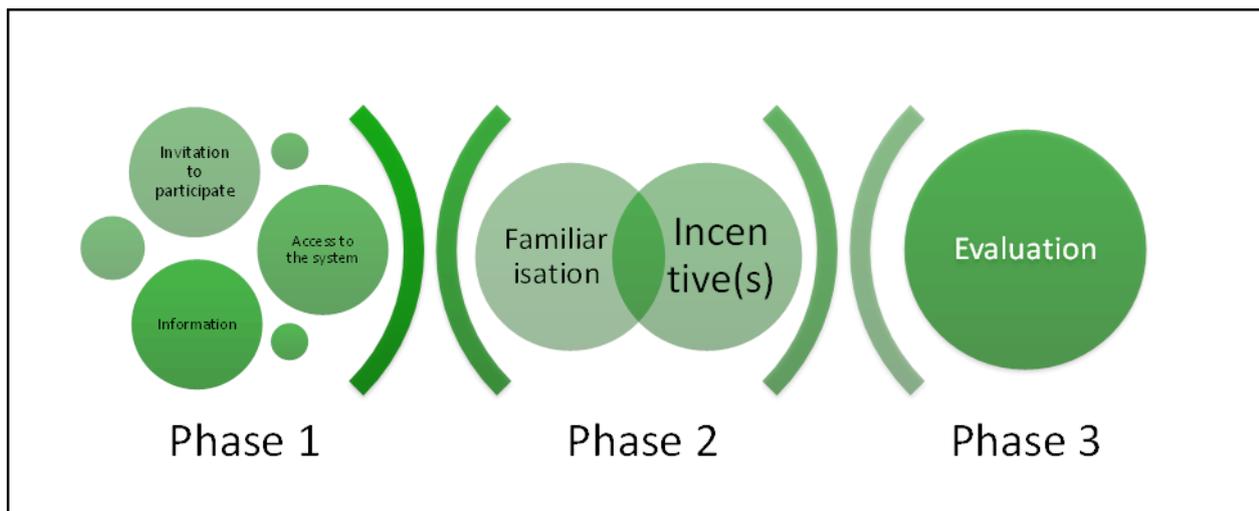


Figure 3-19: SUNSET Living Lab Operation Model for each experiment

**The first phase (involvement phase)** has the objective to recruit users, inform users about the project, get users involved in the project and to solicit early experiences and requirements from lead users. Methodologies for research in this phase include promotional activities, workshops

demonstrating new, unfamiliar technology components with mini experiments, discussions of tripzoom application ideas and guidance in the user registration process. Results are a user base and first experiences and ideas for application;

**The second phase (change phase)** has the objective to engage with the user-base in focused incentive experimentation cycles. It starts with familiarisation where users use the tripzoom app without any other intervention from the project. This way, they get the change the explore the different functionalities of the system and build up a mobility profile of their ‘regular’ behaviour. The methodology during this phase is to have the user base experiment with real-life scenarios and activities. This goes far beyond traditional presentations and focus group discussions. The users are directly immersed into travel behaviour stimuli and create new ideas and feedback regarding usefulness and usability of tripzoom.

In order to align the experiments with all different stakes (user preferences, SUNSET goals, traffic system goals), a general format was used for the experimental design was made (Table 3-2). This format was also used to align the design of experiments between the Living Lab. It works down from the high level ambitions of the experiment, via the context in which it takes place, to the detailing of different parameters.

**Table 3-2: Living Lab operational model: experimental design format**

Research Question					
What do we target in the experiment?		Do we reward behaviour or do we stimulate change?		What is the research question?	
Context					
SUNSET Innovation	SUNSET High level goals	The System	The Data	The Users	The Living Lab
Experiment					
Base case	Incentive situation	Target Group	Incentive	Scope	Repeat Pattern

During this phase the activities of users are monitored using a designed strategy to retain users in the Living Lab to prevent participants to drop out.

**In the third phase (evaluation phase)** the focus shifts to more longitudinal quantitative evaluation within the real-life settings of the user groups. People start to change their ways of travelling supported by related guidance and qualitative evaluation, which allows studying the complex changes in travel behaviour and motivational and acceptance factors.

By using a model for the Living Lab Operation, preparations could be done in a more structured way. Early user involvement learnt the project about the main topics on which feedback could be expected. The distinct separation between the phases keeps the operational efforts concentrated on the right topics. In order to structure the process as good practice this requires that the work in the Living Lab is organized in a structured way. In this project this was done through the design and use

of the Management Model visualised in Figure 3-19. Using three levels of design a comprehensive and complete design of the experimental work was performed prior to experiment, which enabled systematic evaluation of the data generated in the Living Lab. Moreover the model facilitated cross-comparison of the result from one lab to other labs in the project and supported structured good practice elicitation in the areas of:

- **Structured design**

One of the main challenges in designing the experiments is the wide set of optimisation parameters. On the one hand, a meaningful and personal user experience is desired. On the other hand, there are system and project level goals to be achieved. Only by taking this into consideration from the first moment on, one can successfully get to an experimental design. The structured design using a general format makes sure that in the design all essential aspects are covered and fit well together.

- **Involvement Stage**

The pre-operational involvement stage proved to be an essential part of the implementation of tripzoom in the Living Lab. During this controlled stage where the app was used intensively and tested on all its features, a lot of improvements have been made. During the open operational stage, technical issues were quite often a trigger for people to drop out. Based on the findings during this stage, a flexible planning was used during operations as a contingency plan for unexpected incidents and delays.

- **Balancing act**

The operation of the Living Lab was a balancing act; on one hand a stable Living Lab worthy system was desirable to prevent drop outs, on the other hand users made change requests and hoped to see them implemented. Expectations of users regarding the amount of changes to be realised have to be managed from the start. Ideally, there would be a great deal of flexibility in the system components as this would allow for user involvement in the design. However, users also expect a functioning system which requires high system stability and availability.

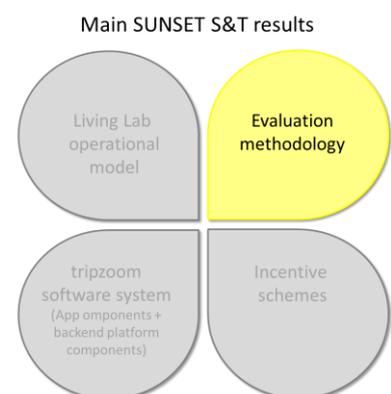
- **The central role of the Living Lab Co-ordinator**

The Living Lab Co-ordinator serves as the hub between all different activities within the Living Lab. It is important that the Living-Lab Co-ordinator has an excellent understanding of the system, close contact with the developers and social researchers and close contact with the end-users and other stakeholders. This linking pin position requires competences and experience with complex, multidisciplinary user-centred innovation processes, Living Lab operation and overall organisation skills on preferably a university level.

### 3.5 **SUNSET evaluation methodology**

Finally, tripzoom and the incentive schemes delivered via tripzoom are evaluated in the Living Labs using a comprehensive **evaluation methodology**. The evaluation methodology has been developed in two stages, the first stage covering a) key indicators for the evaluation of operational success and b) an analysis approach for the effectiveness of incentives in the SUNSET system. The second stage has derived a final set of indicators, describes a unified framework and finally provides specific recommendations on measurement in practice within Living Labs.

In order to specify an overall evaluation framework it was firstly necessary to outline the requirements of the framework, review different methodological approaches



to evaluation and assess the state of the art in terms of existing evaluation frameworks- particularly those relating to ICT enhanced transport schemes. A review of the evaluation methods for social-media orientated initiatives generally did not reveal a comprehensive and readily adoptable method for use with SUNSET. Similarly, the state of the art in evaluation of ICT enhanced transport systems revealed a small number of evaluation approaches with relevance, but which did not include social media networks or use of incentives. As a result a new method has been proposed which is informed by the state of the art, but focused around the features of the SUNSET system and objectives of the project. The evaluation method encapsulates the following framework elements:

- **Comparability against ‘traditional’ schemes:** this is an important features for decision making concerning investment in alternative schemes.
- **Captures performance against objectives:** the evaluation should be able to assess impacts against both system level objectives and individual traveller objectives. Furthermore it should have the ability to reflect the extent to which the scheme meets both of these in different ways. The interaction between individual and system objectives is a fundamental part of the SUNSET concept.
- **Ability to handle dynamic nature of impacts:** the SUNSET system impacts overall will generated by the accumulation of impacts resulting from a number of (potentially small) changes in travel behaviour by individuals. These micro-changes in the system may be different from journey to journey and therefore the level of impact may change in a very dynamic way.
- **Ability to reflect long term costs and benefits:** from the stakeholder/decision makers perspective, the ability to understand longer term goals (e.g carbon reduction, long term ‘smarter choices’ and more) is desirable.
- **Flexibility for different schemes/contexts:** the framework should allow evaluation of different applications and interpretations of the SUNSET system. The urban context (which the system is aimed towards) varies considerably in the nature of transport related problems, the availability of transport options, the types of incentives that may be available or appropriate, and the local transport objectives of the city transport operators and planners.
- **Ability to monetise some or all of impacts:** whilst various types of indicators and evaluation approaches are candidates for the overall framework, it would be advantageous to include monetisation of impacts where feasible. This would allow comparability with many of the existing evaluation frameworks applied in the transport context.
- **Disaggregate outputs by stakeholder:** a number of stakeholders have already been identified in the business case for the system (see D5.3). These include some stakeholders with different roles to those seen in more traditional transport schemes, for example in providing incentives, in providing governance to data etc. The ability to show disaggregate outputs by stakeholder is important in the framework to identify how any shifts in costs and benefits are distributed – and how these may be different to the pattern of costs and benefits expected from a traditional transport scheme.
- **Ability to reflect ‘intangibles’ and broader socio-economic impacts:** a system based around pervasive technology, encouraging smarter choices and the use of incentives as ‘carrots rather than sticks’ has the potential for impacts that may not be usually monitored in a transport scheme. These may include, for example, equity consequences or shifts in perceptions rather than actual behaviour. As a result it is considered essential that a broad range of socio-economic indicators are included as part of the evaluation framework.
- **Practical with respect to measurability and data demands:** the evaluation framework should be developed initially at a methodological level but then is intended for ‘real life’ use within the

living labs. As a result it is necessary that the data requirements implied by the method are feasible in practice, either directly or through use of substitute data and proxies.

