MyWay
EUROPEAN SMART MOBILITY RESOURCE MANAGER

MyWay: European Smart Mobility Resource Manager

D1.5 Methods of Influencing Mobility Behaviour - Final Version

EU Seventh Framework Programme
Grant Agreement No. 609023

Work Package	WP1
Deliverable Number	D1.5
Version	2.0
Status (F: final, D: draft)	F
Dissemination level	Public
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Project start date and duration	1 September 2013 - 29 February 2016
Submission date	31st March 2016
Resubmission date	22nd June 2016

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Version History

Version	Date	Main author(s)	Summary of changes
0.1	10/11/2015	Kate Pangbourne (UNIABDN)	Draft TOC
0.2	23/02/2016	Kate Pangbourne (UNIABDN)	Advanced draft for internal review
0.3	25/02/2015	Tom Schilling (VMZ) Daniel Becker (FOKUS)	Internal reviewers
0.4	29/02/2016	Kate Pangbourne (UNIABDN)	Modifications to formatting supplied by SOFTECO, responses to internal reviewers, and integration of supplementary material for section 3 by POLIS and SOFTECO.
0.5	04/03/2016	Judith Masthoff/Kate Pangbourne (UNIABDN)	Final edit
1.0	04/03/2016	Marco Garré (SOFTECO)	Final formatting check
2.0	20/06/2016	Kate Pangbourne (UNIABDN)/Judith Masthoff (UNIABDN)	Edits after 3rd Review

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EXECUTIVE SUMMARY

The goal of this document is to support the MyWay project by describing work done in Work Package 1 Mobility Behaviour to support the implementation of voluntary behaviour change (VBC) features in the Phase 2 trial of MyWay.

The report describes the final VBC user feedback algorithm implemented in Phase 2, along with some data about take up, and the stakeholder opinions about the VBC functionality.

The report also describes a set of experiments intended to support future development of VBC functionality in MyWay, presents the findings, and reveals a set of algorithms for future message personalisation based on segmentation. Some recommendations for future research for message selection are given, along with recommendations about how MyWay could investigate refinements to the personalisation offer by utilising the preferences and trip history to infer a user's attitudinal segment.

The preliminary experiments on VBC messaging by segment show a promising line of enquiry in terms of the likely success of personalising message delivery by user segment, for four segments initially: Devoted Drivers, Malcontented Motorists, Image Improvers and Active Aspirers. Initial message selection algorithms have been produced and are ready for testing, for example through a future development of MyWay.

Further experiments have been designed to explore different ways of framing messages and how that affects message acceptability for different segments. It is hoped that we will be able to take that forward to inform future academic research.

LIST OF ABBREVIATIONS

Abbreviation	Description
BC	Benefits of Cycling
BCP	Benefits of Car-pooling
BCS	Benefits of Car-sharing
BED	Benefits of Eco-driving
BEV	Benefits of Electric Vehicles
BPT	Benefits of Public Transport
BW	Benefits of Walking
D	Deliverable
DD	Drawbacks of Driving
DoW	Description of Work
MTurk	Mechanical Turk
SEQ	Subjective Evaluation Questionnaire
T	Task
VBC	Voluntary Behaviour Change
WP	Work Package

1. INTRODUCTION

This section gives a brief overview of MyWay and the purpose of the deliverable. This Deliverable forms part of the reporting for Work Package 1 Mobility Behaviour (WP1). The goal of this work package is to provide the overall design framework, grounded in user research, for the MyWay project, by elaborating target scenarios, defining core functionalities (T1.1), defining metrics for validating MyWay from the perspective of users and their behaviour (T1.2), and investigating how passenger behaviour can be influenced (T1.3). Citizens and other stakeholders have been involved in participatory processes to inform and elaborate usage scenarios and validate them using several methods. The purpose of each task in the Work Package is described below:

- Task 1.1 of WP1 elaborated usage scenarios, showing how the MyWay platform may be used by citizens. The main aim of the scenarios in the first year of the project was to inform the development of the first high-level definition of MyWay functionality and deriving specific low-level requirements for the implementation and system architecture in Work Package 2 Reference Design and Architecture (WP2). In period 2 the scenarios were refined into a subset for detailed evaluation of both functionality and usability using Scripted Journeys.

- Task 1.2 of WP1 was to define key performance indicators (KPIs) and guidelines for their validation, for user adoption and satisfaction, induced behaviour change and impact on mobility. The output of Task 1.2 is used by WP6 Evaluation Governance and Business (WP6).

- Task 1.3 of WP1 is to investigate methods for influencing mobility behaviour in the context of the MyWay App to inform the back and front-end development of MyWay.

Initial work for T1.1 was reported in D1.1 Scenarios [MyWay-D1.1], for T1.2 in D1.2 Definition of KPIs and guidelines for validation [MyWay-D1.2] and D1.4 Scenarios, KPIs and Guidelines for Validation – Final Version [MyWay-D1.4], which were fed through to WP6 Evaluation, Governance and Business Models (specifically D6.1 – MyWay Evaluation Methodology and Plan and D6.2 – Evaluation of the MyWay Integrated Systems [MyWay-D6.2]), and for T1.3 in D1.3 Methods of Influencing Behaviour Change – Initial Version [MyWay-D1.3]. This deliverable (D1.5) provides the final version of Methods of Influencing Behaviour Change. A user research activity from T1.1, the Scripted Journey Plan tests, was carried out in collaboration with WP5 Living Labs Execution. This was described in D5.2 Living Labs Execution Report – Initial Version [MyWay-D5.2] and D5.3 Living Labs Execution Report – Final Version [MyWay-D5.3] with the main results reported in D6.2 Evaluation of the MyWay Integrated Systems [MyWay-D6.2].

The MyWay app is being validated using the Living Lab methodology of testing in the field, in three phases of trial. The Pre-phase (Phase 0), Phase 1 and Phase 2 include new functionalities incrementally, and thus more sophisticated features are evaluated in Phase 2. Some elements of the user research were changed as a result of the experiences in Year 1 and Year 2, particularly in response to user feedback from Phase 0 and Phase 1. The voluntary behaviour change (VBC) features were introduced to users for the first time in Phase 2 (Year 3).

This deliverable reports the final experience with the VBC functionality that was implemented, and describes some experiments undertaken to better understand the interactions between user segment and mode preferences in relation to persuasive messages.

1.1 About MyWay

MyWay aims to place the traveller at the heart of mobility by developing an integrated platform (the European Smart Mobility Resource Manager) which will make it easier for travellers to get a complete, holistic overview of sustainable mobility options in their area. MyWay will automate the integration of information from many types of transport services, to create a seamless point-to-point mobility service. The journey itineraries that MyWay suggests will also make use of registered users' travel preferences, thus providing greater satisfaction to individual users, whilst also serving policy and social aims of reducing congestion and reducing the environmental impacts of transport.

1.2 Scope of the document

The main objective of this deliverable is to provide a final version of the implementation and learning about VBC in the context of MyWay. The document concludes with some recommendations for future work and for policy-makers.

1.3 Links to other Work Packages

1.3.1 Cross-WP Interactions

In periods 2 and 3, the work of WP1 has interacted with Living Labs work in WP4 (Livinbg Labs Set-up) and WP5 (Living Labs Execution), with WP6 (Evaluation, Governance and Business Models) and with WP7 (Awareness and Dissemination). The Stakeholder Interviews were designed as part of T1.1 in period 2, and undertaken in Period 3 within the Living Labs. They have been analysed as part of WP6 (Evaluation, Governance and Business Models) and reported in D6.2 Evaluation of the MyWay Integrated Systems [MyWay-D6.2], with the exception of the Phase 2 question about Voluntary Behaviour Change, which is analysed in this deliverable.

Furthermore, the Scripted Journey Plan methodology has been developed in collaboration with WP5, where it has been applied as validation tool during the project execution. Thereby, very specific user feedback in terms of functionality and usability was generated which helped to improve the platform as well as execution methodology. The methodology was reported in D5.2 Living Labs Execution Report – Initial Version [MyWay-D5.2], the execution in D5.3 Living Labs Execution Report – Final Version [MyWay-D5.3] and the analysis is reported in D6.2 Evaluation of the MyWay Integrated Systems [MyWay-D6.2].

1.3.2 WP1 contributions to deliverables

Work conducted through WP1 or designed as part of WP1 has been reported in the following deliverables, as well as the project newsletters produced by POLIS: [MyWay_D2.4, MyWay_D5.2, MyWay_D5.3, MyWay_D6.2, and MyWay_D6.5].

2. MYWAY IMPLEMENTED APPROACH

2.1 Introduction

In period 2, WP1 has worked in collaboration with other WPs to select a VBC focus for the Phase 2 trial. The selected focus was to integrate a feedback strategy for VBC through MyWay. The first steps were to develop requirements with WP2 [MyWay_D2.4]. The implemented approach was to include an optional item in User Preferences for behaviour change. Selecting this option enables journey tracking. This provides MyWay with the data to provide users with a statistics dashboard which visualises metrics on their daily/weekly travel.

As this is only a preliminary step in providing users with feedback that is effective in supporting them to change their behaviour, WP1 has continued to work to establish a message set that could be implemented as part of the dashboard. During Period 3, two experimental studies were completed, building on the groundwork established in Periods 1 and 2 [MyWay-D1.3]. These studies are described in Section 3 below. In line with the recommendations of Section 3.4.6, a draft plan for a third experiment has also been drawn up and is described in Annex 3.

2.2 Implemented VBC

2.2.1 Trip Plan Feedback

Users are able to give feedback through the MyWay App regarding the trip plan and other features (such as a traffic issue, see Figure 1) and feedback that help the developers to understand users' perceptions of how well their individual preferences are being met by MyWay.

Figure 2 shows a screenshot of the trip plan feedback tool. This appears when a user selects a journey plan from those offered.

The rest of the feedback capability is shown in Figure 4. These features all give feedback from users back to the MyWay developers. In contrast, the VBC feedback gives feedback to the users about their mobility behaviour. This is described in the next section.

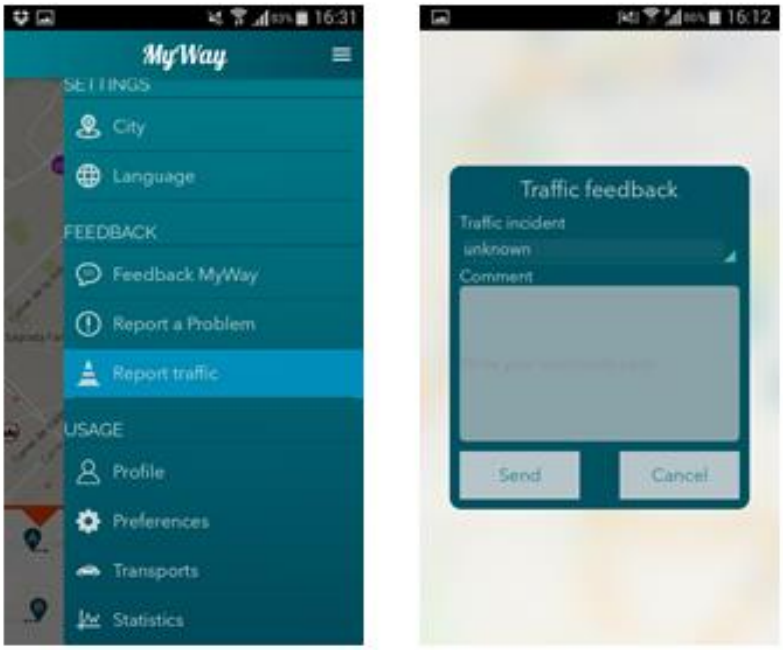

Figure 1. Report Traffic Screenshot

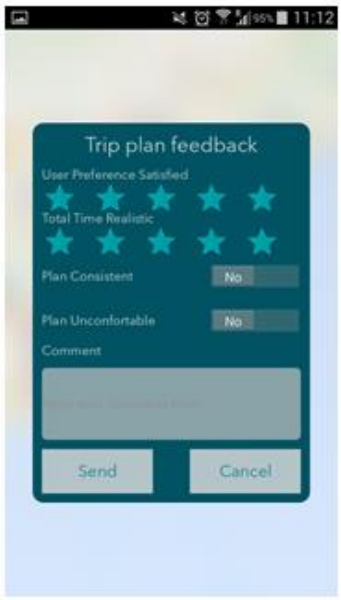

Figure 2. Trip Plan Feedback Screenshots

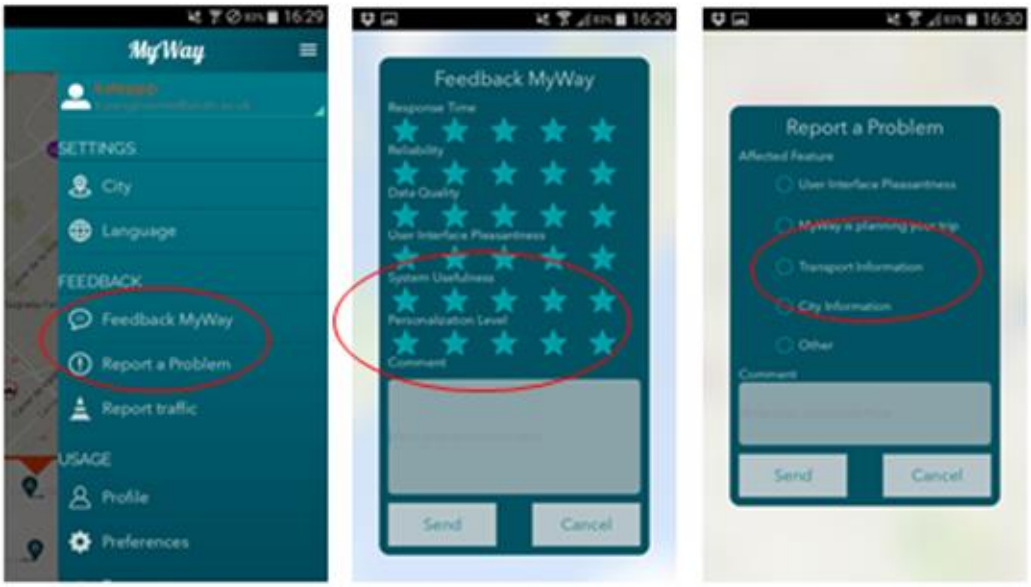

Figure 3. Screenshot of Tools for Users to give other feedback to MyWay Developers

2.2.2 Statistics Dashboard

2.2.2.1 Final Algorithm

From the three high-level algorithms identified in period 1 [MyWay-D1.3], it was agreed that 'Feedback to user on usage' was the most appropriate in relation to user-centric journey planning principles. Providing users with feedback is known to be important to encouraging self-reflection and supports motivated users to change behaviour. An important principle is that the usage feedback presents statistics on the metrics that are most salient to the object and the user. In this case we have initially implemented carbon emissions, calories and mode used. The final algorithm is shown in Figure 4 below. Dotted lines show a feature that remains part of the model but which has not been implemented in Phase 2.

