Factors influencing greenways use in Italy: definition of a method for estimation

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1. Introduction

The issue of non-motorized mobility in the last decades has seen increasing attention at the international level. Also in Italy we assisted at the creation of hundreds of miles of trails dedicated to cycling and walking, many of which meet the greenway definition of the European Greenways Association: "*Communication routes reserved exclusively for non-motorized journeys, developed in an integrated manner which enhances both the environment and quality of life of the surrounding area. These routes should meet satisfactory standards of width, gradient, and surface condition to ensure that they are both user-friendly and low-risk for users of all abilities. In this respect, canal towpaths and disused railway lines are a highly suitable resource for the development of greenways*" (EGWA, 2002).

More generally, greenways are green infrastructures that can be planned at different scales and for multiple purposes (ecological, recreational, cultural, non-motorized mobility) (Fabos, 1995; Ahern, 1995).

Various methodologies and several studies on greenways planning have been conducted also in Italy (Rovelli et al., 2004; Toccolini et al., 2006; Senes et al., 2010).

The growing number of infrastructures built and the related costs, combined with the recent economic crisis, led to an increasing need for public bodies to evaluate each project in terms of its ability to meet the needs of the communities, particularly in terms of attractiveness for users and benefits (not only economic) for local communities. To do this, planners and decision makers need to be provided with: 1) updated and consistent data on greenways and trails users; 2) models, based on the previous data, that can help to "predict" the number of users on a planned infrastructure.

In such a context, the aim of this research was to assess the relationships between the number of users detected along some Italian greenways and the characteristics of the territory crossed (in terms of population and environment), in order to define a model capable of estimating the potential users of a greenway before it is realized. It represents one of the first attempts in Italy.

2. Background and Literature Review

Several authors (Wigan et al., 1998; Eash, 1999; Betz et al., 2003; Rodriguez and Joo, 2004; Furuseth and Altman, 2004; Barnes and Krizek, 2005; Lindsey et al., 2006; Lindsey et al., 2007) have addressed the issue over the past two decades, highlighting the main factors that influence the use of greenways and proposing some methods for its estimation, based on the collection of available users data for similar paths or surveys of the population potentially affected.

Unfortunately, these methods are often applicable only in similar contexts and require baseline data usually not available in Italy. For a general review of the used methods in literature it is possible to see Turner et al. (1997), Federal Highway Administration (1999), and Porter et al. (1999).

Factors influencing greenways and trails use, are linked to the characteristics of (Federal Highway Administration, 1999; Bhat et al., 2005):

- the greenways and trails themselves (accessibility, safety, surface, length etc.) (Hopkinson and Wardman, 1996; Wigan et al., 1998; Cervero and Duncan, 2003; McDonald et al., 2007);
- the population (social, economic and demographic characteristics) (Baltes, 1996; Ortuzar et al., 2000; Betz et al., 2003; Cervero and Duncan, 2003; Dill and Carr, 2003; Furuseth and Altman, 2004; Krizek et al., 2007; Lindsey et al., 2007; Arnberger et al., 2010);
- the landscape (land-use, topography etc.) (Cervero and Duncan, 2003; Rodriguez and Joo, 2004, Lindsey et al., 2007);
- the climate and the season (Baltes, 1996; Dill and Carr, 2003; Ploner and Brandenburg, 2003; Lindsey et al., 2007).

The variables (proxies) used in the different models and case-studies can vary considerably, depending on the goals of the investigation and the available resources (Parkin et al., 2008). The linear regression is one of the most used technique for modeling the relationship between the greenways/trails users and the different variables (Baltes, 1996; Dill and Carr, 2003; Ploner and Brandenburg, 2003; Lindsey et al., 2007).

Apart from the model choice, it is essential to have the availability of data on the users (Lindsey, 1999).