Given these elements, the evaluation method has eight main components:

- A Cost-Benefit analysis,
- An indicator based evaluation of Operational success
- An indicator and sentiment based evaluation of social media aspects
- An exposure based Safety evaluation
- An Indicator based Sustainability evaluation
- An indicator based assessment of Liveable Communities
- A qualitative assessment of basic functionality of the system, and
- An assessment of the success of incentives based on both attitudes and revealed choices

The methodological components to each of these are described in detail. The approach has been to draw on the state of the art from the literature, review this against the SUNSET evaluation requirements and propose adaptations, interpretations or new indicators as appropriate. Each of the components has been developed individually and with the goal of capturing as fully as possible the potential impacts within particular impact categories. It is expected that the application of the evaluation methodology with real-life data will present results in disaggregate format for each of these components. However, following the example of some established evaluation methods, a description is given of how a weighting and aggregation approach may be used to generate a summary performance statistic for the success of a scheme overall. The advantages and disadvantages of this are described and a broad analysis of double counting reported. This is one of the key issues in generating a composite indicator, with Operational Success and Success of the Incentives components being most affected. A proposal on how to work around this challenge is therefore also described.

The SUNSET evaluation approach includes components that are not present in most orthodox evaluation methods. Notably the evaluation of ‘the success of the social media concept’ and the ‘success of incentives’ components. Neither component currently exist in the standard recommended national or transnational transport scheme evaluation methods, neither do they exist in (published) evaluation approaches for ITS schemes. For the evaluation of the success of the social media concept, the collection and analysis of a new type of data comprising posted comments and information is recommended – so called ‘sentiment analysis’. The components ‘operational success’ and functionality are also not generally included in national or international evaluation methods, but variations of these may be seen in the evaluation methods derived for use in Field-Operational Trials projects. Each of these evaluation methods proposes indicators of operational success with interpretations of this aimed towards the main type of ITS scheme they address in the evaluation problem. This necessarily implies some restrictions in the extent to which the method is transferable (for example from fixed-based ITS to pervasive and mobile ITS). Whilst most recent of these methods give illustrative examples of indicators for a range of schemes, these do not extend to the social media centred scheme. The remaining components of Sustainability and Liveable communities in the SUNSET evaluation method may be recognisable as being present in many social-welfare based evaluation approaches, although the precise indicators developed here may vary.

**Table 3-3: SUNSET evaluation framework: Summary evaluation components and data types**

SUNSET evaluation components	€	Q	Scalar
Cost-benefit analysis	+		
Operational success		+	+
Success of social media concept		+	
Sustainability indicators		+	
Liveable communities		+	+
Basic functionality			+
Success of incentives		+	+

These seven components are all measured on either a Quantitative scale (Q), Scalar (S) or are monetised (€). It can be seen from Table 3-3 that several components have a single data type but Operational Success, Liveable communities and the success of incentives are mixed data types.

Finally, the question of how the indicators within the evaluation components can be measured in practice is addressed, with a detailed tabulation for each of the 130 indicators. This shows the type of data, the units of measurement, the monitoring periodicity, the source of data and finally comments on any local priority or variance in the evaluation approach for each Living Lab. It can be seen from this detailed tabulation that a high degree of concordance is expected between all three labs, with only a small number of local interpretations. Finally, the overall experimental design for the evaluation process in the living labs is shown, together with comments on the expected interpretation and prioritisation of the design in the Living Labs.

Overall, it has been possible to define an evaluation method that addresses the evaluation criteria and is sufficiently focused to allow practical application. The method has been outlined in such a way that other social media transport projects will be able to adopt the approach or readily adapt it for local use, resulting in added value to the EC and other stakeholders.

## 4 Project potential impact

The yearly growth of personal mobility in the EU results in increasing safety, economic and environmental concerns. With more than 80% of the EU population living in cities, the biggest challenge facing European cities and citizens alike is to find solutions that create win-win solutions on sustainable, safe and efficient ways of travel. This calls for a people-centric vision on urban mobility management that puts users at the heart of the transport system in terms of needs, priorities, information flows and dynamic responses.

SUNSET leverages on this personal mobility paradigm aiming at:

- Optimizing personal mobility through the careful use of personal, mobile ICT services via the Smartphone and by providing mechanisms to distribute personalised incentives to adopt new ways of travel in line with city-level goals on sustainability, safety and personal well-being;
- Optimizing social-induced mobility, in which travellers inform and help each other using ICT-enabled social networks, such as Twitter, Facebook and mobile applications on the Smartphone. Exchange and sharing of information on the individual level will take place and in that process individuals have the chance to respond to common challenges and collect rewards that encourage them to change their travel towards more sustainable choices.

### 4.1 Reflection on SUNSET objectives

The central concept of the SUNSET project has been to balance system goals by influencing personal behaviour using positive incentives. Therefore a number of (technological) innovations were developed and introduced in the SUNSET Living Labs via the tripzoom software-as-a-service. Although the project didn't reach broad product up-take, SUNSET has been able to demonstrate that the concept creates positive effects within the scale of the Living Labs towards sustainable travel behaviour of individuals. For example, tripzoom has created effects in its user base like travel at different times, using different routes and travel using alternative modalities. Also SUNSET shows that insight in individual's own 24x7 travel behaviour is considered a valuable source of information for people supporting them in travel decision making and is considered as a new way for stakeholders to tailor incentives such as social challenges or individual rewards on the actual personal travel behaviour, history, context and personal interests. As such tripzoom has delivered a solid conceptual basis and technological engine for exploitable next generation products and services in either localized or specific markets around smart travel that can truly create visible macro-level effects on either congestion, sustainability, safety and personal well-being.

#### 4.1.1 Congestion

Important element in influencing travel behaviour within the Living Labs has been the ability of tripzoom to create meaningful, pin-pointed challenges on the basis of actual travel patterns of the Living Lab participants. SUNSET has designed a number of challenges focused on the congestion objectives of the SUNSET project and aimed at getting car commuters to avoid driving during the peak hour or to shift modality to cycling or public transport. A drawback of more pin-pointed, personalised challenges is that they only become relevant and feasible to the minority of the overall participants. As a result challenge design shifts towards portfolio design.

Although the majority of the tripzoom participants reported not to have changed their travel behaviour as a result of the tripzoom challenges, 23% of the participants that did respond to the challenge and indicated to have changed their behaviour showed changed departure times. Although the change was rather small (share of departures in the peak hour dropped about 3% in both Enschede and Gothenburg) a trend was perceived that the morning peak was alleviated. In

Gothenburg the peak was shifted in time and occurred 30 minutes earlier. In Enschede the peak appeared to be broadened during the challenge. Specifically in Gothenburg some users indicated that they have switched from car to public transport. The car use of the users in the challenge dropped from 63% to 57%-47% depending on the time the challenge was in place and the level of the rewards. Simultaneously the share of public transport increased from 9% to 10%-16%. The users report however to have changed only incidentally as a result of the challenges. Finally, it seems that the challenge in itself or in terms of raising awareness on travel timing rather than the size or nature of the reward is the more important factor. Moreover to relieve traffic congestion a minor behavioural change from some travellers in the system may be sufficient to reduce congestion dramatically. This type of marginal change is very much in the spirit of the smarter choices agenda as a whole, which is targeted towards improving overall system efficiency through a large number of marginal changes.

### **4.1.2 Environment**

Users think the impact of their travels on the environment is important, however CO<sub>2</sub>-emission may not be the full representation of the impact on the environment to users as the project shows. Also users indicate the awareness of the impact on the environment as less important than time and costs. Nevertheless, users don't seem to be able to relate to any CO<sub>2</sub>-emission. For example, although the users in Gothenburg claim to be aware of the CO<sub>2</sub>-emission, only 7% of users has an idea of the CO<sub>2</sub> an average car emits per kilometre.

In this respect it proved difficult to relate mode-change by the individual user with explicit environmental objectives of this individual. More general, users relate cycling to be of influence on all higher level objectives (cycling is good for environment AND personal well-being and not OR) and do not necessarily couple a certain specific objective to their cycling behaviour.

It proved difficult to demonstrate clear environmental effects as a result of our experiments and challenges focussed on modality-changes towards sustainable modes of travel. However the SUNSET experiments did observe relative changes in favour of more bicycle use, but in absolute sense the amount of bicycle trips decreased. On the other hand the experiment to reduce congestion and improve the environment in Gothenburg did show an increase the use of public transport to the expense of the car, as previously mentioned. This can also be considered as an environmental improvement.

### **4.1.3 Well-being**

Health is considered to be very important in the personal life of travellers, but an improvement to the tripzoom system would be needed to provide more insight in how health issues could be related to an incentive to alter travel behaviour. Tripzoom did provide information on calories burnt, but only a limited number of users can relate to this as an indicator of health. Maybe a more appealing way could be related to the recommended daily amount of physical exercise, but this could very well be an App in itself.

In the SUNSET experiments it showed difficult to demonstrate clear effects on well-being where challenges were focussed on modality changes towards active travel. Since cycling is a physical activity, cycling more may increase the personal well-being of these users. In Enschede relative changes in favour of more bicycle use has been observed, but in absolute sense the amount of bicycle trips decreased. The users in the experiment to increase the number of cycling trips indicated not to have cycled more as a result of the challenge. However, from the travel behaviour data we could see an increase in the weekly number of bicycle trips per person from 9 to more than 10 during the challenge.

The experiments in Gothenburg show there is an impact on personal well-being when trying to encourage public transport users to use the bike. In Gothenburg the share of public transport use dropped from 19% to 13% and simultaneously the use of the bike increased from 10% to 16%-38% depending on the time the challenge was in place and the level of the rewards.

## **4.2 Safety**

Tripzoom did not show prove for system-level safety enhancements. Although tripzoom allows municipalities and road authorities to influence people's personal mobility goals and enables people to optimize their route, tripzoom has not been able to show effects of users avoiding for example dangerous situations like roads with many cyclists for car drivers, unusual conditions, or waiting times on dark and silent railway stations.

## **4.3 Wider socio-economic impact**

This section describes the potential socio-economic impact and the wider societal implications of the project.

