Can multimodal trip planning alter the travelers' mobility behavior? A cross-European study.

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***Abstract*— The availability of multimodal information is expected to shift travelers to environmentally-friendly transport modes. A questionnaire study was conducted in three European regions, Catalonia (Spain), Berlin (Germany) and Trikala (Greece), among 95 travelers who were asked to use a specific multimodal trip planner in their everyday life. The travelers' attitudes towards the planner were positive and they expected it to be beneficial, offering them more possibilities to find the optimum route, enhancing their comfort and reducing their stress while travelling. Some decrease in the frequency of use of private car and increase in the frequency of use of public transport and walking before and while using the planner were found in two of the regions. Users did not expect a change in the number of journeys done by private car or public transport due to the usage of the planner. Although the findings have to be further verified, the present study indicates that the availability of information about environmentally-friendly transport modes via a multimodal trip planner, is rather not enough to achieve a shift of travelers to such modes. The adequate planning and integration of green transport services within a sustainable urban mobility plan and a supporting policy framework are also needed to achieve the greening of urban and interurban transport.**

I. Introduction

Road transport contributes about one-fifth of the European Union's total emissions of carbon dioxide and light duty vehicles produce around 15% of that [1]. Private cars represent 72.3% of all passengers kilometers in the EU [2]. The communication COM/2014/015 of the European Commission sets a greenhouse gas emission reduction target of 40% in 2030 relative to emissions in 1990 [3].

Efforts have been undertaken to shift travelers to greener transport modes. Such efforts are based, among others, on promoting the integration of transport modes and on making the information about multimodal itineraries available to travelers, so as to improve the attractiveness and convenience of using other modes instead of a private car [4]. The white paper "Roadmap to a Single European Transport Area" of 2011 [5] includes the promotion of awareness of the availability of alternatives to individual conventional transport (i.e. drive less, walk and cycle, car sharing, park & drive, intelligent ticketing etc.) as means to promote more sustainable travelers' behavior. According to the same white paper, this may be achieved by the development and use of intelligent systems for multimodal information and scheduling of travelers' trips.

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Several multimodal trip planners have been developed and some are available in the market, but results on their effects on travelers' mobility behavior in real life are not documented in the literature. Few findings are available and only as part of local studies of performance and acceptance of the planners themselves. In a questionnaire survey among 71 people in the city of Stockholm [6], before and after nine months of availability of a multimodal planner, 9% of them (5 people) stated using more often the public transport than earlier, only one stated having decreased the frequency of use of private car. None expected a further decrease in car usage or increase in public transport usage after further using the planner. In a questionnaire study in the city of Lyon among 50 participants, no influence on the stated modal share was found after using a multimodal information application for smartphones for five months [7].

Based on the same methodological approach, this work aimed to study in more detail the effects of using a multimodal trip planner on mobility, by collecting and analyzing richer data from more users via a cross-European experimentation. More specifically, the primary objective of the work presented in this paper was to study whether the availability of information about multimodal trips, via a multimodal trip planner, would have an effect on travelers' mobility behavior in real life conditions, namely whether travelers would use greener means, like public transport or would walk, even as part of multimodal trips, instead of using their private car. A secondary objective was to analyze the travelers' perceptions and attitudes towards a multimodal trip planner and their expectations about its possible impacts on mobility.

The rest of the paper is structured as follows. Section II presents the data collection methodology and the analysis. Section III describes the findings, Section IV includes the discussion and links the findings with results of previous studies, while Section V is the general conclusion.

II. Methodology

A. Location of the study

A questionnaire study was designed and took place in three different European regions from September to December 2015. The regions were Catalonia (Spain), Berlin (Germany) and Trikala (Greece). They were selected so as to represent different geographical areas in Europe with different traffic networks. Berlin is a large and densely populated metropolitan area with a big variety of different modes of transport, including innovative services like bicycle sharing. Trikala is a small city in central Greece with a population of 76,000, with few transport modes alternatives. The city center is congested and parking is not easy, so effort

is given to decongest it. Catalonia is a region including different municipalities of variable size, one of them being Barcelona. The total population is around 3.2 million, and the transport network includes urban and interurban public transport and sustainable modes like bicycle sharing services.

