Weather Impacts on Natural, Social and Economic Systems (WISE)

Part II: Individual Perception of Climate Extremes in Italy

Marzio Galeotti, Alessandra Goria,
Paolo Mombrini and Evi Spantidaki

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Marzio Galeotti, *University of Milan and Fondazione Eni Enrico Mattei*
Alessandra Goria, *Fondazione Eni Enrico Mattei*
Paolo Mombrini, *University of Bergamo*
Evi Spantidaki, *Fondazione Eni Enrico Mattei*

Weather Impacts On Natural, Social And Economic Systems (WISE) Part II: Individual Perception of Climate Extremes in Italy

Summary

This paper focuses on the results of the research work carried out by Fondazione Eni Enrico Mattei (FEEM) within the WISE project. This project aims at investigating the effects and the impacts of extreme weather events, particularly very warm summers, mild winters and storms, on the socio-economic systems of European countries. The output consists of a series of empirical studies, both of quantitative and qualitative-descriptive nature. The work of FEEM in the WISE project covers the quantitative analysis of the impacts of climate extremes on the socio-economic system in Italy and the analysis of individuals' perception of climate extremes based on results from individuals' surveys. In this paper is considered the study of the perception of weather impacts through questionnaire survey to the general public. With regard to the individuals' perception survey, a sample of 300 individuals were interviewed by telephone: 150 extracted from the North of Italy and 150 from the South of Italy. Individuals were asked general questions about their perception of climate extremes, and about the impacts of weather extremes on their daily habits at work, at home, in their leisure activities, on their transport patterns, on their health and tourism choices.

Keywords: Climate change, Weather extremes, Perception, Impacts

JEL Classification: Q2, Q250

Address for correspondence:

Marzio Galeotti
Fondazione Eni Enrico Mattei
Corso Magenta, 63
20123 Milano
Italy
Phone: +39-02-52036936
Fax: +39-02-52036946
E-mail: marzio.galeotti@feem.it

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1. Introduction

The paper presents the results of the research work carried out by Fondazione Eni Enrico Mattei (FEEM) within the WISE project.
WISE is a project financed by European Commission within the Environment and Climate Research Programme.
The FEEM's partners involved in the project are: the Climatic Research Unit (CRU), University of East Anglia, Norwich (UK); the Postdam Institute for Climate Impact Research (PIK), Postdam (Germany); the Institute for Environmental Studies (IVM), Vrije Universiteit, Amsterdam (NL).

The WISE project aims at investigating the effects and the impacts of extreme weather events, particularly very warm summers, mild winters and storms, on the socio-economic systems of European countries.

The main objectives of WISE were:

- to examine the impacts of a recent hot summer and a recent mild winter on the natural environment and on national economies; to set a monetary value on these impacts, where possible.
- To examine how the impacts of extreme seasons propagate between the national economies of the member countries of the EU. The sectors to be analysed were tourism and agricultural products.
- To examine the impact of climate 'shocks'. The selected shocks are wind storm and cold spells. The sectors to be examined are forestry and property insurance for wind storm, and health and energy supply for cold spells.
- To investigate the perceptions of the general public and management regarding climate extreme and shocks.

The output of the project consists of a series of empirical studies, both of quantitative and qualitative-descriptive nature.
The research work carried out by FEEM was developed in parallel with the research carried out by the other partners: the methodology adopted for the econometric analysis and the economic evaluation of the impact of weather extremes is homogenous across all partners, the surveys' questionnaire for Italy instead was slightly modified in order to be carried out through telephone interviews.

The work of FEEM in the WISE project covered:

- the quantitative analysis of the impacts of climate extremes on the socio-economic system in Italy.
- The analysis of individuals' perception of climate extremes based on results from individuals' surveys.
- Where possible, the economic evaluation of the impacts of weather extremes on the various sectors under analysis.

In this paper is considered the study of the perception of weather impacts through questionnaire survey to the general public.

In a previous paper is considered the statistical modelling of the impact of weather, through quantitative analysis of activity time series.

Surveys were carried out in order to complement through qualitative tools the quantitative evidence on the climate extremes' impacts on the Italian economy and society. With regard to the individuals' perception survey, 300 individuals were interviewed by telephone: 150 individuals in the sample were extracted from Lombardy, a northern Italian region, and the remaining 150 individuals were extracted from Sicily, the Southern island. Individuals were asked general questions about their perception of climate extremes, and about the impacts of weather extremes on their daily habits at work, at home, in their leisure activities, on their transport patterns, on their health and tourism choices.
In *Appendix 1* is presented an econometric investigation, based on the same telephonic interviews, to better understand the socio-demographic factors that could influence the perception of extreme seasons.

2. Public Perception Survey of Climate Impacts

2.1. Introduction

The results of the perception survey aim at providing further possible explanations for trends in activities and impacts related to climate change identified through the econometric analysis.
The survey in particular aims at finding out how well people remember unusually extreme seasons and at identifying individuals' adaptive behaviour. Adaptive behaviour is analysed with regard to water and energy consumption, transport patterns, habits at work and at home, as well as tourism choices. The survey identifies which weather extremes' impacts on individuals' behaviour are perceived as relevant, and whether these impacts are positive or negative.
The survey mainly addresses adaptive behaviour to weather sensitivity, although marginally it addresses as well global warming issues, in order to motivate people to answer all the questions.

2.2. Methods

The survey questionnaire is in the Appendix.
The survey was conducted by SELECTA, a market research Italian firm, on behalf of Fondazione Eni Enrico Mattei.
Phone interviews have been carried out on a stratified sample of 300 individuals, selected from two Italian regions, Lombardy and Sicily, located respectively in the North and in the South of Italy.
The two regions differ considerably because of geographical and climate characteristics, as well as because of economic and cultural features.
Lombardy is a flatland and mountain region, characterised by a continental climate, endowed with a highly productive economic activity, concentrated mainly in the industry and service sectors. Sicily, a beautiful and renowned island in South, is indeed characterised by a Mediterranean climate; its beautiful setting, and its historical and cultural richness, represent a big attractiveness for tourism: its economy is mainly based on agriculture and tourism activities.
These two regions have been selected to represent respectively the North and the South, since they exemplify the main differences in terms of economic, cultural, geographic and climate characteristics between the North and the South of Italy. Therefore we refer indiscriminately to the North and to the South when reporting the survey results respectively from Lombardy and Sicily.
The sample is stratified by age, sex and city size. In the sample individuals are identified as well by income level, occupation, education, province and city of residence.

2.3. Perception of Hot and Dry Summers

Figure 1 shows whether for the two regions on average hot and dry summers have a positive or negative influence on individuals' behaviour. In general, people value negatively hot and dry summers. Hot and dry summers have a negative impact on comfort, work, household's activities, leisure, health, commuting and air quality. Air quality is the most important negative aspect associated to hot, dry summers. With regard to water and energy consumption, water use increases considerably during hot and dry summers, while electricity and gas consumption remain constant.

Figure 2 displays the distribution of the perception of specific impacts of hot and dry summers by region. All the impacts are evaluated more negatively by interviewees from the Southern region, Sicily, except for the impact on air quality which is perceived as stronger in Lombardy. The consumption of water and energy in hot and dry summers tends to increase in the South, particularly with regard to water. In Lombardy, there is a positive effect on water consumption, whereas the effect on energy is neutral.

In Figure 3, a closer look at the regional distribution of the level of consumption of energy and gas in hot and dry summers shows a large variability of answers. In the North, for most interviewees the effect of hot and dry summers on energy consumption is mainly neutral, or negative; hot and dry summers tend to have a relatively bigger positive effect on energy consumption in Sicily.