3. Methods

3.1 Greenway traffic counts

In order to develop a model for the estimation of the potential users of a greenway, in the present study we gathered data on users from 13 automatic counters, over a period of four years, along 7 greenways in Northern Italy: the greenways of Adige Valley (100 km), Val Rendena (23 km), Valsugana (50 km), Val di Fiemme (36 km) and Valley of Lakes (15 km) in Trentino-Alto Adige Region, and the greenways of Mantova-Peschiera (45 km) and Mantova-Bagnolo San Vito (11 km) in Lombardy Region (Fig. 1). All the greenways considered run mainly in rural areas, crossing the Po valley or mountain valleys, along streams or disused railways lines. They have a mild average slope and are mainly used for tourist-recreational purposes, for walking, cycling or skating. Their choice was determined by the limited availability in Italy of systematic data on greenways and trails users, and with the objective of analyzing greenways with heterogeneous characteristics.

The automatic counters allow to detect the users 24 hours a day, 365 days a year, recording the users passages at fixed points of the track, but cannot distinguish the different types of users (cyclists, pedestrians, skaters, etc.) neither the number of users from the number of passages.

The data collected by each counter were aggregated on a monthly basis, thus creating a dataset of 337 observations used for the development of the model. This number could have been higher if we had not been obliged to discard 140 monthly observations (29%), due to the climatic conditions of some mountain areas and faults of the automatic counters.

The monthly mean traffic varies from a minimum of 57 passages detected by the counter C1 in January along the Mantova-Peschiera greenway to a maximum of more than 85,000 passages registered in August by the counter C13 along the Valley of Lakes greenway, with a total average value of 13,600 passages per month (Fig. 2). The annual mean traffic varies from a minimum of 30,000 passages detected by the counter C3 along the Mantova-Bagnolo S. Vito greenway to a maximum of more than 350,000 passages registered by the counter C13. The Valley of Lakes greenway presents a number of passages significantly higher than the others greenways, due to the presence of the Garda Lake, an important tourist attraction.

