

# The London School of Economics and Political Science

*The influence of nature on secondary school students' subjective well-being in England and Greece*

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## ABSTRACT

The main aim of this thesis is to investigate the potential benefits of affiliation with nature on British and Greek secondary school students' positive functioning, and the variations in relation to climate and geography conditions. Particular emphasis is given on the role of schools' environmental education programs and activities. Following the contemporary positive psychology theory, we have focused on two main well-being conceptualizations: (i) the hedonic (or so-called subjective well-being), i.e. life satisfaction/happiness, and (ii) the eudaimonic, i.e. personal growth/flourishing life.

A wide range of objective and subjective indicators have been used to represent various environmental parameters. The subjective indicators include students' perceptions about the surrounding environment, their experiential exposure to nature (participation in outdoor sports, excursions to nature, etc.), environmental attitudes, values and knowledge, while the objective indicators assess the local climate and geographical characteristics, such as average annual temperature, wind and precipitation, altitude, distance from sea, rural vs. urban areas, and local environmental conditions, such as air pollution, proximity to heavy industries and airports, and proximity to areas of outstanding natural beauty.

The study employs a quantitative survey approach (paper and internet based) to collect cross-sectional data from various lower and upper secondary schools across the two countries. A sample of 3614 students (aged between 14 and 19 years old) from 94 Greek secondary schools and 527 students (aged between 12 and 19 years old) from 15 English secondary schools have been collected during the academic years 2010-2011 and 2011-2012. The statistical analysis is mainly based on OLS and ordered logistic regressions with clustered standard errors, to control for intraclass correlation among the respondents. The findings highlight the significant effect of connectedness with nature on subjective and eudaimonic well-being, and the beneficial role of environmental education in promoting overall life satisfaction, school satisfaction and eudaimonia, either directly or indirectly through the enhancement of connectedness with nature.

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## **ABBREVIATIONS**

BMSLSS: Brief Multidimensional Student Life Satisfaction Scale

EWB: Eudaimonia Well-being

LSS: Life Satisfaction Scale

LS: Life Satisfaction

SLS: School Life Satisfaction

NEI: Nature Experience Index

QEWB: Questionnaire for Eudaimonic Well-being

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# 1. Introduction

## 1.1 Policy Background

In recent years there has been an increasing interest in the examination of children's subjective (self-reported) well-being, as an element of a broader national well-being policy implementation (Ben - Arieh 2008, Fattore, Mason, & Watson 2009, Crivello, Camfield, & Woodhead 2009, Statham & Chase 2010, Newton & Ponting 2012). During the last few decades, a growing body of research has emphasized the importance of not viewing children's well-being through an adult prism only, but instead, to let them become active participants in quantitative and qualitative research (Prout 1997, Ben - Arieh 2005, Fattore, Mason, & Watson 2012). This new perspective has been derived not only from the need to develop a more accountable public policy framework that fully recognizes the different aspects of adult and non-adult well-being, but also from the necessity to respect children's rights as expressed by United Nation's Convention on the Rights of the Child (UN 1989).

In addition, it has been recommended that the monitoring of human quality of life, both adult and non-adult, should be based on a balanced combination of objective (social indicators) and subjective indicators, rather than focusing only on objective measures such as income per capita, life expectancy, and poverty rates (Diener & Suh 1997, Huebner 2004). At the same time, the relatively new field of positive psychology (Seligman & Csikszentmihalyi 2000) oriented researchers' attention beyond the traditional focus on the satisfaction of basic needs such as food and shelter and the cure of ill-being, towards the promotion of positive feelings, happiness, and flourishing life.

Focusing on children, various governmental authorities and independent organizations have already incorporated a subjective dimension in their policymaking initiatives. For example, the UK Office for National statistics has recognized the need to capture pupils' perceptions about their own life, and include them in Britain's broader "National Well-being" accounts (Hicks et al. 2011). Pupils' self-reported well-being has also been utilized by Bradshaw and his colleagues (Bradshaw & Richardson 2009, Bradshaw et al. 2011), in an effort to proceed with comparisons of local areas in England, and cross-country comparisons across European Union and OECD countries. Also, the "Good Childhood" index (Rees, Goswami, & Bradshaw 2010) has focused on the subjective well-being of children in the UK, by measuring overall satisfaction with

life, and satisfaction with ten different life domains (including satisfaction with school and the local environment). At an international level, UNICEF (2007) incorporated a subjective indicator – together with a set of objective indicators – by asking pupils to report how satisfied they feel with their lives, in order to assess quality of life in the rich countries of the world. A few years later, OECD (2009) published the “Doing better for Children” report, measuring among others, students’ perceptions about school life.

## **1.2. Measuring Children’s Subjective Well-being**

In the academic field, there is an ongoing systematic attempt to develop appropriate measures for assessing various aspects of non-adult well-being. Several sound constructs have been designed to capture pupils’ satisfaction with life, overall (providing a unified multidimensional score) and domain-specific (such as satisfaction with school life), and positive and negative affects (for a review see Huebner 2004 and Gilman & Huebner 2003).

According to contemporary psychological science, there are two main well-being conceptualizations, the subjective (or sometimes called hedonic<sup>1</sup>), embracing simple feelings of pleasure and happiness, and the eudaimonic, mainly referring to the process of achieving a flourishing and “well-living” life (Ryan & Deci 2001). The commonly used concepts of life satisfaction and of positive and negative affect comprise elements of the “subjective” well-being conceptualization. In both adult and non-adult literatures (Diener 1994, Seligson, Huebner & Valois 2005), life satisfaction represents people’s cognitive judgment of their life circumstances, while positive and negative affects reflect affective/emotional functions of human personality. On the other hand, eudaimonic well-being refers to more advanced aspects of human functioning, such as achieving “higher” goals in life, having a fulfilling and virtuous life.

In relation to non-adult populations, most existing research has arguably focused on the construction of scales that measure concepts associated with the subjective conceptualization of well-being. As far as we are aware, the attempt to create

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<sup>1</sup> Both hedonic and eudaimonic well-being conceptualizations are subjective, in the sense that they are based on self-reported statements. However, in the literature, subjective well-being tends to be used as a synonymous of “hedonic” well-being.

appropriate tools for the assessment of children's eudaimonia has received relatively little attention. Examples include Ryan & Connell's (1989) "Self Regulation" scale and Grolnick, Ryan & Deci (1991) "Perceptions of Parents" scales (assessing children's autonomy). However, in most cases (Hardre & Reeve 2003, Véronneau, Koestner & Abela, Vleioras & Bosma 2005, Jin & Moon, 2006, Linley et al. 2009), the assessment of eudaimonia is based on existing tools that have been originally designed and tested with adult populations, such as Ryff's (1989) "Psychological Well-being" scale and Kasser & Ryan's (1996) "Aspirations Index".

### **1.3. Subjective Well-being and the Natural Environment**

To date, many studies have assessed the impact of socio - demographic and personality factors on both adult and non-adult subjective well-being (Diener, Oishi & Lucas 2003, Dolan, Peasgood & White 2008, Antaramian, Huebner & Valois 2008, Proctor, Linley & Maltby 2009). However, despite the fact that linking quality of life with environmental quality and sustainability has attracted increasing attention in academia and public policy debates (Marks et al. 2006, Steuer, Thompson & Marks, 2006, O'Brien 2008, Kjell 2011), little is known about the potential influence of nature on subjective well-being in practice. Relevant literature has recently emerged mainly within the fields of economics and psychology.

In environmental economic studies, life satisfaction and happiness are usually used as proxies for utility. Some of these studies have implemented the subjective well-being approach to monetize the value of various environmental amenities or estimate the social cost of environmental damage (Moro & Ferreira, 2009, Welsch & Kühling 2009). Air pollution (Welsch 2002, 2006, 2007, MacKerron & Mourato 2009), water pollution (Israel & Levinson 2003), noise pollution (Van Praag & Braasma 2005), climate (Frijters & Van Praag 1998, Rehdanz & Maddison 2005), natural hazards (Luechiner & Raschky 2009, Carroll, Frijters & Shields 2008), local conditions (Brereton, Clinch & Ferreira 2008), environmental attitudes (Ferrer-i-Carbonell & Gowdy 2007), and natural capital (Vemuri & Costanza 2006) are some of the main environmental conditions that have been assessed until now.

In psychology, a small group of studies have examined the relationship of relatedness with nature, proxied by various scale constructs assessing cognitive, affective, and/or experiential affiliation with nature, and various well-being aspects, such as happiness, life satisfaction, positive and negative emotions, eudaimonia, autonomy, and vitality (Mayer & Frantz 2004, Nisbet, Zelenski & Murphy 2011). Other studies have explored the linkages between happiness and ecologically responsible behavior (Brown & Kasser 2005, Jacob, Jovic & Brinkerhoff, 2009). Overall, we note that the vast majority of these studies have focused on adults and the “subjective” conceptualization of well-being.

### *Children’s Subjective Well-being and the Natural Environment*

As noted above, the natural environment is arguably amongst the least researched determinants of well-being. And research investigating these links amongst children is even scarcer. Addressing this gap was the core motivation for the work presented in this thesis, where the focus is the influence of the natural environment on children’s subjective well-being. There are many potential benefits associated with this type of research.

A vast volume of work has focused on the importance of nature in healing ill-being and promoting social, physical, emotional, and mental well-being (Kahn & Kellert 2002, Pretty 2004, Thomas & Thompson 2004, Huby & Bradshaw 2006). Research has shown that a bidirectional relationship exists between ill-being and well-being. The absence of positive and happy feelings has been associated with serious mental issues such as depression, loneliness and negative emotions (Fredrickson 1998, Valois et al. 2001, Suldo & Huebner 2003, Rees et al. 2012), whereas the presence of negative feelings and psychological problems is detrimental to subjective well-being. If it can be empirically shown that nature can promote subjective well-being, an extra “tool” will be available in the research effort to promote well functioning personalities and, through this process, prevent mental illness. It should be underlined that, especially from a policymaking perspective, it would be beneficial to upgrade the focus on the eudaimonic aspect of well-being and construct appropriate tools for its measurement. This would allow policy makers to fully “utilize” various aspects of the environment and design appropriate interventions for the promotion of children’s flourishing.

Furthermore, adolescence is a very sensitive, vulnerable period characterized by continuous personality growth and changes, and mood fluctuations (Antaramian, Huebner, & Valois, 2008, Ma & Huebner 2008). From a policy perspective, improving children's quality of life through a stronger affiliation with the natural world may help them go through this transitional developmental process more smoothly and creatively, and keep them away from dangerous activities that often occur during that age.

Moreover, cultivating children's environmental personality today may have benefits not only for children's future well-being, but also for the natural environment itself. Evidence from past research has shown that contact with nature during early childhood and adolescence can play a key role in the formation of environmental attitudes, beliefs, and concerns in adult life (Ulrich 1993, Palmer 1993, Olli, Grendstad, & Wollebaek 2001, Villacorta, Koestner & Lekes 2003, Ewert, Place & Sibthorp 2005). Thus, enhancing affiliation with nature today may work as an important shield for the protection of the environment and as a means of achieving sustainable development in the future. In turn, following suggestions from the available literature (Brown & Kasser 2005), sustainable development and "environmentally responsible" attitudes appear to be positively associated with people's subjective well-being. Conversely, disconnectedness from nature in early years has been found to be associated with 'biophobia' in the years to come (White 2008).

#### **1.4. Aims and Objectives**

The main aim of this thesis is to examine the impact of the natural environment on children's subjective and eudaimonic well-being<sup>2</sup>. The key objectives of the thesis are the following:

- (i) To examine how life satisfaction and eudaimonic well-being vary with children's empirical connectedness with the natural world.
- (ii) To examine how the two well-being dimensions (subjective well-being and eudaimonic well-being) vary with reference to pupils' perceptions about their surrounding natural environment.

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<sup>2</sup> In this thesis, we use life satisfaction and happiness interchangeably with subjective well-being, and flourishing, personal growth and expressiveness interchangeably with eudaimonia.



(iii) To examine how objective local demographic, environmental, and climate conditions affect the links between well-being and the natural world amongst children.

(iv) To investigate the role of environmental education in promoting pupils' satisfaction with life as a whole, school satisfaction and eudaimonia.

(v) To perform a comparative analysis of well-being among pupils living in countries (England and Greece) with different cultural and geographic characteristics, and investigate potential differences in the effect of environmental, location, and climate variables.

## **1.5. Overview of Research Methods**

Cross-sectional well-being and environmental data were collected via original surveys of children carried out in secondary schools in both England and Greece following a multistage clustering strategy. The English sample consists of 527 students aged between 12 and 19 years old, whereas the Greek sample consists of 3614 students aged between 14 and 19 years old, both covering a wide range of locations in terms of socio-demographic and climate characteristics.

Focusing on England and Greece enables us to examine the links between nature and children's well-being through the prism of two countries with very different cultural and climatic characteristics. In terms of culture, England is a core individualistic society, promoting personal autonomy and independence, whereas Greece is a core collectivistic society, emphasizing on the value of family and social interdependences (Triandis 1995, Karatzias et al. 2001). In relation to climate, Greece falls mainly within Köppen's "Csa" classification (Köppen 1936, Peel et al. 2007), i.e. a typical Mediterranean climate, whereas England is characterized by an oceanic climate ("Cfb" in Köppen's classification).

The two country samples are used to explore the influence of environmental, location (including information about local demography, i.e. urban vs. rural, geographical characteristics such as distance from sea and altitude, and objective measures of environmental quality such as proximity to heavy pollution industry and areas of outstanding natural beauty) and climate variables, after controlling for basic socio-demographic and personality characteristics, on three main well-being dimensions, i.e.

satisfaction with life as a whole, satisfaction with school life, and eudaimonic well-being.

The estimation of the effects of the various predictors on overall life satisfaction and eudaimonia is based on standard linear regression models with clustered standard errors, to control for intra-class correlation (Moulton 1990), fitted using the ordinary least squares (OLS) method<sup>3</sup>. The cross-country comparison analysis is performed with two different statistical techniques: (i) fitting a separate regression for each sample and computing Wald statistic to test whether the slope of each predictor is significantly different across the two samples, (ii) merging the two datasets and forming interaction variables (by multiplying a “country dummy” with the predictors of interest) to assess the significance differences between the two countries. Finally, the influence of environmental education on school satisfaction is based on a standard OLS model and a non-linear ordered logit model.

The assessment of overall life satisfaction is based on Huebner et al.’s (2006) “Brief Multidimensional Students Life Satisfaction” scale (BMSLSS), a 5-item tool assessing satisfaction with family, friends, school, self, and living environment, whereas the assessment of school satisfaction is based on a single relevant question derived by the aforementioned BMSLSS scale. To measure eudaimonic well-being, we modified Waterman et al.’s (2010) 21-item “Questionnaire for Eudaimonic Well-Being” (QEWB) tool, originally designed and tested with adults, in order to make it suitable for research with children. The modified version consists of seven items.

The set of environment-related predictors has been designed to measure children’s empirical connectedness with the natural environment, engagement in environmental education activities at school, perceptions on neighborhood and school environmental conditions, environmental worldviews, values, awareness, knowledge, and concerns. Based on Kahn and Kellert’s (2002) theory about children’s experiential relationship with the environment, we formed “Nature Experience” index (NEI), a 10-item tool, capturing three main types of experience: direct (such as playing in a park), indirect (such as visiting a natural history museum), and vicarious (such as watching a documentary about the environment).

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<sup>3</sup> In the next sections of the thesis, we use the terms “OLS regressions” or “OLS models” to briefly describe linear regression models fitted by ordinary least squares.

## 1.6. Contribution to Knowledge

The thesis offers the following contributions to the existing literature:

(i) To the best of our knowledge, this is the first study to investigate the links between the natural world and children's well-being, by using a wide range of objective and subjective indicators and focusing on both main conceptualizations of well-being: life satisfaction and eudaimonia.

(ii) It adds to the eudaimonic well-being literature by modifying Waterman et al.'s (2010) QEWB scale to make it suitable for research with non-adult populations. The findings suggest that the scale performs satisfactorily with both samples. This is particularly important in case of Greece, since it appears that translation bias does not affect the quality of the scale.

(iii) It adds to the economic and psychological literatures by verifying the positive role of affiliation with nature, which has been already well established with adult populations, in non-adult populations as well.

(iv) It provides arguably the first evidence that the effect of empirical connectedness with nature on pupils' well-being can be similar across two countries with different cultural, climate, and environmental characteristics.

(v) It shows that engagement in environmental education activities has a direct and indirect - through the enhancement of empirical connectedness with nature - positive influence on all aspects of well-being, i.e. overall life satisfaction, school satisfaction and eudaimonia. Taking into account that promoting positive psychology in secondary education has attracted increasing attention among scholars and policymakers (Noddings 2003, Morris 2009, White 2011), the current study provides the first empirical evidence of the usefulness of environmental education towards that target.

## **1.7. Thesis Structure**

The rest of the thesis is structured as follows. In Chapter 2, we provide a theoretical framework for subjective well-being research and a literature review on the impact of nature on adult and non-adult well-being. The survey design and implementation process are presented in Chapter 3, while Chapter 4 includes a description of the statistical methods and the construction of the modified eudaimonic well-being scale. The core analysis of the thesis is included in Chapters 5, 6 and 7. Chapter 5 examines how subjective well-being (life satisfaction) and eudaimonic well-being vary with reference to pupils' perceptions of their surrounding natural environment, connectedness with nature, and local demographic, environmental, and climate conditions. We use a case study of Greek students. Chapter 6 presents a comparative analysis of well-being between pupils in Greece and England to assess differences in the effect of environmental, location, and climate variables. Chapter 7 investigates the role of environmental education in promoting pupils' subjective well-being, using both Greek and English case studies. Finally, Chapter 8 concludes with a summary of the most important findings of the thesis.

## **2. Theoretical Background and Literature Review**

In this chapter, we provide a historical overview of the well-being research, emphasizing on contemporary developments mainly within the field of psychology. Our discussion will be focusing on two basic conceptualizations of self-reported well-being, i.e. hedonic (often called subjective well-being) and eudaimonic well-being. In the second part of the chapter, we review previous research on the impact of natural environment on adults and children's well-being.

### **2.1. Theoretical Background**

#### **2.1.1. Well-Being History**

Someone should look as far as 2500 years ago (McMahon 2006) to find the roots of the first human avocation with the concept of well-being. Its meaning may seem obvious; however the exact definition remains elusive, whereas various debates, thoughts and arguments exist among scientists and scholars from different disciplines. The plethora of words such as well-being, happiness, welfare, quality of life, the Good Life, and flourishing, provides a sufficient proof about the different terminologies that have been used over time. It is worth mentioning that many paper and book authors use the abovementioned words interchangeably.

The pursuit of happiness is present in a big part of human history, both chronologically and geographically. Eastern and western world classic philosophy schools have provided excellent theories, thoughts and answers about the "big" questions: how should one live, what constitutes the Good Life? The eastern classic tradition is mainly represented by ancient China and the schools of Confucianism, Buddhism and Taoism (Zhang & Veenhoven 2008), while the western tradition, where the current study belongs to, has its roots mainly in ancient Greek philosophy. These distinct schools of thought have approached the concept of well-being from different standpoints. In the next paragraphs, we provide a brief overview of the western avocation and contribution to "happiness" research. For a more detailed discussion, interested readers may refer to Fung (1985) and Zhang & Veenhoven (2008) for the eastern tradition, and McMahon (2006) and White (2006) for the western tradition.

## *Western Tradition*

The western tradition on the pursuit of human happiness can be divided into three main periods: Ancient Philosophy (mainly Greek school), Post-Enlightenment European Philosophy (Utilitarianism particularly) and Modern Period, referring mainly to contemporary research conducted in the rich countries of the world (Veenhoven 1991). During the first classic period of antiquity the main belief was that happiness is an objective situation and can be achieved only when human beings get divested from needs and desires and reach a situation of perfection (McMahon 2006). For example, Aristotle and Herodotus mention that happiness cannot be reached before death (McMahon 2006). This objective-normative approach is a common characteristic of many religions such as Christianity, Judaism and Islam.

However, the objective norm of happiness altered during the Age of Enlightenment (17<sup>th</sup> - 18<sup>th</sup> Century). In that period, people started believing that being happy and having a good life is attainable in daily situation. McMahon (2006, p.13) explains: *"Happiness, in the Enlightenment view, was less an ideal of godlike perfection than a self-evident truth, to be pursued and obtained in the here and now"*. This significant "ideological" shift in human conception gradually created the substratum for the formation of the contemporary, modern science of applied happiness research. In the past, the academic work of philosophers and other thinkers had not been supported by empirical evidence. Nowadays, the work of academic philosophy is framed and tested by empirical theories and findings by various social scientists (Gasper 2004). Indeed, well-being concepts are now widely used and investigated in the field of psychology (well-being, happiness, flourishing), sociology (quality of life) and economics (well-being, welfare). Happiness concepts (health and quality of life) are also broadly utilized in medicine science.

## 2.1.2. Well-being Conceptions and Current Academic Theories

### *General Well-Being Definitions*

According to Gasper (2004), well-being may be used as an “umbrella” notion which covers multiple themes. Newton (2007, p.6) also states: *“Literature suggests that well-being should be treated as a multidimensional phenomenon that captures a mixture of people’s life circumstances, how they feel and how they function”*, whereas Felce & Perry (1995, p.60) mention that *“well-being comprises objective descriptors and subjective evaluations of physical, material, social and emotional well-being, together with the extent of personal development and purposeful activity, all weighted by a set of values”*. Finally, Ryan & Deci (2001, p.141) describe well-being as *“a complex construct that concerns experience and functioning”*. Generally, it is quite ambiguous, if not impossible, to state all different definitions that can be found in the academic literature. However, a careful overview of the literature yields a certain result: *“There is no accepted, universally used definition of wellbeing”* (Hird 2003, p.3).

### *Subjective vs. Objective Theories*

One of the main issues in the philosophy of well-being research is the distinction between subjective and objective theories. The subjective theory considers that people’s attitude of favour and disfavour can determine their well-being (Varelius 2004). On the other hand, the objective theory presumes that people’s well-being is dependent on some “objective” personal and social goods such as moral goodness, rational activity, personal development, and knowledge (Varelius 2004). In social sciences, the “objective” theory is behind the widely used “social indicators” as determinants of human quality of life. Diener & Suh (1997, p.192) define social indicators as follows: *“...they are societal measures that reflect people’s objective circumstances in a given cultural or geographical unit. The hallmark of social indicators is that they are based on objective, quantitative statistics rather than on individuals’ subjective perceptions of their social environment”*.

On the other hand, subjective well-being theory (Diener 1984, Diener et al. 1999, Schwarz & Strack 1999) relies upon peoples self-reports about their own life. The findings of this method are derived by using various quantitative and qualitative techniques such as surveys, questionnaires and interviews. The application of the

subjective theory has raised some questions regarding the validity and reliability of the results. Do people have the adequate background and knowledge for giving precise and sufficient answers<sup>4</sup>? Are the derived results comparable with each other? Recent study findings (Veenhoven 2002, Donovan & Halpern 2003, Easterlin 2003, Kahneman et al 2004, Layard 2005, Krueger & Schkade 2008) have concluded that the reliability and validity of the subjective measures is rather sufficient. On the other side, criticism exists for the objective theory as well. Varelius (2004, p.85) believes that *“objective theories of individual well-being separate what is good for a person from that person’s attitudes of favour...This problem makes current objective theories of individual well-being unappealing”*.

In contemporary research, using a mixture of objective and subjective indicators has received increasing popularity. Diener & Suh (1997) and Griffin (2007) agree that there is no superior, “appropriate” method. Both theories may be used together and can significantly contribute towards a satisfactory appraisal of human well-being aspects. So, for example, Veenhoven (2004, 2005) has proposed “Happy Life Years” as the best indicator for measuring well-being. It consists of both subjective and objective aspects and the main argument is that: *“when a person lives long and happily, the preconditions are apparently sufficient; both the environmental conditions and the persons coping abilities must surpass the minimum level”* (Veenhoven 2004, p.18). Costanza et al. (2007), based on Max-Neef (1992) and Doyal & Gough (1991) theories of human needs, have constructed the multidimensional “Quality of Life” index which contains both subjective and objective rudiments. Parfit (1984) divided well-being into three main categories which include elements from both subjective and objective concepts: Hedonism, (people’s subjective feeling of pleasure), Desire (people’s choice satisfaction, preference fulfillment) and Objective Lists (people’s life status judged by objective “goods”).

### ***Hedonia vs. Eudaimonia***

Another nodal point in the field of well-being research is the distinction between hedonia (pleasure) and eudaimonia (“good” daemon). Both concepts originate from the ancient classic Hellenic Philosophy. Many centuries ago, Aristippus avowed that the pursuit of maximum pleasure should be people’s life target. This view has been continued and embraced by Utilitarian philosophers such as Jeremy Bentham

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<sup>4</sup> Though, the lack of knowledge may rule out strategic responses on subjective questions.



(McMahon 2006). In modern literature, Kraut (1979, p.170) defines hedonia as *“the belief that one is getting the important things one wants, as well as certain pleasant affects that normally go along with this belief”*.

The eudaimonic view is attributed to Aristotelian ethical philosophy. Aristotle viewed eudaimonia as an objective condition of human perfection and excellence (Waterman 1993). In contemporary theory, eudaimonia is divided into two main trends: subjective and objective. In a nutshell, the modern term of eudaimonia is viewed as a continuation of Aristotelian objective tradition (Cooper 1975, Keyes & Haidt 2002). Conversely, scholars such as Kraut (1979), Norton (1976) and Waterman (1993, 2008) consider eudaimonia as a subjective human experience. For example, Waterman (2008, p.236) writes: *“Eudaimonia includes a constellation of subjective experiences including feelings of rightness and centeredness in one’s actions, identity, strength of purpose, and competence”*.

Within this framework lay two of the current well-being conceptualizations, subjective and eudaimonic well-being. The subjective well-being research started in the late 1950s (Keyes, Shmotkin & Ryff 2002) and since then many important scholars contributed to the field (Bradburn 1969, Andrews & Withey 1976, Diener 1984, Kahneman et al. 1999). According to Diener & Suh (1997), subjective well-being (SWB) can be defined as a combination of people’s hedonic feelings and cognitive satisfactions. In other words, it examines *“what makes experiences and life pleasant or unpleasant”* (Kahneman et al. 1999, page ix). It consists of the following three basic elements: positive affect, negative affect and life satisfaction (Kahneman et al 1999). The balance between positive and negative affect determines whether people are happy or not (Samman 2007). On the other hand, life satisfaction is a cognitive component that can be measured on an aggregate level (life as a whole) or split into distinct life domains. For example, Cummings (1996) has proposed the following seven important domains of life satisfaction: material well-being, health, productivity, intimacy, safety, community, and emotional well-being.

The term of eudaimonic well-being has been first introduced by Ryan & Deci (2001). It mainly refers to Waterman’s (1993) contemporary theory stating that eudaimonia is achieved when people live in accordance to their “daemon”, are intensively involved and take full advantage of their potentials during their daily activities. Waterman calls

the situation of “full functioning” as personal expressiveness or self-realization. Deci & Ryan’s (2000) self-determination theory and Ryff & Keyes’ (1995) psychological well-being theory are additional perspectives that also embrace the concept of eudaimonia.

Self-determination theory considers autonomy, competence, and relatedness as the basic needs that need to be fulfilled to achieve high levels of psychological growth. The psychological well-being construct identifies six basic aspects/dimensions of human quality of life: autonomy, personal growth, positive relations with others, purpose in life, environmental mastery, and self-acceptance<sup>5</sup>. Meaning in life (Seligman 2002, Steger et al. 2006), curiosity (Kashdan, Rose & Fincham 2004), flow or engagement (Csikszentmihalyi 1997, Seligman 2002), vitality (Ryan & Frederick 1997), intrinsic aspirations (Kasser & Ryan 1996, Grouzet et al. 2005), self-actualization (Lefrancois et al. 1997), mindfulness (Brown & Kasser 2005), are examples of other conceptions that have been associated with the eudaimonic well-being tradition (Ryan & Deci 2001, Samman 2007, Deci & Ryan 2008, Waterman 2007, Waterman 2008, Ryan, Huta & Deci 2008, Vella-Brodrick et al. 2009)<sup>6</sup>.

Generally, the eudaimonic theorists support that the subjective well-being model of positive affect, negative affect and life satisfaction should not be equated with overall well-being (Ryan & Deci 2001). As Waterman (2008, p.239) writes: *“To date there have been very few studies that have investigated that relationship and in those that have been conducted only a very weak association of EWB to SWB has been reported”*. Indeed, some empirical studies (Waterman 1993, Compton et al. 1996, Kopperud & Vitterso 2008, Delle Fave et al. 2011, Vitterso & Soholt 2011) have shown that, although the two conceptualizations overlap to some extent, they comprise two clearly different elements of well-being. Finally, Peterson, Park & Seligman (2005) have conducted empirical research supporting Seligman’s (2002) theory that happiness can be achieved through three distinct ways, i.e. pleasure (hedonic term), meaning (eudaimonic term), and engagement (flow). In the analysis chapters of this thesis, following the aforementioned studies, we treat subjective and eudaimonic well-being as two distinct concepts.

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<sup>5</sup> Waterman (2007, 2008) supports that psychological well-being concept should be distinct from eudaimonic well-being.

<sup>6</sup> It should be noted that there is still no clear consent on the conceptions that should be associated with the eudaimonic well-being approach.

## 2.2. Well-being and the Natural Environment

### 2.2.1. Key Findings: Adults

#### *Psychology Literature*

In 1984, Wilson used the word biophilia to describe people's inborn tendency to get connected with nature. A few years later, Kellert & Wilson (1993) introduced "biophilia hypothesis" to explain the inclination of human beings to affiliate with nature. People's stated preferences toward green spaces, outdoor activities, gardening, natural landscapes and animals provide strong evidence for the validity of the aforementioned hypothesis (Nisbet & Zelenski 2005).

The fact that affiliation with nature has positive effects on people's psychological and physical health is extensively highlighted mainly in psychological research (Kaplan & Kaplan 1989, Ulrich 1993, Frumkin 2001, Morris 2003, Burns 2005, Duffy & Verges 2009). For example, Ulrich (2002) has argued that green spaces enhance people's physical and mental well-being, and reduce stress. Research has also shown a positive relation between green spaces and human physical, mental, and social well-being<sup>7</sup> (Kuo et al. 1998, Mace, Bell & Loomis 2004, Pretty et al. 2005, Maller et al. 2006). Various studies have suggested the restorative/remedial effect that nature has against people's stress, anxiety, and illness (Ulrich 1993, Frumkin 2001). Another study conducted by Kaplan (2001) has shown that a view of nature from window may help people become more positive, alert, and effective at work. On the contrary, disconnection from nature or contact with degraded environments has been linked with higher levels of negative emotions, frustration, and discouragement (Pelletier, Legault & Tuson 1996, Conn 1998).

There are also a small number of psychological studies examining the influences of "connectedness with the natural world"<sup>8</sup> on adults' subjective and eudaimonic well-being. To provide some examples, Nisbet, Zelenski & Murphy (2011) used correlation and regression analysis to examine the relationships between their "Nature

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<sup>7</sup> A more analytical review of the benefits of green spaces and other natural assets is provided by Nisbet & Zelenski (2005), Marks et al. (2006) and Newton (2007).

<sup>8</sup> The measurement of connectedness with nature is based on scales and questionnaires that capture people's subjective experiences.

Relatedness” scale and a variety of subjective and eudaimonic well-being measures, such as positive and negative affect, autonomy, personal growth, purpose in life, environmental mastery, self acceptance, positive relations with others, vitality, and life satisfaction. The findings of the study highlight the importance of nature relatedness in determining people’s well-being.

A second study by Mayer & Frantz (2004), correlated their “Connectedness to Nature” scale (CNS), a tool assessing affective connectedness with nature, with life satisfaction based on a small undergraduate sample of psychology students. CNS correlated positively with life satisfaction. More recently, Mayer et al. (2009) published a study that employed a more in-depth statistical analysis to verify the strong relationship between nature connectedness (as measured by CNS scale) and positive and negative affect.

Moreover, Weinstein, Przybylski & Ryan (2009) employed correlation and mediation analysis that highlighted the significant relationship between connectedness with nature (measured again by the CNS scale) and intrinsic motivation and autonomy, elements associated with the eudaimonic well-being conceptualization. However, it should be noted that a recent empirical study by Perrin & Benassi (2009) has raised questions about the accuracy of CNS as a measure of emotional connection with nature. Instead, their findings suggest that the CNS is appropriate for capturing cognitive beliefs about nature.

Finally, two other studies conducted by Jacob, Jovic & Brinkerhoff (2009) and Brown & Kasser (2005) found a strong positive correlation between environmentally responsible behaviour (ERB) and two dimensions of subjective well-being, i.e. happiness and intrinsic motivation. Given that the principles of ecopsychology suggest that nature connectedness is strongly linked to ERB (Nisbet, Zelenski & Murphy 2009), these two studies indirectly confirm the important influences of connection with nature on human well-being.

## *Economic Literature*

In the economic literature, there is a growing body of research examining the association between subjective well-being and various environmental conditions such as air, noise and water pollution, climate and weather conditions, and natural hazards (Welsch & Kühling 2009). In addition, some of these studies have used subjective well-being and income per capita to monetize the value of the environmental goods or bads (Welsch & Kühling 2009). More specifically, happiness or life satisfaction is modeled as a function of income, the examined environmental condition, and some other covariates such as health, age, gender and family conditions in order to calculate people's willingness to pay for the examined environmental condition (Frey, Luechinger & Stutzer 2009). However, as Ferrer-i-Carbonell & Gowdy (2007) have underlined, one of the main disadvantages of the environmental valuation approach is that it does not take into consideration the fact that the traditional economic trade-offs do not necessarily hold between non-competitive goods such as the various environmental amenities or disamenities.

In general, existing studies can be classified into two main categories: (i) micro-level, examining the impact of nature on individual well-being within the context of a country or region, and (ii) macro-level studies, using country-level data to examine the "global" effect of various indicators such as natural capital and environmental sustainability. There are also a few cross-country comparison studies that have followed a mix of micro-level and macro-level analysis in order to capture the effect of regional environmental and climate conditions on individual (without aggregating to country-level) subjective well-being (Bonini 2008, Murray, Maddison & Rehdanz 2011, Ferreira et al. 2012). In the next paragraphs, we review the main literature with reference to the main environmental amenities (or disamenities) and climate characteristics that have been examined to date.

### *Air pollution*

Welsch conducted a series of macro-level data studies (2002, 2006, 2007) to explore the association between country-level life satisfaction and measured air pollution. Initially, he employed a cross-section analysis with data from 54 countries to study how happiness levels vary with prosperity and environmental quality (2002). Although the

study examined various objective pollutant indicators (sulfur and nitrogen dioxide, particles, phosphorus and solids), only nitrogen dioxide appeared to have a strong negative effect on happiness in the linear regression. Given that nitrogen dioxide was the only pollutant indicator that appeared to have a weak correlation with income, it is likely that the effect of the other pollutant indicators is insignificant due to their prevailing negative relationship with income. To control for the unobserved between-country heterogeneity problem, Welsch used a panel data set including annual information (for the period 1990-1997) for ten European countries. Then, he examined the effects of nitrogen dioxide, particles and lead on country-level life satisfaction. The econometric analysis indicated a strong and negative effect of nitrogen dioxide and lead. The significant effect of nitrogen dioxide was also confirmed by Welsch's last study (2007), treating air pollutant (nitrogen dioxide) as a quasi-input, and adopting the same data set and happiness function of the initial study (2002) to estimate the optimal abatement levels of air pollution benefits and costs.

Di Tella & MacCulloch (2005) used a panel-data analysis with about four thousand people from 12 OECD countries during the period 1975-1997 to examine the determinants of individual self-reported satisfaction. Among other variables, sulfur dioxide emissions were found to be negatively and significantly associated with life satisfaction. Their model contained a variety of basic macro-level control factors of life satisfaction, such as life expectancy, crime rates, inflation and unemployment, and openness to trade.

Levinson (2012) conducted a macro-data analysis to investigate the effect of objective air pollution (measured by levels of PM10 particles) on self-reported happiness after controlling, among others, by local climate conditions (temperature and precipitation). The findings indicated that people report lower levels of happiness when interviewed on a day with higher than average levels of air pollution. Surprisingly, the effects of air pollution (total suspended particulates, nitrogen and sulfur dioxide) appeared to have an insignificant relationship with life satisfaction and happiness in a macro-level cross-sectional study with 30 countries, conducted by Israel and Levinson (2003). However, the findings of this study revealed a strong and negative association between water pollution (organic water pollutants) and life satisfaction/happiness.

In 2008, Rehdanz & Maddison added a “subjective” dimension in the measurement of air quality. They conducted a micro-level study in Germany to explore the relationship between self-reported life satisfaction and individual perceptions about the local air and noise pollution levels. The findings indicated that, after controlling for socio-demographic differences, economic conditions, and neighbourhood characteristics, negative perceptions are significantly associated with lower scores of satisfaction. Their estimated model did not include objective measures of air and noise pollution.

In another study conducted by MacKerron & Mourato (2009), a survey of 400 participants was employed to examine the impact of both measured and perceived air quality on life satisfaction in London. GIS software was used to calculate the level of air pollution (as measured by nitrogen dioxide and PM10 particles concentrations) around participants’ home area (spatial dimension). The findings of the analysis suggested a negative correlation between life satisfaction and both objective and subjective air quality levels.

Smyth, Mishra & Qian (2009) found that air pollution (sulphur dioxide) is the strongest determinant of life satisfaction among the other objective environmental variables that were included in the analysis (natural disasters, traffic congestion and area of parkland per capita in participants’ neighbourhood, which were also found to be significant and had the expected sign). Of the subjective variables, only environmental consciousness appeared to have a positive and significant effect on life satisfaction.

Luechinger (2009) introduced a different approach to correct for simultaneity problems when assessing the effects of air pollution on life satisfaction. Specifically, he modeled local sulfur dioxide emission as a function of the wind directions and the existence of scrubber installation at power plants in various counties in Germany. Using a panel data for the period 1985 - 2003 with 29000 individual observations, he found a negative effect of sulfur dioxide emissions on self-reported life satisfaction.

Finally, Ferreira et al. (2012) employed a mix of micro-level and macro-level analysis to capture the effect of local environmental quality and climate conditions on individual subjective well-being across 23 European countries for the period 2002 - 2007. Their model contained a set of spatial characteristics, including air pollution, climate, and macroeconomic data at local level within each country, and a set of individual socio-

demographic data. Their findings highlighted the negative influence of air pollution on individual life satisfaction.

### *Noise*<sup>9</sup>

In 2005, Van Praag & Baarsma investigated the impact of noise pollution on subjective well-being. They employed a micro-level data analysis to assess the effects of measured airport noise pollution on individuals' subjective quality of life around Amsterdam's airport. The initial results suggested that objective nuisance (measured in Kosten units) has no significant effect on self-reported well-being. Next, they modeled noise pollution in terms of family size, presence at home during the day, presence of balcony and garden, and objective noise pollution (Kosten units). Interestingly, the new perceived noise variable that substituted the objective noise variable appeared to have a significant effect on self-reported well-being.

Weinhold (2010) found that people's perceptions about noise pollution in their neighborhood are significantly and negatively correlated with individual self-reported life satisfaction in a micro-level sample of about 26000 people from 28 European countries (European quality of life surveys). The effect of nuisance perceptions remained significant even after including a "complainer" variable (based on people's negative perceptions about other local issues such as air quality and availability of green spaces), to control for people who may have the tendency to complain more and be less happy.

### *Natural Hazards*<sup>10</sup>

Luechinger & Raschky (2009) combined cross-sectional and time-series data (1973-1998) to examine the effect of flood on individual life satisfaction in 16 European countries. Their findings suggest a strong and negative relationship between micro-level life satisfaction and flood. Moreover, Carroll, Frijters & Shields (2008) found that drought has a negative impact on individual life satisfaction for people living in Australia's rural areas during spring (for the period 2001-2004).

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<sup>9</sup> See also Rehdanz & Maddison (2008) study, p.31 of this chapter.

<sup>10</sup> See also Smyth, Mishra & Qian (2009), p. 31 of this chapter.



### *Climate and Weather/Local Amenities*

A group of existing studies has investigated the role of climate and local amenities on subjective well-being. To provide some examples, Rehdanz & Maddison (2005) conducted a macro-level analysis with a sample of 67 countries to study the effects of climate (temperature and precipitation) on self-reported levels of happiness. Their analysis suggested that higher mean temperatures in the coldest months and lower mean temperatures in the hottest months are associated with higher levels of happiness. It was also found that, in general, a limited climate change would benefit high-latitude countries and would harm low-latitude countries. In 2011, Maddison & Rehdanz introduced a different approach for the description of the climate by using cooling and heating degree months. Using macro-level data from 87 countries between 1981 and 2008, they found that life satisfaction is strongly associated with mild climates, i.e. climates with slight deviations from average temperature, i.e. (18.3 °C).

Murray, Maddison & Rehdanz (2011) performed a mix of micro-level and macro-level analysis in order to investigate the impact of climate across 19 European countries. The results from their linear and non-linear regression techniques suggested that life satisfaction is negatively associated with lower levels of sunshine, higher levels of humidity, and -similarly to Maddison & Rehdanz (2011) - with significant standard deviations from average annual temperature.

Frijters & Van Praag (1998) employed a micro-data analysis to assess the effect of climate on households' self-reported life satisfaction in 35 'climate regions' of Russia. They adopted 13 climate variables, including among others information about temperature, precipitation, rainfall, sunshine and wind speed. Their analysis suggests that life satisfaction is positively correlated with the number of sun hours, while it is negatively correlated with high levels of humidity and temperature, and heavy winters.

Becchetti, Castriota & Bedoya (2007) conducted a study with about 120000 participants to investigate the effect of climate on self-reported life satisfaction in the USA. The findings suggest that life satisfaction is negatively associated with wind speed and foggy days, positively associated with rainy days until reaching a peak of 110 days and negatively associated afterward, and U-shaped with temperature.

Barrington-Leigh (2008) employed a micro-level analysis to examine the effect of weather conditions on individual life satisfaction in Canada. Interestingly, the study findings did not detect a strong relation between participants' life satisfaction and weather conditions during the day where the interviews took place. Only sunny days appeared to strongly and positively influence life satisfaction. Reasonably, favorable weather promotes outdoor activities that, in turn, enhance happiness.

Moro et al. (2008) conducted an individual-level data analysis to investigate, among others, the effect of climate on self-reported life satisfaction in 34 counties of Ireland. They found that wind speed is negatively associated with life satisfaction, while mean annual bright sunshine is positively associated with life satisfaction. An interesting finding of this study is that the mean annual precipitation is found to be positively associated with life satisfaction. The reason behind this conclusion could be attributed to the positive correlation between rainfall levels and landscape beauty in Ireland.

Furthermore, Brereton, Clinch & Ferreira (2008) adopted a holistic approach to study the impact of geography and climate conditions on life satisfaction in Ireland. They used Geographical Information Systems (GIS) to create environmental and location specific variables aggregated at the individual and local level. Proximity to landfill, coast, beach, and airport, precipitation, wind speed and average annual sunshine are some of the variables that were included in the estimated model. Their findings underline the importance of environmental amenities and spatial dimension in determining life satisfaction.

More recently, Ambrey & Fleming (2011) adapted Brereton, Clinch & Ferreira's (2008) model to investigate the impact of scenic amenity on life satisfaction in Australia. For the purposes of the analysis, they focused on a region of Queensland's state where a rapid population growth (which in turn leads to a rapid increase in the built environment and to a decline in natural beauty amenities) has been observed the last few decades. The findings from the cross-sectional OLS and ordered probit regressions revealed that improvements in scenic amenity, based on participants' preferences (of least desirable to most desirable scenery), are significantly beneficial for individual-level life satisfaction. In terms of location, they found that living within three kilometers from the coast is associated with higher levels of satisfaction.

### *Natural Capital/Sustainable Development*

Some studies have used natural capital as an aggregate measure of environmental quality. In a study conducted by Vemuri & Costanza (2006), a macro-level data from 45 countries was used to investigate the role of human, social, built, and natural capital in determining country-level life satisfaction. Natural capital was measured by the ecosystem services product (ESP) developed by Sutton & Costanza (2002). The value of this variable is estimated for each country by multiplying the amount of each type of land-cover with the relevant unit ecosystem service values. The results of their analysis suggested a significant impact of the natural capital on life satisfaction. The significant role of natural capital, measured by Sutton & Costanza's (2002) approach again, was also confirmed by Abdallah, Thompson & Marks (2008), based on a stepwise regression with a macro-level data set of 178 countries.

Engelbrecht (2009) employed a macro-level bivariate analysis to explore the relationship between subjective well-being (life satisfaction and happiness) and natural capital using a sample of 58 developed and developing countries. He adopted the World Bank's natural capital per capita index (consisting of a variety of renewable and nonrenewable resources) as an indicator of country-level natural capital. Similarly, a macro-level study conducted by Zidansek (2007), using two alternative environmental indices ("Environmental Sustainability" and "Environmental Performance" index), found a strong positive correlation between life satisfaction/happiness and environmental sustainability.

On the other hand, Bonini (2008) used a combination of micro-level and macro-level data to investigate the cross-country relationship between individual self-reported life satisfaction and environmental conditions (measured by "Environmental Sustainability" index). After controlling for region-specific effects, he found that the region characteristics are the most significant indicators of life satisfaction, while environmental conditions variable influences life satisfaction no more than GDP per capita.

## *Biodiversity*

In 2007, Rehdanz explored the impact of biodiversity on people's life satisfaction. The study used country-level life satisfaction scores for 73 countries and defined biodiversity as the existing number of threatened and non-threatened bird and mammal species in each country (objective measures). The spatial econometric analysis revealed a significant and strong relationship between the number of existing species and national life satisfaction. Moreover, the number of threatened bird species appeared to significantly diminish life satisfaction.

## *Attitudes*

Finally, Ferrer-i-Carbonell & Gowdy (2007) used micro-level data from British Household Panel Survey (BHPS) to examine the relationship between environmental attitudes and life satisfaction. Their initial ordered probit model contained a set of basic explanatory variables (such as age, gender, health, income, and employment status) and two subjective environmental variables based on the following statements: "*individual cares about ozone layer*" and "*individual cares about animal extinction*". The findings of their analysis verified their main hypotheses that concern about ozone layer is negatively correlated with life satisfaction (because it represents a preoccupation with environmental degradation) and concern about animal extinction is positively correlated with life satisfaction (because it implies a psychological connection with other living things that is stronger from the negative feelings caused by the awareness of animal extinction). The significance of the derived results does not change after including psychological trait variables and objective environmental variables (capturing local environmental conditions and individuals' exposure to the natural world) to control for unobserved effects<sup>11</sup>.

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<sup>11</sup> In 2009, Smyth, Mishra & Qian adopted two subjective variables, i.e. individual perceptions about the importance of environmental protection for the benefit of the society and perceptions of changes in the environmental consciousness in participants' neighbourhood to measure the effects of environmental attitudes on micro-level life satisfaction in China. Only environmental consciousness was found to be significantly correlated with life satisfaction. Both variables had the expected sign.

### 2.2.2. Key Findings: Children

The main body of psychological research with non-adult data samples focuses on environmental influences on children and adolescents' physical and psychological health (Kahn & Kellert 2002, Huby & Bradshaw 2006, Steuer, Thomson & Marks 2006, Newton 2007, Lester & Maudsley 2007, White & Stoecklin 2008). So, for example, indoor air pollution (Mendell & Heath 2005), outdoor air pollution (Kim 2004, Gauderman et al. 2007) and noise pollution (Niskar et al. 2001), as expected, have been found to be detrimental to children's physical health.

Within the economic literature, there are a number of studies trying to estimate the benefits that might occur from the reduction of environmental health risks to children (OECD 2006). Non-market valuation techniques have been applied to quantify the value of objective health (illness symptoms, life expectancy, etc.), self-reported perceptions of physical and mental health, and societal benefits from the reduction of health risks (Nord 2006).

Concerning the effects of the environmental quality or degradation on mental and psychological health, there is empirical evidence that affiliation with nature benefits children with attention deficit hyperactivity disorder (Faber Taylor, Kuo & Sullivan 2001), improves children's concentration and self-discipline (Wells 2000, Faber Taylor, Kuo & Sullivan 2002), and enhances children's cognitive development (Pyle 2002).

Moreover, play in natural settings appears to enhance children's language and collaborative skills (Moore & Wong 1997, Fjortoft 2001), while it reduces anti-social behaviour (Coffey 2001). Some other studies have underlined the role of the natural environment (such as access of green spaces) in enhancing children's play and exercise, which in turn promote their physical, mental, and social well-being. Rickinson et al. (2004) conducted an extensive review of the existing literature indicating that outdoors learning may have strong positive impacts on children's psychological well-being such as self-esteem and autonomy. Wells & Evans (2003) have found that higher "nearby nature" in rural areas is associated with less stress. Finally, according to Bartlett (1996), nature enhances children's independence and autonomy, concepts associated with eudaimonic well-being.

Surprisingly, to the best of our knowledge, there is a substantial lack of research examining the impact of the natural environment on children's subjective and eudaimonic well-being (Steuer, Thompson & Marks 2006, Proctor, Linley & Maltby 2009). Possibly, this could be attributed to the fact that the systematic attempt to investigate non-adult positive psychology and construct appropriate measurement tools has been started only recently.

In 2004, Marks, Shah & Westall conducted a study exploring the factors that influence children and adolescents' well-being. They adopted a two dimensional model assessing life satisfaction and personal development (curiosity, enthusiasms, absorption and commitment), a concept linked to eudaimonic well-being. They surveyed about 1000 children between 7 and 19 years old in Nottingham to predict the determinants of children and young people's subjective and eudaimonic well-being. The findings suggested that satisfaction with the living environment (being an average of satisfaction with house, neighbourhood and wider area) explains a relatively small percentage of life satisfaction and curiosity variance. Also, the outcomes of the study verified that participation in sport activities is incremental to both dimensions of well-being. On the other hand, they did not detect any significant association between materialistic values and well-being.

Furthermore, Brown & Kasser (2005) employed a mediation analysis to explore the relationship between intrinsic values (associated with eudaimonic well-being), happiness and environmentally responsible behaviour - linked with nature connectedness (Nisbet, Zelenski & Murphy 2011) - with a sample of 209 middle school adolescents in the United States. The outcomes of the study revealed a strong positive correlation between the two examined measures, suggesting that personal happiness and sustainability can be jointly achieved. In 2009, Fattore, Mason & Watson (2009) employed a qualitative study with the participation of 120 children between 8 and 15 years old in Sydney. The outcome of the interviews suggested that, among other factors, the physical environment make children feel happier because they view it as a place for leisure activities.

There are also a few studies where environment is included as a basic dimension on well-being indices. For example, Bradshaw et al. (2009) constructed an index to measure child well-being in various counties in England. The environmental domain of the index includes objective indicators that capture environmental access and quality at each location. The environmental quality sub-domain contains information about measured air quality, the percentage of green space and woodland, the number of bird species, and local road safety. The environmental access sub-domain contains information about the availability of opportunities for sport and leisure, and average distance to school. Although the environmental domain captures useful components of the environment affecting children's physical well-being, more variables are needed to examine the influences of the natural world on children's self-reported well-being. Also, the "Good Childhood" index (Rees, Goswami & Bradshaw 2010), an index focusing on the subjective well-being of children in the UK, has included, among others, children's perceptions about the quality of the local environment.