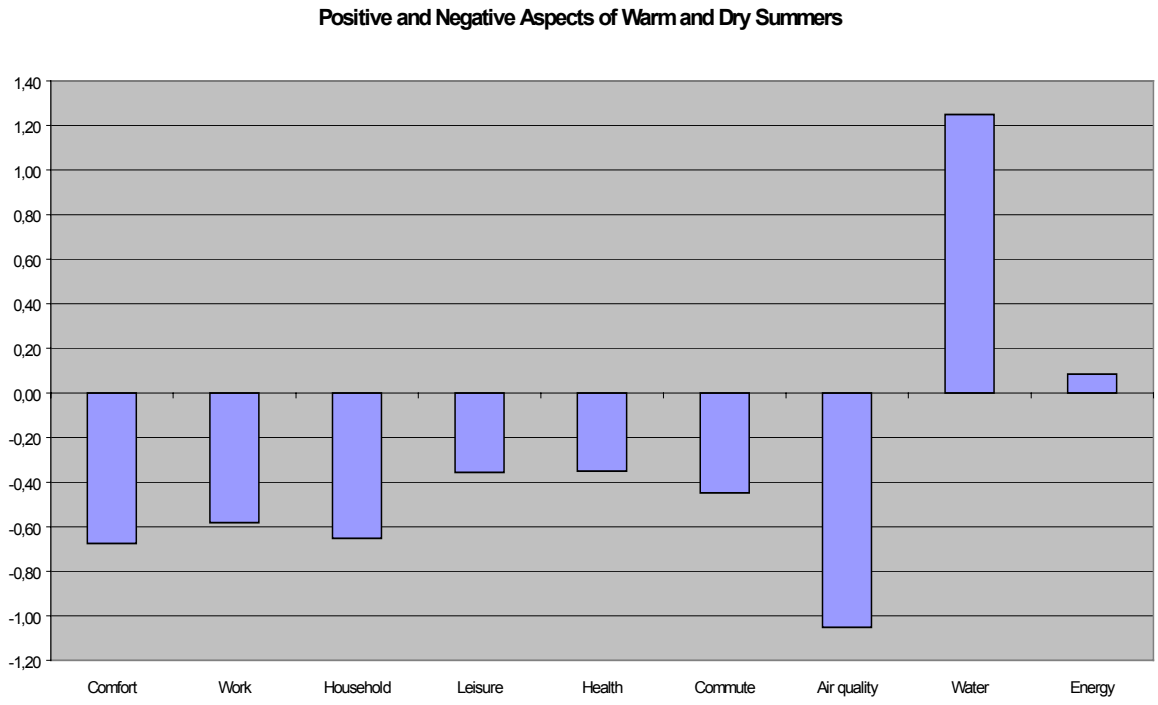

Figure1

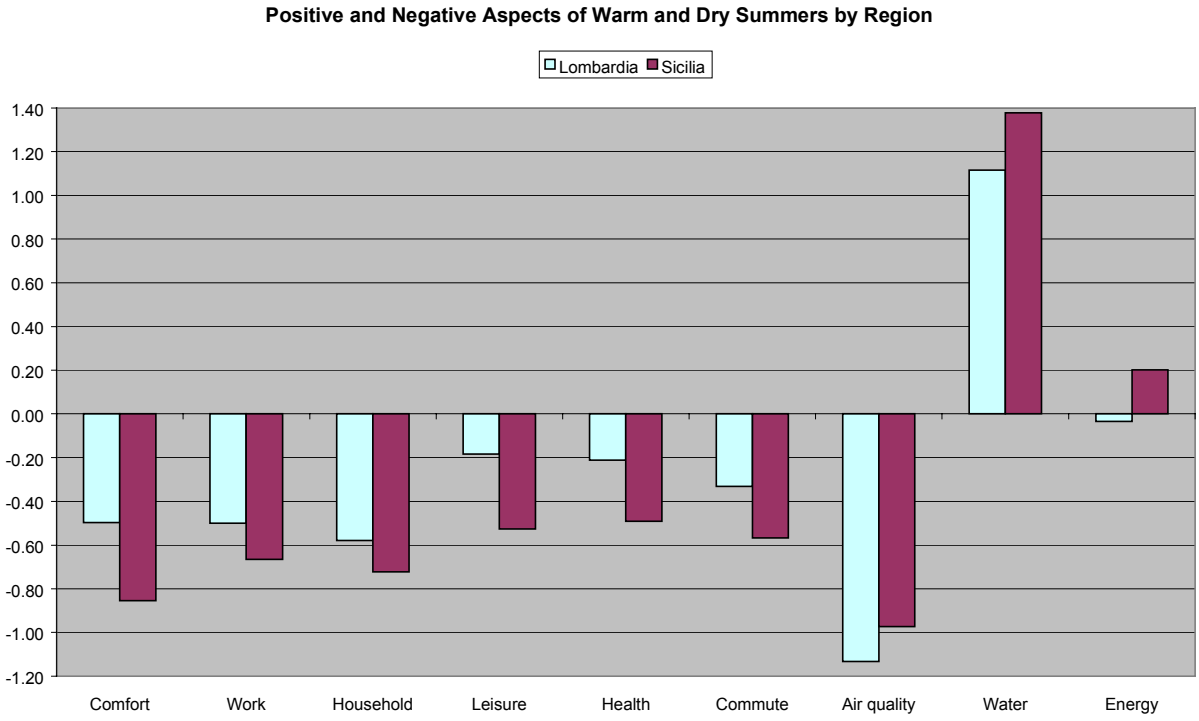

Figure 2

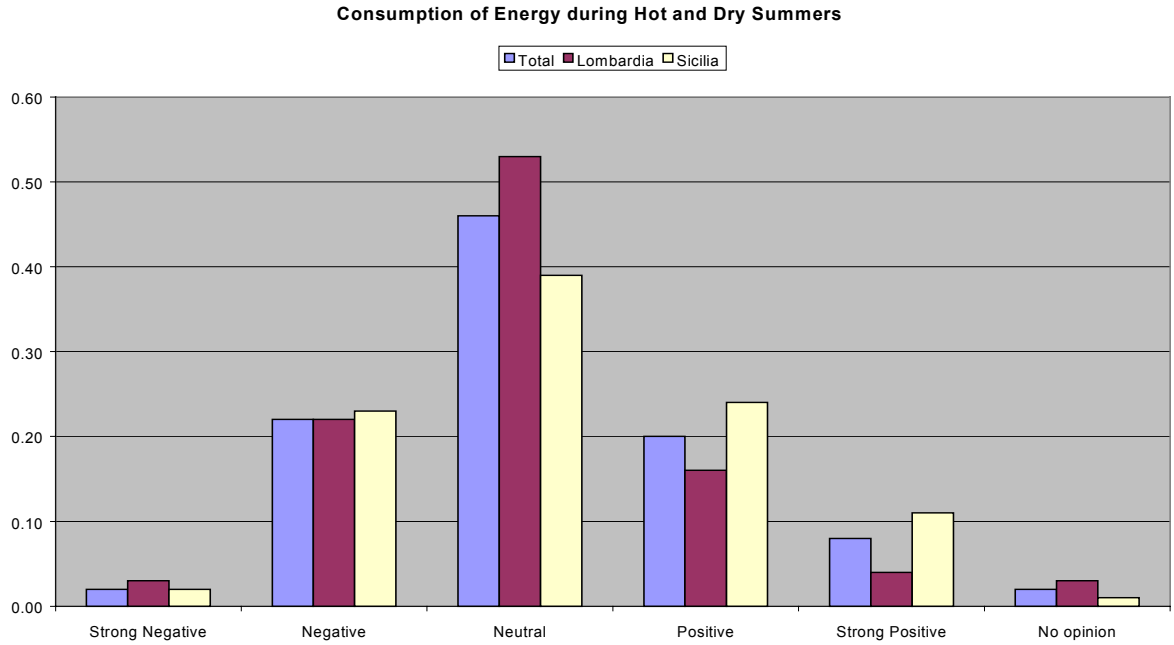

Figure 3

2.4. Perception of Mild Winters

Figure 4 shows the perceived impacts of mild winters. In general, people value positively mild winters, with an exception for air quality, energy consumption and the practice of winter sports, which are negatively affected by mild winters. The negative effect of mild winters on air quality is perceived as the strongest negative effect, whereas the positive impact on comfort is perceived as the strongest positive impact.

Figure 5 shows that the sensitivity to weather extremes in terms of comfort, leisure, health, commuting and insects is perceived more positively in Lombardy than in Sicily. The sensitivity to mild winters in terms of air quality is indeed perceived considerably more negatively in Lombardy. Surprisingly, the practice of winter-sports is perceived as affected more negatively by mild winters in Sicily than in Lombardy. Energy consumption in mild winters as well is affected more negatively in Sicily than in Lombardy.

Figure 6 displays the impacts which show a large variability of answers, with regard to atmosphere, health and air quality. Responses on the other impacts show a low-variance distribution.

In Figure 7, the distribution of the individuals' perception of air quality reveals that in Lombardy most people consider the air quality to be negatively influenced by weather extremes, while in Sicily the spread of the answers is large. However in both regions the size of the indecisive answers is quite large.

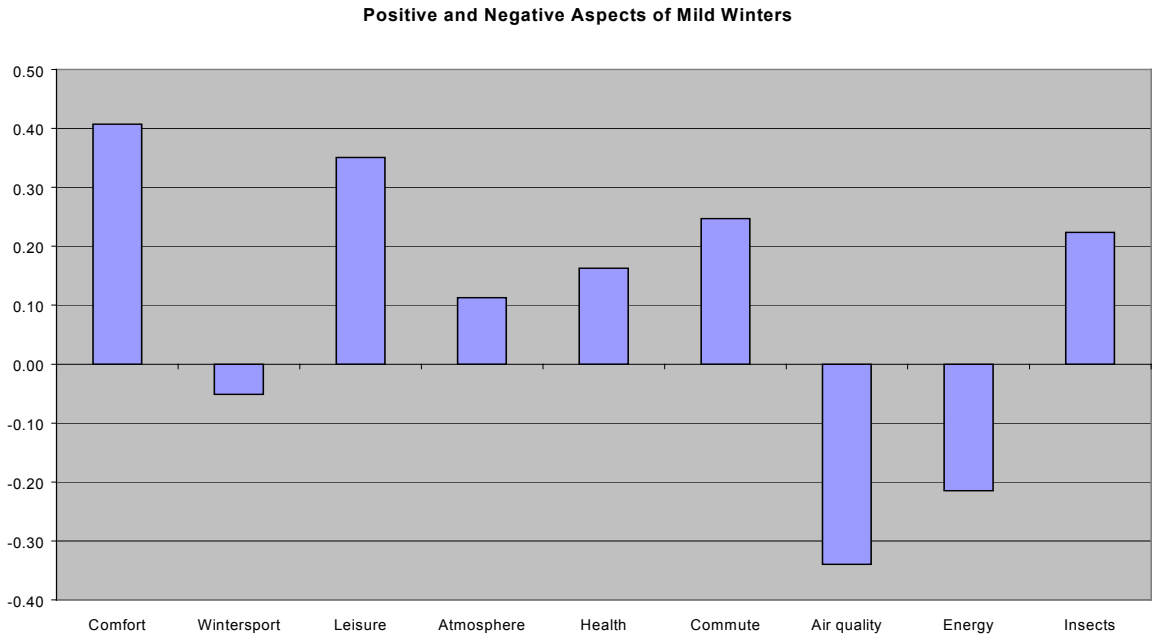

Figure 4

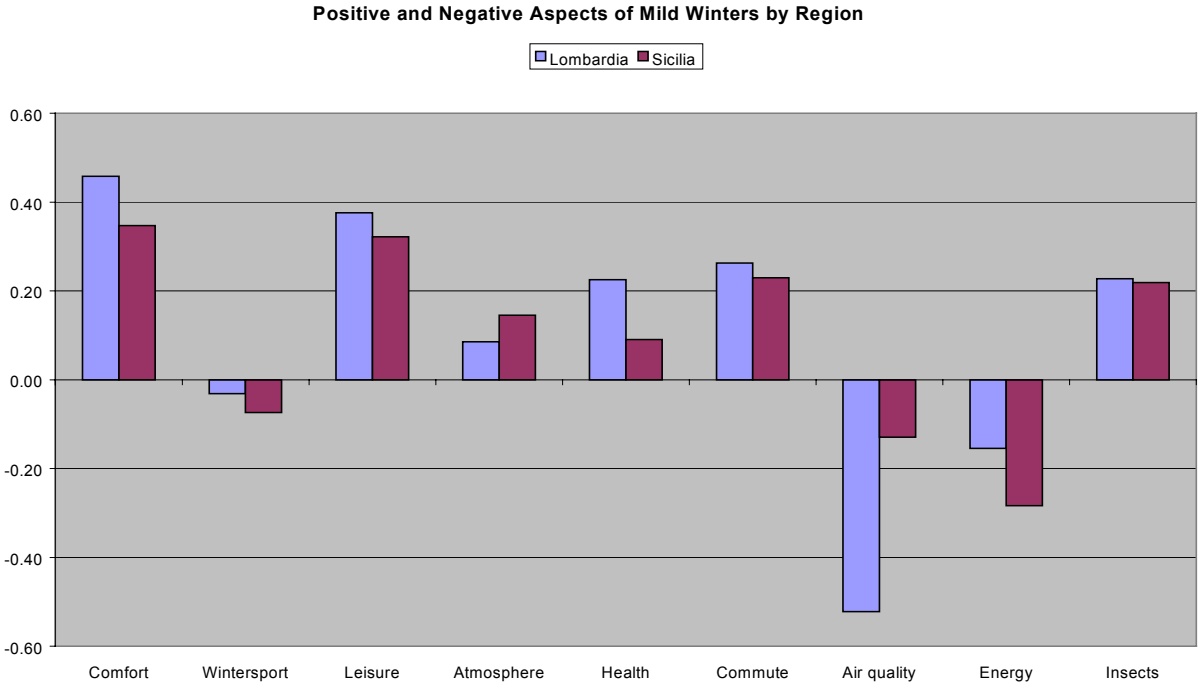

Figure 5

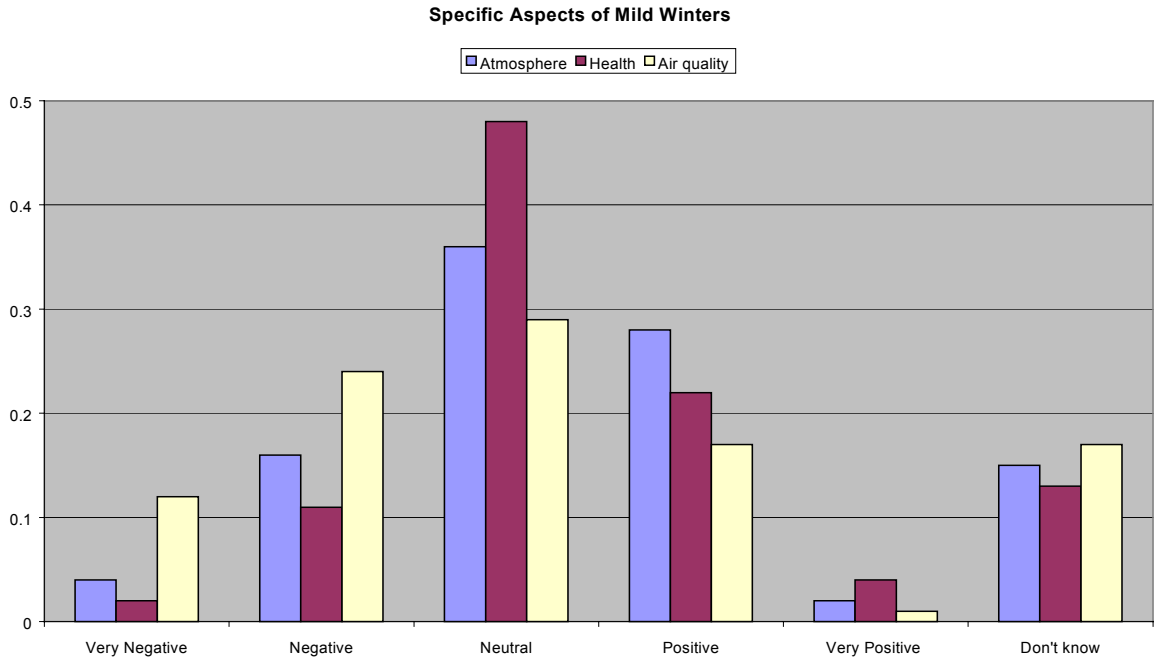

Figure 6

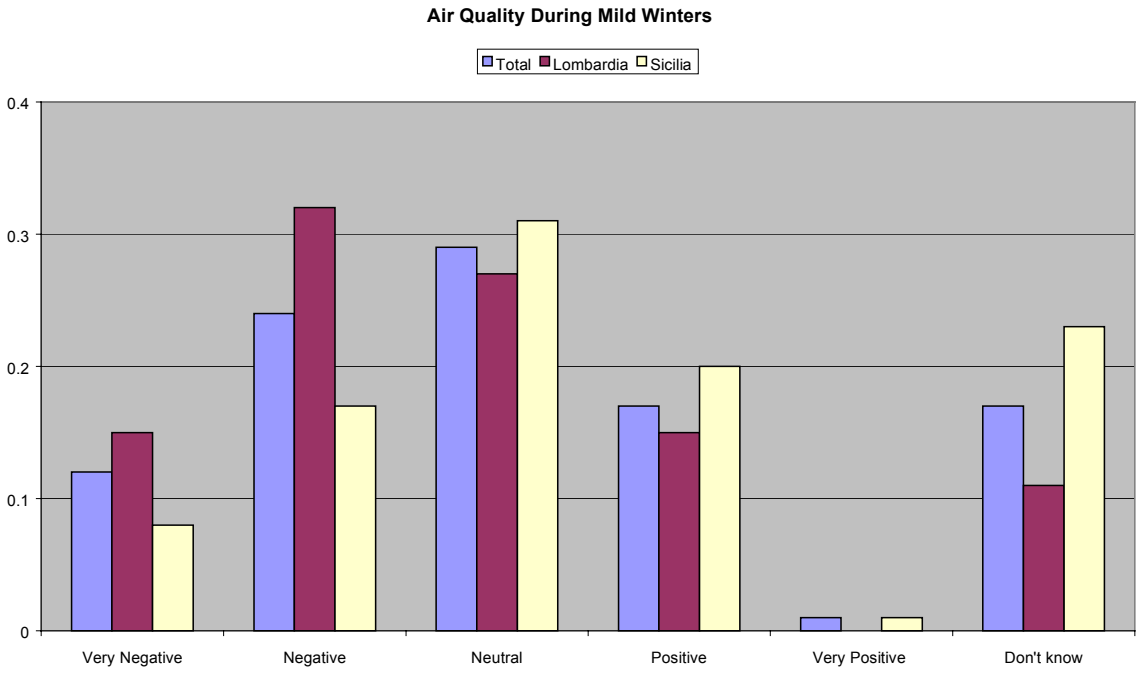

Figure 7

2.5. Perceptions of Climate Change

In Figure 8 we can notice that, although the number of indecisive answers is large, the majority of interviewees think that it is very likely, or simply likely, that hot and dry summers will become more frequent in the future. Figure 9 clearly shows that this opinion is stronger in the region of Sicily, with a larger number of indecisive answers in Lombardy.