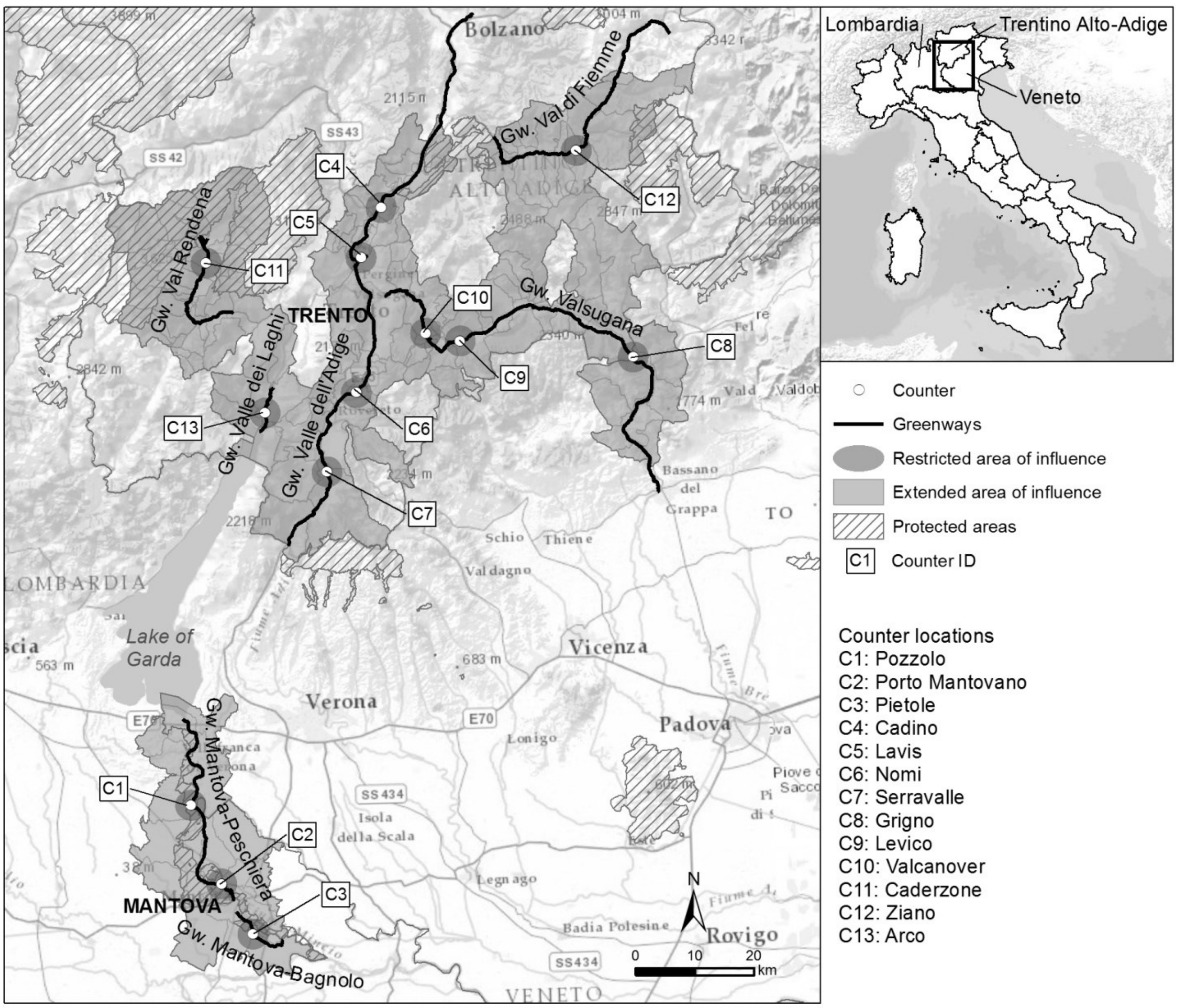

Fig. 1 – The study area and the location of the automatic counters

In general, most users can be seen from April to September, with a peak in the spring months for greenways in Lombardy (located in lowland areas) and in the summer for greenways in Trentino-Alto Adige (located in mountain valleys) (Fig. 2).

3.2 Measures of socio-demographic characteristics of potential users and geographical characteristics of the area

The data gathered from the automatic counters have been related with the main variables influencing the greenways use, based on the available literature. We divided them into four categories:

- socio-demographic characteristics of the potential users, both residents and tourists (population density, age, level of education and income, number of tourists);
- accessibility of the greenway (presence of roads and railways nearby, intersections between the greenway and the road network);
- geographical characteristics of the area (topography, land use, historical-cultural and natural resources, presence of other greenways);
- time and climatic variables (month, holidays per month).