B. *The multimodal trip planner and ITS platform*

Within the framework of the MyWay project (www.myway-project.eu), co-funded by the Seventh Framework Programme of the European Commission, an integrated smart mobility resource manager was developed, to enable the efficient use of mobility resources and services in a region in a seamless way. The smart mobility resource manager offered to the end users transport information and the possibility to plan urban and interurban multimodal trips. In more detail, it provided dynamic information about the availability of all transport modes in each of the three regions, including public transport, flexible on-demand services, car and bicycle sharing services, while private car and walking were also considered. The multimodal trip planner was able to calculate and propose multimodal itineraries to travelers according to their preferences and according to dynamic data about availability and actual context, by submitting specific queries and combining the results of other existing planners in each region [8]. The multimodal trip planner of MyWay is available for download as an app for android and iOS operating systems.

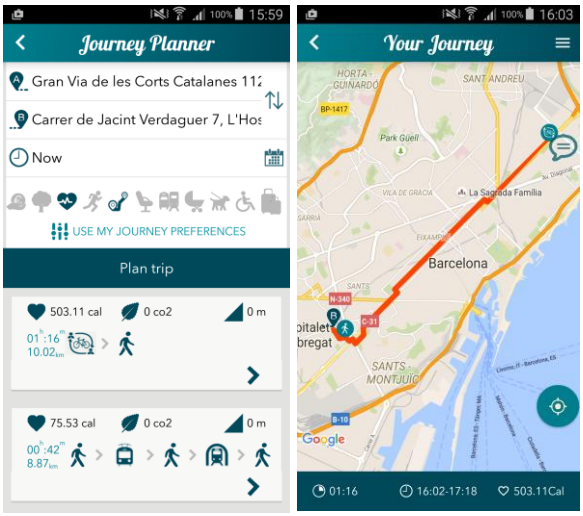

Figure 1. Screenshots of the trip planner

C. *Participants and data collection tools*

Participants in each region were recruited via local press and internet announcements. They were asked to download the trip planner and use it as they would wish in their everyday life. No specific instructions for its use were given. Participants were asked to register online and participate in the study. For this, they were initially asked to complete a background questionnaire. While using the planner, they were asked to complete a Subjective Evaluation Questionnaire (SEQ) three times, at time points selected so as to split the data collection period in equal intervals. The aim was to study whether responses would variate with time, namely with increasing familiarization with the trip planner. Questionnaires are appropriate tools for conducting wide scale surveys on travel and mobility patterns [9].

The background questionnaire collected the users' demographic data and their initial mobility habits. They were asked how often they had used several transport modes during the week before completion of the questionnaire. Each of the SEQs collected data about: i) the travelers' perceptions relevant to the technical performance of the trip planner, as compared to other commercial trip planners, ii) their stated mobility behavior, i.e. the frequency of using each transport mode during the week before completing each of the SEQs, iii) their attitudes towards the multimodal trip planner and iv) their expectations as regards the impact of such a multimodal planner on issues relevant to mobility in general. The first set of questions aimed to survey whether the trip planner employed in this study was of similar functionality to other commercial planners. If yes, then the findings of this survey as regards the rest questions could be indicative of users' behavior, attitudes and expectations as a result of using other multimodal planners.

D. *Analysis*

The questions in the background questionnaire and in the SEQ were formed as statements. Possible responses were given as Likert items [10]. The responses in five-level Likert items have been coded in a -2 to +2 scale, where -2 was the worst rating (i.e. "Strongly disagree" or "Definitely worse") and + 2 the best rating (i.e. "Strongly agree" or "Definitely better"), while 0 was the neutral rating. The possible answers to the question about the frequency of using each transport mode during the week before completing each questionnaire, were coded as follows: 0 - "Never", 1 – "Only once", 4 – "Several days a week", 7 – "Every day", 14 – "More than once a day". For each question the weighted mean [11] of all users' responses has been calculated.

Wilcoxon Signed-Rank tests were used to check for statistically significant differences between responses in the background and in the SEQs completed in each of the three time points (denoted as SEQ-1, SEQ-2 and SEQ-3). When used in data sets of 7-point Likert scales, the Wilcoxon Signed-Rank has been found to have higher power than the t-test for almost all combinations of sample size and alpha level [12].