**SUNSET – Impact 1: “Improved safety, efficiency and competitiveness of transport systems across Europe, towards the objective of reducing fatalities within the EU.”**

SUNSET potentially enhances system-level safety and efficiency in that it allows municipalities and road authorities to influence people's personal mobility goals. Municipalities can for instance use SUNSET services to dynamically suggest alternative routes that guide through traffic away from a football stadium when a match is about to begin. This will temporarily reduce the number of cars near the stadium, thus making the area safer for large groups of fans walking to the stadium. It will also increase the efficiency of the city's overall transport system as it will reduce the level of traffic congestion near the stadium. Municipalities can also use the SUNSET system to suggest alternative routes of another modality, for instance by guiding drivers en route to the stadium to a nearby Park & Ride facility and take the bus from there onwards.

SUNSET services like these could also enhance safety and efficiency at the personal level, for instance because drivers experience fewer traffic jams and fewer situations that they might consider dangerous (such as traffic backing up onto a roundabout), cyclists can see which roads have no heavy traffic, pedestrians get informed which place are well illuminated, or because lone travellers can get quick access to communication with other travellers. This will improve the “travelling experience” (comfort) for cities in which SUNSET services are available. At the same time, SUNSET services balance optimized safety and efficiency at the system level with personal mobility goals such as shortest time or distance of a planned route. This will increase travel efficiency at the personal level while attaining the system-level mobility goals.

SUNSET services could provide further travel efficiency for individuals by automatically learning detailed mobility patterns and by providing suggestions and incentives to change (or at least have an influence on) normal every day mobility patterns without the user having an active navigation application. SUNSET services will do so based on mobility experiences of other travellers in the community, allowing them to learn from each other's transport choices. Being able to use this collective knowledge in a structured manner will improve safety and efficiency because only one or a few members of the community make the wrong or suboptimal decisions, and the rest of the community (or at least the part for which this is relevant information) will learn quickly and be informed about safer and more efficient alternatives.

**SUNSET – Impact 2: “Optimised mobility of people and goods in urban environments** across different transport modes, through the provision of accessible and reliable logistics information services.”

SUNSET services focus on optimising mobility in urban environments to reduce traffic congestion, increase safety, and reduce environmental pollution, both from the perspective of municipalities and road authorities as well as from the perspective of individual travellers.

SUNSET services could provide information services to travellers across different transport modes because they use mobile phones to measure mobility behaviour and derive mobility patterns. As a result, a SUNSET service can as easily record a bus ride as it can register a car trip or a walking event between the bus and the train and provide appropriate incentives in a multi-modal way. For example, if the SUNSET system detects that someone is driving to work and that the last leg of his commute is congested, an incentive provider can use the system to automatically suggest alternative routes. The best alternative might be to drive to a nearby train station so that the commuter can take the train for the last part of his travel.

Travellers will be able to easily access SUNSET services because they will be available through well-known and established social networks on the internet, for instance through Facebook. This will allow SUNSET services to spread quickly as people can recommend them to their online buddies, who they usually trust. Because network infrastructures are more and more moving to all-IP, SUNSET services will also be widely available across consumer devices, not only mobile phones and PCs, but also public displays and TVs, thus further adding to their accessibility. Because of their Web 2.0 nature, SUNSET services allow travellers to easily share mobility information and to make use of the “wisdom of the crowds”. If the crowd is large enough, they will have more reliable and richer mobility information at their disposal more quickly. SUNSET services will provide the right incentives at the right time: just in time to influence decisions on the means of transport to choose, and which carpool buddy, route, detour or departure time to pick.

**SUNSET – Impact 3: “Improved quality of life in urban environments**, through the provision of innovative demand management and traffic control and management systems, as well as new mobility concepts which meet the increased demand, support economic growth, are environmentally sustainable and capable of accommodating future uncertainties and shocks.”

SUNSET can contribute to improved quality of life in urban environments, because anonymised mobility data can be summarized per place, based on the real-life measurements on the community members, and places in an urban environment can be characterized automatically based on the total traffic volume, delay patterns, sound quality and estimated air pollution (emission of CO<sub>2</sub>, SOX, NOX, etc.). This will be valuable input for urban planning and transport system renovation, which is expected to improve quality of life both for the travelling members and for the members living or working in the vicinity of these places.

The ability to influence people’s mobility behaviour enables municipalities and road authorities to use SUNSET services to dynamically modify the municipality’s safety, congestion, and pollution objectives for certain urban areas. As a result, they are able to support economic growth because it will become more attractive for businesses to move to these areas and for citizens to work and live there. Another factor contributing to economic growth is that third party services are able to provide new value-added services using the social networks and rich mobility information available through SUNSET services. For example, they can use SUNSET to promote services specific for people who follow a regular commuting pattern, such as ride sharing to work.

The system is also designed to improve the environmental footprint of an entire community by both increased awareness of the environmental impacts of travel choices and encouraging behavioural changes. The system will for instance be able to show the CO<sub>2</sub> footprint of a travel, or provide

personalised and dynamic navigation suggestions that enable car drivers to avoid traffic jams, which reduces CO2 emissions.

It will learn long-term personal mobility patterns in an automatic way, unobtrusive to the user, and use this information to decide for which users information about observed exceptions and future uncertainties and shocks is considered to be relevant.

SUNSET services can also contribute to an improved quality of life will because they allow for an increase in safety and travelling efficiency, as discussed under Impact 1.

**SUNSET – Impact 4: “Wider uptake of intelligent vehicle systems and co-operative systems through proof-of-concept to all stakeholders in Field Operational Tests.”**

SUNSET will move from co-operative systems tied to the infrastructure or transport vehicles to a next generation of mobile co-operative systems tied to the end-user. A proof-of-concept will be tested in a living lab setting, by equipping users with a mobile measuring application and measure their daily normal routine, in Enschede in The Netherlands, qualifying as a field operational test in real-life conditions. The living lab will be set up and carried out by the SUNSET consortium, which contains all relevant stakeholders.

The evaluation itself will analyse the progress on the system-level goals over a long period of time (one year). The results of the evaluation will contribute to fine-tuning the concept from the perspective of different stakeholders, thus contributing to the adoption and wider uptake of SUNSET services. The social nature and easy accessibility of SUNSET services (see Impact 2) will also help in this regard.

**SUNSET – Impact 5: “Increased European research excellence by fostering closer cooperation with leading international partners.”**

SUNSET contributes to an increased European research excellence because it brings together well-known European research institutes in combination with various stakeholders that together represent the SUNSET value chain. Moreover SUNSET introduces advanced services that bridge multidisciplinary research domains. As a result, SUNSET is able to mix research and practice, thus fuelling research into social traffic services that is both academically relevant as well as practically feasible. In addition, the SUNSET partners provide complementary expertise and capabilities, allowing for significant scientific contributions in multiple areas relevant to the project.

The SUNSET living lab provides new insights into how social traffic services work in practice. This knowledge will allow the research partners in SUNSET to obtain a competitive edge over their colleagues in the USA and Asia, thus enabling Europe to extend its world leadership in research on validated social traffic services.

SUNSET has brought together not only different geographical aspects of urban traffic and everyday travel management, but also different research disciplines, approaches to how digital services can support the traveller and also an arena for open innovation, where the different types of actors in the project can co-create the next generation of travel management tools where the traveller him/herself, is a part of the providing of information.

#### **4.4 Main dissemination activities**

The following outlines some of the main dissemination activities that have been performed by the SUNSET partners during the course of the project.

SUNSET has adopted a multiple concurrent dissemination approach geared towards different stakeholders to the project. There has been a full programme of scientific papers and presentations at

related academic and technical conferences, as well as publications in scholarly journals and teaching courses to (under)graduates. The project has also disseminated results at industrial events and EC events, for instance through publication of papers and articles or presentations at industrial and business seminars and conferences.

The presentation of both project objectives and results at conferences and workshops has been an excellent opportunity not only to disseminate the project results, but also to exchange knowledge with other experts in the field as well as to collect feedbacks from EU officials, industry and the academia. A milestone has been the successful presentation of SUNSET to EU Members of parliament at the Made in Europe exhibition.

A broader interaction with the industry has also enabled the consortium to obtain a fair assessment of the market potential of SUNSET and its position in the broader business spectrum, which has also been relevant in the context of the SUNSET exploitation plans and take-up. In order to get appropriate input from the industry, the project has organised several workshops and one-on-one interactions to solicit input and guidance from other industrial and public partners in the SUNSET value chain, aligned with appropriate industry events and end-user events.

The project also was involved in broader interaction with the scientific community, in particular by disseminating the SUNSET approach and results towards other PPP R&D projects. This allowed these industry-driven projects to benefit from the SUNSET results, thus helping them to achieve their goals (fast integration of existing research results into new products and services) and work towards making the Zero-Zero Vision of the Commission a reality. We have particularly focused on PPP projects that deal with social ICT services and applications for cooperative systems and mobility, projects on Field Operation Tests (FOTs), and projects on roadmaps. Besides providing input, the project also has learned from the work in the PPP projects and has fed results and learnings back into SUNSET. With respect to scientific dissemination, the SUNSET consortium has identified a first list of potential national and European conferences and journals, which are of interest for disseminating the SUNSET project results.

Finally, a range of dissemination materials was produced, including a public website, project flyers, banners, posters and factsheets describing the goals, objectives, approach and achievements of the project. The material was disseminated and distributed via a range of digital channels like social networks and via personal activities and interactions with the field. Furthermore a range of dissemination material has been developed and used in the Living labs to engage with and inform end-users and stakeholders. The project also created a short animated movie. The video is on Youtube (<http://www.youtube.com/watch?v=8bWuxMhgbvs>) and is also accessible via the project website (<http://www.sunset-project.eu>).

#### **4.5 Exploitation of the results**

As exploitation and active take-up of the SUNSET results has been an ambition from the very project start, already during the course of the project a twofold exploitation strategy was deployed comprising of

- the individual dissemination and exploitation strategy and activities per partner on the scientific and technical results of the project;
- an overall exploitation approach centred on the SUNSET Living Labs. The overall service oriented exploitation approach must be seen in the context of the ambition to create successful new social transport services with the tripzoom software system as the main integrated technical result of SUNSET deployed in the SUNSET Living Labs.

Part of the SUNSET overall exploitation approach has been to analyse the practical results of the tripzoom system, components and architecture, and study how the tripzoom services and approach in the project

- can benefit different public – private stakeholders and can commercially work and grow;
- can be packaged to be implemented in other cities or urban regions;
- can be the basis for next generation commercial service offerings, with either the same scope or with a more condensed purpose with less, more specific and elaborated functionality.