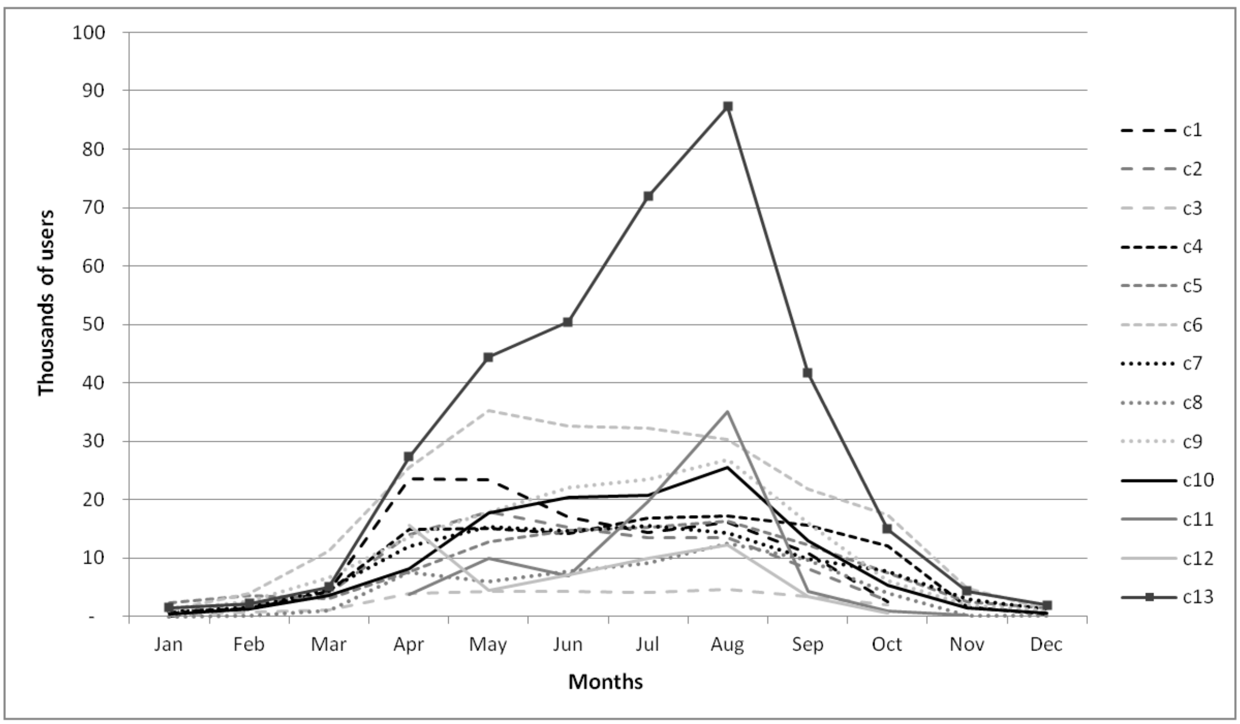

Fig. 2 – Number of monthly passages registered by the automatic counters

The variables were chosen with the dual aim of characterizing both the greenways themselves and the surroundings of the counters. To this end, two different areas of influence for each counter have been defined (Fig. 1) using a Geographical Information System (GIS), taking into account the level of detail of the data available for the calculation of the variables (Toccolini et al., 2004):

- a "restricted" area of influence, defined by a circular buffer of 2.5 km around the point of installation of the counter (Barnes et al., 2005);

- an "extended" area of influence, defined by the intersection of a 16 km circular buffer around the counter with a linear buffer of 6 km along the greenway.

Since the statistical data used for the calculation of some variables are only available at the municipal level, all the municipal territory has been included in the extended area of influence if:

- more than 50% of the municipal land area or all the residential area falls within the area of influence, and
- the municipal territory has a difference of less than 1,000 m respect to the counter elevation.

In Table 1 the variables considered in this study are summarized, with the indication of the area of influence to which they have been calculated and the expected effect on monthly users. Table 2 shows the most significant statistical values for each variable (mean, standard deviation, minimum and maximum value).

Variable names	Definition	Area of influence	Hypothetical effect
Dependent variable			
Users	The monthly traffic of each counter	-	
Socio-demographic variables			
Density	Population density (inhabitants per sq. km of land area)	Extended	Positive
%young	% of the population aged less than 15 years	Extended	Negative
%old	% of the population aged more than 64 years	Extended	Negative
Education	% of the population having an education level ISCED 3 or upper	Extended	Positive
Income	Per capita Gross Domestic Product (€)	Extended	Positive
Tourism	Annual number of overnight stays in tourist accommodations per sq. km of land area	Extended	Positive
Accessibility variables			
Road density	Length of roads per sq. km of land area (km)	Extended	Positive
Intersections	Number of intersections between greenways and roads	Restricted	Positive
Railways	Number of railway stations	Extended	Positive
Highways	Number of highways toll-booths	Extended	Positive
Landscape variables			
Parks_small	% of total land area covered by protected areas	Restricted	Positive
Parks_large	% of total land area covered by protected areas	Extended	Positive
Forests_small	% of total land area covered by woodlands	Restricted	Positive
Forests_large	% of total land area covered by woodlands	Extended	Positive
Lakes_small	% of total land area covered by lakes	Restricted	Positive
Lakes_large	% of total land area covered by lakes	Extended	Positive
Rivers_small	Length of rivers per sq. km of land area	Restricted	Positive
Rivers_large	Length of rivers per sq. km of land area	Extended	Positive
Urban_small	% of total land area covered by urbanized areas	Restricted	Positive
Urban_large	% of total land area covered by urbanized areas	Extended	Positive

Elements of interest	Number of elements of historical and cultural interest	Restricted	Positive
Orography	Standard deviation of elevations	Restricted	Negative
Cycle trails	Presence of other cycle trails in the study area (yes/no)	Extended	Negative
Temporal variables			
Holiday	% of holidays in the month	-	Positive

Tab. 1 – Description of the variables considered in the study

The variables used to describe the socio-demographic characteristics of potential users were calculated at the municipal level and include population density, age, level of education and income (census data from the National Institute of Statistics - ISTAT) and the number of overnight touristic stays (Provincial Tourist Offices). The expected effect is positive for all the variables, with the exception of the percentage of the population under 15 and over 64 years old, that, according to the literature, is expected to have a negative effect on the number of users.