### 3. Survey and Data Collection Methods

#### 3.1. Introduction

In the current section, we provide an analytical description of the survey content, the procedures that were followed for the recruitment of the participating schools, the design and implementation process. The content and the logic behind the construction of the questionnaires are common for both countries. For this reason, the two case studies are treated in the discussion that follows as components of a single survey. A brief overview of time sequence of the survey design and implementation steps is provided in Table 3.1.

**Table 3.1 – Survey Design and Implementation Steps**

<b>Time Sequence</b>	<b>Survey Process</b>
July 2009	Focus groups in Greece
September 2009	Cognitive interviews in Greece
July 2010	Focus group in England
April 2010	“Informal” piloting in Greece
October 2010	Pilot survey in Greece
November 2010	Pilot survey in England
November 2010 – April 2011	Main survey in Greece
March 2011 – March 2012	Main survey in England

#### 3.2. Survey Objectives

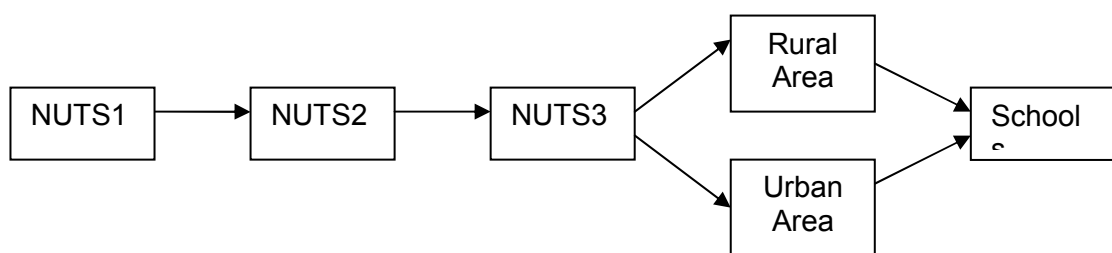
The development of the survey was based on the following main objectives: (i) measure the two basic dimensions of subjective well-being, i.e. life satisfaction and eudaimonia (ii) measure the basic aspects of students’ affiliation with the natural environment, emphasizing on experiential connectedness, (iii) collect information on pupils’ exposure to environmental education teaching and programs at school, (iv) ensure that the biggest part of questionnaire’s content is the same in the two countries, in order to be able to proceed with a cross-country comparison, (v) collect basic information about students’ socio-demographic and personality background in order to use them as control variables in the regression analysis, and (vi) ensure that the included questions are phrased simply and shortly, and that there is a satisfactory depth vs. breadth balance.



### 3.3. Sampling Strategy

The target population of the survey is students attending state-funded secondary schools in England, and students attending public and private schools in Greece. The sample frame is a list with all types of the aforementioned schools in the two countries. The recruitment of schools was based on a stratified multi-stage cluster sampling strategy. To achieve a satisfactory coverage of the two countries in terms of socio-demographic and geography characteristics, we adopted Eurostat's NUTS classification of European countries' territories (European Regional Yearbook 2011). According to this classification system, each country is divided into three levels: (i) NUTS 1, "major socio-economic regions", (ii) NUTS 2, "basic regions for the application of regional policies", and (iii) NUTS 3, "small regions for specific diagnoses"<sup>12</sup>. The sampling strategy, as depicted in Figure 3.1, has been implemented in four main steps: (i) random selection of at least one NUTS 2 territory within each NUTS 1 territory, (ii) random selection of at least one NUTS 3 territory within each selected NUTS 2 territory, (iii) distinction between rural and urban schools within each selected NUTS 3 territory, and (iv) selection of at least one rural and/or urban school within each selected NUTS 3 territory.

**Figure 3.1 - Sampling Strategy Steps**



#### *Sampling Strategy Outcome and Participants*

**England:** The English sample (Table 3.2) consists of 527 students aged between 11 and 19 years old and coming from 15 secondary schools (seven rural and eight urban, five of which are in London) across the country. Most of the participants are in key stages 3, i.e. years 7 - 9, and 4, i.e. years 10 - 11 (43.07% and 41.74% respectively), while another 15.19% attends post-compulsory key stage 5. The sample is slightly unbalanced in

<sup>12</sup>More information online at the following webpage:  
[http://epp.eurostat.ec.europa.eu/portal/page/portal/nuts\\_nomenclature/introduction](http://epp.eurostat.ec.europa.eu/portal/page/portal/nuts_nomenclature/introduction)

favor of boys<sup>13</sup>, mainly because one of the recruited schools admits male students only. As it is shown in Table 3.4, the survey sample is distributed across seven (out of a total number of nine) NUTS 1 English territories. To estimate the loss of sample's effectiveness (which affects the accuracy of regression coefficients and standard errors) due to cluster sampling strategy, we estimated sample's design effect (Kish 1965):

$$deff = 1 + \rho(n - 1) \quad (3.1)$$

where  $\rho$  is the intra-class correlation (correlation between units within each cluster) and  $n$  is clusters' average size. Design effect value shows how bigger the sampling variance of a cluster sampling is compared to a single random sample (by definition, the design effect of simple random samples is equal to one). Here, the design effect has been found to be  $deff = 1.20$  and  $deff = 1.35$  with reference to life satisfaction and eudaimonia respectively, implying that "efficiency damage" is very low.

For a basic assessment on whether the English sample is representative of the target population in England, i.e. state-funded secondary schools, we compared target and sample population with regards to two main indicators: gender and key stage<sup>14</sup>. With reference to gender, as the statistics in Table 3.3 suggest, there is a somewhat stonger percentage of male students in sample population compared to the percentage of male students in target population at each key stage. Moreover, key stage 3 students are slightly underrepresented, whereas key stage 4 students are slightly overrepresented in population sample. The percentage of key stage 5 students is almost identical between the two populations.

**Greece:** The Greek sample consists of 3614 students, 2005 girls and 1609 boys, coming from 88 public and six private schools throughout Greece (Table 3.5). In relation to schools' location, we recruited 50 rural schools and 44 urban schools, 27 of which are in the greater area of Attica, covering 28 out of a total of 52 NUTS 3 territories (Table 3.7). Survey participants come from the upper years of lower secondary school, i.e. years 8 and 9 and all upper secondary school years (10, 11 and 12). The design effect of the sample has been found to be  $deff = 1.99$  with reference to life satisfaction and

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<sup>13</sup> In the total population of secondary school students, there is a gender balance, i.e. 50.38% are boys and 49.62% are girls.

<sup>14</sup> Given the relatively small size of the sample especially across years 7, 8, 12 and 13, we preferred to perform the comparison by key stage rather than by school year.

$deff = 1.65$  with reference to eudaimonic well-being. The design effects of the Greek sample are slightly higher than the design effects of the English sample, due to relatively larger intra-class correlations and cluster sizes (as it can be seen in equation 3.1, design effect increases as average cluster size increases). In terms of sample's representativeness, as it can be seen in Table 3.6, there is a good balance between target and sample population with reference to gender and school year. This is an expected outcome given the large sample size and its dispersion across a large number of NUTS 3 regions.

### *Survey Weights*

Survey weights can be used to improve the representativeness of the sample in cases where a discrepancy exists between the distribution of individuals in the actual population and the distribution of individuals in the sample population in terms of certain characteristics (De Vaus 2002, Gelman 2007). For example, post-stratification weights can be constructed in order to account for the fact that males are under-represented and females are over-represented in the final sample. The construction of these weights requires availability and access to auxiliary (census data) information about the target population.

In this study, given that access to census data was not always possible (especially in Greece) and that the construction of sampling weights can become very complicated when adjustments need to be made for more than one characteristic (age and gender for example, which is also the case in this study), we preferred to avoid the usage of survey weights in the regression analysis that has been employed. Instead, we controlled for potential biases by including all important variables which are related to sample selection (such as age, gender, rural vs. urban) as explanatory variables in the regression analysis. In that case, unweighted OLS analysis provides unbiased and consistent estimations (Winhsip & Radbill 1994).

**Table 3.2 – Basic Descriptive Statistics of English Sample**

English sample					
Gender	N#	%	Location	N#	%
Girls	231	43.83	Rural	213	40.42
Boys	296	56.17	London	174	33.02
			Other urban	140	26.56
School Year	N#	%	Age	N#	%
Year 7 - 8	106	20.11	11 - 12	34	6.45
Year 9	121	22.96	13 - 15	362	68.69
Year 10	146	27.70	16-18	123	23.34
Year 11	74	14.04	19	8	1.52
Year 12 - 13	80	15.19			

**Table 3.3 – Total vs. Sample Population by Key Stage and Gender in England**

English sample								
Key Stage**	Total Population*				Sample Population			
	Students N#	%		Students N#	%			
Key stage 3	1640035	51.58		227	43.07			
Key stage 4	1121505	35.27		220	41.75			
Key stage 5	418030	13.15		80	15.18			
<b>Total</b>	<b>3179570</b>	<b>100</b>		<b>527</b>	<b>100</b>			
Key Stage**	Girls N#	Girls %	Boys N#	Boys %	Girls N#	Girls %	Boys N#	Boys %
Key stage 3	806845	49.20	833190	50.80	106	46.70	121	53.30
Key stage 4	553270	49.33	568235	50.67	94	42.73	126	57.27
Key stage 5	217955	47.86	200075	52.14	31	38.75	49	61.25

\* It is the population of students attending key stage 3 – key stage 5 of state-funded schools in England as of January 2012. For more information about school types in England please see Chapter 7, p. 176. Source: School and Pupil Numbers, [www.gov.uk](http://www.gov.uk)

\*\* Key stage 3: Years 7 - 9, Key Stage 4: Years 10 & 11, Key Stage 5: Years 11 & 12.

**Table 3.4 – Survey Participants by School NUTS Regions in England**

NUTS 1	NUTS 2	NUTS 3	Students (#)
<u>North</u> <u>West</u>	East Cumbria <i>(Lancashire)</i>	East Cumbria <i>(Lancashire CC)</i>	12 <i>(5)</i>
	Cumbria	West Cumbria <i>(East Cumbria)</i>	8 <i>(2)</i>
	Greater Manchester	Greater Manchester South	18
NUTS 1	NUTS 2	NUTS 3	Students (#)
<u>Yorkshire</u> <u>&amp; the</u> <u>Humber</u>	East Riding & North Lincolnshire	East Riding of Yorkshire <i>(Kingston upon Hull)</i>	30 <i>(1)</i>
NUTS 1	NUTS 2	NUTS 3	Students (#)
<u>East</u> <u>Midlands</u>	Leicestershire, Rutland & Northamptonshire <i>(Herefordshire, Worcestershire, &amp; Warwickshire)</i>	Leicestershire CC & Rutland <i>(Warwickshire CC)</i>	77 <i>(1)</i>
NUTS 1	NUTS 2	NUTS 3	Students (#)
<u>West</u> <u>Midlands</u>	Herefordshire, Worcestershire & Warwickshire	Herefordshire	9
	Herefordshire, Worcestershire & Warwickshire <i>(Leicestershire, Rutland &amp; Northamptonshire)</i>	Warwickshire CC <i>(West Northamptonshire)</i>	36 <i>(4)</i>
NUTS 1	NUTS 2	NUTS 3	Students (#)
<u>East of</u> <u>England</u>	Bedfordshire & Hertfordshire	Hertfordshire	67
	East Anglia	Suffolk <i>(Cambridgeshire)</i>	32 <i>(2)</i>
NUTS 1	NUTS 2	NUTS 3	Students (#)
<u>London</u>	Inner London <i>(Outer London)</i>	East Inner London <i>(East &amp; North East Outer London)</i>	43 <i>(5)</i>
	Inner London <i>(Inner London)</i>	West Inner London <i>(East Inner London)</i>	17 <i>(9)</i>
	Outer London <i>(Inner London)</i> <i>(Bedfordshire &amp; Hertfordshire)</i>	East & North East Outer London <i>(East Inner London)</i> <i>(Hertfordshire)</i>	33 <i>(23)</i> <i>(3)</i>
	Outer London	West & North West Outer London	44
NUTS 1	NUTS 2	NUTS 3	Students (#)
<u>South</u> <u>West</u>	Gloucestershire, Wiltshire & Bristol/Bath	Wiltshire <i>(Bath &amp; North East Somerset, North Somerset)</i>	44 <i>(2)</i>

\* In most cases, schools' NUTS 3 area is identical with students' residence area. In cases where a student resides in a NUTS 3 area other than that of the school's, we have included that area in parenthesis. For example, of the students attending a school located in East Cumbria, 12 reside in East Cumbria as well and five reside in Lancashire CC.

**Table 3.5 – Basic Descriptive Statistics of Greek Sample**

Greek Sample					
Gender	N#	%	Location	N#	%
Girls	2005	55.48	Rural	1966	54.40
Boys	1609	44.52	Athens	1201	33.23
			Other urban	447	12.37
School Year	N#	%	Age	N#	%
Year 8	91	2.52	14	89	2.46
Year 9	930	25.73	15 - 16	1.821	50.38
Year 10	942	26.07	17 - 18	1.677	46.40
Year 11	859	23.77	19	27	0.76
Year 12	792	21.91			

**Table 3.6 – Total vs. Sample Population by School Year and Gender in Greece**

Greek sample								
School Year	Total Population*				Sample Population**			
	Students N#	%		Students N#	%			
Year 9	104712	30.44		930	26.40			
Year 10	85689	24.91		942	26.74			
Year 11	78164	22.72		859	24.38			
Year 12	75431	21.93		792	22.48			
<b>Total</b>	<b>343996</b>	<b>100</b>		<b>3523</b>	<b>100</b>			
School Year	Girls N#	Girls %	Boys N#	Boys %	Girls N#	Girls %	Boys N#	Boys %
Year 9	51701	49.37	53011	50.63	496	53.33	434	46.67
Year 10	44658	52.12	41031	47.88	505	53.61	437	46.39
Year 11	42039	53.78	36125	46.22	489	56.93	370	43.07
Year 12	41286	54.73	34145	45.27	462	58.33	330	41.67

\* It is the population of students attending years 9 to 12 of public and private “General” schools in Greece. For more information about school types in Greece please see Chapter 7, p. 178. Source: National Statistics Office, [www.statistics.gr](http://www.statistics.gr)

\*\* Due to the small sample size, we excluded 91 students attending year 8.

**Table 3.7 –Survey Participants by School NUTS Regions in Greece**

NUTS 1	NUTS 2	NUTS 3	Students (#)	
<u>North Greece</u>	Easter Macedonia & Thrace	Evros	69	
	Central Macedonia	Kilkis	105	
	Central Macedonia	Pella	275	
	Thessaly	Karditsa	95	
	Thessaly	Magnesia	193	
	Thessaly	Trikala	68	
NUTS 1	NUTS 2	NUTS 3	Students (#)	
<u>Central Greece</u>	Epirus	Ioannina	156	
	Ionian Islands <i>(West Greece)</i>	Lefkada <i>(Aitolokarnania)</i>	64 <i>(5)</i>	
	West Greece <i>(Peloponnesus)</i>	Achaia <i>(Arcadia)</i>	81 <i>(1)</i>	
	West Greece	Ilia	76	
	Continental Greece	Boeotia	152	
	Continental Greece	Euboia	250	
	Continental Greece	Evrytania	97	
	Continental Greece	Fthiotida	64	
	Continental Greece	Fokida	82	
	Peloponnesus	Corinth <i>(Nemea)</i>	81 <i>(6)</i>	
	Peloponnesus	Messinia	59	
NUTS 1	NUTS 2	NUTS 3	Students (#)	
<u>Attica</u>	Attica <i>(Attica)</i> <i>(Attica)</i> <i>(Attica)</i>	Athens <i>(East Attica)</i> <i>(West Attica)</i> <i>(Piraeus)</i>	841 <i>(34)</i> <i>(6)</i> <i>(6)</i>	
	Attica	East Attica	68	
	Attica <i>(Attica)</i>	Piraeus <i>(Athens)</i>	156 <i>(9)</i>	
	Attica	West Attica	81	
	NUTS 1	NUTS 2	NUTS 3	Students (#)
	<u>Aegean Islands &amp; Crete</u>	North Aegean	Lesbos	151
South Aegean		Dodecanese Prefecture	77	
South Aegean		Cycladic Prefecture	68	
Crete		Chania	138	

\* In most cases, schools' NUTS3 area is identical with students' residence area. In cases where a student resides in a NUTS3 area other than that of the school's, we have included that area in parenthesis. For example, of the students attending schools located in Corinth, 81 reside in Corinth as well and 6 reside in Nemea.

### 3.4. Questionnaire Development Process

#### 3.4.1. Focus Groups

*England:* A 60-minutes focus group with six secondary school students took place in St Albans, Hertfordshire, in July 2010. A basic description of participants' profile is presented in Table 3.8. The discussion focused on a long version of the final survey, including a wider range of well-being and environmental questions. Following the questionnaire format, the discussion was split into three main sessions: (i) well-being, (ii) environment, and (iii) background information. Students were asked to explicitly indicate the degree of understanding and the clarity of the questions, propose ways that would improve the phrasing of the questions and to provide a general assessment of the questionnaire as a whole. The outcome of the discussion offered valuable feedback mainly with reference to questions' phrasing. The incorporation of students' hints improved the clarity of the questionnaire in a substantial way. Some of the key issues that were raised by most students are the following:

(i) It is not clear how "well-being" and "natural environment" questionnaire sections are linked (based on this observation, we provided a more detailed explanation of the study purpose during the survey process).

(ii) Some of the questions, especially those ones included in the "natural environment" section, were positively or negatively biased; a neutral phrasing would be suggested. In addition, they felt that some of the questions, especially within the "well-being" section, were too vague.

(iii) Students felt that "well-being" part is too long. Overall, they thought that the questionnaire is too long to do in class.

By the end of the procedure, the participants were asked to provide (anonymously) a general assessment of the survey with reference to difficulty, clarity and willingness to take it in class: (response frequency for each response choice is provided in parentheses):



*Level of difficulty:* very easy (3) easy (2) neutral (1) difficult (0) very difficult (0)

*Content:* very boring (0) boring (0) neutral (4) interesting (2) very interesting (0)

*If you were asked to complete this questionnaire at school, would you be willing to do it?* No (1) Maybe (1) Yes (2) Depends on the mood (2)

**Table 3.8 – Basic Profile of Focus Group Participants in England (St' Albans)**

Students	Gender	Date of Birth	School Year*
Student 1	Male	1992	Year 13
Student 2	Male	1993	Year 11
Student 3	Male	1993	Year 11
Student 4	Male	1994	Year 11
Student 5	Female	1996	Year 9
Student 6	Female	1996	Year 9

\* School year 2009 - 2010

Greece: The main purpose of the focus groups was to capture students' general views and thoughts about their relation with the natural environment in order to ensure that the questionnaire will be covering all possible aspects of pupils' nature connectedness in a sufficient and understandable way. In addition, it was attempted to explore how pupils perceive the concept of eudaimonia and check whether they can recognize the conceptual difference with "happiness". Two 60 minutes focus groups have been conducted with secondary school students in Athens and Livanates, a short rural town in Central Greece, in July 2009. A basic description of participants' profile is presented in Tables 3.9 and 3.10. The following questions were raised for discussion:

1. *What comes to your mind when you hear the phrase "natural environment"?*
2. *Please mention ways that a person can come in touch with the natural environment.*
3. *According to your opinion, what are the most serious problems that threaten the natural environment today?*

4. *According to your opinion, why do people need, if you believe that they need at all, to save the planet?*

5. *What can we do to protect the environment?*

6. *One of the issues that some psychologists and environmentalists deal with today is whether there is any relationship between the connectedness with the natural environment and the human eudaimonia. What does "eudaimonia" mean for you?*

None of the students had participated in environmental education courses or programs with school before, except from one student who had engaged in an UNESCO program related to environment and nutrition. The three main conclusions that can be derived from the group discussions are the following:

(i) Upper secondary school students (years 10 - 12) appeared to have a very good level of knowledge and understanding of environmental issues, and they were very familiar with the relevant terminology. On the other hand, lower secondary school students (years 7 - 9) showed a limited theoretical background. Their knowledge about the natural environment was relatively poor.

(ii) Rural areas' students appeared to have a substantially higher experiential familiarity with nature compared to urban areas' students. Not surprisingly, rural areas offer better opportunities for direct contact with nature.

(ii) Upper school students appeared to have a much better understanding of "eudaimonia" term. Lower school students viewed eudaimonia as conceptually similar to "good luck". On the contrary, upper school students exhibited a broader understanding by mentioning expressions such as "live well" and "be fulfilled".

**Table 3.9 – Basic Profile of Focus Group Participants in Greece (Athens)**

Students	Gender	Date of Birth	School Year*
Student 1	Male	1992	Year 11
Student 2	Male	1992	Year 11
Student 3	Female	1992	Year 11
Student 4	Female	1993	Year 10
Student 5	Male	1993	Year 10
Student 6	Female	1994	Year 9

\* School year 2008 - 2009

**Table 3.10 – Basic Profile of Focus Group Participants in Greece (Livanates)**

Students	Gender	Date of Birth	School Year*
Student 1	Male	1995	Year 8
Student 2	Male	1995	Year 8
Student 3	Male	1995	Year 8
Student 4	Female	1995	Year 8
Student 5	Female	1996	Year 7
Student 6	Male	1996	Year 7

\* School year 2008 - 2009

### 3.4.2. Cognitive Interviews

*England:* Cognitive interviews were not conducted in England, since we felt that the outcome of the focus group discussion provided sufficient information for the improvement of the survey structure and content. In addition, given the time and budget constraints, we felt that it would be not necessary to further examine students' perceptions about the meaning and quality of the questions, since most of them were derived from widely known scales and past research in English speaking countries. The preliminary findings from the piloting survey verified our decision.

*Greece:* At first, the full versions of well-being scales and the environmental questions were translated into Greek (see next section for more details). Cognitive interviews have been widely used since early 1980's, mainly within the fields of criminology and psychology, as a prominent tool for in-depth examination of respondents' perceptions and understanding of specific survey questions (Beatty & Willis, 2007). For the purpose of this study, cognitive interviews were employed with ten secondary school students in Athens (September 2009, see Table 3.11 for a basic profile of interview participants) to receive feedback on the content and phrasing of well-being<sup>15</sup> and environmental questions, and verify whether the questions measure what they are intended to measure.

During the interviews, students were asked to "think aloud" and indicate how they "interpret" each question, and whether there are any questions or words that confuse them or are hard to understand. They were also asked to express their opinion about the quality of the whole questionnaire, whether they found it interesting, easy or difficult to deal with it. Overall, the interview outcomes suggested that students had a clear understanding of most questions, although changes to the phrasing of some questions (mainly those ones included in the eudaimonic well-being scale) were necessary.

#### **Translation Procedure:**

In general, the translation process was rather straightforward, since most of the questions expressed simple concepts (life satisfaction statement and socio-demographic questions for example) and were written in a very simple way. Also, during the initial questionnaire development process (in English), in order to minimize cultural bias, we generally refrained from including statements and expressions (such as certain idioms for example) that would make sense only within the context of English culture and, thus, would add complexities to the translation process.

Special care needed to be taken mainly for the translation of the eudaimonic well-being and "future aspirations" statements, which include relatively more complex meanings.

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<sup>15</sup> Life satisfaction questions were not provided, since we use Huebner et al.'s (2006) BMSLSS scale that has been specifically designed and already tested with children and adolescents.

Following relevant suggestions (Dillman, Smyth & Christian 2009), our main focus was on the “conceptual” content of each question, which was preserved by conducting, when necessary, a free translation, instead of simply providing a direct/literal translation. Two English teachers (native in Greek) contributed to the translation process. Here, it should be noted that budget and time constraints did not allow the assessment of the quality of the translation. Common assessment methods include: (i) back translation<sup>16</sup>, i.e. translating back into the original (source) language, (ii) committee assessment, i.e. translation undertaken by a group of monolingual and/or bilingual speakers and survey experts, and (iii) comprehension assessment, i.e. checking that survey participants can properly explain and understand the meaning and concept of the translated materials (Harkness & Schoua - Glusberg 1998).

**Table 3.11 – Basic Profile of Cognitive Interview Participants in Greece (Athens)**

<b>Students</b>	<b>Gender</b>	<b>Date of Birth</b>	<b>School Year*</b>
<b>Student 1</b>	Male	1992	Year 12
<b>Student 2</b>	Male	1992	Year 12
<b>Student 3</b>	Male	1992	Year 12
<b>Student 4</b>	Female	1992	Year 12
<b>Student 5</b>	Female	1992	Year 12
<b>Student 6</b>	Female	1993	Year 11
<b>Student 7</b>	Female	1993	Year 11
<b>Student 8</b>	Female	1995	Year 9
<b>Student 9</b>	Male	1995	Year 9
<b>Student 10</b>	Male	1996	Year 8

\* *School year 2009 - 2010*

<sup>16</sup> Although a relatively inexpensive and widely used method, back translation focuses on “literal” (and not “conceptual”) translation and, thus, it would be not an appropriate quality assessment for the purposes of this study (Dillman, Smyth & Christian 2009)

### 3.4.3. "Informal" Piloting

England: We did not conduct informal piloting in England.

Greece: Informal pilot surveys were conducted with a group of ten students (across years 10 and 12) in a private tutorial centre for secondary school students in Athens (April 2010). As it will be discussed later, conducting research with public and private Greek schools requires a formal approval by the Ministry of Education. As part of the approval process, the full version of the survey needed to be included in the application documents. Given that major changes are not allowed once the formal approval is issued by the Ministry, we conducted an "informal" piloting to ensure that the survey performs satisfactorily in practice before submitting the questionnaire for approval. By the end of this stage, the questionnaire was slightly shortened (by dropping a few more questions mainly from the "natural environment" section), since we found out that it was difficult for students to complete the whole questionnaire within a reasonable time limit (20 - 25 minutes), something that could possibly cause a high percentage of incomplete returns and difficulties in recruiting schools.

### 3.5. Questionnaire Content

Following common practice in the development of surveys (Dillman, Smyth & Christian 2009), we grouped questions by content into three main parts: (i) environment-related, (ii) well-being, and (iii) socio-demographics/background information. The order in which the three parts are presented is based on the level of difficulty; the survey starts with the easiest (environment-related) questions, proceeds with the more difficult/sensitive ones (well-being questions) and finishes with the typical section of socio-demographic/background questions.

One key issue that should be recognized when constructing a questionnaire is the potential biases that may occur from the order of the questions<sup>17</sup>. Prior questions may influence participants' responses on subsequent questions through the elicitation of specific cognitive and/or normative processes and judgements (Dillman, Smyth & Christian 2009). An example of cognitive-based order effect is when respondents use

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<sup>17</sup> Question order effects are present in all surveys where answers to various questions are based on participants' perceptions and subjective judgements, such as environmental attitudes and worldviews questions, and well-being questions.

similar logic in answering two questions that are perceived as strongly related, whereas an example of normative-based order effect is when respondents reply to a subsequent question similarly to a prior question in order to be consistent. In this study, one of the main concerns was that starting with the environment-related section might influence students into adapting a more positive attitude towards the environment and, thus, providing biased answers. To attenuate this problem, we underlined during the employment of the survey in classes that the main goal of this study is to assess whether affiliation with nature can have an impact on well-being, rather than evaluating the quality and level of affiliation.

### *Part 1: Environmental Questions*

The assessment of affiliation with nature is based on a set of questions that are appropriate to evaluate participants' cognitive, affective, and experiential relationship with the natural world. Some of the questions are specifically developed for the purposes of this thesis, while others are selected from the existing literature (Kellert 1996, Kaiser et al. 1999, Schultz 2001, Manoli, Johnson & Dunlap 2007). During the statistical analysis, as it will be explained later, some of the questions will be used as single variables, while some other ones will be used to form short indices.

More specifically, the questions which have been included in this part are classified into the following main categories: (i) worldviews, attitudes, values, and concerns (ii) behavior, (iii) empirical connectedness with nature, and (iv) environmental knowledge. The first part includes questions that capture pupils' worldviews about the value and utility of the environment, their attitudes and concerns towards global, national, and local environmental issues, and their values and reasoning. Worldviews are defined as a person's established beliefs about the natural world and the human-nature relationship, while attitudes refer to people's subjective judgment about nature (Schultz et al. 2004).

Some of the questions are designed in such a way in order to be used for multiple purposes. For example, some of the worldviews and attitudinal questions are able to measure pupils' specific environmental values and reasoning as well. As Kellert (1996, cited in Kahn & Kellert 2002) explains, values are distinct elements of human experience and are based on people's affective (emotions) and cognitive (intellectual)

functions. In relation to the environment, Kellert has suggested nine main categories of values: (i) aesthetic (ii) dominionistic, (iii) humanistic, (iv) moralistic, (v) naturalistic, (vi) negativistic, (vii) scientific, (viii) symbolic, and (ix) utilitarian (see Table 3.12 for a brief definition for each of the stated nine values).

In addition, according to Kahn (1999), people's environmental beliefs, values, concerns and attitudes are based on two main distinct aspects of human reasoning: anthropocentric and biocentric. Anthropocentric reasoning refers to people's environmental concerns under a human perspective (influences of the environment on human beings), while biocentric reasoning (intrinsic value of nature, rights, relational reasoning) recognizes nature's unique value (not related to human utility) that must be respected and protected. Schultz (2001) proposed a similar classification for reasoning behind environmental concerns: (i) for self (egocentric), (ii) for other people (altruistic), and (iii) for the biosphere (biospheric).

The second part of this questionnaire section includes four main questions that intent to use pupils' environmentally responsible behavior. According to the theory of planned behavior (Ajzen 1991), people's attitude and beliefs are key determinants of intention to behave in a certain way, which in turn predicts actual behavior. In line with this theory, our intention was to construct a behavior index to measure pupils' affiliation with nature in practice. The included questions assess some basic aspects of environmentally "proper" behavior, i.e. recycling, gathering garbage from the ground, turning off lights when leaving a room for a while and saving water during tooth brushing.

The third group consists of questions that aim to assess pupils' empirical affiliation with the environment. Kahn & Kellert (2002) have suggested that children may experience nature in three main ways: directly (outdoor activities, playing in parks, walking in the forest, etc.), indirectly (visiting a zoo or a natural history museum, participating in an environmental education activity), and vicariously (watching a documentary about the environment, looking at pictures of landscape in magazines, etc.). With reference to direct exposure, we distinguished between built/local and open environment. Examples of the former include questions measuring participants' perceptions about elements of nature in their neighborhood (presence of "green"), home (garden, green balcony, view of nature from bedroom window, pet), and school



environment (green schoolyard, view of nature from classroom window), and their outdoor activities (exercise or play) in parks and open sports areas, whereas examples of the latter include questions regarding students' involvement with outdoor activities in natural environments, such as trekking and hiking, and leisure excursions.

To measure indirect and vicarious exposure, students are asked to mention if and how often they have visited areas of "natural interest", such as natural history museums, national parks and gardens, zoos and aquariums. They are also asked to report whether they have participated in a variety of environmental education activities with or without school (such as gardening, tree planting, recycling, art in nature, attending a seminar related to environmental issues, writing a paper about the environment, etc.).

In the final set of variables, three environmental knowledge questions have been included as an "objective" assessment of pupils' cognitive relatedness and understanding of basic environmental issues. There are also two questions asking students to report how often they read articles or books, and/or watch movies or documentaries related to the natural environment. This type of activities consist a form of vicarious contact with nature<sup>18</sup>.

**Control Factors:** In this subsection of the first part of the questionnaire we have included a few questions to capture sources that influence well-being, but are related to factors other than the natural environment. So, students are asked to indicate whether and how often they exercise in indoor sports centers, they go out to cafeterias or shopping centers, and they enjoy free/leisure time at home every week. Another question seeks from students to mention how secure they feel in their local neighborhood, as a factor of restricted access to open spaces.

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<sup>18</sup> In the Greek case study there is an extra question asking students whether they have taken any of the elective courses that are focusing on environmental issues (these courses are offered only in the upper secondary school stage).

## *Part 2: Well-being Questions*

The second part of the questionnaire consists of 26 questions measuring participants' satisfaction with life (overall and domain-specific), eudaimonic well-being and future aspirations (intrinsic and extrinsic).

**Life Satisfaction:** Life satisfaction is measured by using Huebner et al.'s (2006) "Brief Multidimensional Student Life Satisfaction Scale" (BMSLSS), a widely used tool (especially in English speaking countries) specifically designed for research with children and adolescents (8 to 18 years old). It consists of five questions assessing satisfaction with family, friends, school, self, and place respectively, which are averaged to yield a single score. It also contains a single (global) question asking students to rate satisfaction with their overall life.

**Eudaimonic Well-being:** To measure pupils' levels of eudaimonia, nine relevant questions have been selected from Waterman et al.'s (2010) 21-item "Questionnaire for Eudaimonic Well-being" (QEWB), which has been developed and tested with two adult population samples. The original (21-item) instrument appeared to have strong psychometric properties, but more empirical testing would be useful for safe conclusions. For the purposes of the current analysis, we needed to construct a brief modified version in order to make it suitable for research with non-adults, and be able to acquire a convenient measurement within the space and time restrictions of our survey plan. The procedures that were followed for the construction of the modified scale (which consists of seven relevant questions) will be presented in details in Chapter 4.

**Intrinsic vs. Extrinsic Aspirations:** The measurement of future aspirations is based on 11 questions taken from Kasser & Ryan's (1996) 36 - item "Aspirations Index" (AI) and its modified 21-item version for children (Linley et al. 2009). Both versions of AI are suitable for assessing four main intrinsic domains, i.e. self-acceptance, affiliation, community feeling, and physical fitness, and three main extrinsic aspiration domains, i.e. financial success, attractive appearance and social recognition. In the current survey, eight of the selected questions are measuring participants' intrinsic dimension, whereas three of the questions are measuring participants' extrinsic dimension.

### ***Part 3: Socio-demographics / Background Information***

The final part of the questionnaire has been designed to gather information about pupils' socio-demographic background and some basic aspects of their personality, as suggested by the existing literature (Kasser 2005, Huppert 2009, Proctor, Linley & Maltby 2009). The information that survey participants are asked to provide can be classified into five main sub-categories: (i) demographics & socio - economics: gender, age, weekly pocket money, full-time or part-time work, free meal at school (English sample only), (ii) school -related: school year, top three favorite courses, environment-related GCSE courses (English sample only), (iii) time allocation & activities: weekly time allocation to key activities (homework, extra-curricular activities, hobbies, watching TV, playing computer games, internet usage, socializing with friends) and top three favorite school holiday activities, (iv) location: current home location and years of residence, past home location , if any, and years of residence, summer location, if any, frequently visited during school holidays, and (v) personality/psychometrics: self-rated self-esteem, physical health and mental health status. Examples of statements included across the three questionnaire parts are presented in Table 3.13.

**Table 3.12 - Kellert's Typology of Environmental Values**

<b>Values</b>	<b>Definition</b>
Aesthetic	Physical attraction and appeal of nature
Dominionistic	Mastery and control of nature
Humanistic	Emotional bonding with nature
Moralistic	Ethical and spiritual relation to nature
Naturalistic	Exploration and discovery of nature
Negativistic	Fear and aversion of nature
Scientific	Knowledge and understanding of nature
Symbolic	Nature as a source of language and imagination
Utilitarian	Nature as a source of material and physical reward

*Source: Kahn & Kellert (2002)*

**Table 3.13 – Examples of Questionnaire’s Content**

<b>Variables</b>	<b>Question Type</b>	<b>Response Choice</b>
<i>“Love” is an emotion that people should feel only for other people, not for animals</i>	Attitude, humanistic value	Strongly disagree to strongly agree (1-5)
<i>There is nothing wrong with sports such as horse racing or hunting that require intense training of animals</i>	Attitude, dominionistic value	Strongly disagree to strongly agree (1-5)
<i>People are treating nature badly</i>	Worldview	Strongly disagree to strongly agree (1-5)
<i>Please indicate how worried you are about the consequences of the environmental problems today on: (i) animals, (ii) personal health (iii) health of future generations</i>	Biocentric (animals), egocentric (personal health), altruistic (health of future generations) concern	Not at all worried to very worried (1-5)
<i>According to your opinion, how severe are the following environmental issues in the community where you live: (i) air pollution, (ii) noise/traffic</i>	Concerns for local environmental problems	Not at all severe to very severe (1-5)
<i>How often do you go out in nature (forests, mountains, sea, etc.) for outdoor activities/sports (trekking, hiking, climbing, rafting, skiing, etc.)</i>	Direct exposure	Never to many times a year (1-5)
<i>How many times have you visited the following places during the past: (i) natural history museums, (ii) national parks and reserves</i>	Indirect exposure	Never to many times (1-5)
<i>Do you read articles or books about the natural environment?</i>	Vicarious exposure	Never/Rarely to very often (1-5)

### 3.6. Survey Implementation Process

#### 3.6.1. Formal Approvals

**England:** The decision to participate in survey research is made by each school independently. A formal invitation letter was sent to a large group of randomly selected schools explaining in details the purpose and implementation of the study and offering some basic incentives such as providing a copy of the study for the school library and/or organizing a poster exhibition or brief talk to discuss about the outcomes of the survey with staff and students. To ensure the credibility and suitability of the survey for research with sensitive groups such as non-adult students, an application was submitted to acquire ethical approval by LSE Research Ethics Committee.

*Greece*: Initially, following governmental requirements for conducting research with public and private school students in Greece, an application was submitted to the Hellenic Pedagogical Institute (Ministry of Education), including a detailed research proposal, the questionnaire, a survey implementation plan and a list with all schools that we were planning to recruit. Afterward, school principals were called directly in order to request their consent and make the appropriate implementation arrangements.

### **3.6.2. Pilot Surveys**

*England*: A pilot survey was conducted with 59 students in a public secondary school in, London, in November 2010. The participants were attending school years 7, 8, 10, 12, & 13, with the mean age being 14.57 years old. All students were boys. Students of upper classes were able to complete the questionnaire in a short period of time, usually within twenty minutes. On the other hand, younger students, mainly in year 7, needed relatively more time. We underlined this outcome to all participating schools, and suggested either to exclude lower school students from the survey procedure or offer them a greater amount of time. Regarding questionnaire content, we did not detect any difficulties or confusion in the understanding of the provided statements. For this reason, we included piloting data in the statistical analysis.

*Greece*: A piloting survey was administered with the participation of 153 students from five schools in Athens, four public and one private, in October 2010. The sample consisted of 63 girls (41%) and 90 boys (59%). The mean age was 15 years old, while the majority of students (58%) were in year 9. Three of the schools (the private and two public) employed the online version of the survey. Based on pupils' questions and feedback during the piloting process, some of the questions were slightly rephrased in order to improve their clarity, while a few ones were dropped from the survey in order to reduce the length of the questionnaire. In addition, as with English students, the piloting procedure revealed that students in the lower stages of secondary schools (years 7 and 8) needed more time to answer the survey questions, especially the more complex ones related to future aspirations and eudaimonia.

### 3.6.3. Main Surveys and School Response Rates

*England:* The main survey implementation phase started in March 2011 and finished in March 2012. In most cases, the procedure was administered and employed by the Head of Geography (or Head of Humanities or Physical Education in a few cases)<sup>19</sup>. Hard copies of the questionnaires and analytical guidelines were sent to the participating schools via postal service, since, as with Greek schools, most teachers felt that it would be easier to take the paper-based version of the survey. Only two schools filled out the questionnaires online at this stage. The response rate of schools' participation reached 7%, whereas the response rate of students' participation (including complete surveys only) was roughly over 70%.

*Greece:* We conducted the main survey in three waves. The first, the shortest one, took place in November 2010. At this stage, a few more modifications were made in the content of the survey; some questions were slightly rephrased. The second wave took place between December 2010 and February 2011, while the final wave took place between March and April 2011. The questionnaire was available in paper-based and internet - based format. Although schools were encouraged to employ the internet-based version, since the procedure was quicker and more pleasant for students, most teachers preferred to take the paper-format. Regarding schools' response rate, 92 out of 105 public schools, i.e. 88 % approximately, accepted to participate in the survey. At within-school level, the vast majority of the students (99%) accepted to participate in the research. The response rate of successfully submitted questionnaires was approximately 90%.

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<sup>19</sup> In England, most schools mentioned that they would prefer to employ the questionnaire at their time convenience, without our presence or assistance. On the other hand, we were present during the survey procedure in all Greek schools.

## 4. Methodological Approach

In the first part of this chapter, we describe the main techniques that are employed for the estimation of the statistical findings, and we provide details about the variables that have been used in the analysis of the three main chapters of this thesis (Chapters 5, 6 and 7). In the second part, we discuss about the procedures that we followed in order to modify Waterman et al's (2010) 21-item QEWB scale (originally developed and tested with two adult samples) and make it suitable for research with children and adolescents. The modified 7-item scale appeared to perform well in terms of validity and reliability.

### 4.1. Regression Analysis

#### 4.1.1. The Model

In this thesis, we specify subjective well-being (SWB), life satisfaction or eudaimonia, as a function of three main groups of predictors, i.e. socio-economic and psychometric characteristics ( $SP$ ), environmental variables ( $EV$ ), and location and climate variables ( $LC$ ):

$$SWB = f(SP, EV, LC, \varepsilon) \quad (4.1)$$

The estimation of equation 4.1 is based on ordinary least square regressions with the error term clustered at school class level in order to control for intra-correlation among responses (Moulton 1990). In the first study (Chapter 5), the regression is fitted with the Greek sample only. In the second study (Chapter 6), i.e. the comparative analysis between England and Greece, we follow two alternative statistical methods in order to explore potential differences in the magnitude of the effects across the two country populations. First, we estimate equation 4.1 separately for each country, and we compute Wald statistic to test whether the effect of a certain predictor is significantly different across the two populations. Second, we merge the two samples and introduce a "country" dummy (England) to distinguish between the two populations. The investigation of effect differences is based on the formation of interaction terms between the country dummy and the predictors of interest (mainly environment-related, location and climate predictors).

In order to ensure comparability, the two country models include the same set of variables. Some of the predictors that were used in the first study (Chapter 5) were dropped from the comparative analysis for the following main reasons: (i) the effects of predictors were statistically negligible in both samples, (ii) lack of available data (we could not find data for heavy pollution industries in England for example), (iii) low response variance (for example, most pupils in England reported that they have a garden or “green” balcony at home). On the other hand, the lack of available public statistics, especially in Greece, prevented us from including some important objective variables such as regional air pollution, sunshine hours and local deprivation rates.

In the third study (Chapter 7), we used the two country samples to investigate the role of environmental education and school green in promoting satisfaction with life as a whole, school satisfaction and eudaimonia. For simplicity, we have excluded location and climate variables in this part of the analysis. Instead, we have included school dummies in order to control for school fixed effects. It should be noted that, since the vast majority of survey participants attend schools that are located nearby their home, school dummies and location and climate variables explain almost the same percentage of variation in the dependent variable.

Furthermore, to assess the impact of environmental education and school green on satisfaction with school, we specify the latter as a function of some basic socio-demographic & psychometrics ( $\tilde{SP}$ ), and environment-related characteristics<sup>20</sup> ( $\tilde{EV}$ ):

$$SL = f(\tilde{SP}, \tilde{EV}, SD, \varepsilon) \quad (4.2)$$

As before, a set of school dummies ( $SD$ ) has been included in the analysis to control for fixed effects, whereas errors are clustered at school class level. The estimation of the above function is based on an OLS model, and an ordered logit non-linear model. Also, to detect potential environmental education indirect effects on well-being – through the enhancement of connectedness with nature – and estimate the relative importance of direct effects compared to indirect effects, we followed a simple structural equation modelling (SEM) approach (Kline 2010).

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<sup>20</sup>  $\tilde{SP}$  and  $\tilde{EV}$  are subvectors of  $SP$  and  $ER$  respectively.



### **4.1.2. Clustering**

In all regression models, errors are clustered at school class level. Alternatively, the data could have been clustered at a higher-level, i.e. school or neighbourhood level, but we preferred to proceed with the lowest-level clustering for two main reasons. First, we achieved a higher number of clusters, something that is extremely important especially in case of England, where data has been collected from only 15 schools. According to theory, it is necessary to have at least 30 clusters in order to extract meaningful estimates (Cameron, Miller & Gelbach 2008). Second, it has been suggested (Wooldridge 2002) that it is preferable, for more efficient results, to have a greater number of clusters with a relatively smaller size rather than a smaller number of clusters with a relatively larger size. At school-level, we would have 15 clusters of 35 students on average in England, and 94 clusters of 38 students in Greece. At school-class level, we have created 51 clusters of ten students in England and 182 clusters of 20 students in Greece.

### **4.1.3. Working with OLS Models**

Our preference towards the employment of simple OLS models is based on three main reasons. First, it is a simple and robust method; the interpretation of the estimated parameters is straightforward and easily understandable. Second, OLS is an attractive method for the comparison purposes of the second study (Chapter 6), since a potential violation of the main assumption of equal error variance across the two country samples has minimal effect on the quality of the estimated parameters (Williams 2009). Third, given that the dependent variables of life satisfaction and eudaimonia take a wide range of values (because they are scales and not “global” questions) and, thus, can be treated as continuous, using OLS sounds a natural choice. Nunnally & Bernstein (1994) have suggested that an ordinal variable can be treated as continuous if it takes, as it happens in this thesis, at least 11 distinct values.

#### 4.1.4. Methodological Limitations

In cross-sectional studies, it is practically unavoidable to completely eliminate the problem of endogeneity, especially when focusing on broad and complex concepts such as life satisfaction and eudaimonia. Endogeneity issues may occur either from the existence of specification (omitted variable bias for example) and measurement errors, or the ambiguous flow of causality between the dependent and certain independent variables. Indeed, it sounds really hard to control for all important factors that affect participants' judgements of their own life. For example, it could be reasonably argued that reciprocal relationships are more likely to exist between variables such as life satisfaction and self-reported health; naturally, happy people may feel healthier and vice versa. Someone could also argue, to mention another example with reference to the natural environment, that there is a bidirectional relationship between going out to nature and happiness; happier people might tend to go out more often, and going out more often might lead to higher levels of happiness. However, it should be noted that the issue of reverse causality may be attenuated by the fact that children (especially the younger ones) are not fully independent and, thus, they have no fully free choice of spaces and activities.

Another concern is the potential bias arising from the fact that the sorting of the individuals on various neighbourhoods is not random, but depends on specific observed (income for example) or unobserved characteristics. Although children have not the option of choice in this case, as we mentioned before, the sorting across various neighbourhoods is affected by children's family background. Finally, the estimates of a cross-sectional analysis are based on a specific point of time. Given that people's behaviour and perceptions are unlikely to remain constant over time, especially when focusing on adolescence, the estimates of the current analysis should be viewed only as a snapshot of population's actual behaviour<sup>21</sup>.

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<sup>21</sup> An additional consequence of this limitation is that it may be hard to detect the short-term effects of various variables on overall well-being. For example, concerns about a local environmental problem could affect happiness levels only for a certain period of time. A possible way of examining these effects would be "Day Reconstruction" method (Kahneman et al. 2004), linking moment-to-moment happiness with daily activities. Time and budget constraints did not allow us to employ it for the purposes of this study.

#### 4.1.5. Quality of Subjective Well-being Indicators

Using subjective indicators, scales or single questions, to assess human well-being has received various criticisms. A key point of concern is whether subjective indicators perform well in terms of validity and reliability, i.e. whether they measure what they are intended to measure and whether the outcome is stable over time. The quality and comparability of the responses may be affected by recent life events, by the fact that people perceive their life circumstances differently and have different experiences, and by the survey design (Schwarz & Strack 1999, Van Hoorn 2007). Comparability issues have been further highlighted in case of cross-country research, because of the different language and cultural characteristics (Van Hoorn 2007). However, empirical findings have shown that, despite the sensitivity of the answers, the assessment of subjective well-being is accurate (Diener & Diener 1995, Diener, Oishi & Lucas 2003, Kahneman & Krueger 2006, Krueger & Schkade 2006).

A common source of bias comes from the ordering of subjective questions, since answering prior questions may elicit specific attitudes and judgements which in turn will affect respondents' answering on subsequent questions<sup>22</sup> (Bertrand & Mullainathan 2001). Another point of concern is the so-called social desirability issue, i.e. responding in a way that people think that is socially "correct" rather than providing their honest judgement (Gilman & Huebner 2003). This issue can be addressed by asking survey participants to complete a social desirability scale that can be used as a control factor during the statistical analysis. With reference to children, concerns have been raised about children's cognitive ability to respond adequately (Ben-Arieh 2005). However, at least for later stages of childhood (over eight years old), there is empirical evidence available that children and adolescents are able to provide accurate and reliable answers (Gliman, Huebner & Laughlin 2000).

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<sup>22</sup> We have discussed about question ordering effects in Chapter 3 as well. Please see Section 3.5, p.54 for more details.

## 4.2. Variables

### 4.2.1. Dependent Variables

**Brief Multidimensional Students' Life Satisfaction:** This is a single score ranging between 1 - 7, derived from pupils' self-reported satisfaction with five main life domains, i.e. family, friends, school, self and living environment. The content of the scale is presented in Table 4.1. The internal consistency of the scale, as assessed by cronbach's alpha value (Cronbach 1951), appears to be satisfactory in both samples,  $\alpha = 0.80$  for England and  $\alpha = 0.70$  for Greece.

**Eudaimonic Well-being:** The eudaimonic well-being score, ranging from 1 to 5, is based on seven questions derived from Waterman et al.'s (2010) original 21-item QEWB. The modified tool appears to have good levels of internal consistency,  $\alpha = 0.78$  for the English sample and  $\alpha = 0.68$  for the Greek sample. As in case of BMSLSS scale, cronbach alpha coefficient is somewhat lower in the Greek model, which is not surprising given that the tool has been originally developed and tested with English speaking populations.

**Satisfaction with school life:** The aforementioned two scales are used as dependent variables in all analysis chapters of this thesis. For the purposes of the third study (SWB and environmental education), item 3 from BMSLSS scale (Table 4.1), is used as a "global" assessment of pupils' satisfaction with school life.

**Table 4.1 - Brief Multidimensional Students' Life Satisfaction Scale**

<b>These six questions ask about your satisfaction with different areas of your life. Circle the best answer for each.</b>
1. I would describe my satisfaction with my family life as:
2. I would describe my satisfaction with my friendships as:
3. I would describe my satisfaction with my school experience as:
4. I would describe my satisfaction with myself as:
5. I would describe my satisfaction with where I live as:
<i>Single/"Global" question</i>
6. I would describe my satisfaction with my overall life as:
<i>Response choices: a) Terrible, b) Unhappy, c) Mostly dissatisfied, d) Mixed (about equally satisfied and dissatisfied), e) Mostly satisfied, f) Pleased, g) Delighted</i>

*Items 1-5 are averaged to yield a single score. Alternatively, item 6 may be used separately as a "global" score.*

## 4.2.2. Independent Variables

### *Socio-Demographics and Psychometrics (Table 4.4)*

The socio-demographics group consists of the following variables: (i) gender dummy, being “1” for girls, (ii) age (12 - 19 years old in England and 14 - 19 years old in Greece), (iii) weekly pocket money, an ordinal variable taking values from 1 to 4 (for Greece: up to 15 euro, 16 - 30 euro, 31 -50 euro, 50+ euro, and for England: up to 5 pounds, 6 - 10 pounds, 11 - 15 pounds, 15+ pounds)<sup>23</sup>, (iv) work dummy, being “1” if a student works part-time or full-time, (v) weekly time allocation to homework, hobbies, TV watching, internet surfing, computer games, and time with friends (never/rarely - very often, 1 - 5), (vi) income per capita at NUTS 3 regional level<sup>24</sup>, representing the economic development of the greater area of students’ location. Work dummy and income per capita variables are used only in the Greek case study analysis (Chapter 5 only).