Figure 10 shows that when interviewees are asked whether they find worrying the prospect of climate change, the majority finds it very worrying or simply worrying. In this case the number of indecisive answers is limited. In Figure 11 it can be noted that the spread of answers by region is similar.

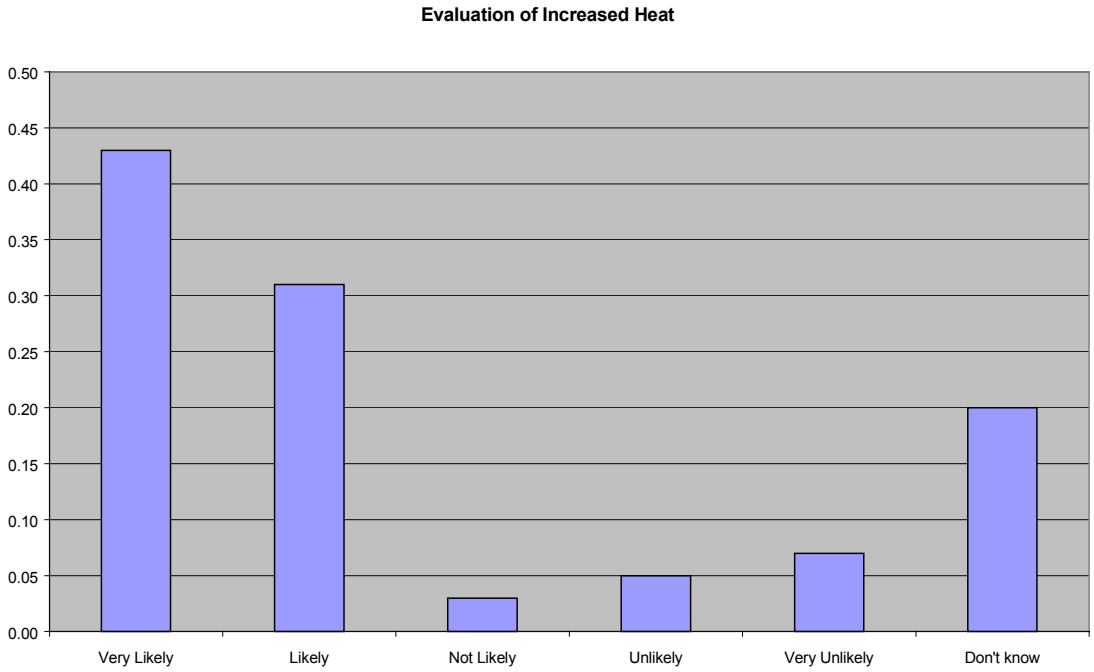

Figure 8

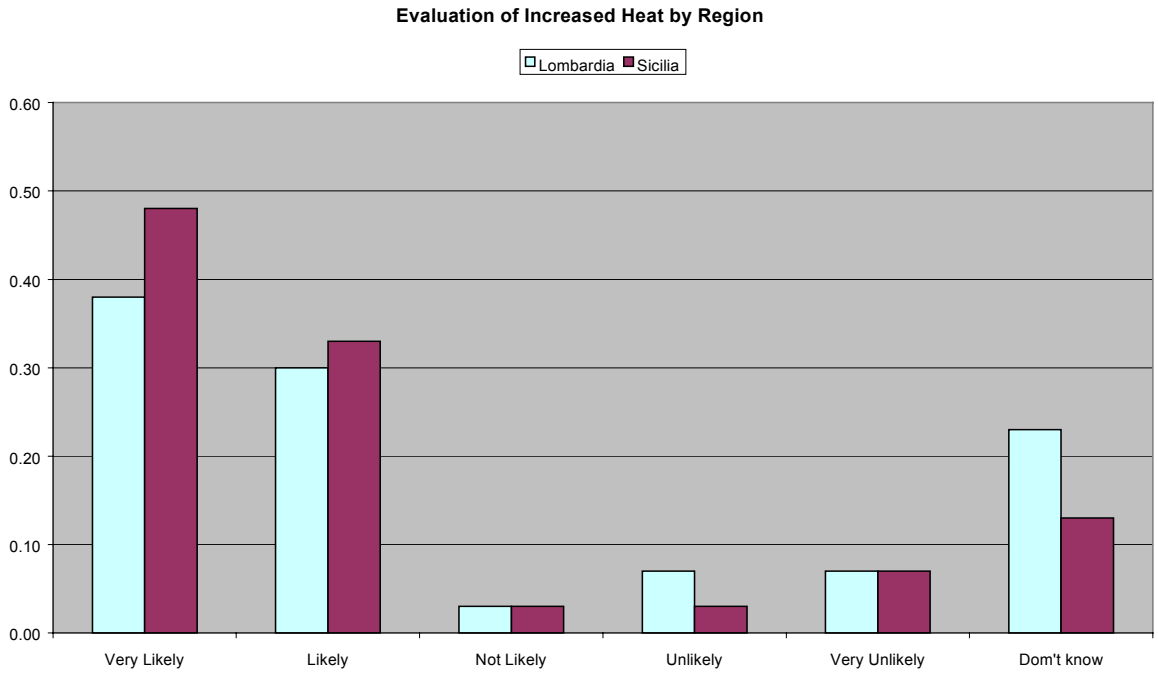

Figure 9

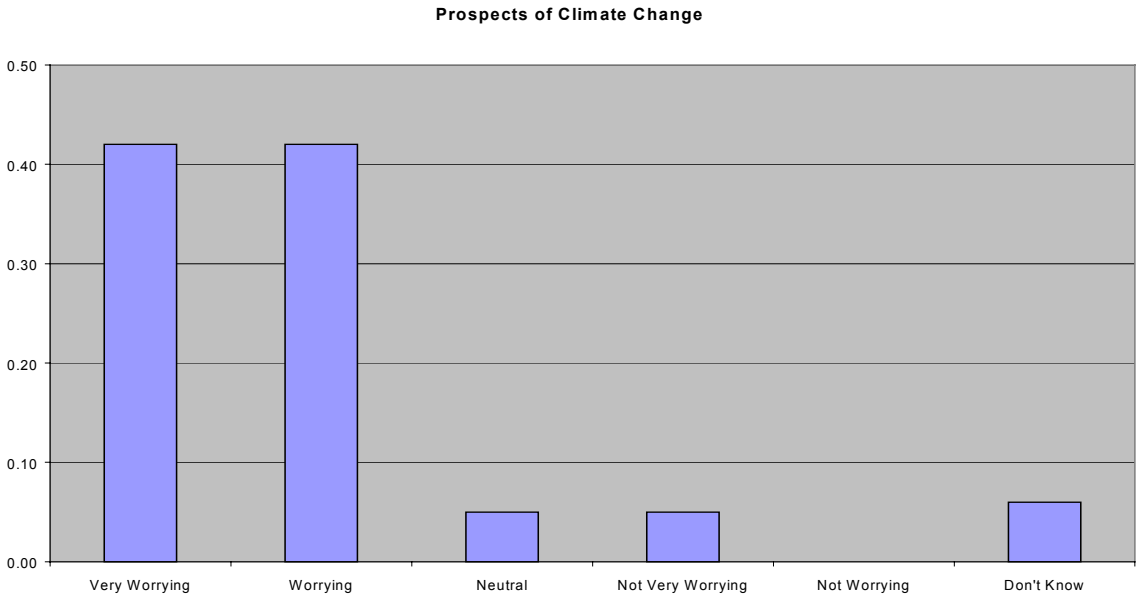

Figure 10

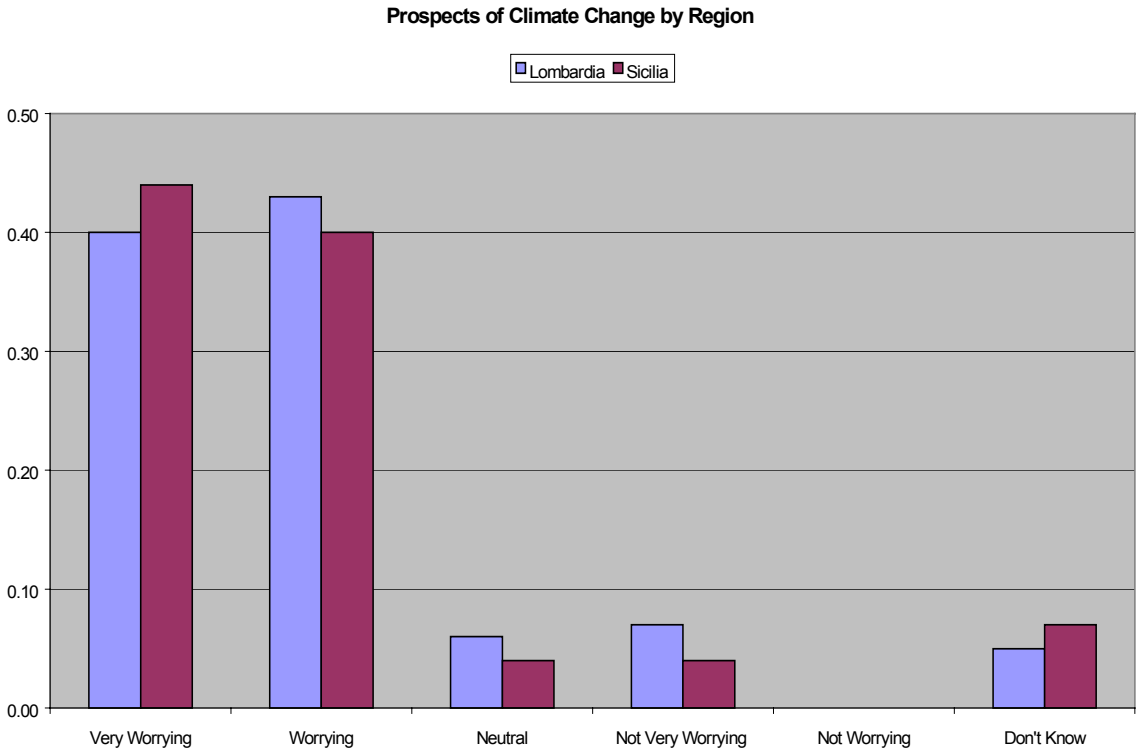

Figure 11

2.6. Adaptation

Figures 12-17 display how interviewees perceive that their behaviour is altered during periods of hot and dry weather.

Figure 12 shows that people tend to use more their motors and their bikes, while the propensity to use public transport, cars and to walk tends to decrease. The distribution of answers by region in Figure 13 reveals that the use of motors and bikes is more popular in Lombardy than in Sicily.

Figure 14 displays how people tend to change their consumption patterns during hot and dry summers. As it could be expected, people tend to prefer outdoor services and activities, such as going to the beach, to the swimming-pool, and being in the nature, with the exception of the preference for outdoor sports which remains constant in Lombardy.
A comparison between the two regions in Figure 15 shows that people from Sicily have a higher preference for going to the beach and to the outdoor restaurants/bars when compared to those from Lombardy. People from Lombardy indeed favour going to the swimming-pool and being in the nature with respect to people from Sicily.

Figure 16 shows that most people do not change their plans for their main vacation due to the extreme seasons, and, if they change them, they prefer to stay home. In addition, short holidays seem to be as responsive as day trips. Figure 17 shows that the answers between the two regions are very similar.
In Figures 18 and 19 a closer look at the distribution of day trips and short holidays following weather extremes reveals that the distribution of answers is spread: there are people who did more day trips/holidays and people who did much less, or simply less. The distribution of the positive, neutral or negative perception between the two regions varies particularly with regard to the negative and neutral impact of weather extremes in terms of adaptation of day trips.