This has been done by a range of interactions of SUNSET partners with stakeholders in the Living Lab context (local stakeholders), the related national (NL, GB, SE) context and more general with contacts in the international urban mobility markets (DE, JP, US, FR, Turkey). Stakeholders include local city governments (municipalities/regions), road authorities, public transport companies, mobility management service providers, (large) employers and ICT service providers. For each of the stakeholders we utilised an exploitation strategy which consists of different stages:

- In the first stage we tried to get in touch and interact with relevant stakeholders via media releases, one-on-one talks, presentations, workshops and discussions to pitch the vision and approach of SUNSET and make people aware of and interested in the results and outcomes of SUNSET;
- In the second stage we tried to set up joint collaborations like joint proposals for further work or projects or involvement in the Living Labs;
- In the third stage we tried to let stakeholders to take-up results of SUNSET whether these are software (re-use or application of components, App technology, developed services) or other results (evaluation method, LL approach, incentive design & creation).

Important aspect of the tripzoom exploitation results is that SUNSET delivered a basic personal mobility measurement engine and application services on which public or private stakeholders like local or regional public governments, road authorities, employers, transport companies, local retailers, service providers and event organisers can couple, integrate or build their own (cross-sectoral) services, Apps and campaigns on a scale of their choice to incentivise travellers (commuters, local citizens, visitors, tourists). This is a fast growing market as tripzoom type of services are flexible and cost-effective opposed to more traditional traffic- and mobility management solutions and allow for new business models– for example in information exchange and incentive distribution between third parties, city authorities, transport suppliers, employers and end-users. Already from the SUNSET results, a start-up company has been created, which will bring SUNSET-like personal and social mobility services to the commercial market. Therefore the SUNSET innovations and results have contributed significantly to a further market development featuring integration of a ‘user led’ and individualized approach with wider societal (‘top down’) objectives benefiting current sustainability, health and well-being, safety and economic concerns in transport.

## 5 List of beneficiaries

**Table 5-1: The SUNSET project consortium**

No.	Beneficiary name	Short Name	Country
1	Stichting Novay	NOVAY	NL
2	Docomo Communications Laboratories Europe GMBH	DOCOMO	DE
3	Queen Mary and Westfield College, University of London	QMUL	UK
4	University of Leeds	UNIVLEEDS	UK
5	Eco2Win AB	ECO2WIN	SE
6	LocatieNet	LOCNET	NL
7	Universiteit Twente	UTWENTE	NL
8	Gemeente Enschede	ENSCHEDÉ	NL
9	Viktoria Swedish ICT	VIKTORIA	SE

## 6 Coordinator contact details

Company name: Stichting Novay  
Address: Capitoool 15, 7521 PL, Enschede, The Netherlands  
Tel: +31 53 4850485

Project Coordinator dr. M.E. Bijlsma  
E-mail: marcel.bijlsma@novay.nl

## 7 Project logo



## 8 Project website

The public website is accessible through: <http://www.sunset-project.eu>

## Part II Use and dissemination of foreground

This section summarises the plan for use and dissemination of foreground (including socio-economic impact and target groups for the results of the research). Both sections are public.

### 9 Section A: Dissemination (Public)

This section A outlines the dissemination strategy, measures, target groups, channels and dissemination activities regarding the SUNSET results.

#### Dissemination objectives

The main objective for the dissemination activities is the provisioning of appropriate and value-adding information to interested parties about the SUNSET project scope and results so as to enable uptake and exploitation. The particular dissemination actions are deemed to be meaningful if they succeed in spreading the technological and scientific achievements of the SUNSET project both to the research and academic environment, as well as industry in different sectors (ICT, transport).

#### SUNSET dissemination ‘products’

The SUNSET dissemination ‘products’ are as follows:

- **Tripzoom social networking services.** Integrated software-as-a—service platform with frontend App providing insight into personal travel behaviour and challenging and rewarding (groups of) users towards sustainable travel choices;
- **Tripzoom software components.** Individual re-usable software components to a) measure individual travel behaviour (sensing machine), b) to analyse and enrich sensed data into a personal mobility profile and c) to intelligently distribute incentives to target groups utilising actual travel behaviour conditions;
- **Incentive schemes.** Knowledge about feasible and effective incentive schemes to positively stimulate people to ‘better’ travel choices with the purpose to make the mobility system of urban environments more efficient and sustainable;
- **Living Lab operational model.** Knowledge and approach about how to create and maintain a successful Living Lab featuring innovative mobility services;
- **Evaluation methodology.** Unified framework with key indicators for the evaluation of operational success and a re-usable analysis approach for the effectiveness of incentives in the SUNSET system.

#### SUNSET target groups for dissemination

The target audiences for the SUNSET dissemination activities include the following:

1. The EC-CNECT community: with the aim to raise awareness regarding the SUNSET vision, approach and results and trigger collaborations which enables SUNSET to exploit synergies with projects sharing similar or complementary goals.
2. The scientific community: with the aim to spread the scientific results, promote multi-disciplinary connections, provide education and enable triggering their use in other areas as well.

3. The industrial community: with the aim to communicate and promote project results to both technology and transport service providers as well as business and governmental professional mobility management users and policy makers.
4. The wider public: with the aim to raise overall awareness on the project and its objectives.

General dissemination activities target mainly groups 1, 2 and 4 above. It is apparent that all the SUNSET achievements are disseminated extensively to the wide scientific community, as well as the EC and CNECT community, so that academics, researchers, policy makers and relevant stakeholders are informed on the technological and scientific advances and concepts introduced by SUNSET. Highlight of the dissemination to the EC community has been taking part of the October 2012 EP exhibition "MADE IN EUROPE – ICT BUILDING BLOCKS TACKLING SOCIETAL CHALLENGES" organised under the patronage of VP Kroes and MEP Carvalho. Also, the "Research EU – Results Magazine" hosted a SUNSET article in its June 2013 edition.

Further to the above, a second level of dissemination is employed towards the market and stakeholders targeted for potential exploitation and service take-up. The target audiences for these dissemination activities include primarily:

- Road authorities and city governments interested in ICT services to design and deploy tailored incentives to actively influence and seduce individuals or groups of people towards more sustainable travel decisions.
- Transport service providers interested in personal mobility, services to tailor incentives to individuals or groups and new possibilities to interact with their traveller-base.
- (New entrant) information service providers interested in collecting, enriching and distributing travel and traffic information. E.g. social media enhanced traffic and travel information offers considerable opportunities across sectors, for example for social safety situations, event and crowd management, tourist support or the well-being sector to align, share and enrich information on travel patterns of individuals or groups.
- Employers interested in sustainable and cost-effective mobility management. E.g. to create a company specific involvement and community building, where employees share their mobility profile to engage in individual or common challenges with colleagues.
- SME's offering either business vertical solutions extending the software system to other domains or application areas or exploitation services of service components in the area of personal and social mobility and traffic management.

In this context, all partners from the SUNSET consortium have been active in the dissemination activities for their identified target groups. The specific events and activities are detailed in the tables below.

**TEMPLATE A1: LIST OF SCIENTIFIC (PEER REVIEWED) PUBLICATIONS, STARTING WITH THE MOST IMPORTANT ONES**

NO.	Title	Main author	Title of the periodical or the series	Number, date or frequency	Publisher	Place of publication	Year of publication	Relevant pages	Permanent identifiers (if available)	Is/Will open access provided to this publication?
1	<i>Move better with tripzoom</i>	<i>J. Bie et al</i>	<i>International Journal On Advances in Life Sciences</i>	<i>4(3/4), 2012</i>	<i>Iaria</i>		<i>2012</i>	<i>pp. 125 -135</i>		<i>Yes</i>
2	<i>Short Term Traffic Volume Prediction for Sustainable Transportation in Urban Area</i>	<i>H. Mei et al</i>	<i>Journal of Computing in Civil Engineering</i>	<i>April 19, 2013</i>	<i>ACSE</i>	<i>U.S.</i>	<i>2013</i>		<i>DOI: 10.1061/(ASCE) CP.1943-5487.0000316</i>	<i>Yes</i>
3	<i>tripzoom: a system to motivate sustainable urban mobility</i>	<i>P. Holleis et al</i>	<i>Proceedings of the First International Conference on Smart Systems, Devices and Technologies (SMART 2012),</i>	<i>May 2012</i>			<i>2012</i>			<i>Yes</i>
4	<i>Individual sustainability performance indicators for urban everyday traveling</i>	<i>R. Carlson</i>	<i>Proceedings of the Ecobalance 2012 conference, Yokohama, Japan</i>	<i>Nov. 2012</i>	<i>The Institute of Life Cycle Assessment</i>	<i>Japan</i>	<i>2012</i>			<i>Yes</i>
5	<i>A travel app to make you — and your environment — feel</i>	<i>M.E. Bijlsma</i>	<i>Research*eu results magazine</i>	<i>N° 23</i>			<i>June 2013</i>			<i>Yes</i>

	<i>better'</i>									
6	<i>Extending prospect theory for modelling day-to-day traffic dynamics: Risk aversion and equilibrium stability</i>	<i>J. Bie et al</i>	<i>4th International Symposium on Dynamic Traffic Assignment (DTA)</i>			<i>Martha's Vineyard, Massachusetts, US</i>	<i>2012</i>			<i>No</i>
7	<i>tripzoom – an app to improve your mobility practices</i>	<i>G. Broll et al</i>	<i>11th International Conference on Mobile and Ubiquitous Multimedia (MUM'12)</i>	<i>Nov. 2012</i>			<i>2012</i>			<i>Yes</i>
8	<i>A next generation approach to sustainable transport</i>	<i>M.E. Bijlsma</i>	<i>Eg Magazine on sustainable development</i>	<i>Volume 17, Issue 3</i>	<i>Global to Local Foundation</i>		<i>2012</i>			<i>Yes</i>
9	<i>SUNSET</i>	<i>S.M. Grant-Muller</i>	<i>ITS International</i>				<i>2010</i>	<i>Pp1-2</i>		<i>No</i>
10	<i>A virtuous Cycle</i>	<i>S.M. Grant-Muller et al</i>	<i>Thinking Cities</i>	<i>Issue 1</i>	<i>H3B MEDIA LTD</i>	<i>UK</i>	<i>2013</i>	<i>Pp 52-53</i>		<i>Yes</i>
11	<i>Mind the Gap</i>	<i>S.M. Grant-Muller et al</i>	<i>Thinking Highways</i>	<i>Vol 8, No.1</i>	<i>H3B MEDIA LTD</i>	<i>UK</i>	<i>2013</i>	<i>pp 64-65</i>		<i>Yes</i>