The assessment of pupils’ psychometrics is based on three “global”<sup>25</sup> self-reports on physical health (not at all healthy - very healthy, 1 - 5), self-esteem (not at all confident - very confident, 1 - 5), and stress status (not at all stressed - very stressed, 1 - 5), and on two short scales measuring intrinsic and extrinsic aspirations.

***Intrinsic Aspirations:*** We assess intrinsic aspirations by selecting and averaging eight questions from AI (Kasser & Ryan 1996, Linley et al. 2009), covering students’ aspirations for self-acceptance, affiliation, community feeling and physical fitness (Table 4.2). In terms of internal consistency, the value of cronbach’s alpha coefficient has been found to be  $\alpha = 0.76$  for England and  $\alpha = 0.68$  for Greece, indicating satisfactory levels of performance.

***Extrinsic aspirations:*** A 3-item score based again on questions from AI, assesses pupils’ extrinsic aspirations for financial success, attractive appearance and social recognition (Table 4.2). Despite the short length of the index, it shows good levels of

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<sup>23</sup> The range of response choices and the pocket money levels have been based on information collected during the focus groups and interviews process.

<sup>24</sup> Data provided by the Hellenic Ministry of Finance.

<sup>25</sup> These variables were formed from single survey questions.

internal consistency in both populations,  $\alpha = 0.70$  and  $\alpha = 0.66$  for England and Greece respectively. This index has been included only in the Greek case study analysis.

**Table 4.2 - Aspirations Index (Intrinsic & Extrinsic) Items**

The following statements are related to the goals you may have for the future. Rate each item by circling how important each goal is to you. Response choices: not at all important (1) - very important (5)	
<b><i>Intrinsic Aspirations</i></b>	
<i>In the future, it will be very important for me:</i>	<b>Aspiration Category</b>
1. To choose what I do, instead of having people decide for me.	Self-acceptance
2. To feel good about my abilities.	Self-acceptance
3. To overcome the challenges that life presents me.	Self-acceptance
4. To have people in my life who will accept me as I am, no matter what.	Affiliation
5. To have a couple of good friends that I can talk to about personal issues.	Affiliation
6. To assist people who are in need, and asking nothing in exchange.	Community feeling
7. Help the world become a better place.	Community feeling
8. To be in good physical shape.	Physical fitness
<b><i>Extrinsic Aspirations</i></b>	
9. To have many expensive possessions (large fortune).	Financial success
10. To be admired by many people.	Social recognition
11. To keep up with fashion in hair and clothing.	Appearance

***Environmental Variables (Table 4.5)***

This group of variables assesses students' experiential relationship with nature (including empirical exposure to open and built natural settings, and to various environmental education programs at school), their perceptions about the surrounding environmental conditions, and their worldviews, values, concerns, awareness and environmental knowledge. The experiential relationship with nature is measured by the "Nature Experience" index (NEI), a 10-item indicator taking values between 1 - 5, and two environmental education variables, environmental participation dummy ("enveducdummy", being "1" if students have or are currently participating in an environmental education program at school) and environmental education score ("enveduscore"). The latter is a short index (10-item in case of England and 12-item in

case of Greece)<sup>26</sup> based on students' participation on a range of basic school environmental activities such as gardening, recycling and tree planting.

***Nature Experience Index (Table 4.3):*** To capture all possible dimensions of pupils' empirical connectedness with nature, a short 10-item index has been created covering direct, indirect and vicarious experience (Kahn & Kellert 2002). The direct experience is based on five questions capturing relevant activities within built and open environments. For the former, pupils have been asked to indicate how often they exercise outdoors, go to the pool and play in green spaces in the neighbourhood every week. For the latter, they have been asked to indicate how often they visit nature for leisure (excursions, camping, etc.) or sports activities (trekking, climbing, etc.) every year. Indirect experience is measured by three questions asking whether students have ever visited the following nature-related places: natural history museums, botanical gardens and national parks, aquariums and zoos. Finally, vicarious experience is captured by two questions asking students to indicate how often they read and watch materials related to the natural environment. Cronbach alpha value for the index is  $\alpha = 0.66$  and  $\alpha = 0.70$  for the English and Greek sample respectively, indicating acceptable levels of internal consistency.

**Table 4.3 - "Nature Experience" Items**

10-item indicator based on students' self-report on participation in the following nature-related activities (Likert-type items, 1-5)*	
1. Simple visit/excursion or leisure trip	Direct Experience
2. Outdoor activities/sports (trekking, hiking, climbing, rafting, skiing, etc.)	Direct Experience
3. Swimming (indoors or outdoors)	Direct experience
4. Local outdoor sport areas (football or tennis court, etc.).	Direct experience
5. Neighbourhood park/green space.	Direct experience
6. Natural History museums	Indirect experience
7. Botanical gardens & national parks**	Indirect experience
8. Aquariums or zoos	Indirect experience
9. Reading articles/books about the natural environment	Vicarious experience
10. Watching documentaries about the natural environment	Vicarious experience

*\*Items 1-2: never - many times a year, items 3-5: never - very often/everyday, items 6-8: never - many times, items 9-10: never/rarely - very often. \*\* For the English sample, the score of this item was derived by averaging survey questions 20b and 20c (Appendix B).*

<sup>26</sup> Please see Chapter 7 for more details.

The second subgroup of environmental variables, i.e. perceptions on surrounding environmental conditions, assesses pupils' daily contact with elements of nature within a built environment setting. Specifically, a Likert-type variable measures students' perceptions on the existence of natural features (green spaces, lakes, etc.) in their neighbourhood (not at all/very few - many, 1 - 5), whereas four dummy (based on students' perceptions again and not on objective information) indicate whether there is a garden or balcony with flowers at home (Chapter 5 only), a green schoolyard, and a view of nature from bedroom's and classroom's window.

In the third subgroup, we have included variables measuring students' worldviews, moralistic, utilitarian and dominionistic values<sup>27</sup>, concerns about local and global environmental problems (awareness), biocentric reasoning, and knowledge. All these variables (except from "dominionistic values" which is a single question variable), as we will explain in greater detail in the subsequent paragraphs, are short indicators, consisting of two or three statements.

**Local concerns:** To measure pupils' perceptions about local environmental problems, we formed a 4-item index by asking participants to indicate the degree of their concern (from 1 to 5) about four main local issues: air, noise, and water pollution, and neighbourhood degradation (such as garbage on streets and lack of green spaces). Cronbach alpha coefficient for the two populations is  $\alpha = 0.79$  for England and  $\alpha = 0.82$  for Greece, showing strong levels of internal consistency.

**Awareness:** A 4-item indicator is formed measuring students' concerns (from 1 to 5) on the following important global issues: climate change, ozone layer depletion, species extinction and deforestation. A "don't know" (taking "0") response option was available for pupils who had never listened to any of the above issues before. As in most cases, the short indicator appears to perform somewhat better with the English sample in terms of reliability ( $\alpha = 0.70$  and  $\alpha = 0.60$  for the English and Greek case study respectively).

**Worldviews:** For the formation of this variable, we averaged two questions from Manoli, Johnson & Dunlap's (2007) NEP scale for children, measuring pupils' agreement on whether "people are treating nature badly" and whether "nature is

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<sup>27</sup> Utilitarian and dominionistic values have been included only in the analysis of Chapter 5.



strong enough to handle our modern lifestyle” (strongly disagree – strongly agree, 1 - 5).

**Moralistic values:** This is a short 3-item indicator based on participants’ degree of agreement on whether “the life of plants and animals is of the same value of the life of humans” (Manoli, Johnson & Dunlap’s 2007), “nature’s value is unique; nobody has the right to damage it”, and “nature must be kept clean in favour of future generations”.

**Utilitarian values:** This variable measures the degree to which children value the importance of nature in relation to human needs satisfaction. The score of this variable is derived by averaging students’ rating on two relevant statements, i.e. “the world would not suffer if species like snakes and mosquitoes became extinct” (Kellert-type statement, found in Rauwald & Moore 2002), “I feel that the most important role of the natural environment is to satisfy human needs”.

**Dominionistic values:** The assessment of dominionistic values is based on a single Kellert-type statement (found in Rauwald & Moore 2002), i.e. “there is nothing wrong with sports such as horse racing or hunting that require intense training of animals”.

**Relatively Biocentric Reasoning:** This is a mean-corrected variable (ranging from -2 to 2 approximately), with positive values indicating relatively stronger biocentric reasoning and negative values indicating relatively stronger anthropocentric reasoning. The mean-corrected score is computed by subtracting the total score of environmental concerns derived by Schultz’s (2001) “Environmental Motives” scale<sup>28</sup> from the biocentric-specific score (average score from Schultz’s scale items 1 and 2, Appendix B, questions 10aa and 10ab).

**Environmental knowledge:** For an objective evaluation, we asked students to indicate (among five response choices) what animal is under extinction (red squirrel in England and brown bear in Greece), what source of energy (among five response options) is non-renewable (natural gas), and whether they agree with the statement that “Climate Change is mainly the result of the increased levels of carbon emissions (CO<sub>2</sub>) released in the atmosphere because of the daily human activity”(taken, and

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<sup>28</sup> For the purposes of the current analysis, we employed a shorter version of Schultz’s original tool.

slightly rephrased, from Keiser et al. 2009). Each correct answer is awarded with one point, forming a short 3-item index ranging from 0 to 3.

Finally, to control for non-environment related factors, we formed four single statement variables measuring participants' perceptions on local "safety" in their neighbourhood (not at all severe - very severe, 1 - 5), weekly frequency of home play, indoors exercise and cafeteria/shopping centres visits (never - very often/everyday, 1 - 5). The latter is included only in the analysis of Chapter 5 (Greek case study).

#### *Location and Climate Variables<sup>29</sup> (Table 4.6)*

In relation to local demography, we have formed two rural dummies, sparse rural (less than two thousand people<sup>30</sup>) and rural (between two thousand and ten thousand people), and an "Athens" dummy (for Athens centre and suburbs). For the purposes of the country - comparison analysis (in Chapter 6), we included a "large urban zone" dummy representing metropolitan areas in the two countries, i.e. Athens, London and Manchester. Also, to explore whether travelling to school has an impact on students' well-being, we measured the distance between pupils' home and school location and formed two relevant variables, "schooldistance" and "schooldistance2" (squared).

To assess local environmental conditions objectively, we have computed proximity (within 10 km) to areas of outstanding natural beauty dummy and/or "Natura 2000"<sup>31</sup> as a proxy for environmental quality, proximity to international airports (within 10 km) and the number of heavy pollution industries (within 10 km) around participants' location as proxies of environmental degradation (for Greek case study only). In Greece, the areas of outstanding natural beauty were located from "Filotis"<sup>32</sup> - Online Database for the Greek Nature (National Technical University of Athens). In total, there are 449 areas of outstanding natural beauty covering 4.8% of land. The selection of these areas has been mainly based on natural and ecological characteristics, and easy

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<sup>29</sup> We entered coordinates of all locations of interest (students' home and school locations, meteorological stations, airports, areas of outstanding natural beauty, etc.) and measured relevant distances with the help of Google Earth maps.

<sup>30</sup> In the cross-country comparison of Chapter 6, we set the boundary between rural and sparse rural areas at five thousand people, since there are only a very small number of students living in areas with less than two thousand people in England.

<sup>31</sup> Natura 2000 is a network of protected natural areas in European Union countries established by 1992 Habitat Directive. Its main purpose is to protect and conserve valuable species and habitats. For more details: [http://ec.europa.eu/environment/nature/natura2000/index\\_en.htm](http://ec.europa.eu/environment/nature/natura2000/index_en.htm)

<sup>32</sup> Accessible at (in Greek): <http://filotis.itia.ntua.gr>

accessibility for recreation purposes. In England, there are 33 areas of outstanding beauty covering 15% of land<sup>33</sup>. It should be noted that, contrary to England, these areas have not been defined or protected by national legislation in Greece; it is just the outcome of scientific work and empirical observation conducted by the researchers of the database.

As “heavy pollution” industries have been characterized all industries regulated by the SEVESO<sup>34</sup> and IPPC<sup>35</sup> directives. The former refers to regulations for the prevention of accidents in industries with dangerous substances (such as chemical and petrochemicals), whereas the latter refers to regulations for the prevention and control of pollution caused by heavy industries in Europe. The coordinates of these areas have been taken from the databases of the Ministry of the Environment<sup>36</sup> and transferred into Google Earth. Finally, to describe geographical characteristics, we have included a variable measuring distance from sea (in kilometres), an altitude variable (in meters), and an island dummy (Greek caste study only). Since survey participants’ post codes were not available, centroids of participants’ municipality areas were used to compute distances<sup>37</sup>.

Finally, we collected climate data by the various meteorological stations of the Hellenic Meteorological Office and UK Met Office that are dispersed throughout the country. The selection of the stations for each location was based on two main criteria: distance<sup>38</sup> and altitude. In cases where a location is equidistant from two or more meteorological stations, average values were estimated. The set of climate variables includes annual average temperature (in °C), July maximum temperature (in °C), as a proxy for climate extremes, average annual precipitation (in mm), and average annual wind speed (in knots), for the period between 1951 – 1997<sup>39</sup> in Greece and 1971 – 2000 in England.

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<sup>33</sup> Accessible at: <http://www.aonb.org.uk/>

<sup>34</sup> For more details: <http://ec.europa.eu/environment/seveso/index.htm>

<sup>35</sup> For more details: <http://ec.europa.eu/environment/air/pollutants/stationary/ippc/index.htm>

<sup>36</sup> Accessible at (in Greek): <http://www.e-per.gr/>

<sup>37</sup> We computed centroids with the following online tool:

<http://www.earthpoint.us/Shapes.aspx>

<sup>38</sup> As a general rule, only meteorological stations that were within a radius of ten kilometers from a location were considered. In most cases, especially in main urban areas, the distance of the nearest weather station was less than five kilometers.

<sup>39</sup> In Greece, this is the maximum range of period for which climate data is available. In most stations, there is available data for a shorter period of time.

**Table 4.4 - Socio - Demographic & Psychometric Predictors (by Chapter\*)**

Variables	Variable Type	C5	C6	C7a	C7b
Girl	Dummy (1 for girls)	✓	✓	✓	✓
Age	Numerical	✓	✓	✓	✓
Money	Ordinal, 1-4	✓	✓	✓	
Work	Dummy	✓			
Homework	Ordinal, 1-5	✓	✓	✓	✓
Hobbies	Ordinal, 1-5	✓	✓	✓	
TVwatching	Ordinal, 1-5	✓	✓	✓	
Internet	Ordinal, 1-5	✓	✓	✓	
PCgames	Ordinal, 1-5	✓	✓	✓	
Friends	Ordinal, 1-5	✓	✓	✓	✓
IncomePerCap2010	Value in thousand euro	✓			
Health	Ordinal, 1-5	✓	✓	✓	✓
SelfEsteem	Ordinal, 1-5	✓	✓	✓	
Stress	Ordinal, 1-5	✓	✓	✓	
Intrinsic	8-item score between 1 - 5	✓	✓	✓	
Extrinsic	3-item score between 1 - 5	✓			

\* C5: Chapter 5, C6: Chapter 6, C7a: Chapter 7, LS & EWB model, C7b: Chapter 7, SLS model

**Table 4.5 - Environmental Predictors (by Chapter\*)**

Variables	Variable Type	C5	C6	C7a	C7b
NEI	10-item score between 1 - 5	✓	✓	✓	✓
EnvEducScore	10-item index (England) and 12- item index (Greece), score 1 - 10 (1-12)			✓	✓
NeighborhoodGreen	Ordinal, 1 - 5	✓	✓	✓	
HouseGreen	Dummy	✓		✓	
SchoolGreen	Dummy	✓	✓	✓	✓
SchoolGreenView	Dummy	✓	✓	✓	✓
HouseGreenView	Dummy	✓	✓	✓	
LocalConcerns	4-item score between 1 - 5	✓	✓	✓	
Worldviews	2-item score between 1 - 5	✓	✓	✓	
MoralisticValue	3-item score between 1 - 5	✓	✓	✓	
UtilitarianValue	2-item score between 1 - 5	✓			
DominionisticValue	Ordinal, 1-5	✓			
RelBiocentricReas	Mean corrected score between -0.2 - 0.2	✓	✓	✓	
Awareness	4-item score between 1 - 5	✓	✓	✓	
EnvKnowledge	3-item index, ordinal score 0 - 3			✓	✓
IndoorSports	Ordinal, 1 - 5	✓	✓	✓	
InHomePlay	Ordinal, 1 - 5	✓	✓	✓	
Shopping/Cafe	Ordinal, 1 - 5	✓			
UnsafeFeeling	Ordinal, 1 - 5	✓	✓	✓	
England	Country dummy		✓		

\* C5: Chapter 5, C6: Chapter 6, C7a: Chapter 7, LS & EWB model, C7b: Chapter 7, SLS model

**Table 4.6 – Location & Climate Predictors (by Chapter\*)**

Variables	Variable Type	C5	C6	C7a	C7b
SparseRural	Dummy	✓	✓		
Rural	Dummy	✓	✓		
Athens	Dummy	✓			
LargeUrban	Dummy		✓		
SchoolDistance	Distance in km	✓			
SchoolDistance2	Distance in km	✓			
Altitude	Altitude in meters	✓			
Island	Dummy	✓			
SeaDistance	Distance in km	✓			
MeanTemper	In °C	✓	✓		
JulyMaxTemper	In °C	✓	✓		
MeanPrecipitation	In mm	✓	✓		
MeanWindSpeed	In knots	✓	✓		
Industry(#)	Numerical (industries within 10 km)	✓			
Airport10	Dummy (proximity, within 10 km)	✓			
NatBeauty	Dummy (proximity, within 10 km)	✓	✓		

\* C5: Chapter 5, C6: Chapter 6, C7a: Chapter 7, LS & EWB model, C7b: Chapter 7, SLS model

### 4.3. Construction of Eudaimonic Well-being Scale

#### 4.3.1. Introduction

In the current section, we provide a detailed description of the steps that we followed in order to construct a brief 7-item scale suitable for measuring adolescents' eudaimonic well-being. Our main effort was to form a scale that would be easy for children to complete within the tight time constraints of the survey. The modified version is based on Waterman et al.'s (2010) 21-item QEWB, which has been built and tested with adults only. The original tool appears to have strong psychometric properties, i.e. strong levels of reliability and validity. To ensure that the modified scale is of acceptable quality, we employed confirmatory factor and principal component analysis to verify that the tool is unidimensional, and we assessed its performance with reference to three basic forms of reliability and validity, i.e. internal consistency, and construct and discriminant validity<sup>40</sup>. The version presented in this chapter consists of seven items<sup>41</sup> and the preliminary statistical findings show satisfactory quality in terms of validity and reliability.

<sup>40</sup> A detailed discussion about other forms of reliability and validity is offered by Netemeyer, Bearden & Sharma (2003).

<sup>41</sup> The seven items are summed over to obtain a single score.

### 4.3.2. Questionnaire for Eudaimonic Well-being: Original Tool

The content of the 21-item QEWB tool designed by Waterman et al. (2010) is presented in Table 4.7. The performance of the scale has been evaluated by the employment of two surveys with 1728 and 5606 undergraduate USA students respectively. The size and the origin of the participants ensured a representative geographical and demographical coverage of the country. The study proceeded with the following steps to assess the performance of the scale: (i) structure form, i.e. unidimensional vs. multidimensional, (ii) reliability, (iii) validity, i.e. convergent, discriminant, construct and incremental validity, and (iv) comparison of scale scores across various demographic groups.

In terms of reliability, cronbach alpha value for the two samples was  $\alpha = 0.86$  and  $\alpha = 0.85$  respectively, indicating strong levels of internal consistency (Cronbach 1951). Moreover, the performed confirmatory factor analysis suggested a unidimensional structure. The validity of the scale was tested by comparing it with other measures of identity function, personality traits and subjective well-being. The statistical finding confirmed the main hypotheses of the study. So, for example, QEWB appeared to be strongly and positively correlated with Luycks et al.'s (2008) "Dimensions of Identity Development", Pavot & Diener's (1993) "Satisfaction with Life" scale, Ryff & Keyes' (1995) "Psychological Well-being" scale and Rosenberg's (1986) "Self-esteem" construct. On the other hand, as expected, a negative correlation was found between QEWB and anxiety, as it has been assessed by "Beck Anxiety Inventory" (Beck, Steer & Garbin 1988).

One-way ANOVA were performed to test whether there is a significant variability across different demographic groups. The study examined five main demographic dimensions, i.e. age, gender, ethnicity, family income and family structure. In most cases, the influence of demographic variables on the variability of eudaimonic score was found to be very weak. In the few cases (such as gender<sup>42</sup>) where the influence appeared to be stronger, Cohen's *d* computation indicated very small size effects (Cohen 1988).

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<sup>42</sup> Female participants showed higher levels of eudaimonic well-being compared to male participants in both samples.

### 4.3.3 Modified 7-item tool: Case studies and Methods

The construction of the modified 7-item scale has been implemented in such a way in order to satisfy two basic criteria: shortness and simplicity. Before the employment of piloting surveys for testing the performance of the scale statistically (see below), we excluded questions that we considered as inappropriate (2<sup>nd</sup> question in Table 4.7 for example: “I believe I have discovered who I really am”) or conceptually confusing (4<sup>th</sup> question in Table 4.7 for example: “my life is centred around a set of core beliefs that give meaning to my life”) for non-adult populations. Students’ valuable feedback during the focus group in England and the cognitive interviews in Greece<sup>43</sup> has been taken into account for the selection of scale’s items at this initial stage.

#### *Case study: England*

We employed a piloting survey with 59 secondary school students in London, across school years 7, 8, 10, 12 & 13. The mean age is 14.57 years old, whereas all students are males. The size of the sample is relatively small for assessing the quality of the scale performance, but the rule of “at least five observations” per scale question is satisfied (DeVellis 1991). The first statistical findings suggested that it would be better to exclude the two reversed score statements (Table 4.8, items 4 & 9). Cronbach’s alpha for the 7-item tool was  $\alpha = 0.78$  (0.79 standardized), indicating again good levels of reliability.

Participants in main survey were 527 students, 231 girls and 296 boys, from 15 public schools in England. The average age of the survey participants is 14.5 years old. A percentage of 43.07% attends key stage 3 (years 7, 8 & 9), 41.74% attend key stage 4 (years 10 & 11), and 15.19% of the students attend key stage 5. The majority of students is between 13 - 15 (68.69%) and 16 - 18 years old (23.34%). In terms of location, 213 students (40.42%) reside in rural areas and 314 students reside in urban areas (more than ten thousand people). The average eudaimonic well-being score of the main sample is  $m = 3.71$ .

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<sup>43</sup> Please see Section 3.4 for a more detailed description regarding focus groups and cognitive interviews.

### *Case study: Greece*

In the beginning, we administered a piloting survey with the participation of 153 students from five schools in Athens, attending school years 7, 8, 9 & 10<sup>44</sup>. The sample consists of 63 girls (41%) and 90 boys (59%), whereas the mean age is 15 years old. Students responded in a satisfactory way; some of their comments and questions during the survey procedure were used to further modify the wording of the scale statements. As with the English case study, we eliminated the two reversed score statements (Table 4.8, items 4 & 9). Cronbach's alpha coefficient of the remaining seven items was found to be  $\alpha = 0.68$  (0.69 standardized), indicating acceptable levels of reliability (Lowenthal 2001).

Participants in the main survey were 3614 students, 2005 girls and 1609 boys. Students were recruited from 94 schools, 88 public and 6 private ones. Of those schools, 44 are located in urban areas (27 in the greater area of Athens) and 50 are located in rural areas. The average age of the sample is 16.42 years. The size and the geographical distribution of the sample provide a representative coverage of the country in economic and demographic terms.

### *Measures*

The validation of the scale is based on correlations with measures of life satisfaction, aspirations, psychological and physical conditions. For life satisfaction, we used Huebner et al.'s (2006) 5-item BMSLSS scale (Table 4.1). For aspirations, we used the 8-item indicator of intrinsic goals and the 3-item indicator of extrinsic goals, based on Kasser & Ryan's (1996) and Linley et al.'s (2009) AI (please see Table 4.2 for more details). Students' self-reported self-esteem and health status have been used as proxies for psychological and physical condition respectively. Finally, we compared statistically significant differences of eudaimonic well-being score with reference to four main demographic variables: gender, age, school class and location (rural vs. urban). For meaningful comparisons, in relation to age, we classified students into four main categories, 11 - 13, 14, 15, 16 - 19 in England, and 14 - 15, 16, 17, 18 - 19 in Greece. Also, we created five school categories in England, years 7 - 8, year 9, year 10,

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<sup>44</sup> Please note that secondary education stage consists of seven years (year 7 - year 13) in England and six years in Greece (year 7 - year 12). English students enter secondary education one year earlier than Greek students.



year 11, years 12 – 13, and four school categories in Greece, i.e. years 8 – 9, year 10, year 11 and year 12.

**Table 4.7 – 21 - item Questionnaire for Eudaimonic Well-being Content**

<p><b>This questionnaire contains a series of statements that refer to how you may feel things have been going in your life. Read each statement and decide the extent to which you agree or disagree with it. Try to respond to each statement according to your own feelings about how things are actually going, rather than how you might wish them to be. Please use the following scale when responding to each statement: <i>Strongly Disagree</i> 0 1 2 3 4 <i>Strongly Agree</i></b></p>
<ol style="list-style-type: none"><li>1. I find I get intensely involved in many of the things I do each day.</li><li>2. I believe I have discovered who I really am.</li><li>3. I think it would be ideal if things came easily to me in my life. (R)</li><li>4. My life is centred around a set of core beliefs that give meaning to my life.</li><li>5. It is more important that I really enjoy what I do than that other people are impressed by it.</li><li>6. I believe I know what my best potentials are and I try to develop them whenever possible.</li><li>7. Other people usually know better what would be good for me to do than I know myself. (R)</li><li>8. I feel best when I'm doing something worth investing a great deal of effort in.</li><li>9. I can say that I have found my purpose in life.</li><li>10. If I did not find what I was doing rewarding for me, I do not think I could continue doing it.</li><li>11. As yet, I've not figured out what to do with my life. (R)</li><li>12. I can't understand why some people want to work so hard on the things that they do. (R)</li><li>13. I believe it is important to know how what I'm doing fits with purposes worth pursuing.</li><li>14. I usually know what I should do because some actions just feel right to me.</li><li>15. When I engage in activities that involve my best potentials, I have this sense of really being alive.</li><li>16. I am confused about what my talents really are. (R)</li><li>17. I find a lot of the things I do are personally expressive for me.</li><li>18. It is important to me that I feel fulfilled by the activities that I engage in.</li><li>19. If something is really difficult, it probably isn't worth doing. (R)</li><li>20. I find it hard to get really invested in the things that I do. (R)</li><li>21. I believe I know what I was meant to do in life.</li></ol>

*(R) Item is reverse scored.*

**Table 4.8 – Modified Eudaimonic Well-being Scale Content**

<p>This questionnaire contains a series of statements that refer to how you may feel things have been going in your life. Read each statement and decide the extent to which you agree or disagree with it. Try to respond to each statement according to your own feelings about how things are actually going, rather than how you might wish them to be. Please use the following scale when responding to each statement: <i>Strongly Disagree</i> 1 2 3 4 5 <i>Strongly Agree</i></p> <ol style="list-style-type: none"><li>1. I find I get intensely involved in many of the things I do each day.</li><li>2. I believe I know what my best attributes are and I try to develop them whenever possible.</li><li>3. I feel best when I'm doing something worth putting a great deal of effort.</li><li>4. I can't understand why some people want to work so hard on the things that they do.*</li><li>5. I believe it is important to know how what I'm doing fits with purposes worth pursuing.</li><li>6. When I engage in activities that involve my best attributes, I have this sense of really being alive.</li><li>7. I find that a lot of the things I do bring out my personality.</li><li>8. It is important to me that I feel fulfilled by the activities in which I engage.</li><li>9. If something is really difficult, it probably isn't worth doing.*</li></ol>
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\* *The two reverse scored questions were finally excluded from the analysis.*

#### **4.3.4. Results**

##### *Demographic comparisons*

For each sample, we employed one-way ANOVA with age and school class and t-test with gender and location in order to check for statistically significant differences of mean eudaimonic score across the various categories (Table 4.9). In both countries, we found statistically significant differences only with relation to gender; girls appear to be slightly more eudaimonic in Greece ( $m = 4.16$ ,  $sd = 0.51$  and  $m = 4.13$ ,  $sd = 0.52$  for female and male students respectively) and slightly less eudaimonic in England ( $m = 3.65$ ,  $sd = 0.61$  and  $m = 3.77$ ,  $sd = 0.60$  for female and male students respectively). The t-test values are  $t(525) = 2.2067$  ( $p < 0.05$ ) for England and  $t(3612) = 2.1643$  ( $p < 0.05$ ) for Greece. However, the mean differences are small in absolute terms. This is verified by Cohen's  $d$  size effect value, being  $d = 0.18$  in England and  $d = 0.07$  in Greece, indicating that gender explains only a small percentage of eudaimonic score's total variability (Cohen 1988).

For all other demographic variables, mean differences appeared to be insignificant across the various categories in both samples. For age, the F-values from the one-way ANOVA test have been found to be  $F(3, 524) = 0.39$  ( $p > 0.1$ ) in England and  $F(3, 3613) = 0.26$  ( $p > 0.1$ ) in Greece. For school class, the estimated values are  $F(3, 524) = 1.18$  ( $p > 0.1$ ) and  $F(3, 3613) = 1.49$  ( $p > 0.1$ ) for England and Greece accordingly. In all cases, the null hypothesis of significant mean differences across groups is rejected. Finally, in relation to location, the t-test values for the two countries are  $t(525) = 1.1017$ ,  $p > 0.1$  (England) and  $t(3612) = 1.0763$ ,  $p > 0.1$  (Greece). The null hypothesis is rejected again.

### *Unidimensionality*

To check for the unidimensional structure of the scale, a single - factor confirmatory factor analysis (CFA) and principal component analysis (PCA) were conducted consequently. According to PCA analysis, the first eigenvalues for the Greek and English case study accounted for 44% and 45% of scale's total variability respectively, suggesting that one factor may not be enough for including all scale items. However, the CFA results support the unidimensionality of the scale sufficiently well. Specifically, in the Greek case study, the chi-square of the CFA analysis is  $\chi^2(13) = 291.58$  ( $p < 0.001$ ), which is expectedly large due to the large sample size (Waterman et al. 2010). Root mean square error of approximation has been found to be  $RMSEA = 0.0776$ , comparative fit index is  $CFI = 0.91$ , non-normed fit index is  $NNFI = 0.86$ , and normed fit index is  $NFI = 0.91$ . For the English sample, chi-square value is  $\chi^2(13) = 28.31$  ( $p < 0.05$ ),  $RMSEA = 0.0609$ ,  $CFI = 0.97$ ,  $NNFI = 0.95$  and  $NFI = 0.95$ . The above findings confirm the hypothesis of unidimensionality in both cases<sup>45</sup>. A summary of scale's performance is provided in Table 4.10.

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<sup>45</sup> Generally, values of CFI, NFI and NNFI greater than 0.80 indicate good model fit (Cohen 1988, Hoyle & Panter 1995), while RMSEA should be less than 0.08.

**Table 4.9 – Mean Eudaimonic Score across basic Demographic Categories**

English Sample (N = 527)				Greek Sample (N = 3614)			
Group	Freq.	M <sub>EWB</sub> *	S.D.**	Group	Freq.	M <sub>EWB</sub> *	S.D.**
Boys	296	3.77	0.60	Boys	1609	4.13	0.52
Girls	231	3.65	0.61	Girls	2005	4.16	0.51
Age 11-13	110	3.73	0.58	Age 14-15	985	4.15	0.56
Age 14	145	3.69	0.61	Age 16	925	4.14	0.49
Age 15	141	3.70	0.67	Age 17	879	4.16	0.49
Age 16-19	131	3.76	0.54	Age 18-19	825	4.16	0.49
Year 7 - 8	106	3.73	0.62	Year 8 - 9	1021	4.15	0.55
Year 9	121	3.77	0.67	Year 10	942	4.13	0.51
Year 10	146	3.65	0.59	Year 11	859	4.18	0.48
Year 11	74	3.67	0.61	Year 12	792	4.16	0.49
Year 12-13	80	3.80	0.50				
Urban	314	3.75	0.63	Urban	1648	4.16	0.49
Rural	213	3.68	0.57	Rural	1966	4.15	0.53

\* Mean eudaimonic well-being score, \*\* Standard deviation

### **Reliability**

The elimination of the two reversed score statement from the final scale improved the performance of the construct, as indicated by cronbach alpha, in both samples. Specifically, alpha value improved from  $\alpha = 0.62$  (0.63 standardized<sup>46</sup>) to  $\alpha = 0.68$  (0.69 standardized) in Greece and from  $\alpha = 0.73$  (0.76 standardized) to  $\alpha = 0.78$  (0.79 standardized) in England. It should be noted that, although there is no standard rule, values of alpha over 0.60 indicate acceptable levels of reliability, especially in the case of short scales (DeVellis 1991, Loewenthal 2001).

In Greece, the average item-test<sup>47</sup> correlation for the remaining seven items varies from 0.50 to 0.65 (average 0.58), indicating that all items fit well within the new scale. Moreover, the average inter-item correlation<sup>48</sup> is 0.17 (0.24 standardized), ranging from 0.16 to 0.18 (0.22 to 0.26 standardized). The value of the average inter-item correlation appears to be very modest, but according to the theory (Briggs & Cheek 1986, Clark &

<sup>46</sup> Standardized cronbach is computed by setting scale items' mean to 0 and variance to 1.

<sup>47</sup> Item-total correlation assesses how well each item fits with the whole scale.

<sup>48</sup> Inter-item correlation assesses the association between all pairs of items in the scale.

Watson 1995) this is an acceptable, if not desirable, outcome in the case of scales that measure broad concepts (such as eudaimonia). For the English case study, the average item-test correlation is 0.67 (0.67 standardized), while the average inter-item correlation is 0.29 (0.36 standardized), showing again a good fit.

**Table 4.10 – Modified QEWB Properties**

<b>Reliability*</b>		
	<b>English Sample</b>	<b>Greek Sample</b>
<b>Cronbach alpha</b>	0.78 (0.79)	0.68 (0.69)
<b>Average item-test correlation</b>	0.67*** (0.67)	0.58** (0.59)
<b>Average inter-item correlation</b>	0.29 (0.36)	0.17 (0.24)
<b>Structure</b>		
	<b>English Sample</b>	<b>Greek Sample</b>
<b>CFI</b>	0.97	0.91
<b>NFI</b>	0.95	0.91
<b>NNFI</b>	0.95	0.86
<b>RMSEA</b>	0.0609	0.0776
<b>PCA "factor 1" variance</b>	45%	44%

*\*Standardized scores in parenthesis*

*\*\*min 0.53 (0.50), max 0.62 (0.65), \*\*\* min 0.55 (0.55), max 0.75 (0.75)*

### **Validity**

The present study assesses two main forms of validity: convergent and discriminant. The convergent validity is satisfied by showing that the examined construct is correlated with other constructs measuring similar concepts (Netemeyer, Bearden & Sharma 2003). In this case, the following three hypotheses are examined:

*Hypothesis 1: Eudaimonic well-being is positively correlated with life satisfaction.*

*Hypothesis 2: Eudaimonic well-being is positively correlated with intrinsic values.*

*Hypothesis 3: Positive psychological and physical functioning are positively associated with eudaimonic well-being.*

On the other hand, discriminant validity is satisfied by showing that the construct is statistically unrelated with other measures that are supposed to be unrelated in theory (Netemeyer, Bearden & Sharma 2003). In this case, the following hypothesis is tested:

*Hypothesis 4: Eudaimonic well-being should be unrelated with extrinsic/materialistic values.*

For the first hypothesis, eudaimonic well-being scale is correlated with BMSLSS scale. The zero-order correlation between the two scales is found to be  $r = 0.20$  and  $r = 0.39$ , for the Greek and English sample respectively (Table 4.11). The latter is closer to Waterman et al.'s (2010) study findings, where the estimated correlation has been found to be  $r = 0.55$ . For the second hypothesis, eudaimonic well-being scale is correlated with the modified 8-item "Intrinsic Aspirations" scale. For Greece, the estimated zero-order correlation is  $r = 0.44$ , much higher than the correlation between eudaimonic well-being and life satisfaction. For England, the correlation is  $r = 0.55$ , confirming again the strong association between the two concepts. In general, this is an expected outcome since intrinsic aspirations are conceptually related with eudaimonic well-being (Waterman 2008).

For the third hypothesis, we have found a modestly positive association between 7-item QEWB and the proxies for positive psychological functioning (self-esteem) and good physical condition (health). In Greece, the correlation between health status and eudaimonic well-being is  $r = 0.23$ , while the correlation between self-esteem status and eudaimonic well-being is  $0.21$ . The corresponding correlations appear to be positive, but somehow stronger in England,  $r = 0.24$  for health status and  $r = 0.32$  for self-esteem status accordingly.

Finally, to test the fourth hypothesis, eudaimonic well-being scale is correlated with the 3-item modified extrinsic aspirations indicator. In case of Greece, the zero-order correlation between extrinsic values and eudaimonic well-being is  $r = 0.03$ , showing an almost zero association between the two measures. The correlation between the two constructs is larger with the English sample,  $r = 0.14$ , but it is much smaller than correlation between eudaimonic well-being and intrinsic values ( $r=0.55$ ). As a general conclusion, the statistical finding confirm the reasonable expectation that eudaimonia should not be related to extrinsic/materialistic values.

**Table 4.11 – Zero Order Correlations (r)**

Variable	English Sample	Greek Sample
<b>BMSLSS</b>	0.39	0.20
<b>Intrinsic goals</b>	0.55	0.44
<b>Extrinsic goals</b>	0.14	0.03
<b>Self-reported self-esteem</b>	0.32	0.21
<b>Self-reported health</b>	0.24	0.23

#### **4.3.5. Limitations and Suggestions for Future Research**

The preliminary findings suggest that the modified 7-item scale is an appropriate tool to measure non-adults populations' well-being. The length of the scale and its simplicity make it friendly for children to respond. Interestingly, we did not detect important differences in the performance of the scale across the two sample populations, indicating that it fits well with both English and non-English speaking samples. However, given the relatively small English-speaking sample and the generally limited research focusing on eudaimonia, further investigation is necessary to verify the current results.

The current research could be extended in a few important ways. First, it would be beneficial to examine the performance of the current scale with reference to test-retest reliability, i.e. exploring whether the outcomes are stable over time by surveying the same sample at two different time points. Second, the validation of the scale should be based on correlations with more analytical constructs. It would be interesting to examine how eudaimonic well-being is related (or unrelated) with other measures of well-being, such as positive and negative affect (PANAS scale; Laurent et. al. 1999), psychological well-being, i.e. autonomy, environmental mastery, personal growth, positive relations with others, purpose in life and self-acceptance (Ryff 1989, Ryff & Keyes 1995), and personality traits, such as extraversion, agreeableness, conscientiousness, neuroticism and intellect/imagination (Donnellan et. al 2006). And third, it would be worth extending our focus on younger school children, in lower secondary stages or primary school. In this case, the survey design and the content of the questionnaires would be a major challenge.

## 5. The Influence of Natural Environment on Secondary Students' Subjective Well-being in Greece

### 5.1. Introduction

During the last few decades, a significant volume of empirical work has been conducted to investigate the main factors influencing subjective well-being (Diener & Seligman 2004, Dolan, Peasgood & White 2008). Indicators that have been examined include personal characteristics (such as age, gender, ethnicity and personality traits), socially developed characteristics (such as education and type of work), time allocation (such as working hours, leisure and exercise time), life attitudes and beliefs (such as religion, trust and political persuasion), relationships (such as marriage and children) wider economic, political and social conditions (such as income inequality, inflation, degree of democracy, natural environment, safety and urbanization).

However, little emphasis has been given to the association between subjective well-being and the natural environment (Newton 2007). Moreover, to the best of our knowledge, most of the existing studies have mainly focused on the impact of the environment on adults' life satisfaction or happiness. There is a substantial lack of research examining the impact of the natural environment on children's subjective and eudaimonic well-being (Steuer, Thompson & Marks 2006, Proctor, Linley & Maltby 2009). In addition, the importance of the eudaimonic dimension of life, i.e. intrinsic aspirations, need for personal growth and purpose in life, is clearly underestimated in both adult and non-adult literatures<sup>49</sup>. Arguably, it may be worth investigating whether nature has more to offer than a "happy" life. The inclusion of the "eudaimonic dimension" in policy making could be very beneficial in promoting "flourishing" and "well functioning" citizens.

This study intends to fill the research gap by investigating the potential benefits of affiliation with nature on secondary school students' life satisfaction and eudaimonic well-being, and the variations in relation to climate and geography conditions. For the purposes of the analysis, we have collected original data by employing surveys with lower and upper secondary schools in Greece. The final sample consists of 3614 students aged between 14 and 19 years old. Arguably, one of the key factors behind the

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<sup>49</sup> A detailed discussion on relevant literature is provided in Chapter 2.



on-going process of environmental degradation is the modern materialistic lifestyle. In the long-run, the development of people with anti-materialistic values and attitudes might ensure better environmental quality, which in turn might lead to higher quality of life. Evidence from past research has shown that stronger affiliation with life during childhood affect the formation of environmental attitudes and beliefs during adulthood (Ulrich 1993, Palmer 1993, Olli, Grendstad & Wollebaek 2001, Villacorta, Koestner & Lekes 2003, Ewert, Place & Sibthorp 2005). For this reason, this study focuses on adolescent populations; since today's young people will constitute the members of future society. For the purposes of the analysis, extensive quantitative surveys were employed throughout the country in order to achieve a representative sample collection in terms of socio-demographic, climate and geographical/spatial characteristics.

The chapter is structured as follows. Section 5.2 contains a brief description of the two modern self-reported well-being conceptualizations and a summary of the available literature about the influence of nature on adult and non-adult well-being. In Section 5.3, a description of the Greek case study, survey content and methodology is provided, while the main findings are stated in Section 5.4. Finally, Section 5.5 provides a summary of the key findings and proposes paths for future research.

## **5.2. Subjective Well-being and Natural Environment**

### **5.2.1. Subjective Well-being Conceptualizations: Hedonia vs. Eudaimonia**

In the contemporary psychological theory, a distinction is made between two main self-reported well-being conceptualizations: hedonic (often called subjective) and eudaimonic well-being (Ryan & Deci 2001). The former refers mainly to feelings of joy and happiness, while the latter refers to "higher" feelings and goals in life, the effort for flourishing, growth and fulfilment. In both adult and non-adult literatures (Kahneman, Diener & Schwarz 1999, Huebner 2004), subjective well-being is divided into three main elements: positive affect, negative affect and life satisfaction. Its measurement is based on multidimensional psychological scales or single ("global") questions. In the field of environmental economics for example, single life satisfaction survey questions are usually used as a proxy for experienced utility (Welsch & Kühling 2009). Examples of multi-dimensional scales include Diener et al's (1985) "Satisfaction with Life" scale, mainly used in studies with adults, and Huebner et al. 's (2006) "Brief

Multidimensional Student Life Satisfaction” scale (BMSLSS), specifically designed for research with children.

On the other hand, the meaning of eudaimonia embraces feelings of fulfilment, self-realization and personal expressiveness, a situation where life is lived in accordance with the “true deamon” (Waterman 1993, Ryan & Deci 2001). Waterman et al’s (2010) “Questionnaire for Eudaimonic Well-being” (QEWB), Ryff & Keyes’ (1995) “Psychological Well-being” scale measuring autonomy, personal growth, positive relations with others, purpose in life, environmental mastery and self-acceptance, and Kasser & Ryan’s (1996) “Aspirations Index” (intrinsic vs. extrinsic) , are some examples of constructs appropriate for measuring various dimensions of eudaimonia. In non-adult literature, the measurement of eudaimonic well-being is mainly based on modified versions of scales which have been originally developed with adult datasets (Vleioras & Bosma 2005, Jin & Moon 2006, Linley et al. 2009).

To date, there is still no complete agreement on whether subjective well-being and eudaimonia should comprise two distinct conceptualizations of well-being (Kashdan, Biswas-Diener & King 2008, Waterman 2008, Biswas - Diener, Kashdan & Minhas 2008). A limited number of studies have provided empirical evidence that, although the two conceptualizations overlap, they should be treated as two clearly different dimensions of well-being (Kopperud & Vitterso 2008, Delle Fave et al. 2011, Vitterso & Soholt 2011). More empirical evidence would be necessary to verify this result.

### **5.2.2. Well-being and the Natural Environment: Children and Adolescents**

As it has been mentioned in the literature review, most of the available research has focused on the impact of the environment on children and adolescents’ physical, mental and psychological health. Adequate empirical evidence is available about the positive role of nature in curing ill-being and about the harmful consequences of living in degraded environments (Kahn & Kellert 2002, Morris 2003, Pretty et al. 2005, Huby & Bradshaw 2006, Steuer, Thompson & Marks 2006, Newton 2007, Lester & Maudsley 2007, White & Stoecklin 2008).

Only a handful of studies have attempted to examine the potentially positive role of nature in promoting children’s positive functioning, i.e. happiness, life satisfaction and

flourishing. For example, Marks, Shah & Westall (2004) attempted to explore, among other things, the influence of living environment and active leisure activities such as sport, on life satisfaction and curiosity (employed as a proxy for eudaimonia) on children aged between 7 and 19 years old in the city of Nottingham. Their findings suggest that satisfaction with school and the living environment accounts for a relatively small percentage of life satisfaction's and curiosity's variation compared to other domains. Nonetheless, it would be difficult to capture the concrete influence of nature in this study, since the living environment was treated in their study as a single dimension without distinguishing between built and natural environments.

In 2005, Brown & Kasser conducted a survey with 209 middle school adolescents in the US to explore the relationship between ecologically responsible behaviour, happiness, and intrinsic aspirations. Their findings suggest that there is a positive association between adolescents' subjective well-being (proxied by a single life satisfaction question) and environmentally responsible behaviour (assessed by a relevant 10-item scale). Intrinsically oriented people appeared to score higher in both aspects, implying that it is possible to jointly enhance personal and collective (i.e. preserving the environment by behaving in a sustainable way) well-being. However, the analysis does not establish clear paths of causality between subjective well-being and environmentally responsible behaviour.

### **5.2.3. Well-being and the Natural Environment: Adults**

As in the case of the non-adult population, environmental quality and strong contact with nature have been positively associated with adults' physical and mental health, whereas environmental degradation has been found, as expected, to increase ill-being (Kaplan & Kaplan 1989, Ulrich 1993, Frumkin 2001, Burns 2005, Duffy & Verges 2009). With reference to positive functioning, a small number of psychological studies have investigated the relationship between nature connectedness and life satisfaction and/or eudaimonia. The former is measured by various scales asking people to indicate the level of connectedness (cognitive, affective and experiential) with the natural world.

For example, Mayer & Frantz (2004) found a positive association between their "Connectedness with Nature" scale and life satisfaction in a sample of 200 people

(including 30 adolescents). More recently, Nisbet, Zelenski & Murphy (2011) examined the association between “Nature Relatedness” (NR), a scale measuring people’s cognitive, affective and experiential relatedness with nature, and various aspects of subjective and eudaimonic well-being. Their findings suggested a moderate association between NR and positive affect (hedonic well-being), personal growth, autonomy and purpose in life (eudaimonic well-being dimensions). The quasi-experimental, longitudinal design of their study enabled them to investigate causal paths.

In the field of environmental economics, various studies have highlighted the negative effect of environmental degradation, such as air, water and noise pollution (Welsch 2002, Israel & Levinson 2004, Van Praag & Braasma 2005, Welsh 2006, Welsh 2007) on life satisfaction. On the other hand, environmental sustainability and amenities appear to be positively associated with subjective well-being (Brereton, Clinch & Ferreira 2008). In relation to climate, although the results from the existing literature vary, pleasant conditions such as sunshine are generally positive determinants of happiness, while extreme conditions such as humidity, wind speed or very low temperatures are detrimental to life satisfaction (Frijters & Van Praag 1998, Rehdanz & Maddison 2005).

An important conclusion that should be highlighted from the review of the economic literature is the limited research that has studied the influence of nature based on subjective indicators (Van Praag & Braasma 2005, Ferer-i-Carbonel & Gowdy 2007, Rehdanz & Maddison 2008, MacKerron & Mourato 2009, Smyth, Mishra & Qian 2009). The findings suggest that people’s environmental concerns and negative perceptions about the condition of the local environment are detrimental to subjective well-being. On the other hand, environmental consciousness and positive attitudes towards nature are positively associated with subjective well-being. Although the findings of these studies offer valuable results, they focus on very specific elements of the environment, and, thus, more research is necessary in order to acquire a complete picture of the relation between subjective well-being and affiliation with the natural world.

## 5.3. Survey Methodology

### 5.3.1. Case Study Description

The study has used a survey approach (paper or internet based if possible) to collect cross-sectional data from various secondary schools in Greece. Besides the fact that this is the first attempt to assess the influence of nature on Greek adolescents' subjective well-being, we believe that the wide variety of Greece's climatic and geophysical characteristics makes this case study particularly interesting. So, as the Hellenic Meteorological Office describes:

*"A great variety of climate subtypes, always in the Mediterranean climate frame, are encountered in several regions of Greece. This is due to the influence of topography (great mountain chains along the central part and other mountainous bodies) on the air coming from the moisture sources of the central Mediterranean Sea. Thus from the dry climate of Attica (the great area of capital, Athens) and generally of East Greece change over to the wet one of North and West Greece"*

*Source: [http://www.hnms.gr/hnms/english/climatology/climatology\\_html?](http://www.hnms.gr/hnms/english/climatology/climatology_html?)*

Greece is also characterized by a diversified geomorphology. Valleys with intensive agricultural activities, semi-mountain areas with altitude between 250-600 meters, high mountains with organized ski resorts and many islands of different sizes can be found throughout the country. This diversity offers the opportunity to assess students' well-being through the prism of various climate and location conditions.

For the purposes of the analysis, a sample of 3614 students from 94 lower and upper secondary<sup>50</sup> schools (41 public and 3 private lower secondary schools, 47 public and 3 private upper secondary schools) in Greece has been recruited. For the sampling process, we followed Eurostat's NUTS classification<sup>51</sup> in order to achieve a representative coverage in terms of climate, geography, economic and socio-demographic characteristics. The recruited schools are located across 28 out of a total of 52 NUTS 3 territories in Greece. In economic development terms, we divided the

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<sup>50</sup> Lower secondary school includes years 7, 8 and 9, while upper secondary school includes years 10, 11 and 12.