Variables	Mean	Std. Dev.	Minimum	Maximum
Dependent variable				
Users	13,657	17,634	57	162,297
Socio-demographic variables				
Density	216.63	120.39	38.80	443.11
%young	14.39	1.34	11.20	16.24
%old	20.34	1.83	18.18	25.24
Education	32.50	3.83	25.17	38.66
Income	14,013	1,226	10,946	15,887
Tourism	3,239	3,752	216.24	12,306
Accessibility variables				
Road density	0.751	0.190	0.293	1.072
Intersections	1.486	0.381	0.880	2.072
Railways	3.887	3.689	0	11
Highways	1.181	1.086	0	3
Landscape variables				
Parks_small	15.46	18.77	0	65.45
Parks_large	17.99	11.53	3.57	59.53
Forests_small	33.42	21.31	0	69.39
Forests_large	43.23	22.11	0.59	65.27
Lakes_small	1.675	5.084	0	26.77
Lakes_large	1.640	2.101	0.082	6.183
Rivers_small	0.854	0.395	0.186	1.569
Rivers_large	0.541	0.185	0.315	0.924
Urban_small	11.79	6.049	3.941	21.21
Urban_large	6.665	3.649	1.647	14.85
Elements of interest	5.42	5.72	0	17
Orography	170.46	108.68	2.52	370.69
Cycle trails	0.365	0.482	0	1

Temporal variables				
Holiday	30.64	3.17	25.81	40.00

Tab. 2 – Most significant statistical values for the variables considered in the study

The variables used to describe the greenways accessibility are: the presence of tollbooths and railway stations, the road network density and its intersections with the greenways. These variables were calculated using GIS, starting from the cartographic data available on the National Geoportal of the Italian Ministry of Environment. The expected effect on the number of greenways users is positive for all the variables.

The variables used to describe the characteristics of the territory crossed by the greenways are: the presence (% of the area of influence) of protected areas and certain land uses (urban areas, forests, water bodies), the length of the rivers and the number of elements of historical and cultural interest (churches, museums, historic buildings, etc..). The topography was calculated as the standard deviation of the elevations in the restricted area of influence. The presence of other pedestrian and cycle paths was represented by a binary variable that takes the value 0 (no other paths) or 1 (presence of other paths). Almost all of the "landscape variables" were calculated using GIS, both for the extended and restricted area of influence, starting from cartographic data available on the National Geoportal and from the Italian Touring Club (TCI) data for the tourist attractions. The expected effect on the number of greenways users is positive, with the exception of the variables related to the topography and the presence of other greenways.

Finally, monthly dummy variables were included to check the effect of seasons and the percentage of non-working days for each month was calculated in order to take into account the effect of public holidays. We expect a positive effect on the number of users from all these last variables.

4. Results and discussion

Variables potentially influencing the traffic dynamics in Italian greenways have been statistically tested by mean of a regression analysis with the method of the Ordinary Least Squares (OLS). In selecting the final specification of the model we adopted the following strategy. In a first step we performed a correlation analysis in order to exclude correlated variables. In a second step we modeled a specification that considers the effect of all the categories of determinants and their specific proxies. Then we simplify it, putting emphasis on both theoretical consideration and the robustness of the different determinants.

The result is a model specification (Model I), we tested on the whole sample of 337 observations (all the 13 counters).

As previously highlighted, our greenways are located in two quite different geographical contests. In fact, 10 counters stay in the Alpine Region, while 3 counters have been positioned in the Po Valley, that is the main Italian flatland. For this reason, in a second step we tested the final specification only on a sub-sample of the 10 counters located in the mountain area (Model II).

In a last step (Model III), we excluded from the Model II the observations belonging to counter C13. In fact this counter seems to distinguish itself as an outlier, because of its location in the middle a famous touristic town and the subsequent number of users that is significantly higher than others (Fig. 2).

