FROM CAR TO BIKE: MARKETING AND DIALOGUE AS A DRIVER OF CHANGE

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ABSTRACT

The Paris Climate Agreement has sent a key message to the international community regarding the need to increase efforts to move towards a low-carbon economy and help slow climate change, while underpinning global long-term economic growth and sustainable development.
COP 21 recognizes the social, economic and environmental value of voluntary mitigation actions and their co-benefits for adaptation, health and sustainable development.
In this framework, the PTP Cycle project, running from 2013 to 2016 and funded by the European Commission through the Intelligent Energy Europe program, introduces a non-market approach through voluntary participation in the adoption of sustainable transport modes such as cycling, based on marketing to potential customers through Personalized Travel Plans.
The medium-sized city of Burgos (Spain) and the cities of Ljubljana, Riga, Antwerp and London (boroughs of Haringey and Greenwich) developed a new policy instrument (Personalized Travel Plans) in order to increase bike patronage.
Beyond potential savings of CO2, the results show that PTP as a form of Active Mobility Consultancy is a suitable instrument to influence modal shift to public transport, walking and cycling, and to address the challenges of climate change, while fostering sustainable transportation by changing mobility behaviour.
These results, matching with the state-of-the-art of studies and pilot applications in other countries, allows deriving differentiated results for medium-size and large urban areas.
Keywords: PERSONALIZED TRAVEL PLANS, MARKETING, BEHAVIOURS CHANGE, PUBLIC TRANPORT, CYCLES

1. INTRODUCTION

According to worldwide estimations [1], about two thirds of final energy demand is linked to urban consumption, and up to 70% of CO2 emissions are generated in cities due to their greater use of fossil fuels (mostly for transport and housing). This scenario is strengthen when congestion occurs, leading to lower average speeds and affecting greenhouse gas (GHG) emissions per kilometre [2]. In the case of Spain, congestion continues to be a major problem, as about 5% of the network suffers delays of over 10 seconds per kilometre [3].
Skinner et al. [4] studied policy instruments to reduce GHG emissions, among other aims, with the primary purpose of reducing congestion. One of their findings concerned information to raise awareness and encourage behavioural change. They recommended introducing eco-driving for individuals and organizations, developing new technologies in the fields of transport and demand management, and providing attractive and accessible infrastructure. This approach, focused on private cars, has been widely accepted worldwide [5] [6].
Nevertheless, in the last few years many efforts have focused on a new policy instrument: behavioural change in transport through Personalized Travel Planning (PTP) [7]. This instrument is a form of Active Mobility Consultancy (AMC) and is a “soft” measure, as opposed to “hard” measures such as improving existing infrastructure. Whereas AMC is a

form of direct marketing in which citizens are directly approached to inform them of the sustainable travel options available [8], PTP is a consolidated method that enables people to think about the way they currently travel, and provides them with the information, advice and motivation to walk, cycle and use public transport more often. In other words, PTP is about breaking down subjective barriers to using sustainable transport and providing attractive and reliable information on the alternatives.

This paper includes the overall results from the PTP-Cycle project. First, there is a brief summary of the project objectives, along with a review of the literature on evaluating behavioural change in transport (Section 2). Section 3 describes the case study of Burgos, and section 4 contains the analysis of the results. The last section proposes some conclusions and policy recommendations.

2. PTP-CYCLE PROJECT

PTP-Cycle is a project that takes a holistic approach to delivering PTP by considering its development and application in different settings, namely place of residence, workplace and university. Although recognized in some countries, PTP is not yet common practice across Europe. PTP-Cycle aims to demonstrate that PTP activities are transferable and can be implemented in many different places and adopted by a wide range of target groups to produce increased levels of cycling, walking, public transport use and car-sharing. The project supports cities in their pursuit of reducing congestion and CO2 levels and ensuring better and cleaner air, and a healthier population.

The cities of Antwerp, Burgos, Ljubljana, London and Riga agreed on a joint scheme as partners in the project (Figure 1), supported by technical experts all over Europe. The segmentation of the population was a key issue since the aim of the project was to develop the first pan-European PTP delivery program, in which individuals identified as having the greatest potential for behaviour change were contacted in their homes, workplaces and universities.

Figure 1: Partners in the PTP-Cycle project

It is specifically approaching countries where cycling is far to be the main transport mode (figure 2), particularly Spain, where the selected case study is located.