<sup>51</sup> Please see Chapter 3 for more details.

country into three main zones: lower, average and higher development, according to income per capita for NUTS 3 territories in 2010 (€ 12.582<sup>52</sup>). Moreover, following National Statistics Bureau 1991 Census guidelines, we classified population into three main categories according to the degree of urbanity: (i) sparse rural areas for population less than 2000, (ii) rural areas for population between 2000 and 10000, and (iii) urban areas for population more than 10000. Table 5.1 provides some basic summary statistics of the 374 recruited locations (i.e. the cities or villages where survey participants come from) with reference to economic development zones and local characteristics.

**Table 5.1 – Case Study Locations’ Characteristics**

Rurality	N #	Island vs. Mainland	N #	Altitude**	N #	Development	N #
Sparse Rural	258	<i>Island</i>	132	0-250	272	<b>Low</b>	127
Rural	43	<i>Mainland</i>	242	250-600	61	<b>Average</b>	144
Urban	73 *			600 +	41	<b>High</b>	103
	<b>374</b>		<b>374</b>		<b>374</b>		<b>374</b>

*\*The high number of locations with population of more than 10000 is attributed to the fact that most Athens suburbs are administratively considered as independent provisions.*

*\*\* In meters.*

### 5.3.2. The Model

The study of the determinants of students’ subjective well-being is based on the following function:

$$swb_{i,jk} = \beta + \beta_1 x_{i,jk} + \beta_2 w_{i,jk} + \beta_3 z_{i,jk} + \varepsilon_{i,jk} \quad (5.1)$$

where  $swb_{i,jk}$  denotes individual’s  $i$  life satisfaction or eudaimonic well-being in school  $j$  and school class  $k$ ,  $\beta$  is the constant factor,  $x$  is a vector containing socio-demographic and various background characteristics,  $w$  is a vector with various environmental variables, and  $z$  is a vector with location and climate variables (varying at an individual level).

<sup>52</sup> Data provided by the Ministry of Finance.

We employ an OLS regression<sup>53</sup> with errors clustered at school class level in order to control for intraclass correlation<sup>54</sup> (Moulton 1990). To estimate the unique contribution of environmental, location and climate variables in the explanation of life satisfaction and eudaimonia, we also perform an OLS hierarchical regression analysis, where variables are entered in blocks.

***Dependent Variables (Table 5.2)***

Subjective well-being is measured by using Huebner’s et al. (2006) BMSLSS. It consists of five questions assessing students satisfaction with family, school, friends, self, place of living. The formed dependent variable - life satisfaction scale (LSS) - is the average score of the aforementioned five questions. To measure students’ eudaimonia, we modified Waterman et al.’s (2010) 21-item QEWB tool, originally constructed with adult populations, in order to make it suitable for research with children and teenagers. Our modified version consists of seven statements assessing personal expressiveness and flourishing (for example: “I feel intensively involved with things I am doing every day” and “I find many of the things I am doing personally expressive”). The seven items are summed over in order to obtain a single EWB score.

**Table 5.2 - Dependent Variables**

<b>Dependent Variables</b>	<b>Description</b>
<b>Life Satisfaction Scale</b>	<b>5-item scale measuring LS with family, friends, school, self and living environment (from 1 to 7): very unhappy to very happy</b>
<b>Eudaimonic Well-being Scale</b>	<b>7-item (statements) scale assessing functioning and levels of eudaimonia (from 1 - 5): strongly disagree to strongly agree</b>

<sup>53</sup> In Chapter 4, we mentioned the reasons we preferred to employ an OLS regression analysis. However, given the ordinal nature of the dependent variables, we employed an ordered logit regression as well. Results appeared to be quite similar (Appendix A5, Table A5.1). Also, to examine whether the results are robust under different specifications, we employed an OLS regression with standard errors clustered at school level (instead of school class level), a three-level random effects analysis with school, school class and students as the three levels, and a few alternative OLS specifications (with a smaller number of variables). The derived findings (Appendix A5, Tables A5.2 – A5.5) verify the robustness of the analysis.

<sup>54</sup> As we have mentioned in Chapter 4, the main reason for clustering at school class level is to construct a greater number of clusters of a relatively smaller size (as if we had clustered at school level for example), which has been suggested to increase the efficiency of the estimation (Cameron, Miller & Gelbach 2008).

### *Independent Variables (Table 5.3)*

The set of dependent variables is divided into three main categories: (i) socio-demographics and psychometrics, (ii) environmental variables, and (iii) location and climate variables. The formation of the variables has been based on an extensive review of the available empirical studies and includes a combination of subjective and objective indicators. In the first group, gender and age are included to acquire fundamental information about students' demographic background. Since collecting information about the financial situation of the students' family was not possible, weekly pocket money is adopted as a proxy for family wealth. Students were asked to choose among four categories, i.e. up to 15 euro, 15 - 30 euro, 30 - 50 euro, over 50 euro. A dummy variable has been also included indicating whether students are working on a full-time or part-time basis.

To collect information about students' life routine during a normal school week, they were asked to rate how much time they allocate (from 1 - 5, never/rarely to very often) to some fundamental activities and obligations. The formed variables measure time allocation for homework, hobbies, television, internet, computer games and gatherings with friends. All the aforementioned variables have been widely used in the non-adult literature (Huebner 2004, Antaramian, Huebner & Valois 2008, Bradshaw 2011). In particular, relations with peers and social activities have been found to raise the probability of a happy and flourishing life (Huppert 2009, Eryilmaz 2012). Arguably, the inclusion of these important determinants of well-being may ensure that there will be no significant bias in the examination of environmental impact due to endogeneity issues. Moreover, a variable of income per capita in NUTS 3 territories in 2010<sup>55</sup> has been added as a proxy for regional economic development.

The set of psychometric variables includes students' self perceptions about some crucial dimensions of their life and personality. Specifically, three variables were formed based on students' self-rating (from 1 - 5) of the status of their physical health, stress and self-esteem. The positive influence of these factors on human well-being is well established in both adult and non-adult literatures (Valois et al. 2004, Huebner 2004, Waterman et al. 2010). Furthermore, we have selected 11 questions from Kasser and Ryan's (1996) "Aspirations Index" (AI) to examine students' intrinsic (8-item scale) and extrinsic (3-item scale) goals.

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<sup>55</sup> Data source: Hellenic Ministry of Finance.



Specifically, the intrinsic scale measures (between 1 - 5) how importantly students weight goals for self-acceptance (in the future, it will be very important: “to choose what I do, instead of having people decide for me”, “to overcome the challenges that life presents me”, “to feel good about my abilities”), community feeling (“to assist people who are in need, and asking nothing in exchange”, “help the world become a better place”), affiliation with others (“to have a couple of good friends that I can talk to about personal issues”, “to have people in my life who will accept me as I am, no matter what”) and health (“to be in good physical shape”), while the extrinsic scale measures the significance of goals for financial success (“to have many expensive possessions”), image (“to keep up with fashion in hair and clothing”) and social recognition (“to be admired by many people”).

To date, various empirical studies have highlighted the strong association between intrinsic aspirations, subjective and eudaimonic well-being (Brown & Kasser 2005, Kasser 2005, Waterman 2008, Huppert 2009). On the contrary, the majority of the available literature suggests that extrinsic aspirations are detrimental to well-being (Ryan et al. 1999, Schmuck, Kasser & Ryan 2000). Though, it should be noted that Ingrid, Majda & Dubravka (2009) argued that extrinsic goals could be positively associated with people’s well-being in the case of less developed countries, since materialistic orientation may be aiming at the achievement of a minimum level of financial security and prosperity.

The variables in the second group (environmental variables), have been designed to assess students’ “environmental profile”. According to Kahn & Kellert (2002), children experience nature in three main ways: directly (outdoor activities, playing in parks and walking in the forest for example), indirectly (visiting a zoo, participate in an environmental education program for example), and vicariously (such as watching a documentary about the environment and looking at pictures of landscape in magazines). To measure students’ empirical exposure consistently with the above categorization, we formed a “Nature Experience” index (Likert - type score ranging between 1 and 5) based on students’ responses on ten relevant questions. Specifically, five questions measure direct experience on unstructured nature setting (excursions and outdoor sports) and frequency involvement with built environment activities (outdoor sports, swimming pool and play in green spaces), three questions measure indirect experience (visits to natural history museums, national parks & botanical

gardens, and zoos & aquariums), and two questions measure vicarious experience (reading articles or books and watching documentaries about the natural environment).

Furthermore, to measure students' perceptions about local environmental quality, we have included a "green home" dummy indicating whether there is a balcony with flowers or garden in students' home, a "green school" dummy measuring perceptions on how green the school yard is, a "home green view" dummy indicating whether there is view of nature from home window, a "school green view" dummy indicating whether there is view of nature from the class window, and a neighborhood variable measuring participants' perceptions on the existence of green spaces in their neighborhood environment (not at all/very few - many, 1 - 5). To examine students' perceptions about local degradation, we formed a 4-item indicator (ranging between 1 and 5) based on students' concerns about local air pollution, traffic noise, water pollution and green spaces degradation (garbage on the street, lack of green spaces, etc.).

In addition, a few variables measuring participation (never - very often/everyday, 1 - 5) in non-nature related activities, i.e. indoor sports, playing in home, and going to shopping centers/cafeterias have been added to the analysis as control factors for the potential non-nature related effects on well-being. Moreover, as a control factor for conditions that might prohibit exposure to nature, students were asked to rate the severity of safety issues (not at all severe - very severe, 1 - 5) in their neighborhood.

To control for cognitive and affective affiliation with nature, we created several variables measuring pupils' worldviews, values, awareness and biocentric reasoning. The following statements (strongly disagree - strongly agree, 1 -5) were used to form the attitudinal variables (worldviews and values): (i) "people are treating nature badly", (ii) "nature is strong enough to handle the bad effects of our modern lifestyle" (reversed score), (iii) "the life of plants and animals is of the same value of the life of humans" (these statements are taken from Manoli, Johnson & Dunlap's (2007) "New Ecological Paradigm" scale), (iv) "nature's value is unique; nobody has the right to damage it" (v) "nature must be kept "clean" in favour of future generations", (vi) "the world would not suffer if species like snakes and mosquitoes became extinct", (vii) "I feel that the most important role of the natural environment is to satisfy human needs",

and (viii) “there is nothing wrong with sports such as horse racing or hunting that require intense training of animals”. Statements (vi) and (viii) are based on Kellert’s (1997) typology of environmental values. Here, the average score of statements (i) and (ii) is used to assess students’ worldviews, while the average score of statements (iii), (iv) and (v), average score of statements (vi) and (vii), and statement (viii), are used as proxies for measuring moralistic, utilitarian and dominionistic values respectively.

As Kahn and Kellert explain, “*these values are thought to constitute “weak” biological tendencies or genetic inclinations to affiliate with natural process and diversity and are collectively labeled biophilia*” (Kahn & Kellert 2002, p.129)”. For this reason, the attitudinal variables can work as control factors for “environmental” traits/biological inclinations. It should be noted that each of these values, even those entailing negative connotations, yields specific benefits for pupils’ personality. For example, fear of nature (negativistic values) might prevent children from risky actions or help them recognize the extreme power of nature (Kahn & Kellert 2002).

To assess awareness, we formed a 4 - item indicator based on students’ self-reported concerns (not at all worried - very worried, 1 - 5) about four important global environmental issues, i.e. climate change, ozone layer depletion, species extinction and deforestation. Finally, to further examine participants’ environmental traits, an adapted version of Schultz’s (2001) “Environmental Motives” scale is used to assess his proposed tripartite classification of environmental concerns: (i) for self (egocentric), (ii) for other people (altruistic), and (iii) for the biosphere (biocentric). Specifically, students were asked to report how concerned they were (score between 1 and 5) about the consequences of environmental degradation to animals and plants (biocentric concerns), personal health (egocentric concerns), and the health of future generations, people on other sides of the planet and people in the participants’ community (altruistic concerns).

Kahn (1999) suggested a similar categorization by distinguishing between two main categories of reasoning: anthropocentric, which incorporates egocentric and altruistic perceptions, and biocentric. The anthropocentric reasoning refers to people’s tendency to emphasize the effects of nature on themselves and on other people’s well-being. On the other hand, biocentric reasoning refers to people’s view that nature stands itself as a unique value not necessarily linked to the fulfillment of human well-being. Following

his categorization, egocentric and altruistic scores from Schultz's scale were averaged to form an anthropocentric variable. To assess the relative importance of biocentric reasoning, the mean - corrected "relbiocentric" variable was formed by subtracting scale's total score from the biocentric subscale score.

The final set of variables, location and climate, provides an objective evaluation of local demography, climate and environmental conditions. The lack of information about students' home address prohibited the employment of a highly disaggregated spatial analysis. However, an analysis at the level of village or neighborhood was feasible. In relation to local demography, we included two dummy variables for sparse rural (less than 2000 people) and rural (between 2000 and 10000) locations. We also included an "Athens" dummy for students living in the greater area of Attica (Athens centre and nearby suburbs).

In relation to climate, following relevant literature (Frijters & Van Praag 1998, Brereton, Clinch & Ferreira 2008, Rehdanz & Maddison 2008) and the advice of a climatologist, the description of climate was based on time-series data about annual mean temperature, precipitation and wind speed<sup>56</sup>. July maximum temperature has been included to measure climate upper extremes. The geography characteristics were represented by an "altitude" variable, a "sea" variable measuring distance from coast (in km) and an "island" dummy distinguishing between island and mainland.

The objective quality of the local environment is assessed by including a dummy indicating the existence of an area of extraordinary beauty or "Natura 2000"<sup>57</sup> within ten kilometers from participant's home location. The Greek database "Filotis"<sup>58</sup> is used to locate areas of great natural beauty on the maps. These areas are usually easily accessible and can be used as recreational sites for the local population. On the other hand, the environmental degradation is evaluated by estimating the number of heavy pollution industries (within 10 km) around participants' home location and close proximity (within 10 km) to national or international airports. Information about polluting industries was provided by the Ministry of Environment, Energy and Climate Change<sup>59</sup>.

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<sup>56</sup> Using sunshine data was not possible due to many missing observations.

<sup>57</sup> "Natura 2000" is a network of ecological areas protected by the European Union Law.

<sup>58</sup> Database web address: <http://filotis.itia.ntua.gr>

<sup>59</sup> Web addresses: <http://geodata.gov.gr> and <http://www.e-per.gr>

**Table 5.3 – Independent Variables**

Independent Variables	Values and Description
<i>Socio-demographics/ Psychometrics</i>	
<b>Girl</b>	1 if female
<b>Age</b>	from 14 to 19
<b>Money</b>	Weekly pocket money: 1 - 4 (up to 15 euro, 15-30, 30-50, 50+)
<b>Work</b>	1 if working full or part-time
<b>Homework</b>	Weekly school reading: 1 - 5 (never/rarely - very often)
<b>Hobbies</b>	Weekly time for hobbies: 1 - 5 (never/rarely - very often)
<b>TVwatching</b>	Weekly TV watching: 1 - 5 (never/rarely - very often)
<b>Internet</b>	Weekly internet surfing: 1 - 5 (never/rarely - very often)
<b>PCgames</b>	Weekly computer games: 1 - 5 (never/rarely - very often)
<b>Friends</b>	Weekly time with friends: 1 - 5 (never/rarely to very often)
<b>IncomePerCap2010</b>	Proxy for regional economic development (in euro)
<b>Health</b>	Health status: 1 - 5 (not at all healthy - very healthy)
<b>SelfEsteem</b>	Confidence status: 1 - 5 (not at all confident - very confident)
<b>Stress</b>	Stress status: 1 - 5 (not at all stressed - very stressed)
<b>Intrinsic</b>	8-item score: 1 - 5 (not at all important - very important)
<b>Extrinsic</b>	3-item score: 1 - 5 (not at all important - very important)
<i>Environmental Variables</i>	
<b>NatureExperienceIndex (NEI)</b>	10-item index: students' empirical exposure to nature (score between 1 - 5)
<i>Direct experience</i>	<i>Excursions to nature: 1 - 5 (never, rarely, once/twice a year, several times a year, many times a year)</i>
<i>Direct experience</i>	<i>Sports in an unstructured natural setting (trekking, climbing, etc.): 1 - 5 (never, rarely, once/twice a year, several times a year, many times a year)</i>
<i>Direct experience</i>	<i>Participation in local outdoor sports (football, etc.): 1 - 5 (never, rarely once or twice a week, several times a week, very often/everyday)</i>
<i>Direct experience</i>	<i>Indoor or outdoor swimming: 1 - 5 (as above)</i>
<i>Direct experience</i>	<i>Play in green spaces: 1 - 5 (as above)</i>
<i>Indirect experience</i>	<i>Visits to natural history museums: 1 - 5 (never, once, at least once, several times, many times)</i>
<i>Indirect experience</i>	<i>Visits to national parks/botanical gardens: 1 - 5 (as above)</i>
<i>Indirect experience</i>	<i>Visits to zoos &amp; aquariums: 1 - 5 (as above)</i>
<i>Vicarious experience</i>	<i>Reading articles or books about the environment : 1 - 5 (never/rarely - very often)</i>
<i>Vicarious experience</i>	<i>Watching material related to the environment : 1 - 5 (as above)</i>
<b>NeighborhoodGreen</b>	Perception about green neighborhood: 1 - 5 (not at all/ very few - many)
<b>HouseGreen</b>	1 if there is a green balcony or garden at home
<b>SchoolGreen</b>	1 for existence of green schoolyard
<b>SchoolGreenView</b>	1 if there is a view of nature from classroom window
<b>HouseGreenView</b>	1 if there is a view of nature from home window
<b>LocalConcerns</b>	4-item score: concerns about local problems such as traffic and neighborhood degradation; score between 1 - 5 (not at all worried - very worried)
<b>Worldviews</b>	2-item score: "people are treating nature badly" and "nature is strong enough to handle the bad effects of our modern lifestyle; 1 - 5 (strongly disagree - strongly agree)

<b>MoralisticValue</b>	3-item score: “the life of plants and animals is of the same value of the life of humans”, “nature’s value is unique; nobody has the right to damage it”, and “nature must be kept “clean” in favor of future generations”; 1 - 5 (strongly disagree - strongly agree)
<b>UtilitarianValue</b>	2-item score: “I feel that the most important role of the natural environment is to satisfy human needs” and “The world would not suffer if species like snakes and mosquitoes became extinct”; 1 - 5 (strongly disagree - strongly agree)
<b>DominionisticValue</b>	“There is nothing wrong with sports such as horse racing or hunting that require intense training of animals”; 1 - 5 (strongly disagree - strongly agree)
<b>RelBiocentricReas</b>	Mean-corrected biocentric reasoning: relatively stronger biocentric (over anthropocentric) concerns about the consequences of environmental degradation to animals and plants: score between -0.2 and 0.2
<b>Awareness</b>	4-item score: awareness and concerns about 4 global environmental issues, climate change, ozone layer depletion, species extinction, deforestation; 1 - 5 (not at all worried - very worried)
<b>IndoorSports</b>	Participation to indoor sports: 1 - 5 (never, rarely, once or twice a week, several times a week, very often/everyday)
<b>InHomePlay</b>	Play at home: 1 - 5 (as above)
<b>Shopping/Cafe</b>	Visits to Shopping Centers/Café: 1 - 5 (as above)
<b>UnsafeFeeling</b>	Concerns about neighborhood security issues: 1 - 5 (not at all severe - very severe)
<b>Location &amp; Climate</b>	
<b>SparseRural</b>	1 if city/village population less than 2000
<b>Rural</b>	1 if city/village population between 2000 and 10000
<b>Athens</b>	1 if participant lives in Athens centre or suburbs
<b>SchoolDistance</b>	Home distance from school in km
<b>SchoolDistance2</b>	Home distance from school squared
<b>Altitude</b>	Area’s altitude in meters (data available on Google earth)
<b>Island</b>	1 if the village/city is in an island
<b>SeaDistance</b>	Distance between village/city and coast (in km)
<b>MeanTemper</b>	Annual average temperature (in Celsius): time series from 1960 to 1997)
<b>JulyMaxTemper</b>	July Max temperature in (Celsius): time series data from 1960 to 1997)
<b>MeanPrecipitation</b>	Annual average precipitation (in mm): time series data from 1960 to 1997)
<b>MeanWindSpeed</b>	Annual average wind speed (in m/s): time series data from 1960 to 1997)
<b>Industry(#)</b>	Number of heavy industries within 10 km from city/village
<b>Airport10</b>	1 if airport exists within 10 km from city/village
<b>NatBeauty</b>	Dummy: 1 if there is an area of extraordinary beauty and/or Natura 2000 within 10 km from city/village

## 5.4. Results

### 5.4.1. Sample Characteristics

#### *Sample Profile: Socio-demographics*

The majority of participants, i.e. 55.48%, are girls, while the average age is 16.42 years old (sd = 1.17). Matching age and school class level, as a general rule, 14 years old students are in school year 8, 15 years old students are in year 9, while 16, 17 and 18 (or 19) years old students are in years 10, 11 and 12 respectively. A few exceptions may exist in cases of students who entered school in younger ages or failed to qualify to the next school year. In terms of location, 1648 pupils live in urban areas, 1146 pupils live in semi-urban areas, while 820 pupils live in rural areas throughout the country. A strong percentage of students, i.e. 33.23%, come from schools located in the greater area of Athens. Tables 5.4 and 5.5 provide a brief summary of the main demographic statistics.

Given that collecting information about the financial situation of students' families was not possible, weekly pocket money was adopted as a proxy for family wealth. Most of the students, i.e. 42%, reported that they receive no more than 15 euros per week. Only 5.79% of the students stated that they receive more than 50 euros per week. Not surprisingly, the average amount of pocket money increases as long as students become older, probably because they need more money for the increased personal and social activities with peers. Family, mainly parents and grandparents, is the most important source of the pocket money. However, a respectable percentage of students, 20.03% (64.08% of them are boys), mentioned that they receive income from full-time or part-time work. The percentage of working students in the rural areas (29%) is much higher than the percentage of working students in urban or semi-urban areas (13% and 22% respectively). In the countryside, many students reported that they work in family owned businesses or agricultural activities.

The statistics of students' reports on time allocation (Table 5.6) indicate that, as expected, more than 60% of the students spend plenty of time doing their homework. In addition, a significant percentage of pupils, 85.52%, allocate plenty of their weekly time with friends. Interestingly, students appear to substitute computer games in favor

of web network; 56.29% of the participants reported that they spend plenty of time online, while only 25.57% of them reported high time allocation on computer games.

The aforementioned statistics refer to students' preferences during the school period. Table 5.7 provides a brief summary of pupils' favor activities during the summer period. As expected, the vast majority of the participants indicated gatherings with friends (84.67%), swimming (50.36%) and sports (41.23%) as their most favorite activities during the summer holidays. Literature reading is also high on the ranking list (22.36%), but it is particularly popular mainly among female participants. Girls tend also to get involved with art hobbies much more than boys do, while on the other hand sports (mainly football) appear to be very popular among boys. Interestingly, sport, social and cultural activities are by far more popular than materialistic (shopping), TV and computer related activities. However, nature related activities such as gardening, hunting and fishing are on the lower side of the popularity list (3.87%).

The preference of students for sports is also reflected on the very high popularity of physical education course (Table 5.8). Specifically, 38.49% of lower secondary school students and 41.88% of upper secondary students reported physical education as their favorite school course. As in the case of summer favorite activities, boys' preference on sports is much higher compared to girls, i.e. 47.67% vs. 30.6% in lower secondary schools, and 51.54% vs. 34.34% in upper secondary school. Despite the difficulty level, positive science courses such as mathematics, physics and chemistry are also very popular in all school years. On the other hand, most courses enhancing environmental values and knowledge, such as household economics, geography and environmental science, are very low on students' preferences (3.04%, 9.3% and 4.06% respectively). The only exception is biology, which has been chosen by 26.64% of lower secondary school students and 20.29% of upper secondary school students. Courses such as literature and ancient Greek are on the upper side of the ranking list mainly because of their popularity among girls, while computer science is relatively more popular among boys.



**Table 5.4 - Basic Socio-demographic Descriptive Statistics**

<b>Variables</b>	<b>Min</b>	<b>Max</b>	<b>Mean</b>	<b>St. Dev.</b>
<b>Gender (Girls)</b>	0	1	0.55	0.49
<b>Age</b>	14	19	16.42	1.17
<b>Class</b>	Year 8	Year 12	10.36	1.15
<b>Urban areas</b>	0	1	0.45	0.49
<b>Rural areas</b>	0	1	0.31	0.46
<b>Sparse rural areas</b>	0	1	0.22	0.41
<b>Athens</b>	0	1	0.33	0.47
<b>Money</b>	1	4	1.82	0.86
<b>Work</b>	0	1	0.20	0.40
<b>Homework</b>	1	5	3.75	1.05
<b>Non-school reading</b>	1	5	2.37	1.24
<b>Hobbies</b>	1	5	3.27	1.41
<b>TV</b>	1	5	3.34	1.10
<b>PC games</b>	1	5	2.38	1.42
<b>Internet</b>	1	5	3.49	1.26
<b>Friends</b>	1	5	4.30	0.84

**Table 5.5 – Basic Socio-demographic Frequencies**

Gender	N #	%	Age	N #	%	Class	N #	%
Girls	2005	44.52	14	89	2.46	Year 8	91	2.52
Boys	1609	55.48	15	896	24.79	Year 9	930	25.73
			16	925	25.59	Year 10	942	26.07
			17	879	24.32	Year 11	859	23.77
			18	798	22.08	Year 12	792	21.91
			19	27	0.76			
Location	N #	%	Pocket Money**	N #	%	Work	N #	%
Urban*	1648	45.60	Up to 15	1518	42	Yes	724	20.03
Rural	1146	31.71	16 – 30	1416	39.18	No	2890	79.97
Sparse rural	820	22.69	31 – 50	471	13.03			
			50+	209	5.79			
*Athens	1201	33.23	** In euro					

**Table 5.6 – Time Allocation Frequencies (%)**

Response	Homework	Non-School Reading	Hobbies	TV	PC Games	Internet	Friends
Not at all	3.83	31.77	16.85	5.89	40.23	8.59	0.95
A little bit	8.47	25.92	15.18	17.55	18.75	15.53	2.86
Average	22.49	21.49	16.55	27.99	15.45	19.59	10.67
Quite a lot	38.56	14.50	26.64	33.55	13.41	30.09	35.73
A lot	26.65	6.32	24.78	15.02	12.16	26.20	49.79

**Table 5.7 – Summer Favorite Activities Frequencies (%)**

Summer Activities	Total	Boys	Girls	Summer Activities	Total	Boys	Girls
Friends	84.67	77.19	90.67	Travel	5.04	2.61	6.98
Swimming	50.36	45.25	54.46	Nature activities	3.87	5.41	2.64
Non water sports	41.23	58.23	27.58	Work	3.68	3.92	3.49
Literature reading	22.36	11.19	31.32	Shopping	2.71	0.93	4.14
Art hobbies	16.99	10.1	20.05	Water sports	2.02	2.18	1.9
Internet	8.55	7.83	9.13	Cars and moto	1.69	3.42	0.3
PC/PC games	7.42	13.55	2.49	School reading	1.25	1.18	1.3
TV movies	7.14	4.66	9.13				

**Table 5.8 – School Favorite Courses Frequencies\* (%)**

Lower Secondary	Total	Boys	Girls	Upper Secondary	Total	Boys	Girls
Mathematics	38.69	42.37	35.52	Physical education	41.88	51.54	34.34
Physical education	38.49	47.67	30.6	Mathematics	38.91	48.72	31.25
Chemistry	28.8	28.6	28.96	Physics	30.27	41.34	21.63
<b>Biology</b>	<b>26.64</b>	<b>22.88</b>	<b>29.87</b>	Chemistry	23.56	23.66	23.49
Physics	26.05	30.93	21.86	Ancient Greek	21.33	12.4	28.3
Computer	21.94	28.6	16.21	<b>Biology</b>	<b>20.29</b>	<b>14.25</b>	<b>25.0</b>
History	21.84	24.79	19.31	Computer	20.17	27.8	14.7
Art	19.59	16.1	22.59	History	18.51	18.56	18.48
Ancient Greek	16.26	9.96	21.68	Literature	18.51	7.74	26.92
Professional orientation	15.48	14.19	16.58	Foreign language	16.08	12.75	18.68
Music	15.18	14.83	15.48	Modern Greek	13.88	9.06	17.65
Foreign language	14.79	8.47	20.22	Religion	9.56	9.85	9.34
Literature/ modern Greek	13.52	5.93	20.04	Sociology	8.96	6.36	10.82
Religion	10.09	10.81	9.47	Economic principles	8.33	9.32	7.55
<b>Geography</b>	<b>9.3</b>	<b>12.29</b>	<b>6.74</b>	Philosophy	7.51	4.0	10.09
Politics	5.97	4.24	7.47	Astronomy	5.75	4.4	4.63
Technology	5.0	7.63	2.73	Statistics	5.24	19.09	11.47
<b>Household economics</b>	<b>3.04</b>	<b>2.12</b>	<b>3.83</b>	<b>Environmental science</b>	<b>4.06</b>	<b>2.71</b>	<b>5.05</b>

*\*Courses with strong environmental content are marked with green color.*

### *Sample Profile: Environment, Empirical Exposure and Perceptions*

Tables 5.9, 5.10, 5.11 and 5.12 include the basic statistics of students' affiliation and perceptions with the natural world. Students appear to have generally positive perceptions about how "green" their home, neighborhood and school yard are (Table 5.11). A significant percentage of participants, 25.85% and 33.99%, perceived their local environment as green or very green accordingly. In addition, the majority of the pupils, 92.13%, mentioned that a garden or balcony with flowers exists in their house or apartment, while 82.57% mentioned that there is a green area in the school yard where they can relax or play with other peers during the breaks. It is worth noting that evidence during the survey procedure suggested that students' perceptions on the school green percentage varied extensively within schools. In many cases, same school students provided very different evaluations. It is reasonable to expect that the same may occur in the case of neighborhood green space evaluation as well. Moreover, 63.52% of the pupils mentioned that they are concerned (or very concerned) about various environmental issues such as air pollution and traffic congestion in their neighborhood. Though, the perceptions about the local problems cannot provide an objective evaluation of the surrounding environment. Low concerns might imply that either problems are not crucial or the respondent is not fully aware of the severity of the issue (and vice versa).

In relation to cognitive and affective affiliation with nature, 90.42% of the students indicated that they are aware and concerned about global environmental problems such as climate change, ozone layer depletion, species extinction and deforestation (Table 5.12). Regarding worldviews, 84.73% of the pupils' mentioned that they are aware that people are treating nature badly (Table 5.12, Worldview1), while only 12.77% believed that nature is strong enough to handle the bad effects of human modern lifestyle (Table 5.12, Worldview2).

Students appear to believe that nature stands as a unique value itself: 97.49% mentioned that human life is equally important with the life of animals and plants (Table 5.12, Value1), while 96.4% of the students agreed with the statement that nature's value is unique and nobody has the right to damage it (Table 5.12, Value2). In addition, 70.56% of the students agreed with the importance of keeping the

environment safe in favor of future generations, indicating strong levels of altruistic and moralistic reasoning (Table 5.12, Value3).

Students' realization about the value of nature and its importance for human well-being is reflected in the presence of strong anthropocentric and biocentric reasoning. Specifically, the mean values of anthropocentric and biocentric reasoning are  $m = 4.29$  ( $sd = 0.60$ ), and  $m = 4.11$  ( $sd = 0.69$ ) respectively (Table 5.9). However, similarly to the available literature findings (Kahn 1999), the anthropocentric reasoning mean is greater than the biocentric reasoning mean. The paired t-statistic test indicates that the difference is statistically significant,  $t(3562) = 14.68$ ,  $p < 0.001$ . The same conclusion is derived when using the "relative importance" mean-corrected<sup>60</sup> values; the mean-corrected biocentric score is  $m = -0.11$  ( $sd = 0.49$ ), while the mean-corrected anthropocentric score is  $m = 0.05$  ( $sd = 0.24$ ), clearly indicating that anthropocentric reasoning is relatively more important than biocentric reasoning.

The mean value of students' empirical exposure to nature, i.e. NEI variable (Table 5.9), is  $m = 3.11$  ( $sd = 0.63$ ). In terms of percentages, as it can be seen in Table 5.10, less than 50% of the participants have mentioned that they participate frequently (or very frequently) on indirect (such as visiting national parks and national history museums) and vicarious activities (reading or watching materials about the environment). Specifically, the corresponding percentages of frequent participation in indirect and vicarious activities are 46.56% and 37.44% respectively. The only exception is involvement with direct experience activities (such as playing in parks or going out to nature for leisure or sports), where 69.42% of the students mentioned that they participate several or many times on a yearly basis.

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<sup>60</sup> The "relative importance" mean-corrected scores, anthropocentric and biocentric, are derived by subtracting the total mean score from the anthropocentric (concerns about personal health, health of future generations, health of people in other places of the world and health of people in participants' community) and biocentric (concerns about plants and animals) subscale scores respectively.

**Table 5.9 - Basic Environment Variables Descriptive Statistics**

Variables	Min	Max	Mean	St. Dev.
NEI	1	4.83	3.11	0.63
<i>Direct experience</i>	1	5	3.75	0.91
<i>Indirect experience</i>	1	5	3.16	1.36
<i>Vicarious experience</i>	1	5	2.55	1.11
Worldview1*	1	5	4.21	0.82
Worldview2	1	5	2.33	1.05
Value1**	1	5	4.00	1.16
Value2	1	5	4.73	0.54
Value3	1	5	4.70	0.58
Awareness	1	5	4.13	0.72
Anthrop reasoning	1	5	4.29	0.60
Biocentric reasoning	1	5	4.11	0.69
Neighborhood green	1	5	3.67	1.25
House green	0	1	0.92	0.26
School green	0	3	1.47	0.97
Local concerns	1	5	3.44	0.99

\* As we have explained before, average value of worldview1 and worldview2 (2-item worldviews variable) and average value of value1, value2 and value3 (3-item moralistic values variable) are entered in the regression analysis. \*\* Reversed score statement.

**Table 5.10 - Frequencies (%): Nature Experience Elements**

Frequency	Direct Experience	Frequency	Indirect Experience
Very low	2.21	Very low	9.74
Low	12.24	Low	34.52
Average	16.13	Average	9.18
High	32.60	High	36.73
Very high	36.82	Very high	9.83
Frequency	Vicarious Experience		
Very low	12.82		
Low	29.18		
Average	20.56		
High	21.34		
Very high	16.10		

**Table 5.11 – Frequencies (%): Perceptions about Local Environment**

Response	Neighborhood Green	Response	Local Concerns
Not at all	6.67	Not at all	8.98
A little bit	13.22	A little bit	12
Average	20.27	Average	15.5
Quite a lot	25.85	Quite a lot	32.07
A lot	33.99	A lot	31.45
Response	House Green	Response	School Green
No	7.87	No	17.43
Yes	92.13	Yes	82.57

**Table 5.12 – Frequencies (%): Attitudinal Elements**

Response	Value1	Value2	Value3
Strongly disagree	0.39	0.55	3.24
Disagree	0.31	0.31	5.49
Neutral	1.81	2.74	20.71
Agree	19.93	20.69	33.35
Strongly agree	77.56	75.71	37.21
Response	Worldview1	Worldview2*	
Strongly disagree	1.11	23.09	
Disagree	2.16	37.54	
Neutral	12	26.60	
Agree	43.21	8.65	
Strongly agree	41.52	4.12	
Response	Awareness		
Very low	0.67		
Low	4.48		
Average	4.43		
High	32.91		
Very high	57.51		

\* Reversed score statement.

## *Well-being and Psychometrics*

As depicted in Table 5.13, the mean value of life satisfaction scale is  $m = 5.22$  ( $sd = 0.83$ ). Among the various life domains, students' satisfaction with school and the local environment<sup>61</sup> are considerably lower compared to the other life domains, i.e. satisfaction with family, friends and self. Interestingly, the eudaimonic well-being mean score,  $m = 5.88$ <sup>62</sup> ( $sd = 0.50$ ), is significantly higher than all life satisfaction scores. In addition, as it can be observed in Figures 5.1 and 5.2, although the life satisfaction and the eudaimonic well-being distributions are slightly left - skewed (skewness coefficient is -0.60 and -0.87 respectively), the slight violation of perfect normality does not cause significant problems when the sample is large (Cohen et al. 2003). A concerning result is that students have reported high levels of stress,  $m = 3.54$  ( $sd = 1.29$ ). Although having stress in the last school year is reasonable because of the university entry exams (Table 5.15), descriptive statistics show that stress levels are constantly high across all school stages. According to the frequency statistics in Table 5.15, 52.41% of years 8 and 9 students, 51.54% of year 10 students, and 56.96% of year 11 students have reported that they feel stressed. The percentage of stressed students, 69.16%, increases dramatically during the last school stage.

Furthermore, comparing the five life satisfaction domains (Table 5.14 and Figure 5.3), there is a relatively significant proportion of students reporting very low satisfaction with school and the living environment. The frequency statistics (Table 5.14) indicate that 57.32% of the students are satisfied with school, while 62.16% of the students are happy with their living environment. These numbers are relatively small compared to the 80.16% of the pupils reporting satisfaction with family or 82.76% reporting satisfaction with friends. On the other hand, a significant percentage of 42.68% and 37.84% of the pupils are dissatisfied or moderately satisfied with school and living environment respectively.

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<sup>61</sup> The living environment domain is based on students' perceptions about their home, neighborhood and greater area conditions.

<sup>62</sup> The 5 - point Likert scale EWB score has been multiplied by 1.4 in order to be comparable with life satisfaction domains (ranging between 1 and 7).



**Table 5.13 – Basic Well-being and Psychometric Descriptive Statistics**

Variables	Min	Max	Mean	St. Dev.
LS Scale	1	7	5.22	0.83
LS with family	1	7	5.53	1.20
LS with friends	1	7	5.65	1.18
LS with school	1	7	4.78	1.38
LS with self	1	7	5.21	1.21
LS with place	1	7	4.95	1.51
Intrinsic goals	1.75	5	4.47	0.42
EWB scale*	1.42	7	5.88	0.50
Health	1	5	4.09	0.78
Stress	1	5	3.54	1.29
Self-esteem	1	5	3.80	0.99

\* For the original scale (ranging between 1 and 5): mean = 4.15, sd = 0.5.

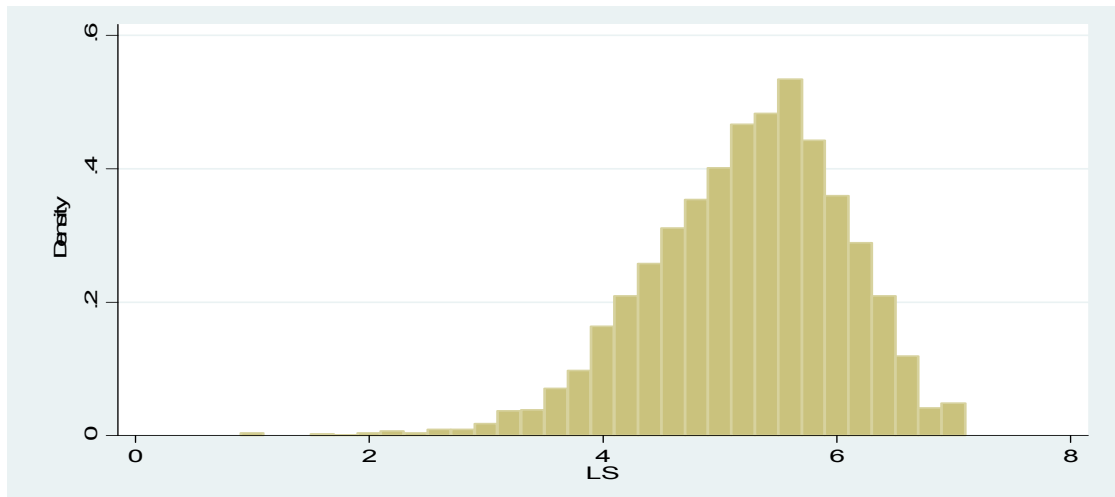
**Table 5.14 – “Satisfaction with Life” Domain Frequencies (%)**

Life Domains	Low	Average	High
Satisfaction with family	5.35	14.49	80.16
Satisfaction with friends	4.49	12.75	82.76
Satisfaction with school	13.13	29.55	57.32
Satisfaction with self	5.84	23.50	70.66
Satisfaction with place	14.46	23.38	62.16

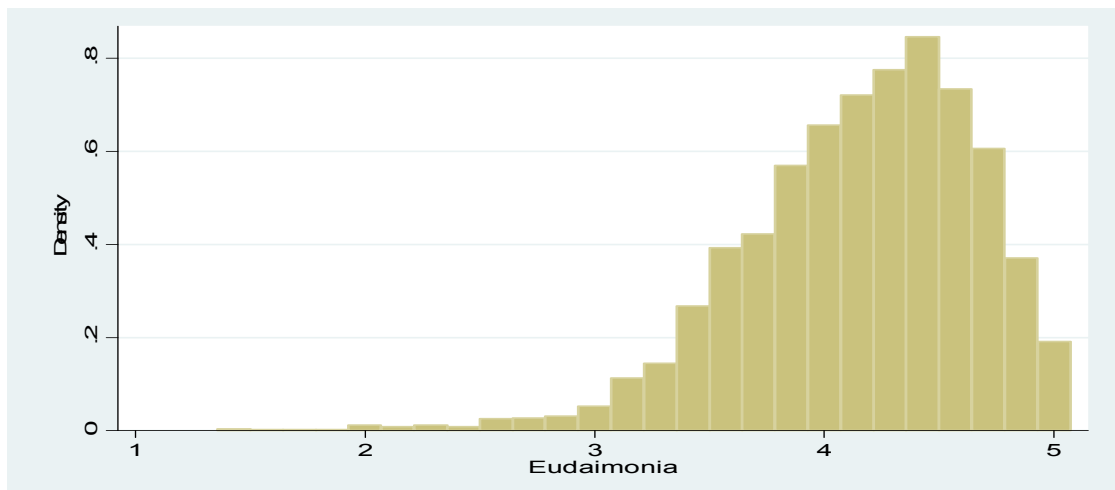
**Table 5.15 – Stress Status per School Year**

School Stages	Low	Average	High
Years 8 & 9	23.45	24.14	52.41
Year 10	24.12	24.34	51.54
Year 11	21.40	21.64	56.96
Year 12	15.36	15.48	69.16

**Figure 5.1 - LS Scale Distribution**



**Figure 5.2 - EWB Scale Distribution**



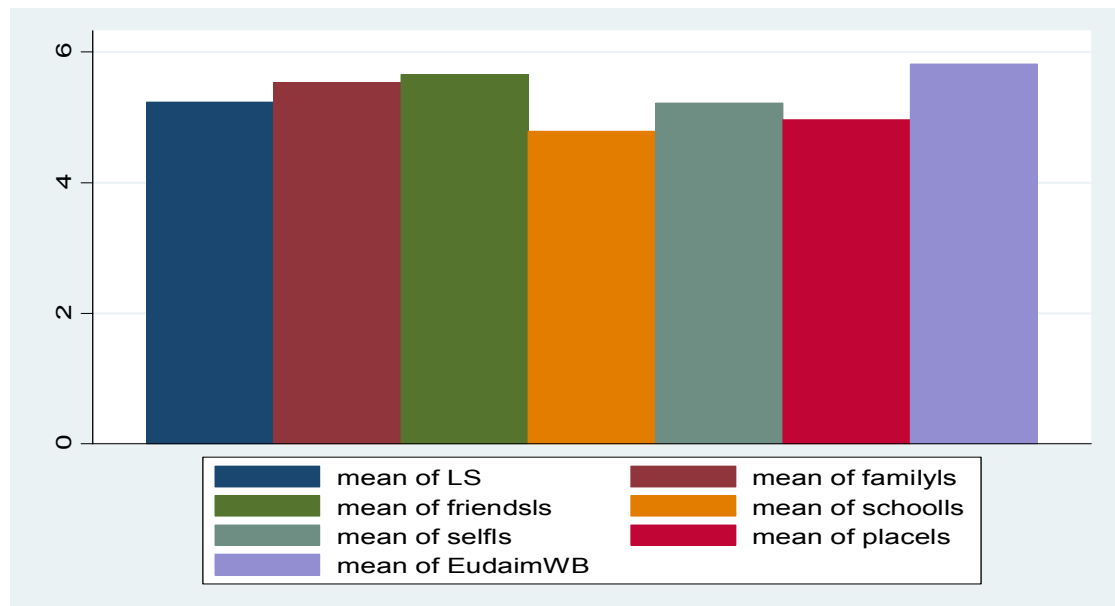
***Correlations: LS, Eudaimonia, Aspirations, and Environment***

The raw correlation between the LS scale and EWB is  $r = 0.20$  (Table 5.16) indicating that, at least within the context of this study, subjective and eudaimonic well-being should be treated as two moderately overlapping but distinct conceptualizations. Not surprisingly, there is a strong positive association between intrinsic goals and EWB ( $r = 0.44$ ). There is also a weak correlation,  $r = 0.12$ , between intrinsic goals and life satisfaction. On the other hand, the relationship of both measures of well-being with extrinsic goals is negligible, i.e.  $r = 0.05$  and  $r = 0.03$  with life satisfaction and eudaimonia respectively. An interesting outcome is that eudaimonic well-being appears to be moderately correlated,  $r = 0.31$ , with NEI. In relation to life satisfaction, there is an association with nature empirical exposure,  $r = 0.19$ , but it is weaker than the association with eudaimonia.

**Table 5.16 – Raw Correlations: Well-being and Environment**

Variables	LS Scale	EWB Scale
LS	-	0.20
Intrinsic Goals	0.12	0.44
Extrinsic Goals	0.05	0.03
NEI	0.19	0.31

**Figure 5.3 – LS domains and Eudaimonic Well-being Comparisons**



## 5.4.2. Statistical Findings: Life Satisfaction

### *Socio-demographics and Psychometrics*

The findings from the OLS regression are generally in line with the majority of the available literature regarding the main determinants of pupils' satisfaction with life. As depicted in Table 5.17, spending more time with friends, feeling physically healthy and confident (self-esteem), are associated with higher levels of self-reported well-being (Dew & Huebner 1994, McKnight, Huebner & Suldo 2002). However, the current findings cannot ascertain a strong association between subjective well-being and extrinsic/intrinsic aspirations. Although the signs of the two variables suggest the positive impact of intrinsic goals and the negative impact of extrinsic goals, none of the variables is statistically significant.

In relation to demographics, in line to some available studies (Goldbeck et al. 2007, Weaver & Habibov 2010), there is a significant gender difference in the reported levels of life satisfaction. Male students appear to be happier than female students. Also, life satisfaction is significantly decreasing with age consistently with some of the existing studies (Marks, Shah & Westall 2004, Goldbeck et al. 2007).

With reference to weekly time allocation, it is interesting that spending more time for homework appears to be positively and significantly associated with life satisfaction. This is not surprising if reading for school is viewed as a proxy for academic achievement and success, which have been shown to be important determinants of pupils' well-being (Suldo, Riley & Shaffer 2006). On the other hand, unexpectedly, "hobbies" variable has a negative albeit insignificant influence on life satisfaction.

Spending more time online is negatively associated with subjective well-being. This finding is similar to other studies (Wang, Chen & Wang 2008, Stepanikova, Hie & He 2010, Cao et al. 2011), which have highlighted the dangers of increased internet time usage and PC games on adolescents' self-reported well-being. On the other hand, the impact of TV watching is insignificant. In the adult literature, Frey, Benesch & Stutzer (2007) have suggested that TV may have a negative impact on life satisfaction among heavy viewers with increased opportunity cost of time. Here, the descriptive statistics of pupils' time allocation (Table 5.4) show that "TV watching" mean ( $m = 3.34$ ) is lower than other important activities' mean such as doing homework or going out with friends ( $m = 3.75$  and  $m = 4.30$  respectively), indicating a relatively modest time allocation.

In terms of socio-economic characteristics, initially, weekly pocket money appears to be a positive but insignificant determinant of life satisfaction. However, when "shopping/cafe" variable is excluded from the model, its impact becomes significant, indicating that the primary sources of happiness are the increased opportunities for socialization and recreation that pocket money offers<sup>63</sup>. On the other hand, although statistically insignificant, working full-time or part-time has a negative influence on well-being. On a "macro-level", there is no significant association between individual satisfaction and regional economic development as measured by income per capita for NUTS 3 regions in 2010.

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<sup>63</sup> Results are reported in Appendix A5, Table A5.6.

### *Environment, Location and Climate*

The positive sign of NEI slope and its significant effect verifies the findings from the adult literature (Nisbet, Zelenski & Murphy 2011) regarding the beneficial role of empirical connectedness with nature for human well-being (Table 5.17). The “unsafe feeling” variable controlling for students’ perceptions about neighborhood safety is insignificant, indicating that there are no major accessibility constraints to green spaces and local natural settings. Also, the inclusion of three other non-environment related controls, i.e. “shopping/cafe” (positive and significant), “indoorsport” (negative and significant), and “inhomeplay”, does not affect the magnitude of NEI effect. Especially the fact that exercising indoors is detrimental to happiness highlights the importance of a natural setting.

Moreover, in line with the findings of some studies with adult populations (Kaplan 2001), a view of nature from home window is positively associated with life satisfaction. On the other hand, a view of nature from classroom window and the existence of a garden or balcony with flowers at home appear to have no significant influence on subjective well-being. However, the statistical results show that perceptions about green neighborhood and school yard are strongly associated with life satisfaction. Both “neighborhood green” and “school green” variables are positive and significant.

Concerns about various local environmental problems are negatively and significantly associated with well-being. Thus, it appears that the established relationship between adults’ subjective views about the condition of the environment and life satisfaction (Ferrer-i-Carbonell & Gowdy 2007, Rehdanz & Maddison 2008, MacKerron & Mourato 2009, Smyth, Mishra & Qian 2009, Silva, De Keulenaer & Johnstone 2012) applies to non-adult populations as well.

Worldviews related to the potential threats to nature due to modern human lifestyle appear to be detrimental to life satisfaction. It could be argued that the realization of harmful human activity raises concerns about the state of the environment, which in turn cause unhappy feelings (Ferrer-i-Carbonell & Gowdy 2007). Moreover, stronger biocentric reasoning (compared to anthropocentric reasoning), as measured by the mean-corrected “relatively biocentric” variable, is detrimental to subjective well-being.

Interestingly, this outcome indicates that stronger concerns about non-human living beings are associated with lower levels of happiness. This outcome contradicts Ferrer-i-Carbonell & Gowdy's (2007) argument, that being concerned about other living things implies a strong positive preoccupation towards positive elements of nature (such as animals) and, thus, it may be incremental to adults' life satisfaction.

In relation to climate, similarly to studies with adults (Becchetti, Castriota & Bedoya 2007, Brereton, Clinch & Ferreira 2008), annual average wind speed and maximum average temperature in July have a negative effect on life satisfaction. On the other hand, annual average precipitation and annual average temperature are insignificant. Unexpectedly, "sea distance" variable is insignificantly related to pupils' life satisfaction. This result is contradictory to our initial hypothesis that proximity to the sea should positively affect satisfaction with life in a Mediterranean country. In their study, Brereton, Clinch & Ferreira (2008) attributed the insignificant effect of proximity to the beach to the unfavorable climate conditions in Ireland. However, despite the favorable weather conditions and the existence of innumerable beaches throughout Greece, the impact of being close to the beach remains weak. In addition, living in islands is a negative predictor of satisfaction with life. A possible explanation could be the fact that islands are usually isolated during the winter season and overcrowded during the summer season. Finally, in line with Rehdanz & Maddison (2005), there is no effect of altitude on life satisfaction.