III. RESULTS

95 persons, 61 in Catalonia, 11 in Berlin and 23 in Trikala, completed the background and all three SEQs. 65 of respondents were male and 30 were female, their mean age was 37.9 years. All participants were familiar with other commercial trip planners and all of them reported having used or being using such trip planners. It must be noted that none of the other planners integrates all transport modes in each region.

A. *Perceptions about the planner's technical performance*

Initially, users were asked to compare the performance of the MyWay trip planner against the performance of other commercial planners. Their responses in each of the three SEQs to the questions "How do you evaluate the MyWay response time compared to other planners?", "How reliable is the information provided by MyWay compared to other planners?" and "I think that I would like to use this system more frequently than other planners" are shown in Table I.

In general, the users' responses were consistently very close to the neutral rating, meaning that they perceived the response time and reliability of information of the trip planner employed in the study as comparable to that of the other trip planners. For example, the weighted mean of responses as regards response time in the third time point (SEQ-3) was -0.08 in Catalonia, -0.36 in Berlin and 0.13 in Trikala, while as regards reliability of information they were -0.03 in Catalonia, 0.09 in Berlin and, rather more positive, 0.52, in Trikala. Similarly, users were as eager to use the MyWay multimodal trip planner as other trip planers. Indeed, their responses were consistently close to the neutral rating, which represents the answer "I would use it as frequently as other planners". For example, the weighted mean of their responses in the third time point (SEQ-3) was 0.36 in Catalonia, 0.27 in Berlin and 0.17 in Trikala. Users' perceptions about the technical performance of the MyWay trip planner, as compared with that of other commercial trip planners, were stable in time, as the Wilcoxon signed-rank test did not detect any difference between responses per time point.

TABLE I. USERS' PERCEPTION ABOUT THE PERFORMANCE OF THE TRIP PLANNER USED COMPARED TO THAT OF COMMERCIAL TRIP PLANNERS

Site	**Performance of trip planner used, as compared to that of other trip planners**			
	Time point	***Response time***	***Reliability of information***	***Willingness to use***
Catalonia	SEQ-1	-0.16	0.13	0.13
	SEQ-2	-0.13	-0.16	0.19
	SEQ-3	-0.08	-0.03	0.36
Berlin	SEQ-1	-0.18	0.09	0.45
	SEQ-2	-0.27	0.00	0.36
	SEQ-3	- 0.36	0.09	0.27
Trikala	SEQ-1	0.13	0.48	0.21
	SEQ-2	0.26	0.52	0.30
	SEQ-3	0.13	0.52	0.17

B. Stated frequency of use of transport modes

The weighted means of users' stated usage of transport modes before using the multimodal trip planner, as recorded in the background questionnaire, and at the three time points along the tests, as captured by the three SEQs, are shown in Table II.

Users in Catalonia reported using less often their private car while using the multimodal trip planner. The weighted mean of their responses was 3.56 in the background questionnaire versus 2.97 in SEQ-3. The same holds true for Trikala, the weighted mean was 6.21 in the background questionnaire versus 4.13 in SEQ-3.

On the opposite, users in Catalonia reported using public transport more often while using the multimodal trip planner, the weighted mean of responses was 5.39 in the background questionnaire, while it was always higher in all three SEQs, for example it was 6.07 in SEQ-3. The same trend was seen in Trikala, the weighted mean of responses was 0.30 in background versus 0.65 in the SEQ-3.

As regards walking the whole trip, there was no change reported in Catalonia, the weighted mean of responses was 6.4 in the background questionnaire and 6.5 in SEQ-3. The frequency of walking seemed to increase in Trikala, the weighted mean was 4.4 in the background questionnaire versus 5.2 in SEQ-3.

The findings were different in Berlin as regards the stated frequency of using private car and public transport. In Berlin, the stated usage of private car seemed to increase when using the multimodal trip planner, the weighted mean of responses was 0.90 in the background questionnaire and 2.46 in SEQ-3, while the stated usage of public transport seemed to decrease, the weighted mean was 11.3 in the background questionnaire and 8.37 in SEQ-3. The stated frequency of walking seems to fluctuate per time point in Berlin, the weighted mean of responses ranges between a minimum of 6.2 to a maximum of 8.6 in SEQ-2.