**TEMPLATE A2: LIST OF DISSEMINATION ACTIVITIES**

<b>NO</b>	<b>Type of activities</b>	<b>Main leader</b>	<b>Title</b>	<b>Date/Period</b>	<b>Place</b>	<b>Type of audience</b>	<b>Size of audience</b>	<b>Countries addressed</b>
<i>1</i>	<i>Workshop</i>	<i>VIKTORIA</i>	<i>-</i>	<i>March 6 2011</i>	<i>Discussion session about Göteborg Region involvement in SUNSET</i>	<i>Governmental agencies</i>	<i>~20 participants</i>	<i>SE</i>
<i>2</i>	<i>Presentation</i>	<i>UNIVLEEDS</i>	<i>SUNSET: Sustainable Social network Service for Transport</i>	<i>March 9 2011</i>	<i>Invited presentation: plus stakeholder data collection</i>	<i>Regional and international policy makers, IRF, city transport providers</i>	<i>~20 participants</i>	<i>UK</i>
<i>3</i>	<i>Presentation</i>	<i>UNIVLEEDS</i>	<i>SUNSET: Sustainable Social network Service for Transport</i>	<i>Mar 23-24 2011</i>	<i>Invited presentation to the CONDUITS City Pool, and stakeholder data collection</i>	<i>city transport operators, researchers and academics, local dignitaries</i>	<i>~50 participants</i>	<i>Europe</i>

**TEMPLATE A2: LIST OF DISSEMINATION ACTIVITIES**

<b>NO</b>	<b>Type of activities</b>	<b>Main leader</b>	<b>Title</b>	<b>Date/Period</b>	<b>Place</b>	<b>Type of audience</b>	<b>Size of audience</b>	<b>Countries addressed</b>
4	<i>Workshop</i>	<i>NOVAY</i>	<i>SUNSET: Sustainable Social network Service for Transport</i>	<i>Apr 4,5 2011</i>	<i>ICT for Transport Concertation Meeting,</i>	<i>Science, governmental agencies</i>	<i>~30 participants</i>	<i>Europe</i>
5	<i>Conference</i>	<i>NOVAY, UNIVLEEDS, ENSCHEDE</i>	-	<i>May 18-20 2011</i>	<i>European Conference on Mobility Management (ECOMM)</i>	<i>Science, governmental agencies</i>		<i>World</i>
6	<i>Workshop</i>	<i>NOVAY</i>	-	<i>Jun 8 2011</i>	<i>Roundtable IBM</i>	<i>Industry</i>	<i>~25 participants</i>	<i>NL</i>
7	<i>Briefing</i>	<i>UNIVLEEDS</i>	<i>~20 participants</i>	<i>Jul 5 2011</i>	<i>Leeds City Council</i>	<i>Governmental agencies</i>	<i>~20 participants</i>	<i>UK</i>

**TEMPLATE A2: LIST OF DISSEMINATION ACTIVITIES**

<b>NO</b>	<b>Type of activities</b>	<b>Main leader</b>	<b>Title</b>	<b>Date/Period</b>	<b>Place</b>	<b>Type of audience</b>	<b>Size of audience</b>	<b>Countries addressed</b>
8	<i>Workshop</i>	<i>NOVAY, ENSCHEDÉ, UNIVLEEDS</i>	-	<i>Sept 6 2011</i>	<i>Meeting with Transport for London (TFL) to discuss stakeholder needs</i>	<i>Policy makers</i>	<i>~12 participants from TFL</i>	<i>UK</i>
9	<i>Workshop</i>	<i>UNIVLEEDS</i>	-	<i>Sept 16-17 2011</i>	<i>NECTAR Workshop participation</i>	<i>Experts and academics</i>	<i>~20 participants</i>	<i>UK</i>
10	<i>Presentation</i>	<i>UNIVLEEDS</i>	<i>SUNSET: Sustainable Social network Service for Transport</i>	<i>Sept 20 2011</i>	<i>Invited panel presentation to the Connekt/ITS event: 'Mobility in 2030'</i>	<i>Industry bodies, consultants, experts, academics</i>	<i>30 participants</i>	<i>NL</i>
11	<i>Network event</i>	<i>UNIVLEEDS</i>	-	<i>Sept 29 2011</i>	<i>Networking meeting of Business Forum</i>	<i>Business and industry</i>	<i>~150 participants</i>	<i>UK</i>

**TEMPLATE A2: LIST OF DISSEMINATION ACTIVITIES**

<b>NO</b>	<b>Type of activities</b>	<b>Main leader</b>	<b>Title</b>	<b>Date/Period</b>	<b>Place</b>	<b>Type of audience</b>	<b>Size of audience</b>	<b>Countries addressed</b>
12	<i>Workshop</i>	<i>UNIVLEEDS</i>	-	<i>Oct 14-15 2011</i>	<i>NECTAR workshop participation</i>	<i>experts and academics</i>	<i>~20 participants,</i>	
13	<i>Presentation</i>	<i>UNIVLEEDS</i>	<i>SUNSET: Sustainable Social network Service for Transport</i>	<i>Oct 4 2011</i>	<i>PIMMS transfer: presentation, 'grill the expert' and data gathering</i>	<i>and internationally, diverse backgrounds</i>	<i>~50 participants</i>	<i>Europe</i>
14	<i>Workshop</i>	<i>VIKTORIA</i>	-	<i>Oct 8-9 2011</i>	<i>TravelHack 2011,</i>	<i>General public</i>	<i>76 participants + 86 visitors from diverse backgrounds</i>	<i>SE</i>
15	<i>Network event</i>	<i>ENSCHUDE</i>	-	<i>Oct 10-13 2011</i>	<i>Open Days (9th European Week of Regions and Cities),</i>	<i>Governmental agencies</i>		<i>Europe</i>

**TEMPLATE A2: LIST OF DISSEMINATION ACTIVITIES**

<b>NO</b>	<b>Type of activities</b>	<b>Main leader</b>	<b>Title</b>	<b>Date/Period</b>	<b>Place</b>	<b>Type of audience</b>	<b>Size of audience</b>	<b>Countries addressed</b>
16	<i>Presentation</i>	<i>UNIVLEEDS</i>	-	<i>Oct 16-20 2011</i>	<i>ITS World Congress, IBEC Session invited talk</i>	<i>Science, industry, governmental agencies</i>		<i>World</i>
17	<i>Workshop</i>	<i>NOVAY</i>	<i>SUNSET: Sustainable Social network Service for Transport</i>	<i>Nov 16 2011</i>	<i>Knowledge congress Europe</i>	<i>Science, industry, governmental agencies</i>		<i>Europe</i>
18	<i>Workshop</i>	<i>UNIVLEEDS, ENSCHEDE, NOVAY</i>	<i>SUNSET: Sustainable Social network Service for Transport</i>	<i>Nov 25 2011</i>	<i>PIMMS Transfers proceedings paper</i>	<i>Science, industry, governmental agencies</i>	<i>~80 participants</i>	<i>Europe</i>
19	<i>Workshop</i>	<i>VIKTORIA</i>	<i>SUNSET: Sustainable Social network Service for Transport</i>	<i>Dec 6 2011</i>	<i>Viktoria Forum</i>	<i>science, industry and governmental agencies</i>	<i>150 participants from 50 organizations</i>	<i>SE</i>

**TEMPLATE A2: LIST OF DISSEMINATION ACTIVITIES**

<b>NO</b>	<b>Type of activities</b>	<b>Main leader</b>	<b>Title</b>	<b>Date/Period</b>	<b>Place</b>	<b>Type of audience</b>	<b>Size of audience</b>	<b>Countries addressed</b>
20	<i>Conference</i>	<i>ENSCHEDÉ</i>	<i>SUNSET: Sustainable Social network Service for Transport</i>	<i>Dec 13 2011</i>	<i>CATCH conference</i>	<i>Science, industry, governmental agencies</i>		<i>World</i>
21	<i>Workshop</i>	<i>VIKTORIA</i>	-	<i>Jan 14 2012</i>	<i>Call-to-Arms, Conceptual Service Workshop</i>	<i>12 organizations within the public transportation field in Sweden</i>		<i>SE</i>
22	<i>Exhibition</i>	<i>ENSCHEDÉ</i>	-	<i>Feb 15 2012</i>	<i>IT-Trans 2012 Exhibition and Conference</i>	<i>Science, industry, governmental agencies</i>		<i>World</i>
23	<i>Workshop</i>	<i>NOVAY</i>	<i>SUNSET: influencing travel behaviour via new transport services</i>	<i>Apr 4 20 12</i>	<i>(‘Verkeersgedragdag’, workshop</i>	<i>Science, industry, governmental agencies</i>	<i>~80 participants</i>	<i>NL</i>

**TEMPLATE A2: LIST OF DISSEMINATION ACTIVITIES**

<b>NO</b>	<b>Type of activities</b>	<b>Main leader</b>	<b>Title</b>	<b>Date/Period</b>	<b>Place</b>	<b>Type of audience</b>	<b>Size of audience</b>	<b>Countries addressed</b>
24	<i>Conference</i>	<i>DOCOMO</i>	-	<i>May31 20 12</i>	<i>Int. Conf. on Smart Systems, Devices and Technologies (SMART'12)</i>	<i>Science, industry</i>		<i>World</i>
25	<i>Workshop</i>	<i>ENSCHEDÉ, VIKTORIA</i>	-	<i>June7,8 2012</i>	<i>ITRACT workshop</i>	<i>Science, industry, governmental agencies</i>	<i>~150 participants</i>	<i>Europe</i>
26	<i>Workshop</i>	<i>ENSCHEDÉ</i>	-	<i>June 19-21 2012</i>	<i>Internet of Things workshop, I-Core project</i>	<i>Science, industry, governmental agencies</i>		<i>Europe</i>
27	<i>Workshop</i>	<i>UNIVLEEDS</i>	<i>Pervasive devices and mobility tracking: unintended consequences</i>	<i>Sept 2012</i>	<i>NECTAR C1 Cluster workshop: Exploring equity issues in transport and communication networks, Harrogate, UK</i>	<i>Scientific, industry, policy</i>	<i>~50 participants</i>	<i>UK</i>