To discuss with reference to local demographic characteristics, it is interesting to note that living in rural areas is negatively associated with subjective well-being; both rural dummies have a significantly negative effect. A possible explanation for this could be the lack of amenities and resources, prospects for the future, and the deteriorating socio-economic conditions (Glendinning et al. 2003, Kim & ShinShin 2009). Living in the metropolitan city of Athens is also detrimental to happiness, but the effect is statistically insignificant. Although there are no consistent outcomes, a significantly detrimental effect of living in large cities has been highlighted in part of the adult literature (Dolan, Peasgood & White 2008, Ambrey & Fleming 2011).

Contrary to subjective perceptions about the status of the local environment, the association between objective environmental conditions and life satisfaction is weak. The effect of environmental degradation variables, i.e. proximity to airports and heavy

pollution industries<sup>64</sup> is weak. On the other hand, proximity to areas of natural beauty dummy, a proxy for local environmental beauty, appears to be incremental to happiness, although significant at a 10% confidence level.

Finally, distance from school appears to have a strong positive effect on life satisfaction, while “squared distance from school” variable has a negative effect. Thus, there is a bell-shaped relationship between school distance and life satisfaction. A possible explanation could be that, when it takes a decently reasonable time to commute to school, well-being may be enhanced through walking, cycling, or socializing and playing with other peers during transportation.

### **5.4.3. Statistical Findings: Eudaimonia**

#### *Socio-demographics and Psychometrics*

As shown in Table 5.17, there is a positive association between age and eudaimonia, whereas gender-related differences are negligible. In terms of psychometrics, in line with the previous literature (Huppert 2009, Waterman et al. 2010), physical health, self-esteem and intrinsic aspirations have a significant positive effect. Regarding extrinsic aspirations, previous research has linked it with lower levels of eudaimonia (Ryan et al. 1999, Schmuck, Kasser & Ryan 2000). A similar conclusion cannot be derived based on the findings of the current study. Surprisingly, stress is positively linked with eudaimonic well-being. Although stress decreases happiness in the short term (as suggested by the statistical analysis in the previous section), it may arguably work as a productive factor for achieving higher goals in life.

In the relevant non-adult literature (Kasser 2005, Huppert 2009), socializing with peers has been suggested as an important determinant of eudaimonic/psychological well-being. Such a relationship cannot be established here. The effect of spending time with friends is insignificant. This finding provides a signal that hanging around with friends or acquaintances is not always an adequate condition for achieving higher levels of eudaimonia, especially if the activities are not personally expressive or fulfilling. On the contrary, reading for school and spending time for hobbies are significant and

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<sup>64</sup> The effect of heavy pollution industries remains insignificant even if NUTS 3 income per capita variable is excluded from the model.

positive determinants of eudaimonia. Maybe doing homework and having a good academic performance enhance feelings of purpose in life, personality growth, and achievement of personal goals.

Of course, the positive influence of hobbies is a reasonable outcome, since hobbies/leisure activities offer opportunities for exploration and personal growth (Gordon & Caltabiano 1996). Furthermore, playing inside the home is positively associated with eudaimonia. It should be worth investigating what types of home activities contribute to eudaimonic well-being, taking into account that the impact of spending time with friends and internet use is insignificant, while the impact of playing computer games and watching TV is significantly negative.

Pocket money is significantly and negatively associated with eudaimonic well-being. The explanation of this outcome could be twofold. First, it may highlight, indirectly, the detrimental impact of materialistic orientation, an argument that could not be confirmed by the "extrinsic aspirations" variable. Second, it could be argued that when children receive more money, they spend it in activities that do not promote eudaimonic goals. For example, some students reported during the survey procedure that they enjoy spending money for shopping purposes or sports gambling.



Table 5.17 – Life Satisfaction and Eudaimonic Well-being OLS Regressions

Variables	LS		EWB	
	Coeff.	St. E.	Coeff.	St.E.
<i>Socio-Demographics/Psychometrics</i>				
Girl	<b>-0.209***</b>	<b>0.033</b>	-0.024	0.022
Age	<b>-0.036***</b>	<b>0.012</b>	<b>0.021**</b>	<b>0.008</b>
Money	0.020	0.014	<b>-0.025***</b>	<b>0.009</b>
Work	-0.046	0.035	-0.002	0.021
Homework	<b>0.118***</b>	<b>0.014</b>	<b>0.038***</b>	<b>0.008</b>
Hobbies	-0.003	0.010	<b>0.048***</b>	<b>0.007</b>
TVwatching	0.015	0.013	<b>-0.022***</b>	<b>0.008</b>
Internet	<b>-0.042***</b>	<b>0.013</b>	-0.006	0.008
PCgames	<b>-0.026**</b>	<b>0.013</b>	<b>-0.021***</b>	<b>0.008</b>
Friends	<b>0.211***</b>	<b>0.020</b>	0.001	0.011
IncomePerCap2010	0.093	0.145	0.075	0.102
Health	<b>0.231***</b>	<b>0.018</b>	<b>0.066***</b>	<b>0.012</b>
SelfEsteem	<b>0.159***</b>	<b>0.015</b>	<b>0.066***</b>	<b>0.009</b>
Stress	<b>-0.073***</b>	<b>0.010</b>	<b>0.011*</b>	<b>0.006</b>
Intrinsic	0.021	0.038	<b>0.365***</b>	<b>0.025</b>
Extrinsic	-0.009	0.016	0.012	0.009
<i>Environmental Variables</i>				
NEI	<b>0.074***</b>	<b>0.023</b>	<b>0.107***</b>	<b>0.015</b>
NeighborhoodGreen	<b>0.073***</b>	<b>0.014</b>	0.011	0.008
HouseGreen	0.063	0.045	<b>0.054*</b>	<b>0.031</b>
SchoolGreen	<b>0.113***</b>	<b>0.038</b>	-0.028	0.023
SchoolGreenView	0.019	0.032	0.022	0.021
HouseGreenView	<b>0.086**</b>	<b>0.042</b>	0.004	0.022
LocalConcerns	<b>-0.033**</b>	<b>0.016</b>	0.010	0.011
Worldviews	<b>-0.053***</b>	<b>0.019</b>	0.016	0.012
MoralisticValue	0.039	0.025	<b>0.057***</b>	<b>0.018</b>
UtilitarianValue	0.015	0.015	-0.005	0.010
DominionisticValue	-0.003	0.011	0.005	0.007
RelBiocentricReas	<b>-0.068**</b>	<b>0.030</b>	-0.015	0.014
Awareness	-0.022	0.021	<b>0.047***</b>	<b>0.012</b>
IndoorSports	<b>-0.018**</b>	<b>0.009</b>	<b>0.026***</b>	<b>0.008</b>
InHomePlay	0.012	0.013	<b>0.026***</b>	<b>0.007</b>
Shopping/Cafe	<b>0.023*</b>	<b>0.013</b>	0.006	0.007
UnsafeFeeling	-0.010	0.012	-0.015	0.007
<i>Location &amp; Climate</i>				
SparseRural	<b>-0.18***</b>	<b>0.046</b>	<b>-0.067**</b>	<b>0.034</b>
Rural	<b>-0.094**</b>	<b>0.043</b>	-0.011	0.033
Athens	-0.008	0.084	-0.079	0.059
SchoolDistance	<b>0.016**</b>	<b>0.007</b>	-0.00001	0.004
SchoolDistance2	<b>-0.0004**</b>	<b>0.0002</b>	0.00006	0.0001
Altitude	-0.00005	0.00008	-0.00005	0.00006
Island	<b>-0.142***</b>	<b>0.046</b>	-0.048	0.034
SeaDistance	0.0003	0.0002	-0.0001	0.0002
MeanTemper	0.018	0.016	0.008	0.011
JulyMaxTemper	<b>-0.046***</b>	<b>0.013</b>	-0.011	0.008
MeanPrecipitation	0.008	0.007	-0.0009	0.0057
MeanWindSpeed	<b>-0.016**</b>	<b>0.007</b>	-0.005	0.006
Industry(#)	-0.003	0.002	0.001	0.002
Airport10	-0.006	0.056	-0.004	0.026
NatBeauty	<b>0.077*</b>	<b>0.044</b>	0.0005	0.037
Observations	3614		3614	
R-squared	0.3208		0.3155	

Robust clustered standard errors in parenthesis, \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

### *Environment, Location and Climate*

The NEI variable appears to have a strong positive influence on eudaimonia,  $b$ -coefficient = 0.107 ( $p$ -value < 0.001). Similarly to the adult literature findings (Nisbet, Zelenski & Murphy 2011), the experiential relation with nature is rather useful for adolescents' flourishing. Also, having a garden or green balcony at home appears to be significantly incremental to eudaimonic well-being. The effect of all other subjective measures of empirical affiliation with nature, i.e. perceptions about "green" neighborhood, view of nature from home and classroom window, is insignificant.

The significant role of deep bonding with nature, in line with (Ferrer-i-Carbonell & Gowdy 2007), has been verified by the strong positive effect of moralistic values, i.e. recognizing that nature's value is unique, human life is equally important than the life of other living things, and caring about the preservation of the environment in favor of future generations. In addition, being aware of global environmental problems such as climate change, animal extinction and deforestation is incremental to eudaimonia. These results could be combined with the negative impact of worldviews and relatively biocentric reasoning on life satisfaction. On the one hand, students become unhappy when realizing the threats for the quality of the natural environment and the living things. On the other hand, students with a stronger bonding with nature, realization of its unique value and the dangerous consequences of global environmental threats (proxied by "awareness" and "moralistic values" variables), score higher on eudaimonia.

With reference to location, the findings show that there is no significant relationship between urbanity and eudaimonia; "Athens" dummy has a statistically insignificant effect. On the other hand, rurality appears to be associated with lower levels of eudaimonic well-being, but only for sparse rural areas, i.e. villages or small towns with less than 2000 people; the effect of "sparse rural" dummy is negative and significant at a 5% level. Except from "sparse rural" dummy, the effect of all other location and climate variables are insignificant.

#### 5.4.4. Hierarchical Analysis: Nature-related Variance of Subjective and Eudaimonic Well-being

For a more complete picture of the impact of the natural environment on well-being, a hierarchical regression analysis was performed to estimate the percentage of variation in life satisfaction and eudaimonic well-being explained by the various aspects of nature (i.e. estimating the improvement in R-squared when a variable or a block of variables is added to the model). Here, we grouped the variables into four blocks: (i) control variables, i.e. socio-demographics and psychometrics, (ii) empirical contact with nature and perceptions, i.e. NEI, “neighborhoodgreen”, “schoolgreen”, “schoolgreenview”, “housegreenview” and “localconcerns” variables, (iii) attitudinal variables, i.e. worldviews, values (moralistic, utilitarian and dominionistic), awareness, and biocentric reasoning, and (iv) location and climate variables.

For the estimations, we employed OLS regressions with robust clustered standard errors. In the first step of the analysis, all blocks were entered together except for the predictor one. The predictor block, i.e. the group of variables for which we are interested in measuring their contribution to the model variation, was each time entered in the second step<sup>65</sup>. The percentage changes in R-squared attributed to each main predictor block (socio-demographics and psychometrics were used as control variables only) are reported in Table 5.18. The computation of F-tests has revealed a statistically significant contribution of all blocks to models’ variance, except from the contribution of “location and climate” block to eudaimonic well-being model. This is an expected outcome based on the findings of the simple OLS regression that we employed in the previous section. The impact of most location and climate variables on eudaimonic well-being appeared to be negligible (Table 5.17).

The largest variance on life satisfaction and eudaimonia is added by the “empirical contact with nature and perceptions” group (2.22 and 1.72 respectively). Interestingly, the attitudinal group accounts for a greater percentage of eudaimonic well-being model’s variance than life satisfaction model’s variance (0.92 and 0.5 respectively). It should not be surprising that the absolute values of the variance explained by the environmental and climate variables are not large, since according to the non-adult

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<sup>65</sup> For example, to estimate the contribution of block (ii) – empirical contact with nature and perceptions –, blocks (i), (iii) & (iv) enter the regression at the first step and block (ii) enters afterwards.

literature, there are other primary factors such as social relations with peers, self-esteem, health and relation with parents (Ben - Zur 2003, Gilman & Huebner 2003, Kasser 2005, Antaramian, Huebner & Valois 2008, Proctor, Linley & Maltby 2009) that determine the basic level of pupils' well-being. After all, our expectations would be to verify whether a stronger affiliation with nature may provide a supportive role for achieving better outcomes; the current statistical findings seem to be encouraging.

**Table 5.18 - Hierarchical Regression Analysis**

Blocks	Change in R-Squared	
	Life satisfaction	Eudaimonic well-being
<b>Empirical contact &amp; perceptions</b>	2.22***	1.72***
<b>Attitudinal variables</b>	0.5***	0.92***
<b>Location &amp; climate</b>	1.02***	0.50

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## 5.5. General Discussion: Comparing the Impact of Nature on Subjective and Eudaimonic Well-being

The findings of the current study provide some encouraging evidence about the positive influence of the natural environment on non-adult well-being. Following the contemporary theories of subjective well-being conceptualizations (Kahneman, Diener & Schwarz 1999, Ryan & Deci 2001, Waterman 2008), we distinguished between hedonia (happiness, life satisfaction) and eudaimonia (pursuit of virtue and excellence, purpose in life, personal expressiveness). The modest correlation ( $r = 0.20$ ) between the two measurement tools i.e. Huebner et al.'s (2006) BMSLSS and Waterman et al.'s (2010) QEWB scale (7-item modified version), indicates that there is good reason to separately investigate the two different well-being dimensions. This finding adds to the current debate on whether eudaimonia and life satisfaction should be treated as two distinct conceptualizations of subjective well-being (Kopperud & Vitterso 2008, Delle Fave et al. 2011, Vitterso & Soholt 2011).

A brief comparison of the two regression outcomes shows that, among the socio-demographic and psychometric variables, health, self-esteem status and reading for school are common positive determinants of the two well-being dimensions. Intrinsic orientations appear to be incremental to eudaimonia, while extrinsic aspirations are

insignificant in both cases. On the other hand, the involvement with electronic media appears to be detrimental to both subjective and eudaimonic well-being. Spending time online is associated with lower levels of life satisfaction, while watching television is associated with lower levels of eudaimonia. Playing PC games is harmful for both aspects of well-being. Arguably, the harmful effect on well-being could be attributed to increased feelings of depression and loneliness associated to computer and TV use (Moore & Schultz 1983, Sanders et al. 2000).

In relation to affiliation with the natural world, empirical exposure to nature is a significant determinant of pupils' well-being. It appears that nature does not only increase happiness, but also offers good opportunities for personal growth and expressiveness. Additionally, cognitive affiliation with nature and perceptions about environmental quality or degradation are associated with both dimensions of well-being as well. Students with positive perceptions about "green" neighborhood and schoolyard, and a view of nature from their bedroom window appear to be happier, while students who have reported that they live in a home with a garden or green balcony exhibit higher levels of eudaimonia. On the other hand, concerns about local environmental problems, such as air, water and noise pollution are detrimental to life satisfaction.

Concerns about the degradation of the natural environment are detrimental to happiness. On the other hand, the statistical findings provide some first evidence that a stronger cognitive and psychological bonding with nature can be beneficial for eudaimonic well-being. Students with stronger awareness about global problems such as climate change and species extinction, and deep respect for nature's unique value (moralistic values) exhibit higher level of eudaimonia.

Moreover, the outcomes of the analysis suggest that there is a negative effect of unfavorable climate conditions on subjective well-being. Higher temperatures during July and stronger annual wind speed are detrimental to happiness. Interestingly, as with perceptions about environmental quality, proximity to an area of outstanding natural beauty is a significant (at a 10% level) positive determinant of life satisfaction. The important role of green scenery is verified by both subjective and objective indicators. However, the explanatory power of objective indicators for environmental degradation is negligible in both regression models.

In summary, the findings of the current study verified the basic hypothesis of this thesis. As with adults (Nisbet, Zelenski & Murphy 2011), being empirically connected with nature can be beneficial for two important conceptualizations of children's well-being, i.e. life satisfaction and eudaimonia. Although more research is necessary, the current research suggests that focusing mainly on life satisfaction (which usually occurs based on a review of the literature) does not provide a complete picture of the benefits that may occur from stronger affiliation with nature. From a policymaking perspective, it would be beneficial to measure and monitor eudaimonic well-being with the help of appropriate scales, and designing specific interventions that would promote eudaimonia through the enhancement of various aspects of affiliation with the natural world.

We also found that subjective perceptions are significantly associated with both concepts of well-being. After all, it could be argued that it is how people perceive the surrounding environment that matters the most. Of course, it would be reasonable to expect a relatively strong association between objective conditions and subjective perceptions. However, in the current study, the effect of most objective variables is rather weak. Neither proximity to heavy pollution industries nor proximity to airports had a significant impact on well-being. On the other hand, living near areas of natural beauty appeared to have a positive impact on life satisfaction, but the effect was significant only at a 10% confidence level. These findings inform policy makers about the importance of adopting subjective indicators for a proper evaluation of local environmental conditions.

Of course, the current study exhibits some major limitations and opportunities for further research. First, since the data collection is based on regular school students, adolescents who have quitted school or are visiting technical schools are not represented in this study. This is particularly important especially for some urban and countryside areas with lower socio-economic characteristics, where higher levels of school drop-outs are observed. Second, the results of the study are based on older pupils', between 14 and 19 years old. For more generalized conclusions, it would be important to focus on pre-school, primary and early secondary school students as well. Third, the statistical findings refer to students' well-being during a specific period of time. For safer conclusions about long-term impact of nature and variations over the course of time, it would be necessary to employ a time series analysis.

Some of our findings may deserve further investigation. First, a potential research idea would be to investigate whether there are any specific individual or community related characteristics that make girls feel relatively unhappier. Second, perhaps surprisingly, spending time with friends is an insignificant indicator of eudaimonia, while doing hobbies and playing inside the home is incremental to eudaimonic well-being. Probably cognitive interviews could be employed to investigate pupils' opinions about their social environment, how they perceive relations with peers, and the types of the activities they are involved with when they are with friends or at home. Third, qualitative research may also be useful to assess the contradictory influence of stress on the two dimensions of well-being. Although reasonably stress can be particularly painful in the short-term, as indicated by the lower levels of life satisfaction, its positive association with eudaimonic well-being provides some evidence about the potential beneficial effect on personal growth (Updegraff & Taylor 2000, Britt, Adler & Bartone 2001). Fourth, the lower levels of well-being for pupils living in the countryside should raise serious concerns about the quality of life in the rural areas of Greece. Further research is necessary to reveal the particular personal, family, school and social conditions that make rural life more unpleasant.

## APPENDIX A5

Tables A5.1 – A5.5 present the statistical findings from model specifications. In Table A5.1 are included the results of LS and EWB ordered logit regressions, with standard errors clustered at “school class” level. The findings from LS and EWB OLS analysis are presented in Table A5.2 with errors clustered at “school” level (contrary to the main analysis of this chapter, where standard errors are clustered at “school class” level; please see Table 5.17 for the corresponding results). In Table A5.3 are presented the results from the LS and EWB three-level random-effects (multilevel) models with schools, school class and students as the three levels respectively. Finally, Tables A5.4 and A5.5 present the findings of more parsimonious OLS model specifications (with errors clustered at “school” level) for LS and EWB respectively. As the findings suggest, the results remain robust under various model specifications.



Table A5.1 - LS and EWB Ordered Logit Regressions

Variables	LS		EWB	
	Coeff.	St. E.	Coeff.	St.E.
<i>Socio-Demographics/Psychometrics</i>				
Girl	-0.560***	0.081	-0.062	0.094
Age	-0.102***	0.031	0.064**	0.033
Money	0.060**	0.038	-0.086*	0.038
Work	-0.091	0.088	-0.029	0.089
Homework	0.302***	0.037	0.171***	0.034
Hobbies	-0.014	0.027	0.217***	0.029
TVwatching	0.049	0.033	-0.103***	0.032
Internet	-0.124***	0.035	-0.022	0.035
PCgames	-0.056*	0.033	-0.080*	0.032
Friends	0.525***	0.051	0.015	0.047
IncomePerCap2010	0.144	0.369	0.415	0.426
Health	0.634***	0.048	0.288***	0.050
SelfEsteem	0.424***	0.039	0.311***	0.041
Stress	-0.180***	0.026	0.096*	0.040
Intrinsic	0.066	0.095	1.545***	0.098
Extrinsic	0.001	0.042	0.043	0.027
<i>Environmental Variables</i>				
NEI	0.210***	0.061	0.447***	0.064
NeighborhoodGreen	0.216***	0.037	0.069*	0.035
HouseGreen	0.191	0.119	0.314*	0.128
SchoolGreen	0.272***	0.095	-0.132	0.096
SchoolGreenView	0.064	0.078	0.096	0.093
HouseGreenView	0.197*	0.107	0.002	0.090
LocalConcerns	-0.085**	0.043	0.041	0.046
Worldviews	-0.122**	0.050	0.048	0.052
MoralisticValue	0.091	0.066	0.216***	0.069
UtilitarianValue	0.031	0.039	-0.035	0.042
DominionisticValue	-0.006	0.028	0.0005	0.031
RelBiocentricReas	-0.185**	0.076	-0.049	0.059
Awareness	-0.077	0.054	0.185***	0.049
IndoorSports	-0.050**	0.024	0.050*	0.025
InHomePlay	0.042	0.035	0.098***	0.032
Shopping/Cafe	0.057*	0.032	0.009	0.031
UnsafeFeeling	-0.013	0.032	0.006	0.031
<i>Location &amp; Climate</i>				
SparseRural	-0.412***	0.125	-0.331*	0.143
Rural	-0.254**	0.113	-0.032	0.131
Athens	-0.005	0.223	-0.411	0.252
SchoolDistance	0.040**	0.017	0.001	0.017
SchoolDistance2	-0.001**	0.001	0.0004	0.001
Altitude	0.00006	0.0002	0.0003	0.0003
Island	-0.315***	0.115	-0.117	0.137
SeaDistance	0.0003	0.001	0.0005	0.001
MeanTemper	0.030	0.039	0.009	0.044
JulyMaxTemper	-0.100***	0.032	-0.031	0.035
MeanPrecipitation	0.018	0.018	0.009	0.023
MeanWindSpeed	-0.047**	0.020	-0.021	0.025
Industry(#)	-0.005	0.007	0.007	0.008
Airport10	0.040	0.107	-0.020	0.113
NatBeauty	0.227**	0.120	0.017	0.153
Observations	3614		3614	
Pseudo R-squared	0.0696		0.0718	

Robust clustered standard errors in parenthesis, \* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$

Table A5.2 - LS and EWB OLS Regressions with Errors Clustered at "School" Level

Variables	LS		EWB	
	Coeff.	St. E.	Coeff.	St.E.
<i>Socio-Demographics/Psychometrics</i>				
Girl	-0.209***	0.031	-0.024	0.023
Age	-0.036***	0.013	0.021**	0.008
Money	0.020	0.014	-0.025***	0.010
Work	-0.046	0.033	-0.002	0.022
Homework	0.118***	0.013	0.038***	0.007
Hobbies	-0.003	0.010	0.048***	0.007
TVwatching	0.015	0.012	-0.022***	0.008
Internet	-0.042***	0.013	-0.006	0.008
PCgames	-0.026**	0.013	-0.021***	0.007
Friends	0.211***	0.019	0.001	0.011
IncomePerCap2010	0.093	0.141	0.075	0.101
Health	0.231***	0.017	0.066***	0.013
SelfEsteem	0.159***	0.014	0.066***	0.009
Stress	-0.073***	0.010	0.011*	0.005
Intrinsic	0.021	0.040	0.365***	0.022
Extrinsic	-0.009	0.017	0.012	0.010
<i>Environmental Variables</i>				
NEI	0.074***	0.023	0.107***	0.014
NeighborhoodGreen	0.073***	0.014	0.011	0.008
HouseGreen	0.063	0.048	0.054*	0.032
SchoolGreen	0.113***	0.043	-0.028	0.021
SchoolGreenView	0.019	0.034	0.022	0.021
HouseGreenView	0.086**	0.042	0.004	0.021
LocalConcerns	-0.033*	0.017	0.010	0.011
Worldviews	-0.053***	0.016	0.016	0.012
MoralisticValue	0.039	0.025	0.057***	0.018
UtilitarianValue	0.015	0.016	-0.005	0.010
DominionisticValue	-0.003	0.012	0.005	0.007
RelBiocentricReas	-0.068**	0.030	-0.015	0.013
Awareness	-0.022	0.023	0.047***	0.011
IndoorSports	-0.018*	0.010	0.026***	0.006
InHomePlay	0.012	0.014	0.026***	0.007
Shopping/Cafe	0.023*	0.013	0.006	0.007
UnsafeFeeling	-0.010	0.013	-0.015	0.007
<i>Location &amp; Climate</i>				
SparseRural	-0.18***	0.047	-0.067**	0.038
Rural	-0.094**	0.042	-0.011	0.036
Athens	-0.008	0.085	-0.079	0.057
SchoolDistance	0.016**	0.007	-0.00001	0.004
SchoolDistance2	-0.0004**	0.0002	0.00006	0.0002
Altitude	-0.00005	0.00007	-0.00005	0.00007
Island	-0.142***	0.057	-0.048	0.036
SeaDistance	0.0003	0.0003	-0.0001	0.0002
MeanTemper	0.018	0.018	0.008	0.009
JulyMaxTemper	-0.046***	0.014	-0.011	0.007
MeanPrecipitation	0.008	0.008	-0.0009	0.0051
MeanWindSpeed	-0.016*	0.009	-0.005	0.006
Industry(#)	-0.003	0.002	0.001	0.002
Airport10	-0.006	0.051	-0.004	0.028
NatBeauty	0.077*	0.044	0.0005	0.038
Observations	3614		3614	
R-squared	0.3208		0.3155	

Robust clustered standard errors in parenthesis, \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table A5.3 - Three-level (Multilevel) LS and EWB Regressions

Variables	LS		EWB	
	Coeff.	St. E.	Coeff.	St.E.
<i>Socio-Demographics/Psychometrics</i>				
Girl	-0.209***	0.032	-0.023	0.019
Age	-0.036***	0.012	0.020**	0.008
Money	0.020	0.015	-0.024***	0.009
Work	-0.048	0.032	0.001	0.019
Homework	0.117***	0.013	0.038***	0.008
Hobbies	-0.004	0.010	0.048***	0.006
TVwatching	0.014	0.012	-0.021***	0.007
Internet	-0.041***	0.013	-0.006	0.008
PCgames	-0.026**	0.012	-0.021***	0.007
Friends	0.210***	0.017	0.001	0.010
IncomePerCap2010	0.093	0.142	0.074	0.101
Health	0.232***	0.017	0.066***	0.010
SelfEsteem	0.160***	0.014	0.066***	0.008
Stress	-0.073***	0.010	0.010*	0.006
Intrinsic	0.025	0.033	0.364***	0.020
Extrinsic	-0.009	0.014	0.014	0.009
<i>Environmental Variables</i>				
NEI	0.074***	0.022	0.108***	0.014
NeighborhoodGreen	0.071***	0.013	0.011	0.008
HouseGreen	0.064	0.046	0.051*	0.028
SchoolGreen	0.111***	0.034	-0.028	0.021
SchoolGreenView	0.020	0.035	0.018	0.021
HouseGreenView	0.085**	0.035	0.003	0.021
LocalConcerns	-0.033**	0.017	0.012	0.010
Worldviews	-0.050***	0.018	0.017	0.011
MoralisticValue	0.038	0.025	0.059***	0.015
UtilitarianValue	0.016	0.015	-0.006	0.009
DominionisticValue	-0.003	0.011	0.005	0.007
RelBiocentricReas	-0.068***	0.024	-0.015	0.014
Awareness	-0.022	0.019	0.046***	0.011
IndoorSports	-0.018**	0.010	0.024***	0.006
InHomePlay	0.012	0.012	0.026***	0.007
Shopping/Cafe	0.024*	0.012	0.006	0.008
UnsafeFeeling	-0.010	0.012	-0.002	0.007
<i>Location &amp; Climate</i>				
SparseRural	-0.148***	0.051	-0.063**	0.031
Rural	-0.087*	0.045	-0.010	0.028
Athens	0.030	0.095	-0.069	0.059
SchoolDistance	0.016**	0.006	-0.00001	0.003
SchoolDistance2	-0.0004**	0.0002	0.00005	0.0002
Altitude	-0.00006	0.00009	-0.00005	0.00006
Island	-0.137**	0.054	-0.052	0.034
SeaDistance	0.0003	0.0003	-0.0001	0.0002
MeanTemper	0.019	0.016	0.007	0.010
JulyMaxTemper	-0.043***	0.013	-0.011	0.008
MeanPrecipitation	0.008	0.009	-0.0008	0.0056
MeanWindSpeed	-0.016*	0.009	-0.005	0.006
Industry(#)	-0.004	0.003	0.001	0.002
Airport10	-0.006	0.047	-0.003	0.027
NatBeauty	0.076	0.060	0.0005	0.037
Observations		3614		3614

Robust standard errors in parenthesis, \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table A5.4 - Life Satisfaction OLS Regressions: Alternative Specifications

Variables	Model 1		Model 2		Model 3	
<i>Socio-Demographics/Psychometrics</i>	Coeff.	St. E.	Coeff.	St.E.	Coeff.	St. E.
Girl	<b>-0.144***</b>	<b>0.029</b>	<b>-0.155***</b>	<b>0.029</b>	<b>-0.158***</b>	<b>0.029</b>
Age	<b>-0.035***</b>	<b>0.013</b>	<b>-0.032**</b>	<b>0.013</b>	<b>-0.031**</b>	<b>0.013</b>
Money	<b>0.028**</b>	<b>0.014</b>	<b>0.024*</b>	<b>0.014</b>	<b>0.025*</b>	<b>0.014</b>
Work	-0.054	0.034	-0.050	0.036	-0.055	0.035
Homework	<b>0.127***</b>	<b>0.014</b>	<b>0.124***</b>	<b>0.014</b>	<b>0.124***</b>	<b>0.015</b>
Hobbies	-0.009	0.010	-0.008	0.011	-0.007	0.011
TVwatching	-	-	-	-	-	-
Internet	-	-	-	-	-	-
PCgames	-	-	-	-	-	-
Friends	<b>0.219***</b>	<b>0.018</b>	<b>0.212***</b>	<b>0.019</b>	<b>0.210***</b>	<b>0.019</b>
IncomePerCap2010	0.088	0.135	0.089	0.135	0.088	0.135
Health	<b>0.239***</b>	<b>0.019</b>	<b>0.233***</b>	<b>0.018</b>	<b>0.232***</b>	<b>0.018</b>
SelfEsteem	<b>0.158***</b>	<b>0.015</b>	<b>0.153***</b>	<b>0.015</b>	<b>0.153***</b>	<b>0.015</b>
Stress	<b>-0.077***</b>	<b>0.010</b>	<b>-0.074***</b>	<b>0.010</b>	<b>-0.073***</b>	<b>0.010</b>
Intrinsic	0.024	0.037	0.030	0.038	0.027	0.038
Extrinsic	-	-	-	-	-	-
<i>Environmental Variables</i>						
NEI	<b>0.057***</b>	<b>0.023</b>	<b>0.076***</b>	<b>0.024</b>	<b>0.073***</b>	<b>0.024</b>
NeighborhoodGreen	<b>0.084***</b>	<b>0.014</b>	<b>0.077***</b>	<b>0.014</b>	<b>0.079***</b>	<b>0.014</b>
HouseGreen	0.063	0.043	0.073	0.046	0.073	0.046
SchoolGreen	<b>0.115***</b>	<b>0.037</b>	<b>0.101**</b>	<b>0.039</b>	<b>0.109***</b>	<b>0.039</b>
SchoolGreenView	0.020	0.033	0.017	0.033	0.020	0.032
HouseGreenView	<b>0.101**</b>	<b>0.042</b>	<b>0.094**</b>	<b>0.042</b>	<b>0.094**</b>	<b>0.042</b>
LocalConcerns	<b>-0.034**</b>	<b>0.016</b>	<b>-0.036**</b>	<b>0.017</b>	<b>-0.030*</b>	<b>0.016</b>
Worldviews	-	-	<b>-0.048***</b>	<b>0.019</b>	<b>-0.050***</b>	<b>0.019</b>
MoralisticValue	-	-	0.037	0.025	0.040	0.025
UtilitarianValue	-	-	0.012	0.016	0.014	0.016
DominionisticValue	-	-	-0.003	0.011	-0.004	0.011
RelBiocentricReas	-	-	<b>-0.069**</b>	<b>0.031</b>	<b>-0.069**</b>	<b>0.031</b>
Awareness	-	-	-0.020	0.022	-0.018	0.022
IndoorSports	-0.014	0.009	<b>-0.017*</b>	<b>0.010</b>	-0.016	0.010
InHomePlay	-0.016	0.010	-0.017	0.011	-0.014	0.011
Shopping/Cafe	-	-	-	-	-	-
UnsafeFeeling	-0.007	0.012	-0.009	0.012	-0.012	0.012
<i>Location &amp; Climate</i>						
SparseRural	<b>-0.126***</b>	<b>0.037</b>	<b>-0.128***</b>	<b>0.042</b>	<b>-0.109***</b>	<b>0.043</b>
Rural	<b>-0.128***</b>	<b>0.034</b>	<b>-0.124***</b>	<b>0.043</b>	<b>-0.113***</b>	<b>0.042</b>
Athens	0.004	0.070	0.091	0.088	-0.015	0.085
SchoolDistance	-	-	-	-	-	-
SchoolDistance2	-	-	-	-	-	-
Altitude	-	-	-	-	0.00006	0.00005
Island	-	-	-	-	<b>-0.069**</b>	<b>0.035</b>
SeaDistance	-	-	-	-	0.0003	0.0002
MeanTemper	0.004	0.009	0.007	0.010	-	-
JulyMaxTemper	<b>-0.024**</b>	<b>0.011</b>	<b>-0.026**</b>	<b>0.011</b>	-	-
MeanPrecipitation	0.005	0.007	0.006	0.007	-	-
MeanWindSpeed	<b>-0.021***</b>	<b>0.008</b>	<b>-0.022***</b>	<b>0.008</b>	-	-
Industry(#)	-	-	-0.004	0.003	-0.003	0.003
Airport10	-	-	-0.005	0.066	-0.005	0.065
NatBeauty	-	-	0.065	0.052	0.053	0.052
Observations	<b>3614</b>		<b>3614</b>		<b>3614</b>	
R-squared	<b>0.3152</b>		<b>0.3120</b>		<b>0.3117</b>	

Robust clustered standard errors in parenthesis, \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table A5.5 – Eudaimonic Well-being OLS Regressions: Alternative Specifications

Variables	Model 1		Model 2		Model 3	
<i>Socio-Demographics/Psychometrics</i>	Coeff.	St. E.	Coeff.	St.E.	Coeff.	St. E.
Girl	0.010	0.017	0.007	0.018	0.008	0.018
Age	<b>0.029***</b>	<b>0.009</b>	<b>0.026***</b>	<b>0.009</b>	<b>0.026***</b>	<b>0.008</b>
Money	<b>-0.018**</b>	<b>0.009</b>	<b>-0.020**</b>	<b>0.009</b>	<b>-0.020**</b>	<b>0.009</b>
Work	-0.006	0.021	0.001	0.021	0.001	0.022
Homework	<b>0.047***</b>	<b>0.008</b>	<b>0.042***</b>	<b>0.008</b>	<b>0.042***</b>	<b>0.008</b>
Hobbies	<b>0.047***</b>	<b>0.007</b>	<b>0.045***</b>	<b>0.007</b>	<b>0.045***</b>	<b>0.007</b>
TVwatching	-	-	-	-	-	-
Internet	-	-	-	-	-	-
PCgames	-	-	-	-	-	-
Friends	-0.010	0.010	-0.004	0.010	-0.005	0.010
IncomePerCap2010	0.063	0.105	0.065	0.105	0.069	0.098
Health	<b>0.064***</b>	<b>0.012</b>	<b>0.067***</b>	<b>0.012</b>	<b>0.068***</b>	<b>0.012</b>
SelfEsteem	<b>0.067***</b>	<b>0.009</b>	<b>0.066***</b>	<b>0.009</b>	<b>0.066***</b>	<b>0.009</b>
Stress	0.007	0.006	0.010	0.006	0.010	0.006
Intrinsic	<b>0.415***</b>	<b>0.025</b>	<b>0.368***</b>	<b>0.025</b>	<b>0.367***</b>	<b>0.025</b>
Extrinsic	-	-	-	-	-	-
<i>Environmental Variables</i>						
NEI	<b>0.124***</b>	<b>0.014</b>	<b>0.108***</b>	<b>0.014</b>	<b>0.108***</b>	<b>0.014</b>
NeighborhoodGreen	0.011	0.008	0.010	0.008	0.011	0.008
HouseGreen	<b>0.066**</b>	<b>0.032</b>	<b>0.055*</b>	<b>0.031</b>	<b>0.055*</b>	<b>0.031</b>
SchoolGreen	-0.027	0.022	-0.028	0.022	-0.026	0.022
SchoolGreenView	0.031	0.022	0.023	0.022	0.021	0.022
HouseGreenView	0.006	0.022	0.003	0.022	0.005	0.022
LocalConcerns	0.017	0.011	0.009	0.011	0.010	0.011
Worldviews	-	-	0.018	0.012	0.018	0.012
MoralisticValue	-	-	<b>0.057***</b>	<b>0.017</b>	<b>0.057***</b>	<b>0.017</b>
UtilitarianValue	-	-	-0.007	0.010	-0.007	0.010
DominionisticValue	-	-	0.005	0.007	0.006	0.007
RelBiocentricReas	-	-	-0.016	0.014	-0.016	0.014
Awareness	-	-	<b>0.050***</b>	<b>0.012</b>	<b>0.050***</b>	<b>0.012</b>
IndoorSports	<b>0.024***</b>	<b>0.007</b>	<b>0.024***</b>	<b>0.007</b>	<b>0.024***</b>	<b>0.005</b>
InHomePlay	<b>0.012**</b>	<b>0.006</b>	<b>0.015**</b>	<b>0.006</b>	<b>0.015**</b>	<b>0.006</b>
Shopping/Cafe	-	-	-	-	-	-
UnsafeFeeling	-0.002	0.007	-0.001	0.007	-0.001	0.007
<i>Location &amp; Climate</i>						
SparseRural	<b>-0.082***</b>	<b>0.029</b>	<b>-0.076**</b>	<b>0.031</b>	<b>-0.064**</b>	<b>0.032</b>
Rural	-0.034	0.028	-0.025	0.031	-0.015	0.032
Athens	-0.030	0.044	-0.060	0.059	-0.074	0.059
SchoolDistance	-	-	-	-	-	-
SchoolDistance2	-	-	-	-	-	-
Altitude	-	-	-	-	0.00002	0.00005
Island	-	-	-	-	-0.047	0.032
SeaDistance	-	-	-	-	-0.0002	0.0002
MeanTemper	0.012	0.010	0.010	0.007	-	-
JulyMaxTemper	-0.009	0.008	-0.005	0.008	-	-
MeanPrecipitation	0.00006	0.0042	0.00007	0.0048	-	-
MeanWindSpeed	-0.006	0.005	-0.005	0.006	-	-
Industry(#)	-	-	0.001	0.002	0.001	0.002
Airport10	-	-	-0.001	0.026	-0.007	0.027
NatBeauty	-	-	-0.002	0.037	-0.003	0.036
Observations	3614		3614		3614	
R-squared	0.2996		0.3106		0.3117	

Robust clustered standard errors in parenthesis, \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table A5.6 - Life Satisfaction OLS Regression (Dropping "shopping/cafe" Variable)

Variables	LS	
	Coeff.	St. E.
<i>Socio-Demographics/Psychometrics</i>		
Girl	-0.200***	0.031
Age	-0.034***	0.012
Money	0.026**	0.014
Work	-0.048	0.035
Homework	0.117***	0.014
Hobbies	-0.005	0.010
TVwatching	0.015	0.013
Internet	-0.040***	0.013
PCgames	-0.027**	0.013
Friends	0.218***	0.019
IncomePerCap2010	0.087	0.145
Health	0.231***	0.018
SelfEsteem	0.161***	0.015
Stress	-0.073***	0.010
Intrinsic	0.021	0.038
Extrinsic	-0.006	0.016
<i>Environmental Variables</i>		
NEI	0.076***	0.023
NeighborhoodGreen	0.072***	0.014
HouseGreen	0.065	0.045
SchoolGreen	0.113***	0.039
SchoolGreenView	0.023	0.032
HouseGreenView	0.087**	0.042
LocalConcerns	-0.033**	0.016
Worldviews	-0.052***	0.019
MoralisticValue	0.037	0.025
UtilitarianValue	0.017	0.015
DominionisticValue	-0.003	0.011
RelBiocentricReas	-0.069***	0.031
Awareness	-0.024	0.022
IndoorSports	-0.017*	0.009
InHomePlay	0.014	0.013
Shopping/Cafe	-	-
UnsafeFeeling	-0.010	0.012
<i>Location &amp; Climate</i>		
SparseRural	-0.160***	0.047
Rural	-0.095**	0.043
Athens	0.010	0.084
SchoolDistance	0.015**	0.006
SchoolDistance2	-0.0004**	0.0002
Altitude	0.00006	0.00008
Island	-0.140***	0.046
SeaDistance	0.0003	0.0002
MeanTemper	0.018	0.016
JulyMaxTemper	-0.046***	0.013
MeanPrecipitation	0.008	0.008
MeanWindSpeed	-0.015**	0.008
Industry(#)	-0.003	0.002
Airport10	-0.006	0.056
NatBeauty	0.077*	0.044
Observations	3614	
R-squared	0.3198	

Robust clustered standard errors in parenthesis, \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## **6. Subjective Well-being and the Natural Environment: Comparing England and Greece**

### **6.1. Introduction**

The econometric findings from the previous chapter highlighted the positive association between empirical exposure to nature and both dimensions of secondary school students' subjective well-being in Greece. It was also found that unfavorable climate conditions, i.e. higher temperatures in July and higher annual average wind speed are detrimental to pupils' life satisfaction. Given the paucity of studies examining the influence of nature and climate on pupils' self-reported well-being, we are still very far away from achieving generalizability of the findings. In an attempt to go a step further, a country comparison between Greece and England is employed by incorporating in the analysis a sample of approximately five hundred secondary school students from various urban and rural locations of England.

Comparing England and Greece offers the advantage of examining more thoroughly the role of nature in European societies through the prism of different cultural and climate characteristics. To the best of our knowledge, this is the first attempt to add an environmental and climate dimension on a micro-level comparison across two countries. The existing comparative studies, mainly within the field of psychology, have attempted to explore differences in non-adult self-reported well-being with reference to basic socio-demographic and cultural characteristics such as age, gender and individualism vs. collectivism (Park & Huebner 2005, Ferguson, Kasser & Jahng 2010). In the field of environmental economics, besides that most studies have focused on adult populations, the analysis is usually based on pooled datasets from a wide range of countries, yielding "global" estimates, i.e. the effect of certain predictors on well-being, rather than exploring effect differences across two or more countries (please see Chapter 2 for an extensive review).

The aim of the analysis is three-fold. First, it assesses whether pupils' self-reported well-being scores vary significantly between the two countries. Second, it explores the determinants of subjective and eudaimonic well-being that appear to be significant in both samples. Third, it investigates country differences on the magnitude of the effects by focusing, as in the previous chapter, on environmental predictors, i.e. students'

perceptions about the surrounding environmental quality, self-assessment of empirical and cognitive connectedness with nature, and on objective climate and location characteristics.

Since the availability of public statistics in Greece - especially at a small area level - is limited, the analysis is mainly based on the survey questions and a limited number of objective variables. Following again Kahn & Kellert's (2002) theory about the three types of empirical affiliation with the natural world, i.e. direct, indirect and vicarious, a "Nature Experience" index (NEI) was constructed as a proxy for all three types of exposure. Students' attitudes toward the environment, based on questions from well-known relevant scales (Kellert 1997, Schultz 2001, Manoli, Johnson & Dunlap 2007), are used to control for "environmental traits" in pupils' personality. The assessment of students' well-being is, as in the previous chapter, based on Huebner et al.'s (2006) 5-item BMSLSS scale, designed for primary and secondary school students, and on 7-item EWB scale, a modified version of Waterman et al.'s (2010) 21-item QEWB scale.

The rest of the chapter is structured as follows. Section 6.2 provides a rationale for the comparative analysis of England and Greece. A brief discussion on previous cross-national studies that have examined the impact of nature and climate on subjective well-being is provided in Section 6.3, while details about the survey methodology are discussed in Section 6.4. Next, the results from the comparison of the two samples (based on descriptive and econometric analyses) are presented in Section 6.5. Finally, Section 6.6 concludes with a summary of the main findings, limitations of the current work and ideas for future research.

## **6.2. Reasons to Compare England and Greece**

The different cultural, educational and climate characteristics of England and Greece provide strong reasons to expect variations on pupils' quality of life and way of thinking<sup>66</sup>. In relation to cultural differences, English society can be seen as individualistic, whereas Greek society can be considered collectivistic (Triandis 1995, Karatzias et al. 2001, Kalogeraki 2009). In general, individualistic societies promote

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<sup>66</sup> Cultural and educational differences are described in details in order to provide justification for the comparison of these two countries. In the regression analysis, a single dummy variable is included to account for country differences.



personal autonomy and independence, whereas collectivistic societies emphasize more the importance of tight family bonds and social interdependences (Schwartz 1990, Triandis 1995). According to the psychological literature (Park & Huebner 2005), the different cultural nuances and societal values associated with these two culture types appear to affect, among others, the formation of people's perceptions of self and others. The findings from the handful of studies that focused on non-adult populations suggest that people in individualistic societies tend to report higher scores on most domains of satisfaction with life than people in collectivistic societies (Park 2004, Park & Huebner 2005, Gilman et al. 2008).

Moreover, findings from the adult literature have shown that cultural differences are likely to affect people's attitudes and behaviors toward the natural environment. For example, Schultz (2002) has suggested that adult citizens of collectivistic nations are more likely to exhibit stronger concerns about environmental problems and a greater degree of biosphere reasoning than citizens of individualistic nations. Sarigöllü (2009) found that adults in Turkey (collectivistic society) have more positive environmental attitudes than people in Canada.

In case of non-adult populations, there are conflicting findings about the role of culture (not necessarily with reference to the distinction between individualism and collectivism) in shaping children's perceptions of nature. For example, the results from a qualitative study between elementary school students in Brazil and Portugal (Kahn & Lourenco 2002) showed that there are no cultural-related differences in pupils' affiliations with the natural world between the two countries. Evans et al. (2007) found only weak cross-cultural differences in elementary school students' attitudes in Austria, Mexico, Spain and the USA. In contrast, Boeve - de Pauw & Van Petegem (2011) found significant differences in environmental values and behaviors of lower secondary school students' in Belgium, Guatemala and Vietnam.

Hofstede's (2001) model of national cultures characteristics sheds further light on the key differences between the United Kingdom more broadly and Greece. Figure 6.1 introduces the ranking of the two countries on the four cultural dimensions of Hofstede's model: (i) power distance, (ii) individualism vs. collectivism, (iii) masculinity vs. femininity, and (iv) uncertainty avoidance. The content of the dimensions are described as follows:

**Power Distance (PDI):** This dimension expresses the degree to which the less powerful members of a society accept and expect that power is distributed unequally. The fundamental issue here is how a society handles inequalities among people. People in societies exhibiting a large degree of power distance accept a hierarchical order in which everybody has a place and which needs no further justification. In societies with low power distance, people strive to equalise the distribution of power and demand justification for inequalities of power.

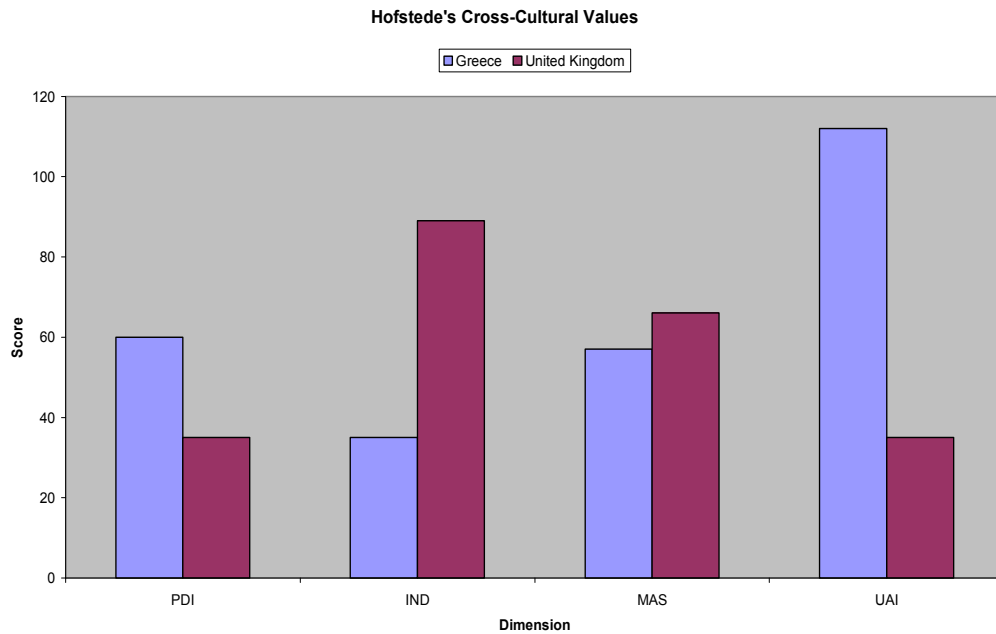
**Individualism vs. Collectivism (IND):** The high side of this dimension, called Individualism, can be defined as a preference for a loosely-knit social framework in which individuals are expected to take care of themselves and their immediate families only. Its opposite, Collectivism, represents a preference for a tightly-knit framework in society in which individuals can expect their relatives or members of a particular in-group to look after them in exchange for unquestioning loyalty. A society's position on this dimension is reflected in whether people's self-image is defined in terms of "I" or "we."

**Masculinity vs. Femininity (MAS):** The masculinity side of this dimension represents a preference in society for achievement, heroism, assertiveness and material reward for success. Society at large is more competitive. Its opposite, femininity, stands for a preference for cooperation, modesty, caring for the weak and quality of life. Society at large is more consensus-oriented.

**Uncertainty Avoidance (UAI):** The uncertainty avoidance dimension expresses the degree to which the members of a society feel uncomfortable with uncertainty and ambiguity. The fundamental issue here is how a society deals with the fact that the future can never be known: should we try to control the future or just let it happen? Countries exhibiting strong UAI maintain rigid codes of belief and behaviour and are intolerant of unorthodox behaviour and ideas. Weak UAI societies maintain a more relaxed attitude in which practice counts more than principles.