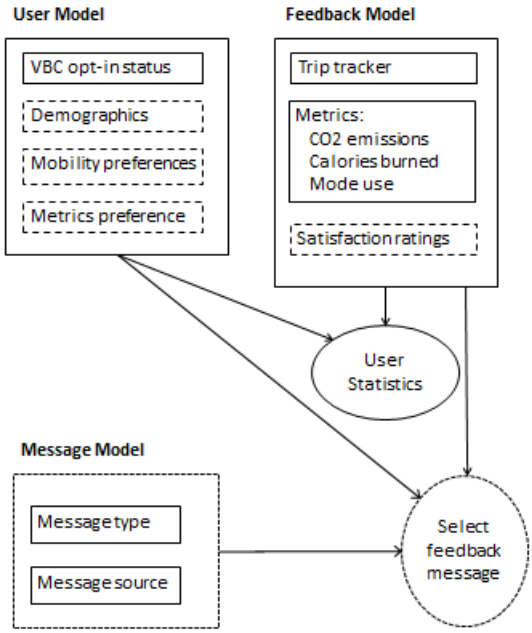

Figure 4. User Statistics Feedback Algorithm

Figure 5 below shows a screenshot of part of the user statistics dashboard (mode use in the last week) in the Android version. The user can scroll through the dashboard. This view shows the bottom of the mode split for the current day, with the distribution across Monday and Thursday below.

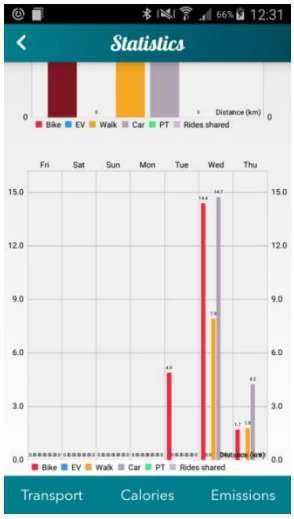

Figure 5. User statistics dashboard – screen-shots of Android version

2.3 Usage of VBC elements

2.3.1 Trip Plan Feedback

The relationship between Trip plan feedback and VBC is implicit, in that if users do not find the trip plans to be in accordance with their preferences, or if they are not trusted or uncomfortable, it is unlikely that MyWay would be able to influence VBC. Therefore, we analysis the trip plan feedback received through the App during Phase 2. Trip plan feedback was received from 149 users: 24 in Berlin, 123 in Catalonia and 2 in Trikala. The headline data for Catalonia was analysed in [MyWay-D5.3], but we have repeated the results here for comparison, calculating a mean rating across the values reported in [MyWay-D5.3].

The relevant figures are shown in Table 1 below. Very little information of value is derived from the results from Trikala, as there are only two users who gave Trip Plan Feedback through MyWay. The figure for Berlin is much better. The ratings in this analysis are based on a scale in which 0 is the worst rating and 5 is the highest rating. Therefore it is very good to have an average above 4 for both the satisfaction of user preferences and the realism of the trip duration shown in the plan. However, with a greater number of respondents in Catalonia, the results are closer to the mid-point of the scale.

However, the results for the Consistency of the Plan, which is a true/false question, are not so good for the Berlin users. Only 5 out of 24 in Berlin rated the plan received as consistent with their preferences (1 of the 2 respondents in Trikala rated it as Consistent). For the Plan Comfort, also a true/false question, only 3 out of 24 rated it as Uncomfortable, which is good. In Trikala it was again half and half (1 out of 2), and in Catalonia around one-third of participants declared the plan to be consistent, and a similar proportion declared the plan to be uncomfortable.

Overall, we have some doubt as to whether the plan_consistent question is understood in the same way by the respondents, and consider the user_preferences satisfied result to be more meaningful, in spite of the low respondent numbers.

Table 1. Data Analysis for Trip Plan Feedback: Berlin and Trikala

	user_preferences satisfied (mean of ratings)	total_time realistic (mean of ratings)	plan_consistent	plan_uncomfortable
Berlin	4.08	4.46	5	3
Catalonia	3.02	2.78	42	40
Trikala	2.50	2.50	1	1

2.3.2 Statistics Dashboard

2.3.2.1 User uptake

Unfortunately, the Phase 2 trial period included the Christmas holidays, a seasonal period in which travel patterns are often temporarily altered, and was too short to detect statistically significant data to verify any impact on mobility behaviour from VBC. However, 49% of authenticated users opted-in to VBC, and the evaluation data in [MyWay-D6.2] suggests that MyWay itself may have had some impact on mobility behaviour, suggesting that the VBC feature could be worth further evaluation.

We envisage that stronger VBC effects could be attained if the statistics information was accompanied with appropriate personalised messages to encourage use of different modes. For example, if a user has done a lot of car driving and has a high CO_2 emissions result, they could be given messages about the benefits of lower carbon transport along with the statistics. We imagined that this might be a useful future development so we undertook some experiments to investigate what messages might be useful for different user segments.

2.3.2.2 Relationship with User Behaviour

The users that opted in to VBC have been matched to the Travel Diaries and Subjective Evaluation Questionnaires (SEQs). The following results have been obtained.

A total of 15 of the 39 users who were opted-in to VBC completed either an initial travel diary or a final travel diary, though none did both. This limits the analysis that is possible. However, we can learn something about trip purposes, multi-modality and inter-modality, where multi-modality is the number of different modes reported by an individual user, and inter-modality is the number of different modes used in one trip as reported by an individual user. In relation to VBC, it is important to understand the revealed preferences of users in relation to their current use of modes, particularly in relation to encouraing inter-modal journeys to reduce overall distance travelled by cars (e.g. by travelling only part of the journey in a private or shared vehicle and then transferring to another mode - intermodality, or replacing car journeys with a wider variety of alternative modes suitable for different trip distances – multi-modality). Six journey types could be coded: Going to work, Shopping, Leisure/Sport, Escorting someone else, Returning home, Other reason (unspecified).

In the initial travel diaries of the VBC users, there are 6 inter-modal trips involving 3 modes. There are also 6 unimodal trips. The unimodal journeys are either walking, using the bus or using the tram.

In the final travel diaries of the VBC opted-in users, there are 12 inter-modal trips involving three modes, three inter-modal trips involving two modes, and seven single mode trips. The distribution of these reported trips by purpose is shown in Table 2 below.

Table 2. Travel Diary Results for Users Opted in to VBC - intermodality and trip purpose

	Initial		Final		
	Intermodal (3 modes)	Unimodal (1 mode)	Intermodal (3 modes)	Intermodal (2 modes)	Unimodal (1 mode)
Going to work	3	3	5	1	1
Shopping	1		0	0	2
Leisure			2	0	0
Escorting someone			1	0	0
Other reasons	2	1	1	1	3
Returning home		2	3	1	1

In relation to individual multi-modality, of the six VBC users who completed the initial travel diary, the mean number of different modes reported by users is 2.8. The mean number of trips reported in the previous day is 1.8 (the maximum was four). One user only reported the use of one mode on the previous day, two reported using two modes, and three reported using four modes. However, it should be noted that one of the users at least seems to have entered unreliable results, reporting a trip to go to work involving the following intermodal sequence ‘own motorbike’ ‘own bicycle’ ‘own motorbike’. Also, three users report only a trip to go TO work, with no other trip reported.

For the final travel diary, a total of nine VBC users report a mean modality of 3.2 and a mean number of trips of 2.4 (maximum was five). Two report using only two modes on the previous day, five report using three, one reports using four and one reports using six.

We also matched the VBC opt-in users to the SEQs. The following results have been obtained. Eleven VBC users completed a background questionnare, at least one SEQ and one Travel Diary. However, a qualitative analysis of the changes in reported use of different modes show that variation is very small, and attributable to normal causes, such as seasonality in use of cycling (for example).

Nevertheless, there was variation in the self-reported frequency of use of the different modes (Private own car, Private own motorcycle/moped, Private own bicycle, Shared bicycle, Public Bicycle, Public transportation, Flexible on demand transportation, Taxi, Walk). In the background questionnaire and the SEQs, the Walk option was specifically to note ‘whole trip’. In the travel diary, all the modes could be combined to describe inter-modal trips, with the Walk segment being over a certain duration (to distinguish between a short walk to the bus stop or parking garage, and a distinct Walk segment of an intermodal trip).

2.3.2.3 Implications

Whilst generally recognised as the most reliable, if imperfect, method of gathering data about individuals' actual travel habits, the travel diaries have been problematic in the My-Way project. Despite awarding points as part of the incentivisation to complete the evaluation activities, only a very small number of users completed the task, and none completely fulfilled it, preventing us from undertaking before and after comparisons. Also, some of the data that has been entered appears counter-intuitive. Therefore, we cannot draw strong conclusions from it.

Nevertheless, there is *some* indication that people are already making trips that include at least three modes, particularly in relation to the 'going to work' purpose. This suggests that asking people to make more use of inter-modal trips, particularly if it shortens the distance they travel by car, is not unreasonable. Thus, the VBC facility of MyWay could promote messages that suggest inter-modality, and we would recommend experiments that to validate messages that promote the benefits of inter-modality, to complement the experiments we report below regarding the benefits of single modes.

However, the wealth of research in this area also shows that a behavioural intervention directed at car users is unlikely to be sufficient. Hard evironmental restructuring (e.g. providing more parking facitilites to create Park & Ride interchanges) is also necessary.

2.3.2.4 Stakeholder Feedback

The requirement and process for Stakeholder Interviews were first outlined in D6.1 My-Way evaluation methodology and plan [MyWay-D6.1] as gathering feedback from stakeholders is an important part of the evaluation activity. Stakeholder feedback is also an element in T1.1 Scenarios, use cases and user research, as stakeholders are a special type of user. Therefore the detailed guidelines and instrument for undertaking the stake-holder interviews have been produced as part of collaboration between WP1 Mobiltiy Be-haviour and WP6 Evaluation, Governance and Business Models. The Phase 1 Stakeholder Interviews were reported in D1.4 Scenarios, KPIs and guidelines for validation – Final Version [MyWay-D1.4].

In Phase 2, the Stakeholder Interviews in Catalonia and Trikala included a question about their opinion regarding the newly introduced VBC functionality[1]. All the stakeholders (seven in total) liked this function as they could see how it would support objectives for increasing the sustainability of transport. The organisations and their type are shown in Table 3.

[1] This question was not asked in Berlin as it was deemed more important to add new additional stakeholders for breadth, rather than interview the original stakeholders for a second time. Therefore, the Phase 2 Berlin stakeholder interviewees would not have been able to answer the question properly, not having knowledge of the Phase 1 MyWay implementation.

Table 3. Stakeholder Interviews: Organisation and Type for Catalonia and Trikala

Organization name and description	Type
Catalonia	
SAGALÉS: Interurban private bus operator	2
AMB_CETRAMSA: Metropolitan Area of Barcelona	1
AMTU: Association of municipalities with urban transport	1
AVANCAR: Car sharing service	3
MUNICIPALITY of LLIÇÀ DE MUNT	4
DIBA: Barcelona Provincial Council	3
Trikala	
Environment Division, Municipality of Trikala	4
Urban Transportation Services	4
KTEL Trikalon SA	1

The organisation type is coded as follows: city/local government (coded 1); city/local transport authority (coded 2); providers of private transport services (coded 3) and providers of public transport services (coded 4). Allowance was made for stakeholders to include other types of organisation such as research organisations (coded 5) or commercial providers of transport information (coded 6).

The full data obtained from the VBC question in the Stakeholder Interviews is in Annex 1. Figure 6 shows selected positive comments about the VBC functionality. Speech bubbles outlined in red come from stakeholders in Catalonia. Those in green come from Trikala.

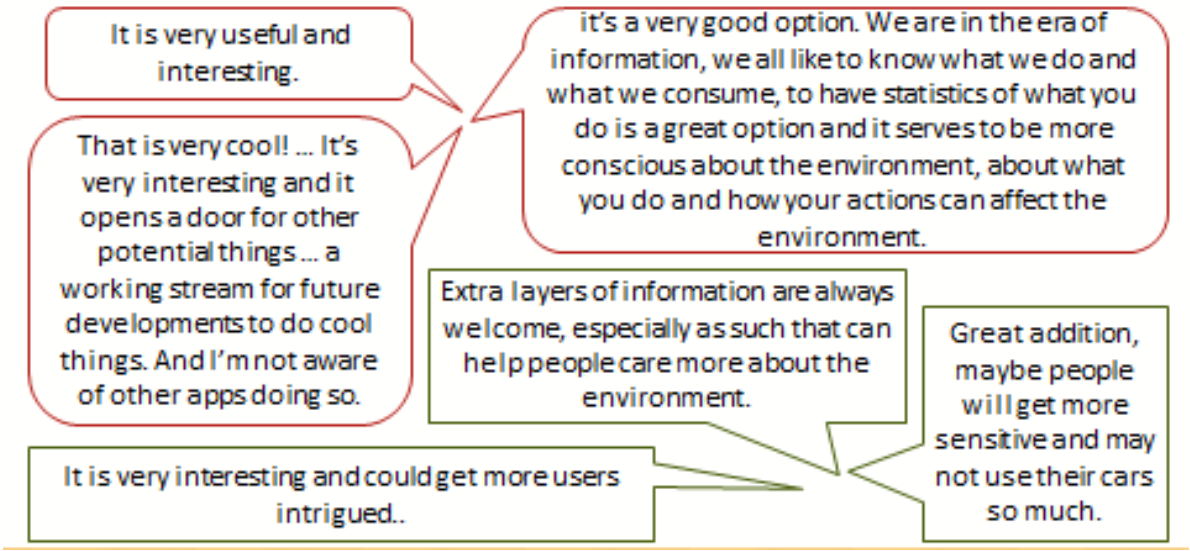

Figure 6. Stakeholder Opinion about VBC functionality in Catalonia (red) and Trikala (green)

3. KNOWLEDGE FOR FUTURE DEVELOPMENT

3.1 Introduction

As described in the previous chapter, the current prototype of MyWay has the facility for interested users to monitor their own travel behaviour through a user statistics dashboard, which records the CO_2 emissions, distance travelled and modes used by the user whilst Trip Following is activated. In this chapter, we report findings from exploratory user VBC research intended to support future developments of MyWay beyond the project period that will enable more personalisation of sustainable travel recommendations that can be coupled to the dashboard and to the journey planner (see Figure 4 Algorithm diagram above).

Our aim is to seek evidence that the concept of matching messages to segment is worthwhile, in order to support future MyWay development. Ultimately this functionality could underpin:

- User goal-setting
- Analytics (e.g. use demographics and preferences to benchmark against other similar users)
- Stakeholder travel policy campaign promotion (targeted VBC)

This is a development from previous Mturk studies which took the first steps towards understanding how to better deliver personalized persuasive messages to support intention formation having regard for situational contexts in the urban mobility domain [Pangbourne and Masthoff 2015]. In the original Mturk experiments conducted for the Superhub project [Forbes et al 2014], half of the message categories were focused on modes (benefits or drawbacks) and the remainder were focused on motivational techniques (i.e. suggesting that Change is Possible, encouraging reflection about sustainable behaviour, encouraging social comparison and advice about sustainable travel).