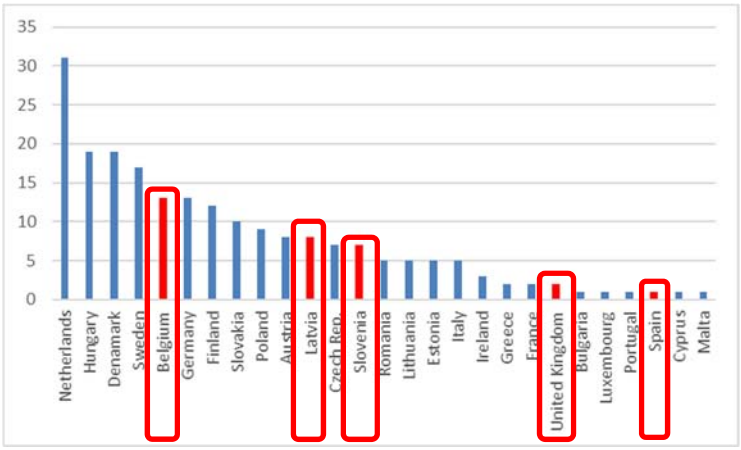

Figure 2: Cycling as main mode of transport in EU27 countries in 2013 [% of population]

Volunteers received information, advice and motivations tailored to their needs in order to convince them and help change their travel behaviour. The project was co-funded by the Intelligent Energy-Europe Program granted by the Executive Agency for Small and Medium-sized Enterprises (EASME).

Although the case study in this paper refers to the city of Burgos and its results, it is important to highlight that the main outcomes within the process of obtaining the final evaluation results of the project after one year were as follows [8]:

- Reduction in fuel consumption by cars: 401,000 liter;
- Decrease in car traveling: 7,931,000 km;
- Reduction in CO_2 emissions: 1,031 t;
- Reduction external costs for traffic noise in each city: € 13,500;
- Reduction in absenteeism: 2.2 sick days per person.

In short, the aim of the project was to prove that as a mechanism for behavioural change, PTP was transferable across a number sites and audiences, to many different countries, and is a cost-effective way of reducing greenhouse gas emissions and urban congestion whilst improving health and economic development, fully in line with the world sustainability goals.

3. EVALUATING BEHAVIORAL CHANGE IN TRANSPORT

The PTP approach is a travel advice conversation with people within the intended target audience to motivate them to rethink their day-to-day travel choices. This can take place in a range of settings including homes (on the doorstep), workplace, universities and schools, bus/rail stations, retail areas and at certain events. The conversation is basing on good-quality information on the options for using sustainable transport. PTP is not about changing anyone's lifestyle, it is rather about identifying small and relatively easy changes for people to adopt (at least at the outset), which can then collectively add up to a noticeable difference across the target audience.

It is also about inspiring people to change their behaviour and maintain these changes, or to go even further.

PTP relies on a basic premise, namely that transport users are generally rational decision makers, who have perfect knowledge and take decisions that maximize their utility [9]. However, a more proactive approach is required to help transport users to decide which alternative best suits them [10]. This approach, tested in several European and Australian cities through individualized marketing, leads to reductions of around 10% in private car use [11]. Based on Behaviour Change Theory, the stages in Figure 3 are often used to gauge a person's level of responsiveness and what support they might need [12].

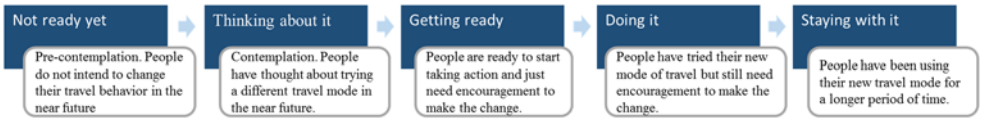

Figure 3: Stages of behaviour change

One of the most effective attempt at achieving behaviour change in mobility was the TravelSmart project, which succeeded in reducing car travel by an average of 10.4 km per household per day, a decrease of 18% [13]. In Victoria (Australia), one person in four, who cycled to work for the first time (as part of an event) was still cycling five months after receiving transport advice to change their travel behavior [14]. Avineri and Goodwin [15] suggested that PTP, in addition to workplace and school travel plans and general marketing campaigns, could reduce car use by 5÷10% overall or 10÷20% for specific types of journeys. However, PTP is not always individually applicable: when implemented in parallel with other "hard" measures, the effectiveness of "soft" measures may also increase [16].
The present study aims to contribute by quantifying the impact of PTP on behavioural change in mobility by analysing the results of the PTP-Cycle project in the case study of Burgos. More specifically, this paper adds to the knowledge of delivering a PTP project in residential areas. To achieve these objectives, several door-to-door PTP entered in force for workers and students in Burgos from September 2014 to November 2015.