(Source: <http://geert-hofstede.com/dimensions.html>)

**Figure 6.1 – Hofstede’s Values Ranking for England & Greece**



*Source: <http://geert-hofstede.com/countries.html>*

As it can be seen in Figure 6.1, the two societies clearly differ in three out of four dimensions. More specifically, people in the United Kingdom appear to be less tolerant of social inequality compared to people in Greece (PDI dimension). They also appear to exhibit much lower anxiety about the future than the Greeks do (UAI dimension). Not surprisingly, the United Kingdom ranks very high on the individualistic society dimension, whereas Greece ranks rather low (IND dimension). Finally, although the scores of the two countries are similar, people in the United Kingdom appear to be slightly more driven by competitive values than people in Greece (MAS dimension).

Furthermore, with reference to child development, according to Bronfenbrenner’s ecological theory (1979, 1986), the “microsystem” environment of children and adolescents, i.e. their relations and interactions with friends, family and teachers during daily life, is strongly influenced by the “macrosystem” environment of a nation, i.e. ideologies, institutions and cultural norms for core issues such as politics and education. Since the “macrosystems” of England and Greece differ considerably, it is reasonable to expect different effects on pupils’ life at the “microsystem” level.

To mention a few examples with reference to education, England is characterized by a highly decentralized educational system with schools enjoying a high degree of independence. Conversely, despite various reforms that have taken place during the last few decades, the Greek educational system is highly centralized; schools are fully dependent and controlled by the central government (OECD 2011). Moreover, the underpinning philosophy of the English system is “humanism”, emphasizing individualism and morality, and promoting “intuitive” learning, while the Greek system is more collectivistic and egalitarian, being traditionally oriented toward the acquisition of academic knowledge (Pepin 1999, Karatzias et al. 2001, Matsagouras 2001). Finally, according to PISA<sup>67</sup> evaluation of secondary schools in England (Bradshaw et al. 2009), English students report high levels of satisfaction with school climate<sup>68</sup>, compared to most OECD countries, which is found to be strongly associated with higher levels of satisfaction with school and overall life (Konu, Lintonen & Rimpelä 2002, Baker & Maupin 2009, Suldo et al. 2012).

In relation to climate characteristics, most part of Greece falls within Köppen’s “Csa” classification (Köppen 1936, Peel, Finlayson & McMahon 2007), i.e. a typical Mediterranean climate with mild and wet winters, dry and hot summers. On the other hand, England has a typical oceanic climate (“Cfb” in Köppen’s classification) with cool winters, warm summers and increased levels of precipitation. The differences become very obvious by looking at some basic climate statistics in the two countries. According to the data we have collected from the locations of the recruited survey participants, the annual average temperature is 9.8°C and 16.6°C in England and Greece respectively, whereas the annual mean precipitation for the two countries is 646 mm for England and 569 mm for Greece.

The climate in England appears to be somewhat milder in terms of temperature extremes; the deviations of minimum January (England: 1.5°C, Greece: 4.2°C) and maximum July temperatures (England: 21.2°C, Greece: 31°C) from mean annual temperature are relatively stronger in Greece. Undoubtedly, climate characteristics are likely to affect pupils’ empirical contact and attitudes toward nature. For example, it would be reasonable to expect that higher temperatures and longer summer seasons would be positively associated with water-based outdoor activities, whereas lower temperatures would promote mountain-related activities. It could be also assumed, to

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<sup>67</sup> Program for International Student Assessment.

<sup>68</sup> It refers to social climate and school’s ethos.

mention one more example, that increased precipitation levels might restrict pupils' access to various local outdoor activities and sports in school or the neighborhood.

### **6.3. Influence of Nature and Climate on Subjective Well-being**

Existing studies focusing on well-being and the natural environment can be divided into two main subgroups: (i) micro-level studies examining the role of nature and climate within a single country context and (ii) macro-level studies employing international comparisons by using nation-level statistics of self-reported well-being and its main indicators, such as national GDP per capita, social capital, natural capital and climate characteristics. The outcomes of these studies have been discussed in details in previous chapters<sup>69</sup>. As a brief summary, the findings have highlighted the positive influence of affiliation with nature, positive perceptions about the environment, objective environmental quality (measured by various indices of environmental sustainability such as natural capital), mild climate conditions and sunshine on well-being of adult and non-adult populations (Frijters & Van Praag 1998, Marks, Shah & Westall 2004, Brown & Kasser 2005, Brereton, Clinch & Ferreira 2008, Bonini 2008, Engelbrecht 2009, Nisbet, Zelenski & Murphy 2011, Maddison & Rehdanz 2011).

Conversely, environmental degradation, usually represented by objective air pollution measures and proximity to major sources of pollution such as airports, and negative attitudes and concerns toward the environment, appears to be detrimental to well-being (Welsch 2002, Welsch 2006, Ferer-i-Carbonel & Gowdy 2007, Rehdanz & Maddison 2008, MacKerron & Mourato 2009). As it has been mentioned already, most of the literature has concentrated on adult populations and on the hedonic dimension of well-being, i.e. happiness or life satisfaction.

There are also a few recent cross-country comparative studies that have employed a mix of micro-level and macro-level analysis to investigate the effect of regional environmental quality and climate on individual (without aggregating to country-level) subjective well-being. Ferreira et al. (2012) investigated the effect of regional air pollution on individual subjective well-being across 23 countries in Europe between

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<sup>69</sup> Please see Chapters 2 and 5.

2002 and 2007. They combined a unique data set of spatial characteristics, including air pollution, climate and macroeconomic data at regional level within each country, with a set of individual socio-demographic data provided by the European Values Survey. Their findings highlighted the negative influence of air pollution on individual life satisfaction. The coefficients of climate extremes variables, i.e. maximum temperature in July (negative sign) and minimum temperature in June (positive sign), indicated people's preferences toward milder climates, but they were statistically insignificant. Oddly, precipitation appeared to be incremental to subjective well-being.

A main focus on the impact of climate characteristics has been given by Murray, Maddison & Rehdanz (2011). Similarly to Ferreira et al. (2012), their spatial analysis was performed at regional level within 19 European countries in order to assess whether geographical variations of climate within each country accounts for different levels of subjective well-being. The results from various linear and non-linear model specifications revealed that lower levels of average annual percentage sunshine, higher levels of annual relative humidity and larger standard deviation from average annual temperature are all detrimental to individual life satisfaction. Furthermore, they created a non-monetary "quality of climate" indicator to rank households' preferences for climate. For each region of a country, they summed over the products of each climate variable coefficient (yielded from the regression analysis) and the regional value of the climate variable to derive a regional indicator. The ranking of each country was derived by averaging all regional indicators<sup>70</sup>. Among 19 countries, Greece ranked second, whereas the United Kingdom ranked seventh. Interestingly, Spain, Greece, Portugal and Italy are at the top of the ranking list, indicating a clear preference towards the Mediterranean climate in general.

However, it should be noted that most of the available studies (as those ones described in this section) did not report potential differences in the magnitude of the effect of various environmental or climate variables across regions of a certain country or across countries, since their main objective was to estimate the "global" effect of the various parameters and not to proceed with cross-country comparisons. An attempt to estimate cross-national differences on the magnitude of air pollution effect has been made by

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<sup>70</sup> The index for each region was calculated as follows:  $QOC_j = \sum_i \phi_i z_{ij}$ , where  $\phi_i$  is the coefficient of climate variable  $i$  and  $z_{ij}$  is the level of climate variable  $i$  in location  $j$ . The total index for the country was computed by averaging the  $j$  regional indices.

Welsch (2006), but he employed a macro-level analysis, focusing on aggregated country-level happiness. Specifically, he used data from ten European countries, including Greece and the UK, to examine the effect of atmospheric pollution, as measured by nitrogen dioxide and lead concentration, on life satisfaction for the period 1990 - 1997. Not surprisingly, higher levels of atmospheric pollution are negatively associated with subjective well-being. To assess the magnitude of the effects on each country, the author estimated how well-being was affected by the change of air pollution levels between 1990 and 1997. As a general conclusion, drops in air pollution levels were beneficial to subjective well-being. Although the pollution reduction was greater in Greece than in the United Kingdom, -11.6 % and -7.9% respectively, the positive change in well-being was only slightly higher in Greece, 0.019 vs. 0.014 in England, implying that the magnitude of air pollution effect was stronger in the United Kingdom.

## **6.4. Survey Methodology**

### **6.4.1. Survey Process and Data**

The data collection was based on quantitative surveys conducted in 94 secondary schools in Greece and 15 secondary schools in England during the academic years 2010-2011 and 2011-2012. The final sample consists of 527 British and 3614 Greek students coming from 374 locations in Greece and 40 locations in England. The objective of the sampling strategy was to select locations that would cover a wide range of economic and climate characteristics across the two countries. Table 6.1 presents the NUTS <sup>271</sup> areas where survey participants come from and their distribution between rural and urban region, and households' gross disposable income (HGDI) per head for 2010.

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<sup>71</sup> Nomenclature of Territorial Units of Statistics: A hierarchical classification of European countries' regions used by Eurostat to derive statistics at regional level. Three levels have been defined: (i) NUTS 1: major socio-economic regions, (ii) NUTS 2: basic regions for the application of regional policies, (iii) NUTS 3: small regions for specific diagnose. England is divided into 30 and Greece into 13 NUTS 2 areas. More details can be found in Eurostat's "European Regional Yearbook, p.16" (2011).

### *Dependent Variables*

Students' subjective well-being assessment is based on Huebner et al.'s (2006) 5-item "Brief Multidimensional Life Satisfaction" scale (BMLSS), assessing five main life domains: (i) family, (ii) friends, (iii) school, (iv) self, and (v) place. Eudaimonia is measured by the modified 7-item EWB scale derived by Waterman et al.'s (2010) original 21-item QEWB, assessing pupils' "deeper" fulfillment with life. The updated short version was designed in such a way to be suitable for research with non-adult populations. The modification process and the performance quality of the adapted scale are presented in Chapter 4.

### *Independent Variables (Table 6.2)*

As in the Greek case study analysis, the predictors were classified into three main categories<sup>72</sup>: (i) socio-demographics and psychometrics (ii) environmental variables, and (iii) location and climate variables. The first two groups contain mainly subjective variables constructed by students' answers during the survey procedure, whereas the third group contains some basic objective variables at regional level. More specifically, the first group consists of predictors that have been used widely in existing research as determinants of pupils' self-reported well-being (Huebner 2004, Antaramian, Huebner & Valois 2008, Huppert 2009), i.e. age, gender, pocket money, time allocation for various basic activities (school reading, hobbies, TV watching, computer games, internet usage, gatherings with friends), self-reported physical health, stress status, self-esteem and intrinsic aspirations.

In the second group (environmental variables), "Nature Experience" index (NEI) measures pupils' empirical affiliation with nature (direct, indirect and vicarious)<sup>73</sup>, while relatively biocentric reasoning, worldviews, moralistic values and awareness of global environmental issues such as climate change and ozone layer depletion are used as proxies for "environmental traits" in pupils' personality or natural inclination toward nature. The subjective assessment of local environmental quality is based on

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<sup>72</sup> A detailed discussion on the selection of the variables can be found in Chapter 5.

<sup>73</sup> Direct experience is gained when students are involved with local outdoors (via sports, park play, etc.) and nature outdoor activities (excursions, camping, mountain and water sports for example). Indirect experience refers to students' visits to areas of "natural interest" such as natural history museums, zoos and aquariums. Vicarious experience is gained when students read or watch materials about the natural environment. NEI consists of ten questions covering all types of empirical experience. Please see Chapters 4 and 5 for more details.



students' perceptions of how green their neighborhood is and of local environmental problems such as air and noise pollution, and on statements about "view of nature" from bedroom and school class windows. Finally, to control for non nature-related effects on life satisfaction and eudaimonia, students' involvement with play at home and indoor sports have been included, while pupils' perceptions on how safe they feel in the neighborhood is used to control for problems that prohibit or restrict outdoor activities.

In the third group (location and climate), two rural dummy variables distinguish between pupils living in areas of less than 5000 thousand people (sparse rural) and between 5000 and 10000 thousand people (rural) respectively. According to the UK's Office for National Statistics, an area is considered rural if it is inhabited by less than 10000 people. In turn, the Greek Statistical Authority distinguished between rural (less than 2000 thousand people) and semi-rural (between 2000 and 10000 thousand people) areas during the 1991 Census. The semi-rural classification was later removed during the 2001 Census and the threshold of 2000 residents was used in the updated classification to define rural and urban locations.

For the purpose of the current analysis, we felt that it would be preferable to follow the classification of the 1991 Census, since it would allow us to make a convenient distinction among very small rural (mainly villages) and moderately small rural areas (larger villages or small towns). Since the small percentage of British pupils living in very small areas did not allow us to construct the appropriate dummy, we increased the threshold to 5000 residents. Also, a dummy variable was added representing students living in large urban centers, i.e. Athens, London and Manchester.

The description of the regional climate conditions is based on statistics about the annual mean temperature, July maximum temperature, annual mean precipitation and wind speed for the period between 1960 and 1997 for Greece, and between 1970 and 2000 for England. Unfortunately, lack of data availability did not allow us to add important indicators such as sunshine and relative humidity. Finally, the existence of an area of outstanding natural beauty<sup>74</sup> and/or "Natura 2000" within ten kilometers of participants' location is used as a proxy for objective environmental quality.

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<sup>74</sup> There are 33 areas in the United Kingdom and 449 areas in Greece. Each country has implemented different criteria for the selection of these areas. More information can be found in Chapter 4.

Some of the variables that had been used in the analysis of the Greek case study (Chapter 5) were excluded from the current comparative analysis. Specifically, we excluded variables that appeared to be of relatively little importance (as basic predictors or control factors) in both samples - the work dummy, cafeteria visits, extrinsic goals, income per capita, regional disposable income per capita, proximity to coast and airport, distance to school - in order to simplify the specification of the models and avoid losing degrees of freedom from the relatively smaller English sample. Moreover, we excluded the “island” dummy, altitude, “garden or green balcony” dummy and “heavy pollution industries” variable; the former three variables showed very little variance within the English sample, whereas spatial data was not available for the latter variable in England.

**Table 6.1 - NUTS 2 HGDI per Head, and Distribution of Participants between Urban and Rural Areas**

NUTS2 - England	Rural Sample	Urban Sample	GHDI per head (£)
Bedfordshire & Hertfordshire	1	69	17830
East Anglia	7	27	15276
East Riding & North Lincolnshire	30	1	13303
Gloucestershire, Wiltshire & Bristol/Bath	34	12	15935
Greater Manchester	-	18	13548
Herefordshire, Worcestershire & Warwickshire	43	3	16147
Inner London	-	92	23846
Outer London	-	82	17892
Leicestershire, Rutland & Northamptonshire	63	18	14640
Cumbria	17	5	15021
Lancashire	3	2	13763
<b>Total/Average</b>	<b>198</b>	<b>329</b>	<b>15931*</b>
NUTS2 - Greece	Rural Sample	Urban Sample	GHDI per head (€)
Attica (Greater area of Athens)	-	1.201	19362
Continental Greece	645	-	15625
Central Macedonia	303	77	13751
Crete	57	81	15938
East Macedonia & Thrace	69	-	14362
Epirus	76	80	15289
Ionian Islands	64	-	14052
North Aegean	151	-	15816
Peloponnesus	99	48	14774
South Aegean	91	54	15816
Thessaly	149	207	15148
West Greece	162	-	14809
<b>Total/Average</b>	<b>1.866</b>	<b>1.748</b>	<b>15249*</b>

\* This is the average HGDI for the whole country (based on all NUTS 2 areas, not only those ones reported here. Statistics available by Greece's Ministry of Finance & UK's Office of National Statistics.

**Table 6.2 – Description of Independent Variables**

<b>Independent Variables</b>	<b>Values and Description</b>
<i>Socio-demographics/Psychometrics</i>	
<b>Girl</b>	1 if female
<b>Age</b>	Between 12 and 19
<b>Money</b>	Weekly pocket money: ordinal variable (1 - 4)
<b>Homework</b>	Weekly school reading: 1 - 5 (never/rarely - very often)
<b>Hobbies</b>	Weekly time for hobbies: 1 - 5 (never/rarely - very often)
<b>TVwatching</b>	Weekly TV watching: 1 - 5 (never/rarely - very often)
<b>Internet</b>	Weekly internet surfing: 1 - 5 (never/rarely - very often)
<b>PCgames</b>	Weekly computer games: 1 - 5 (never/rarely - very often)
<b>Friends</b>	Weekly time with friends: 1 - 5 (never/rarely - very often)
<b>Health</b>	Health status: 1 - 5 (not at all healthy - very healthy)
<b>SelfEsteem</b>	Confidence: 1 - 5 (not at all confident - very confident)
<b>Stress</b>	Stress status: 1 - 5 (not at all stressed - very stressed)
<b>Intrinsic</b>	8-item score: 1 - 5 (not at all important - very important)
<i>Environmental Variables</i>	
<b>NEI</b>	Students' empirical exposure to nature (score between 1 to 5)
<b>NeighborhoodGreen</b>	Perception about green neighborhood: 1 - 5 (not at all/very few - many)
<b>SchoolGreen</b>	Perception about school green yard: 1 for existence of green schoolyard
<b>SchoolGreenView</b>	1 if there is a view of nature from classroom window
<b>HouseGreenView</b>	1 if there is a view of nature from home window
<b>LocalConcerns</b>	4-item score: concerns about local environmental problems: 4-item score between 1 - 5 (not at all worried - very worried)
<b>Worldviews</b>	2-item score ranging between 1 and 5 (strongly disagree - strongly agree)
<b>MoralisticValue</b>	3-item score ranging between 1 and 5 (strongly disagree - strongly agree)
<b>RelBiocentricReas</b>	Mean-corrected biocentric reasoning: relatively stronger biocentric (over anthropocentric) concerns about the consequences of environmental degradation to animals and plants; score between -0.2 and 0.2
<b>Awareness</b>	Awareness about global environmental issues: 4-item score, 1 - 5 (not at all worried - very worried)
<b>IndoorSports</b>	Participation to indoor sports: 1 - 5 (never, rarely, once or twice a week, several times a week, very often/everyday)
<b>InHomePlay</b>	Play at home: 1 - 5 (as above)
<b>UnsafeFeeling</b>	Perceptions on local security issues: 1 - 5 (not at all severe - very severe)
<i>Location &amp; Climate</i>	
<b>SparseRural</b>	1 if city/village population less than 5000
<b>Rural</b>	1 if city/village population between 5000 and 10000
<b>LargeUrban</b>	1 if participant lives in a large urban zone
<b>MeanTemper</b>	Annual average temperature in Celsius (time series data between 1960 - 1997)
<b>JulyMaxTemper</b>	July Max temperature in Celsius (time series data between 1960 - 1997)
<b>MeanPrecipitation</b>	Annual average precipitation (in mm) (time series data between 1960 - 1997)
<b>MeanWindSpeed</b>	Annual average wind speed (in m/s) (time series data between 1960 - 1997)
<b>NatBeauty</b>	1 if there is an area of extraordinary beauty and/or Natura 2000 within 10 km from participant's city/village

## 6.4.2. The Model

Initially, the comparison of the two countries was based on the estimation of two separate regressions. This approach allows all coefficients to vary across the two samples (fully unconstrained model):

$$\text{England: } swb_{i,jk} = a + a_1 x_{i,jk} + a_2 w_{i,jk} + a_3 z_{i,jk} + \varepsilon_{i,jk} \quad (6.1)$$

$$\text{Greece: } swb_{i,jk} = \beta + \beta_1 x_{i,jk} + \beta_2 w_{i,jk} + \beta_3 z_{i,jk} + \varepsilon_{i,jk} \quad (6.2)$$

where  $swb_{i,jk}$  denotes life satisfaction or eudaimonic well-being score of student  $i$  in school  $j$  and school class  $k$ ,  $x_{i,jk}$  is a vector of socio-demographic and psychometric variables,  $w_{i,jk}$  is a vector of environmental variables and  $z_{i,jk}$  is a vector of location and climate variables (varying at individual level). To detect specific effect differences across the two groups, Wald tests are employed testing the null hypothesis, i.e.  $H_0 : \alpha_1 - \beta_1 = 0, \alpha_2 - \beta_2 = 0$ . However, the Wald test cannot inform about the direction and the size of the potential effect differences. For that purpose, we fit a joint model by pooling the two samples together:

$$swb_{i,jk} = \gamma + \gamma_1 x_{i,jk} + \gamma_2 w_{i,jk} + \gamma_3 z_{i,jk} + \gamma_4 d + \gamma_5 du_{i,jk} + e_{i,jk} \quad (6.3)$$

where  $d$  is the country dummy (England) and  $\gamma_5 du_{i,jk}$  is a set of interaction terms between the country dummy and a vector  $u$  with variables from vectors  $x$ ,  $w$  and  $z$ . For the estimation of the parameters we employed OLS linear regressions with robust clustered standard errors in order to account for intraclass correlation among respondents. In order to avoid estimation problems that arise when there are only a few clusters<sup>75</sup> (Cameron, Miller & Gelbach 2008), we increased the number of clusters by classifying students within classes in each school, and not within school only. The problem mainly arises with the English sample, since clustering only at school level would yield 15 different clusters, far less than the number of the independent variables that are entered in the model.

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<sup>75</sup> The estimations of clustered analysis are correct only as long as the number of clusters approaches "infinity". According to Cameron, Miller & Gelbach (2008), a number of at least 30 clusters are required to satisfy this assumption.

## 6.5. Cross - country Comparison Results

### 6.5.1 Descriptive Statistics

The descriptive statistics summarized in Tables 6.3 - 6.5 show the main differences between the two sample populations. To highlight some key points, the majority of the English pupils, i.e. 56.17%, are boys, while the majority of the Greek pupils, i.e. 55.48%, are girls. The mean age of the English pupils is somewhat lower than the mean age of the Greek students,  $m_e = 14.68$  ( $sd_e=1.55$ ) and  $m_g=16.42$  ( $sd_g=1.17$ ). In England, survey participants are distributed across all school grades of secondary and sixth form school, year 7 to year 13, while students in year 7<sup>76</sup> were excluded from the survey procedure in Greece. Concerning participants' location, 59.58% of the students reside in London or other urban areas and 40.42% of the students live in the countryside (sparse rural areas and rural areas). In contrast, more than half of the Greek sample, 54.40%, is located in rural areas, while 45.60% live in Athens or other urban areas.

In relation to time allocation for various activities (Tables 6.5 & 6.8), English students dedicate relatively higher amounts of time to hobbies,  $m_e = 3.71$  ( $sd_e=1.32$ ), TV watching,  $m_e = 3.75$  ( $sd_e=1.14$ ) and "social media" related activities such as computer games,  $m_e = 3.43$  ( $sd_e=1.44$ ), and internet surfing,  $m_e = 3.89$  ( $sd_e=1.07$ ). For Greek students, the corresponding mean time allocation values for the aforementioned activities are  $m_g=3.27$  ( $sd_g=1.41$ ),  $m_g=3.34$  ( $sd_g=1.10$ ),  $m_g=2.38$  ( $sd_g=1.42$ ), and  $m_g=3.49$  ( $sd_g=1.26$ ) respectively. Here, it would be worth highlighting the noticeably low popularity of computer games among Greek adolescents; only 25.57% of the participants have mentioned that they are frequently involved with computer games during a regular week. On the contrary, the vast majority of the Greek participants, 85.52% ( $m_g=4.30$ ,  $sd_g=0.84$ ), appear to spend plenty of their weekly time with their friends. The corresponding percentage for the English participants is 60.34% ( $m_e=3.64$ ,  $sd_e=1.15$ ). Finally, the weekly average time dedicated to homework appears to be almost identical for the two populations,  $m_e = 3.74$  ( $sd_e=1.18$ ) and  $m_g=3.75$  ( $sd_g=1.05$ ) respectively. Except for this latter variable, the t-test comparison yielded statistically significant mean differences for all other time allocation variables<sup>77</sup>.

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<sup>76</sup> The secondary education stage in Greece, compulsory and post-compulsory, consists of six years, year 7 - year 12.

<sup>77</sup> Homework:  $t(4139) = 0.27$ ,  $p > 0.1$ , hobbies:  $t(4139) = -6.72$ ,  $p < 0.001$ , friends:  $t(4139) = 15.88$ ,  $p < 0.001$ , TV:  $t(4139) = -7.90$ ,  $p < 0.001$ , PC games:  $t(4139) = -15.66$ ,  $p < 0.001$ , internet:  $t(4139) = -6.93$ ,  $p < 0.001$ .

Regarding psychometric statistics, English students score higher in all aspects of satisfaction with life. As it can be seen in Table 6.4, the mean life satisfaction scale score is  $m_e=5.42$  ( $sd_e=0.92$ ), slightly higher than the mean life satisfaction scale score of Greek students,  $m_g=5.22$  ( $sd_g=0.83$ ). This finding is consistent with the available adult and non-adult literature suggesting that people from individualistic societies tend to report higher satisfaction with life than people from collectivistic societies (Diener, Oishi & Lucas 2003, Park & Huebner 2005). In terms of percentages (Table 6.7), 74.76% of the English students and 67.93% of the Greek students are happy or very happy with their life overall.

A high percentage of Greeks, 42.68% and 37.84%, appear to be particularly dissatisfied or moderately satisfied with their school life and their living environment respectively. In the latter domain, the highest difference in mean values between the two samples is observed,  $m_e=5.27$  ( $sd_e=1.48$ ) and  $m_g=4.95$  ( $sd_g=1.51$ ) accordingly. Given that concerns about local environmental problems and unsafe feelings are higher among Greek students (Tables 6.6 & 6.9), it could be argued that there are negative environmental degradation and safety - related effects on self-reports about satisfaction with the living environment in Greece. Table 6.11 presents the raw correlations between satisfaction with place and three neighborhood environment variables, i.e. perceptions about green neighborhoods, concerns about local environmental conditions (such as air and noise pollution) and concerns about local safety. Not surprisingly, there is a moderate positive correlation between satisfaction with place and perceptions on green neighborhood ( $r_{en} = 0.31$ ,  $r_{gr} = 0.33$ ), while a moderate negative correlation is observed with local safety feelings ( $r_{en} = -0.28$ ,  $r_{gr} = -0.12$ ) and concerns ( $r_{en} = -0.17$ ,  $r_{gr} = -0.18$ ).

In contrast, Greek students reported considerably higher levels of eudaimonic well-being ( $m_g=4.20$ ,  $sd_g=0.50$  vs. England's  $m_e=3.71$ ,  $sd_e=0.60$ , Table 6.4). This is an unexpected outcome if taking into account that individualistic societies tend to promote autonomy (Ferguson, Kasser & Jahng 2010), a concept associated with the concept of eudaimonia (Waterman 2008). In addition, the fact that lower scores on life satisfaction are associated with higher scores on eudaimonia (in Greece) and vice versa (in England), indicates that the contemporary research findings suggesting that adults' eudaimonic well-being is not necessarily strongly associated with life satisfaction (Keyes 2007, Delle Fave et al. 2011), apply to non-adult populations as well.

Greek students also show higher levels of physical health ( $m_g=4.09$ ,  $sd_g=0.78$  vs. England's  $m_e=3.80$ ,  $sd_e=0.80$ ), self-confidence ( $m_g=3.80$ ,  $sd_g=0.99$  vs. England's  $m_e=3.59$ ,  $sd_e=1.02$ ) and stress (Table 6.5). The fact that stress levels are particularly high in both samples,  $m_e=3.14$  ( $sd_e=1.15$ ) in England and  $m_g=3.54$  ( $sd_g=1.29$ ) in Greece, should raise concerns about pupils' school and social environment. Furthermore, a relatively high percentage of the English sample reported low scores on health and self esteem (Table 6.8). In particular, 29.41% and of the English pupils mentioned that their health status is poor or moderate and a 40.23% reported low or average self-confidence. The relevant percentages for the Greek pupils are 18.38% and 32.62% respectively. The t-test statistics indicate that mean differences of all psychometric variables are statistically significant at a 1% confidence level, except for satisfaction with family which appears to be significant only at a 5% confidence level<sup>78</sup>.

As argued before, Greek students appear to have more positive perceptions about the existence of green in their neighborhood (Table 6.9). Particularly, 59.84% of them mentioned that they live in an area with plenty of green. The percentage for the English sample is 49.53%. On the other hand, 63.52% of the Greek participants appear to be anxious about local environmental degradation factors such as air and noise pollution, and 55.88% of them feel unsafe in their neighborhood. For the English sample, 27.13% and 36.12% are worried about local environmental problems and safety respectively. The vast majority of the Greek pupils, 90.42%, showed awareness about global environmental problems such as climate change and ozone layer depletion. A smaller percentage (72.68%) of aware students is observed in the English sample.

These findings are in line with part of the adult and non-adult literatures, suggesting that people in collectivistic societies show a higher degree of environmental awareness and concerns (Schultz 2002, Boeve - de Pauw & Van Petegem 2011). In relation to empirical affiliation with the natural world, roughly over than half of the Greek student sample, 53.90%, scored high on the relevant index (NEI), while the corresponding percentage is slightly lower, 44.59%, for the English student sample. This outcome might be partially explained by the more favorable conditions for outdoor activities and recreation in Greece. The t-test comparisons suggest that all

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<sup>78</sup> LSS:  $t(4139) = -5.03$ ,  $p < 0.001$ , LS family:  $t(4139) = -1.90$ ,  $p < 0.05$ , LS friends:  $t(4139) = -4.08$ ,  $p < 0.001$ , LS school:  $t(4139) = -2.95$ ,  $p < 0.01$ , LS self:  $t(4139) = -2.73$ ,  $p < 0.01$ , LS place:  $t(4139) = -4.47$ ,  $p < 0.001$ , EWB:  $t(4139) = 17.88$ ,  $p < 0.001$ , health:  $t(4139) = 7.82$ ,  $p < 0.001$ , stress:  $t(4139) = 6.61$ ,  $p < 0.001$ , self-esteem:  $t(4139) = 4.54$ ,  $p < 0.001$ .

mean differences of the aforementioned environmental variables between the two countries are statistically significant at a 1% confidence level<sup>79</sup>. Only differences in relatively biocentric reasoning were found to be statistically insignificant, an expected outcome given the very slight difference in the absolute mean values,  $m_e = -0.14$  ( $sd_e = 0.63$ ) and  $m_g = -0.11$ ,  $sd_g = 0.52$  (Table 6.6). The negative sign implies that students' anthropocentric reasoning prevails over biocentric reasoning in both countries.

To briefly discuss the raw correlations between some basic variables (Table 6.10), the relationship of life satisfaction and eudaimonia is considerably weaker among Greek students,  $r = 0.20$ , when compared to British students,  $r = 0.39$ . In general, all correlations between the various variables, ranging from negligible/very weak to moderately strong, are more powerful in the English sample. Interestingly, the relationship between life satisfaction and intrinsic aspirations is modest in case of England ( $r = 0.27$ ), but weak in case of Greece ( $r = 0.12$ ); while the correlations with extrinsic aspirations are fairly weak in both samples ( $r_{en} = 0.12$  and  $r_{gr} = 0.05$ ). In accordance with eudaimonic well-being theory (Waterman 2008), a fairly strong correlation has been observed between pupils' eudaimonic well being and intrinsic aspirations in England ( $r = 0.55$ ) and Greece ( $r = 0.44$ ). On the other hand, as in the case of life satisfaction, the correlation of extrinsic aspirations with eudaimonia is fairly weak among British students,  $r = 0.14$ , and negligible among Greek students,  $r = 0.03$ .

Finally, in line with previous research with adults (Nisbet, Zelenski & Murphy 2011), the findings suggest a moderate relationship between "nature experience" and both conceptualizations of well-being. Interestingly, as it can be seen in Table 6.10, the magnitude of the relationship is stronger in case of eudaimonia, and considerably higher among British students ( $r_{en} = 0.41$  and  $r_{gr} = 0.31$ ). But the association with life satisfaction is modest and almost equal in both populations ( $r_{en} = 0.24$  and  $r_{gr} = 0.19$ ).

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<sup>79</sup> NEI:  $t(4139) = 4.15$ ,  $p < 0.001$ , green neighbourhood:  $t(4139) = 5.85$ ,  $p < 0.001$ , local concerns:  $t(4139) = 18.86$ ,  $p < 0.001$ , worldviews:  $t(4139) = 10.38$ ,  $p < 0.001$ , relatively biocentric reasoning:  $t(4139) = 1.18$ ,  $p > 0.1$ , awareness:  $t(4139) = 16.33$ ,  $p < 0.001$ , unsafe feeling:  $t(4139) = 9.78$ ,  $p < 0.001$ .



**Table 6.3 – Basic Socio-demographic Frequencies**

<b>Variables</b>	<b>English Sample</b>		<b>Greek Sample</b>	
<b>Gender</b>	<b>N#</b>	<b>%</b>	<b>N#</b>	<b>%</b>
<b>Boys</b>	296	56.17	1609	44.52
<b>Girls</b>	231	43.83	2005	55.48
<b>School Year</b>	<b>N#</b>	<b>%</b>	<b>N#</b>	<b>%</b>
<b>Year 7</b>	47	8.92	-	-
<b>Year 8</b>	59	11.20	91	2.52
<b>Year 9</b>	121	22.96	930	25.73
<b>Year 10</b>	146	27.70	942	26.07
<b>Year 11</b>	74	14.04	859	23.77
<b>Year 12</b>	60	11.38	792	21.91
<b>Year 13</b>	20	3.80	-	-
<b>Age</b>	<b>N#</b>	<b>%</b>	<b>N#</b>	<b>%</b>
<b>11</b>	4	0.76	-	-
<b>12</b>	30	5.69	-	-
<b>13</b>	76	14.42	-	-
<b>14</b>	145	27.52	89	2.46
<b>15</b>	141	26.76	896	24.79
<b>16</b>	66	12.52	925	25.59
<b>17</b>	34	6.45	879	24.32
<b>18</b>	23	4.36	798	22.09
<b>19</b>	8	1.52	27	0.75
<b>Location</b>	<b>N#</b>	<b>%</b>	<b>N#</b>	<b>%</b>
<b>Urban areas</b>	314	59.58	1648	45.60
<b>Rural areas</b>	99	18.79	1374	38.02
<b>Sparse rural areas</b>	114	21.63	592	16.38
<i>Athens</i>	-	-	<b>1201</b>	<b>33.23</b>
<i>London</i>	174	33.02	-	-
<i>Large Urban Zone (LUZ*)</i>	201	38.14	<b>1201</b>	<b>33.23</b>

\* In Greece, the only large urban zone is the greater area of Athens.

**Table 6.4 – Life satisfaction and Eudaimonic Well-Being Descriptive Statistics**

Variables	Values		English Sample		Greek Sample	
	Min	Max	Mean	St. Dev.	Mean	St. Dev.
LS scale (LSS)	1	7	<b>5.42</b>	0.92	<b>5.22</b>	0.83
LS family	1	7	<b>5.63</b>	1.34	<b>5.53</b>	1.20
LS friends	1	7	<b>5.87</b>	1.07	<b>5.65</b>	1.18
LS school	1	7	<b>4.97</b>	1.37	<b>4.78</b>	1.38
LS self	1	7	<b>5.37</b>	1.30	<b>5.21</b>	1.21
LS place	1	7	<b>5.27</b>	1.48	<b>4.95</b>	1.51
EWB scale	1	5	<b>3.71</b>	0.60	<b>4.20</b>	0.50

**Table 6.5 – Basic Socio-demographic & Psychometric Descriptive Statistics**

Variables	Values		English Sample		Greek Sample	
	Min	Max	Mean	St. Dev.	Mean	St. Dev.
Age	11	19	<b>14.68</b>	1.55	<b>16.42</b>	1.17
Class*	Year 7	Year 13	<b>9.76</b>	1.53	<b>10.36</b>	1.15
Money	1	4	<b>1.98</b>	1.01	<b>1.82</b>	0.86
Health	1	5	<b>3.80</b>	0.80	<b>4.09</b>	0.78
Self-esteem	1	5	<b>3.59</b>	1.02	<b>3.80</b>	0.99
Stress	1	5	<b>3.14</b>	1.15	<b>3.54</b>	1.29
Homework	1	5	<b>3.74</b>	1.18	<b>3.75</b>	1.05
Hobbies	1	5	<b>3.71</b>	1.32	<b>3.27</b>	1.41
Friends	1	5	<b>3.64</b>	1.15	<b>4.30</b>	0.84
TV watching	1	5	<b>3.75</b>	1.14	<b>3.34</b>	1.10
Internet	1	5	<b>3.89</b>	1.07	<b>3.49</b>	1.26
PC games	1	5	<b>3.43</b>	1.44	<b>2.38</b>	1.42

\* Year 8 – Year 12 for Greece.

**Table 6.6 – Basic Environmental Variables: Descriptive Statistics**

Variables	Values		English Sample		Greek Sample	
	Min	Max	Mean	St. Dev	Mean	St. Dev
NEI	1	5	<b>2.98</b>	0.68	<b>3.11</b>	0.63
Neighborhood green	1	5	<b>3.33</b>	1.19	<b>3.67</b>	1.25
Local concerns	1	5	<b>2.54</b>	0.93	<b>3.44</b>	0.99
Worldviews	1	5	<b>3.61</b>	0.65	<b>3.94</b>	0.68
Rel Biocentric Reason	-2	2	<b>-0.14</b>	0.63	<b>-0.11</b>	0.52
Awareness	1	5	<b>3.57</b>	0.77	<b>4.13</b>	0.72
Unsafe feeling	1	5	<b>2.91</b>	1.34	<b>3.53</b>	1.36

**Table 6.7 – Life Satisfaction and Eudaimonic Well-being Frequencies (%)**

Variables	Low - Average (%)		High (%)	
	English Sample	Greek Sample	English Sample	Greek Sample
LS scale	25.24	32.07	74.76	67.93
LS family	18.79	19.84	81.21	80.16
LS friends	11.20	17.24	88.80	82.76
LS school	35.10	42.68	64.90	57.32
LS self	23.34	29.34	76.66	70.66
LS place	26.76	37.84	73.24	62.16
EWB scale	11.76	2.65	88.24	97.35

**Table 6.8 – Socio-demographic & Psychometric Frequencies (%)**

Variables	Low - Average (%)		High (%)	
	English Sample	Greek Sample	English Sample	Greek Sample
Health	29.41	18.38	70.59	81.62
Self-esteem	40.23	32.62	59.77	67.38
Stress	58.82	43.08	41.18	56.92
Homework	35.48	34.79	64.52	65.21
Hobbies	34.54	48.58	65.46	51.42
Friends	39.66	14.48	60.34	85.52
TV watching	35.10	51.43	64.90	48.57
PC games	45.73	74.43	54.27	25.57
Internet	30.55	43.71	69.45	56.29

**Table 6.9 – Environmental Variables Frequencies (%)**

Variables	Low - Average (%)		High (%)	
	English Sample	Greek Sample	English Sample	Greek Sample
NEI	55.41	46.10	44.59	53.90
Neighborhood green	50.47	40.16	49.53	59.84
Local concerns	72.87	36.48	27.13	63.52
Worldviews	28.46	14.15	71.54	85.85
Rel biocentric reasoning	64.90	68.57	35.10	31.43
Awareness	27.32	9.58	72.68	90.42
Unsafe feeling	63.88	44.12	36.12	55.88

**Table 6.10 – Raw Correlations of LS scale and E WB scale with Intrinsic & Extrinsic Aspirations, and NEI**

Variables	LSS		EWB	
	English Sample	Greek Sample	English Sample	Greek Sample
LSS	-	-	0.39	0.20
Intrinsic	0.27	0.12	0.55	0.44
Extrinsic*	0.12	0.05	0.14	0.03
NEI	0.24	0.19	0.41	0.31

\* 3-item indicator based on Kasser & Ryan's (1996) Aspirations Index. More details can be found in Chapter 4.

**Table 6.11 – Raw Correlations of Satisfaction with Place with Perceptions about Neighborhood Green, Safety and Concerns for Local Environmental Problems**

Variables	Satisfaction with Place	
	English Sample	Greek Sample
Neighbourhood green	0.31	0.33
Unsafe feeling	-0.28	-0.12
Local concerns	-0.17	-0.18

## 6.5.2 Regression Analysis Results: Life Satisfaction

### *Comparison at “significance level”*

We start the main analysis by comparing the two country samples based on predictors' significance level across the two models. In subsequent sections, we will extend the analysis by identifying significant differences in the magnitude of the effects across the two samples. As it can be seen in Table 6.12, a common set of predictors emerged as important determinants of life satisfaction in both samples. The direction of all commonly significant predictors, as expressed by the sign of their coefficients, is also the same across the two samples. To start with the socio-demographic and psychometrics subgroup of variables, the current estimates demonstrate the positive effect of time allocation to homework and friends, self-reported health and self-esteem, and the negative effect of self-reported stress on life satisfaction of British and Greek students.

As we have discussed in previous chapters, the beneficial influence of school performance, relations with peers, physical and mental health, and the negative influence of stress on children and adolescents' subjective well-being are well established by the existing literature (Hartup & Stevens 1997, McKnight, Huebner & Suldo 2002, Huebner 2004, Eryilmaz 2012). In addition, similarly to the findings of some previous studies (Goldbeck et al. 2007), we have found that subjective well-being is decreasing by age across both populations. Moreover, as Stepanikova, Hie & He (2010) and Wang, Chen & Wang (2008) have highlighted, internet usage and involvement with computer games are detrimental to life satisfaction. Surprisingly, hobbies are found to be insignificant determinants of well-being in both samples.

There are also some predictors that appear to be significant only in one of the two samples. A gender-related effect is detected in the Greek sample; girls appear to be less happy than boys. Importantly, the English sample provides evidence, established by both adult and non-adult literatures (Brown & Kasser 2005, Waterman 2008, Huppert 2009), of the positive association between life satisfaction and intrinsic aspirations. On the other hand, receiving greater weekly pocket money, as suggested by Clarke, Bradshaw & Williams (2000), makes no difference in British pupils' life satisfaction. Finally, the latter appears to be positively associated with TV viewing. This could be attributed to the pleasure that TV watching offers as a passive leisure activity, although

as Garton, Harvey & Price (2004) have highlighted, passive leisure activities are much less pleasant than active ones such as sports.

Looking at the second group of variables (environmental variables), the derived results verify the beneficial role of empirical affiliation with nature on pupils' life satisfaction. Specifically, having a stronger nature experience, living in a green neighborhood (based on self-reported perceptions), and attending a school with a green yard increases satisfaction with life in both countries. Having a view of nature from the bedroom window appears to be beneficial only for Greek students, while a view of nature from the class window makes no difference in both models.

The influence of most attitudinal variables on British participants' well-being is negligible. In contrast with what is observed in the Greek sample, worldviews, relatively biocentric reasoning and concerns about local environmental problems are all insignificant. As for moralistic values and environmental awareness, its effect on happiness is insignificant in both models. In relation to the non nature-related control factors, feelings of insecurity in the neighborhood appear to be significantly detrimental only to British pupils' happiness, whereas playing in home is a significant positive indicator. The surprising outcome of the negative association between Greek pupils' life satisfaction and indoor sport cannot be detected on the English group.

Regarding location, living in rural areas is negatively associated with life satisfaction in both samples. In terms of policy, this should raise questions about the social conditions in the countryside. Our findings are partially conflicting with the findings derived by Shucksmith et al. (2009), where greater urban-rural differences on life satisfaction (in favor of urban life) have been observed mainly in poorer countries of Europe, such as Greece. Here, differences in well-being are observed in a rich country as well; rural life is always a significantly negative determinant of happiness, whereas living in large urban centers makes no difference in both populations.

In relation to climate, it appears that, as with adults, adolescents dislike extreme climate conditions; greater temperatures in July decrease British and Greek pupils' happiness. Moreover, wind speed is significantly detrimental to Greek students' life satisfaction, whereas precipitation is significantly detrimental to satisfaction with life of British students. In some studies (Brereton, Clinch & Ferreira 2008, Moro et al. 2008),

mean precipitation appeared to be positively associated with life satisfaction. This outcome was attributed to the possibly positive linkage between precipitation and natural landscapes. Here, the direction and strength of precipitation and “natural beauty” variables remain unaffected whether or not the two variables are included together in various model specifications. Annual mean precipitation is significantly negative for British pupils, while “natural beauty” dummy is insignificant for both populations. Finally, as in most relevant studies, mean annual temperature is always insignificant.

### *Comparing effects' magnitude*

At this stage, we explore differences in the magnitude of the effects across the two models. The Chow test computation,  $\chi^2(34) = 246.21$  (p-value < 0.001), shows that, overall, the two country models differ, i.e. there is at least one predictor whose effect is statistically different between the two models. To estimate effect differences for each predictor separately, we apply the Wald statistic testing the hypothesis  $H_0 : \alpha_1 - \beta_1 = 0$ , where  $\alpha_1$  and  $\beta_1$  are the estimates of a certain predictor for group 1 and group 2 respectively. As it can be seen in Table 6.12, from the socio-demographic and psychometric predictors, the magnitude of gender, age, TV watching, time with friends, self-reported physical health and stress status, and intrinsic aspirations effects appear to be significantly different across the two country samples. Climate-related differences have been detected only for July maximum temperature and annual mean precipitation, whereas no differences can be established in the effects of environmental variables.

Although in some cases the effect of a certain predictor is significant only in one country sample, the difference of the effects between the two samples is statistically insignificant. For example, while the effect of local concerns is significant in the Greek sample and insignificant in the English sample, the difference itself (between the two samples) is insignificant. Technically, this outcome usually occurs in cases where there is not enough power in the smaller sample to detect significance for some variables or when the standard error of the smaller sample is so large that causes the two coefficients to overlap (Gelman & Stern 2006).

When the two samples are pooled together (Table 6.13 – Model 1), the country dummy (England) appears to be insignificant in the first model specification<sup>80</sup>, mainly because it is highly correlated with the location and climate variables. If they are excluded, consistently with the t-test outcome (Section 6.5.1), the country dummy becomes significant and with the expected sign (beta = 0.35, p-value <0.01), i.e. English pupils appear to be happier<sup>81</sup>. To investigate differences in the magnitude of the effects, we formed interaction terms for the environmental, location and climate variables that were previously found to be significant in at least one of the two country samples, and for a few basic control variables (time with friends, self-esteem status, intrinsic aspirations and safety perceptions). In order to avoid serious multicollinearity issues and the loss of statistical power, we specified two partially unconstrained models (Table 6.13 – Models 2 & 3). In model 2, we entered the interaction terms for the control factors and environmental variables (NEI, green neighborhood, school green yard, view of nature from home window, local concerns, worldviews, relatively biocentric reasoning). In model 3, we entered the interactions for location and climate, whereas the interactions for the environmental variables were dropped.

The findings suggest that spending time with friends is more beneficial for Greek pupils' well-being, while the effect of intrinsic aspirations is stronger among British pupils. Also, the magnitude of the negative effect of local safety concerns appears to be greater in the English sample. However, the joint model analysis could not detect a difference in the magnitude of self-esteem effect, which appeared to exist according to the Wald statistic results in the fully unconstrained (separate models, Table 6.12) analysis. Of the environmental, location and climate variables, the existence of a green school yard has a relatively stronger effect (significant at a 5% level), on English pupils' life satisfaction, as it can be seen by the positive sign of the interaction term. Higher maximum temperatures in July and mean annual precipitation appear to cause greater damage to the life satisfaction of British pupils.

Here, it should be noted that slight differences in the outcomes of the two analysis approaches (separate regressions and pooled regression), as in the case of self-esteem

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<sup>80</sup> The meaning of the dummy variable (and all main effect variables in general) becomes of little importance when an interaction term is added. To provide an example, when an interaction term is formed by the country dummy and NEI variable, then the effect of the country dummy represents the difference between a British and a Greek student when their "nature experience" is zero, which is a non-existing case.

<sup>81</sup> Regression findings are presented in Appendix A6, Table A6.1.



effect, should be expected for two main reasons. First, as mentioned before, the comparison of two different models is fully unconstrained, i.e. coefficients are allowed to vary freely between the two groups, while only those coefficients for which interaction terms have been added are allowed to vary across the two groups when the joint model is employed. Reasonably, it should be expected that different model specifications yield somewhat different results. The two approaches would have provided the same outcomes only if interaction terms were included for all variables in the joint model. Second, the two samples have unequal variances which affect the estimates of the regressions. The comparison of two separate models accounts for different variances, whereas the joint model analysis assumes that the two variances are equal. This is not true here, but the bias in the computation of the standard errors is minor, whereas the estimation of the OLS coefficients remains efficient (Williams 2009).

### **6.5.3 Regression Analysis Results: Eudaimonic Well-being**

#### *Comparison at “significance level”*

As it can be seen in Table 6.14, only hobbies, self-esteem, intrinsic aspirations, empirical affiliation with nature and indoor sports (significant only at a 10% confidence level) appear to have a significant effect on pupils’ eudaimonia in both countries. Again, all commonly significant predictors have the same sign across the two models. In contrast with life satisfaction analysis, gender-related differences have been detected among British pupils; girls appear to be less eudaimonic than boys. On the other hand, age appears to be incremental to Greek pupils’ eudaimonic well-being. A negative effect of on-screen activities (TV watching and computer games) and weekly pocket money, and a positive effect of homework have been found only in the Greek sample.

Besides experience with nature, all other environmental, location and climate variables appear to be insignificant determinants of British pupils’ eudaimonic well-being. For the Greek sample, moralistic values and awareness are positively associated with eudaimonia, highlighting the beneficial role of cognitive and affective affiliation with nature. Finally, Greek students from rural areas with less than 5000 people exhibit lower levels of eudaimonia, indicating the restrictive role of the unfavorable countryside socio-economic conditions for personal growth.

### *Comparing effects' magnitude*

Although the two models differ a lot by significance level of the predictors – many more predictors achieve significance at least at a 10% confidence level in the Greek sample –, the Wald statistics show that the magnitude of the effects does not differ significantly between the two samples for most of the predictors. Still, the Chow test value ( $\chi^2(34) = 125.82$ ,  $p\text{-value} < 0.001$ ) indicates that, overall, the effects of the independent variables are statistically different across the two populations. As it can be seen in Table 6.14, among the socio-demographic and psychometric variables, the effects of pocket money, TV watching, health status, stress status and intrinsic aspirations differ between the two samples. Of the environmental, location and climate variables, only the magnitude of school green yard dummy effect has been found to differ, although the effect of this variable appears to be insignificant (marginally insignificant in the English sample though) in each separate model.

The joint model analysis yields similar results (Table 6.15). As in case of life satisfaction analysis, when climate variables are excluded from model 1, the country dummy becomes significant ( $\beta = -0.14$ ,  $p < 0.01$ ) and with the expected sign; British adolescents are less eudaimonic than Greek adolescents<sup>82</sup>. To assess magnitude of the effects, interaction terms were created for two basic psychometric factors (self-esteem status and intrinsic aspirations), the environmental, location and climate variables whose effect appeared to be significant in at least one of the two samples (NEI, moralistic values, awareness, sparse rural dummy) and for the school green yard dummy whose effect difference was found to be significant across the two models. Since we needed to create only a few interactions this time, they were all entered in the regression together.

The findings (Table 6.15 – Model 2) indicate that the effects of nature experience, moralistic values, awareness and rurality do not differ among the two populations, since the relevant interaction terms are all insignificant. But the analysis shows that having a green school yard makes English pupils more eudaimonic. The fact that the effect of school green dummy is marginally insignificant when a separate model for England is fitted, gives us evidence to suspect that the aforementioned variable would reach significance with a somewhat larger sample.