In this set of studies, we adopted a more parsimonious approach focused only on modal benefits and drawbacks. However, we needed motivational messages to address the wider range of transport modes that are available through MyWay, as well as two 'modes' that could support Car Contemplators and Devoted Drivers in particular to reduce their CO2 emissions (eco-driving and electric vehicles). Therefore, we have added the following message categories:

- Benefits of Car-sharing (BCS)
- Benefits of Car-pooling (BCP)
- Benefits of Eco-Driving (BED)
- Benefits of Electric Vehicles (BEV)

We selected candidate statements for these new categories from a range of websites promoting sustainable mobility. BCP reflects the US terminology for Lift-sharing (though it is also known as ride-sharing) and BCS reflects the US terminology for what is usually called a Car Club in the UK. We then had to repeat the Superhub validation study to ensure that the new message categories were valid.

We have conducted two experimental studies:

Study 1 creates a set of validated messages for each mode (Benefits of walking, cycling, public transport, car-pooling, car share programs, eco-driving, electric vehicles, drawbacks of driving). Study 2 matches validated messages to each travel attitude segment and develops algorithms for message selection for a subset of the segments.

Firstly, we provide a brief update of the literature review.

3.1.1 Summary of behaviour change literature

As reported in D1.2 [MyWay_D1.2] there is a vast amount of material on behavior and behavior change coming from a range of different fields (such as psychology, health, persuasive technology, and behavioral economics). Consequently a number of models of behavior and behavior change have been developed and it would be impossible to conduct a thorough review here. A good overview of many of these is contained in [Darnton 2008], upon which we have drawn, along with a number of other sources such as [Anable et al 2006, Meloni et al 2013, Parker et al 2007, Sanjust et al 2014]. Our work is based on the concept of dual-path models of decision-making, which acknowledge that conscious cognition is not always fully active in determining behavior. This alternative decision-making path utilises habit or cognitive shortcuts (also known as heuristics), and is perceived by many as a key barrier to achieving behavior change, as most models of change require that the behavior has to be brought into conscious focus in order to effect change. Triggering focus is the key to persuasion and often requires something to be known about the individual. Thus behavior change interventions are often personalized. These techniques have been effective in the healthcare domain, where a personalized approach has been feasible even before ICTs. For example, [Noar et al 2007] performed a meta-analysis and found that tailored health messages outperformed social comparison health messages. With ICT the effect might be magnified: tailoring in health intervention applications also boosts user adoption of the system [Wantland et al 2004. In MyWay, we draw primarily on Michie's meta-categorization of behavior change techniques [Michie et al 2011] and Fogg's model of persuasion using technology [Fogg 2002 and 2009]. Deliverable 1.2 contained a full literature review which covered this material [MyWay_D1.2].

3.1.2 Review of State of the Art in Travel Behaviour Change

This section carries brief summaries of a number of EU-funded projects that have addressed aspects of travel behaviour change in the last 5-10 years. The focus reflects the intractable and urgent problem that is created by negative externalities from transport.

Some have been funded under the Intelligent Energy Europe - STEER Programme. E.g. CARMA Cycle Awareness Raising and Marketing; SEGMENT: Market Segmentation for energy efficient transport.

The SUPERHUB project [Gabrielli et al 2014] aimed to achieve VBC by a combination of: i) prompting intention formation, ii) setting and reviewing specific goals; iii) providing monitoring, feedback, and rewards; iv) supporting (social) comparison; v) aiding decision-making.

The European project STARS (Sustainable Travel Accreditation and Recognition for Schools) had nine implementation partners pursuing a common goal: to increase the number of pupils cycling to and from school, who would previously have been escorted by car. The partners sought to embed cycling culture in schools through accreditation and peer-to-peer methods, delivering personalised travel advice, and promoting sustainable mobility among employees through gamification.

The PTP-Cycle project used Personalised Travel Planning (PTP) methods to promote a shift from private motor vehicle use towards cycling, walking and public transport in order to support cities in their pursuit of reduced congestion, cleaner air, healthier citizens and reduced CO2 levels.Five cities participated, supported by LEPT, Polis, Traject, URIS and Sustrans, to develop the first pan-European PTP delivery programme. PTP-Cycle takes a tried and tested methodology to changing behaviour and applies it to households, universities and workplaces.PTP is by nature a flexible approach, allowing the common methodology to be adapted to suit local needs, sites and demographics. The project has already produced a number of transferable resources including methodology guides, evaluation guidance and practical guides to implementing in residential areas, universities and workplaces.The project has produced a number of transferable resources including methodology guides, evaluation guidance, champions resource pack and training manual for project managers on how to how to give good travel advice and practical guidelines to implementing in residential areas, universities and workplaces.

The MOBI project aims to reduce overall levels of car-based commuting through a gamification approach. It builds on the successes of the From5to4 game from the Netherlands. The aim of the game is to encourage employees to travel to work more smartly (e.g. walking, cycling, public transport and car sharing) as well as having fun competing against their friends and colleagues at the same time. In return, the website gives employees bespoke information about how much energy they have saved, calories burned as well as the opportunity to win prizes. It's a simple formula: every week, 1 day smarter commuting. The aims of the European MOBI-project are:

- to inform employees about the benefits of using sustainable transport modes for their commute and business trips
- to encourage employees to use sustainable transport modes through the implementation of a smart mobility competition
- to encourage local authorities, public transport providers and organisations providing electric vehicles to champion the benefits of sustainable travel

- to make recommendations to policy makers about further actions to increase energy effiiciency in commuter travel.

We provide basic details of a number of other projects in a similar domain:

PRESTO (Promoting cycling for everyone as daily transport mode) aimed to improve energy efficiency, reduce CO2 emissions and air pollution by increasing the modal share of cycling. It also aimed at increasing traffic safety and at improving public health by promoting physical activity. The project worked around three thematic pillars: - Infrastructure Planning; Promotional "soft measures"; Promotion of pedelecs. https://ec.europa.eu/energy/intelligent/projects/en/projects/presto

ASTUTE aimed at overcoming the organisational barriers that prevent an increase in the use of walking and cycling in European urban centres. It used mobility management techniques such as Travel Awareness campaigns and Workplace Travel Plans. (http://www.astute-eu.org/)

TRACE is a Horizon 2020 project developing a set of ICT tools to track the movement of people (citizens) supporting thus their behaviour change and it will be tested in eight pilots around Europe.

The mission of the TRACE project is to assess the potential of movement tracking services to better plan and promote walking and cycling in cities, and develop tracking tools that will fuel the take up of walking and cycling measures.The project targets established measures to promote cycling and walking to the workplace, to school, for shopping purposes or simply for leisure.

Traffic Snake Game Network (TSG Network) establishes an effective EU-wide and long-term support network to replicate, transfer and expand the uptake of the Traffic Snake Game as a successful proven tool for changing the travel behaviour of primary school children (age 6-12) and their parents. http://www.trafficsnakegame.eu/

BAMBINI aims to change the current mobility behaviour of the population that favours car use. It will achieve this by targeting children (age 0-6) and their parents. BAMBINI will address key actors from the baby & child merchandise industry, child care facilities, educational bodies and municipalities, to work together in bringing about a shift from the present socialisation of babies & children towards more sustainable mobility. http://www.mobile-bambini.eu/

ACTIVE ACCESS aims at increasing the use of cycling, and especially walking short everyday trips in local areas, in order to benefit people's health, and health of the local economy. It aims at transferring longer car trips to shorter walking & cycling trips by changing people's mental maps of their local neighbourhoods. http://www.active-access.eu/

BIKE2WORK -The main objective of Bike2Work is to achieve a significant energy-efficient modal shift from motorized modes to cycling by introducing behaviour change programs to employers that sustainably change the behaviour of commuters. http://www.bike2work-project.eu/en/

CARMA seeks to develop new methods for the marketing of cycling that lead to increased levels of cycling. Instead of mass communication, the project will focus on selected target

groups. It will link communication activities to the implementation of cycling infrastructure to promote cycling. http://www.cyclingcarma.com/

The SWITCH-approach uses personalized travel planning approaches to encourage people to switch car trips to active modes. The innovation comes from (I) the combination of tried and tested personalized travel planning approaches, (ii) their application to target groups of persons in life changing moments on large scale, (iii) the application of ICT solutions like Smartphone applications and Intelligent Health's Beat the Street system, (iv) and the use of arguments from public health to motivate behaviour change. The SWITCH Campaign Guide and Toolbox is a resource made for transport planners, practitioners working in travel behavioural change, and sustainable mobility advocates on how to design and develop a tailored SWITCH campaign. http://www.switchtravel.eu/

EMPOWER sets out to substantially reduce the use of conventionally fuelled vehicles (CFV). Adopting a 'reward rather than punishment' approach, EMPOWER will explore the use of positive incentives delivered through smart phone technologies and the web to persuade people to make modest shifts in their transport choices. The project combines empirical research with practical implementation in four Living Lab Cities and seven Take-Up Cities and Communities. http://empowerproject.eu/

B-TRACK-B - "Bike the track/ track the bike" promotes the use of bicycles by families with children aged 9-15 for their leisure (urban) trips in 7 European cities. The action intends to engage indicatively 100 families per site in an innovative track-the-bike "lottery" to motivate them to shift from car to bike use. Two competition-based marketing campaigns are planned and monitoring will be done through tracking systems (RIFD, GPS or simply through km counter and stamp cards). Local leisure trips generators (e.g. sport facilities, parks, shopping centres, etc.) will be involved. www.btrackb.eu/

There have been a few other previous EU funded projects that may have synergies with achieved voluntary behaviour change, or which have provided earlier advances that have contributed to the field in the past, such as: STREETLIFE (aiming to reduce carbon emissions through a sustainable mobility concept for cities based on ICT (FP7-ICT); Peacox - Persuasive Advisor for CO2-reducing cross-modal Trip Planning (Peacox) (aiming to provide personalised information to help people reduce ecological impact from travel (FP7-ICT): USEMOBILITY - Understanding Social behaviour for Eco-friendly multimodal mobility (FP7-TRANSPORT); i-TOUR: intelligent Transport system for Optimized URban trips (which aimed to develop an open framework for anyone to provide smart multimodal mobility services, ended 2013) and CATCH - Carbon Aware Travel Choices in the climate-friendly world of tomorrow, a knowledge platform for public information on emissions from transport (FP7-Transport, ended 2012).

3.2 Uses for targeted messaging in MyWay

The MyWay project used segmentation as part of the user requirement gathering process, through a combination of personas and scenarios (i.e. each scenario has specific characters associated with it). As described in Deliverable 1.1 [MyWay_D1.1], the MyWay usage scenarios were validated in Focus Groups held in each Living Lab: Catalonia-Barcelona (Spain), Berlin (Germany) and Trikala (Greece). The purpose of the focus groups was to

elicit reactions to scenarios illustrating how MyWay can be used by citizens (showcasing the contexts and functions where the developers believe it will enhance journey planning and influence travel behavior). In this way we are able to validate the concept of MyWay, and the user feedback about their requirements helped to prioritise the achievable functionalities in relation to VBC in addition to other features of the MyWay App. Segmenting the focus group participants enabled us to understand the participants' perspectives in more depth. Based on segmentation, uses could include improved personalisation of VBC messages (e.g. encouraging use of wider range of modes, introducing benefits of newly available modes, such as the electric scooters), targeting MyWay users with specific messages that are linked to stakeholder travel behaviour change campaigns, or other transport/city policy information.

The starting point for defining MyWay's VBC strategy is the attitude segmentation carried out for the focus groups, considered alongside the overall project objectives. Whilst the MyWay project has overall targets to reduce congestion and achieve mode shift, the need to personalise journey plans by user preferences limits the ability to introduce persuasive behavior change techniques into the technology, which is in contrast to the aims of most of the projects described above, because this type of personalisation reinforces existing user preferences, though it does have the advantage of making the Application more appealing to a wider user base. However, by using our analysis of the focus group results and segmentation of participants, we have inferred which segments within the MyWay target user groups could be receptive to behavior change functionality in a journey planner.

For example, emissions tracking functionality is present in some scenarios, but the results were inconclusive in terms of its salience to participants. As a clear commitment to environmental issues is present for only two segments (Active Aspirers and Car-free Choosers) this is not surprising given the profiles of the focus groups. In Barcelona only 17 out of a total of 55 participants fall into these two categories, one out of 11 in Berlin and 22 out of 73 in Trikala. However, knowing that some segments were present in our focus groups and might be more receptive to messages or functions that encourage sustainable travel has enabled us to identify a hybrid strategy to support VBC in a manner that is compatible with the personalisation objective (which is likely to appeal to Practical Travelers, for example), and we decided to retain emissions tracking functionality as a user requirement.

Of the nine intervention strategies identified by Michie, three are clearly present in the version of MyWay deployed for the final trial: Education, Persuasion, and Environmental Restructuring. Incentivisation through a points system has been included in the trial only for users registering to be part of the evaluation activities. A key role for MyWay in achieving VBC is to educate users about the full range of transport options meeting their preferences and available for any particular journey (lack of service awareness is a common problem, found also in our focus groups). As an information provider, this is already done in MyWay. Persuasion can take the form of sending users personalised messages about making certain changes to their trip-making, as was done for Superhub. MyWay is also an 'environmental restructuring', as it alters the decision-making context for users.

However, a choice had to be made regarding initial functionality for achieving VBC through persuasion. To include more persuasion in the VBC capability of MyWay we made it an explicit 'opt-in' feature. Such a feature was not included in any of the first round scenarios. However, support for this functionality did emerge in the focus group results. For example,

in one of the Trikala scenarios (S12), the focus group participants spontaneously suggested that MyWay ought to provide Sophia with recommendations that support active travel or public transport modes to help her meet her appointment schedule as well as providing a parking locator/booking service.

Building on this user-generated suggestion, and given the relevance of the segments present in the Trikala focus groups that made the suggestion we identified an opportunity to include behavior change opt-in features, focused initially on Image Improvers, Active Aspirers and Car-free Choosers by providing the facility to prefer environmentally-friendly or more active trips (according to whether they are more motivated by environmental or personal health considerations), with a user statistics dashboard for monitoring progress of their own behavior, as feedback has been found to be useful in changing habits. For example, a Japanese study of a PTP that used feedback found evidence of a sustained mode switch of 4% [Taniguchi et al 2003]. Therefore, in MyWay, users opting in to VBC and allowing trip following (which enables MyWay to store details of trips taken from which to calculated the metrics) can view their burned calories, CO2 emissions and distances travelled by different modes.

This feedback to the user that is intended to provide an additional level of service to users self-selecting for VBC can in future be supported by more overt persuasion, through including tailored messages for example. For example, a user might want to track their burned calories through MyWay. This will implicitly suggest that a user is motivated by a healthy, fitness-oriented outlook. Therefore, MyWay could suggest a more active journey for the user's regular trips when giving the weekly feedback on calories burned. Table 4 below sets out standard metrics, hypotheses about which segments will be interested in these metrics, and how feedback messages might be constructed to make best use of the metric for each segment. These hypotheses regarding interested segments were used within the project to develop and prioritise the VBC approach.