4. CASE STUDY IN BURGOS

Burgos is a medium-sized city of some 177,000 inhabitants with an area of 107 km^2, located in the north of Spain. The city has about 30 urban bus lines, 9 metropolitan bus lines and a bicycle sharing system (Bicibur). Sustainable mobility is a key priority, and since 2005, the city has worked hard to increase the number of cyclists with new cycling facilities, a bicycle loan system and multiple marketing and dissemination activities.
Walking and cycling can contribute significantly to sustainable transportation objectives, leading to healthier lifestyles and improving neighbourhoods, while substantially lowering traffic and pollution levels [17].
The aim of the PTP-Cycle project is to advise citizens about sustainable options for travelling to work or study. Several survey waves starts in September 2014 and proceeded for more than one year.

5. PTP-CYCLE PROJECT DELIVERY

The different phases of the PTP-Cycle project in Burgos are in synthesis in this chapter and more extensively in the PTP-Cycle Methodology Guide [18]. The following stages are the basis for the subsequent door-to-door engagement.

a) Choosing the target area. The objective is to maximize the reach of engagement and its respective impacts. This includes assessing the transportation options for traveling sustainably and identifying the information/services available to enhance

it. The elements considered are landscape, infrastructures, resources, public transport, housing and culture, and information.

b) Identifying the target audience. People will be more responsive depending on where they are on the behavior change spectrum (Figure 3). Project resources maximizes by targeting people with a greater propensity to change. This requires analysing the population to seek out high levels of car ownership, low levels of active travel, short car journeys and issues around poor air quality.
c) Timing. The best time to hold travel advice conversations is from spring to autumn, when the weather is generally better.
d) Awareness raising. This phase is necessary to prepare the target audience for engagement. Some ideas include branding and linking with existing schemes, posters and leaflets, TV, events and social media.
e) Travel advice. PTP works by highlighting the positive effects of sustainable transport and making it 'normal', along with supporting and encouraging rather than asking individuals to change their behavior. More information is in the PTP-Cycle Training Manual [19].
f) Information pack. All the information provided should be personal and relevant, up-to-date, clear and attractive.
g) Evaluation of behavior change. The aim is to demonstrate the effectiveness of behavior change. More information is in the PTP-Cycle Monitoring and Evaluation Guide [20].

6. DOOR-TO-DOOR ENGAGEMENT

The aim of the door-to-door engagement was to inform residents about the transport alternatives that best suited them. Sixteen travel advisors (TAs) took part in this task in several survey waves. Once the target audience was selected, the TAs contacted people who did not use a sustainable mode of transport (basically private car) to offer them customized origin-destination information for about 15 minutes, regarding bus, bicycle systems and private bicycle. The target audience is the result of the analysis of census datasets and workplace travel surveys to find people with a greater propensity to change. Information on age and distance to the city centre helps when forming the samples. The city of Burgos targeted over 10,000 households (attempted visits), contacted 7,800 (visited) and delivered (agreed to receive PTP) more than 5,000 PTPs throughout the duration of the project. Table 1 includes information on the date, number of respondents and a description of all the samples considered in the analysis, and differentiates two wider groups: residential, people who received PTP, and the control group, not interested in taking part, to test differences in behavioural change from the beginning and in the long term.

2,960 households of workers and students were contacted first by knocking directly on the door. The TAs made three attempts at different times of day and if they were unsuccessful, they left a leaflet explaining they had tried to contact the resident and the nature of the project, and including a contact email and telephone number in case they were interested in meeting at some point. The TAs asked about the availability of private vehicles, their mobility to their place of work or study, frequency and distance, any seasonal mobility patterns, gender and age and, finally, an email for evaluation purposes. Although the surveys reached more than 2,000 emails, only 403 answered in the short term and 389 in the long term. Other tools were used in addition to email: Survey Monkey (50 persons) and phone (100 persons). People also received updates on the public system (bus, bike-sharing system) as they agreed to receive this type of communication when they gave their email.

Table 1: Samples in the PTP-Cycle project. Case study of Burgos

Sample number	Sample	Date	Respondents - Workers	Respondents - Students	Total number of respondents
1	Residential	September 2014 October 2014	2,406	554	2,960
2	Residential - Short term	November 2014 January 2015	230	173	403
3	Residential - Long term	September 2015 October 2015	229	160	389
4	Control group	September 2014	205	40	245
5	Control group - Long term	November 2015	204	39	243

In parallel, 245 workers and students formed the control group, which did not receive any PTP advice. This group allows the comparison of differences in behavioural change in the short and long term, by answering about their travel patterns on their way to work or study.
Samples were representative of the total population. The residential sample was composed of 44% male and 56% female respondents, with an average age of 48 years. The control group was 45% male and 55% female, with an average age of 47 years. The average distance to work and school or college is 3.3 and 2.7 km respectively.