Following Lindsey et al. (2007) the dependent variable is converted in a logarithmic form in order to normalize the distribution, respecting OLS assumptions.
Given a log-linear form of the model:

$$Ln\ U = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n \quad (1)$$

where U is the monthly number of greenways users,

the expected value of U can be predicted as:

$$E(U|x_1, x_2 \ldots) = \hat{U} = e^{\hat{\beta}_0 + \hat{\beta}_1 x_1 + \hat{\beta}_2 x_2 + \cdots + \hat{\beta}_n x_n} \quad (2)$$

from which the estimated marginal effect $\frac{d\hat{U}}{dx_n}$ of the variable x_n on U, that has to be read as a percent increase of the users consequential to one unit increase of x_n (all other factors held constant), is expressed by the formula:

$$\frac{d\hat{U}}{dx_n} = \left(e^{\hat{\beta}_n} - 1\right) \times 100 \quad (3)$$

Table 3 displays the regression results of the three models, in which we controlled for month fixed effects with the use of specific dummies. For each model, we report the estimated coefficients, and their respective p-value. For comparability and symmetry, we chose to include in the final specification the same set of variables for all the three models. The criterion adopted for the final specification is to include a variable only if it results to be significantly different from zero in at least one model (p-value < 0.1).

All the three models have a significant χ^2, meaning that all the regressors are jointly significantly different from zero, thus the set of our explanatory variables plays a role in estimating greenways monthly potential users.

	Model I		**Model II**		**Model III**	
	Coefficient	**P-value**	**Coefficient**	**P-value**	**Coefficient**	**P-value**
Temporal variables						
January	-0.2828791	0.267	-0.2701101	0.305	-0.1745205	0.517
February	0.5621449	0.018	0.4779576	0.063	0.6710171	0.010
March	1.559288	0.000	1.526959	0.000	1742953	0.000
April	2.750626	0.000	2.692144	0.000	2.718508	0.000
May	2.99123	0.000	2.971842	0.000	2965159	0.000
June	3.056132	0.000	3.08846	0.000	3.0727	0.000
July	3.180259	0.000	3.289552	0.000	3.263584	0.000
August	3.356938	0.000	3.50448	0.000	3.488594	0.000
September	2.756585	0.000	2.845388	0.000	2.847208	0.000
October	1.918765	0.000	1.99794	0.000	2145008	0.000

November	0.7455168	0.001	0.7504362	0.001	0.7592061	0.002
Socio-demographic variables						
Population density	-0.0154728	0.000	-0.0230691	0.002	-0.0214335	0.003
%young	-0.7045987	0.000	-2.528816	0.002	-1.960272	0.010
%old	-0.5348318	0.000	-1.694303	0.017	-1.601141	0.022
Education	0.2873542	0.000	0.2828231	0.000	0.2443862	0.000
Tourism	0.0000501	0.013	0.0000139	0.728	-0.0001317	0.027
Accessibility variables						
Road density	4.3832	0.000	4.95718	0.057	5.768171	0.060
Landscape variables						
Orography	-0.0030615	0.000	-0.0068234	0.000	-0.0052962	0.002
Elements of interest	0.0380183	0.003	0.0471008	0.004	0.0314481	0.182
Intercept	18.77017	0.001	70.6318	0.005	605573	0.011
Nr. of observations	337		263		219	
Adjusted R-squared	0.80		0.81		0.82	
F-statistic	71.9		58.1		64.3	

Tab. 3 - Regression results of the three models used

Particularly, Model I, that has been tested on the whole sample, accounts for about 80% of the variation in monthly use of the considered greenways; this is an outcome in line with Lindsey et al. (2007) results. The restriction of the analysis to the sub-samples increases the adjusted R-squared, but to a slightly extent. In fact, in Model II the overall explanatory power reaches 81%, while in Model III it raises 82%.

Going in-depth to the different categories of determinants, almost all proxies related to socio-demographic characteristics of potential users appears to be strongly significant. Indeed, only the income does not present any effect in all the three explained models, while the others are generally significant at the 1 or 5 percent level.