Table 4. Metrics for user statistics feedback

Metric	Hypothesis about which segment(s) likely to be most interested	Possible message type with feedback
CO2 emissions	Car-free chooser	Focus on Drawbacks of Driving
Calories burnt	Active aspirer	Encouragement, focus on Benefits of Cycling and Benefits of Walking
Mode choices (by comparing distances by each mode)	Car contemplator	Encouragement, focus on Benefits of Public Transport and Drawbacks of Driving

3.2.1 Establishing message effectiveness

We report results from a set of online experiments to categorise and validate sets of messages for VBC as a knowledge acquisition exercise for MyWay. Our aim is to provide targeted VBC messaging that is personalised according to the travel profile of the user. We have collected examples of real-life travel behaviour change messaging. Our analysis of this corpus highlights that much of the content conflates different aspects of benefits and drawbacks, creating 'mixed messages' and hampering evaluation. Our premise is that messages that are incorrectly framed with respect to the recipient, either in terms of the mode information or content framing, are likely to be counter-productive in encouraging adoption of more sustainable travel behaviours [Waygood and Avineri 2001]. In the study reported here, we advance a message validation technique developed for the EU Superhub project [Forbes et al 2014] in order to assess whether the travel-related segment of the participant is correlated with their receptivity to messages explaining the drawbacks/benefits of different modes. This includes investigating the impact of message framing, such as whether the message is presented as a personal or collective gain or loss. We have used examples from the real-life corpus that we gathered, keeping the facts, but manipulating the framing. The work has two steps. Step one uses crowd-sourcing to validate that the messages fall into the expected mode-related categories (e.g. Benefits of Car-pooling (sharing lifts) or Benefits of Car-sharing (using car clubs)). Step Two segments the participants and asks which messages are effective for them. Step Two itself has two parts, finding out which messages are effective for which segments, and also researching whether manipulating the framing of the messages influences the perceived effectiveness in any systematic ways. We use the findings to identify short messages that could be used within MyWay in the future, if it is decided to include personalised messages to user, either to deliver stakeholder messages or as a basic service to support VBC developments.

3.2.2 Methodology

We recruited participants via Mechanical Turk (Mturk) to complete surveys held on a server accessible only by the University of Aberdeen. Research has shown that the Mturk platform is more demographically diverse and at least as reliable as other convenience or internet-based samples and that it is a good tool for rapid and cost-effective research tasks [Buhrmester et al 2011]. The US-based nature of our participants can be seen as a disadvantage as the participants have a different socio-economic and cultural background to Europeans[2]. This means that the findings may not be fully transferable. However, the MT tool is well-established, and we only selected participants with an Mturk acceptance rate of 90% (meaning that 90% of the work they do is accepted by other requesters as good quality) and used a Cloze Test for English fluency due to the language based nature of the study. Potential participants who failed the test were excluded. These were the main tests applied to ensure that participants' answers were reliable.

[2] The US is actually very similar to the UK on Hofstede's five cultural dimensions except for the dimension of "long term orientation". There is a lot of variation amongst the European countries on Hofstede's cultural dimensions, so any study involving participants from one European country would also not have been fully transferable to other European countries.

At the time the experiments were undertaken Amazon's Mturk had more users than the European tools, across a broader socio-economic range. Our review of available European tools for crowd-sourcing research participants suggests that they are not representative of all socio-economic groupings, with students and younger people over-represented, and unevenly distributed across European nations. The details of each study are given in the following sub-sections. Whilst we used MTurk for recruitment and payment of participants, the study was fully run on a server in the University of Aberdeen, and all data stored in a secure location. Only anonymous data was obtained.

3.2.3 Study One

In Study One, 31 participants were paid $1 for completing the task (52% male; 23% 16-25, 61% 26-40, 16% 41-65). We consider that the rate of reward was suitable as the he average time take to complete Study 1 was around 10 minutes, meaning that Mturk workers could achieve an hourly rate of at least $6. The participants were presented with a series of messages, one at a time and asked "Click on the category below that you think the message belongs to". In the event that they felt it could belong to more than one category, they were instructed to choose the category that was the best match. There were 9 clickable buttons, which were labelled with both the category name and description. An example screenshot is shown in Figure 7

In each category, the five best messages were selected to go forward to Study 2 (that is, those that achieved a Kappa rating of >0.4) [Randolph 2005].

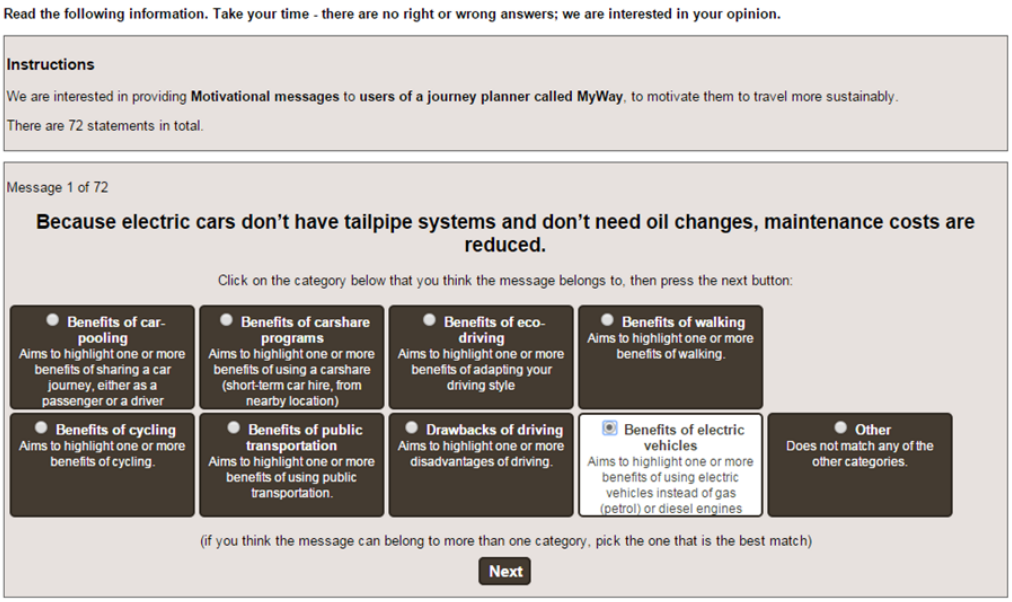

Figure 7. Study One Example Question Screenshot

Table 5. Overview of validated messages (total number of messages validating at each level of agreement is shown in the columns)

Message category	Complete agree-ment Kappa = 1	High agree-ment Kappa = 0.7-0.99	Moderate agree-ment Kappa = 0.40-0.69	Low agree-ment Kappa = 0.01-0.44
Benefits of cycling	3	7		
Benefits of walking	5	3	2	
Benefits of public transport	5	4		
Benefits of electric vehicles	7	2		
Benefits of car-sharing/car clubs	1	7		
Benefits of car-pooling/lift-share	3	3	3	
Benefits of eco-driving	1	7		
Drawbacks of driving		3	3	
Other				

3.2.4 Study Two

In Study 2, 102 participants were paid $1.50 for completing the study (49% male; 12% 16-25, 55% 26-40 31% 41-65, 2% > 65). This study is slightly more complicated that Study 1, hence the 50% higher rate of reward. The average time taken to complete Study 2 was around 13 minutes, 30% greater than Study 1.

The participants were first asked to rank each of the 48 selected messages from Study 1 on a scale of 1 to 9 (1 is worst, 9 is best) for three criteria: whether the message was 1) appropriate, 2) convincing and 3) motivational for them. Participants were advised that there were no right or wrong answers and that it was their opinion that counted. The order in which the participants saw the messages was randomised.

In Study 2, participants were asked to completed a travel attitude questionnaire (using the 18 Golden Questions from the SEGMENT project (see below) and were then asked to rank messages on a scale of 1 to 9 (1 is worst, 9 is best) for three criteria: appropriate, convincing and motivational.

We chose to use the travel attitude segment categories developed by Anable and colleagues [Anable 2005, Anable 2013, Anable and Wright 2013]. Normally Anable's method of segmentation by travel attitude involves asking respondents # questions. A simplified

survey instrument consisting of 18 questions (the 'Golden Questions') was produced by the SEGMENT project that makes it a bit easier to calculate a person's travel attitude segment, with a confidence level of around 80% [Anable and Wright 2013]. The method places an individual into one of eight segments. Five of the segments relate to car owners, and three to non-car owners (see Table 5 below from [Anable and Wright 2013]).

Table 6. Segments derived from the Golden Questions [Anable and Wright 2013]

Has driven a car within the last year	Has not driven a car within the last year
Devoted Driver	Car Contemplator
Image Improver	Public Transport Dependent
Malcontented Motorist	Car-free Chooser
Active Aspirer	
Practical Traveller	

3.2.5 Findings

Study 1: The complete list of tested statements is shown in Annex 2, with the validation results. For a statement to go through to Study 2, it had to achieve at least κ 0.4 (moderate agreement). Table 6 shows the frequencies of $\kappa > 0.4$ across the messages by category. From this it can be seen that it was relatively easy to select at least six statements meeting this criterion from every category, though the achieved κ values for DD were much lower than for all other categories. For categories which validated very well, we chose the top six highly rated ones unless they were too similar to one another, in which case we selected statements with slightly lower κ values that added more variety to the message set.

Table 7. Levels of inter-rater agreement (k>0.4) for eight categories of message

Message Category	Number of Validated Messages	Breakdown by K value
Benefits of Cycling (BC)	9	3 (κ= 1); 5 (κ= 0.93); 2 (κ= 0.86)
Benefits of Carpooling (BCP)	8	3 (κ= 1); 2 (κ= 0.93); 1 (κ= 0.86); 1 (κ= 0.44) and 1 (κ= 0.43)
Benefits of Car-sharing (BCS)	8	1 (κ= 1); 7 (κ= 0.93)
Benefits of Eco-driving (BED)	9	1 (κ= 1); 3 (κ= 0.93); 1 (κ= 0.86); 3 (κ= 0.85); 1 (κ= 0.56)
Benefits of Electric Vehicles (BEV)	9	7 (κ= 1); 1 (κ= 0.85); 1 (κ= 0.73)
Benefits of Public Transport (BPT)	9	5 (κ= 1); 2 (κ= 0.93); 1 (κ= 0.86); 1 (κ= 0.79)
Benefits of Walking (BW)	10	5 (κ= 1); 1 (κ= 0.93); 1 (κ= 0.86); 1 (κ= 0.85); 1 (κ= 0.66); 1 (κ= 0.51)
Drawbacks of Driving (DD)	6	1 (κ= 0.85); 2 (κ= 0.79); 1 (κ= 0.44); 2 (κ= 0.41)

There were only three statements that failed to validate for one of the eight modal categories: “People starting their day with a ride to work or school become more alert, confident and better able to process information and handle tasks”; “One vehicle travelling with 4000 rpm produces the same amount of noise as 32 vehicles travelling at the same speed with only 2000 rpm” and “If you have to travel by car, sharing lifts can be an easy way to halve your fuel costs”. We believe that this might be because the terminology was either too complex or used terms that are ambiguous (e.g.ride not being understood to be a cycle ride rather than a car ride). Otherwise, we had taken great care to ensure that the use of English was consistent throughout, bearing in mind that the messages that were tested are drawn from real life examples of transport behaviour change campaigns.

Study 2: The results of the segmentation of participants are shown in Figure 8

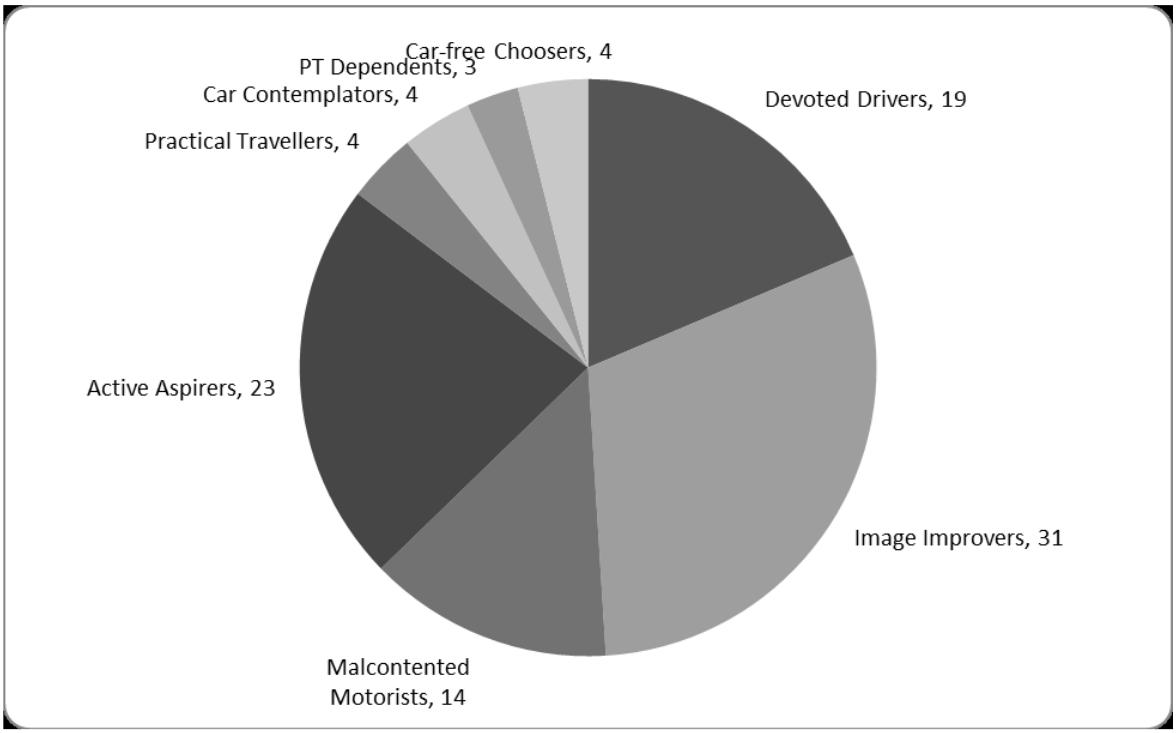

Figure 8. Segmentation results of participants in Study 2

From this it can be seen that Image Improvers are the single largest group, followed by Active Aspirers, Devoted Drivers and Malcontented Motorists. The remaining groups are very small, and will therefore be excluded from the statistical analysis. However, given that our sample is US-based, which is well known as a car-dominated culture [Sperling and Gordon 2009], we are not entirely surprised by this result. In relation to the transferability to a European context, we think that it is particularly important to understand the effectiveness of messages that are aimed at car drivers, as these are the groups that MOST need to be persuaded to increase their use of more sustainable modes. Therefore, if the messages are effective in the US context, they are likely to be effective for the same segments in a European context, particularly as viable sustainable alternatives are generally more developed and widespread than in the US.