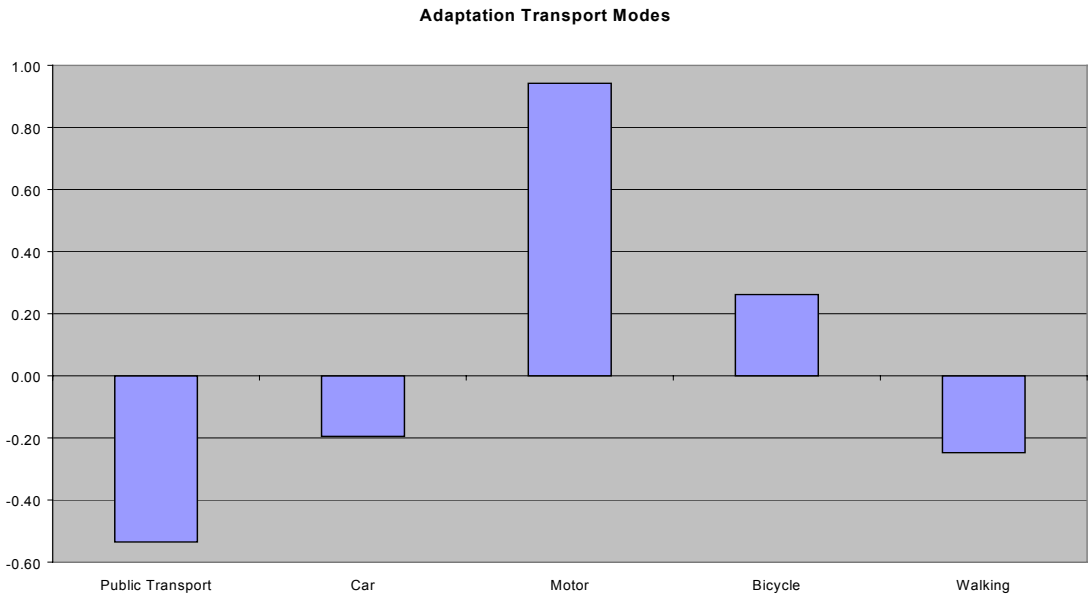

Figure 12

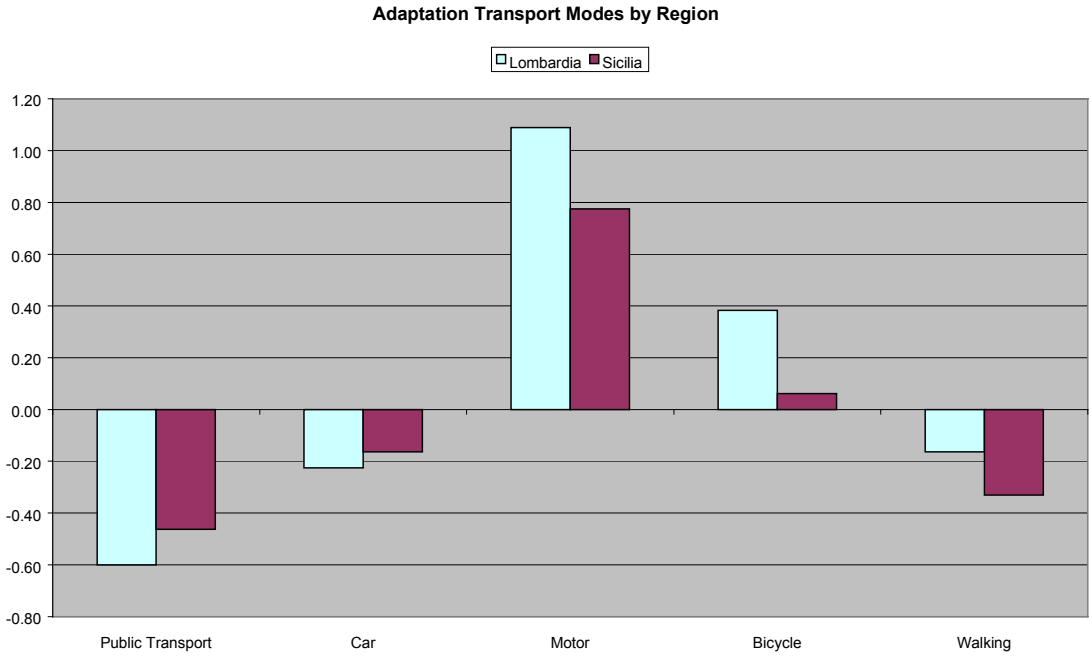

Figure 13

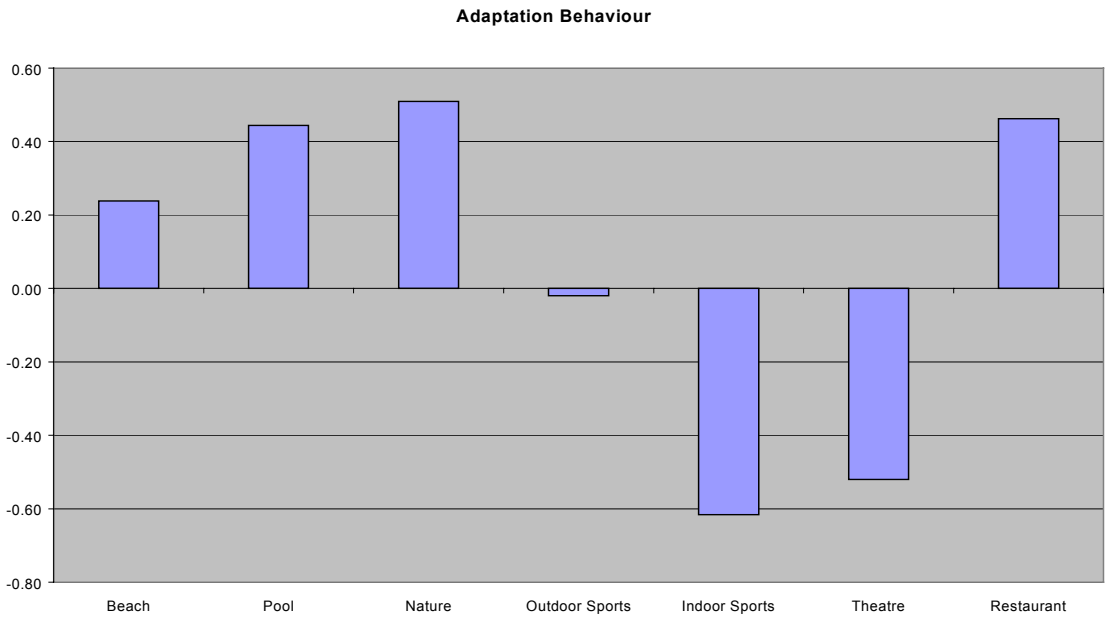

Figure 14

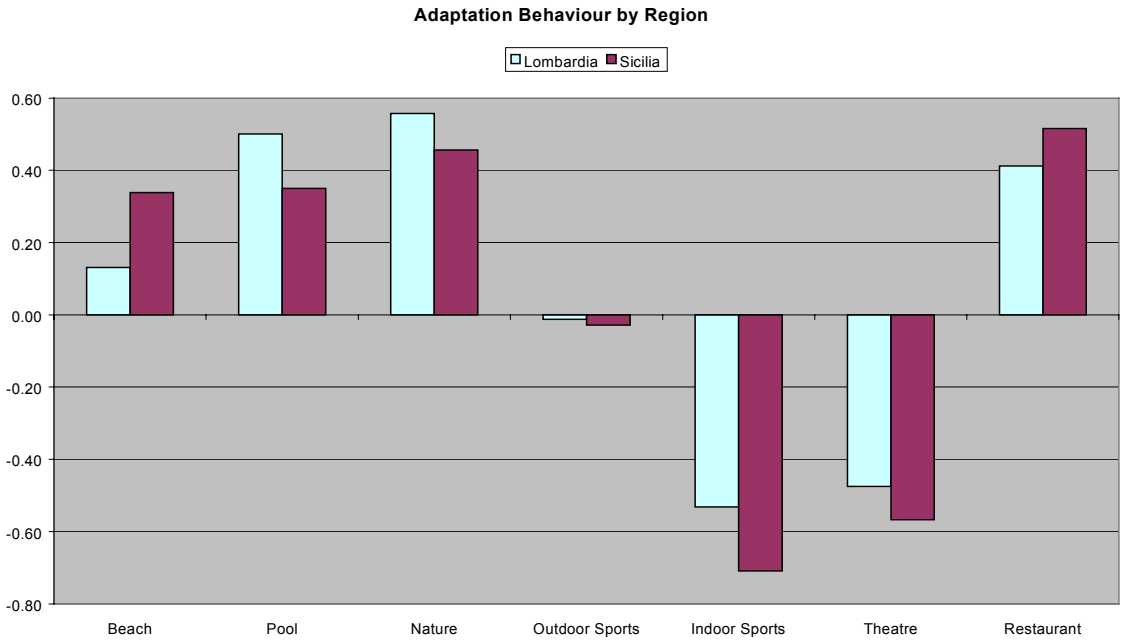

Figure 15

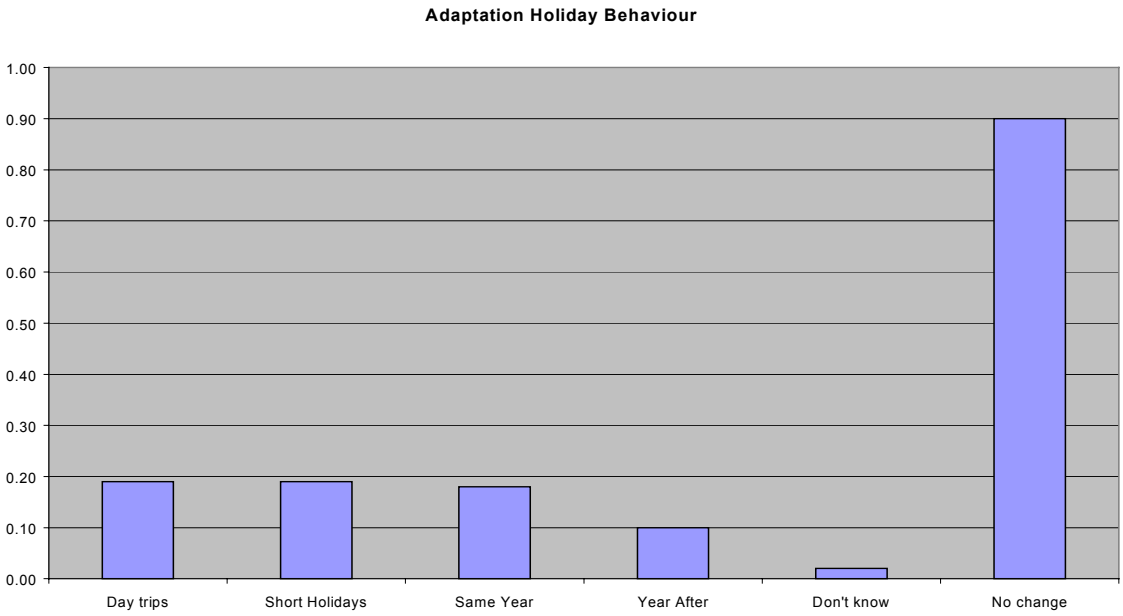

Figure 16

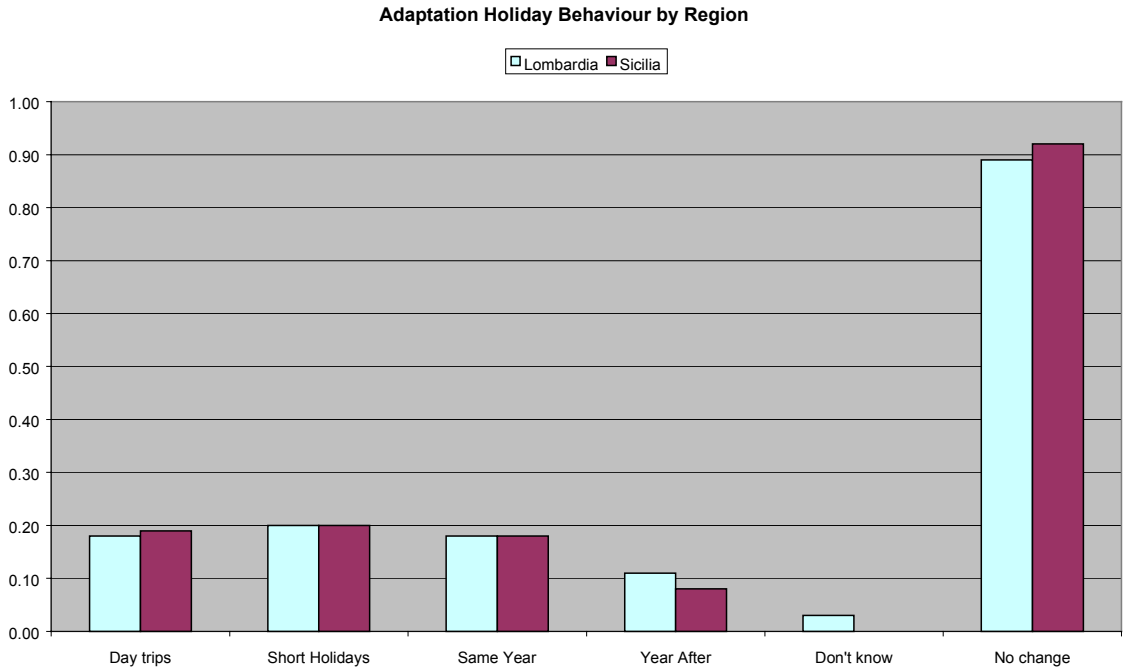

Figure 17

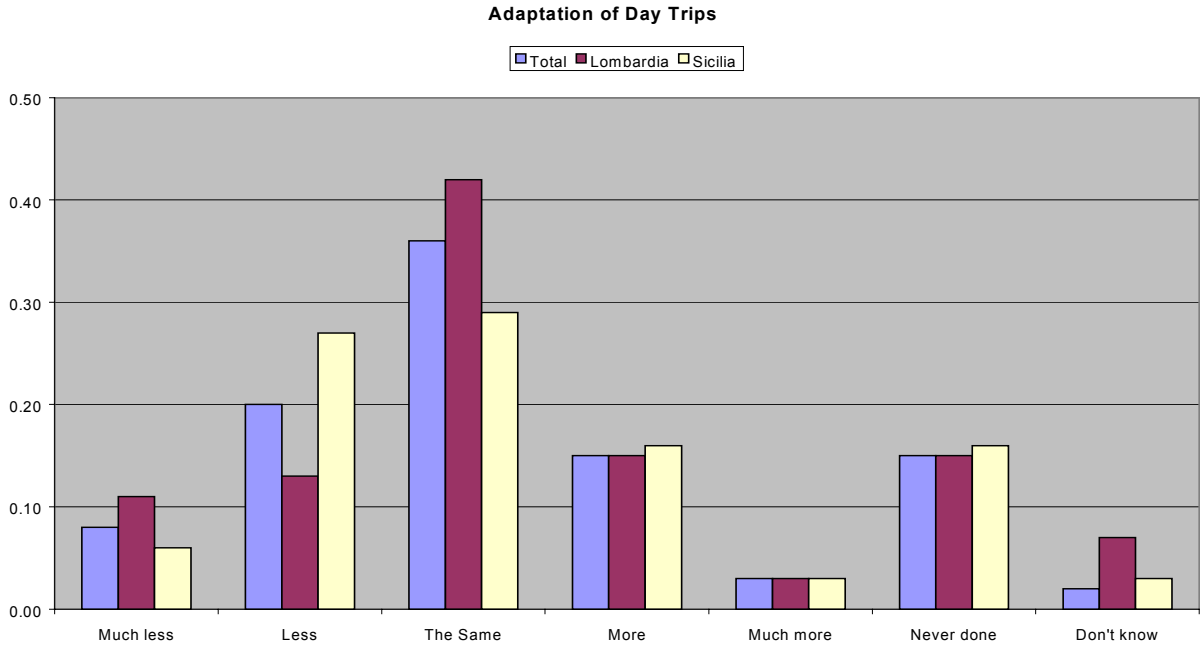

Figure 18

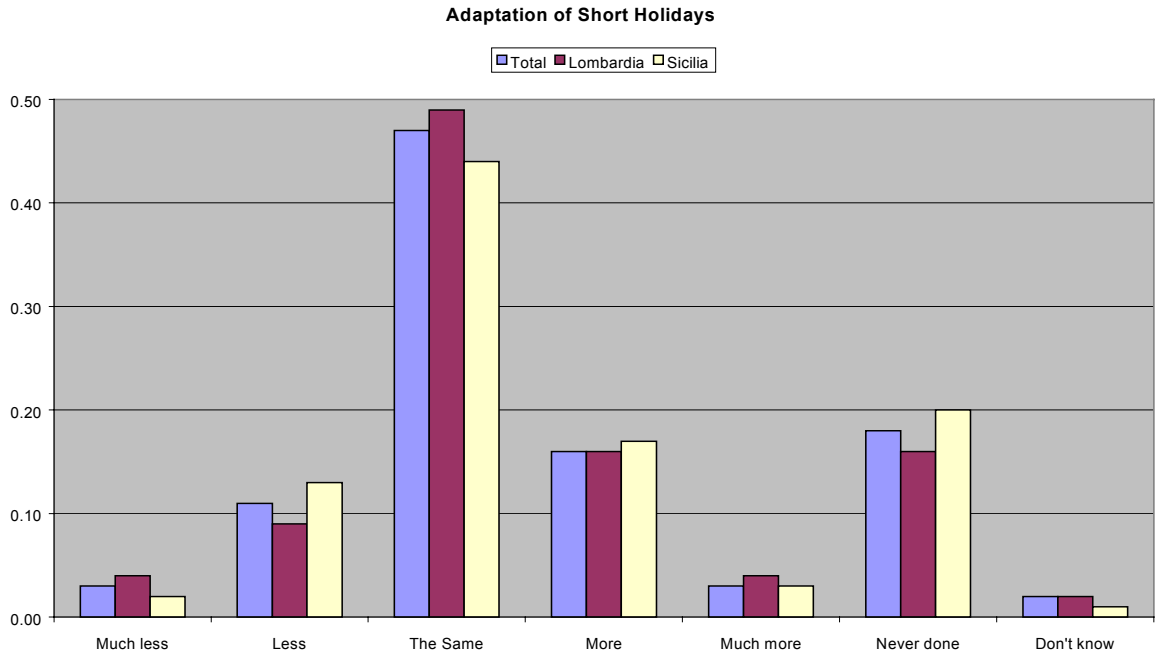

Figure 19

2.7. Perception of Temperature

People were then asked to indicate which summer they remembered being very hot and dry, and which winter was very mild.
Figures 20-23 show that most people think that the last summer was very hot and dry and the last winter was very mild, which may be indicative of 'short memory'. With regard to the mild winter, however, there was a big number of indecisive answers.