As regards the rest transport modes, the usage of moped seemed to decrease in Catalonia and to increase in Trikala, no significant usage was reported in any of the questionnaires in Berlin. No significant changes were reported as regards the usage of public bicycles and on-demand transport in any of the three regions.

The users' responses seem stable with time, as no significant difference in answers between the three SEQs was identified by the Wilcoxon signed-rank test.

TABLE II. STATED USAGE OF TRANSPORT MODES DURING THE WEEK BEFORE EACH QUESTIONNAIRE (0: NEVER, 14: MORE THAN ONCE A DAY)

Site	**Stated Usage of Transport Modes**			
	Time point	***Private Car***	***Public Transport***	***Walking the whole trip***
Catalonia	Background	3.56	5.39	6.4
	SEQ-1	3.04	6.16	6.6
	SEQ-2	3.10	5.78	6.4
	SEQ-3	2.97	6.07	6.5
Berlin	Background	0.90	11.3	6.5
	SEQ-1	2.46	8.73	6.2
	SEQ-2	2.18	8.73	8.6
	SEQ-3	2.46	8.37	6.5
Trikala	Background	6.21	0.30	4.4
	SEQ-1	6.17	0.17	5.2
	SEQ-2	4.69	0.22	5.6
	SEQ-3	4.13	0.65	5.2

Site	**Stated Usage of Transport Modes**			
	Time point	***Moped***	***Public bicycle***	***On-demand transport***
Catalonia	Background	3.86	0.88	0.15
	SEQ-1	0.89	1.27	0.05

Site	Stated Usage of Transport Modes			
	Time point	*Moped*	*Public bicycle*	*On-demand transport*
	SEQ-2	0.93	0.82	0.09
	SEQ-3	0.93	1.24	0.29
Berlin	Background	0.06	0.30	1.35
	SEQ-1	0	0.23	0.46
	SEQ-2	0	0.67	2.23
	SEQ-3	0	0.08	1.54
Trikala	Background	1.52	0.52	0.65
	SEQ-1	2.23	0	0.04
	SEQ-2	1.62	0.04	0.26
	SEQ-3	2.39	0.18	0.44

C. Assessment of users' attitudes towards the planner

The users' attitudes towards the multimodal trip planner used in this study are shown in Table III.

In all three regions the users' immediate reaction was always positive. In Catalonia the weighted mean of responses ranged between a minimum 0.44 (in SEQ-2) to a maximum of 0.51 in SEQ-3. In Berlin the users' immediate reaction was even more positive than in Catalonia, the weighted mean was over 1 in all three SEQs. In Trikala the weighted mean ranged between 0.74, in SEQ-1 and SEQ-2, to 0.44, in SEQ-3.

Similarly, the users' overall satisfaction with the multimodal trip planner was always positive. In Catalonia the weighted mean of responses ranged between 0.27 in SEQ-1 to 0.42 in SEQ-3, indicating that the users were closer to the neutral response. In Berlin the overall satisfaction ranged between 0.45, in SEQ-2 and SEQ-3, to 0.54, in SEQ-1, meaning that the users were "rather satisfied". In Trikala the overall satisfaction ranged between 0.69 in SEQ-1 to 0.21 in SEQ-3, meaning that the users were between "rather satisfied" and "neutral".

As regards the potential benefit of having access to the multimodal trip planner, users in Catalonia expected a more than moderate benefit at all three time points, the weighted mean of their responses was 0.20 in SEQ-1 and 0.25 in SEQ-3. Users in Berlin expected a higher benefit than in Catalonia, the weighted mean of responses ranged from 0.54 in SEQ-1 to 0.88 in SEQ-3, indicating that they expected a "Large benefit". Users in Trikala expected a "moderate benefit", the weighted mean of their responses ranged between -0.14 in SEQ-1 to 0.07 in SEQ-2 and SEQ-3.

Users' responses were stable across time, as no statistically significant difference was found by the Wilcoxon signed-rank test.