On this occasion we did not attempt to stratify the sample by car/non-car use, nor did we ask for any data by the modes of transport potentially available to the participants or for their geographic location, so we cannot do any further analysis on this. However, more information about the participants' context would be useful. For example, some of our participants used the comment boxes to mention these contextual factors. One referred to having a disability that prevented walking and cycling, whilst another said:

> *"Many of these forms of transportation (public transport, for example) are not available where I live."*

Moving on to the effectiveness ratings for the 48 messages, Cronbach's alpha for the three criteria was 0.900. We tested for improvement by deleting any single category. Whilst removing the criterion 'Appropriate' would have achieved a small improvement to 0.915, 0.9

indicates that the three criteria have high internal reliability, therefore we have calculated an overall rating for each participant for each message, by taking the average of the participant's ratings on the three criteria. We have used these means for the subsequent analysis. Table 8 shows the mean overall rating per message category per scenario. It is particularly notable that the Car Contemplator segment has achieved an overall mean lower than the midpoint of the scale across all categories.

Table 8. Mean Overall Rating and Standard Deviation for Message Categories by Segment

	Message Category								
Segment Name	**BCP**	**BC**	**BW**	**BCS**	**DD**	**BED**	**BEV**	**BPT**	**Overall**
Active Aspirer (N = 23)	**6.7** (1.7)	**7.5** (1.1)	**7.6** (1.3)	**6.7** (1.4)	**6.7** (1.4)	**6.8** (1.6)	**7.2** (1.3)	**6.6** (1.5)	**6.9** (1.1)
Car Contemplator (N= 4)	4.9 (1.0)	4.6 (0.3)	5.1 (0.3)	4.5 (1.5)	4.8 (0.7)	4.0 (1.5)	4.7 (1.1)	4.2 (1.8)	4.6 (1.0)
Car Free Chooser (N = 4)	**6.7** (1.0)	**7.9** (1.0)	**7.3** (1.2)	**6.3** (1.0)	**6.7** (0.3)	**6.2** (1.3)	**5.9** (1.2)	**6.3** (1.0)	**6.7** (0.3)
Devoted Driver (N = 19)	**6.1** (1.3)	4.9 (1.0)	**6.6** (1.5)	**5.7** (1.5)	**6.1** (1.6)	**6.5** (1.4)	**6.2** (1.4)	5.2 (1.6)	**5.9** (1.2)
Image Improver (N = 31)	**5.8** (1.7)	**6.1** (1.4)	**6.9** (1.3)	**5.6** (1.7)	**6.0** (1.5)	**6.5** (1.5)	**6.4** (1.3)	5.4 (1.8)	**6.1** (1.3)
Malcontented Motorist (N = 14)	**5.7** (1.5)	5.2 (1.0)	**6.7** (1.1)	**5.8** (1.2)	**6.0** (1.5)	**5.9** (1.5)	**5.7** (1.4)	5.1 (1.5)	**5.7** (1.0)
Practical Traveller (N = 4)	5.4 (0.6)	**6.8** (1.5)	**7.7** (0.6)	5.0 (2.1)	**6.1** (0.8)	**5.5** (0.7)	**6.0** (0.9)	**5.6** (2.2)	**6.0** (0.8)
PT Dependent (N = 3)	**7.2** (0.6)	4.6 (2.8)	**6.3** (2.9)	**6.3** (0.9)	**5.8** (0.6)	**5.6** (1.1)	**7.7** (0.6)	**6.3** (1.1)	**6.2** (0.8)
Total (N = 102)	**6.1** (1.5)	**6.1** (1.7)	**6.9** (1.4)	**5.9** (1.5)	**6.1** (1.4)	**6.3** (1.5)	**6.4** (1.4)	**5.6** (1.7)	**6.2** (1.2)

A 4x8 2-way ANOVA[3] was performed for segment and message category on overall rating. There was a statistically significant main effect of segment ($F(7,4832) = 48.6$, $p<0.001$) on overall rating. We are not surprised by this finding, as the theory would suggest that some segments are inherently less easy to motivate to travel sustainably than other segments (e.g. Devoted Drivers versus Car Free Choosers).

There was also a statistically significant main effect of message category ($F(7,4832) = 9.6$, $p<0.001$). This suggests that some categories are more effective than others overall. A post-hoc (Bonferroni-corrected) comparison of overall category effectiveness, showed that message categories significantly differed pairwise ($p<0.05$). For example, Benefits of Walking does better than all other categories ($p<0.001$), whereas Benefits of Public Transport does worse than all other categories (including Drawbacks of Driving) ($p<0.008$). The lesser appeal of Benefits of Public Transport messages is in line with [Forbes et al 2014], and there was one participant comment that referred to perceptions of the undesirability of sharing space with strangers on public transport. Benefits of Eco-driving (one of the newly validated message categories), only does better than Benefits of Car-sharing ($p<0.003$).

[3] The analysis only included the four segments for which we had sufficient participants namely Active Aspirers, Malcontented Motorists, Devoted Drivers and Image Improvers

Table 9. Effectiveness results for selected segments

Segment	Results
Active Aspirers	**Benefits of Cycling** performs better than Benefits of Car-Pooling (p<0.02), Benefits of Car-sharing (p<0.04) and Drawbacks of Driving (p<0.01). **Benefits of Walking** is better than Benefits of Car-Pooling (p<0.01), Benefits of Car-sharing (p<0.01), Drawbacks of Driving (p<0.01) and Benefits of Eco-driving (p<0.02. **Benefits of Electric Vehicles** performs better than Drawbacks of Driving (p<0.01).
Devoted Drivers	**Benefits of Walking** is better than Benefits of Cycling (p<0.01) and Benefits of Car-sharing (p<0.02). **Benefits of Car-pooling** performs better than Benefits of Cycling (p<0.01). **Drawbacks of Driving** performs better than Benefits of Cycling (p<0.01). **Benefits of Eco-driving** is better than Benefits of Cycling (p<0.01). **Benefits of Electric Vehicles** performs better than Benefits of Cycling (p<0.01).
Image Improvers	**Benefits of Walking** is better than Benefits of Cycling (p<0.02), Benefits of Car-pooling (p<0.01), Benefits of Car-sharing (p<0.01) and Drawbacks of Driving (p<0.01). **Benefits of Eco-driving** performs better than Benefits of Car-sharing (p<0.01). **Benefits of Electric Vehicles** is better than Benefits of Car-sharing (p<0.01).
Malcontented Motorists	**Benefits of Walking** performs better than Benefits of Cycling (p<0.01), Benefits of Car-pooling (p<0.02), Benefits of Car-sharing (p<0.04) and Benefits of Electric Vehicles (p<0.02).

Finally, there was a statistically significant interaction between the effects of segment and category on overall rating ($F(49,4832)=3.2$, $p<0.001$). This indicates that the effectiveness performance of the message categories is dependent on the segment. In turn this suggests that for some of the message categories, we did not have enough participants in certain segments to obtain significant results in the pair-wise comparison (for example, the pair-wise comparison for Benefits of Car-pooling was only significant against Benefits of Walking (where it was less effective, $p<0.001$) and Benefits of Public Transport (where it was more effective, $p<0.006$).

For selected segment cases (Active Aspirers, Image Improvers, Devoted Drivers and Malcontented Motorists) we had sufficient participants to undertake an ANOVA for each selected segment, with a post-hoc (Bonferroni-corrected) comparison between message categories. For each segment there was a significant effect of message category ($p<0.001$), indicating that some message categories perform better than others for certain segments. We use the pair-wise comparisons to select promising message category candidates for the four selected segments, as show in Table 8.

In addition to the candidate message categories shown in Table 8, our recommendations for our message selection algorithm below are also based on the trend indicated by the means per category per segment. We have added a trip distance function by drawing on knowledge of the mode suitability for different trip lengths and typical urban transport issues such as congestion (e.g. the use of EVs does not address congestion), and the need to continue to try and promote public transport for the public good.

Overall, for Active Aspirers we recommend Benefits of Cycling (BC) and Benefits of Car-Sharing (BCS) messages for mid-length journeys, and Benefits of Walking (BW) and BC messages for short journeys. This segment appears the most receptive to BC messages, something that is in line with the segment description as developed by [Anable and Wright 2013]. This group might also be one that is more receptive to Benefits of Public Transport (BPT) messages and we suggest promoting public transport for longer journeys for this group, combined with a Drawbacks of Driving (DD) message.

For Devoted Drivers, we consider that policy makers should promote BW messages for short journeys (e.g. shorter than 3 km), and suggest DD accompanied with BCS, BCP, Benefits of Eco-Driving (BED) and Benefits of Electric Vehicles (BEV) for longer journeys. Unfortunately BC messages do not appear to resonate with this group (the mean for this category was also low for the small number of Car Contemplators in our sample), and to avoid falling into the latitude of rejection promoting BC to Devoted Drivers and Car Contemplators should be avoided *cf* [Stiff and Mongeau, 2002].

Image Improvers should also have BW promoted for shorter journeys, BC is worth trying for mid-length messages accompanied by DD, and messages promoting BED and BEV for longer journeys. Malcontented Motorists remain a difficulty. We had expected that messages regarding the BED, BCP or BCS would score more highly as being relevant and addressing a problem that we perceived Malcontented Motorists to have. However, this group only contained 14 people. Going on the trends suggested by the mean ratings by this group (which tend to suggest a lower level of enthusiasm in general than some other groups), we would suggest that BW, DD, BED and BEV are the best message categories to promote to this group, though we do not rule out BCS and BCP.

We have compiled a simple high level algorithm, shown in Table 10 below and also visualised in Figure 9, Figure 10, and Figure 11.

Table 10. High-level message selection algorithm for selected segments

Segment	Message Category and Rule
Active Aspirer	If distance < 3 miles *category* = Select from BW, BC
	If distance 3-10 miles *category* = Select from BC, BCS
	If distance >10 miles *category* = Select from BEV, BCS, BED, BCP, DD + BPT
Devoted Driver	If distance < 2 miles *category* = BW
	If distance ≥ 2 miles *category* = DD plus Select from BED, BEV, BCS, BCP
Image Improver	If distance < 2 miles *category* = BW
	If distance 2-10 miles *category* = DD plus BC
	If distance > 10 miles *category* = Select from BED, BEV
Malcontented Motorist	If distance < 2 miles *category* = BW
	If distance ≥ 2 miles *category* = DD plus Select from BED, BEV, BCS, BCP

The work discussed here is an advance in matching messages to personal characteristics, because in the original experiments conducted as part of the Superhub project [Forbes et al 2014], participants were not segmented, but asked to categorise messages by their fitness for a fictional persona describing each segment (termed a scenario). In this set of experiments, conducted as part of the MyWay project, we have taken the extra step of segmenting the participants (Study 2), as well as asking them to rate how effective each validated message is for them on three criteria (Appropriate, Convincing, Motivational).

As a result of this, we are able to make some initial recommendations about appropriate targeting of mode-based messages to four segments (Active Aspirers, Devoted Drivers, Image Improvers and Malcontented Motorists). We suggest that these are highly important groups for policy makers to target with behaviour change interventions. However, we did not have enough participants in the Car Contemplator segment to find messages that we can be confident would help to guide this segment away from purchasing a conventionally-fuelled car, either to avoid a car altogether or shift their aspiration to an electric vehicle. This latter option is a less 'radical' shift, which may be easier to achieve for some people. We consider it to be particularly important to sustainable urban mobility to influence this segment away from purchasing a conventionally-fuelled personal vehicle. Graphical representations of the algorithms are shown in Figure 9, Figure 10 and Figure 11. It is also important to note that our sampling frame is US-based, and thus likely to have a more car-oriented bias than an otherwise similar European sample.

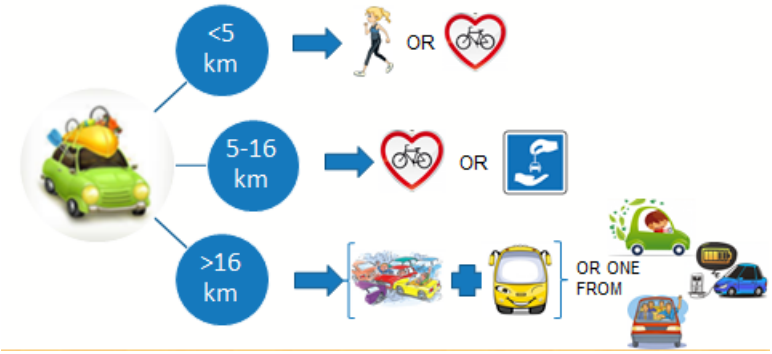

Figure 9. Graphic representation of the message selection algorithm for Active Aspirers

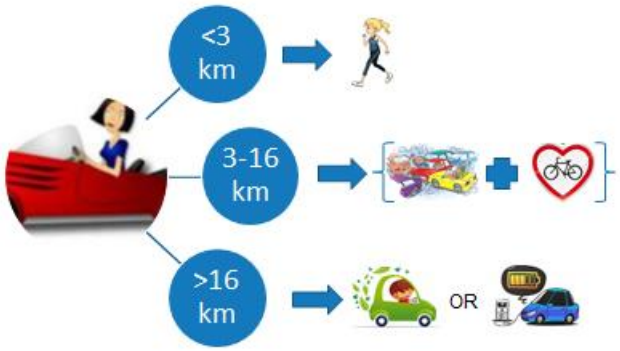

Figure 10. Graphical representation of the message selection algorithm for Image Improvers

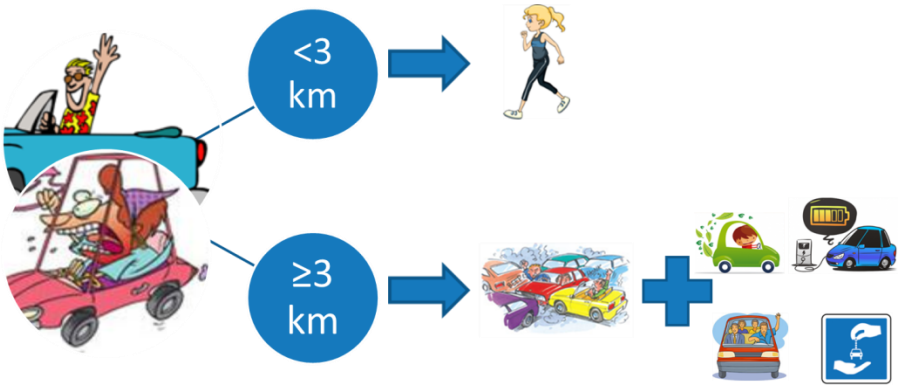

Figure 11. Graphical representation of the message selection algorithm for Devoted Drivers and Malcontented Motorists

3.2.6 Recommendations for future research

In order to advance the work, it would be helpful to have additional data for the segments that are not well represented in the work reported here. Therefore, there is an opportunity to repeat this experiment to increase the number of data points. It would also be useful to

improve the methodology to gather other relevant context about the participants, such as geographic location, mode availability and personal impairments impacting on mobility.

It is also necessary to work on producing shorter messages. These should be shorter than 16 words, particularly if they are to be delivered via a Smartphone app such as MyWay. The real-world messages that we tested are quite elaborate, which is likely to reduce their potential effectiveness outside the experiment, and could have been challenging for some respondents. Furthermore, the average word count of our existing set is too high for delivery via an app. However, we consider that the messages are realistic for this set of effectiveness experiments as the messages are drawn from real life transport behaviour change campaigns, and as such are exactly the same as those that participants are exposed to. We could find no previous research that had evaluated the effectiveness of the content and framing of real travel behaviour change messages. An alternative approach could be to investigate how to translate the core information in each message into graphic information or persuasive visualisations.