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<sup>82</sup> Regression findings are presented in Appendix A6, Table A6.1.

Table 6.12 – Separate Models Analysis / Life Satisfaction OLS Regressions

Variables	English Sample		Greek Sample		
<i>Socio-Demographics/Psychometrics</i>	Coeff.	St. E.	Coeff.	St. E.	Wald
Girl	-0.035	0.066	<b>-0.193***</b>	<b>0.031</b>	4.90**
Age	<b>-0.077***</b>	<b>0.021</b>	<b>-0.037***</b>	<b>0.013</b>	2.86*
Money	0.052	0.039	<b>0.028**</b>	<b>0.014</b>	0.33
Homework	<b>0.069**</b>	<b>0.033</b>	<b>0.118***</b>	<b>0.014</b>	2.00
Hobbies	0.006	0.031	-0.009	0.010	0.21
TVwatching	<b>0.083***</b>	<b>0.029</b>	0.014	0.013	5.03**
Internet	<b>-0.056*</b>	<b>0.031</b>	<b>-0.039***</b>	<b>0.013</b>	0.27
PCgames	<b>-0.071*</b>	<b>0.039</b>	<b>-0.028**</b>	<b>0.013</b>	1.18
Friends	<b>0.067***</b>	<b>0.023</b>	<b>0.223***</b>	<b>0.019</b>	28.11***
Health	<b>0.138**</b>	<b>0.056</b>	<b>0.239***</b>	<b>0.019</b>	3.03*
SelfEsteem	<b>0.214***</b>	<b>0.044</b>	<b>0.159***</b>	<b>0.015</b>	1.45
Stress	<b>-0.240***</b>	<b>0.039</b>	<b>-0.076***</b>	<b>0.010</b>	17.92***
Intrinsic	<b>0.265***</b>	<b>0.086</b>	0.018	0.039	7.31***
<i>Environmental Variables</i>					
NEI	<b>0.106**</b>	<b>0.051</b>	<b>0.067***</b>	<b>0.023</b>	0.49
NeighborhoodGreen	<b>0.078**</b>	<b>0.032</b>	<b>0.082***</b>	<b>0.014</b>	0.01
SchoolGreen	<b>0.192**</b>	<b>0.089</b>	<b>0.103***</b>	<b>0.038</b>	0.92
SchoolGreenView	-0.057	0.080	0.019	0.033	0.82
HouseGreenView	0.126	0.104	<b>0.101**</b>	<b>0.043</b>	0.05
LocalConcerns	0.034	0.046	<b>-0.036**</b>	<b>0.017</b>	2.25
Worldviews	-0.030	0.061	<b>-0.052***</b>	<b>0.018</b>	0.15
MoralisticValue	-0.028	0.049	0.036	0.025	1.50
RelBiocentricReas	-0.030	0.053	<b>-0.076**</b>	<b>0.031</b>	0.63
Awareness	-0.004	0.043	-0.020	0.022	0.12
IndoorSports	-0.012	0.023	<b>-0.016*</b>	<b>0.009</b>	0.02
InHomePlay	<b>0.073**</b>	<b>0.037</b>	0.011	0.013	2.73*
UnsafeFeeling	<b>-0.118***</b>	<b>0.038</b>	-0.010	0.012	7.83***
<i>Location &amp; Climate</i>					
SparseRural	<b>-0.246***</b>	<b>0.067</b>	<b>-0.134***</b>	<b>0.033</b>	2.46
Rural	<b>-0.178**</b>	<b>0.081</b>	<b>-0.085**</b>	<b>0.044</b>	1.13
LargeUrban	0.011	0.095	0.029	0.043	0.03
MeanTemper	0.310	0.275	0.008	0.010	1.30
JulyMaxTemper	<b>-0.267**</b>	<b>0.119</b>	<b>-0.025**</b>	<b>0.011</b>	4.44**
MeanPrecipitation	<b>-0.040**</b>	<b>0.017</b>	0.004	0.007	5.81**
MeanWindSpeed	0.045	0.059	<b>-0.023*</b>	<b>0.008</b>	1.42
NatBeauty	-0.061	0.097	0.088	0.054	1.92
Observations		527		3614	
R-squared		0.4472		0.3171	

Robust clustered standard errors in parenthesis, \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 6.13 – Joint Model Analysis / Life Satisfaction OLS Regressions

Variables	Model 1		Model 2		Model 3	
<i>Socio-Demographics/Psychometrics</i>	Coeff.	St. E.	Coeff.	St. E.	Coeff.	St. E.
Girl	-0.168***	0.029	-0.164***	0.029	-0.164***	0.030
Age	-0.043***	0.011	-0.043***	0.011	-0.044***	0.011
Money	0.032**	0.013	0.032**	0.013	0.030**	0.013
Homework	0.112***	0.014	0.112***	0.014	0.113***	0.014
Hobbies	-0.007	0.010	-0.009	0.010	-0.009	0.010
TVwatching	0.024**	0.012	0.023*	0.012	0.024**	0.012
Internet	-0.038***	0.012	-0.044***	0.012	-0.045***	0.012
PCgames	-0.030**	0.013	-0.029**	0.013	-0.031**	0.013
Friends	0.177***	0.017	0.216***	0.019	0.218***	0.019
Health	0.232***	0.019	0.228***	0.019	0.229***	0.019
SelfEsteem	0.163***	0.015	0.159***	0.015	0.159***	0.015
Stress	-0.098**	0.011	-0.093***	0.010	-0.093***	0.010
Intrinsic	0.077**	0.040	0.022	0.040	0.023	0.040
<i>Environmental Variables</i>						
NEI	0.075***	0.022	0.072***	0.023	0.071***	0.022
NeighborhoodGreen	0.082**	0.013	0.081***	0.014	0.082**	0.013
SchoolGreen	0.135***	0.035	0.102***	0.038	0.130***	0.034
SchoolGreenView	0.011	0.031	0.013	0.031	0.007	0.031
HouseGreenView	0.106***	0.040	0.100**	0.043	0.103**	0.040
LocalConcerns	-0.028*	0.016	-0.036**	0.016	-0.028*	0.015
Worldviews	-0.045***	0.016	-0.050***	0.017	-0.049***	0.016
MoralisticValue	0.023	0.022	0.035	0.024	0.025	0.022
RelBiocentricReas	-0.070***	0.025	-0.077**	0.029	-0.072***	0.025
Awareness	-0.021	0.021	-0.019	0.021	-0.014	0.021
IndoorSports	-0.014	0.009	-0.014	0.009	-0.013	0.009
InHomePlay	0.014	0.013	0.013	0.013	0.015	0.013
UnsafeFeeling	-0.024**	0.012	-0.011	0.012	-0.024**	0.012
<i>Location &amp; Climate</i>						
SparseRural	-0.148***	0.030	-0.144***	0.029	-0.149***	0.032
Rural	-0.116***	0.040	-0.115***	0.040	-0.112***	0.042
LargeUrban	0.020	0.035	0.032	0.036	0.010	0.038
MeanTemper	0.004	0.009	0.004	0.009	0.006	0.009
JulyMaxTemper	-0.025**	0.011	-0.027**	0.011	-0.022**	0.011
MeanPrecipitation	0.0001	0.006	0.002	0.006	0.003	0.007
MeanWindSpeed	-0.020**	0.008	-0.022***	0.008	-0.021	0.008
NatBeauty	0.003	0.048	0.019	0.047	0.032	0.048
EnglandDummy	0.165	0.113	-0.215	0.509	1.202	1.300
England*Friends	-	-	-0.153***	0.034	-0.156***	0.035
England*SelfEsteem	-	-	0.044	0.049	0.057	0.048
England*Intrinsic	-	-	0.226**	0.096	0.223**	0.089
England*NEI	-	-	-0.014	0.057	-	-
England*NeighborhoodGreen	-	-	-0.004	0.032	-	-
England*SchoolGreen	-	-	0.169**	0.080	-	-
England*HouseGreenView	-	-	0.006	0.107	-	-
England*LocalConcerns	-	-	0.055	0.049	-	-
England*Worldviews	-	-	0.023	0.058	-	-
England*RelBiocentricReas	-	-	0.032	0.054	-	-
England*UnsafeFeeling	-	-	-0.100***	0.037	-	-
England*SparseRural	-	-	-	-	-0.044	0.082
England*Rural	-	-	-	-	-0.030	0.093
England*JulyMaxTemper	-	-	-	-	-0.084**	0.041
England*MeanPrecipitation	-	-	-	-	-0.036**	0.017
England*MeanWindSpeed	-	-	-	-	0.063	0.068
Observations	4141		4141		4141	
R-squared	0.3235		0.3327		0.3311	

Robust clustered standard errors in parenthesis, \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 6.14 – Separate Models Analysis / Eudaimonic Well-being OLS Regressions

Variables	English Sample		Greek Sample		Wald
	Coeff.	St. E.	Coeff.	St. E.	
<i>Socio-demographics/Psychometrics</i>					
Girl	<b>-0.100**</b>	<b>0.049</b>	-0.021	0.020	2.48
Age	0.010	0.014	<b>0.021**</b>	<b>0.009</b>	0.43
Money	0.028	0.024	<b>-0.018**</b>	<b>0.009</b>	<b>3.65*</b>
Homework	0.017	0.020	<b>0.038***</b>	<b>0.008</b>	1.05
Hobbies	<b>0.058***</b>	<b>0.019</b>	<b>0.048***</b>	<b>0.007</b>	0.28
TVwatching	0.014	0.018	<b>-0.019**</b>	<b>0.008</b>	<b>3.17*</b>
Internet	0.003	0.028	-0.005	0.008	0.10
PCgames	-0.010	0.017	<b>-0.021***</b>	<b>0.007</b>	0.37
Friends	-0.004	0.019	0.006	0.011	0.22
Health	-0.017	0.038	<b>0.068***</b>	<b>0.013</b>	<b>4.72**</b>
SelfEsteem	<b>0.100***</b>	<b>0.023</b>	<b>0.068***</b>	<b>0.009</b>	1.89
Stress	-0.029	0.023	<b>0.011*</b>	<b>0.006</b>	<b>2.94*</b>
Intrinsic	<b>0.497***</b>	<b>0.069</b>	<b>0.366***</b>	<b>0.026</b>	<b>3.36*</b>
<i>Environmental Variables</i>					
NEI	<b>0.152**</b>	<b>0.062</b>	<b>0.109***</b>	<b>0.015</b>	0.47
NeighborhoodGreen	-0.002	0.019	0.009	0.008	0.32
SchoolGreen	0.079	0.050	-0.028	0.022	<b>4.14**</b>
SchoolGreenView	-0.027	0.069	0.026	0.022	0.58
HouseGreenView	-0.007	0.056	0.004	0.022	0.03
LocalConcerns	0.001	0.032	0.008	0.010	0.05
Worldviews	-0.013	0.037	0.015	0.011	0.56
MoralisticValue	0.041	0.038	<b>0.057***</b>	<b>0.017</b>	0.16
RelBiocentricReas	-0.059	0.048	-0.016	0.016	0.80
Awareness	0.041	0.032	<b>0.049***</b>	<b>0.011</b>	0.06
IndoorSports	<b>0.034*</b>	<b>0.019</b>	<b>0.01*</b>	<b>0.006</b>	1.59
InHomePlay	0.022	0.025	<b>0.026***</b>	<b>0.008</b>	0.02
UnsafeFeeling	-0.030	0.019	-0.001	0.007	2.18
<i>Location &amp; Climate</i>					
SparseRural	-0.087	0.068	<b>-0.057**</b>	<b>0.025</b>	0.19
Rural	-0.019	0.051	-0.029	0.040	0.02
LargeUrban	-0.027	0.058	-0.031	0.028	0.00
MeanTemper	-0.099	0.232	0.010	0.007	0.24
JulyMaxTemper	-0.042	0.101	-0.005	0.009	0.15
MeanPrecipitation	-0.099	0.231	0.011	0.007	0.26
MeanWindSpeed	-0.051	0.068	-0.005	0.007	0.49
NatBeauty	-0.023	0.045	-0.007	0.040	0.08
Observations	527		3614		
R-squared	0.4640		0.3118		

Robust clustered standard errors in parenthesis, \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 6.15 – Joint Model Analysis / Eudaimonic Well-being OLS Regressions

Variables	Model 1		Model 2	
	Coeff.	St. E.	Coeff.	St. E.
<i>Socio-demographics/Psychometrics</i>				
Girl	-0.030	0.019	-0.029	0.019
Age	<b>0.022***</b>	<b>0.008</b>	<b>0.019***</b>	<b>0.008</b>
Money	-0.013	0.008	-0.013	0.008
Homework	<b>0.036***</b>	<b>0.007</b>	<b>0.037***</b>	<b>0.007</b>
Hobbies	<b>0.047***</b>	<b>0.006</b>	<b>0.047***</b>	<b>0.006</b>
TVwatching	<b>-0.015**</b>	<b>0.007</b>	<b>-0.013**</b>	<b>0.007</b>
Internet	-0.007	0.008	-0.008	0.008
PCgames	<b>-0.021***</b>	<b>0.006</b>	<b>-0.020***</b>	<b>0.006</b>
Friends	0.004	0.009	0.004	0.009
Health	<b>0.058***</b>	<b>0.012</b>	<b>0.058***</b>	<b>0.012</b>
SelfEsteem	<b>0.072***</b>	<b>0.008</b>	<b>0.067***</b>	<b>0.009</b>
Stress	0.007	0.006	0.008	0.006
Intrinsic	<b>0.397***</b>	<b>0.027</b>	<b>0.372***</b>	<b>0.026</b>
<i>Environmental Variables</i>				
NEI	<b>0.116***</b>	<b>0.015</b>	<b>0.110***</b>	<b>0.014</b>
NeighborhoodGreen	0.007	0.007	0.008	0.007
SchoolGreen	-0.006	0.021	-0.027	0.022
SchoolGreenView	0.022	0.021	0.022	0.021
HouseGreenView	0.005	0.020	0.004	0.020
LocalConcerns	0.006	0.010	0.005	0.010
Worldviews	0.011	0.011	0.011	0.011
MoralisticValue	<b>0.049***</b>	<b>0.016</b>	<b>0.060***</b>	<b>0.017</b>
RelativeBiocentricReas	-0.024	0.015	-0.025	0.016
Awareness	<b>0.045***</b>	<b>0.010</b>	<b>0.052***</b>	<b>0.011</b>
IndoorSports	<b>0.013**</b>	<b>0.005</b>	<b>0.012**</b>	<b>0.005</b>
InHomePlay	<b>0.027***</b>	<b>0.008</b>	<b>0.028***</b>	<b>0.007</b>
UnsafeFeeling	-0.005	0.007	-0.003	0.007
<i>Location &amp; Climate</i>				
SparseRural	<b>-0.057**</b>	<b>0.023</b>	<b>-0.056**</b>	<b>0.023</b>
Rural	-0.035	0.033	-0.034	0.033
LargeUrban	-0.024	0.023	-0.023	0.024
MeanTemper	0.010	0.007	0.011	0.007
JulyMaxTemper	-0.006	0.008	-0.007	0.008
MeanPrecipitation	-0.006	0.005	-0.006	0.005
MeanWindSpeed	-0.005	0.006	-0.006	0.006
NatBeauty	-0.025	0.029	-0.020	0.029
EnglandDummy	-0.120	0.081	<b>-0.528**</b>	<b>0.263</b>
England*SelfEsteem	-	-	<b>0.045*</b>	<b>0.024</b>
England*Intrinsic	-	-	0.100	0.070
England* NEI	-	-	0.024	0.047
England*SchoolGreen	-	-	<b>0.110**</b>	<b>0.054</b>
England*MoralisticValue	-	-	-0.040	0.037
England*Awareness	-	-	-0.028	0.029
England*SparseRural	-	-	-0.039	0.055
Observations	4141		4141	
R-squared	0.3837		0.3879	

Robust clustered standard errors in parenthesis, \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## 6.6. Summary, Study Limitations and Further Research

In this chapter, an attempt was made to explore differences and similarities between the factors that influence the subjective quality of life of British and Greek secondary school students. Particular emphasis was given on the magnitude of the effects of environmental, climate and location variables on the two conceptualizations of well-being, i.e. life satisfaction and eudaimonia (Ryan & Deci 2001). In this section, we highlight the key findings by focusing on the predictors that appear to be significant determinants of well-being in both samples or they are significant in one of the two samples only, but the magnitude of their effect differs significantly across the populations.

As a general conclusion, the variability of life satisfaction and eudaimonia in both countries is mainly explained by the socio-demographic and psychometric predictors. This is an expected outcome supported by the available adult and non-adult literatures, where factors such as relationships with friends, school performance, physical and mental health, have emerged as important determinants of subjective and eudaimonic well-being (Huebner 2004, Antaramian, Huebner & Valois 2008, Huppert 2009, Proctor, Linley & Maltby 2009). Similarly, most of the statistically significant differences in effects' magnitude across the two samples have been detected among the socio-economic and psychometric variables.

In the first stage, the comparison of the two countries, based on a separate model for each sample, showed that age, computer-related activities (internet usage and computer games) and stress are detrimental, whereas doing homework, spending time with friends, and being in good physical shape are incremental to life satisfaction of British and Greek students. Not surprisingly, hobbies and intrinsic aspirations appeared to be positively associated with eudaimonic well-being across the two populations. Finally, self-esteem emerged as a significant indicator for both dimensions of well-being. Of these variables, differences in effects' magnitude have been revealed for age, time with friends, stress and health status in case of life satisfaction, and for self-esteem (only with the "joint model" approach) and intrinsic aspirations in case of eudaimonia. Other socio-demographic and psychometric variables whose effect differs between the two samples are gender, money and TV watching. Specifically, Greek girls appear to be unhappier, whereas British girls are less eudaimonic. TV viewing has a

significantly negative effect on Greek pupils' eudaimonic well-being and a significantly positive effect on British pupils' life satisfaction, whereas pocket money has a significantly negative effect and a significantly positive effect on eudaimonic well-being and life satisfaction of Greek students respectively.

One of the key findings of this chapter is that having a stronger empirical contact with nature is beneficial for both dimensions of adolescents' subjective well-being, i.e. life satisfaction and eudaimonia, for both populations. Given that the two countries have different amenities, natural and physical characteristics, it could be argued that the frequency of experience matters the most and not the characteristics of the natural environment. Of course, a counterargument could be that the frequency of empirical exposure can be affected by preferences for a specific natural beauty spot or amenity. Moreover, the fact that the magnitude of the effect does not differ significantly across the two populations, provides evidence that the impact of natural affiliation is not affected by cultural differences at least for the two specific countries.

The positive role of empirical connectedness with the natural world has been further highlighted by the significant influence of positive perceptions about the existence of green in the neighborhood and school yard on life satisfaction across the two samples. Having a view of nature from the bedroom window appeared to be important only for Greek pupils' subjective well-being. In addition, the joint model approach provided evidence of positive impact of perceptions about green school yard on British pupils' eudaimonia. From a policy perspective, these outcomes underline once again the importance of using subjective indicators to capture adolescents' judgments about their daily interaction with elements of nature in a built environment, and the subsequent influence on well-being.

To make sure that the aforementioned results hold for adolescents with different "environmental" traits and levels of cognitive or affective bonds with nature, we added a few attitudinal variables that could detect pupils' level of biophilia, i.e. the biological desire to affiliate with nature (Wilson 1984). Our results indicate a strong influence of empirical contact with nature even after including variables measuring students' worldviews, moralistic values, biocentric reasoning and environmental awareness. However, the findings showed that the influence of these variables on well-being was negligible among the British pupils. On the other hand, worldviews and biocentric



reasoning have been found to be negatively associated with Greek pupils' happiness, implying that pupils become less happy when realizing the threats arising from environmental degradation<sup>83</sup>. Moreover, Greek pupils with stronger moralistic values, i.e. ethical and spiritual bonds with nature (Kahn & Kellert 2002), appear to report higher levels of eudaimonia. Though, statistically significant differences in the magnitude of the effect of the attitudinal variables could not be detected by any of the two comparison approaches.

In relation to location and climate, the findings of the comparative analysis suggested that rurality, i.e. areas with less than 10000 people, is detrimental to happiness for both populations, while living in a large urban centre had no effect on well-being. With reference to climate, unfavorable conditions are detrimental to life satisfaction in both countries. Interestingly, the negative effect of climate extremes on satisfaction with life (average maximum temperatures in July), has been found to be stronger for British pupils, despite the fact that deviations from regular annual temperatures appear to be milder in England. As expected, the negative effect of mean precipitation is stronger for British students' life satisfaction.

The comparison study suffers from several limitations. Firstly, it may have failed to capture significant differences on the magnitude of various effects mainly due to the relatively small size of the English sample. This is more obvious with the "separate models" approach, where we have noticed that the Wald test failed to reject the equality of the effects for some predictors that appeared to be significant only in the Greek sample. For example, although wind speed was a significant negative indicator of Greek pupils' life satisfaction only (at a 1% confidence level), the hypothesis of equality of the effect across the two samples could not be rejected. Very possibly, the detection of significant effects would be more likely to be achieved by a larger English dataset with smaller standard errors. A second limitation of the study is the absence of detailed information about the socio-economic background of the survey participants and local macroeconomic<sup>84</sup> conditions. Although some basic information about students background is available (gender, age, time allocation for various school and

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<sup>83</sup> Recall that the variable "worldviews" assessed students' agreement for the following statements: (i) "people are treating nature badly", (ii) "nature is strong enough to handle the bad effects of our modern lifestyle", while biocentric reasoning is assessed by asking students to report their concerns about the negative consequences of environmental problems on animals and plants.

<sup>84</sup> The problem is particularly strong in case of Greece.

extra-curricular activities, and location), and the economic and geography conditions of the greater area were taken into account during the sampling procedure, the comparability of the two samples could have been improved if more detailed objective information about pupils' personal, family and social environment were available. Another limitation is the lack of objective environmental variables, such as levels of air pollution and hours of sunshine for example, that have been used extensively in previous research with adults. Here, the evaluation of the local environment conditions is mainly based on students' subjective perceptions.

The current analysis could be extended in various ways. First, future research might take into account within-country cultural differences, since it is likely that people with different cultural backgrounds in a society may experience different levels of well-being (Diener, Oishi & Lucas 2003). This would be particularly interesting in case of the United Kingdom which is a very multicultural and diverse society (Abercrombie & Warde 2001). Second, the analysis could be expanded to explore the magnitude of the effects at regional level within each country. Thus, instead of allowing slopes to differ only at country level, interaction terms could be formed by using several regional dummy variables to detect how well-being varies among various locations of each country. In this case, a prerequisite would be to collect an adequate/representative number of observations from each region. It would be also preferable to focus on a limited number of predictors to avoid complexities with the specification of the joint model. And third, it might be worth trying to investigate whether the beneficial role of affiliation with nature in promoting subjective and eudaimonic well-being - especially if its universality is verified by future studies - depends only on the contact frequency or strength, or it can vary according to different natural and location characteristics.<sup>85</sup>

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<sup>85</sup> Testing for example whether water-based activities have a stronger impact than mountain-based activities.

## APPENDIX A6

**Table A6.1 - Joint Model Analysis: Life Satisfaction and Eudaimonic Well-being  
OLS regressions (without Location & Climate Variables)**

Variables	Life Satisfaction		Eudaimonic Well-being	
<i>Socio-demographics/Psychometrics</i>	Coeff.	St. E.	Coeff.	St. E.
Girl	-0.173***	0.028	-0.032	0.019
Age	-0.041***	0.012	0.024***	0.007
Money	0.034**	0.014	-0.012	0.008
Homework	0.114***	0.013	0.037***	0.007
Hobbies	-0.004	0.010	0.048***	0.007
TVwatching	0.025**	0.012	-0.014**	0.007
Internet	-0.032***	0.012	-0.006	0.008
PCgames	-0.031***	0.012	-0.021***	0.007
Friends	0.173***	0.017	0.003	0.009
Health	0.230***	0.019	0.058***	0.012
SelfEsteem	0.161***	0.014	0.071***	0.009
Stress	-0.099***	0.011	0.006	0.006
Intrinsic	0.074*	0.040	0.396***	0.026
<i>Environmental Variables</i>				
NEI	0.073***	0.022	0.118***	0.015
NeighborhoodGreen	0.069***	0.012	-0.002	0.006
SchoolGreen	0.125***	0.036	-0.009	0.021
SchoolGreenView	0.002	0.031	0.021	0.020
HouseGreenView	0.097**	0.040	0.002	0.020
LocalConcerns	-0.021	0.017	0.010	0.010
Worldviews	-0.046***	0.017	0.011	0.012
MoralisticValue	0.027	0.023	0.049***	0.016
RelBiocentricReas	-0.070***	0.026	-0.024	0.015
Awareness	-0.014	0.020	0.047***	0.011
IndoorSports	-0.009	0.009	0.014***	0.005
InHomePlay	0.013	0.012	0.028***	0.007
UnsafeFeeling	-0.022*	0.012	-0.004	0.007
EnglandDummy	0.349***	0.050	-0.141***	0.031
Observations	4141		4141	
R-squared	0.3178		0.3809	

*Robust clustered standard errors in parenthesis, \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$*

## 7. The Role of Environmental Education in Promoting Secondary School Students' Well-being in England and Greece

### 7.1. Introduction

The need to enhance pupils' well-being has become one of the top priorities, especially during the last decade, of national curricula in England and Greece. A report published by the Department of Children, Schools and Families in 2008, "School's Role in Promoting Pupil Well-being", sets as a main target of schools the delivery of the five main well-being aspects defined by "Every Child Matters" report (DFES 2004), i.e. health, safety, enjoyment and achievement, positive contribution and economic well-being. Moreover, in secondary school teachers' handbook (DFEE/QCA 2004, p.10), the promotion of individual well-being through the "*spiritual, moral, social, cultural, physical and mental development*" of children is defined as one of the main purposes of the national curriculum. Similarly, facilitating pupils' "*physical, mental and social development*" is defined as one of the main aims of education in Greece (Hellenic Pedagogical Institute 2003, p.11).

Recently, a growing stream of literature has suggested that, besides focusing on the satisfaction of the basic well-being aspects such as health and safety, a positive psychology dimension, i.e. the promotion of happiness and fulfillment, should be incorporated among the aims of education (Noddings 2003, Morris 2009, White 2011). For example, Noddings (2003, p.2) writes:

*"Closely related to the observation that happy students learn better than unhappy ones is something I judge to be even more important. Happy people are rarely mean, violent, or cruel...Our basic orientation to moral education, then, should be a commitment to building a world in which it is both possible and desirable for children to be good – a world in which children are happy".*

Theoretically, this trend is reflected on the national curriculum of the two countries. One of the main aims of education in the United Kingdom is to enable students to become "*confident individuals who are able to live safe, healthy, and fulfilling lives*" (QCA 2007, p.68), while the values of the curriculum should relate, among others, to "*our relationships as fundamental to the development and fulfilment of happy and healthy lives, and*

*to the good of the community*" (p. 69). In Greece, the need to embody a positive psychology approach has been highlighted in the recently revised national curriculum (Hellenic Pedagogical Institute 2011), currently implemented at piloting stage.

The main aim of this chapter is to link environmental education, a topic that has also received increasing attention in educational policy, with positive psychology, and investigate whether pupils' personal well-being and satisfaction with school can be promoted by participation in environmental education activities. To date, there is evidence that environmental education promotes students' awareness and pro-environmental behavior at least in the short-term (Rickinson 2001, Goodwin et al. 2010). This is of vital importance nowadays, where the need to deal with environmental degradation is very high on the political and social agenda.

There is also some evidence that the relatively recent re-orientation of the school curriculum towards the so-called education for sustainable development can have a positive impact on pupils' well-being, physical and emotional (Thomas & Thompson 2004, Bell & Dymont 2008, Blair 2009). Also, the outcomes of some studies, mainly with adult populations, have shown that sustainable lifestyles can lead to higher levels of subjective well-being. For example, Brown & Kasser (2005) have found that ecologically responsible behavior is positively linked with adolescents' happiness, whereas Nisbet, Zelenski & Murphy (2011) found that participation in environmental education activities can promote college students' happiness and eudaimonia indirectly, via the enhancement of relatedness with nature.

However, to the best of our knowledge, there is a substantial lack of empirical evidence assessing the role of environmental and sustainability education in enhancing non-adult satisfaction and eudaimonia, either directly by creating a positive school climate and opportunities for personal development and growth which, in turn, would make pupils' life more pleasant and fulfilling, or indirectly by strengthening connectedness with nature, which, according to the findings of the previous chapters and other research, has been found to be incremental to both dimensions of subjective well-being. Within this context, we test the following two main hypotheses:

*Hypothesis 1: Students who have been involved with environmental education activities in school exhibit higher levels of satisfaction with life as a whole, school satisfaction, and eudaimonic well-being.*

*Hypothesis 2: Empirical connectedness with nature mediates the relationship between self-reported well-being and participation in environmental education programs at school.*

The rest of the chapter is structured as follows. Section 7.2 provides a brief historical overview of the establishment of environmental education teaching worldwide. Section 7.3 provides a brief description of education systems in England and Greece by mainly focusing on environmental education. Section 7.4 describes the methodological approach, while the main descriptive statistics and the econometric findings are discussed in Section 7.5. Finally, Section 7.6 concludes with a summary of the results, discussion on the limitations of the study and suggestions for future work.

## **7.2. Brief Historical Overview: From Environmental Education to Education for Sustainable Development**

Although discussions about environmental education had taken place during the decades of 1950 and 1960 (Palmer 1998), a formal definition and recognition of the importance of incorporating environmental education in the school curriculum was established for first time during Nevada's "International Working Meeting on Environmental Education in the School Curriculum" (IUCN 1970). Environmental education has been defined as follows:

*"Environmental education is the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness among man, his culture, and his biophysical surroundings. Environmental education also entails practice in decision-making and self-formulation of a code of behavior about issues concerning environmental quality."(p.11)*

The subsequent international meetings of Stockholm (Stockholm Conference on the Human Environment, 1972), Belgrade (A Global Framework for Environmental Education, 1975), and Tbilisi (First Intergovernmental Conference on Environmental Education, 1977) verified the need to enhance the role of environmental education in

schools as a tool for halting the increasing degradation of the natural environment. The central idea of these discussions was the need to cultivate environmental knowledge, positive attitudes, proper behaviors and skills that would enable pupils to understand the value of nature, the importance of protecting it, and would increase their capability to participate actively in the improvement and protection of the environment. So, for example, the Belgrade Charter (UNESCO/UNEP 1976) framed the mission of environmental education as:

*“To develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones”. (p.2)*

Ten years later, a nodal development emerged in the conference of Moscow (UNESCO/UNEP Educational Congress on Environmental Education & Training, 1987). For first time, the need to achieve sustainable development, i.e. *“development that meets the needs of the present without compromising the ability of future generations to meet their own needs”* (“Our Common Future”, WCED 1987, p. 43), was recognized. Since then, a series of subsequent international meetings (UNESCO “Earth Summit, Rio De Janeiro, 1992, International Conference of Thessaloniki, Greece, 1997, Johannesburg Summit, 2002), recommended the revision of environmental education content to make sure that it effectively links development and environmental protection. The first steps of the transition from environmental education to education for sustainable development had been emerged. Finally, UN’s “Decade of Education for Sustainable Development” report (UNESCO 2005, p.23) set the following vision for education for sustainable development: *“the vision of education for sustainable development is a world where everyone has the opportunity to benefit from quality education and learn the values, behaviour and lifestyles required for a sustainable future and for positive societal transformation”*.

### 7.3. Brief Description of the Educational System of England and Greece, and Content of Environmental Education in National Curricula

#### 7.3.1. Educational System: England<sup>86</sup>

Receiving full-time education is compulsory for all pupils between five and sixteen years old in England. In 1992, a national curriculum, which had been developed according to the Educational Reform Act of 1988, was implemented for first time in most public schools<sup>87</sup>. Before then, all schools were free to develop and teach their own curricula. Only independent schools, mainly including academies (independent but state-funded schools) and private schools, are still not obliged to follow the national curriculum.

According to the formal curriculum, the period of compulsory education is divided into four key stages: (i) key stage 1, including years 1 and 2 (age 5 to 7), (ii) key stage 2, including years 3, 4, 5 and 6 (age 8 to 11), (iii) key stage 3, including years 7, 8 and 9 (age 12 to 14), and (iv) key stage 4, including years 10 and 11 (age 15 to 16). Once students graduate from key stage 4, they may choose to terminate their formal education or proceed to post-compulsory key stage 5 (years 12 and 13, age 17 to 19). The national curriculum does not cover Key Stage 5.

During primary education, i.e. key stages 1 and 2, students are taught ten statutory (history, geography, science, physical education, music, mathematics, ICT, English, design & technology, art & design) and four non-statutory broad subjects (religion, citizenship, PHSE and modern foreign languages). In secondary education, i.e. key stages 3 and 4, the subjects that are offered are quite similar with those ones offered in primary education. However, citizenship and modern foreign languages become

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<sup>86</sup> Information for England's educational system is collected from the following sources: (i) Department of Education: <http://www.education.gov.uk>, (ii) [www.direct.gov.uk](http://www.direct.gov.uk), (iii) Eurypedia, European Encyclopedia on National Education Systems: [http://eacea.ec.europa.eu/education/eurydice/index\\_en.php](http://eacea.ec.europa.eu/education/eurydice/index_en.php), (iv) National Curriculum Handbook for Primary Teachers in England (DFES/QCA 2004), (v) National Curriculum Handbook for Secondary Teachers in England (DFES/QCA 2004), and (vi) The National Curriculum (QCA 2007).

<sup>87</sup> The main types of state schools are: (i) Community schools, (ii) Foundation & Trust schools, Voluntary - aided schools, and (iv) Voluntary - controlled schools. There are also a few school types with "special" characteristics in terms of curriculum, admission criteria, and/or funding system: (i) Academies, (ii) City Technology colleges, (iii) Community & Foundation special schools, (iv) Faiths schools, (v) Grammar schools, and (vi) Maintained Boarding schools.



statutory, while the teaching of economic well-being is added to the PHSE subject, renamed to PHSEE. At the upper stages of national curriculum students are specializing in at least one core subject by taking the GCSE (General Certificate of Secondary Education) qualification. In the post-compulsory years of education (year 12 and 13), A-level (Advanced Level General Certificate of Education) qualification (or equivalent) is offered - a strong specialization in selected subjects - for students who wish to get prepared for entry into Higher education. Table 7.1 presents the offered subjects in each school year of compulsory education.

**Table 7.1 - England: Taught Subjects at each Key Stage**

<b>Subjects</b>	<b>Offered at:</b>
<b>Religion</b>	All stages
<b>History</b>	Key stages 1 - 3
<b>Geography</b>	Key stages 1 - 3
<b>Citizenship</b>	All stages
<b>Personal, social &amp; health education (PSHE)</b>	Key stages 1 - 2
<b>Science</b>	All stages
<b>Physical education</b>	All stages
<b>Music</b>	Key stages 1 - 3
<b>Modern foreign languages</b>	Key stage 1 - 3
<b>Mathematics</b>	All stages
<b>ICT</b>	All stages
<b>English</b>	All stages
<b>Design &amp; technology</b>	Key stages 1 - 3
<b>Art &amp; design</b>	Key stages 1 - 3
<b>Personal, social, health &amp; economic education (PSHEE)</b>	Key stages 3 - 4

### 7.3.2. Educational System: Greece<sup>88</sup>

In Greece, the full-time compulsory education starts a year later and finishes a year earlier compared to the compulsory education in England; pupils enter school at six and may terminate their formal education at the age of fifteen years old. The compulsory period is divided into two main stages: (i) primary education, including years 1 to 6 (age 6 to 12) and (ii) lower secondary education<sup>89</sup> (Gymnasium), including years 7, 8 and 9 (age 13 to 15). After graduating from lower secondary school, students may continue their training by attending the post-compulsory upper secondary schools (Lyceum). At this stage, there are two main types of schools, General and Technical (Vocational) upper schools<sup>90</sup>. General schools are usually selected by pupils who wish to get prepared for the university entry exams, while technical schools are selected by pupils who wish to acquire the necessary qualifications for a technical profession right after their graduation or get prepared for entering a relevant university department. The entrance is based on the final grade in the university entry exams and their declaration of preferred departments or faculties.

The basic subjects that are taught at each year of the primary and secondary education are presented in Table 7.2. All school courses are core (statutory) during the primary and lower secondary stage. In the latter, they are divided into basic and non-basic courses. Students who proceed to the upper secondary stage are eligible to design their own schedule by selecting from a wide variety of elective courses. In the last two years of upper school, the curriculum is divided into “general education” subjects, attended by all pupils, and “direction” subjects (theoretical, exact and technological directions), where students are allocated according to their preference of specialization. Each pupil is eligible to attend only one “direction”.

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<sup>88</sup> Information about Greece’s educational system is collected from the following sources: (i) Pedagogical Institute: [www.pi-schools.gr](http://www.pi-schools.gr), (ii) Digital School, Ministry of Education: <http://digitalschool.minedu.gov.gr/>, (iii) Eurypedia, European Encyclopedia on National Education Systems: [http://eacea.ec.europa.eu/education/eurydice/index\\_en.php](http://eacea.ec.europa.eu/education/eurydice/index_en.php), (iv) Teaching Guidelines for Secondary School Subjects during 2010-11 Academic Year (Pedagogical Institute 2010), and (v) A Cross-thematic Curriculum Framework for Compulsory Education (Pedagogical Institute 2003).

<sup>89</sup> The majority of students visit “General” Gymnasiums. Other main school types include Experimental, Cross-cultural, Church, Special Education, Art, Music, and Minority schools. In terms of time schedule, there are morning, evening and all-day schools.

<sup>90</sup> Besides General and Vocational lyceums, all other school types described in the previous footnote exist in post-compulsory education stage as well.

**Table 7.2 - Taught Subjects in “General” Lower & Upper Secondary School**

<b>Course</b>	<b>Compulsory at:</b>	<b>Elective at:</b>
<i>Primary School (Years 1 - 6)</i>		
Religion	Year 3 to Year 6	
Modern Greek language	All Years	
Mathematics	All Years	
History	Year 3 to Year 6	
Study of the environment	Year 1 to Year 4	
Geography	Year 5, Year 6	
Physics	Year 5, Year 6	
Social & political education	Year 5, Year 6	
Art	All Years	
Physical education	All Years	
English	Year 4 to Year 6	
School life	Year 1, Year 2	
<i>Secondary School (Years 7 - 12)</i>		
Religion	All Years	
Ancient Greek language & literature	All Years	
Modern Greek language	All Years	
Modern Greek literature	All Years	
History	All Years	
Algebra	Year 10, Year 11	
Geometry	Year 10, Year 11	
Physics	Year 8 to Year 12	
Chemistry	Year 8 to Year 11	
1 <sup>st</sup> foreign language (English)	All Years	
2 <sup>nd</sup> foreign language	Year 7 to Year 9	Year 10 to Year 12
Economic principles	Year 10	Year 12
Technology	Year 7, Year 8, Year 10	Year 12
Physical education	All Years	
School & professional orientation	Year 9, Year 10	
Biology	Year 7, Year 9, Year 11, Year 12	
Introduction to law & politics	Year 11	
Mathematics & statistics	Year 12	
Sociology	Year 12	
Social & political education	Year 9	
Mathematics	Year 7 to Year 9	
Geography	Year 7, Year 8	
Music	Year 7, Year 8	Year 10
Art	Year 7 to Year 9	Year 10 to Year 12
Household economics	Year 7, Year 8	
Computer science	Year 7, Year 8	Year 10 to Year 12

### 7.3.3. Environmental Content in English and Greek Secondary Curriculum<sup>91</sup>

The integration of environmental education in the curricula of the two countries took place about two decades ago (Spyropoulou 2005, Chatzifotou 2006, Cotton 2006), and since then it has evolved as one of the key priorities of educational process<sup>92</sup>. So, one of the aims of the English curriculum is to “*sustain and improve the environment, locally and globally*” (QCA 2007, p.7), while one of the key objectives of the Greek curriculum (Pedagogical Institute 2003) is to help students realize the importance of nature’s value and the need to protect the environment and promote sustainable development. Especially in England, education for sustainability has already emerged as a multidimensional subject incorporated not only in the formal and informal (extra-curricular) curriculum, but also in the hidden<sup>93</sup> (school social environment and ethos) curriculum of the school (DCSF 2010), fully supported by the governmental authorities. So, for example, “Top Tips for Sustainability in Schools” report (DfE 2012), provided hints on how schools could become more sustainable by reducing carbon, energy and water use, and engaging with biodiversity.

On a theoretical basis, the revised versions of the curricula that currently take place in the two countries, have further upgraded the sustainability dimension across the aims and objectives of education. Specifically, the “Framework for the National Curriculum” report (DfE 2011, p.17) talks about the need to “*promote understanding of sustainability in the stewardship of resources locally, nationally, and globally*”, while the “New School” curriculum in Greece (Hellenic Ministry of Education 2010) has underlined the need to promote green schools, save energy sources, and learn to protect and manage the environment in a sustainable way.

An important part of environmental teaching in England is covered by the statutory subjects of science, geography, design and technology, and citizenship. Topics about environment and sustainability exist also in the objectives and contents of other subjects such as religion, ICT and mathematics. These include discussions about moral and social questions with reference to contemporary environmental issues, the impact

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<sup>91</sup> Information about environmental education was collected from the curriculum handbooks of the two countries and the cited sources.

<sup>92</sup> By that time, the European Resolution on Environmental Education (in 1998) formally launched the promotion of environmental education teaching at schools of all European Union countries (Palmer 1998, Stokes, Edge & West 2001).

<sup>93</sup> A description of the various types of school curriculum can be found in Brighouse (2006).

of ICT on sustainable development and the use of mathematical models in complex environmental issues. Finally, the curriculum includes a variety of cross-subject themes, linking for example sustainability and global issues, or sustainability, environmental problems, and citizenship. In the final stage of education (key stage 5), the provided environmental training depends on the specialization and subjects that students have selected, and on schools' curriculum implementation.

In Greece, although mainly embedded in the courses of science and geography/geology, environmental topics are diffused across most parts of the curriculum. So, for example, in the learning units of "English" course, called "Weather" and "Natural Phenomena", pupils learn about weather conditions, natural disasters, climate, and energy resources. To mention a few more examples, one of the main objectives of history class is to help students realize the value of nature and the impact of human activity on the environment, whereas students are asked to draw ideas from nature as a requirement of the art class. In the upper secondary school, four courses - environmental studies principles, industrial production and energy, principles of agriculture, and natural resources management - focusing mainly on environmental and sustainability issues are offered as electives<sup>94</sup>. Moreover, in every subject, a recommended list of topics - many of them cross-thematic - is provided to teachers to help them organize a class discussion or project related to environmental issues.

Environmental training is also provided in the two countries informally through the employment of activities beyond the compulsory context of the curriculum. For this purpose, schools may choose to work independently or coordinate with various governmental or independent organizations specializing in the development and planning of short-term and long-term environmental projects. In Greece, an important contribution to the development and delivery of informal education is offered by Environmental Education Centers, operating in various parts of the country under the auspices of Ministry of Education (Michaelides 2005). Environmental Education Centers operate in England as well, mainly controlled by local authorities and private organizations. Examples of other independent initiatives include the "Eco-school" scheme and the "Sustainability and Environmental Education" charity in England, and the "Eco-mobility" scheme in Greece.

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<sup>94</sup> Elective courses may not be available in some schools every academic year.

Here, it should be underlined that the different structure and implementation strategy of the curricula might affect the validity of a qualitative comparison between the two countries. In England, the curriculum offers a general framework for the topics that need to be covered and the goals that need to be achieved in each subject. Within the general context, schools and teachers are flexible to design their own teaching approaches. On the other hand, the implementation of the Greek curriculum is rather strict and mandatory for all schools, public and private ones. Each year, the Ministry of Education provides specific guidelines about the teaching materials, the teaching hours to be invested for each topic, and the learning and evaluation procedures that need to be followed. All school books are published by the government and distributed to students free of charge. Thus, students' "formal" exposure to environmental issues is predetermined and specifically defined by the Greek authorities, whereas it is highly dependent on each school's policy and teaching procedures in England.

Another issue that would make a comparative analysis problematic is the lack of information regarding teachers' contribution to environmental teaching. Existing literature (Hart, Jickling & Kool 1999, Gayford & Dillin 1995, Cotton 2006, Spiropoulou et al. 2007) has suggested that disparities may be observed between the theoretical description of environmental aims and objectives in school curricula, and its practical implementation in schools. The content, the quality and the effectiveness of the provided environmental education depend to a great extent on teachers' attitudes, beliefs, personal experience, training and motivation to get involved with environmental teaching (Cotton 2006).

#### **7.4. Survey Methodology and Analysis**

For the analysis, as in the previous chapters, we have used two case studies, the English one consisting of 527 students from 15 secondary schools, and the Greek one consisting of 3614 students from 94 schools. Satisfaction with life as a whole is assessed by Huebner et al.'s (2006) BMSLSS scale (score from 1 to 7), while eudaimonic well-being is measured by the modified 7-item version of Waterman et al.'s (2010) original 21-item QEWB. The assessment of satisfaction with school life is based on a single/"global" question taken from BMSLSS: *"Overall, I would describe my satisfaction with school life as..."* (single score from 1 to 7).

### *Overall Life Satisfaction and Eudaimonic Well-being Model*

A brief description of the independent variables is provided in Table 7.3. For the model specification, we have used almost the same socio-demographic and environmental variables as in the comparative analysis of Chapter 6. Here, we have also added “envknowledge”, a 3-item variable, assessing pupils’ environmental knowledge background, and environmental education score (“enveducscore”), a 10-item index for England and 12-item index for Greece, assessing students’ environmental education experience according to their participation on a wide range of relevant activities at school. The activities<sup>95</sup> that have been included in the survey (please see Appendix B, question 22, p. 246) for the formation of “enveducscore” are presented in Table 7.5. One point is awarded for participation in each of the stated activities<sup>96</sup>.

For simplicity, we dropped location and climate variables from the analysis. Instead, we included dummies for each different school in order to control for school fixed effects. This change does not affect the fit and performance of the model, since school dummies and location variables are almost equivalent factors. This occurs because most pupils’ residence location is very close to the location of the school which they attend.

The estimation of the results is based on OLS regressions with robust clustered standard errors:

$$swb_{i,jk} = \beta + \beta_1 x_{i,jk} + \beta_2 w_{i,jk} + d_j + \varepsilon_{i,jk} \quad (7.1)$$

where  $swb_{i,jk}$  is pupil’s  $i$  life satisfaction or eudaimonia in school  $j$  and school class  $k$ ,  $x_{i,jk}$  is a vector of socio-demographic and psychometric variables,  $w_{i,jk}$  is a vector of

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<sup>95</sup> The selection of these activities has been based on an extensive review of school curricula and on information provided by students during focus group discussions.

<sup>96</sup> Since the main focus of this chapter is on the role of school environmental education activities, “enveducscore” is based on students’ answers about participation in relevant activities within the school context only. However, as it can be seen in the relevant survey question (question 22, p. 246), students were also asked to report whether they have participated in an environmental education activity outside of school. A non-school environmental education variable has been formed to assess the potential impact of non-school environmental education on well-being, but its effect appeared to be insignificant (also, the inclusion of this variable did not affect the impact of “enveducscore” variable).

environmental variables and  $d_j$  is a vector of school dummy variables. In addition, we created a simple structural equation model (SEM) to capture potential indirect effects of environmental education (through the enhancement of empirical affiliation with nature on the three dimensions of well-being). More details about the construction of the model are provided in Section 7.5.3.

**Table 7.3 – Overall LS & EWB Analysis: Independent Variables**

Independent Variables	Values and Description
<i>Socio-demographics/Psychometrics</i>	
Girl	1 if female
Age	Between 12 and 19
Money	Weekly pocket money: ordinal variable (1 - 4)
Homework	Weekly school reading: 1 - 5 (never/rarely - very often)
Hobbies	Weekly time for hobbies: 1 - 5 (never/rarely - very often)
TVwatching	Weekly TV watching: 1 - 5 (never/rarely - very often)
Internet	Weekly internet surfing: 1 - 5 (never/rarely - very often)
PCgames	Weekly computer games: 1 - 5 (never/rarely - very often)
Friends	Weekly time with friends: 1 - 5 (never/rarely - very often)
Health	Health status: 1 - 5 (not at all healthy - very healthy)
SelfEsteem	Confidence: 1 - 5 (not at all confident - very confident)
StressStatus	Stress status: 1 - 5 (not at all stressed - very stressed)
Intrinsic	8-item score: 1 - 5 (not at all important - very important)
<i>Environmental Variables</i>	
NEI	Students' empirical exposure to nature (score between 1 to 5)
NeighborhoodGreen	Perception about green neighborhood: 1 - 5 (not at all/ very few - many)
SchoolGreen	Perception about school green yard: 1 for existence of green schoolyard
SchoolGreenView	1 if there is a view of nature from classroom window
HouseGreenView	1 if there is a view of nature from home window
LocalConcerns	4-item score: concerns about local environmental problems: 4-item score between 1 - 5 (not at all worried - very worried)
Worldviews	2-item score ranging between 1 and 5 (strongly disagree - strongly agree)
MoralisticValue	3-item score ranging between 1 and 5 (strongly disagree - strongly agree)
RelBiocentricReason	Mean-corrected biocentric reasoning: relatively stronger biocentric (over anthropocentric) concerns about the consequences of environmental degradation to animals and plants; score between -0.2 and 0.2
Awareness	Awareness about global environmental issues: 4-item score, 1 - 5 (not at all worried - very worried)
IndoorSports	Participation to indoor sports: 1 - 5 (never, rarely, once or twice a week, several times a week, very often/everyday)
InHomePlay	Play at home: 1 - 5 (as above)
UnsafeFeeling	Perceptions on local security issues: 1 - 5 (not at all severe - very severe)
EnvKnowledge	3-item environmental knowledge score: from 0 to 3
EnvEducScore	12-item score (10-item for England): score based on participation in various environmental education activities with school



### *Satisfaction with School Life Model*

According to the existing non-adult literature, relations with peers and academic achievement are two important positive determinants of students' satisfaction with school (Huebner & Gilman 2006, Suldo, Shaffer & Riley 2008, Suldo et al. 2012). In order to control for these factors, we included "friends" variable (time allocation to friends) as a proxy for socialization with other pupils, and "homework" variable (time allocation to school reading) as a proxy for academic performance. We also added a variable based on students' reports about their self-esteem, which has been found to be incremental to school satisfaction (Baker & Maupin 2009), and a self-reported stress variable, which has been found to be detrimental to satisfaction with school life (Baker & Maupin 2009). Finally, two basic demographic variables whose impact is typically examined in the literature, age and gender, have been included in the model.

To assess the influence of environmental education on school satisfaction, we used again "enveducscore" as a proxy for environmental education experience. Furthermore, we included "schoolgreen" and "schoolgreenview" dummies, based on students' reports on whether there is a green schoolyard and a view of nature from at least one classroom window, to measure the potential impact of a green surrounding on school happiness and explore potential interactions between school green and environmental education activities. We also included the 10-item NEI index, assessing connectedness with the natural world. Someone could argue that a potential positive effect of participation in environmental education on school satisfaction may be predominantly attributed to the recreation and joy of play, team work and socialization with student mates, rather than on the interaction with the natural environment. If this assumption holds, the effect of "enveducscore" should be absorbed by NEI (proxy for general experiential connectedness with nature, not directly related to environmental education activities) and "friends" variable (proxy for interaction with peers). A brief description of the independent variables is provided in Table 7.4. The estimation of the results is based on two regression approaches: OLS and ordered logit.