In line with the *a-priori* expectations the percentages of younger and older people are negatively and significantly correlated to the fruition of greenways, as well the tourism intensity and the level of education show a positive effect. Contrary both to Lindsey et al. (2007) and our expectations, population density coefficient takes a negative value. This is probably due to a different influence of the population density on urban (Lindsey et al., 2007) and rural greenways (the present study). Making reference to the Model I, the marginal effect magnitude of demographic variables is very high, as well as the education's one (+33.3%). An increase of the tourism intensity, equal to its standard deviation, should cause an users growth of 20.7%. Notably, the absolute value of socio-demographic variables coefficients, as well the population density one, increases in model II and III, whereas tourism either is not significant (model II) or turns to be slightly negative (model III).

Accessibility plays an important role in all the three presented models, but only if we refer to the road density proxy, calculated on the extended area of influence. Instead, the other proxies, such as intersections, railways and highways, either do not capture the effect or are not important.
With regards to the landscape variables we find a negative correlation with the orography and a positive correlation with the presence of elements of historical and cultural interest. An increase

of the orography variable, equal to its standard deviation, lead to a 28.3% decrease of the potential users. The marginal effect of an additional element of interest is 3.9%.
In our analysis we have not found any effect of the others landscape and natural characteristics, but we are conscious of the difficulties to model landscape attractiveness with quantitative proxies such as lakes, rivers and forests. Probably, further research is needed to investigate this issue. Also the cycle trails variable does not show any significant effect.

Finally, the holidays variable has not been included in the model, because its effect is largely absorbed by the month fixed effects.

5. Conclusions

The present study has confirmed, also in the Italian context examined, a significant correlation between a great part of the variables chosen and the greenways use:

- socio-demographic variables, all the proxies appears to be strongly significant, except for income;
- accessibility variables, only if we refer to the road density proxy;
- landscape variables, only for orography and presence of elements of historical and cultural interest.

Compared to the literature, it is possible to make two kinds of considerations:

- there are some variables that are in contrast with the literature (income is usually considered an important variable, population density is usually positively related to the number of users);
- there is a general difficulty to define and calculate the proxies for some variables.

This kind of problems could be caused by calculation procedure or by the lack (availability and quality) of data; or could be related to a typical Italian situation. Further research should be carried out in order to better understand these causes.
The present study has several limitations, some of them typical of the Italian situation:

- limited availability of data on the number of greenways users;
- inadequate time scale of data (a lot of data are available only on annual basis or may even be considered as constant);
- inadequate spatial scale of data (a lot of data are available only at municipal level);
- the method used to define and calculate the areas of influence (the “extended” area of influence seems to be of little significance).

Further research should be carried out in order to validate the results of the present study on other Italian greenways with other data. A very first validation performed on the same dataset shows for each counter an average deviation of the estimated annual users from the measured of 23% in Model I and 18.4% in the Model III (counters with less passages show an higher deviation).

References

Ahern J., 1995. *Greenways as a planning strategy*. Landscape and Urban Planning, 33, 131-155.
Arnberger A., Aikoh T., Eder R., Shoji Y., Mieno T., 2010. *How many people should be in the urban forest? A comparison of trail preferences of Vienna and Sapporo forest visitor segments*. Urban Forestry & Urban Greening, 9/3, 215- 225.