**TEMPLATE A2: LIST OF DISSEMINATION ACTIVITIES**

<b>NO</b>	<b>Type of activities</b>	<b>Main leader</b>	<b>Title</b>	<b>Date/Period</b>	<b>Place</b>	<b>Type of audience</b>	<b>Size of audience</b>	<b>Countries addressed</b>
28	<i>Forum</i>	<i>ENSCHEDÉ</i>	-	<i>Oct 23 2012</i>	<i>Eurocities Mobility-Forum/Knowledge Society Forum</i>	<i>Science, industry, governmental agencies</i>		<i>Europe</i>
29	<i>Conference</i>	<i>ENSCHEDÉ, UNIVLEEDS</i>	-	<i>Oct 23-26 2012</i>	<i>ITS world congress</i>	<i>Science, industry, governmental agencies</i>		<i>World</i>
30	<i>Video</i>	<i>NOVAY</i>	<i>SUNSET: Sustainable Social network services for Transport</i>	<i>Oct 2012</i>	<i>http://www.youtube.com/watch?v=8bWuxMhgbvs)</i>	<i>General public</i>		<i>World</i>
31	<i>Exhibition</i>	<i>NOVAY, UTWENTE, ENSCHEDÉ</i>	<i>SUNSET: Sustainable Social network Service for Transport</i>	<i>Oct 2012</i>	<i>Made In Europe</i>	<i>Members of European Parliament</i>	<i>~ 50 policy makers</i>	<i>Europe</i>
32	<i>Presentation</i>	<i>UTWENTE</i>	<i>Optimization in Traffic Management</i>	<i>Oct, 2012</i>	<i>COST TU1102, Leuven, Belgium</i>	<i>Scientific, industry, policy</i>	<i>~100 participants</i>	<i>Europe</i>
33	<i>Conference</i>	<i>UNIVLEEDS</i>	<i>Social media networks and their impact on transportation'</i>	<i>22-26 October 2012</i>	<i>International Benefits Evaluation and Costs (IBEC) special session at ITS world</i>	<i>Scientific, industry, policy</i>		<i>World</i>

**TEMPLATE A2: LIST OF DISSEMINATION ACTIVITIES**

<b>NO</b>	<b>Type of activities</b>	<b>Main leader</b>	<b>Title</b>	<b>Date/Period</b>	<b>Place</b>	<b>Type of audience</b>	<b>Size of audience</b>	<b>Countries addressed</b>
					<i>Congress, Vienna, Austria</i>			
34	<i>Conference</i>	<i>UNIVLEEDS</i>	<i>Social media in behaviourally orientated transport demand management - why, how and when</i>	<i>Nov 2012</i>	<i>POLIS annual Conference, Perugia, Italy, Finalist for the Eltis mobility conference prize.</i>	<i>Scientific, industry, policy</i>	<i>~150 participants</i>	<i>World</i>
35	<i>Presentation</i>	<i>ECO2WIN</i>	<i>Individual sustainability performance indicators for urban everyday traveling</i>	<i>Nov 2012</i>	<i>Ecobalance 2012 conference , Yokohama, Japan</i>	<i>Scientific, industry, policy</i>		<i>World</i>
36	<i>Presentation</i>	<i>DOCOMO</i>	<i>tripzoom: An App to Improve your Mobility Behavior</i>	<i>Dec 4-6 2012</i>	<i>11th International Conference on Mobile and Ubiquitous Multimedia (MUM12), ULM, GE</i>	<i>Scientific, industry,</i>		<i>World</i>
37	<i>Conference</i>	<i>DOCOMO</i>	-	<i>Dec 5 2012</i>	<i>Int. Conf. on Mobile and Ubiquitous Multimedia (MUM'12)</i>	<i>Science, industry</i>		<i>World</i>
38	<i>Forum</i>	<i>VIKTORIA</i>	-	<i>Dec 5 2012</i>	<i>Viktoria Forum</i>	<i>Science, industry, governmental agencies</i>	<i>~200 participants</i>	<i>SE</i>
39	<i>Presentation</i>	<i>UTWENTE</i>	<i>Incentives to Change to Eco-Friendly Travel Behavior using a Smartphone App</i>	<i>Jan 13-17 2013</i>	<i>Transportation Research Board, 92nd Annual Meeting, Washington DC, USA</i>	<i>Scientific, industry, policy</i>		<i>World</i>
40	<i>Presentation</i>	<i>UTWENTE,</i>	<i>The roe of the Smartphone</i>	<i>April 24</i>	<i>Bi-annual congress of the</i>	<i>Scientific,</i>		<i>NL</i>

**TEMPLATE A2: LIST OF DISSEMINATION ACTIVITIES**

<b>NO</b>	<b>Type of activities</b>	<b>Main leader</b>	<b>Title</b>	<b>Date/Period</b>	<b>Place</b>	<b>Type of audience</b>	<b>Size of audience</b>	<b>Countries addressed</b>
		<i>NOVAY</i>	<i>in data acquisition for mobility management,</i>	<i>2013</i>	<i>National Data warehouse for Traffic Information</i>	<i>industry, policy</i>		
<i>41</i>	<i>Workshop</i>	<i>QMUL</i>	<i>-</i>	<i>May 2013</i>	<i>Workshop Transport for London (TfL)- Surface Transport with Academic Universities - Industry Workshops.</i>	<i>Science, industry, governmental</i>		<i>UK</i>
<i>42</i>	<i>Workshop</i>	<i>ENSCHEDÉ</i>	<i>-</i>	<i>May 28-31 2013</i>	<i>Discussion during ECOMM</i>	<i>Governmental agencies, science, industry</i>		<i>Europe</i>
<i>43</i>	<i>Conference</i>	<i>ENSCHEDÉ</i>	<i>-</i>	<i>June 4-7 2013</i>	<i>European ITS conference, SIS 33 on gamification</i>	<i>Governmental agencies, science, industry</i>		<i>Europe</i>
<i>44</i>	<i>Presentation</i>	<i>UTWENTE</i>	<i>Autonomous Transport Systems involving Smartphones</i>	<i>June 4,5 2013</i>	<i>COST ARTS meeting (TU1102) on Autonomous Road Transport Systems, Trinity College, Dublin, Ireland</i>	<i>Science</i>		<i>Europe</i>
<i>45</i>	<i>Summer school</i>	<i>QMUL</i>	<i>-</i>	<i>June 10-15 2013</i>	<i>UBISS 2013 - 4th International UBI Summer School</i>	<i>Students</i>	<i>~50 participants</i>	<i>UK</i>

**TEMPLATE A2: LIST OF DISSEMINATION ACTIVITIES**

<b>NO</b>	<b>Type of activities</b>	<b>Main leader</b>	<b>Title</b>	<b>Date/Period</b>	<b>Place</b>	<b>Type of audience</b>	<b>Size of audience</b>	<b>Countries addressed</b>
46	<i>School student workshop</i>	<i>UNIVLEEDS</i>	-	<i>July 30 2013</i>	<i>Presentation pPart of 'Dreams of a Low Carbon Future' Royal Academy of Engineering, UK</i>	<i>School pupils (aged 11)</i>	<i>100+</i>	<i>UK</i>
47	<i>Conference</i>	<i>DOCOMO</i>	-	<i>Aug 30 2013</i>	<i>Int. Conf. on Human-Computer Interaction with Mobile Devices and Services (MobileHCI'13)</i>	<i>Science, industry</i>		<i>World</i>
48	<i>Forum</i>	<i>ENSCHEDÉ, UTWENTE</i>	-	<i>Sept 25-27 2013</i>	<i>Eurocities, Mobility Forum meeting</i>	<i>Governmental agencies</i>		<i>Europe</i>
49	<i>Lecture</i>	<i>VIKTORIA</i>	<i>Tripzoom as enabler for sustainable urban commuting</i>	<i>Sep 26 2013</i>	<i>SUNSET Lecture</i>	<i>Gothenburg University and Chalmers Technical College</i>	<i>Around 80 students, 6 university teachers</i>	<i>SE</i>
50	<i>Presentation</i>	<i>QMUL</i>	<i>A Personalised Online Travel Time Prediction.</i>	<i>Oct 13–16 2013</i>	<i>IEEE International Conference on Systems, Man, and Cybernetics (SMC), Manchester UK</i>	<i>Scientific, industry</i>		<i>World</i>
51	<i>Roundtable</i>	<i>ENSCHEDÉ</i>	-	<i>Nov 26-29 2013</i>	<i>EUROCITIES Annual General Meeting; roundtable discussion on SUNSET and</i>	<i>Governmental agencies</i>		<i>Europe</i>

**TEMPLATE A2: LIST OF DISSEMINATION ACTIVITIES**

<b>NO</b>	<b>Type of activities</b>	<b>Main leader</b>	<b>Title</b>	<b>Date/Period</b>	<b>Place</b>	<b>Type of audience</b>	<b>Size of audience</b>	<b>Countries addressed</b>
					<i>SMART</i>			
<i>52</i>	<i>Conference</i>	<i>ENSCHEDÉ</i>	-	<i>Dec 2 2013</i>	<i>ITS conference EC: Information Stand on SUNSET and SMART</i>	<i>Governmental agencies, science, industry</i>		<i>Europe</i>
<i>53</i>	<i>Presentation</i>	<i>UTWENTE</i>	<i>Smartphones in Transport Research, Invited lecture,</i>	<i>Jan 16 2014</i>	<i>Virginia Tech Transport Institute, USA</i>	<i>Science</i>		<i>USA</i>
<i>54</i>	<i>Training</i>	<i>ENSCHEDÉ</i>	-	<i>Feb 4-6 2014</i>	<i>TIPS training: from research to exploitation</i>	<i>Science, Industry</i>	<i>25 participants</i>	<i>Europe</i>

## 10 Section B: Foreground exploitation (Public)

### 10.1 Part B1: Patents

The applications for patents have been listed in the table below.

<b>TEMPLATE B1: LIST OF APPLICATIONS FOR PATENTS, TRADEMARKS, REGISTERED DESIGNS, ETC.</b>					
Type of IP Rights:	Confidential Click on YES/NO	Foreseen embargo date dd/mm/yyyy	Application reference(s) (e.g. EP123456)	Subject or title of application	Applicant (s) (as on the application)
<i>Patent</i>	<i>No</i>	-	<i>EP2568309 A1</i>	<i>Method and apparatus for path determination</i>	<i>Marko Luther (DOCOMO)</i>
<i>Patent</i>	<i>No</i>	-	<i>EP2696605 A1</i>	<i>Apparatus and method for Energy-Efficient Location Sensing</i>	<i>Marko Luther, Hu CAO, Bertrand Souville, Michael Marth (DOCOMO)</i>

## 10.2 Part B2: Exploitable foreground

The exploitable foreground generated within the SUNSET project is presented in the table below. With respect to beneficiaries involved NOVAY has passed on its relevant background IPR in the mobility management domain and SUNSET foreground to its spin-off company MOBIDOT.