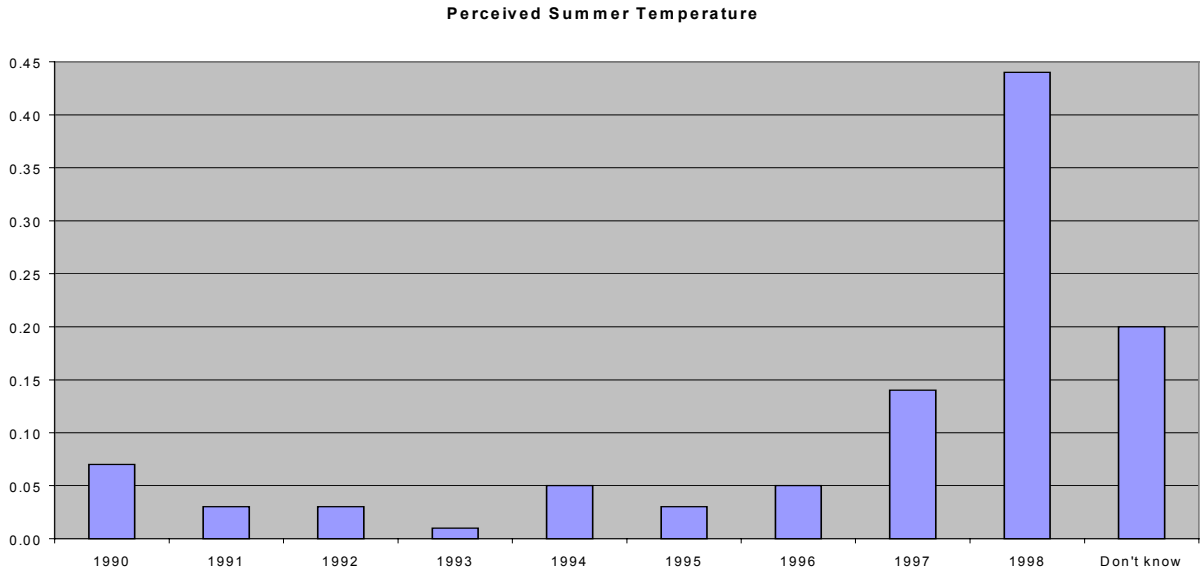

Figure 20

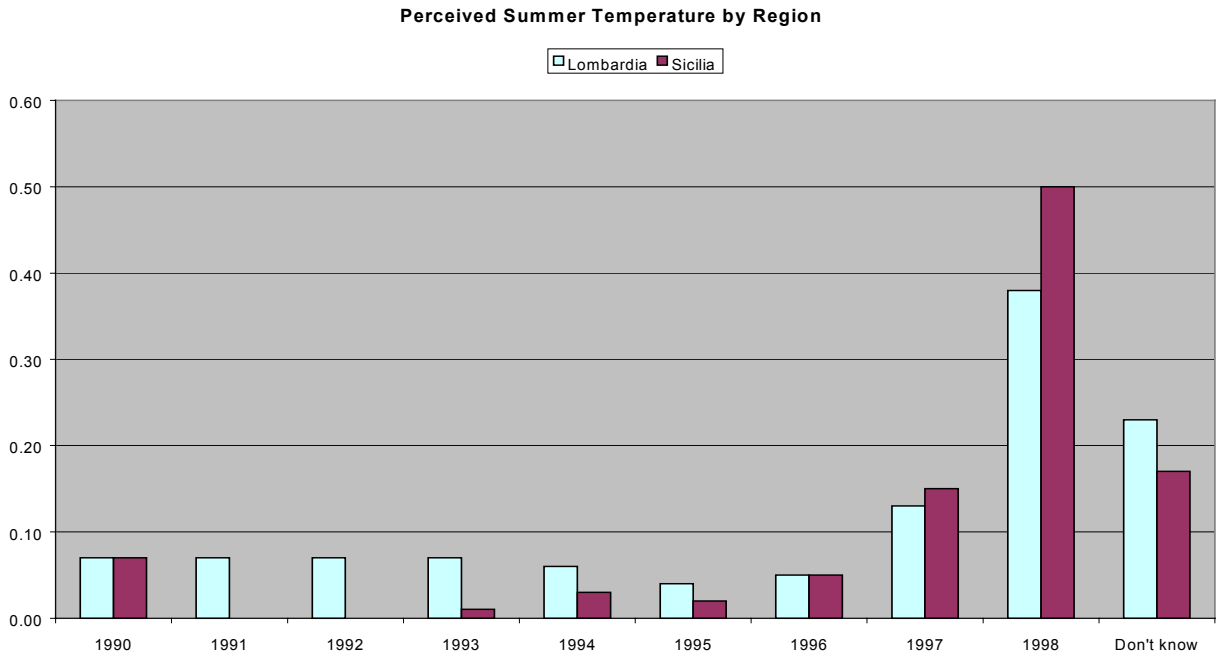

Figure 21

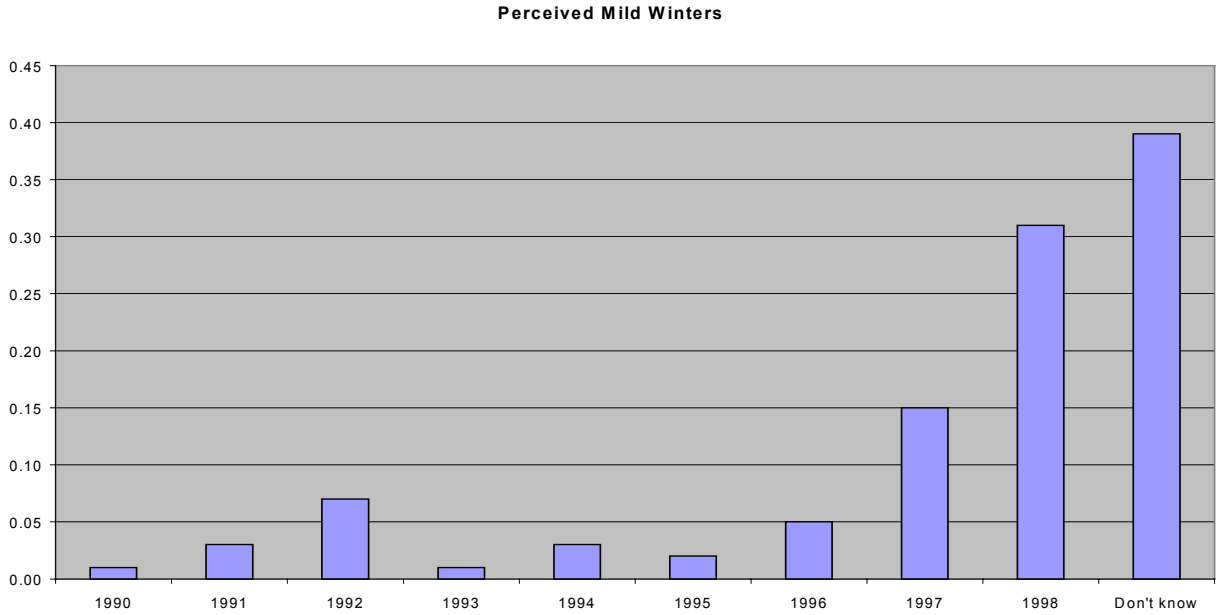

Figure 22

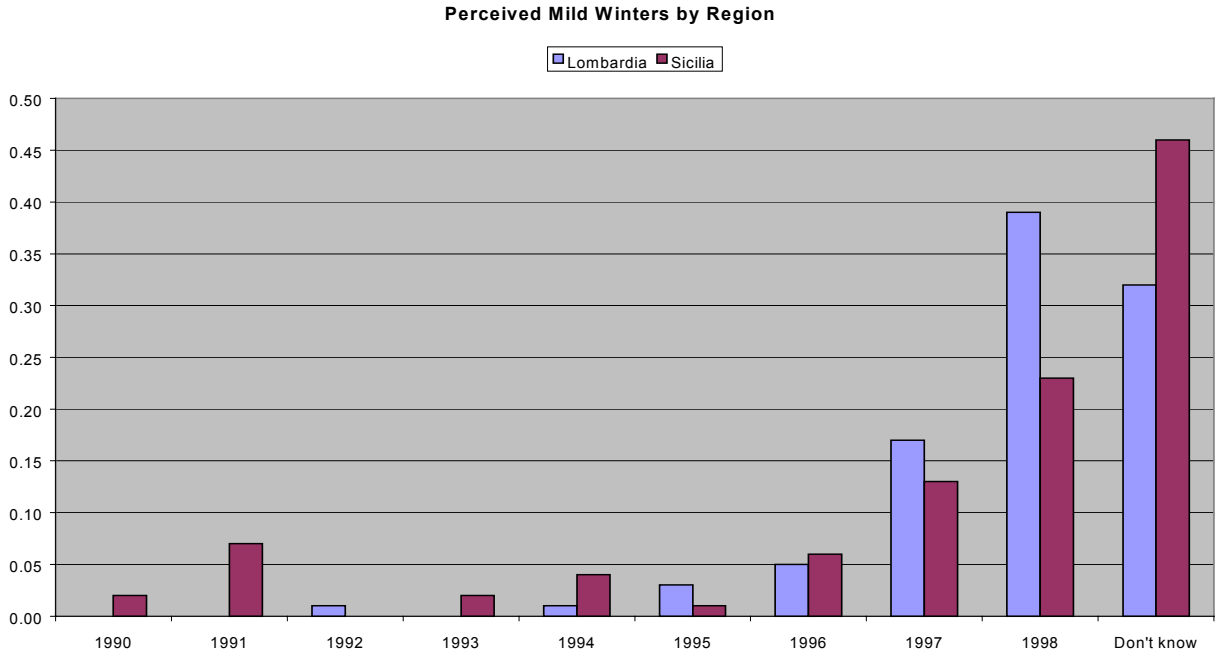

Figure 23

2.8. Conclusions

The survey results show that in the selected sample from the North and the South of Italy individuals perceive unusually extreme seasons as having considerable effects on their life: generally people identify negative effects of extremely hot and dry summers and mild winters on their quality of life, in terms of weather impacts on their comfort, work, leisure, health, commuting and transport patterns, as well as household activities.