7. ANALYSIS OF RESULTS

In the PTP conversation, the targeted individuals answered about their current behavior for all trips and their obligatory mobility. Table 2 shows the number of trips per mode, person and week, and the standard deviation. Differences exist in the comparison of initial and final behaviours.
The results from Table 2 reveal insignificant variations in behavior between the control group (workers and students) in a yearlong period. However, positive differences are in the target population. This suggests that the PTP methodology was successful in achieving its objectives.
The number of total trips by car as a passenger was significantly reduced (and even trips by motorbike) at the expense of an increase in the number of trips by bicycle, which almost doubled. Although the variation in the number of trips by car is not significant, there was also a reduction in the average value.
The results varied slightly in the case of work trips compared to the previous case. The average number of trips by private motor vehicles (car as a driver and as a passenger, and motorbike) remained unchanged, and even increased in the short-term sample. This depends upon the fact that the short-term sample took place in winter, which affects people's travel behavior [21]. However cycling trips increased even in winter and even more so over the

whole year (by a factor of almost five), which is the most important achievement of the project. It is also noticeable that trips by public transport decreased significantly. The increase in cycling trips is explicable by this decline in public transport trips.

Table 2: Trips per mode, person, week, and standard deviation

	Walking	**Cycling**	**Tram /bus**	**Motorbike**	**Car (passenger)**	**Car (driver)**
All trips						
Residential	3.38 *(1.87)*	0.76 *(1.37)*	1.52 *(1.69)*	0.06 *(0.54)*	0.47 *(1.09)*	2.41 *(2.25)*
Residential – Short term	3.40 *(1.86)*	1.08 *(1.67)***	1.56 *(1.72)*	0.08 *(0.60)*	0.59 *(1.22)***	2.33 *(2.16)*
Residential – Long term	3.37 *(1.89)*	1.36 *(1.80)***	1.47 *(1.67)*	0.03 *(0.36)**	0.38 *(1.06)**	2.28 *(2.16)*
Employees						
Residential	1.29 *(2.11)*	0.34 *(1.18)*	0.65 *(1.60)*	0.04 *(0.38)*	0.13 *(0.73)*	2.70 *(2.40)*
Residential – Short term	1.32 *(2.12)*	0.55 *(1.47)***	0.50 *(1.40)**	0.06 *(0.53)*	0.14 *(0.72)*	2.82 *(2.35)*
Residential – Long term	1.42 *(2.18)*	1.51 *(2.09)***	0.45 *(1.31)***	0.04 *(0.47)*	0.13 *(0.70)*	2.64 *(2.38)*
Control group	1.32 *(2.11)*	0.30 *(1.09)*	0.80 *(1.75)*	0.01 *(0.07)*	0.06 *(0.52)*	2.65 *(2.38)*
Control group – long term	1.34 *(2.12)*	0.35 *(1.15)*	0.79 *(1.74)*	0.01 *(0.07)*	0.06 *(0.51)*	2.67 *(2.38)*
Students						
Residential	2.14 *(2.43)*	0.69 *(1.52)*	1.20 *(1.95)*	0.02 *(0.31)*	0.18 *(0.74)*	0.74 *(1.64)*
Residential – Short term	2.57 *(2.42)***	0.75 *(1.60)*	1.17 *(1.97)*	0.03 *(0.23)*	0.27 *(1.02)*	0.68 *(1.56)*
Residential – Long term	2.58 *(2.39)***	1.15 *(1.89)***	1.19 *(1.96)*	0.01 *(0.21)*	0.15 *(0.84)*	0.54 *(1.43)**
Control group	2.00 *(2.30)*	0.59 *(1.51)*	1.40 *(2.09)*	0.00 *(0.00)*	0.05 *(0.22)*	0.82 *(1.74)*
Control group – long term	2.05 *(2.30)*	0.67 *(1.61)*	1.44 *(2.10)*	0.00 *(0.00)*	0.03 *(0.16)*	0.72 *(1.62)*

(*) Significantly different from initial average results at 90% level
(**) Significantly different from initial average results at 95% level

Students stand out as the group with the greatest propensity to change towards more sustainable behavior. Walking and cycling significantly increased at the cost of a decrease in car trips as a driver. Trips by public transport, motorbike and car as a passenger did not vary. As noted by Balsas [22], college campuses are ideal places for communicating sustainability and for helping reshape society's transportation patterns.