TABLE III. ATTITUDES TOWARDS THE MULTIMODAL TRIP PLANNER

Site	Attitudes towards the multimodal trip planner		
	Time point	*Immediate reaction (-2: Very negative, +2: Very positive)*	*Overall satisfaction (-2: Not at all, +2: Completely)*	*Potential benefit (-2: No benefit, +2: Very large benefit)*
Catalonia	SEQ-1	0.49	0.27	0.20
	SEQ-2	0.44	0.29	0.18
	SEQ-3	0.51	0.42	0.25
Berlin	SEQ-1	1	0.54	0.54
	SEQ-2	1.1	0.45	0.88
	SEQ-3	1	0.45	0.88
Trikala	SEQ-1	0.74	0.69	-0.14
	SEQ-2	0.74	0.30	0.07
	SEQ-3	0.44	0.21	0.07

D. Expected impacts according to the users

The users' expectations about the impacts of using a multimodal trip planner are shown in Tables IV and V.

Users in Catalonia expected that the possibility to choose the optimal route according to their preferences will "slightly increase" when using the multimodal trip planner, the weighted mean of their responses ranged between 0.44 in SEQ-1 to 0.73 in SEQ-2. The same holds true in Berlin, the weighted mean of responses ranged between -0.09 in SEQ-1 to 0.6 in SEQ-2. Users in Trikala were more neutral as regards the possibility to choose an optimal route, the weighted mean of their responses ranged between 0 in SEQ-3 to 0.43 in SEQ-1.

No effect on their comfort while travelling when using the multimodal trip planner was expected by users in Catalonia and Trikala, the weighted mean of their responses is closer to the neutral ratings in all SEQs. Still, in Berlin users expected that their comfort will "rather increase", as the weighted mean of their responses ranged between 0.63 in SEQ-2 to 0.81 in SEQ-1.

Again, the users' expectations were stable with time, as no differences between responses per SEQ were found using the Wilcoxon signed-rank test.

TABLE IV. EXPECTED IMPACTS OF THE MULTIMODAL TRIP PLANNER (-2: Will radically decrease, +2: Will radically increase)

Site	Expected impacts of the multimodal trip planner		
	Time point	*Possibility to choose optimal route according to preferences*	*Comfort*
Catalonia	SEQ-1	0.44	0.32
	SEQ-2	0.73	0.31
	SEQ-3	0.59	0.32
Berlin	SEQ-1	-0.09	0.81
	SEQ-2	0.6	0.63
	SEQ-3	0.54	0.72
Trikala	SEQ-1	0.43	0.08

Site	Expected impacts of the multimodal trip planner		
	Time point	*Possibility to choose optimal route according to preferences*	*Comfort*
	SEQ-2	0.21	0.08
	SEQ-3	0.0	0.13

Users in Catalonia and Trikala expected a slight decrease on their stress associated with travelling while using the multimodal trip planner, as the weighted mean of their responses was close to neutral in all SEQs. Users in Berlin expected that their stress will "slightly decrease", the weighted mean of their responses ranged between 0.71 in SEQ-1 and SEQ-3 to 1.09 in SEQ-2.

Users in all three regions did not expect an effect on the time required to reach their destination, since their responses were close to the neutral ("no effect") response in all SEQs. Similarly, they did not expect an effect on fuel consumption, since their responses were close to the neutral ("no effect") response in all three SEQs.

Again, their expectations were stable in time, as no differences between responses were found using the Wilcoxon signed-rank test.

TABLE V. EXPECTED IMPACTS OF THE MULTIMODAL TRIP PLANNER (-2: Will radically increase, +2: Will radically decrease)

Site	Expected impacts of the multimodal trip planner			
	Time point	*Stress*	*Time to reach destination*	*Fuel consumption*
Catalonia	SEQ-1	0.27	0.24	0.26
	SEQ-2	0.29	0.24	0.24
	SEQ-3	0.22	0.34	0.36
Berlin	SEQ-1	0.72	0.0	0.18
	SEQ-2	1.09	0.36	0.45
	SEQ-3	0.72	0.27	0.0
Trikala	SEQ-1	0.04	0.08	0.0
	SEQ-2	0.13	0.21	0.09
	SEQ-3	0.17	0.08	0.0