Once messages have been validated as clearly belonging to a particular category, it is also possible to work on understanding message preferences within the categories, and to explore the impact on acceptability and perceived effectiveness of manipulating the framing of those messages (as explored by [Waygood and Avineri 2011] for example). Therefore, we recommend taking this extra step in order to investigate how manipulating the framing of content impacts on the fitness of the messages for different segments (whilst keeping the underlying fact the same). For such an exercise, it is likely that it would also be helpful to control for personality traits such as openness, conscientiousness and agreeableness which might impact on receptivity to different styles of message, as well as affective state.

We would want to ask the following research questions:

1. How much heterogeneity is there in participant preferences for one style of presentation versus another (i.e. gain versus loss), given a specific scenario?

2. Can any variation be explained in terms of correlation with travel attitude segment and/or personality?

3. Effectiveness: are stated message preferences correlated with the stated likelihood of following the advice?

We give an initial set of manipulated messages in Annex 3, along with the scenarios refered to in the experiment description here. These have been carefully edited to remain as short as possible (word counts shown in square brackets). In reframing from the originals it is difficult to stick entirely to the validated messages from Study 1, as the gain or loss may have to be couched in terms of the drawbacks or consequences of another mode (for example, it makes no sense to convey a carbon emissions loss from not travelling by subway unless you put some parameters on it – if the user walks or cycles, that has better carbon emissions profile than the subway). What is important is that we stick as much as possible to the key characteristics of the originals that we consider contributed to their validity in the inter-rater agreement experiment. For example, in Study 1 three messages failed to validate for any mode (Benefit/Drawback) and we are not using them as our basis. Conversely, the best rated messages are being used, adjusted for variety - personal gain/loss versus collective gain/loss, environmental, financial or health gain/losses, etc.

The scenario stories are presented as if MyWay has the functionality described, as these tests are being conducted to inform future development of MyWay beyond the lifetime of the project. At present, MyWay does not give users textual messages either as part of the journey plan suggestion, nor as part of the VBC/statistics dashboard. The experiment has a “Between-subjects” design, with 40 participants per story. There are three stories. Each participant will be asked to complete the Golden Questions survey so that they can be segmented, as the results of previous studies suggest that there is a relationship between a person’s travel attitude segment and their message effectiveness ratings that show that the travel mode is relevant to the overall rating. In this experiment each participant will be given one story, and asked to select their favourite (the ‘best’) between a series of message pairs (gain versus loss), for two travel modes that would fit the scenario described in the story. For each message pair they are also asked to indicate whether they would consider following the suggestion. There is an optional comment box for participants to elaborate on their answers if they wish. Finally, the participants will be asked to complete the ‘Big 5’ personality sliders.

Each participant will be asked (in order)

1) Demographic and English test

2) Golden Questions (with additional yes/no question for Driver’s Licence)

3) Message experiment

4) Big 5 personality sliders

3.3 Potential uses for segmentation in MyWay

Having demonstrated evidence that there is a correlation between a person’s travel attitude segment and their message preferences, we judge that it would be useful for MyWay to be able to infer a user’s segment from his/her existing profile and trip-making history (e.g. has car/does not have car). The benefits for users would be improved personalisation and the ability to add a tool for social comparison. It would also improve the ability to give stake-holders more detailed analysis of users’ behaviours and preferences in relation to the local transport network.

3.3.1 Suggested future work for automatically detecting segment in MyWay

By re-examining the segment descriptors [MyWay_D1.1], we see opportunities for investi-gating how to automatically detect a user’s segment from the following profile and prefe-rence information.

Table 10, Table 11 and Table 12 reproduce the existing preference settings in MyWay, and we use these for our illustrative example. Thus, we hypothesise that if a user sets CAR as main vehicle (i.e. selecting the variable «Personal Transport: Own vehicle» (see Table 13), the user could be any of the ‘Car-use in last year’ segments. If the variable « car as driver’ » (conductor or driver in Table 11) is a preference, then it can be inferred that they are in one

of the car-using segments (i.e. excluding Car Contemplator, Public Transport Dependent and Car-Free Chooser).

If they also check at least one public transport mode (i.e. from the Public Transport variables in Table 13) then they are not a Devoted Driver : they could be a Practical Traveller or a Malcontented Motorist. If they also set 'My own bike' or 'Bike sharing' in the transport preferences, that would also indicate that they are not a Devoted Driver even if they have not selected any public transport modes. Whilst they could be Image Improver, Active Aspirer or Practical Traveller they are unlikely to be a Malcontented Motorist.

If they have also selected a medium to high cycling distance in the slider (see Table 12) then our hypothesis suggests that they are more likely to be an Image Improver or Active Aspirer than a Practical Traveller.

Table 11, Table 12 and Table 13 below show the preference settings for journey plans, limits and transport modes. We propose that future developments should investigate how to use these settings, coupled with VBC data/Trip Follower data to infer a user's segment, so that MyWay can improve the VBC capability in future. This requires further research.

Table 11. Current Preference Options in MyWay

Preference options :	
Preferred Algorithm	Cheapest, Fastest, Minimum # PTchanges, Only PT used, Safest for Bike, Shortest
Accessibility options :	Reduced Mobility can be ON or OFF
Voluntary Behaviour Change	can be ON or OFF
Modality role :	Conductor, Driver, Not_Applicable, Passenger, Passenger_Back_Seat, Passenger_First_Class, Passenger_Front_Set

Table 12. Current Preference Limits (Sliders) in MyWay

LIMITS (Sliders)	
Max transport changes :	1 to 5
Max cycling distance :	5km-20km
Max walking distance :	500 m – 5 km
Max walking time :	15 min – 2 hours

Table 13. Current Transport Options available in MyWay

TRANSPORT	
Public Transport :	Bus, Metro, Tram, Train, Taxi, Bus on demand, Ferry (all that apply)
Personal Transports :	Walking, My own vehicle, My own bike
Sharing Options :	Bike sharing, car sharing, electric scooter sharing

4. CONCLUSIONS

This document has described the final VBC implementation in MyWay Phase 2, which is based on the principle of giving users feedback about their behaviour as a preliminary step towards more active methods of encouraging sustainable travel behaviour change. We have reported some analysis of the available data from the authenticated users who opted in to VBC, to examine some aspects of their reported travel behaviour revealed in the Evaluation questionnaires and travel diary. We have also reported the conduct and results of two VBC message studies that explored a new area of research in selecting appropriate messages to deliver via a tool such as MyWay. We have made recommendations about future research that should be developed, to enable user segments to be inferred automatically from preference and trip follower data.

4.1 Published outputs

We have achieved the published outputs (in addition to deliverables and newsletters) shown in Table 13:

Table 14. MyWay related publications from WP1

DATE	TYPE OF PUBLICATION	TITLE OF ITEM/ARTICLE	AUTHOR(S)
05/01/15	Conference paper	UTSG_paper_424_2015.docx	Pangbourne and Masthoff
20/05/15	Conference paper	Pangbourne et al STAR 2015 final.pdf	Kate Pangbourne, David Quesada, José Fernández, Michal Jakob, Judith Masthoff, Stefano Persi and Marco Boero
20/05/15	Conference presentation	STAR 2015.pptx	Kate Pangbourne, David Quesada, José Fernández, Michal Jakob, Judith Masthoff, Stefano Persi and Marco Boero
09/06/15	Conference paper	eca 2015 paper.docx	Simon Wells, Kate Pangbourne
01/09/15	Poster	vbc.pptx	Kate Pangbourne, Judith Masthoff
25/09/15	Pecha Kucha	Myway pechakucha.pptx	Kate Pangbourne
26/08/15	Poster	cyberspace poster.pptx	Kate Pangbourne, Judith Masthoff
06/01/16	Conference paper	utsg_2016_final.pdf	Kate Pangbourne, Judith Masthoff
27/01/16	Presentation to Permanent Secretary Department for Transport	Challenging travel preferences: learning from the MyWay project	Kate Pangbourne

4.2 Recommendations for future development of MyWay

We recommend that future development of MyWay ought to take account of user and stakeholder feedback about the user dashboard. This was welcomed, and mentioned specifically as useful innovation, particularly the CO2 emissions and calories burned metrics. Several users mentioned that they would like cost settings in MyWay, and this is something that could also be considered for the VBC statistics dashboard.

The implementation of the VBC was not liked by one user in the Scripted Journey Plans (see [Myway-D6.2]). This is probably because the current offer is quite unsophisticated in relation to many 'quantified self' style products in the market (e.g. running and cycling apps). It ought to be linked to goal-setting, which has been proven to be effective for some people; if it is linked to goal-setting, then specific messages can be pushed to users if they are near their target, falling short, or exceeding it.

To encourage different modes, these can be linked to certain modes. If the users' segments can be inferred from their preferences and behaviours revealed by the Trip Follower, then the algorithms we have developed can be exploited.

4.3 Recommendations for future VBC research

We believe that more research is needed into the message content to underpin selecting VBC messages that are matched to user segment, and more research is needed into methods for inferring user segment automatically.

4.4 Recommendations for policy-makers

When designing VBC interventions using technology, such as Apps, user input is needed from the very earliest stages, and should be returned to as software is developed, including getting user feedback on GUI design. The Scripted Journey Plans (devised in WP1 with WP5, but reported in D6.2) demonstrate the value of this.

Research for the project confirms the findings of other EU funded projects (e.g. SEGMENT): users in different attitude segments will not switch to any other mode, just those that fit with their personal identity and attitudes. Therefore, they will prefer messages that promote benefits for modes that are in-line with their attitude, and the preferences should be used to infer the segment and seek to offer journey plans that are the best match possible: it is counter-productive to suggest a mode that is too far from a user's 'comfort zone'.

Several Stakeholder interviewees were impressed by the user statistics feature, as highly innovative in a mobility planning context. They recommended that this be developed and be given a higher profile.

User preferences vs. policy-makers' objectives: This issue is a limiting factor for achieving behaviour change to sustainable modes through user-centric apps based on personal preferences. Additional features are required to enable promotion of policy objectives. A minimum feature, such as that implemented in MyWay Phase 2, is to give users who want it

feedback on their mobility metrics. It would be helpful to be able to push occasional messages to users, or to include a message alongside journey plans, rather than rely solely on icons.

Our recommendation for practitioners is that they should be specifying a requirement for user segmentation in tools such as MyWay, in order to support guiding particular segments towards particular alternatives, such as shared vehicles (car clubs and city bikes as well as lift-sharing), or electric mobility, in addition to supporting an increase in multi-modal travel (for example, supporting Park and Ride by enabling the provision of bookable parking slots at public transport access points on parts of the network that have capacity). Access to high-quality real-time data and sophisticated routing and planning algorithms are at least as important to achieving this as the effectiveness of behavior change messaging, which needs to be more targeted to individuals.

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Annex I – "Description of Work" to the EC Contract

[MyWay_D1.1]

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[MyWay_D1.4

Kate Pangbourne and Judith Masthoff with Villy Portouli (2015) D1.4 Scenarios, KPIs and Guidelines for Validation – Final Version.

[Myway_D5.2]

Fraunhofer FOKUS (2015) Living Lab Execution Report. First Version.

[MyWay_D5.3]

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ANNEX 1 STAKEHOLDER OPINION ON VBC

This Annex presents the full data of the interviews with Stakeholders in Catalonia and Trikala in answer to Question 4 on VBC. The question was not asked in Berlin.

CATALONIA

Question	CETRAMSA (Metropolitan Area of Barcelona)	DIBA	Avancar	Sagalés
4a: What do you think of the VBC function?	It is very useful and innovative. Other Apps like Moovit and City Mapper are fed by people who give information about public transport, congestion, etc., but there is not the option of trip follower.	It is very interesting! It is the first step to offer an added value to the user trips because you can set a target about distance to walk, bike, etc., per day, or week, and then track your progress.	That is very cool! But it is not easy to find this functionality in the app. It makes a lot of sense. It can provide something that other apps don't provide. I think what could potentially be improved is that you could share those results on the social media (like other apps for runners, etc). It's very interesting and it opens a door for other potential things. For example, as a company, we could make a program to commit ourselves in our daily drips to reduce emissions, and we can measure the emissions with the app. It opens a working stream for future developments to do cool things. And I'm not	This feature seems to me great, but I have not been able to activate it in spite of try it. This is something that should be improved. Whilst searching for travel is very intuitive, the option of try your preferences is not; and it should be improved because is not intuitive enough. Although I have searched it I have not been able to find it, but it's a very good option. We are in the era of information, we all like to know what we do and what we consume, to have statistics of what you do is a great option and it serves to be more conscious about the environment, about what

			aware of other apps doing so.	you do and how your actions can affect the environment.
4b: How could sustainable transport functions evolve/be improved?	People want to have the real time information: disruptions, waiting times, etc. In short, what's happening now?	It's good to have the CO2 emissions, but I do not think that makes a person deciding on the travel option. It should be improved by incorporating information about parking (parking lots next to your destination or information about the ease or difficulty to park, parking restricted to residents, etc). If there is an estimation of the time required to park, it will often show that the public transport is faster than the private one. If not, car trips will likely be faster.	I think a good way is open data. All the data you create with MyWay can be used for other platforms to develop other functionalities. Maybe MyWay is tracking all this data on my mobility and I could potentially use this data in other apps to make something with this data, like developing an emission reduction program for a company, etc.	All about preferences, transport modes, I really think is right. There is an aspect, about "sharing": car sharing, bike sharing and moto sharing which I have not understood how to configure it. I haven't understood this option and I didn't know how to handle it.
9: Threats from market introduction?	Competition with the other current apps. During the last 3-4 years there has been a boom of these kinds of apps. You have to offer a very good instrument and promote it through social networks.	High competition. Not enough being announced and people don't know about it. It should ensure that all options are easily visible to the user (for example, the issue of the stages or the journey by moving the bar above), because if the	Not being relevant. Not being distinctive enough or well marketed enough to be relevant.	I see not threats. MyWay promotes public transport and the sustainability. A threat is what can jeopardize someone. THREATS: if MyWay doesn't have the correct data, if MyWay doesn't have schedules as necessary, he would be

		first user experience is not absolutely positive, the user will no longer use the application.		threats by misinformation. I mean, when you're testing an App, and you do three of these searches,if MyWay fails, you don't give opportunities to this App.
10a: Risks arising from Myway for organisation	No	No.	No	Legal or organizational, I have no idea. Technical risks: MyWay must have the correct data.
10b: Risks arising from MyWay for other users	You have to explain well how you will use the data; Not all citizens have the latest mobile devices and they couldn't use the app; data download and memory limitations of the mobile phone used.	There is a risk of a bad use made with the information collected about the population ways of moving. There is much social awareness about data confidentiality, etc., there is a risk perhaps for other administrations or organisations that promote Apps. I think the role of the government is to provide the data and that it should be the private sector who is developing the app.	For the start-ups that are developing similar technologies and are not subsidized. But maybe they are much faster and find out better solutions so it is not a major risk. Being subsidized is not a guarantee if being successful.	No Answer/not applicable
11: Would organisation support Myway usage by users	Yes	Yes	Yes	Yes

How?	At technical level, providing data	MyWay could be recommended by the Urban Mobility Plans which are made at DIBA, as the recommended app. We can support it by giving a positive message on the app through our communication channels and dissemination activities. In the future, we can provide information from the Urban Mobility Plans.	We could promote MyWay within our member base, and we can offer our data into this app as well.	think so, as long as MyWay works well, not deceive the users and It offers as first choice in public transport: Sagalés. I think that is positive, of course.
12: How should MyWay be promoted?	It should be promoted through social media, but taking into account the age and kind of people. For example, young people use more facebook and games. People from 20-40 years use more twitter and Instagram etc	The calculation of CO2 emissions could be promoted as organisations and companies, which could have a calculation of their CO2 emissions associated with their journeys and allow it to set reduction targets and also bonuses or rewards. Another way to promote it should be to ensure that organisations and companies that have many visitors and generate a lot of mobility will use this application as the application of reference and promote MyWay	I think that it should be more promoted as an emissions and calories tracker than as a mobility solution, because as a mobility planner it is not very much distinctive/new/relevant (perhaps the integration of multimodality routes is distinctive and it is what should be promoted)	To promote MyWay is a task of marketing experts. 1) It's essential that data be completely correct, as we have said before, if data are not good, the App, in this case, would be useless. 2) In MyWay, real-time is missing. If we have real time so you can start to advertise MyWay.

		in their website or mobile app. There would be the possibility of 'gamifying' the information of calories, walking distances, cycling, etc., so that users could compare them.		
13: other comments	It is easy to use and it is interesting what the app is offering.	It will be interesting to incorporate information about the cost of the trip. The option of walking (up to an hour) should be always considered, because sometimes it is the most reliable option and preferred.		In general terms, I like MyWay application, it is intuitive, it is right. The fact of MyWay offers all the transport modes is very positive. From my point of view, it lacks: traffic conditions and real time. MyWay is a journey planner, not a car navigator. I think that to have the option of statistics –which I have not been able to find it- it seems to me great, it means… that there are many freaky people who like to know all the time what they expend, what they are consuming, how many calories and CO2, and we due to that, this people can be all the day using MyWay.