Energy and water consumption seem to be quite sensitive to climate extremes, particularly in the South, where water and energy consumption tend to increase during hot and dry summers.

Individuals are particularly concerned about the extreme seasons' impacts on air quality. This concern is definitely stronger in the Northern region.

Regional differences between the North and the South induce people to favour different adaptive behaviours to climate extremes in their daily lives, such as enjoying more activities to the beach and sea-side, abandoning indoor activities, in Sicily, or being more in the nature, going to the swimming pool, using considerably less public transports and private cars in favour of motors and bicycles in Lombardy.

One side of individuals' adaptive behaviour which seems to be not too sensitive to climate extremes is tourism: in both regions vacation patterns do not change neither due to unusually hot and dry summers, nor due to mild winters.

Other interesting results emerge from the individuals' evaluation of the prospect of climate change which is considered to be very worrying, or worrying, for the majority of interviewees.

Past extreme seasons cannot be easily identified by the individuals in the sample: people tend to recall the last summers as being the hottest and driest in the past, which may be indicative of a 'short memory'. More indecisive answers apply to the memory of mild winters.

Overall the survey results suggest that individuals are aware of the effects of climate extremes on their daily habits and on their life's quality, and that they tend to respond to climate extremes through some adaptive behaviour.

3. Conclusions

The results of the public perception survey conducted in Italy show that individuals perceive unusually extreme seasons as having considerable effects on their life: generally people identify negative effects of extremely hot and dry summers and mild winters on their quality of life, in terms of weather impacts on their comfort, work, leisure, health, commuting and transport patterns, as well as household activities.
Energy and water consumption seem to be quite sensitive to climate extremes, particularly in the South.
Individuals, mainly in the Northern region, are particularly concerned about the extreme seasons' impacts on air quality.
Regional differences between the North and the South induce people to favour different adaptive behaviours to climate extremes in their daily lives but in both regions are preferred outdoor activities.
One side of individuals' adaptive behaviour which seems to be not too sensitive to climate extremes is tourism: vacation patterns do not change neither due to unusually hot and dry summers, nor due to mild winters.
Other interesting results emerge from the individuals' evaluation of the prospect of climate change which is considered to be very worrying, or worrying, for the majority of interviewees.
Indicative of a 'short memory' about years with extreme weather is the fact that past extreme seasons cannot be easily identified by the individuals in the sample.
Overall the survey results suggest that individuals are aware of the effects of climate extremes on their daily habits and on their life's quality, and that they tend to respond to climate extremes through some adaptive behaviour.

The WISE surveys show consistent and explicable results within and between countries. Perception and adaptation to unusual hot and dry summer weather have an inverse relation to the daily maximum summer temperature. The higher this temperature the less favourably the weather was perceived and the less actively people reacted.
In the UK and The Netherlands unusual hot and dry summer weather was perceived rather favourably, instead in Germany and Italy it was perceived more unfavourably and as a consequence people there reacted less actively.
Clear positive effects of mild winter weather on everyday life were perceived for almost all selected items in all countries except for Germany.

APPENDIX 1: ECONOMETRIC INVESTIGATION*

Introduction

In this appendix are presented the results of an econometric investigation based on the qualitative analysis conducted by FEEM in the WISE project. As previously showed in this paper, one of the objective of WISE project was to analyse the perception of general public regarding climate extremes and, in particular, about the impacts of weather extremes on daily habits at work, at home, in leisure activities, on transport patterns, on health and tourism choices. Using the data of telephonic interviews (the text of the interview is included in *Appendix 2*), has been possible to carry out an analysis of regressions to quantify the relation between the individual characteristics of the interviewees (gender, age, income class, number of persons in the household, region and size of the village/town) and the probability to reply in certain way.

Methodology

Regressions were made using the *bynary probit model* and the *ordered probit model*, models whose dependent variables are of qualitative nature. Coefficients obtained by regressions express how much the probability to reply in a certain way depends on the vector containing the individual characteristic of each interviewee.
At the beginning the regressions were made including in the independent variables all the individual characteristic available (gender, age, income class, number of persons in the household, region and size of the village/town). Afterwards were included, from time to time, the independent variables that were considered explanatory of the behaviour of the dependent variable represented by the replies to interview.
Regression models were chosen depending on the nature of the values of the dependent variable: most times was used the *ordered probit model* because the observed dependent variable denoted outcomes representing ordered or ranked categories (the possible answers were discrete and ordered, for example from “much less” to “much more”); only in a couple of regressions was used the *bynary probit model*, model in which the dependent variable may take on only two values (the alternative replies were NO-YES (0-1)).
Coefficients obtained by regressions show the average change of the dependent variable for each positive unitary change of independent variables (in this case for the independent variables were determined certain classes of age, size of the town and income classes).

Econometric analysis

Tables 1 show that the negative influence of hot and dry summer on many aspects of everyday life is related with gender, age, income and region. In fact, it results that women and interviewees from Sicily perceive more negatively extreme summers. Furthermore, it was predictable that older people suffered more high temperatures but surprises the fact that the higher is the income class the higher is the discomfort caused by hot seasons.

* by Paolo Mombrini, thesis 2001: "*Cambiamento Climatico: Impatti Socioeconomici degli Eventi Climatici Estremi*"

Tables 1: Influence of hot summer on aspects of everyday life

Dependent Variable: Comfort
Method: ML - Ordered Probit
Included observations: 214
Number of ordered indicator values: 5

	Coefficient	Std. Error	z-Statistic	Prob.
INCOME	-0.145683	0.058523	-2.489329	0.0128
GENDER(m-f)	-0.426082	0.151784	-2.807151	0.0050
REGION(L-S)	-0.466430	0.149326	-3.123578	0.0018
AGE	-0.095230	0.044510	-2.139517	0.0324
Limit Points				
LIMIT_2:C(5)	-2.929708	0.463876	-6.315713	0.0000
LIMIT_3:C(6)	-1.779227	0.447191	-3.978672	0.0001
LIMIT_4:C(7)	-0.757167	0.441625	-1.714501	0.0864
LIMIT_5:C(8)	0.166364	0.464623	0.358062	0.7203

Akaike info criterion	2.657463	Schwarz criterion	2.783294
Log likelihood	-276.3485	Hannan-Quinn criter.	2.708310
Restr. log likelihood	-287.6198	Avg. log likelihood	-1.291348
LR statistic (4 df)	22.54244	LR index (Pseudo-R2)	0.039188
Probability(LR stat)	0.000156		

Dependent Variable: Work
Method: ML - Ordered Probit
Included observations: 213
Number of ordered indicator values: 5

	Coefficient	Std. Error	z-Statistic	Prob.
INCOME	-0.103174	0.058816	-1.754176	0.0794
GENDER	-0.616322	0.157544	-3.912069	0.0001
AGE	-0.075543	0.045878	-1.646618	0.0996
Limit Points				
LIMIT_2:C(4)	-2.526504	0.410371	-6.156637	0.0000
LIMIT_3:C(5)	-1.460092	0.395509	-3.691675	0.0002
LIMIT_4:C(6)	0.296009	0.392424	0.754308	0.4507
LIMIT_5:C(7)	1.022314	0.444548	2.299673	0.0215

Akaike info criterion	2.350657	Schwarz criterion	2.461122
Log likelihood	-243.3449	Hannan-Quinn criter.	2.395299
Restr. log likelihood	-251.8704	Avg. log likelihood	-1.142465
LR statistic (3 df)	17.05092	LR index (Pseudo-R2)	0.033849
Probability(LR stat)	0.000690		

Dependent Variable: Health
Method: ML - Ordered Probit
Included observations: 302
Number of ordered indicator values: 5

	Coefficient	Std. Error	z-Statistic	Prob.
AGE	-0.119963	0.035685	-3.361710	0.0008
GENDER	-0.492851	0.128047	-3.848986	0.0001
REGION	-0.337690	0.126950	-2.660011	0.0078
Limit Points				
LIMIT_2:C(4)	-3.036247	0.334576	-9.074901	0.0000
LIMIT_3:C(5)	-2.020899	0.318902	-6.337052	0.0000
LIMIT_4:C(6)	-0.337258	0.302756	-1.113961	0.2653
LIMIT_5:C(7)	0.331173	0.315075	1.051091	0.2932

Akaike info criterion	2.390975	Schwarz criterion	2.476979
Log likelihood	-354.0373	Hannan-Quinn criter.	2.425386
Restr. log likelihood	-370.3513	Avg. log likelihood	-1.172309
LR statistic (3 df)	32.62795	LR index (Pseudo-R2)	0.044050
Probability(LR stat)	3.86E-07		

Dependent Variable: Commute
Method: ML - Ordered Probit
Included observations: 301
Number of ordered indicator values: 5

	Coefficient	Std. Error	z-Statistic	Prob.
GENDER	-0.497634	0.128565	-3.870679	0.0001
REGION	-0.286754	0.127486	-2.249297	0.0245
Limit Points				
LIMIT_2:C(3)	-2.564434	0.294516	-8.707272	0.0000
LIMIT_3:C(4)	-1.338242	0.275180	-4.863157	0.0000
LIMIT_4:C(5)	0.357615	0.269752	1.325714	0.1849
LIMIT_5:C(6)	1.043488	0.300522	3.472246	0.0005

Akaike info criterion	2.292254	Schwarz criterion	2.366150
Log likelihood	-338.9842	Hannan-Quinn criter.	2.321824
Restr. log likelihood	-349.8704	Avg. log likelihood	-1.126193
LR statistic (2 df)	21.77244	LR index (Pseudo-R2)	0.031115
Probability(LR stat)	1.87E-05		

Air quality in hot and dry summers is perceived more negatively in Lombardy and in bigger towns. Moreover, as before, women and people with higher income are more influenced (*table 2*).

Table 2: Air quality in hot and dry summers

Dependent Variable: Air quality Method: ML - Ordered Probit Included observations: 206 Number of ordered indicator values: 5				
	Coefficient	Std. Error	z-Statistic	Prob.
TOWN SIZE	-0.151824	0.052941	-2.867819	0.0041
REGION	0.390232	0.156318	2.496404	0.0125
GENDER	-0.363941	0.156450	-2.326238	0.0200
INCOME	-0.108489	0.059992	-1.808407	0.0705
Limit Points				
LIMIT_2:C(5)	-1.183041	0.392595	-3.013388	0.0026
LIMIT_3:C(6)	0.170005	0.387308	0.438939	0.6607
LIMIT_4:C(7)	1.239683	0.402613	3.079089	0.0021
LIMIT_5:C(8)	1.855802	0.457801	4.053733	0.0001
Akaike info criterion	2.332033	Schwarz criterion		2.461271
Log likelihood	-232.1994	Hannan-Quinn criter.		2.384301
Restr. log likelihood	-242.4366	Avg. log likelihood		-1.127181
LR statistic (4 df)	20.47446	LR index (Pseudo-R2)		0.042226
Probability(LR stat)	0.000402			

According to the sample considered, the domestic consumption of water, electricity and gas in extremely hot summers would increase more in Sicily and in smaller villages. Furthermore, as intuitable, an higher income would permit higher consumption of water. At last it is curious to observe that, consequently to hot temperatures, men increase more than women the consumption of energy (*tables 3*).

