Environmental sustainable management of urban networks with the use of ICT: URBANETS project. The case of Gallipoli

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Abstract. *This paper is part of a wider work – developed in the context of URBANETS project - Sustainable Management of Urban Networks with the Use of ICT – on traffic and environmental requirements for Brindisi and Gallipoli. The paper considers different aspects, having as an objective the satisfaction of transport and environmental knowledge needs with particular regard to Gallipoli. The aim is to supply policy indications in the light of population, economic operators and stakeholders exigencies. The paper contains transport and environmental analyses referred to Gallipoli area and results, stemming from a consultation process of transport operators, citizens, tourists, public employees and stakeholders, are presented. Through the statistical analysis of data (which describes the nature of data, explore the relation of the data to the underlying population, create a model and prove its validity), here shortly presented, several insights are provided on needs of specific user categories, as gender issues and social equity are key issues in urban policies. In addition, the potential willingness to pay of users to obtain a general improvement in bus service quality and in environmental conditions is investigated through discrete choice modelling. The idea behind this study is to overcome the crucial impediment in understanding urban travel patterns and the key forces behind user attitudes which normally characterise city surveys. Therefore, attitudinal and behavioural variables are considered to evaluate the propensity of using buses and changing habits for modal choices, more environmental sustainable, through a random utility model. Finally, indications on perspectives and final conclusions are supplied. This paper can represent a useful tool for those who operate in the transport and environmental sectors and for policy-makers as well.*

Keywords. *Sustainable mobility; Environmental impact; Random utility model; Willingness to pay; Policy indications.*

1 Results from consultation process of stakeholders and focus groups operating in the transport sector

For the city of Gallipoli some firms have been selected in the data base of Italian Chamber of Commerce. They are part of the transport sector with the ATECO codes H49, H50, H51 e H53. These firms have been contacted to understand the main critical points for the territory under investigation, particularly with reference to the transport sector. The idea is to have a framework of the structure of freight transport supply – also with regard to the location – in the light of territorial characteristics. Firms selection for running focus groups, realised in October and November 2013, were 192. Questionnaire was intentionally brief so that characteristic elements of transport supply could immediately emerge. This aspect contributed to collect useful information for an optimal choice related to transport market organization and logistic services. As for stakeholders, they have been asked

specific questions related to transport and environmental aspects.

1.1 Consultation results

On the basis of contributions obtained, it is possible to say that the current transport system is not considered adequate because the seasonal phenomenon is still heavily hitting transport and environmental situation. Furthermore, there is a problem linked to the funnel shape of the access to the historical centre which creates enormous congestion problems, especially in the summer when there is also the need to have access to the sea. Therefore, a major problem is linked to tourist traffic which have seasonal effects. There is a mismatch demand/supply with regard to private motorized modes and the available supply. Furthermore, road network is not considered adequate by interviewees as for private means and buses, and there are also problems of road burden capacity and of tourist reception. Public services are supplied in accordance with the service contract, nevertheless there are opportunities to cover a higher geographical area and to extend timing for supplying the service. In fact the demand is not satisfied with regard to these two factors. Suggested improvements to overcome criticalities are of infrastructural type and linked to a demand regulation with the closer to traffic of congested areas. It is required an alternative service supply more adequate to users' needs. Effects of the suggested interventions on the territory and on the environment are indicated as a better accessibility and an improved environment as a consequence of different modal choices in favour of more environmental sustainable transport means. To finance those interventions it is asked the participation of the Municipality of Gallipoli and of private investors, where this is possible. Among the priority transport infrastructures, interviewees indicate the construction of a new coastroad, parallel to the existing one and the installation of monitoring control units for the air quality to check transport impact. So doing it could possible to intervene with appropriate transport demand management tools and to regulate the access to congested areas. Suggestions also indicate to realize infrastructures to favour bike mobility.