The users' expectations about the impact of using the multimodal trip planner on the frequency of using private car and public transport are shown in Table VI. Users in all three regions did not expect a change in the number of journeys by car while using the multimodal trip planner, as the weighted mean of their responses was close to neutral in all SEQs, for example in SEQ-3 it was 0.24 in Catalonia, 0.27 in Berlin and 0 in Trikala. Similarly, users in Catalonia and Trikala did not expect a change in the number of journeys by public transport while using the multimodal trip planner, as the weighted mean of their responses was close to neutral in all SEQs, for example in SEQ-3 it was 0.27 in Catalonia and 0.04 in Trikala. Still, users in Berlin expected that the number of journeys by public transport will "slightly increase", the weighted mean of their responses ranged between 0.54 in SEQ-1 to 0.72 in SEQ-3). The expectations were stable with time, as no differences between responses per time point were found using the Wilcoxon signed-rank test.

TABLE VI. ESTIMATIONS ABOUT IMPACT ON NUMBER OF JOURNEYS BY CAR (-2: WILL RADICALLY INCREASE, +2: WILL RADICALLY DECREASE) AND BY PUBLIC TRANSPORT (-2: WILL RADICALLY DECREASE, +2: WILL RADICALLY INCREASE)

Site	Impacts of multimodal trip planner on frequency of using transport modes		
	Time point	*Private car*	*Public Transport*
Catalonia	SEQ-1	0.24	0.26
	SEQ-2	0.21	0.27
	SEQ-3	0.24	0.27
Berlin	SEQ-1	0.27	0.54
	SEQ-2	0.36	0.54
	SEQ-3	0.27	0.72
Trikala	SEQ-1	0.13	0.08
	SEQ-2	0.04	0.08
	SEQ-3	0.00	0.04

IV. DISCUSSION

The main aim of this work was to study the mobility behavior of travelers while using a multimodal trip planner in real world scenarios and to assess whether the usage of a multimodal trip planner could shift them to greener modes of transport, for example to public transport or walking, even as parts of a multimodal trip, instead of using their private car.

Unlike previous studies, the present work focused specifically on these questions, the analysis was based on data collected by a bigger sample than in previous studies, 95 travelers, and covered three different European regions (i.e., Catalonia, Berlin and Trikala) of diverse transportation networks. Users in each region were asked to use a multimodal trip planner as they would wish in their everyday life. It must be emphasized that the study was conducted in a real world setting which is a novelty of the presented work, however this had the drawback of not being possible to control the sample size and synthesis and the experimental conditions as this can be done in an experimental or laboratory setting. Still, the real world studies provide ecological validity which cannot be achieved by experimental settings [13].

The multimodal trip planner employed in the study was perceived by participants as of similar technical performance as other commercial planners and participants were equally willing to use it. These findings seem to indicate that the travellers' responses in this study were not affected by any negative attitudes towards this specific trip planner and could be indicative of their responses when using other planners too.

No consistent changes as regards the stated usage of transport modes were found in this survey. Participants in Catalonia and Trikala stated that they had been using more

frequently public transport and less frequently the private car when they had access to the multimodal trip planner, while in Berlin participants stated the opposite. Participants in Trikala stated that they choose walking more frequently, while no such change was found in Catalonia and Berlin. As the sample sizes in Berlin and Trikala were low, these findings should be considered with care. Still, these differences among regions may be due to the participants' initial mobility patterns and the differences in traffic networks in each region. One possible explanation is that participants in Catalonia and Trikala had initially lower awareness and were using less frequently public transport, while this was the opposite in Berlin. This is supported by the initial stated frequency of using public transport, which was already high in Berlin (11.3), while it was lower in Catalonia (5.39) and even lower in Trikala (0.3). This supports the argument that travelers in Berlin were frequently using public transport before their involvement in this study, so the multimodal trip planner did not have an impact on their behavior in this direction.

No noteworthy changes were reported as regards the frequency of usage of less integrated modes, like mopeds, public bicycles and on-demand transport. This can serve as an indication that the availability of information about such services, i.e. via a multimodal trip planner, is not enough to shift travelers to such transport modes. This finding is in accordance to previous studies of multimodal trip planners [6, 7].