Baltes, M., 1996. *Factors Influencing Nondiscretionary Work Trips by Bicycle Determined from 1990 U.S. Census Metropolitan Statistical Area Data*. Transportation Research Record, 1538, 96-101.
Barnes G., Krizek K.J., 2005. *Estimating Bicycling Demand*. Transportation Research Record, 1939, 45-51.
Betz C.J., Bergstrom J.C., Bowker J.M., 2003. *A Contingent Trip Model for Estimating Rail-trail Demand.* Journal of Environmental Planning and Management, 46, 79-96 .
Bhat C.R., Guo J.Y., Sardesai R., 2005. *Non-motorized travel in the San Francisco bay area*. Prepared for the U.S. Bureau of Transportation Statistics.
Cervero R., Duncan M., 2003. *Walking, bicycling, and urban landscapes: Evidence from the San Francisco Bay Area*. American Journal of Public Health, 93/9, 1478-1483.
Dill J., Carr, T.. 2003. *Bicycle commuting and facilities in major U.S. Cities: If you build them, commuters will use them – Another look*. Proceedings of the "82°Annual Meeting of the Transportation Research Board", Washington DC.
Eash R., 1999. *Destination and Mode Choice Models for Nonmotorized Travel*. Transportation Research Record, 1674 , 1-8.
EGWA (European Greenways Association), 2002. *Declaration of Lille*. www.aevv-egwa.org
Fabos J. G., 1995. *Introduction and overview: the greenway movement, uses and potentials of greenways*. Landscape and Urban Planning, 33, 1-13.
Federal Highway Administration, 1999. *Guidebook on Methods to Estimate Non-Motorized Traffic: Supporting Documentation*. U.S. Department of Transportation, McLean, Virginia.
Furuseth O. J., Altman R.E., 2004. *Who's on the Greenway: Socioeconomic, Demographic, and Locational Characteristics of Greenway Users*. Environmental Management, 15, 329-336.
Hopkinson P., Wardman M., 1996. *Evaluating the demand for new cycle facilities*. Transport Policy, 3/4, 241-249.
Krizek K.J., Poindexter G., Barnes G., Mogush P., 2007. *Analyzing the Benefits and Costs of Bicycle Facilities Via On-Line Guidelines*. Planning Practice and Research, 22/2, 197-213.
Lindsey G., 1999. *Use of urban greenways: insights from Indianapolis*. Landscape and Urban Planning, 45, 145-157.
Lindsey G., Han Y., Wilson J., Yang J., 2006. *Neighborhood Correlates of Urban Trail Use*. Journal of Physical Activity and Health, 3, 139-157.
Lindsey G., Wilson J., Rubchinskaya E., Yang J., Han Y., 2007. *Estimating urban trail traffic: Methods for existing and proposed trails*. Landscape and Urban Planning, 81, 299–315 .
McDonald A. A., Macbeth A.G., Ribeiro K., Mallett D., 2007. *Estimating Demand for New Cycling Facilities in New Zealand*. Land Transport New Zealand Research Report 340.
Ortúzar J.D. de, Iacobelli A., Valeze C., 2000. *Estimating demand for a cycle-way network*. Transportation Research Part A , 34, 353-373.
Parkin J., Wardman M., Page M., 2008. *Estimation of the Determinants of Bicycle Model % for the Journey to Work Using Census Data*. Transportation, 35/1, 93-109.
Ploner A., Brandenburg C., 2003. *Modelling visitor attendance levels subject to day of the week and weather: a comparison between linear regression models and regression trees*. Journal for Nature Conservation , 11, 297-308.
Porter C., Suhrbier J., Schwartz W.L., 1999. *Forecasting Bicycle and Pedestrian Travel: State of the Practice and Research Needs*. Transportation Research Record, 1674, 94-101.
Rodriguez D.A., Joo J., 2004. *The relationship between non-motorized mode choice and the local physical environment*. Transportation Research D, **9,** 151-173.

Rovelli R., Senes G., Fumagalli N., 2004. *Ferrovie dismesse e greenways. Il recupero delle linee ferroviarie non utilizzate per la realizzazione di percorsi verdi*. I quaderni delle greenways n.1, Associazione Italiana Greenways, Milano.
Senes G., Fumagalli F., Toccolini A., 2010. *Urban greenways planning. A vision plan for Milan (Italy)*, Proceedings of Fabos Conference on Landscape and Greenway Planning, July 2010, 8-11, Budapest, pp. 385-392.
Toccolini A., Fumagalli F., Senes G., 2004. *Progettare i percorsi verdi. Manuale per la realizzazione di greenways*. Maggioli Editore, Santarcangelo di Romagna.
Toccolini A., Fumagalli F., Senes G., 2006. *Greenways planning in Italy: the Lambro River Valley Greenways System*. Landscape and Urban Planning 76, 98–111.
Turner S., Hottenstein A., Shunk, G., 1997. *Bicycle and Pedestrian Travel Demand Forecasting: Literature Review*. Research Report prepared for the Texas Department of Transportation.
Wigan, M., Richardson A. J., Brunton P., 1998. *Simplified Estimation of Demand for Non-motorized Trails Using GIS*. Transportation Research Board, 1634, 47-55.