Chapter 5

# Conclusion

This chapter concludes the dissertation, summarising results, arguing limitations, and proposing further research.

**5.1 Summary results**

In this section, the results are briefly summarised.

Concerning the traditional pro-environmental model. The analysis starts with a basic model: Linear Regression. However, as I have already discussed (2.3.2), data do not satisfy all the assumptions, but it is a good starting point to predict behaviour. The prediction models continue to some non-parametric tree models: Decision Tree, Random Forest, and Gradient Boosting. The advantage of these algorithms is that they are more robust than Logistic Regression. However, on the one side, four different classifiers are chosen to improve the model in terms of evaluation (accuracy and macro-f1), on the other side to compare the different important variables' results. Further, being more robust, the tree-based models slightly improve the performance in terms of predictive accuracy and macro-f1. Or rather, Decision Tree is the worst model. Instead, Random Forest and Gradient Boosting have in general a better and satisfactory performance.

Focusing on the content of Chapter 4, the pro-environmental behaviour model satisfies almost all the research questions describe in the methodology (2.1).

Climate change risk perception is one of the main important factors in shaping pro-environmental behaviour in all non-parametric models. I have deeply explained that higher individual climate change risk perception positively influences and predicts pro-environmental behaviour. High worry encourages environmental action, and in the opposite case, low worry leads to apathy in terms of behaviour.

Another important factor that shapes pro-environmental behaviour is extreme green-identity. Individuals who share green values, thus sharing the importance to fight climate change, are more likely to behave ecologically.

Instead, No cultural schemas created with CCA influence behaviour.

Lastly, socio-demographic variables. In the research question (2.1) I assume that younger adults, women, liberals, more-educated and wealthy people are more likely to perform pro-environmental behaviour. The results do not confirm all these hypotheses. The only two relevant variables are age and education. In the Random Forest model age is the most important variable. However, the relationship between age and pro-environmental behaviour is not adequately clear in the analysis. Not only young people act eco-friendly, but in all age groups, there is a high percentage of those who perform some pro-environmental behaviors. only senior citizens (after 80 years old) tend to do nothing. Concerning education, the relationship is more clear: Higher education has a positive effect on pro-environmental behaviour.

The importance of the dissertation is to find some strategies for promoting citizens’ engagement in pro-environmental behaviour. Public policy should encourage education or in general information about climate change to increase risk perception and create an extreme-green identity. All these factors lead to an active engagement of European citizens.

However, as the literature review explains there are some value-action gaps. On the one hand, more worried citizens about climate change are more likely to behave ecologically. On the other hand, not all citizens that declare to be worry perform any pro-environmental actions. The opposite case also happens, thus citizens that declare to not be worry perform some pro-environmental behaviour. For this reason, I decide to continue to investigate this relationship with other blocks of predictions (the same algorithms are fitted). I divide the dataset into two parts: one with only the observations of those who have a high-risk perception level, one with only the observations of those who have a low-risk perception level. Once again, Random Forest and Gradient Boosting yield the best performances in both subsets. For worried citizens, the important variables remain the same of the complete model: extreme green-identity and higher education have a positive effect on pro-environmental behaviour. The age remains unclear. Instead of unworried citizens, the age range 30-60 has a positive effect on pro-environmental behaviour. Therefore, the youngest unworried adults (15-30 years old) have a negative effect and they are less likely to behave eco-friendly. Another important predictor is moderate green-identity. Also in this case worried citizens with a moderate green-identity have a negative effect on pro-environmental behaviour.

Lastly, some new findings are discovered. Some Eastern countries (i.e., Bulgaria, Czech Republic, Romania, and Poland) have a negative effect on pro-environmental behaviour.

**5.2 Limitations**

Some limitations must be examined.

Firstly, some variables would be missing to add to the models. In the literate review, I discuss several dimensions that shape pro-environmental behavior: socio-demographic, internal (or personal characteristics), and external factors, aside from climate change risk perception. In this analysis, only all socio-demographic variables could be included in the model and climate change risk perception. All data available from the Eurobarometer survey are used, but it is not possible to insert other internal or external factors. For example, in the internal dimension, there are present: personal experiences, motivation, environmental knowledge, self-green identity, emotion. Only self-green identity is created using PAM clustering. The cluster groups similar citizens among different attitudes toward climate change. However, the distinction creates between extreme green-identity and moderate green-identity may not reflect reality, as it is not confirmed by citizens themselves. Variables regarding the external dimension are not present in the survey, except for the country of respondents. Another variable of the external dimension is created specifically through CCA: cultural schemas. The limit is the same as for PAM clustering. The method is unsupervised and, therefore, there is no need to supervise the model. It is possible that the algorithm does not find the appropriate shared cultural schemas of citizens. The reason is that, again, the input data is not recognized and is not specified in advance by citizens.

Another limitation is the simple measure of pro-environmental behaviour. As mentioned above in the literature review, pro-environmental behaviour has multiple dimensions. For example, Stern (2000) classify into four macro-groups: environmental activism, nonactivist behaviours in the public sphere, private-sphere environmentalism, other environmentally significant behaviours. Obviously that it is different recycling daily due to some legal and social obligations, from organizing an international march as Greta Thunberg. The ecological impact and the intention are significantly different. However, the study does not diversity the types of behaviours due to the nature of the Eurobarometer’s question. Additionally, as I have deeply explained in the literature review (1.2.3) self-reported behaviour should present some bias and inaccuracy. For example, respondents might be influenced by social desirability, and in this way, pro-environmental behaviour could be overestimated and not entirely precise.

Aggiungere limiti dei dati non tutte le dimensioni?

**5.3 Further studies**

This research wants to be an exploratory study of the pro-environmental behaviour model. Therefore, many opportunities and many questions are yet to be answered. Future research should continue to analyse and examine factors that shape pro-environmental behaviour. Some open questions are described.

Firstly, some research should be done to diversify the types of pro-environmental behaviour. It might be interesting to understand what factors determine activism. Promoting citizens’ engagement in environmental activism is the key necessary to make the individuals aware of the problem, and at the same time, to leading them to perform actions with a strong impact on the environment.

Secondly, as I stress in the limitations (5.2), for this analysis is not possible to adopt all the dimensions’ variables in the models. Especially macro-level factors might be mostly examined and inserted in the analysis. A strategy could be to join different types of data into the Eurobarometer survey and adopt multilevel analysis.

Another open question is the role of each country. Predictions of the behaviour could be divided according to the nation to examine particular strategies at a national level to promote pro-environmental behaviour. Understanding especially the factors that encourage citizens’ engagement in Eastern countries should be fundamental due to the high percentage of citizens who do not perform any pro-environmental behaviours.