Tables 3: Water and energy consumption during hot summers

Dependent Variable: Water Method: ML - Ordered Probit Included observations: 212 Number of ordered indicator values: 5				
	Coefficient	Std. Error	z-Statistic	Prob.
REGION	0.421689	0.160721	2.623727	0.0087
INCOME	0.134037	0.061648	2.174224	0.0297
TOWN SIZE	-0.090398	0.052514	-1.721410	0.0852
Limit Points				
LIMIT_2:C(4)	-1.939723	0.459778	-4.218825	0.0000
LIMIT_3:C(5)	-1.132652	0.340361	-3.327801	0.0009
LIMIT_4:C(6)	-0.210860	0.315146	-0.669086	0.5034
LIMIT_5:C(7)	0.626132	0.318279	1.967242	0.0492
Akaike info criterion	2.236665	Schwarz criterion		2.347495
Log likelihood	-230.0864	Hannan-Quinn criter.		2.281460
Restr. log likelihood	-236.3018	Avg. log likelihood		-1.085313
LR statistic (3 df)	12.43079	LR index (Pseudo-R2)		0.026303
Probability(LR stat)	0.006044			

Dependent Variable: Energy Method: ML - Ordered Probit Included observations: 296 Number of ordered indicator values: 5				
	Coefficient	Std. Error	z-Statistic	Prob.
REGION	0.306593	0.125295	2.446968	0.0144
TOWN SIZE	-0.093506	0.040392	-2.314961	0.0206
GENDER	-0.255663	0.124936	-2.046346	0.0407
Limit Points				
LIMIT_2:C(4)	-2.217069	0.325411	-6.813141	0.0000
LIMIT_3:C(5)	-0.871605	0.285796	-3.049748	0.0023
LIMIT_4:C(6)	0.420954	0.281884	1.493359	0.1353
LIMIT_5:C(7)	1.280227	0.295518	4.332141	0.0000
Akaike info criterion	2.604763	Schwarz criterion		2.692035
Log likelihood	-378.5050	Hannan-Quinn criter.		2.639705
Restr. log likelihood	-385.3417	Avg. log likelihood		-1.278733
LR statistic (3 df)	13.67348	LR index (Pseudo-R2)		0.017742
Probability(LR stat)	0.003385			

As regards the adaptation of transport modes caused by hot summers, the most significant results concern car use (*table 4*): women and older people would tend to use it less. Also the income class and the size of the town seem to affect the propensity to use car in warm seasons: people with high income and that live in bigger towns would reduce less the use of their cars.

Table 4: Car use in hot summers

Dependent Variable: Car Method: ML - Ordered Probit Included observations: 214 Number of ordered indicator values: 6				
	Coefficient	Std. Error	z-Statistic	Prob.
AGE	-0.178977	0.047342	-3.780540	0.0002
INCOME	0.136200	0.058152	2.342138	0.0192
TOWN SIZE	0.103515	0.050914	2.033119	0.0420
GENDER	-0.272313	0.151175	-1.801303	0.0717
Limit Points				
LIMIT_2:C(5)	-1.813646	0.398280	-4.553693	0.0000
LIMIT_3:C(6)	-1.523276	0.392111	-3.884804	0.0001
LIMIT_4:C(7)	-0.758502	0.383514	-1.977771	0.0480
LIMIT_5:C(8)	0.785306	0.385188	2.038763	0.0415
LIMIT_6:C(9)	1.565269	0.419126	3.734605	0.0002
Akaike info criterion	2.755988	Schwarz criterion		2.897547
Log likelihood	-285.8907	Hannan-Quinn criter.		2.813191
Restr. log likelihood	-300.8316	Avg. log likelihood		-1.335938
LR statistic (4 df)	29.88193	LR index (Pseudo-R2)		0.049666
Probability(LR stat)	5.17E-06			

The coefficients obtained by regressions relating to consumption patterns during hot and dry summer point out that people that tend to go more to the beach are the younger, persons from Sicily and from bigger towns and obviously people with high income. Interviewees that decide to stay more in the countryside are men and Lombards (*tables 5*).

Tables 5: Activities influenced by hot summer

Dependent Variable: Beach
Method: ML - Ordered Probit
Included observations: 214
Number of ordered indicator values: 6

	Coefficient	Std. Error	z-Statistic	Prob.
AGE	-0.236255	0.046467	-5.084367	0.0000
INCOME	0.144958	0.057228	2.533001	0.0113
REGION	0.445262	0.149671	2.974940	0.0029
TOWN SIZE	0.105924	0.051637	2.051327	0.0402
Limit Points				
LIMIT_2:C(5)	-0.785482	0.351388	-2.235370	0.0254
LIMIT_3:C(6)	-0.542924	0.348730	-1.556860	0.1195
LIMIT_4:C(7)	-0.223708	0.346841	-0.644988	0.5189
LIMIT_5:C(8)	0.978158	0.353775	2.764914	0.0057
LIMIT_6:C(9)	1.695085	0.362256	4.679247	0.0000

Akaike info criterion	3.015478	Schwarz criterion	3.157038
Log likelihood	-313.6562	Hannan-Quinn criter.	3.072681
Restr. log likelihood	-338.1497	Avg. log likelihood	-1.465683
LR statistic (4 df)	48.98702	LR index (Pseudo-R2)	0.072434
Probability(LR stat)	5.88E-10		

Dependent Variable: Nature
Method: ML - Ordered Probit
Included observations: 302
Number of ordered indicator values: 6

	Coefficient	Std. Error	z-Statistic	Prob.
REGION	-0.290113	0.122625	-2.365846	0.0180
GENDER	-0.294290	0.122943	-2.393705	0.0167
Limit Points				
LIMIT_2:C(3)	-2.070174	0.275931	-7.502511	0.0000
LIMIT_3:C(4)	-1.989745	0.274236	-7.255583	0.0000
LIMIT_4:C(5)	-1.769411	0.270366	-6.544501	0.0000
LIMIT_5:C(6)	-0.643356	0.260529	-2.469419	0.0135
LIMIT_6:C(7)	0.289197	0.261071	1.107734	0.2680

Akaike info criterion	2.935179	Schwarz criterion	3.021183
Log likelihood	-436.2121	Hannan-Quinn criter.	2.969590
Restr. log likelihood	-442.3921	Avg. log likelihood	-1.444411
LR statistic (2 df)	12.35999	LR index (Pseudo-R2)	0.013970
Probability(LR stat)	0.002070		

To analyse the replies relating to influence of hot summer on holiday behaviour see *tables 6*. Compared to a normal summer it results that women and older people express their discomfort doing less day trips and short holidays; on the contrary are willing to do this kind of holidays the young, in particular males.

Tables 6: Adaptation of day trips and short holidays during hot summer

Dependent Variable: Day trips Method: ML - Ordered Probit Included observations: 296 Number of ordered indicator values: 6				
	Coefficient	Std. Error	z-Statistic	Prob.
AGE	-0.171942	0.035084	-4.900787	0.0000
GENDER	-0.370871	0.122971	-3.015918	0.0026
Limit Points				
LIMIT_2:C(3)	-2.267024	0.260820	-8.691913	0.0000
LIMIT_3:C(4)	-1.933363	0.253561	-7.624853	0.0000
LIMIT_4:C(5)	-1.327970	0.245578	-5.407536	0.0000
LIMIT_5:C(6)	-0.259961	0.240524	-1.080810	0.2798
LIMIT_6:C(7)	0.779324	0.262919	2.964120	0.0030
Akaike info criterion	3.120342	Schwarz criterion		3.207614
Log likelihood	-454.8106	Hannan-Quinn criter.		3.155284
Restr. log likelihood	-470.5916	Avg. log likelihood		-1.536522
LR statistic (2 df)	31.56201	LR index (Pseudo-R2)		0.033534
Probability(LR stat)	1.40E-07			

Dependent Variable: Short holidays Method: ML - Ordered Probit Included observations: 212 Number of ordered indicator values: 6				
	Coefficient	Std. Error	z-Statistic	Prob.
AGE	-0.108061	0.044932	-2.404976	0.0162
GENDER	-0.413723	0.152166	-2.718894	0.0066
INCOME	0.143639	0.057545	2.496099	0.0126
Limit Points				
LIMIT_2:C(4)	-1.692735	0.386460	-4.380109	0.0000
LIMIT_3:C(5)	-1.543774	0.384528	-4.014727	0.0001
LIMIT_4:C(6)	-1.190626	0.382163	-3.115495	0.0018
LIMIT_5:C(7)	0.163210	0.376511	0.433481	0.6647
LIMIT_6:C(8)	1.320404	0.401321	3.290141	0.0010
Akaike info criterion	2.832794	Schwarz criterion		2.959458
Log likelihood	-292.2762	Hannan-Quinn criter.		2.883989
Restr. log likelihood	-303.7446	Avg. log likelihood		-1.378661
LR statistic (3 df)	22.93679	LR index (Pseudo-R2)		0.037757
Probability(LR stat)	4.16E-05			

The results obtained by regressions show that the choice to modify the plans for main vacation due to the extreme season depends particularly on income: the higher is the income, the smaller is the propensity to change the plans (*tables 7*). Also the gender and the region are explanatory variables of holiday behaviour: women would not change their plans for main vacation of the same year and people from Sicily would not change their plans for vacation of the following year.

Tables 7: Adaptation of plans for main vacation during hot summer

Dependent Variable: Holiday behaviour (same year)
Method: ML - Binary Logit
Included observations: 211

Variable	Coefficient	Std. Error	z-Statistic	Prob.
GENDER	-0.703000	0.202600	-3.469888	0.0005
INCOME	-0.213579	0.123476	-1.729720	0.0837

Mean dependent var	0.170616	S.D. dependent var	0.377068
S.E. of regression	0.380024	Akaike info criterion	0.939578
Sum squared resid	30.18346	Schwarz criterion	0.971349
Log likelihood	-97.12545	Hannan-Quinn criter.	0.952420
Avg. log likelihood	-0.460310		
Obs with Dep=0	175	Total obs	211
Obs with Dep=1	36		

Dependent Variable: Holiday behaviour (one year later)
Method: ML - Binary Logit
Included observations: 212

Variable	Coefficient	Std. Error	z-Statistic	Prob.
INCOME	-0.595855	0.200327	-2.974417	0.0029
REGION	-0.582316	0.271663	-2.143523	0.0321

Mean dependent var	0.103774	S.D. dependent var	0.305688
S.E. of regression	0.304594	Akaike info criterion	0.678362
Sum squared resid	19.48325	Schwarz criterion	0.710028
Log likelihood	-69.90638	Hannan-Quinn criter.	0.691161
Avg. log likelihood	-0.329747		
Obs with Dep=0	190	Total obs	212
Obs with Dep=1	22		

For the majority of interviewees it is very likely that extreme summers will become more frequent in the future. Looking at the values in *table 8* it can be noted that the reply to this question is related to gender and age: older people and, in particular, women express more this problem.

Table 8: Evaluation of increased heat

Dependent Variable: Evaluation of increased heat
Method: ML - Binary Logit
Included observations: 248

Variable	Coefficient	Std. Error	z-Statistic	Prob.
GENDER	1.213773	0.278264	4.361956	0.0000
AGE	0.153385	0.104999	1.460819	0.1441

Mean dependent var	0.899194	S.D. dependent var	0.301681
S.E. of regression	0.296367	Akaike info criterion	0.626152
Sum squared resid	21.60703	Schwarz criterion	0.654486
Log likelihood	-75.64289	Hannan-Quinn criter.	0.637559
Avg. log likelihood	-0.305012		
Obs with Dep=0	25	Total obs	248
Obs with Dep=1	223		

Passing on the analysis of the answers relative to a recent mild winter (*tables 9*), it is evident that the highest comfort of unusual mild temperatures is perceived by women. With regard to health, instead, higher benefits

are noticed in Lombardy and in smaller villages. At last, both concerning comfort and health, it results that older people enjoy less the positive effect of unusual warm winter.

Tables 9: Influence of mild winter on aspects of everyday life

Dependent Variable: Comfort
Method: ML - Ordered Probit
Included observations: 263
Number of ordered indicator values: 5

	Coefficient	Std. Error	z-Statistic	Prob.
GENDER	0.391534	0.135037	2.899455	0.0037
AGE	-0.058819	0.038914	-1.511506	0.1307
Limit Points				
LIMIT_2:C(3)	-1.653330	0.299445	-5.521306	0.0000
LIMIT_3:C(4)	-0.877086	0.268965	-3.260966	0.0011
LIMIT_4:C(5)	0.436338	0.267562	1.630791	0.1029
LIMIT_5:C(6)	1.974139	0.288395	6.845263	0.0000

Akaike info criterion	2.402154	Schwarz criterion	2.483648
Log likelihood	-309.8832	Hannan-Quinn criter.	2.434904
Restr. log likelihood	-315.5252	Avg. log likelihood	-1.178263
LR statistic (2 df)	11.28386	LR index (Pseudo-R2)	0.017881
Probability(LR stat)	0.003546		

Dependent Variable: Health
Method: ML - Ordered Probit
Included observations: 264
Number of ordered indicator values: 5

	Coefficient	Std. Error	z-Statistic	Prob.
AGE	-0.057120	0.039632	-1.441258	0.1495
TOWN SIZE	-0.084838	0.043121	-1.967434	0.0491
REGION	-0.170433	0.135236	-1.260257	0.2076
Limit Points				
LIMIT_2:C(4)	-2.652018	0.313611	-8.456395	0.0000
LIMIT_3:C(5)	-1.739622	0.280565	-6.200426	0.0000
LIMIT_4:C(6)	-0.144748	0.267189	-0.541744	0.5880
LIMIT_5:C(7)	1.046824	0.279531	3.744927	0.0002

Akaike info criterion	2.359281	Schwarz criterion	2.454098
Log likelihood	-304.4252	Hannan-Quinn criter.	2.397382
Restr. log likelihood	-309.1018	Avg. log likelihood	-1.153126
LR statistic (3 df)	9.353255	LR index (Pseudo-R2)	0.015130
Probability(LR stat)	0.024945		

As observed for extreme summers, also in winters with mild temperatures air quality seems to be negatively influenced in particular in Lombardy and in bigger towns (*table 10*).