It would be interesting to calculate the modal split with the results of Table 1 to compare the groups. Table 3 shows the last modal split in Burgos (2012), and the modal split of workers and students for all trips, and for their obligatory mobility. Differences with the real modal split depends upon the absence of retired people and students from the sample. A slight decrease appears in the use of the car in the control group, which received no PTP, and an increase in the use of public transport. This fact is to take into consideration when analysing each group.

Table 3: Modal split in each sample

	Walking	**Cycling**	**Tram/bus**	**Motorbike**	**Car**
Modal split (2012)	46.60%	4.20%	21.00%	1.20%	27.00%
All trips – Residential	39.30%	8.84%	17.67%	0.70%	33.49%
All trips – Residential long term	37.91%	15.30%	16.54%	0.33%	29.92%
Employees – Residential	25.05%	6.60%	12.62%	0.78%	54.95%
Employees – Residential long term	22.94%	24.39%	7.28%	0.64%	44.75%
Employees – Control group long term	25.67%	6.70%	15.13%	0.19%	52.31%
Students – Residential	43.06%	13.88%	24.14%	0.40%	18.51%
Students – Residential long term	45.91%	20.46%	21.17%	0.18%	12.28%
Students – Control group long term	41.75%	13.65%	29.33%	0.00%	15.27%

In all trips, workers and students cycled more often and slightly reduced their use of other modes (walking, public transport, motorbike and car). Workers travelled almost 20% more by bicycle, at the cost of a reduction in the percentage of walking and public transport, and, most importantly, trips by car, which fell by 10%. The results in Table 2 were not significant for cars, although there was a substantial difference in trips by car compared with the global modal split. This variation is also significant considering the changes in the control group.

Students showed a similar trend in terms of trips by car and public transport. However, the increase in the number of bicycle trips is less than for workers. Students preferred cycling, but also walking more often. This is the main difference between groups. Walking is not an alternative to sustainable travel when going to work, but it is when travelling to a place of study. We can therefore conclude that delivering PTP achieved effective results and significantly varied the existing modal split to make it more sustainable.

One of the most important targets of the PTP-Cycle project is to maintain these variations in mobility behavior over time. According to the respondents' statements, 34% said they intended to maintain their new behavior.

Moreover, PTP delivery helps disseminate information about how to travel sustainably. This may be unnecessary, considering the vast amount of information available on the internet.

However, 85.6% of the respondents found the advice and materials useful, indicating that there is still much to do to bring the information to the attention of the public. These overall results, along with best practices and the experience acquired during the PTP delivery, point to a number of policy recommendations.

8. DISCUSSION AND CONCLUSIONS

Despite the fact that the energy sector is by far the largest source of air pollution emissions [23], the main environmental concern in cities comes from the transportation sector, since it is the fastest growing consumer of fossil fuels, and produces CO_2 and air pollutant emissions. In Europe alone, urban mobility accounts for 40% of all CO_2 emissions and up to 70% of other pollutants from road transport [24]; according to the UITP [25], 23% of greenhouse gas emissions worldwide are attributable to transport, and urban land transport emissions are set to double by 2050. To paraphrase May [26], these figures amply demonstrate that it is not only European urban transport policies that are currently far from sustainable.

This paper provides evidence of the advantages of delivering a PTP project in a medium-sized city to look for benefits such as lower fuel consumption and emissions, reductions in car running and traffic noise and drop in absenteeism. Although PTP is not yet common practice across Europe, it is an efficient tool for achieving more sustainable cities: its effects vary when applied to different groups (workers and students).

After receiving PTP, workers cycled more, albeit, normally, by decreasing trips in public transport. This is not a desirable effect, as while this is certainly a sustainable change. On the contrary, the use of the car, which is the main target for decrease, remains unchanged. Students have greater potential to change their behavior sustainably. The number of trips per week by car as a lone driver decreases in favour of more frequent walking and cycling. Students are thus the group that experiences the greatest sustainability benefits.

The respondents said they cycled more often for all trips, but the use of all other modes of transport remained unchanged from the beginning of the evaluation. In any case, the project produced a greater use of private bicycles. The control group behaviour confirmed the results, which highlighted no significant differences in this group in the study period.

The PTP technique also proved to be an essential tool for the rapid conversion of the modal split of the target population. It serves as a soft measure whose application can contribute to solve mobility issues in the short term (one year). In our case study, the percentage of trips by car was almost 10% less, giving an idea of the potential of this tool.

Additional activities can raise the awareness among members of the community, who are not in principle involved: e.g. local events, such as fairs and neighborhood festivities provide an opportunity for transport advisors to contact residents directly in a more successful manner than engaging with them on their doorstep or by telephone.

Finally, as future work it would also be worthwhile to deliver PTPs in rural areas, where the balance in the modal split tends more relevantly towards private motorized vehicles.

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