<b>Type of Exploitable Foreground</b>	<b>Description of exploitable foreground</b>	<b>Exploitable product(s) or measure(s)</b>	<b>Sector(s) of application</b>	<b>Timetable, commercial or any other use</b>	<b>Patents or other IPR exploitation (licences)</b>	<b>Owner &amp; Other Beneficiary(s) involved</b>
<i>Exploitation of results through (social) innovation</i>	<i>Tripzoom social network services</i>	<i>Social network services for transport</i>	<ul style="list-style-type: none"> <li>- Transport</li> <li>- Public administration</li> <li>- Information services</li> <li>- Advertising and market research</li> </ul>	<i>2014</i>	<i>N/A</i>	<i>NOVAY/MOBIDOT, DOCOMO, LOCNET, QMUL</i>
<i>Commercial exploitation of R&amp;D results</i>	<i>Tripzoom Sensing machine</i>	<i>Sensing software for App-based personal mobility</i>	<ul style="list-style-type: none"> <li>- Transport</li> <li>- Public administration</li> <li>- Information services</li> <li>- Advertising and market research</li> </ul>	<i>2014</i>	<i>Two patents are issued by DOCOMO, Licence model</i>	<i>NOVAY/MOBIDOT, DOCOMO, LOCNET</i>
<i>Commercial exploitation of R&amp;D results</i>	<i>Personal Mobility Store (PMS) Mobility Pattern detector</i>	<i>Personal Mobility profiler Software</i>	<ul style="list-style-type: none"> <li>- Transport</li> <li>- Public administration</li> <li>- Information services</li> <li>- Advertising and market research</li> </ul>	<i>2014</i>	<i>Licence model</i>	<i>NOVAY/MOBIDOT, DOCOMO</i>
<i>Commercial exploitation of R&amp;D results</i>	<i>Incentive marketplace</i>	<i>Intelligent distribution of incentives to</i>	<ul style="list-style-type: none"> <li>- Transport</li> <li>- Information services</li> </ul>	<i>Not clear</i>	<i>N/A</i>	<i>QMUL</i>

Type of Exploitable Foreground	Description of exploitable foreground	Exploitable product(s) or measure(s)	Sector(s) of application	Timetable, commercial or any other use	Patents or other IPR exploitation (licences)	Owner & Other Beneficiary(s) involved
		<i>target groups</i>				
<i>General Advancement of knowledge</i>	<i>Incentive Schemes</i>	<i>Incentive Schemes for stimulating behavioural change towards sustainable transport</i>	<ul style="list-style-type: none"> <li>- Transport</li> <li>- Public administration</li> <li>- Information services</li> </ul>	<i>2014</i>	<i>N/A</i>	<i>UTWENTE, QMUL, UNIVLEEDS</i>
<i>General Advancement of knowledge</i>	<i>Living Lab Operational model</i>	<i>Living Lab</i>	<ul style="list-style-type: none"> <li>- Public administration</li> <li>- Management consultancy</li> </ul>	<i>2014</i>	<i>N/A</i>	<i>ENSCHEDÉ, VIKTORIA, UNIVLEEDS</i>
<i>General Advancement of knowledge</i>	<i>Evaluation methodology</i>	<i>Evaluation methodology</i>	<ul style="list-style-type: none"> <li>- Transport</li> <li>- Information services</li> </ul>	<i>2014</i>	<i>N/A</i>	<i>UNIVLEEDS, UTWENTE, ECO2WIN</i>

## 10.3 Description of exploitable foreground

### 10.3.1 Tripzoom social network services

**Description:** The tripzoom social network services represent the exploitable foreground of the integrated software system services developed in SUNSET. The integrated system consists of a Smartphone application (App) as front-end and a flexible component-based software platform as back-end. The App delivers functionality (end-user services) to automatically measure personal travel behaviour (mobile sensing) and to provide incentives (including social community features) to make people move better.

**Its purpose:** The services were developed to stimulate people to travel in more sustainable ways.

**How the foreground might be exploited, when and by whom:** The integrated services can be exploited as-is by information service providers. However, providers might also re-use core components of the system as described below to build and deploy next generation services and front-end Apps on top of the core components.

**Possible market applications:** The integrated services can be used by local/regional governments, road authorities, employers and transport companies concerned with sustainable mobility and traffic management to stimulate behavioural change and to monitor travel behaviour.

**IPR exploitable measures taken or intended:** No measures are taken so far.

**Further research necessary, if any:** Additional research is needed to further improve automatic sensing capabilities, increase quality of personal mobility profiling and fine-tune the functionality and social features provided to the end-users.

**Potential/expected impact (quantify where possible):** The foreground can be used in other cities throughout Europe to reduce congestion, increase safety and sustainable travel and contribute to personal well-being. At least 2-3 use-cases per year are expected.

### 10.3.2 Tripzoom sensing machine

**Description:** The tripzoom sensing machine is an exploitable front-end software component that provides functionality, via an App installed on the Smartphone, to automatically measure travel behaviour using different sensors of the Smartphone according to a battery-efficient sensing strategy.

**Its purpose:** The component was developed to measure travel behaviour of individuals in an automated 24x7 way. Knowing the actual travel behaviour creates a basis to provide tailored, personalised incentives and incentive services for effective behavioural change.

**How the foreground might be exploited, when and by whom:** The software component can be exploited by information service providers and App developers as part of their service and product offerings.

**Possible market applications:** The component can be used as a Smartphone-based sensing service to automate travel registration, which is of added value for employers and mobility service providers. Moreover local/regional governments, road authorities, employers and transport companies interested in monitoring travel behaviour and concerned with influencing behavioural of travellers can use the component.

**IPR exploitable measures taken or intended:** No measures are taken so far. Licence model is expected.

**Further research necessary, if any:** Additional research could be devoted to further improve automatic sensing capabilities and configuration possibilities.

**Potential/expected impact (quantify where possible):** The foreground can be used as a basis software component that can be incorporated in new or existing Apps. In principle all existing travel advice, traffic and mobility management Apps could be enhanced with this software component.

### 10.3.3 Personal mobility store / Mobility pattern detector

**Description:** The technological components were developed to clean and analyse raw data, to perform trip enrichment, detect patterns in travel behaviour and automatically deduce modality of the measured trip.

**Its purpose:** These two back-end components work closely together in a two-step process to rework raw sensed data into a personal mobility profile. The input for the components is measured data from the Smartphone notably from the tripzoom sensing machine. The profile is the basis for incentivising individuals later in the process. Knowing the actual travel behaviour creates a basis to provide tailored, personalised incentives for effective behavioural change.

**How the foreground might be exploited, when and by whom:** The software component can be exploited by information and mobility service providers as part of their service and product offerings.

**Possible market applications:** The component can be used as back-end mobility profiler service to automate travel registration, which is of added value for employers and mobility service providers. Moreover local/regional governments, road authorities, employers and transport companies interested in monitoring travel behaviour and concerned with influencing behavioural of travellers can use the component

**IPR exploitable measures taken or intended:** No measures are taken so far. Licence model is expected.

**Further research necessary, if any:** additional research could be devoted to further improve modality deduction and pattern recognition algorithms.

**Potential/expected impact (quantify where possible):** The foreground can be used as a basis software component that can be integrate in back-end infrastructure that uses personal profiles to deliver personalised functionality to end-users. In principle all existing travel advice, traffic and mobility management applications and services could be enhanced with this software component.

### 10.3.4 Incentive market place

**Description:** This technological component implements a mechanism to distribute incentives in the form of challenges and rewards to individuals or target groups.

**Its purpose:** With this component professional users can define, manage and issue incentives to end-users.

**How the foreground might be exploited, when and by whom:** The software component can be exploited by information and mobility service providers as part of their service and product offerings.

**Possible market applications:** The component can be used by local/regional governments, road authorities, employers and transport companies concerned with influencing behavioural of travellers.

**IPR exploitable measures taken or intended:** No measures are taken so far.

**Further research necessary, if any:** additional research could be devoted to further improve flexibility of condition matching.

**Potential/expected impact (quantify where possible):** The component could be integrated in a broad range of existing or new Apps and services featuring gamification elements and rewarding end-users for shown behaviour. Especially in the transport domain, influencing travel behaviour via gamification is a fast growing market throughout Europe.

### 10.3.5 Incentive schemes

**Description:** The Incentive Schemes are approaches to incentivise end-users in an effective and successful way.

**Its purpose:** Knowledge about feasible, effective and re-usable incentive schemes to positively stimulate people to 'better' travel choices with the purpose to make the mobility system of urban environments more efficient and sustainable is valuable. For different use-cases or application areas different kinds of incentive schemes can be effective. Knowledge how to design a proper incentive can create successful application and added-value to end-users.

**How the foreground might be exploited, when and by whom:** The knowledge can be exploited by information and mobility service providers that want to design and apply effective measures for stimulating behavioural change or the schemes can be exploited by consultancy organisations that can use this knowledge in their advice.

**Possible market applications:** Local/regional governments, road authorities, employers and transport companies interested in influencing behavioural of travellers can apply the knowledge.

**IPR exploitable measures taken or intended:** No measures are taken so far.

**Further research necessary, if any:** additional research could be devoted to further enrich Incentive Schemes towards Incentive Handbooks.

**Potential/expected impact (quantify where possible):** The foreground can be used to make behavioural change campaigns, programs and initiatives more effective and more tailored to end-user expectations and benefits.

### 10.3.6 Living Lab operational model

**Description:** The Living lab Operational Model provides a three-stage process to create and maintain a successful Living lab around transport innovations.

**Its purpose:** Create guidelines and good practice for other projects and initiatives that want to execute Living Lab-based experiments in the transport domain.

**How the foreground might be exploited, when and by whom:** The knowledge can be exploited by research institutes, local or regional governments involved in Living Lab management. .

**Possible market applications:** N/A

**IPR exploitable measures taken or intended:** No measures are taken so far

**Further research necessary, if any:** additional research could be devoted to further enrich Living Lab Operational Model towards a Living Lab operational Handbook.

**Potential/expected impact (quantify where possible):** The foreground can be used to make Living labs more effective and more tailored to stakeholder expectations and involvement.