TRIKALA

Question	Municipality of Trikala	KTEL	Urban Transportation Services
4a: What do you think of the VBC function?	Extra layers of information are always welcome, especially as such that can help people care more about the environment.	Great addition, maybe people will get more sensitive and may not use their cars so much.	It is very interesting and could get more users intrigued.
4b: How could sustainable transport functions evolve/be improved?	With the inclusion of even more data like this, e.g. how much money can I save from gas or not using my car?	-	By providing ever more details and info about this.

ANNEX 2 MESSAGE EXPERIMENTS RESULTS: STUDY 1

Benefits of Cycling (BC) 3, κ= 1; 5, κ= 0.93; 2, κ= 0.86	**Kappa**
The health benefits of cycling outweigh the safety risks by a factor of 20 to one.	1
In a new study on the connection between mood and transport, bicyclists were found to be the happiest, giving one more reason to choose sustainable.	1
Cycling to work can help you to save time and money while using time you spend travelling to improve your fitness and live a longer, healthier life.	1
Cyclists on average live two years longer than non-cyclists and take 15% fewer days off work through illness.	0.93
Cycling has a positive effect on emotional health, improving levels of well-being, self-confidence and tolerance to stress while reducing tiredness, difficulties with sleep and a range of medical symptoms. (29)	0.93
A bicycle commuter who rides 8 km to work, four days a week, avoids 3220 km of driving a year, the equivalent of 380 l of gasoline saved and 750 kg of CO2 emissions avoided.	0.93
The local journeys most suited to cycling are also the worst for your car, your bank balance and the environment.	0.93
A half hour drive to work can often be easily completed in under 15 minutes by bike.	0.93
Apart from walking, cycling is the cheapest way to travel. It is far cheaper per mile than public transport or driving.	0.86
An adult who cycles regularly will typically have a level of fitness equivalent to being 10 years younger	0.86

Benefits of Carpooling (CP) 3, κ= 1; 2, κ= 0.93; 1, κ= 0.86; 1 = κ 0.44 and 1 = κ 0.43	
Carpooling is good for the environment.	1
Carpooling can save you hundreds and even thousands of dollars a year as it reduces the costs involved in repetitive or long-distance driving.	1
Carpooling enables some families to cut back to one car or to do without a car at all.	1
Carpooling can provide you with new friendships and company for your commute.	0.93
Carpooling reduces air pollution and traffic congestion, something that benefits all of us!	0.93
Carpooling helps to combat rising traffic congestion, by filling the extra seats in your car, there are fewer drivers, and therefore fewer cars crowding the roads.	0.86
Avoid travelling alone on those boring commuting trips, find a new friend to socialise with on your regular journey to work	0.44
Even if you don't drive, you can car share. Car-pooling can help people get from A to B where bus services aren't available	0.43

Benefits of Car-sharing (CS) 1 (κ= 1); 7 (κ= 0.93)	
One car-share car replaces over 20 private cars, helping to reduce traffic jams and free up parking spaces.	1
People who don't need a car every day save money by giving up their own car and using a carshare program instead.	0.93
Each carshare user saves 1 tonne of CO2 per year.	0.93
If you drive less than 6,000 miles a year, joining a carshare program could save you a lot of money.	0.93

Carshare members choose walking, cycling and public transportation much more, only using the carshare when it really is the best option. They drive less, they pollute less.	0.93
Carshare programs can provide a great alternative to car ownership as you get all the convenience of a car without any of the hassle.	0.93
Car sharing allows people who cannot afford their own vehicles access to a car.	0.93
Car sharing offers versatility in vehicle choice. Get a truck the day you move, but go for the smaller, environmentally-friendly hybrid to run minor errands.	0.93

Benefits of Eco-driving (ED) 1 (κ= 1); 3 (κ= 0.93); 1 (κ= 0.86); 3 (κ= 0.85); 1 (κ= 0.56)	
Eco-drivers cause less wear and tear on car parts (tires, brakes and engine) and are less prone to accidents.	1
Eco-driving provides direct benefits to the drivers and the passengers: More comfort and a relaxed atmosphere.	0.93
Eco-driving means small changes for the driver and high impacts on improving fuel economy and reducing emissions.	0.93
Eco-driving reduces local air pollution by reducing fuel consumption	0.93
The distance traveled by an ecodriver on $4 of fuel would require $5.32 of fuel for an aggressive driver.	0.86
By adopting eco-driving techniques you can save up to 15% on your fuel bills, while also reducing your CO2 emissions.	0.85
Eco-driving means more relaxed driving and thus has benefits for drivers' health and improves driver satisfaction.	0.85
Experience shows that Ecodrivers do not take longer to reach their destination, but are often even faster. This is mostly due to accelerating traffic flow and thus avoiding stops.	0.85
A smooth use of the accelerator, steering, transmission and brakes means not only efficient driving, but is also more comfort for the driver and passengers.	0.56

Benefits of Electric Vehicles (EV) 7 (κ= 1); 1 (κ= 0.85); 1 (κ= 0.73)	
An electric car is very quiet and very smooth. It makes most regular cars seem clunky and outdated.	1
Imagine never going to a gas station again. All you have to do is pull into your garage or driveway, reach over for a plug, and push it into the charging inlet. It's very convenient and takes all of about 15 seconds. Wake up the next morning, and you have a car ready to go another 80 to 100 miles. (60)	1
Because electric cars don't have tailpipe systems and don't need oil changes, maintenance costs are reduced.	1
Electric vehicles can be cheaper to run compared with a new gas/diesel when total cost of ownership is considered due to greatly reduced fuel and servicing costs.	1
Electric cars are quiet, no engine noise and very responsive at low speeds.	1
Electric vehicles convert about 60% of the electrical energy from the grid to power at the wheels, conventional gasoline vehicles only convert about 19% of the energy stored in gasoline to power at the wheels.	1
The only emissions from all-electric vehicles come from the power plants generating electricity to charge their batteries, which is always less than burning fuel in a car's engine.	1
The cost per mile to fuel an EV is approximately one-third to one-quarter the cost of gasoline (on a cost per mile basis).	0.85
Driving fuel based cars can burn a hole in your pocket as prices of fuel have gone all time high. With electric cars, this cost can be avoided as an average American spends $2000 - $4000 on gas each year. Though electricity isn't free, an electric car is far cheaper to run.	0.73

Benefits of Public Transport (PT) 5 (κ= 1); 2 (κ= 0.93); 1 (κ= 0.86); 1 (κ= 0.79)	
Your carbon footprint is smallest when you travel by bus and coach compared to any other transport mode.	1
One bus can replace a minimum of 30 cars on the road.	1
Using public transportation for part of your journey frees up a little more time to do something you enjoy. Catch up on emails, chat with friends, read the paper or simply relax, let someone else do the driving, and prepare for the day ahead.	1
Using public transport builds independence and personal confidence especially amongst young people.	1
Using public transportation fosters a real sense of community for regular or older travellers, seeing familiar faces on local routes.	1
A single commuter switching his or her commute to public transportation can reduce a household's carbon emissions by 10 percent and up to 30 percent if he or she eliminates a second car.	0.93
Travelling by bus is completely stress-free, you can read a book or relax whilst you're chauffeur-driven to your destination, instead of fighting your way through rush-hour traffic.	0.93
Public transportation is a $61 billion industry that employs more than 400,000 people.	0.86
One person with a 20-mile round trip commute who switches from driving to public transit can reduce his or her daily carbon emissions by 20 pounds, or more than 4,800 pounds in a year.	0.79

Benefits of Walking (BW) 5 (κ= 1); 1 (κ= 0.93); 1 (κ= 0.86); 1 (κ= 0.85); 1 (κ= 0.66); 1 (κ= 0.51)	
Walking 10,000 steps a day can improve your health, build stamina and burn excess calories	1
Walking has been shown to improve self-esteem and improve mood	1
Walking is one of the best ways to clear your head and reduce stress	1
Walking to work every day for a year would save 17 kg of carbon dioxide. Good for you. Good for the planet.	1
88% of people saw an overall improvement in mood after going for a walk, according to a study by Mind	1
Regular walking reduces the risk of coronary heart disease by up to 50%.	0.93
Walking is suitable for all ages and fitness levels. You'll just need suitable clothing for different weathers and a comfy pair of shoes or trainers.	0.86
Save cash on fuel and bus fares. Take to your feet instead.	0.85
It only takes around 15-20 minutes to walk one mile and around 40 minutes to do two.	0.66
Even if you just walk to get to a car-share parking spot, it's better for your health than constantly driving.	0.51

Drawbacks of Driving (DD) 1 (κ= 0.85); 2 (κ= 0.79); 1 (κ= 0.44); 2 (κ= 0.41)	
Despite safety advancements such as seat belts and airbags, cars remain more dangerous than other major modes of transportation, including travel by air, bus and train.	0.85
Being in a car exposes you to around 25% more pollution than if you are walking or cycling. This can cause or worsen headaches, eye pain, asthma and respiratory complaints.	0.79
Traffic can make you late for important events and business meetings, and cause you to burn extra fuel.	0.79
Operating a car safety requires alertness and sobriety.	0.44
Erratic driving may cause stress levels to rise which can affect concentration and make drivers tired and/or aggressive.	0.41
A car with a single traveller is the least efficient use of energy per mile of road travel.	0.41

ANNEX 3 DRAFT EXPERIMENT CONTENT: STUDY 3

Information for participants

We are interested in what messages about choosing certain travel modes suit different people in particular situations, so that a journey-planning App can select the best message. We are conducting this research as part of an EU-funded project which has developed a prototype journey planning app called MyWay. Journey planning tools help people find out how to get from A to B. They usually provide users with a map, and with suggestions about mode, such as subway line number and scheduled or real-time departure times. Sometimes users can get other information about the cost of their trip, how much CO2 it will emit, or how many calories they can burn if they walk or cycle.

We will present you with a story in which you are asked to imagine yourself in that scenario, and you will be given some context about the availability of the travel modes that we are interested in.

You will then be presented with a sequence of 10 pairs of messages that the MyWay app might present you with.

We have used real places and transport modes, as we want the scenarios to be realistic. We are not evaluating either those places or their transport systems, we are only interested in your opinion about the messages. We acknowledge that some participants might know the places, and other participants will have no pre-knowledge of these places.

STORY ONE

[For this story, there are two sets of modal messages, cycling and public transport]

Imagine you are in Boston, Massachusetts, and you are on vacation. You are going to meet up with your friend at a coffee shop near a museum you plan to visit but you don't have access to a car today. It is a little less than 3 miles away, but you aren't sure how to get there and back, so you check for the route using MyWay on your Smartphone. MyWay makes a suggestion about the best travel mode for you to use today.

There is a bike-share system (Boston Hubway) which offers an instant access 24-hour pass for $6. This will give you access to unlimited 30 minute trips by bicycle during that time, so you could leave the bike while you meet your friend and pick up another later (rides over 30 minutes will cost a bit extra). All you need to sign up is to swipe a credit or debit card at the bike station.

Boston also has a high-quality subway system (known as the 'T'), which costs $2.75 for a sin gle journey with a paper ticket, or $2.10 with the subway smartcard (though you will have to store more value on it than the single fare).

Please click first on the button for the message you like best in terms of the way the information is presented, then indicate whether YOU would consider following this suggestion.

You may also comment about your answers if you wish.

MyWay recommends that you take the [bike-share/subway] because….