Table 10: Air quality in mild winter

Dependent Variable: Air quality Method: ML - Ordered Probit Included observations: 250 Number of ordered indicator values: 5				
	Coefficient	Std. Error	z-Statistic	Prob.
REGION	0.496889	0.137207	3.621471	0.0003
TOWN SIZE	-0.219650	0.043320	-5.070454	0.0000
Limit Points				
LIMIT_2:C(3)	-1.049706	0.242446	-4.329651	0.0000
LIMIT_3:C(4)	-0.049596	0.233869	-0.212067	0.8321
LIMIT_4:C(5)	0.966395	0.240432	4.019404	0.0001
LIMIT_5:C(6)	2.530168	0.323219	7.828026	0.0000
Akaike info criterion	2.669052	Schwarz criterion		2.753567
Log likelihood	-327.6315	Hannan-Quinn criter.		2.703067
Restr. log likelihood	-345.4300	Avg. log likelihood		-1.310526
LR statistic (2 df)	35.59692	LR index (Pseudo-R2)		0.051526
Probability(LR stat)	1.86E-08			

With regard to domestic consumption of electricity and gas (*tables 11*), it is important to say that, as for hot summers, also in mild winters people that live in smaller village change more their consumption: in this case they reduce it. Another analogy with the results of the consequences of hot summers, is the fact that, with unusually mild winter temperatures, women decrease more energy consumption. Observing the results of regressions emerges that also the income class is an explanatory variable: the higher is the income, the higher is the reduction of consumption in mild winter.

Tables 11: Energy consumption in mild winter

Dependent Variable: Energy Method: ML - Ordered Probit Included observations: 187 Number of ordered indicator values: 5				
	Coefficient	Std. Error	z-Statistic	Prob.
INCOME	-0.105242	0.060304	-1.745190	0.0810
TOWN SIZE	0.122106	0.050903	2.398765	0.0165
GENDER	-0.255924	0.161428	-1.585369	0.1129
Limit Points				
LIMIT_2:C(4)	-2.312964	0.389984	-5.930923	0.0000
LIMIT_3:C(5)	-0.616029	0.348963	-1.765313	0.0775
LIMIT_4:C(6)	0.658325	0.348141	1.890976	0.0586
LIMIT_5:C(7)	1.442897	0.366160	3.940618	0.0001
Akaike info criterion	2.469073	Schwarz criterion		2.590023
Log likelihood	-223.8583	Hannan-Quinn criter.		2.518082
Restr. log likelihood	-228.9838	Avg. log likelihood		-1.197103
LR statistic (3 df)	10.25098	LR index (Pseudo-R2)		0.022384
Probability(LR stat)	0.016549			

Conclusions

The results obtained by the analysis of regressions show that the answers to the questions of the interview depends on almost all the individual characteristics considered.

The strongest influence is exerted by the gender of the interviewees. In fact, in most of the regressions the independent variable relative to the gender is explanatory of the replies. Women are strongly and negatively influenced by hot and dry summers, both in everyday life (in particular at work and at school), and in holiday behaviour. Discomfort caused by high temperatures perceived by women is so strong that they would be willing to reduce the number of short holidays and day trips, but not the plans for main holidays. In unusual mild winters, on the contrary, women are influenced positively and in particular improves their personal comfort. It is curious the fact that, concerning domestic consumption of gas and electricity, women always restrict the use: in hot summer, in fact, men increase more the consumption and in mild winter are women to decrease it more.

Another significant independent variable is the age, although in this case the relation was predictable. Older people, in fact, are more influenced by summer heat perceiving negative effects especially on their health. Adaptive behaviour consists on change some daily habits and on the tendency to move less, reducing the use of almost all the means of transport. Less foreseeable was the fact that also in mild winters the old enjoy less the unusually high temperatures. As regards the assumption that future summers will be increasingly hot and dry, older people and women think that this is a very probable and worrying prospect.

Analysing the relation between region and the replies to interview is clear that in Sicily people is more influenced by extreme summer seasons. Considering the impacts on health, in summer the worst effects emerge in Sicily and in winter the advantages are perceived more in Lombardy. As concerns air quality, when occur extreme seasons (hot summers and mild winters) people from Lombardy assert that air become considerably worse.

From the analysis appears that some answers depend on the size of the town in which interviewees live. People living in bigger towns are strongly influenced by extreme seasons and, in particular, perceive a worsening of air quality. Consequently they decide to go more to the seaside and countryside. On the other side, people that live in smaller villages in hot summers adapt their behaviour reducing more the use of their cars and in mild winters they obtain more advantages. As regards the consumption of water, gas and electricity, in summers they would increase more in smaller villages, while in winters would decrease more in bigger towns.

It is interesting to notice that the perception of hot summer is influenced also by income: people with higher incomes are strongly and negatively influenced in their activities at work and in daily habits; furthermore they perceive more that air quality get worse. To limit these negative impacts they would allow themselves more day trips, in particular to the seaside, but they would not be willing to modify their plans for main holidays and to lessen the use of their cars. As concerns the consumption, in hot and dry summer, as predictable, people with higher income would use more water and in mild winter they would reduce more, in proportion, the consumption of electricity and gas.

To finish, it must be underlined that from the regressions emerges that the number of persons living in the household is not a significant explanatory variable of the replies to the interview.

APPENDIX 2: ITALIAN WISE QUESTIONNAIRE

You can probably remember a hot and dry summer in recent years. Please think about this unusual summer, and answer the following questions.

1. In your everyday life, did an especially hot and dry summer here in Italy had any impacts on?

	(-2) very unfavourably	*(-1) somewhat unfavourably*	*(0) un-changed*	*(1) somewhat favourably*	*(2) very favourably*	*can't remember*
A Your personal comfort	☐	☐	☐	☐	☐	☐
B Your activities at work / school	☐	☐	☐	☐	☐	☐
C Your housework	☐	☐	☐	☐	☐	☐
D Your outdoor leisure activities	☐	☐	☐	☐	☐	☐
E Your health	☐	☐	☐	☐	☐	☐
F Your everyday travel	☐	☐	☐	☐	☐	☐
G Air quality	☐	☐	☐	☐	☐	☐

	much less	*somewhat less*	*un-changed*	*somewhat more*	*much more*	*can't remember*
H Your water use	☐	☐	☐	☐	☐	☐
I Your domestic consumption of electricity and gas	☐	☐	☐	☐	☐	☐

2. Did you change the way you travelled during the especially hot and dry summer weather?

	(-2) much less	*(-1) somewhat less*	*(0) un-changed*	*(1) somewhat more*	*(2) much more*	*never use*	*can't remember*
A Public transport use	☐	☐	☐	☐	☐	☐	☐
B Private car use	☐	☐	☐	☐	☐	☐	☐
C Motorbike/scooter use	☐	☐	☐	☐	☐	☐	☐
D Bicycle use	☐	☐	☐	☐	☐	☐	☐
E Walking	☐	☐	☐	☐	☐	☐	☐

3. How did the especially hot and dry summer weather influence the following activities?

	(-2) much less	*(-1) somewhat less*	*(0) un-changed*	*(1) somewhat more*	*(2) much more*	*never use*	*can't remember*
A Beaches / lakes	☐	☐	☐	☐	☐	☐	▒
B Swimming pools	☐	☐	☐	☐	☐	☐	▒
C Countryside (e.g. forests, National parks et.)	☐	☐	☐	☐	☐	☐	▒
D Outdoor sport facilities	☐	☐	☐	☐	☐	☐	▒
E Indoor sport centres	☐	☐	☐	☐	☐	☐	▒
F Theatres/cinemas/museums	☐	☐	☐	☐	☐	☐	▒
G Outdoors restaurants/bars	☐	☐	☐	☐	☐	☐	▒

4. Did you make fewer or more <u>day trips</u> during the hot and dry summer compared to a normal summer?

(-2) much less	*(-1) somewhat less*	*(0) un-changed*	*(1) somewhat more*	*(2) much more*	*never made*	*can't remember*
☐	☐	☐	☐	☐	☐	▒

5. Did you make fewer or more <u>weekend trips and short holidays breaks (2-3 days)</u> during the hot and dry summer?

(-2) much less	*(-1) somewhat less*	*(0) un-changed*	*(1) somewhat more*	*(2) much more*	*never made*	*can't remember*
☐	☐	☐	☐	☐	☐	▒

6. Did the hot summer influence your <u>main summer holiday</u> plans for this year?

yes	*no*	*can't remember*
☐	☐	▒

7. Did the hot summer influence your <u>main summer holiday</u> plans for the next year?

yes	*no*	*Can't remember*
☐	☐	▒

If yes in what way(s) did you change your plans?

(Please tick all that apply)

A Stayed at home instead of going away ☐
B Went away instead of staying at home ☐
C Stayed in Italy instead of going abroad ☐
D Went abroad rather than remaining in Italy ☐
E Changed the timing of my main holiday ☐
F Took more days holiday ☐

8. Perhaps you remember which unusually hot and dry summer you have been thinking about.

		can't remember
Year	☐	☐

Thank you for answering the questions about a previous hot summer. Now we'd like to ask you some questions about the future.

1. How probable do you think is the assumption that future summers will be increasingly hot and dry?

(-2) very probable	*(-1) somewhat probable*	*(0) neither nor*	*(1) somewhat improbable*	*(2) very improbable*
☐	☐	☐	☐	☐

2. How do you judge the prospect of global warming?

(-2) very worrying	*(-1) somewhat worrying*	*(0) indifferent*	*(1) somewhat attractive*	*(2) very attractive*
☐	☐	☐	☐	☐

For the next set of questions, we would like you to remember an unusually warm winter in the last few years.

3. In your <u>everyday life</u>, did an especially warm winter here in Italy had any impacts on?

	(-2) Very unfavourably	*(-1) somewhat unfavourably*	*(0) un-changed*	*(1) somewhat favourably*	*(2) very favourably*	*can't remember*
A Your personal comfort	☐	☐	☐	☐	☐	☐
B Your everyday travel	☐	☐	☐	☐	☐	☐
C Practising winter sports	☐	☐	☐	☐	☐	☐
D Other outdoor leisure activities	☐	☐	☐	☐	☐	☐
E Your perception of winter	☐	☐	☐	☐	☐	☐
F Your health	☐	☐	☐	☐	☐	☐
G Air quality	☐	☐	☐	☐	☐	☐

	much less	*somewhat less*	*un-changed*	*somewhat more*	*much more*	*can't remember*
H Your consumption of electricity & gas	☐	☐	☐	☐	☐	☐
I Insects, mice	☐	☐	☐	☐	☐	☐

12. Perhaps you remember which unusually warm winter you have been thinking about.

		can't remember
Year	☐	☐

<u>Could you please provide us with some information about yourself ?</u>

S1. What is the name of the village/town and province where you life?

☐

S2. Which size has the village/town where you life?

<10	*10-20*	*20-100*	*100-500*	*500-1000*	>1000	don't know

S3. Your gender?

Male ☐ Female ☐

S4. Which age group do you belong to?

A. 16-24	☐	E. 55-64	☐
B. 25-34	☐	F. 65-74	☐
C. 35-44	☐	G. 75+	☐
D. 45-54	☐		

S5. Which of the following best describes you?

A Student	☐
B Housewife	☐
C Employed	☐
D Freelance	☐
E Seeking work	☐
F Retired	☐
G Other *(please say what it is)*:	☐

…… …….
….

If employed, please give occupation:

…… .....…….

S6. In which of the following income classes does your family belong?

A until 1.500.000 Lire	☐
B from 1.500.000 to 3.000.000 Lire	☐
C from 3.000.000 to 4.500.000 Lire	☐
D from 4.500.000 to 6.000.000 Lire	☐
E from 6.000.000 to 7.500.000 Lire	☐
F more than 7.500.000 Lire	☐

S7. How many persons live in your household?

Please state the number ☐

Many thanks for your kind collaboration.

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(lix) This paper was presented at the ENGIME Workshop on "Mapping Diversity", Leuven, May 16-17, 2002
(lx) This paper was presented at the EuroConference on "Auctions and Market Design: Theory, Evidence and Applications", organised by the Fondazione Eni Enrico Mattei, Milan, September 26-28, 2002
(lxi) This paper was presented at the Eighth Meeting of the Coalition Theory Network organised by the GREQAM, Aix-en-Provence, France, January 24-25, 2003
(lxii) This paper was presented at the ENGIME Workshop on "Communication across Cultures in Multicultural Cities", The Hague, November 7-8, 2002
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(lxv) This paper was presented at the EuroConference on "Auctions and Market Design: Theory, Evidence and Applications" organised by Fondazione Eni Enrico Mattei and sponsored by the EU, Milan, September 25-27, 2003
(lxvi) This paper has been presented at the 4th BioEcon Workshop on "Economic Analysis of Policies for Biodiversity Conservation" organised on behalf of the BIOECON Network by Fondazione Eni Enrico Mattei, Venice International University (VIU) and University College London (UCL) , Venice, August 28-29, 2003
(lxvii) This paper has been presented at the international conference on "Tourism and Sustainable Economic Development – Macro and Micro Economic Issues" jointly organised by CRENoS (Università di Cagliari e Sassari, Italy) and Fondazione Eni Enrico Mattei, and supported by the World Bank, Sardinia, September 19-20, 2003

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