To conclude, it is possible to say that from the realized analysis and from the desk analysis of available data and those stemming from consultations, a clearer framework for Gallipoli has been obtained with regard to needs and possible solutions. Therefore it is clear that this area has a high level of transport demand in comparison with the regional framework, which is satisfied almost exclusively with only one mode: road transport. As a consequence operators and stakeholders, on one side, ask for reducing congestion in these areas with infrastructural investments, economic interventions and laws in order to manage transport demand. On the other side, it is useful to intervene with tools to modify modal choices and address them to environmentally-friendly choices. Interviewees also say that in order to stimulate local development is indispensable to realise the suggested interventions and supply adequate services in line with the expressed needs. So doing opportunity of growth can occur and it can attract further tourism which is a competitive leverage for the territory. Besides, also transport needs can be satisfied and the city can offer a better accessibility through an efficient transport system.

2 Survey results and empirical findings on the WTP

In the months of November and December 2013 in the city of Gallipoli interviews have been done to 383 persons next to crucial transport points of the city, in some hotels and in front-offices of the Municipality of Gallipoli. Moreover, also employees of the Municipality of Gallipoli took part to this consultation. The questionnaire was structured by considering a personal profile (like age, gender and occupational status) modal transport choices and motivations, evaluation of transport modes, and perspective preferences and willingness to pay. In this sample, with regard to the gender aspect, there are few additional female in comparisons with males. It comes out that females are 53,3% while males are 46,7%. The age composition of this sample is structured with more than 35% respondents in the range 30-50, followed by the range 19-29 years old, by the range 51-65 years old, then by respondents under 19 and, finally, by those over 65 years old with 8%. With regard to those who have the availability of their own cars, results indicate that 45,69% of respondents have always a private mean, while those who can use a private mode only sometime are 41,78% of the total sample. Finally, with a low percentage equal to 12,53%, there are those who do not have a private mean at all. This is a clear indication of how private cars are normally used in a family context. With regard to results related to transport modes used by interviewees, it emerges a high percentage of those using private cars, equal to 38,62%. To this figure must be added also motorcycles and bicycles which recorded respectively 6,65%

and 4,6%. Interesting for sustainable considerations is the percentage of those who move by foot equal to 12,53%. This is justified by the fact that Gallipoli is a small city. Finally, there are also those who use taxi . This component is referred to tourists and business movements. As for the frequency in the use of buses, it is possible to highlight that 30,4% of interviewees has declared to use only rarely buses. This percentage, considered in combination with that referred to respondents that never use buses (20,1%), gives a clear signal of modal choices and the lack of consideration of public transport for internal movements. There is also 22,4% of respondents who always use buses, followed by those who get buses 1-2 times a week (21%) and 3-4 times a week (6,1%).

To give a further interpretation of data on individual choice related to bus service supplied in Gallipoli, a random utility model framework has been used. As indicated by Green (1997) [1], suppose that ym and yp represent the individual's utility of two choices, denoted Ua e Ub . The observed choice between the two reveals which one provides the greater utility. Therefore, the observed indicator equals 1 if Ua > Ub and 0 if Ua ≤ Ub . A common formulation of the linear random utility model is:

Ua = ß'a x + ε a and Ub = ß'b x + ε b.

Then if we denote by Y=1 the consumer's choice of alternative a, we have:

Prob[Y=1|x] = Prob[Ua >Ub]

$\quad\quad\quad$ = Prob[ß'a x + εa - ß'b x - εb >0|x]

$\quad\quad\quad$ = Prob[(ß a - ß b)' x + εa - εb >0|x]

$\quad\quad\quad$ = Prob[ß'x + ε > 0|x].