Message A OR Message B

[message pairs arrive in random order]

I would consider following this suggestion: Always; Sometimes; Occasionally; Never

Comment (free text):

Benefits of Cycling [8 message pairs to choose from]

Original Message	Note	Gain framing	Loss framing
The health benefits of cycling outweigh the safety risks by a factor of 20 to one. [16]	Health: abstract risk (for individual)	… the benefits for your health of increasing activities like cycling are twenty times greater than the safety risk. [18]	… inactivity is worse for your health than the safety risks of cycling. [17]
In a new study on the connection between mood and transport, bicyclists were found to be the happiest, giving one more reason to choose sustainable. [17]	Health: mental (for individual)	… research suggests that you will be more happy if you cycle regularly. [10]	… research suggests that you will be less happy if you don't cycle regularly. [12]
Cycling to work can help you to save time and money while using time you spend travelling to improve your fitness and live a longer, healthier life.[27]	Economic (for individual)	… it could save you money. [5]	… the alternatives could cost you more money. [7]
Cycling to work can help you to save time and money while using time you spend travelling to improving your fitness so you live a longer, healthier life.[9]	Time (for individual)	… cycling could save you time.[5]	… it could take longer if you don't cycle.[5]
Cyclists on average live two years longer than non-cyclists and take 15% fewer days off work through illness.[18]	Health: long term benefits for individual	… on average you will live two years longer if you cycle regularly. [12]	… on average non-cyclists die two years earlier than regular cyclists. [10]
	Health: short term benefits mainly for employer	… on average you will take 15% fewer sick days if you cycle regularly. [13]	… on average you will take 15% more sick days than if you cycle regularly. [14]

Original Message	Note	Gain framing	Loss framing
Cycling has a positive effect on emotional health, improving levels of well-being, self-confidence and tolerance to stress while reducing tiredness, difficulties with sleep and a range of medical symptoms.	Health: short term benefits (for individual)	… being more active could help you feel less tired and have better sleep. [13]	… being less active could worsen tiredness and sleep problems. [9]
The local journeys most suited to cycling are also the worst for your car, your bank balance and the environment.	Environment: long term (for common good)	… short journeys by bicycle are great for the environment.[9]	… short journeys by automobile can be very bad for the environment. [11]

Benefits of Public Transport [7 message pairs to choose from]

MyWay recommends that you take the [subway] because…. Message A OR Message B

Original	Note	Gain framing	Loss framing
Your carbon footprint is smallest when you travel by bus and coach compared to any other transport modes.[18]	Environmental: common good	… you will have a better carbon footprint compared to the bus or taxi.[16]	… you will have a worse carbon footprint if you use bus or taxi.[13]
One bus can replace a minimum of 30 cars on the road.[12]	Environmental and Congestion: common good	… it will reduce urban congestion.[5]	… if you take a taxi you will cause urban congestion.[8]
Using public transportation for part of your journey frees up a little more time to do something you enjoy. Catch up on emails, chat with friends, read the paper or simply relax, let someone else do the driving and prepare for the day ahead.[44]	Personal	… you will have time to relax or catch up with some reading.[12]	… otherwise you won't have time to relax or catch up with reading.[12]
Using public transport builds independence and personal confidence especially amongst young people.[12]	Personal	… using it will give you a sense of independence and boost your confidence. [13]	… you will lose the chance to be independent and confident. [10]
Using public transportation fosters a real sense of community for regular or older travellers, seeing familiar faces on local routes. [20]	Social	… using public transportation promotes community feeling.[6]	… not using public transportation undermines community feeling. [7]
A single commuter switching his or her commute to public transportation can reduce a	Environmental (common good)	Not suitable	Not suitable

Original	Note	Gain framing	Loss framing
household's carbon emissions by 10 percent and up to 30 percent if he or she eliminates a second car.[33]			
Travelling by bus is completely stress free, you can read a book or relax whilst you're chauffeur-driven to your destination, instead of fighting your way through rush-hour traffic.[28]			
Public transportation is a 461 billion industry that employs more than 400,000 people.[13]		… using the T supports the employment of more than 6,000 people in the region.[12]	… not using the T endangers the jobs of more than 6,000 people.
One person with a 20-mile round trip commute who switches from driving to public transit can reduce his or her daily carbon emissions by 20 pounds, or more than 4,800 pounds in a year.	Environmental: common good	… the round trip could save 11 pounds of carbon emissions.[4][10]	… otherwise your round trip could emit 11 pounds of CO2. [11]

[4] Carbonfund.org's Carbon Calculators use information from the U.S. Department of Energy's Energy Information Administration, the Environmental Protection Agency, and other leading sources to develop an accurate assessment of carbon dioxide emissions emitted per energy type or use. Unleaded gasoline emits 8.91 kg of CO2 per gallon whereas on average, subway trains emit 0.163 kgs CO2 per passenger mile. The Carbon Calculator assumption adds 10% to rail mileage to account for detours and other factors. We have used 0.359 kg for a 6 mile round trip by subway as my starting point and converted that to pounds: 0.79, which is rounded. The car emissions are assumed as the alternative (though not stated), calculated to be 60% of 8.91 kg, which is 5.35 kg (11.8 lb). On average, bus trips emit 0.107kgs CO2 per passenger mile (Source: EPA Climate Leaders table 3, page 5). Road and transportation conditions vary in real life beyond what can be estimated. To ensure that the carbonfund's bus calculator fully covers trips, they add 10% to the total mileage of the trip to account for potential traffic jams, detours, and pit-stops that may arise.

STORY TWO

[For this story, there are two sets of modal messages, Car-pooling and Car-sharing]

[*This story needs participants to be filtered to have answered Yes to Driver's Licence and Yes to Driving in Last Year OR Driving within next year]*

Imagine you have moved to a tri-plex apartment in Portland, Oregon. There is no driveway and though on-street parking is quite easy, you find that there are a lot of traffic jams. You are wondering about whether to keep your own car, as Portland is mostly easy to get around without one. However, sometimes it is really useful to be able to go by car. A friend has told you about a couple of ride-sharing apps which let you offer a ride or find someone to give you a ride to places in real-time (car-pooling). You have also learned that there are several car-sharing services to enable you to rent a vehicle nearby for short periods of time. Before you sell your car, you decide to try to get around without it for a week. MyWay makes suggestions about which travel mode you should use for different journeys and it can seamlessly link with local car-pooling and car-sharing booking systems. This afternoon, you want to go to the movie theater, which is about 4 miles away.

Car-pooling apps in Portland Car-sharing services in Portland

Please click first on the button for the message you like best in terms of the way the information is presented, then indicate whether you would consider following this suggestion.

You may also make a comment about your answers if you wish.

MyWay recommends that you [car-pool/car-share] because…. Message A OR Message B

[message pairs arrive in random order]

I would consider following this suggestion: Always; Sometimes; Occasionally; Never

Comment (free text):

Benefits of Car-pooling [5 message pairs to choose from]

Original	Note	Gain Framing	Loss Framing
Carpooling is good for the environment.		… sharing your car journey is good for the environment. [9]	… driving alone is bad for the environment.[7]
Carpooling can save you hundreds and even thousands of dollars a year as it reduces the costs involved in repetitive or long-distance driving.	Personal	… sharing your car journey can save hundreds or thousands of dollars a year.[13]	… driving alone in your car costs hundreds or thousands of dollars a year more than sharing.[16]
Carpooling enables some families to cut back to one car or to do without a car at all.	Personal	… if you regularly carpool, you could do without owning your own car.[12]	… if you don't carpool, you might not be able to do without your car.[14]
Carpooling can provide you with new friendships and company for your commute.		… it is social and you will make new friends.[9]	… otherwise it will be harder to make new friends.[9]
Carpooling reduces air pollution and traffic congestion, something that benefits all of us!	Collective environmental	… by sharing your journey you help reduce air-pollution for everyone.[10]	… by driving alone you make air-pollution worse for everyone.[9]
	Collective	… by sharing your journey you help reduce congestion for everyone.[10]	… by driving alone you make congestion worse for everyone.[9]
Carpooling helps to combat rising traffic congestion, by filling the extra seats in your car, there are fewer drivers, and		Essentially the same as above.	Essentially the same as above.

therefore fewer cars crowding the roads.			

Benefits of Car-sharing [8 message pairs to choose from]

Original	Notes	Gain Framing	Loss Framing
One car-share car replaces over 20 private cars, helping to reduce traffic jams and free up parking spaces.		… we gain 20 times more road and parking space when drivers share a single vehicle instead of owning.[18]	… using your own car increases traffic jams and uses up parking spaces.[12]
People who don't need a car every day save money by giving up their own car and using a car-share program instead.		… if you don't need to use an automobile every day you will save money if you car-share instead of owning.[20]	… if you don't drive every day it costs you more to own a car than to car-share.[17]
Each car-share user saves 1 tonne of CO2 per year.		… regular car-sharers save 1 tonne of CO2 emissions every year.[10]	… driving your own car will waste 1 tonne of CO2 emissions every year.[13]
If you drive less than 6,000 miles a year, joining a car-share program could save you a lot of money		… if you drive less than 6,000 miles per year you will save money if you car-share instead of owning.[19]	… if you drive less than 6,000 miles per year it costs you more to own a car than to car-share.[20]
Car-share members choose walking, cycling and public transportation much more, only using the car-share when it really is the best option. They drive less, they pollute less.		… car-share users pollute less.[5]	… car-share users pollute more.[4]
		… car-share users walk, cycle and use public transportation much more.[10]	… own car users walk, cycle and use public transportation much less.[11]
Car-share programs can provide a great alternative to car ownership as you get all the convenience of a car without any of the hassle.		… car-share users get all the convenience of a car without the hassle.[12]	… owning a car is a lot of hassle.[8]
Car-sharing allows people who cannot afford their own vehicles access to a car.		Not applicable	Not applicable
Car-sharing offers versatility in vehicle choice. Get a truck the day you move, but go for the smaller, environmentally-friendly hybrid to run minor errands.		… with car-share you can book different sized vehicles. Get a truck for moving, but use a small car for minor errands.[21]	… you are limited to one type of vehicle for every trip if you own your own car.[17]

STORY THREE

[Benefits of Eco-Driving/Benefits of Electric Vehicles]

[Here we are imagining that the VBC capability of MyWay (through the statistics dashboard) has been extended to enable users to explore the potential impact of making changes to a regular journey]

[This story needs participants to be filtered to have answered Yes to Driver's Licence and Yes to Driving in Last Year OR Driving within next year]

[The story is not geographically specific. It might be an idea to ask participants for their zipcode or some other geographic indicator for this story?]

"Imagine you are in the market for a new car. You are considering whether you could save money on running costs, and you've also heard that electric vehicles are starting to gain in popularity. You've been tracking your journeys in MyWay, and you've noticed that you mostly use the car and you have quite high CO2 emissions. However, you do have to make a lot of journeys where not driving would be inconvenient. Could you be more environmentally-friendly or save some money while continuing to drive? You decide to start by checking what MyWay suggests for your daily journey to work."

Eco-driving is a way of driving that involves accelerating moderately (e.g. with manual transmissions shift up between 2000 and 2500 revolutions), anticipating traffic flow and signals to avoid sudden starts and stops, maintaining an even driving pace (e.g. by using cruise control on the highway), never exceeding the speed limit and not leaving the engine idling unnecessarily. Savings in running costs come from reducing wear and tear and potentially from reduced insurance costs through a Usage-Based Insurance policy.

Electric vehicles here means a car that runs using an electric motor that has to be charged in your garage or driveway, or at a public charged at the parking garage or shopping mall, you just push the plug into the charging inlet. It's very convenient and quick. It can charge while you are asleep or at work, and then it's ready to go another 80 to 100 miles. Savings in running costs come from less maintenance of fewer moving parts and cheaper fuel costs (the cost of electricity per mile is much less than the cost of gasoline per mile).

Please click first on the button for the message you like best in terms of the way the information is presented, then indicate whether you would consider following this suggestion.

You may also make a comment about your answers if you wish.

MyWay recommends that you [adopt eco-driving/get an electric vehicle] because….

Message A OR Message B

[message pairs arrive in random order]

I would consider following this suggestion: Always; Sometimes; Occasionally; Never

Comment (free text):

Benefits of Eco-Driving [9 message pairs to choose from]

Original	Notes	Gain Framing	Loss Framing
Eco-drivers cause less wear and tear on car parts (tires, brakes and engine) and are less prone to accidents		… your car's tires, brakes and engine will last longer.[9]	… otherwise your car's tires, brakes and engine will wear out faster.[11]
		… you are less likely to have an accident.[8]	… untrained drivers are more likely to have accidents.[8]
Eco-driving provides direct benefits to the drivers and the passengers: more comfort and a relaxed atmosphere.		… eco-driving is more comfortable and relaxed for you and your passengers.[11]	… otherwise you and your passengers will be more uncomfortable and less relaxed.[12]
Eco-driving means small changes for the driver and high impacts on improving fuel economy and reducing emissions.		… eco-driving greatly improves fuel economy and reduces CO2 emissions.[9]	… otherwise you are wasting fuel and creating extra CO2 emissions.[8]
Eco-driving reduces local air pollution by reducing fuel consumption.		… eco-driving contributes to better local air quality by reducing fuel consumption.[11]	… standard driving contributes to poor local air quality through increased fuel consumption.[12]
The distance travelled by an eco-driver on $4 of fuel would require $5.32 of fuel for an aggressive driver.		… eco-driving increases the distance you can travel for $4, saving you money.[12]	… aggressive driving shortens the distance you can travel for $4 of fuel, costing you money.[15]
By adopting eco-driving techniques you can save up to 15% on your fuel bills, while also reducing your CO2 emissions.		… you can save 15% on your fuel bills.[8]	… not adopting eco-driving will cost you an extra 15% on your fuel bills.[13]

Eco-driving means more relaxed driving and thus has benefits for drivers' health and improves driver satisfaction.		… being more relaxed while driving is better for your health.[10]	… being stressed while driving is bad for your health.[9]
Experience shows that eco-drivers do not take longer to reach their destination, but are often even faster. This is mostly due to accelerating traffic flow and thus avoiding stops.		… smoothing out your driving style could help you reach your destination faster.[12]	… rapid acceleration and sudden braking interrupts the flow of traffic and increases journey time.[14]

Benefits of Electric Vehicles [7 message pairs to choose from]

Original	Notes	Gain Framing	Loss Framing
An electric car is very quiet and very smooth. It makes most regular cars seem clunky and outdated.		… it is quiet and smooth to drive.[7]	… regular cars are noisy and clunky to drive.[8]
Imagine never going to a gas station again. All you have to do is pull into your garage or driveway, reach over for a plug, and push it into the charging inlet. It's very convenient and takes all of about 15 seconds. Wake up the next morning, and you have a car ready to go another 80 to 100 miles.		… you will save time time by never having to go to the gas station again. [28]	… otherwise you will waste time going to the gas station during your journeys.[13]
Because electric cars don't have tailpipe systems and don't need oil changes, maintenance costs are reduced.		… electric cars have low maintenance costs.[6]	… regular cars have higher maintenance costs.[6]
Electric vehicles can be cheaper to run compared with a new gas/diesel when total cost of ownership is considered due to		… electric cars are cheaper to run considering total ownership costs.[10]	… regular cars are more expensive to run considering total ownership costs.[11]

greatly reduced fuel and servicing costs.			
Electric cars are quiet, no engine noise and very responsive at low speeds.		[repetitive]	[repetitive]
Electric vehicles convert about 60% of the electrical energy from the grid to power at the wheels, conventional gasoline vehicles only convert about 19% of the energy stored in gasoline to power at the wheels.		… electric vehicles are very efficient – they convert about 60% of the energy source to power at the wheels.[18]	… regular vehicles are not very efficient – they only convert about 19% of the energy source to power at the wheels.[20]
The only emissions from all-electric vehicles come from the power plants generating electricity to charge their batteries, which is always less than burning fuel in a car's engine.		… the only emissions from using an all-electric vehicle are from the electricity generating plant, which is always less than burning fuel in a car's engine. [25]	… burning fuel in a car's engine always creates more emissions than from the electricity generating plant for using an all electric vehicle. [22]
The cost per mile to fuel an EV is approximately one-third to one-quarter the cost of gasoline (on a cost per mile basis).		… mile-for-mile you will save one-half to two-thirds of your fuel costs if you switch to an EV.[16]	… mile-for-mile it will cost you two to three times as much on fuel to run a regular car.[18]
Driving fuel based cars can burn a hole in your pocket as prices of fuel have gone all time high. With electric cars, this cost can be avoided as an average American spends $2000 - $4000 on gas each year. Though electricity isn't free, an electric car is far cheaper to run.		[Oil prices really low just now…]	]Oil prices really low just now…]