### 10.3.7 Evaluation methodology

**Description:** A unified evaluation framework with key indicators for the evaluation of operational success and a re-usable analysis approach for the effectiveness of incentives.

**Its purpose:** Have a method to evaluate incentive-based transport services on their effectiveness and operational success.

**How the foreground might be exploited, when and by whom:** The knowledge can be exploited by research institutes, consultancy organisations and local or regional governments involved in incentive-based transport services evaluations.

**Possible market applications:** N/A

**IPR exploitable measures taken or intended:** No measures are taken so far

**Further research necessary, if any:** additional research could be devoted to further validate the methodology in different innovation cases.

**Potential/expected impact (quantify where possible):** The foreground can be used in a variety of Living Lab or FOT R&D projects where evaluation of transport innovations is a key aspect.

## 11 Report on societal implications

Replies to the following questions will assist the Commission to obtain statistics and indicators on societal and socio-economic issues addressed by projects. The questions are arranged in a number of key themes. As well as producing certain statistics, the replies will also help identify those projects that have shown a real engagement with wider societal issues, and thereby identify interesting approaches to these issues and best practices. The replies for individual projects will not be made public.

### **A General Information** *(completed automatically when Grant Agreement number is entered.*

Grant Agreement Number:

Title of Project:

Name and Title of Coordinator:

### **B Ethics**

<b>1. Did your project undergo an Ethics Review (and/or Screening)?</b>	YES
<ul style="list-style-type: none"> <li>If Yes: have you described the progress of compliance with the relevant Ethics Review/Screening Requirements in the frame of the periodic/final project reports?</li> </ul>	YES

**2. Please indicate whether your project involved any of the following issues (tick box) :**

<b>RESEARCH ON HUMANS</b>	
• Did the project involve children?	NO
• Did the project involve patients?	NO
• Did the project involve persons not able to give consent?	NO
• Did the project involve adult healthy volunteers?	YES
• Did the project involve Human genetic material?	NO
• Did the project involve Human biological samples?	NO
• Did the project involve Human data collection?	YES
<b>RESEARCH ON HUMAN EMBRYO/FOETUS</b>	
• Did the project involve Human Embryos?	NO
• Did the project involve Human Foetal Tissue / Cells?	NO
• Did the project involve Human Embryonic Stem Cells (hESCs)?	NO
• Did the project on human Embryonic Stem Cells involve cells in culture?	NO
• Did the project on human Embryonic Stem Cells involve the derivation of cells from Embryos?	NO
<b>PRIVACY</b>	
• Did the project involve processing of genetic information or personal data (eg. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?	NO
• Did the project involve tracking the location or observation of people?	YES
<b>RESEARCH ON ANIMALS</b>	
• Did the project involve research on animals?	NO
• Were those animals transgenic small laboratory animals?	NO
• Were those animals transgenic farm animals?	NO
• Were those animals cloned farm animals?	NO
• Were those animals non-human primates?	NO
<b>RESEARCH INVOLVING DEVELOPING COUNTRIES</b>	
• Did the project involve the use of local resources (genetic, animal, plant etc)?	NO

<ul style="list-style-type: none"> <li>Was the project of benefit to local community (capacity building, access to healthcare, education etc)?</li> </ul>	NO
<b>DUAL USE</b>	
<ul style="list-style-type: none"> <li>Research having direct military use</li> </ul>	NO
<ul style="list-style-type: none"> <li>Research having the potential for terrorist abuse</li> </ul>	NO

**C Workforce Statistics**

**3. Workforce statistics for the project: Please indicate in the table below the number of people who worked on the project (on a headcount basis).**

Type of Position	Number of Women	Number of Men
Scientific Coordinator		1
Work package leaders	1	7
Experienced researchers (i.e. PhD holders)	3	13
PhD Students		2
Other		10

**4. How many additional researchers (in companies and universities) were recruited specifically for this project?** **6**

Of which, indicate the number of men: **5**

## D Gender Aspects

5. Did you carry out specific Gender Equality Actions under the project?

NO

6. Which of the following actions did you carry out and how effective were they?

	Not at all effective	Very effective
<input type="checkbox"/> Design and implement an equal opportunity policy	○ ○ X ○ ○	
<input type="checkbox"/> Set targets to achieve a gender balance in the workforce	○ X ○ ○ ○	
<input type="checkbox"/> Organise conferences and workshops on gender	X ○ ○ ○ ○	
<input type="checkbox"/> Actions to improve work-life balance	○ ○ X ○ ○	

○ Other:

7. Was there a gender dimension associated with the research content – i.e. wherever people were the focus of the research as, for example, consumers, users, patients or in trials, was the issue of gender considered and addressed?

○ Yes- please specify

X No

## E Synergies with Science Education

8. Did your project involve working with students and/or school pupils (e.g. open days, participation in science festivals and events, prizes/competitions or joint projects)?

X Yes- please specify

○ No

*SUNSET performed lectures on the Gothenburg University, Chalmers Technical College and the University of Twente to students.*  
*SUNSET performed a project presentation to 100+ school pupils (aged 11). Part of 'Dreams of a Low Carbon Future' Royal Academy of Engineering project, to produce a graphic novel illustrated by school children and narrated by DTC students.*  
*Artwork exhibited in the Cartoon Museum in London and the book released nationally.*

9. Did the project generate any science education material (e.g. kits, websites, explanatory booklets, DVDs)?

○ Yes- please specify

X No

## F Interdisciplinarity

10. Which disciplines (see list below) are involved in your project?

○ Main discipline: Engineering & Technology

○ Associated discipline: Social Science

○

Associated discipline: Transport Science

<b>G Engaging with Civil society and policy makers</b>			
<b>11a Did your project engage with societal actors beyond the research community?</b> <i>(if 'No', go to Question 14)</i>	<input checked="" type="radio"/>	<input type="radio"/>	Yes No
<b>11b If yes, did you engage with citizens (citizens' panels / juries) or organised civil society (NGOs, patients' groups etc.)?</b> <input type="radio"/> No <input checked="" type="radio"/> Yes- in determining what research should be performed <input checked="" type="radio"/> Yes - in implementing the research <input checked="" type="radio"/> Yes, in communicating /disseminating / using the results of the project			
<b>11c In doing so, did your project involve actors whose role is mainly to organise the dialogue with citizens and organised civil society (e.g. professional mediator; communication company, science museums)?</b>	<input checked="" type="radio"/>	<input type="radio"/>	Yes No
<b>12. Did you engage with government / public bodies or policy makers (including international organisations)</b>			
<input type="radio"/> No <input checked="" type="radio"/> Yes- in framing the research agenda <input checked="" type="radio"/> Yes - in implementing the research agenda <input checked="" type="radio"/> Yes, in communicating /disseminating / using the results of the project			
<b>13a Will the project generate outputs (expertise or scientific advice) which could be used by policy makers?</b>			
<input checked="" type="radio"/> Yes – as a <b>primary</b> objective (please indicate areas below- multiple answers possible) <input type="radio"/> Yes – as a <b>secondary</b> objective (please indicate areas below - multiple answer possible) <input type="radio"/> No			
<b>13b If Yes, in which fields?</b>			
<ul style="list-style-type: none"> <li>- Information Society</li> <li>- Regional Policy</li> <li>- Research and Innovation</li> <li>- Transport</li> </ul>			

<b>13c If Yes, at which level?</b>		
<input checked="" type="checkbox"/>	Local / regional levels	
<input checked="" type="checkbox"/>	National level	
<input type="checkbox"/>	European level	
<input checked="" type="checkbox"/>	International level	
<b>H Use and dissemination</b>		
<b>14. How many Articles were published/accepted for publication in peer-reviewed journals?</b>		<b>2</b>
<b>To how many of these is open access provided?</b>		<b>2</b>
<b>How many of these are published in open access journals?</b>		<b>2</b>
<b>How many of these are published in open repositories?</b>		<b>2</b>
<b>To how many of these is open access not provided?</b>		<b>0</b>
<b>Please check all applicable reasons for not providing open access:</b>		
<input type="checkbox"/> publisher's licensing agreement would not permit publishing in a repository <input type="checkbox"/> no suitable repository available <input type="checkbox"/> no suitable open access journal available <input type="checkbox"/> no funds available to publish in an open access journal <input type="checkbox"/> lack of time and resources <input type="checkbox"/> lack of information on open access <input type="checkbox"/> other: .....		
<b>15. How many new patent applications ('priority filings') have been made?</b> <i>("Technologically unique": multiple applications for the same invention in different jurisdictions should be counted as just one application of grant).</i>		<b>2</b>
<b>16. Indicate how many of the following Intellectual Property Rights were applied for (give number in each box).</b>	Trademark	
	Registered design	<b>2</b>
	Other	
<b>17. How many spin-off companies were created / are planned as a direct result of the project?</b>		<b>1</b>
<i>Indicate the approximate number of additional jobs in these companies:</i>		<b>4</b>
<b>18. Please indicate whether your project has a potential impact on employment, in comparison with the situation before your project:</b>		
<input checked="" type="checkbox"/> Increase in employment, or	<input checked="" type="checkbox"/> In small & medium-sized enterprises	
<input type="checkbox"/> Safeguard employment, or	<input checked="" type="checkbox"/> In large companies	
<input type="checkbox"/> Decrease in employment,	<input type="checkbox"/> None of the above / not relevant to the project	
<input type="checkbox"/> Difficult to estimate / not possible to quantify		
<b>19. For your project partnership please estimate the employment effect resulting directly from your participation in Full Time Equivalent (FTE = one person working fulltime for a year) jobs:</b>		<i>Indicate figure:</i> <b>5</b>
Difficult to estimate / not possible to quantify		<input type="checkbox"/>

## I Media and Communication to the general public

20. As part of the project, were any of the beneficiaries professionals in communication or media relations?

Yes

No

21. As part of the project, have any beneficiaries received professional media / communication training / advice to improve communication with the general public?

Yes

No

22 Which of the following have been used to communicate information about your project to the general public, or have resulted from your project?

Press Release

Coverage in specialist press

Media briefing

Coverage in general (non-specialist) press

TV coverage / report

Coverage in national press

Radio coverage / report

Coverage in international press

Brochures /posters / flyers

Website for the general public / internet

DVD /Film /Multimedia

Event targeting general public (festival, conference, exhibition, science café)

23 In which languages are the information products for the general public produced?

Language of the coordinator

English

Other language(s)