This model is one of the most used for the simulation of transport demand, nevertheless it may present some problems. On this point see Cascetta, E.-Papola, A. (2001) [2], Maddala, G.S. (1999) [3], Green, W.H. (1997) [1]. The individual's utility of two choices – use of buses and use of private means – is estimated by binary logistic regression and logistic regression coefficients are used to estimate odds ratios for each independent variable in the model. The values assumed by the dependent variable, as the probability to use buses, is posed equal to 1. All the values assumed by independent variables have been transformed into dummy variables in order to capture each characteristic of independent variables represented by age, availability of private transport means and so on. Equations have been estimated by using single attribute to avoid evident correlation problems and a consequent self-selectivity involved in the data. Here, the selection is given by the significance of parameters, which has been checked with the Wald statistic at a 5% level. All parameters have been chosen with the Wald forward selection method and values reported in Table 1are all significant in accordance with the Wald test.

Female user profile variable/attribute	Items	Probability to use bus	WTP
Age			
	19-29	8.50	1.55
	30-50	4.10	1.78
	51-65	14.57	
Availability of other transport means			
	Always	3.01	
	Sometimes	0.75	3.12
	Never		1.58
Frequency in the bus use			
	Every day	86.34	1.38
	1-2 times per week	6.37	1.72
	3-4 times per week		3.99
	Rarely	1.51	
Reasons			
	School/working activity	15.62	1.65
	Leisure activity	10.52	1.02
	Shopping	4.93	1.94

Table 1: Women- Probability to use bus and WTP for an improvement in the bus service

Table 1 shows values assumed by coefficients as odds ratios. They indicate the probability of women (the most significant sample section) using a public bus for each characteristic, against the probability of using other means in an urban context, and the willingness to pay something more for a general improvement in the bus service estimated by using the same aforementioned procedure. Probability is outlined as a function of various other profile variables.

Table 1 shows that the probability of females to use buses is particularly important for those belonging to the range 51-65, followed by women with 19-29 years, and those in the range 30-50. For women who have always a car or other transport means, the probability to use a bus is more than twice those who have sometimes a car. The most important reason that can push women to get a bus is for studying or working: it is 3 times more important that those who travel for shopping and one time and a half of those who choose public transport for leisure activity. Finally, Tables 1 contains also information on the willingness of women to pay something more for a general improvement in the bus service which may induce people to change their habits. The procedure followed for parameters selection and estimation methods is exactly the same used to investigate the use of public buses. In particular, for women the best profile is to belong to a range 30-50, to have sometime another transport mean, to take 3-4 times per week a bus, to use the bus service for shopping.

Therefore, results give clear indications on the possibility to satisfy with more sustainable transport collective modes latent systematic transport demand, particularly the one expressed by women, within 19-29 years, who always have a car. At the same time there is the willingness to pay higher public transport tariffs to have a better collective transport service which is, again, largely environmental sustainable.

3   Conclusions

To conclude, results indicate very well intervention needs on the territory of Gallipoli. In fact, although it is appreciable the work already done by the administration in planning and programming terms, it is evident a gap between what population, economic operators and stakeholders ask and what is decided by policy-makers. This is essentially due, on one side, to a delay in the execution of those planes which has the effect of slower operative procedures (which is a common element at national level) and, on the other side, there is not a constant listening of needs so to determine the correct priorities and allocate efficiently the tight financial resources. Also this last element is not only typical of this territory, but it is a wider problem, of general type, because very often there is a lack of appropriate structures to run the business. Therefore, it could be suggested to constantly monitor territories under the transport and the environment point of view. By this way services can be supplied in an appropriate and efficient way. Only after, new infrastructures with optimal capacity can be created in accordance with the expressed and potential needs.

With particular regard to Gallipoli it is desirable the implementation of transport demand management tools through a regulation in terms of accessibility and of modal diversion in favour of environmental sustainable means. These needs have to be considered in the light of seasonal problems of congestion which affects the quality of life in the urban centre. In this case it can be useful drastic interventions in the summer period so to favour bicycles and public transport organised with a higher frequency and a geographic extension of the service also to the sea. Finally, for this city, the desired modal switch and rational behavioural transport choices could be easily reached through appropriate information supplied with highly accessible tools of ICT applied to all integrated transport modes.

References

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