Furthermore, the above findings appear to be in line with the previously reported role of habit in modal choice, which poses a psychological barrier to the effective use of information [14]. Transport planning authorities should adequately design such services and integrate them with the rest of the traffic network, for them to be widely used by travelers. This is further supported by the present study, since users in most cases did not expect a change in the number of journeys done by private car or public transport due to the usage of the multimodal trip planner only.

Still, the users' immediate reaction and their overall satisfaction with the multimodal trip planner were positive in all regions in this study. Users in all regions perceived a "moderate" to "large" benefit in having access to it. Furthermore, users expected some positive effects from using a multimodal trip planner, i.e. they expected being offered somewhat more routes better suited to their preferences, some increase in comfort, some decrease in stress, but no effects were expected on journey time or fuel consumption.

V. Conclusions

As a conclusion, although the results of this study are based on subjective data collected by a limited number of users and have to be verified with more users in other regional areas but also with objective data of real usage of transport modes, they support the argument that the availability of information about environmentally-friendly transport modes via a multimodal trip planner, is rather not enough to achieve a shift of travelers to such modes. The impact of other measures, i.e. the pricing of different modes of transport, should be additionally studied. More users should be involved in such surveys to have a clearer understanding and to reach more concrete conclusions. Still, a multimodal trip planner may be beneficial. The adequate planning and integration of all transport services within a sustainable urban mobility plan and a supporting policy framework are rather necessary to achieve the greening of urban and interurban transport.

References

[1] EU Climate Action, November 2015, ISBN 978-92-79-52756-2, doi:10.2834/34323

[2] EU Transport in Figures – Statistical Pocketbook 2015, available: http://ec.europa.eu/transport/facts-fundings/statistics/doc/2015/pocketbook2015.pdf .

[3] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. A policy framework for climate and energy in the period from 2020 to 2030, COM/2014/015 final, available at http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2014%3A15%3AFIN

[4] UK Department for Transport (2009). "Low Carbon Transport: A greener future, A Carbon Reduction Strategy for Transport". July 2009, ISBN:9780101768221.

[5] European Union (20111). WHITE PAPER Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system, COM/2011/0144 final, available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52011DC0144

[6] Skoglund, T. and M. Karlsson (2012). Appreciated – but with a fading grace of novelty! Traveller's assessment of, usage of and behavioural change given access to a co-modal travel planner. *Procedia - Social and Behavioral Sciences*, 48, 932 – 940

[7] Simão, J Pedro (2015). Impacts of Advanced Travel Information Systems on Travel Behaviour: Smartmoov' case study.*ECTRI Young Researchers' Seminar*, June 17-19, 2015 in Rome, Italy, available at: http://www.ectri.org/YRS15

[8] Theodoropoulos, Th., Portouli, E., Fernandez, J., Amditis, A. (2016). European Smart Mobility Planner (MyWay): Frontend design and first evaluation results. *11th ITS European Congress*, Glasgow, Scotland, 6-9 June 2016.

[9] Richardson, A.,J., Ampt, E.S., Meyburg, A.H. (1995). Survey Methods for Transport Planning. *Eucalyptus Press*, Melbourne, Australia.

[10] Allen, Elaine and Seaman, Christopher (2007). Likert Scales and Data Analyses. *Quality Progress*, pp. 64–65

[11] Duane Monette,Thomas Sullivan,Cornell DeJong (2008). *Applied Social Research: A Tool for the Human Services*. Thomson/ Wadsworth, ISBN 0495392464 9780495392460, p. 344.

[12] Nanna, M. J., & Sawilowsky, S. S. (1998). Analysis of Likert scale data in disability and medical rehabilitation research. *Psychological Methods*, 3(1), 55-67.

[13] Schmuckler, M.A. (2001). What Is Ecological Validity? A Dimensional Analysis. *Infancy*, 2(4), 419–436

[14] Aarts, H., Verplanken, B. and van Knippenberg, A. (1997). Habit and Information Use in Travel Choices. *Acta Psychologica*. 96 1-14