The general regression form is as follows:

$$sls_{i,jk} = \beta + \beta_1 \tilde{x}_{i,jk} + \beta_2 \tilde{w}_{i,jk} + d_j + \varepsilon_{i,jk} \quad (7.2)$$

where  $sls_{i,jk}$  is pupil's  $i$  school satisfaction in school  $j$  and school class  $k$ ,  $\tilde{x}_{i,jk}$  is a sub-vector of socio-demographic and psychometric variables,  $\tilde{w}_{i,jk}$  is a sub-vector of environment-related variables and  $d_j$  is a vector of school dummies.

**Table 7.4 - Satisfaction with School Life Analysis: Independent Variables**

Independent Variables	Values and Description
Girl	1 if female
Age	between 12 to 19
Homework	Weekly school reading: 1 - 5 (never/rarely - very often)
Friends	Weekly time with friends: 1 - 5 (never/rarely - very often)
SelfEsteem	Confidence: 1 - 5 (not at all confident - very confident)
Stress	Stress status: 1 - 5 (not at all stressed - very stressed)
NEI	Student empirical exposure to nature (score between 1 - 5)
SchoolGreen	Perception about school green yard: 1 for existence of green schoolyard
SchoolGreenView	1 if there is a view of nature from classroom window
EnvKnowledge	3-item environmental knowledge score: from 0 to 3
EnvEducScore	12-item score (10-item for England): Score based on participation in various environmental education activities with school

**Table 7.5 - Environmental Education Score Questions**

"Enveducscore" Questions	English Sample	Greek Sample
Nature exploring (grassland, pond, or river exploring for example)	Yes	Yes
Sea & coast exploring	No	Yes
Fauna & flora investigation	Yes	Yes
Art in nature	Yes	Yes
Bird watching	Yes	Yes
Gardening	Yes	Yes
Tree planting	Yes	Yes
Recycling	Yes	Yes
Park/green areas cleaning	Yes	Yes
Seminars/talks about environmental topics	Yes	Yes
Writing a paper about an environmental topic	Yes	Yes
EEC* visits	No	Yes

\**Environmental Education Center*

## 7.5. Statistical Findings

### 7.5.1. Descriptive Statistics

The basic descriptive statistics in relation to participation in environmental education programs<sup>97</sup> and various activities are presented in Tables 7.6 – 7.13. For the English sample, 349 pupils (66.23%) have participated in at least one environmental education program at school. Though, for 36.38% of these pupils, their experience took place only during their primary education (Table 7.6). On the other hand, a 33.77% of the sample, i.e. 178 students, has never been involved with a relevant activity during their education training. To provide some more basic demographic information, 43.27% of pupils with environmental education experience are girls, while 56.73% are boys. In terms of education stage, 40.97% of the pupils attend key stage 3, 40.40% attend key stage 4 and 18.63% of students attend key stage 5. In terms of location, 41.55% reside in rural locations (less than 10000 people), whereas 58.45% reside in urban areas.

As it can be seen in Table 7.7, 151 out of 231 girls, (65.37%), and 198 out of 296 boys (66.89%) have been engaged in at least one environmental education activity. With reference to education level, the percentage of pupils with environmental education experience is roughly over 60% in key stages 3 and 4 (62.99% and 64.09% respectively), and 81.25% in key stage 5. High participation percentages are also observed by location; 68.07% of rural school students and 64.96% of urban school students have been involved with a school environmental activity at least once.

According to the frequency statistics presented in Table 7.9, “nature exploring” is the most popular school environmental activity; 73.06% of the students had a relevant experience. Subsequently, 60.45% have written a paper concerning an environmental issue, while 59.02% have an art experience in nature. On the other hand, bird watching (14.89%), cleaning of green areas (15.75%) and gardening (20.91%) are on the lower side of the list. Surprisingly, a relatively low percentage of children have been involved with recycling (28.08%) and tree planting (29.51%) at school.

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<sup>97</sup> For the purposes of the comparison, we have used an environmental education dummy being positive if students have been involved at least once with an environmental education activity at school. Please see Appendix B, question 21a.

The mean differences of some basic experiential and cognitive environmental variables, i.e. “Nature Experience” (NEI), worldviews, moralistic values, relatively biocentric reasoning, knowledge and awareness, with reference to participation in environmental education programs are included in Table 7.8. To assess whether the mean differences are statistically significant, we performed a t-test comparison for each variable. The findings show that only the mean difference of worldviews is statistically insignificant ( $m_p = 3.63$ ,  $m_{np} = 3.58$ ,  $t(525) = -0.90$ ,  $p > 0.1$ )<sup>98</sup>. For moralistic values ( $m_p = 3.87$ ,  $m_{np} = 3.72$ ,  $t(525) = -2.29$ ,  $p < 0.05$ ), relatively biocentric reasoning ( $m_p = -0.10$ ,  $m_{np} = -0.22$ ,  $t(525) = -2.03$ ,  $p < 0.05$ ), awareness ( $m_p = 3.63$ ,  $m_{np} = 3.49$ ,  $t(525) = -1.99$ ,  $p < 0.05$ ), the difference appears to be significant at a 5% level, while the difference for “nature experience” ( $m_p = 3.12$ ,  $m_{np} = 2.72$ ,  $t(525) = -6.51$ ,  $p < 0.001$ ) and knowledge ( $m_p = 1.90$ ,  $m_{np} = 1.62$ ,  $t(525) = -3.33$ ,  $p < 0.001$ ) variables is significant at a 1% level. In general, our findings are in line with the available literature suggesting that environmental education enhances knowledge, attitudes and empirical connectedness with nature (Rickinson 2001, Lieflander et al. 2012).

For the Greek sample, as it is shown in Table 7.10, the majority of the sample (2272 students, 62.87%) has participated in at least one environmental education activity with school. As in case of England, a relatively high percentage of those students, 30.38%, had this experience during their primary stage education only. Of those who have participated in a relevant activity, the majority is girls (58.72%), lives in rural areas (61.18%), and attends the upper levels of secondary education (75.44%).

In relation to gender, 66.53% of girls and 58.30% of boys have been involved with at least one environmental experience with school (Table 7.11). In terms of education stage, 54.65% of lower secondary school students and 66.10% of upper secondary school students had a relevant experience. The corresponding percentage for rural and urban participants is 70.70% and 53.52% accordingly. As with English schools, it appears that Greek rural schools offer more opportunities for environmental activities compared to urban schools and/or rural pupils are more willing to participate.

To briefly discuss about frequencies of various environmental activities, as it is shown in Table 7.13, 54.68% of the students have written a paper about the environment, while 43.11% have visited an Environmental Education Center with school. On the

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<sup>98</sup>  $m_p$  denotes the mean of group with environmental education experience and  $m_{np}$  denotes the mean of group without environmental experience.

other hand, sea/coast exploring and bird watching appear to be the least performed activities (8.69% and 9.41% respectively). Finally, as in the English case study, the findings (Table 7.12) show that pupils with environmental experience at school appear to have stronger levels of empirical affiliation with nature ( $m_p = 3.20$ ,  $m_{np} = 2.97$ ,  $t(3612) = -10.33$ ,  $p < 0.001$ ), moralistic values ( $m_p = 4.52$ ,  $m_{np} = 4.43$ ,  $t(3612) = -4.98$ ,  $p < 0.001$ ), knowledge ( $m_p = 1.98$ ,  $m_{np} = 1.88$ ,  $t(3612) = -3.14$ ,  $p < 0.01$ ), awareness ( $m_p = 4.18$ ,  $m_{np} = 4.05$ ,  $t(3612) = -5.14$ ,  $p < 0.001$ ), worldviews ( $m_p = 3.95$ ,  $m_{np} = 3.92$ ,  $t(3612) = -1.43$ ,  $p < 0.1$ ) and relatively biocentric reasoning ( $m_p = -0.12$ ,  $m_{np} = -0.10$ ,  $t(3612) = 1.55$ ,  $p < 0.1$ ). According to t-test statistics, all mean differences have been found to be statistically significant, at a 1% level for the first four aforementioned variables and at a 10% for the latter two variables.

**Table 7.6 - Basic Descriptive Statistics: British Pupils with Environmental Education Experience**

English Sample				
Variables	Participation		No Participation	
	N	(%)	N	(%)
Girls	151	43.27	80	44.95
Boys	198	56.73	98	55.05
<b>Total</b>	<b>349*</b>	<b>100%</b>	<b>178</b>	<b>100%</b>
Key stage 3	143	40.97	84	47.19
Key stage 4	141	40.40	79	44.38
Key stage 5	65	18.63	15	8.43
<b>Total</b>	<b>349</b>	<b>100%</b>	<b>178</b>	<b>100%</b>
Rural	145	41.55	68	38.20
Urban	204	58.45	110	61.80
<b>Total</b>	<b>349</b>	<b>100%</b>	<b>178</b>	<b>100%</b>

\* 127 pupils, i.e. 36.38%, have participated in an environmental education program only in primary school.

**Table 7.7 – British Pupils’ Participation in Environmental Education by Main Socio-demographic Categories**

English Sample					
Variables	Participation		No Participation		<i>Total</i>
	N	(%)	N	(%)	
Girls	151	65.37	80	34.63	<b>231</b>
Boys	198	66.89	98	33.11	<b>296</b>
Key stage 3	143	62.99	84	37.01	<b>227</b>
Key stage 4	141	64.09	79	35.91	<b>220</b>
Key stage 5	65	81.25	15	18.75	<b>80</b>
Rural	145	68.07	68	31.93	<b>213</b>
Urban	204	64.96	110	35.04	<b>314</b>

**Table 7.8 – Mean Differences by Participation in Environmental Education (England)**

English Sample		
Variables	Participation	No Participation
Nature experience (NEI) <sup>***</sup>	3.12 (0.03)	2.72 (0.05)
Worldviews	3.63 (0.03)	3.58 (0.05)
Moralistic <sup>**</sup>	3.87 (0.04)	3.72 (0.05)
Rel biocentric reasoning <sup>**</sup>	-0.10 (0.03)	-0.22 (0.05)
Awareness <sup>**</sup>	3.63 (0.04)	3.49 (0.06)
Env knowledge <sup>**</sup>	1.90 (0.05)	1.62 (0.07)

*\*\* mean difference significant at a 5% level, \*\*\* mean difference significant at a 1% level.*

**Table 7.9 – Students’ Participation in various Environmental Activities**

Variables	English Sample			
	Participation		No participation	
	N	(%)	N	(%)
Nature exploring (grassland, pond, or river exploring for example)	255	73.06	272	26.94
Writing a paper about an environmental topic	211	60.45	316	39.55
Art in nature	206	59.02	321	40.98
Seminars/talks about various environmental topics	124	35.53	403	64.47
Tree planting	103	29.51	424	70.49
Recycling	98	28.08	429	71.92
Fauna & flora investigation	83	23.78	444	76.22
Gardening	73	20.91	454	79.09
Park/green areas cleaning	55	15.75	472	84.25
Bird watching	52	14.89	475	85.11

**Table 7.10 – Basic Descriptive Statistics: Greek Pupils with Environmental Education Experience**

Variables	Greek Sample			
	Participation		No Participation	
	N	(%)	N	(%)
Girls	1334	58.72	671	50.00
Boys	938	41.28	671	50.00
<b>Total</b>	<b>2272*</b>	<b>100%</b>	<b>1342</b>	<b>100%</b>
Lower secondary	558	24.56	463	34.50
Upper secondary	1714	75.44	879	65.50
<b>Total</b>	<b>2272</b>	<b>100%</b>	<b>1342</b>	<b>100%</b>
Rural	1390	61.18	576	42.92
Urban	882	38.82	766	57.08
<b>Total</b>	<b>2272</b>	<b>100%</b>	<b>1342</b>	<b>100%</b>

\* 688 pupils, i.e. 30.38%, have participated in an environmental education program only in primary school.

**Table 7.11 - Greek Pupils' Participation in Environmental Education by Main Socio-demographic Categories**

Variables	Greek Sample				<i>Total</i>
	Participation		No Participation		
	N	(%)	N	(%)	
Girls	1334	66.53	671	33.47	<b>2005</b>
Boys	938	58.30	671	41.70	<b>1609</b>
Lower Secondary	558	54.65	463	45.35	<b>1021</b>
Upper Secondary	1714	66.10	879	33.90	<b>2593</b>
Rural	1390	70.70	576	29.30	<b>1966</b>
Urban	882	53.52	766	46.48	<b>1648</b>

**Table 7.12 - Mean Differences by Participation in Environmental Education (Greece)**

Variables	Greek Sample	
	Participation	No Participation
Nature experience (NEI) <sup>***</sup>	3.20 (0.01)	2.97 (0.02)
Worldviews <sup>*</sup>	3.95 (0.01)	3.92 (0.02)
Moralistic <sup>***</sup>	4.52 (0.01)	4.43 (0.01)
Rel biocentric reasoning <sup>*</sup>	-0.12 (0.01)	-0.10 (0.01)
Awareness <sup>***</sup>	4.18 (0.01)	4.05 (0.02)
Env knowledge <sup>***</sup>	1.98 (0.02)	1.88 (0.02)

*\* mean difference significant at a 10% level, \*\*\* mean difference significant at a 1% level.*



**Table 7.13 – Students’ Participation in various Environmental Activities**

Variables	Greek Sample			
	Participation		Participation	
	N	(%)	N	(%)
Writing a paper about an environmental topic	1976	54.68	1638	45.32
EEC* visits	1558	43.11	2056	56.89
Fauna & flora investigation	1159	32.07	2455	67.93
Tree planting	1144	31.65	2470	68.35
Park/green areas cleaning	1036	28.67	2578	71.33
Seminars/talks about environmental topics	991	27.42	2623	72.58
Recycling	890	24.63	2724	75.37
Ecosystems exploring	720	19.92	2894	80.08
Art in nature	565	15.63	3049	84.37
Gardening	524	14.5	3090	85.5
Bird watching	340	9.41	3274	90.59
Sea & coast exploring	314	8.69	3300	91.31

\* *Environmental Education Center*

## 7.5.2. Environmental Education and Well-being: Regression Analysis Results

### *English Sample*

As the estimations in Table 7.14 suggest, the engagement in environmental education activities appears to be an insignificant determinant of life satisfaction. In the second model specification, “nature experience” variable was dropped from the analysis to detect potential indirect effects; if the effect of the environmental education variable becomes significant, this would imply that the influence of environmental education on life satisfaction is transmitted through the enhancement of NEI index (which absorbs the power of “enveducscore” variable as long as it is present in the model). However, the effect of “enveducscore” variable remains statistically weak. Similarly, as it is shown in Table 7.15 – Model 1, participation in environmental education is found to have an insignificant effect on eudaimonic well-being under the full model specification. However, the coefficient of “enveducscore” variable increases from beta = 0.011 (p-value = 0.28) to beta = 0.016 (p-value = 0.13) and reaches significance when

NEI is excluded from the model<sup>99</sup>. As we have discussed in the previous chapter, we suspect that significance could have been achieved with a somewhat larger sample (with smaller standard errors).

As expected, time allocation to homework – proxy for academic achievement – and time allocation to friends – proxy for socialization with peers – appear to be positive and significant when self-reported satisfaction with school life (ordinal variable ranging from 1 to 7) is used as a dependent variable. Similarly to the findings of several studies with non-adult populations (Baker & Maupin 2009), higher levels of self-esteem are associated with higher levels of satisfaction with school. On the other hand, self-reported stress is detrimental to school satisfaction. The sign and the significance level of these predictors is the same in both estimation methods, i.e. OLS and ordered logit (Table 7.16). Finally, age and gender appear to be insignificant, verifying evidence of weak/modest impact of demographic variables in the existing non-adult literature (Baker & Maupin 2009, Elmore & Huebner 2010).

Having positive perceptions on the existence of a green school yard (“schoolgreen”) and a view of nature from at least one classroom window (“schoolgreenview”) is associated with higher levels of school satisfaction (Table 7.16). The former is significant in both model specifications, whereas the latter is significant (at a 10% level) only in the OLS analysis. However, it becomes significant at a 5% level once “schoolgreen” is dropped from the analysis, verifying the expected positive correlation between the two variables<sup>100</sup>. Environmental education experience appears to have a direct influence on school satisfaction. The sign of “enveducscore” coefficient is positive and significant at a 1% level for the OLS (beta = 0.069) and ordered logit (beta = 0.123) models respectively. NEI, i.e. empirical exposure to nature, is also positive and significant in both model specifications (OLS: beta = 0.158,  $p < 0.1$  and ordered logit: beta = 0.349,  $p < 0.01$ ). Given that NEI works as control factor for non environmental education related exposure to nature and “friends” works as a control factor for non

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<sup>99</sup> “Enveducscore” becomes significant at a 10% confidence level (beta = 0.020) if “schoolgreen” dummy is excluded from them model together with NEI (see Appendix A7, Table A7.1 for the regression results). A possible explanation for the correlation between “enveducscore” and “schoolgreen” dummy is that increasing schoolyard green spaces may be part of the various environmental education programs that take place in a certain school. Another explanation could be school’s increased interest for the environment, its “green ethos” that enhances students’ perceptions about green schoolyards and promotes participation in environmental education programs.

<sup>100</sup> Please see Appendix A7, Table A7.2 for the regression results.

environment related effects on satisfaction, evidence is provided that a respectable percentage of the positive influence of environmental education on school satisfaction is attributed to the enhancement of participants' affiliation with the natural world (and not only on the pleasure received by the participation in a school activity or interaction with school mates).

### *Greek Sample*

Applying the same model specifications as with the English sample, we found (Table 7.17) that accumulating environmental experience, as expressed by environmental education score ("enveducscore"), has a direct positive impact on overall life satisfaction (beta = 0.020, p-value < 0.01). When NEI variable is dropped, the magnitude of environmental education variable and its standard error remain at almost the same levels as before (b=0.023, p-value < 0.01); the mediating role of "nature experience" cannot be verified at first instance.

In addition, our findings suggest that participation in environmental education activities, marginally significant at a 5% level (beta = 0.006, p - value = 0.057), has a direct impact on eudaimonic well-being (Table 7.18 - Model 1). The effect becomes stronger (beta = 0.009, p - value = 0.015) when NEI is excluded from the analysis (Table 7.18 - Model 2). Again, this could be suggestive of the performance of NEI as a mediator between environmental education and eudaimonic well-being. Interestingly, students with stronger environmental knowledge exhibit higher levels of eudaimonia. "Envknowledge" variable (3-item index) appears to be a very strong positive determinant of eudaimonia in both models (with or without NEI). This outcome verifies the positive effect of environmental education, if environmental knowledge is viewed as a proxy for the latter and taking into account past research associating higher level of knowledge with participation in environmental training (Rickinson 2001). Indeed, "enveducscore" variable becomes significant at a 5% level (beta = 0.007, p - value = 0.032) when "envknowledge" is dropped from the model specification, despite the presence of NEI variable<sup>101</sup>.

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<sup>101</sup> Please see Table Appendix A7, Table A7.1 for the regression results.

Regarding satisfaction with school life (Table 7.19), as with the English sample, a significantly positive impact of NEI and environmental education experience has been found with both regression approaches, i.e. OLS and ordered logistic; both NEI and “enveducscore” variables appear to be significant at a 1% level. Also, the positive effect of both “school green” related variables has been revealed. The probability of being happier is greater for students who have mentioned that their school has a green yard and there is a view of nature from their classroom window. The two variables are statistically significant in both regression specifications (even if they are both included in the model specification).

**Table 7.14 - Overall Life Satisfaction Regressions: England**

Variables	Life Satisfaction 1		Life Satisfaction 2	
	Coeff.	St. E.	Coeff.	St. E.
<i>Socio-demographics/Psychometrics</i>				
Girl	-0.027	0.071	-0.043	0.070
Age	<b>-0.077***</b>	<b>0.023</b>	<b>-0.079***</b>	<b>0.023</b>
Money	0.054	0.039	0.048	0.039
Homework	0.057	0.035	<b>0.067*</b>	<b>0.036</b>
Hobbies	0.008	0.031	0.021	0.030
TVwatching	<b>0.087***</b>	<b>0.030</b>	<b>0.080***</b>	<b>0.030</b>
Internet	-0.051	0.033	-0.048	0.033
PCgames	<b>-0.072*</b>	<b>0.041</b>	<b>-0.070*</b>	<b>0.040</b>
Friends	<b>0.061***</b>	<b>0.023</b>	<b>0.066***</b>	<b>0.024</b>
Health	<b>0.147***</b>	<b>0.055</b>	<b>0.150***</b>	<b>0.053</b>
SelfEsteem	<b>0.210***</b>	<b>0.044</b>	<b>0.210***</b>	<b>0.044</b>
Stress	<b>-0.241***</b>	<b>0.041</b>	<b>-0.239***</b>	<b>0.041</b>
Intrinsic	<b>0.260***</b>	<b>0.085</b>	<b>0.276***</b>	<b>0.082</b>
<i>Environmental Variables</i>				
NEI	<b>0.104**</b>	<b>0.055</b>	-	-
NeighborhoodGreen	<b>0.079***</b>	<b>0.030</b>	<b>0.086***</b>	<b>0.030</b>
SchoolGreen	<b>0.194**</b>	<b>0.090</b>	<b>0.207**</b>	<b>0.090</b>
SchoolGreenView	-0.064	0.079	-0.059	0.081
HouseGreenView	0.111	0.102	0.127	0.103
LocalConcerns	0.031	0.046	0.037	0.045
WorldViews	-0.040	0.060	-0.029	0.063
MoralisticValue	-0.025	0.049	-0.022	0.050
RelBiocentricReas	-0.031	0.058	-0.014	0.054
Awareness	-0.012	0.043	-0.009	0.043
IndoorSports	-0.021	0.024	-0.007	0.022
InHomePlay	<b>0.075*</b>	<b>0.039</b>	<b>0.071*</b>	<b>0.039</b>
UnsafeFeeling	<b>-0.114***</b>	<b>0.039</b>	<b>-0.115***</b>	<b>0.039</b>
EnvKnowledge	0.031	0.044	0.027	0.045
EnvEducScore	0.009	0.022	0.013	0.021
Observations	527		527	
R-squared	0.4469		0.4437	

*Robust clustered standard errors in parenthesis, \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. School dummies have been included to control for fixed effects.*

Table 7.15 – Eudaimonic Well-being Regressions: England

Variables	Eudaimonic WB 1		Eudaimonic WB 2	
<i>Socio-demographics/Psychometrics</i>	Coeff.	St. E.	Coeff.	St. E.
Girl	<b>-0.129**</b>	<b>0.056</b>	<b>-0.149***</b>	<b>0.055</b>
Age	0.011	0.014	0.007	0.014
Money	0.027	0.025	0.020	0.024
Homework	0.020	0.020	0.033	0.022
Hobbies	<b>0.063***</b>	<b>0.020</b>	<b>0.081***</b>	<b>0.019</b>
TVwatching	0.008	0.019	-0.001	0.021
Internet	0.005	0.028	0.009	0.029
PCgames	-0.010	0.017	-0.006	0.018
Friends	-0.007	0.020	0.002	0.020
Health	-0.014	0.037	-0.010	0.038
SelfEsteem	<b>0.098***</b>	<b>0.023</b>	<b>0.098***</b>	<b>0.023</b>
Stress	-0.030	0.024	-0.027	0.025
Intrinsic	<b>0.499***</b>	<b>0.069</b>	<b>0.520***</b>	<b>0.067</b>
<i>Environmental Variables</i>				
NEI	<b>0.140**</b>	0.063	-	-
NeighborhoodGreen	-0.003	0.019	0.007	0.019
SchoolGreen	0.081	0.054	<b>0.098*</b>	<b>0.054</b>
SchoolGreenView	-0.014	0.074	-0.007	0.075
HouseGreenView	-0.006	0.055	0.016	0.060
LocalConcerns	-0.004	0.033	0.004	0.034
WorldViews	-0.008	0.039	0.008	0.040
MoralisticValue	0.038	0.040	0.042	0.043
RelBiocentricReas	-0.058	0.051	-0.035	0.047
Awareness	0.022	0.033	0.025	0.033
IndoorSports	0.025	0.019	0.044	0.019
InHomePlay	0.023	0.025	0.018	0.024
UnsafeFeeling	-0.024	0.020	-0.025	0.021
EnvKnowledge	-0.006	0.024	-0.011	0.023
EnvEducScore	0.011	0.010	0.016	0.010
Observations	527		527	
R-squared	0.4740		0.4613	

Robust clustered standard errors in parenthesis, \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . School dummies have been included to control for fixed effects.

Table 7.16 – Satisfaction with School Life Regressions: England

Variables	OLS		Ordered Logit	
<i>School Satisfaction (1 to 7)</i>	Coeff.	St. E.	Coeff.	St. E.
Girl	-0.014	0.121	0.019	0.189
Age	-0.042	0.035	-0.061	0.059
Homework	<b>0.197***</b>	<b>0.040</b>	<b>0.332***</b>	<b>0.078</b>
Friends	<b>0.314***</b>	<b>0.066</b>	<b>0.590***</b>	<b>0.112</b>
SelfEsteem	<b>0.310***</b>	<b>0.060</b>	<b>0.511***</b>	<b>0.106</b>
Stress	<b>-0.206***</b>	<b>0.052</b>	<b>-0.272***</b>	<b>0.098</b>
NEI	<b>0.158*</b>	<b>0.090</b>	<b>0.349***</b>	<b>0.154</b>
SchoolGreen	<b>0.441***</b>	<b>0.137</b>	<b>0.665***</b>	<b>0.207</b>
SchoolGreenView	<b>0.340*</b>	<b>0.199</b>	0.444	0.295
EnvKnowledge	0.018	0.065	0.006	0.109
EnvEducScore	<b>0.069***</b>	<b>0.024</b>	<b>0.123***</b>	<b>0.041</b>
Obsevation	527		527	
R-squared/Pseudo-R	0.3475		0.1310	

Robust clustered standard errors in parenthesis, \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . School dummies have been included to control for fixed effects.

Table 7.17 – Life Satisfaction Regressions: Greece

Variables	Life Satisfaction 1		Life Satisfaction 2	
	Coeff.	St. E.	Coeff.	St. E.
<i>Socio-demographics/Psychometrics</i>				
Girl	-0.205***	0.033	-0.211***	0.032
Age	-0.031*	0.016	-0.034**	0.016
Money	0.026*	0.014	0.025*	0.014
Homework	0.115***	0.015	0.117***	0.014
Hobbies	-0.008	0.010	-0.003	0.010
TVwatching	0.016	0.013	0.014	0.013
Internet	-0.039***	0.014	-0.037***	0.013
PCgames	-0.025*	0.014	-0.024*	0.013
Friends	0.217***	0.019	0.221***	0.018
Health	0.236***	0.019	0.234***	0.018
SelfEsteem	0.159***	0.015	0.163***	0.015
Stress	-0.076***	0.010	-0.073***	0.010
Intrinsic	0.024	0.040	0.032	0.039
<i>Environmental Variables</i>				
NEI	0.065***	0.024	-	-
NeighborhoodGreen	0.063***	0.014	0.069***	0.014
SchoolGreen	0.122***	0.041	0.127***	0.041
SchoolGreenView	0.004	0.038	0.001	0.038
HouseGreenView	0.093**	0.042	0.106***	0.041
LocalConcerns	-0.030*	0.017	-0.030*	0.017
WorldViews	-0.045**	0.018	-0.047***	0.018
MoralisticValue	0.035	0.025	0.036	0.026
RelBiocentricReas	-0.072**	0.031	-0.063**	0.030
Awareness	-0.016	0.022	-0.009	0.022
IndoorSports	-0.014	0.009	-0.009	0.009
InHomePlay	0.010	0.013	0.007	0.014
UnsafeFeeling	-0.012	0.012	-0.011	0.012
EnvKnowledge	-0.014	0.016	-0.012	0.016
EnvEducScore	0.020***	0.005	0.023***	0.005
Observations	3614		3614	
R-squared	0.3325		0.3306	

Robust clustered standard errors in parenthesis, \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . School dummies have been included to control for fixed effects.

Table 7.18 – Eudaimonic Well-being Regressions: Greece

Variables	Eudaimonic WB 1		Eudaimonic WB 2	
	Coeff.	St. E.	Coeff.	St. E.
<i>Socio-demographics/Psychometrics</i>				
Girl	-0.005	0.021	-0.011	0.021
Age	<b>0.021**</b>	<b>0.010</b>	<b>0.018*</b>	<b>0.010</b>
Money	<b>-0.023**</b>	<b>0.009</b>	<b>-0.021**</b>	<b>0.009</b>
Homework	<b>0.032***</b>	<b>0.008</b>	<b>0.036***</b>	<b>0.008</b>
Hobbies	<b>0.047***</b>	<b>0.007</b>	<b>0.057***</b>	<b>0.007</b>
TVwatching	<b>-0.016***</b>	<b>0.008</b>	<b>-0.017*</b>	<b>0.008</b>
Internet	-0.005	0.008	-0.006	0.008
PCgames	<b>-0.019**</b>	<b>0.008</b>	<b>-0.018*</b>	<b>0.008</b>
Friends	0.007	0.011	0.015	0.011
Health	<b>0.065***</b>	<b>0.012</b>	<b>0.071***</b>	<b>0.013</b>
SelfEsteem	<b>0.068***</b>	<b>0.009</b>	<b>0.070***</b>	<b>0.009</b>
Stress	<b>0.011*</b>	<b>0.006</b>	<b>0.011*</b>	<b>0.006</b>
Intrinsic	<b>0.365***</b>	<b>0.024</b>	<b>0.369***</b>	<b>0.024</b>
<i>Environmental Variables</i>				
NEI	<b>0.105***</b>	<b>0.015</b>	-	-
NeighborhoodGreen	0.005	0.007	<b>0.013*</b>	<b>0.007</b>
SchoolGreen	-0.014	0.023	-0.006	0.023
SchoolGreenView	0.028	0.020	0.033	0.021
HouseGreenView	0.003	0.022	0.014	0.022
LocalConcerns	0.014	0.011	0.014	0.011
WorldViews	0.014	0.012	0.014	0.012
MoralisticValue	<b>0.055***</b>	<b>0.018</b>	<b>0.062***</b>	<b>0.018</b>
RelBiocentricReas	-0.019	0.015	-0.012	0.014
Awareness	<b>0.037***</b>	<b>0.012</b>	<b>0.051***</b>	<b>0.012</b>
IndoorSports	<b>0.010*</b>	<b>0.006</b>	<b>0.018***</b>	<b>0.006</b>
InHomePlay	<b>0.026***</b>	<b>0.007</b>	<b>0.025***</b>	<b>0.007</b>
UnsafeFeeling	-0.001	0.007	0.001	0.007
EnvKnowledge	<b>0.044***</b>	<b>0.009</b>	<b>0.048***</b>	<b>0.009</b>
EnvEducScore	<b>0.006*</b>	<b>0.003</b>	<b>0.009**</b>	<b>0.003</b>
Observations	3614		3614	
R-squared	0.3325		0.3106	

Robust clustered standard errors in parenthesis, \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . School dummies have been included to control for fixed effects.

Table 7.19 – Satisfaction with School Life Regressions: Greece

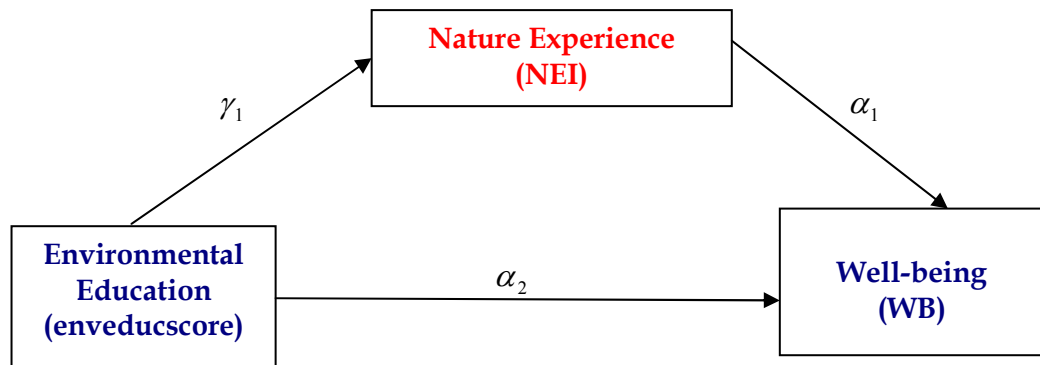
Variables	OLS		Ordered Logit	
	Coeff.	St. E.	Coeff.	St. E.
<i>School Satisfaction (1 to 7)</i>				
Girl	<b>-0.114**</b>	<b>0.049</b>	<b>-0.208***</b>	<b>0.066</b>
Age	-0.005	0.028	-0.024	0.036
Homework	<b>0.133***</b>	<b>0.029</b>	<b>0.244***</b>	<b>0.040</b>
Friends	<b>0.441***</b>	<b>0.031</b>	<b>0.444***</b>	<b>0.032</b>
SelfEsteem	<b>0.125***</b>	<b>0.023</b>	<b>0.185***</b>	<b>0.031</b>
Stress	<b>-0.082***</b>	<b>0.023</b>	<b>-0.108**</b>	<b>0.031</b>
NEI	<b>0.144***</b>	<b>0.045</b>	<b>0.208***</b>	<b>0.058</b>
SchoolGreen	<b>0.251***</b>	<b>0.081</b>	<b>0.284***</b>	<b>0.111</b>
SchoolGreenView	<b>0.128**</b>	<b>0.065</b>	<b>0.187**</b>	<b>0.087</b>
EnvKnowledge	0.002	0.028	-0.017	0.038
EnvEducScore	<b>0.051***</b>	<b>0.010</b>	<b>0.071***</b>	<b>0.014</b>
Observations	3614		3614	
R-squared/Pseudo-R	0.1297		0.0468	

Robust clustered standard errors in parenthesis, \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . School dummies have been included to control for fixed effects.

### 7.5.3. A Simple Structural Equation Model: Direct, Indirect and Total Effects

In this section, we employ a simple structural equation model (SEM) analysis to explore potential indirect effects of environmental education on students' well-being. As we have discussed in the previous paragraphs, there is evidence that NEI, i.e. empirical connectedness with nature, mediates the relationship between "enveducscore" and subjective well-being. To capture the presence of indirect effects and estimate the magnitude of direct, indirect and total effects, we have constructed the SEM model below:

Figure 7.1 – SEM Model Diagram\*



\* Basic control variables have been included for NEI and WB.

The scenario that is depicted in Figure 7.1 can be described with the following equations:

$$WB = \alpha + \alpha_1 nei + \alpha_2 enveducscore + \alpha_3 cv + \varepsilon \quad (7.3)$$

$$WB = \beta + \beta_1 enveducscore + \beta_2 cv + \varepsilon \quad (7.4)$$

$$NEI = \gamma + \gamma_1 enveducscore + \gamma_2 cv + \varepsilon \quad (7.5)$$

, where *enveducscore* is the main exogenous variable of the system, *NEI* is the mediator variable (endogenous), *WB* is the dependent variable (life satisfaction, school satisfaction or eudaimonic well-being) and *cv* is a set of various control variables (age and gender in equation 7.5, and the main determinants of life satisfaction, school satisfaction and eudaimonic well-being – as they have been estimated in the regression



analysis before - in equations 7.3 and 7.4). Coefficient  $\beta_1$  represents the total effect of environmental education on well-being (since the mediator variable *NEI* is excluded from equation 7.4), coefficient product  $\alpha_1\gamma_1$  represents the indirect effect, whereas coefficient  $\alpha_2$  represent the direct effect, i.e. the enhancement of connectedness with nature due to participation in environmental education activities. It should be underlined that the findings from a few recent studies have suggested that environmental education activities are incremental to empirical affiliation with nature (Ernst & Theimer 2011, Sellman & Bogner 2012).

The estimations of the aforementioned coefficients for the two countries are presented in Table 7.20. For the estimation of the results, as in the previous parts of the analysis, we have used robust standard errors clustered at school class level. For England, the findings suggest that environmental education has no impact on satisfaction with life as a whole, neither directly nor indirectly; all effects are statistically insignificant. With reference to eudaimonic well-being, a strong indirect effect has been revealed. In particular, the z-test has suggested that the indirect path coefficient - accounting for almost 50% of the total effect [(indirect effect)/ (total effect) = 0.009/0.019 = 0.47], is statistically significant. Interestingly, the direct effect of environmental education on eudaimonic well-being appears to be insignificant. An obvious explanation of this outcome is that participation in environmental education is beneficial for eudaimonia only through the enhancement of nature connectedness. However, as we have discussed before, a significant direct effect could be captured with a relatively larger sample or by excluding other correlated variables such as “schoolgreen”. Finally, it appears that participation in environmental education activities is beneficial for school satisfaction both directly and indirectly. However, the indirect influence accounts for only 18% of the total effect (0.015/0.083 = 0.18). The direct effect is four and a half times bigger than the indirect effect [(direct effect)/indirect effect) = 0.068/0.015 = 4.53].

For Greece, all possible effects of participation in environmental education on students’ life satisfaction, school satisfaction and eudaimonic well-being are statistically significant at a 1% level, except for the direct effect on eudaimonia which is significant at a 10% confidence level. However, in case of overall and school satisfaction, only a small percentage of total effect is mediated by NEI [(indirect effect)/ (total effect) = 0.003/0.023 = 0.13 for overall LS and 0.006/0.059 = 0.10 for school LS]. The direct impact is 6.6 times larger than the indirect impact in case of overall satisfaction and 8.8

times larger in case of school satisfaction. The opposite is observed with eudaimonic well-being. In this case, it appears that the mediation effect accounts for 40% (0.004/0.010) of the total effect of environmental education on eudaimonic well-being. The direct effect is larger than the indirect effect again, but the difference in the magnitude is relatively small (0.006/0.004 = 1.5).

**Table 7.20 – SEM Analysis: Direct, Indirect & Total Effects**

Effects -England			
Variables	Direct	Indirect	Total*
Life satisfaction	0.009 (0.019)	0.007 (0.005)	0.016 (0.019)
School satisfaction	0.068** (0.032)	0.015** (0.007)	0.083*** (0.031)
Eudaimonic well-being	0.010 (0.010)	0.009*** (0.003)	0.019 (0.012)
Effects -Greece			
Variables	Direct	Indirect	Total
Life satisfaction	0.020*** (0.005)	0.003*** (0.001)	0.023*** (0.005)
School satisfaction	0.053*** (0.010)	0.006*** (0.002)	0.059*** (0.009)
Eudaimonic well-being	0.006* (0.003)	0.004*** (0.001)	0.010*** (0.003)

*Robust clustered standard errors in parenthesis, \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .*

*\* Total effects = direct effects + indirect effects ( $\beta_1 = \alpha_2 + \alpha_1\gamma_1$ ). Stata software has been used for the calculation of the effects.*

## 7.6. Summary, Study Limitations and Ideas for Further Research

In this chapter, we attempted to explore quantitatively whether participation in environmental education at schools may have a positive influence on adolescents' self-reported well-being in England and Greece. We focused on three main aspects of non-adult well-being: overall life satisfaction, eudaimonic well-being and satisfaction with school life. To represent environmental education experience in the analysis, we formed environmental education score ("enveducscore") variable based on students' participation in a range of activities (10-item index in case of England and 12-item index in case of Greece).

Using traditional regression analysis and a structural equation modeling approach, we tested whether environmental education activities can promote children's well-being directly and/or indirectly. Our key assumption was that a proportion of the total effect

of “enveducscore” dummy on well-being is transmitted through the enhancement of empirical connectedness with nature, as it is proxied by the 10-item NEI variable. The employment of structural equation modeling enabled us to capture these effects and calculate their relative importance.

Our findings suggest that participation in environmental education has a direct and indirect impact on all dimensions of Greek students’ well-being. However, the magnitudes of the direct effects on overall and school satisfaction were found to be considerably larger than the magnitudes of the indirect effects (six times larger in case of overall satisfaction and eight times larger in case of school satisfaction). On the other hand, the indirect effect of environmental education on eudaimonic well-being accounted for a respectable 40% of the total effect.

In England, participation in environmental education made no difference, directly or indirectly, on the levels of students’ satisfaction with life as a whole. Although the direct effect on eudaimonic well-being was also insignificant when both NEI and “enveducscore” were included in the OLS model, the structural equation modeling approach revealed a significant indirect impact. In this case, a 47% of the total effect on eudaimonia was transmitted through the mediating path of NEI variable. Significant indirect effects were also revealed in case of satisfaction with school life, but they were considerable lower than the direct effects.

Interestingly, the OLS and ordered logit regressions revealed a positive association between the latter form of well-being (i.e. school satisfaction) and positive perceptions about a green school environment. Students who reported that there is a green school yard and a view of nature from at least one class window reported higher levels of well-being in both countries.

To the best of our knowledge, this was the first attempt to investigate the role of environmental education at schools in the promotion of children’s subjective well-being. From a policy making perspective, the results of this study offer a rationale for the design of environmental education projects at schools and the importance to promote students’ participation. As we show, benefits may occur, directly and indirectly, not only for children’s satisfaction with the school life, but with life

satisfaction and eudaimonia as well. Thus, school could become a main source of students' positive psychology.

The current study is characterized by three main limitations that may give rise to ideas for further investigation. First, time and budget constraints did not allow gathering detailed information about students' involvement in environmental education activities. Our results are mainly indicative, providing some strong evidence about the beneficial role of environmental education, in general, on pupils' self-reported well-being. However, from a policy perspective, it would be very intuitive to assess the impact of certain activities and concepts on the various dimensions of well-being and identify what types of activities are particularly effective in practice. For example, if a positive association is detected between life satisfaction and ecologically responsible behavior, it could be derived that environmental education is effective in promoting well-being through the cultivation of a sustainable lifestyle (Brown & Kasser 2005). At this stage, it would be important to discriminate between the content of the activity or teaching, i.e. the message that it delivers, and the implementation of the activity itself, and identify the contribution of each of these two aspects on well-being change. Of course, it should not be surprising if a negative relationship is derived between well-being and some aspects of environmental education. As we have found in the previous chapter, and is also evident in relevant research with adults (Ferrer - i - Carbonell & Gowdy 2007), realizing, for example, the negative impact of human activities on the environment may be detrimental to subjective well-being.

Second, linked to the previous point, there is no available information on how environmental education activities are implemented by each school and, thus, we are not able to assess the differences between theory and delivery of environmental education in practice (Hart, Jickling, & Kool 1999, Gayford & Dillin 1995, Cotton 2006). Third, some of the key school satisfaction determinants, such as school climate, relation with teachers and pupils' grades (Suldo, Riley & Shaffer 2006, Zullig, Huebner & Patton 2011) were not included in the analysis. This is evident especially in the Greek case study analysis, where the R-squared and pseudo-R squared values are generally low. The values are much higher in the English sample models. Also, in a more complete model, the two key proxies for academic achievement and relations with peers that have been used in the current analysis, although having the expected signs

and both are significant, could have been substituted by pupils' grade (objective measure of academic performance) and relations with school peers only.

Before concluding, there are a few more paths for future research that would be worth highlighting. First, it would be useful in terms of policy to study the content and effectiveness of environmental education across different school grades. This would enable policymaker identify the types of activities and learning that are particularly useful for enhancing well-being at each different school year. Second, as Nisbet, Zelenski & Murphy (2011) did with an adult sample, a time dimension could be added in the analysis in order to assess how the well-being of pupils' without environmental experience is affected after engaging in a relevant activity. This approach requires to surveying the same group of students before and right after the employment of the activity. Third, it would be useful to examine the impact of other sources of environmental education, such as the family environment or participation on environmental education activities without school on the various aspects of pupils' well-being.

## APPENDIX A7

**Table A7.1 - Eudaimonic Well-being Regressions: England (excluding NEI & "schoolgreen") and Greece (excluding "envknowledge")**

Variables	England		Greece	
	Coeff.	St. E.	Coeff.	St. E.
<i>Socio-demographics/Psychometrics</i>				
Girl	<b>-0.144**</b>	<b>0.056</b>	-0.019	0.021
Age	0.011	0.013	<b>0.019*</b>	<b>0.011</b>
Money	0.018	0.024	<b>-0.022**</b>	<b>0.009</b>
Homework	0.031	0.022	<b>0.036***</b>	<b>0.008</b>
Hobbies	<b>0.082***</b>	<b>0.019</b>	<b>0.048***</b>	<b>0.007</b>
TVwatching	0.001	0.022	<b>-0.018**</b>	<b>0.008</b>
Internet	0.007	0.029	-0.004	0.008
PCgames	-0.009	0.017	<b>-0.020**</b>	<b>0.008</b>
Friends	0.001	0.020	0.006	0.011
Health	-0.011	0.038	<b>0.065***</b>	<b>0.012</b>
SelfEsteem	<b>0.100***</b>	<b>0.023</b>	<b>0.066***</b>	<b>0.009</b>
Stress	-0.032	0.025	<b>0.011*</b>	<b>0.006</b>
Intrinsic	<b>0.520***</b>	<b>0.066</b>	<b>0.367***</b>	<b>0.024</b>
<i>Environmental Variables</i>				
NEI	-	-	<b>0.109***</b>	<b>0.015</b>
NeighborhoodGreen	0.006	0.019	0.006	0.007
SchoolGreen	-	-	-0.011	0.023
SchoolGreenView	0.009	0.075	0.028	0.020
HouseGreenView	0.015	0.061	0.004	0.022
LocalConcerns	0.001	0.033	0.012	0.011
WorldViews	0.007	0.040	0.015	0.012
MoralisticValue	0.044	0.044	<b>0.056***</b>	<b>0.018</b>
RelBiocentricReason	-0.036	0.047	-0.013	0.015
Awareness	0.028	0.033	<b>0.047***</b>	<b>0.012</b>
IndoorSports	<b>0.047**</b>	<b>0.018</b>	<b>0.009*</b>	<b>0.006</b>
InHomePlay	0.021	0.025	<b>0.026***</b>	<b>0.007</b>
UnsafeFeeling	-0.024	0.021	-0.002	0.007
EnvKnowledge	-0.014	0.023	-	-
EnvEducScore	<b>0.020*</b>	<b>0.011</b>	<b>0.007**</b>	<b>0.003</b>
Observations	527		3614	
R-squared	<b>0.4573</b>		<b>0.3251</b>	

**Table A7.2 - Satisfaction with School Life Regressions: England (dropping "schoolgreen")**

Variables	OLS		Ordered Logit	
	Coeff.	St. E.	Coeff.	St. E.
<i>School Satisfaction (1 to 7)</i>				
Girl	0.030	0.119	0.058	0.188
Age	-0.029	0.036	-0.033	0.061
Homework	<b>0.188***</b>	<b>0.040</b>	<b>0.305***</b>	<b>0.074</b>
Friends	<b>0.317***</b>	<b>0.064</b>	<b>0.601***</b>	<b>0.106</b>
SelfEsteem	<b>0.313***</b>	<b>0.063</b>	<b>0.503***</b>	<b>0.104</b>
Stress	<b>-0.228***</b>	<b>0.052</b>	<b>-0.301***</b>	<b>0.095</b>
NEI	<b>0.190**</b>	<b>0.088</b>	<b>0.403***</b>	<b>0.150</b>
SchoolGreen	-	-	-	-
SchoolGreenView	<b>0.406**</b>	<b>0.202</b>	<b>0.544**</b>	<b>0.271</b>
EnvKnowledge	0.004	0.065	-0.009	0.111
EnvEducScore	<b>0.085***</b>	<b>0.028</b>	<b>0.142***</b>	<b>0.046</b>
Observations	527		527	
R-squared/Pseudo-R	<b>0.3314</b>		<b>0.1256</b>	

For both tables: robust clustered standard errors in parenthesis, \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . School dummies have been included to control for fixed effects.

## 8. Conclusion

In various parts of this thesis, we highlighted some relatively recent trends in the contemporary research and policy: (i) promoting the role of children as active participants in quantitative and qualitative research, (ii) shifting attention to the promotion of well-being rather than curing ill-being only, (iii) enhancing the use of subjective indicators to evaluate quality of life, and (iv) using objective and subjective environmental variables to explore the impact of nature on self-reported well-being (mainly life satisfaction/happiness). A review of the main literature indicated two main facts: (i) there is a very limited amount of research focusing on the impact of nature on non-adult positive psychology, i.e. happiness and eudaimonia, and (ii) most of the existing research has focused on the “happy” side of well-being; eudaimonic well-being has received relatively little attention. Within this framework, our target was to investigate the potential impact of affiliation with nature on children and adolescents’ subjective well-being. We also explored how well-being varies with certain location and climate characteristics. For this purpose, we collected data from two countries with different cultural and climate characteristics, England and Greece.

To highlight the key conclusions of the thesis, the findings suggest, in line with a few existing adult studies, that life satisfaction and eudaimonia comprise two distinct conceptualizations of self-reported well-being. With reference to natural environment, the statistical findings have verified that the significant links between affiliation with nature and subjective well-being among adults apply to the non-adult populations as well. Not unexpectedly, a stronger (more frequent) empirical affiliation with nature and local environmental quality are positively associated with subjective well-being. On the other hand, extreme climate conditions (such as maximum temperature in July and high mean precipitation) and environmental degradation have been found to be detrimental to subjective well-being.

Interestingly, most of the statistically significant associations between well-being and environment, especially in the case of eudaimonia, have been established by subjective environmental indicators such as students’ perceptions on the quality of the local environment, rather than by objective indicators such as proximity to heavy pollution industries or major airports. Given that most of the existing – especially environmental economics – literature heavily focuses on objective environmental indicators, the

current findings highlight the necessity of considering a wide range of subjective indicators as well. Otherwise, significant influences may be missed<sup>102</sup>. In the next sections, we provide a synthesis of the major findings of this thesis, we discuss on some main limitations and ideas for future research, and we underline some methodological and policy implications.

## 8.1. Major Findings Synthesis

The analysis part of the thesis was divided into three main chapters. In Chapter 5, we studied the impact of nature and climate on secondary school students' well-being in Greece. In Chapter 6, we extended the analysis by including the English case study and proceeding with a cross-country comparison, England vs. Greece. In Chapter 7, we investigated the impact of environmental education at school on three aspects of students' subjective well-being, i.e. satisfaction with life as a whole, satisfaction with school life, and eudaimonic well-being.

The estimation of the effect of the various predictors on life satisfaction (5-item BMSLSS scale) and eudaimonic well-being (7-item modified QEWB scale) has been based on OLS models with clustered standard errors. As control factors, we have included a set of socio-demographic (age, gender, time allocation on basic weekly activities) and psychometric (self-reported health, stress and self-esteem status, intrinsic and extrinsic aspirations) variables, which have been found to explain the greatest percentage of dependent variables' variability, and a few other non-environment related variables (indoor exercise, playing at home, going to cafeterias and shopping centers, and perceptions on neighborhood safety). For the estimation of the effect of environmental education on satisfaction with school (Chapter 7), we experimented with two regression model specifications (OLS and ordered logit) to capture direct effects and we employed a simple structural equation modeling approach to detect potential indirect effects. In the next few paragraphs, we describe the major findings with reference to four basic environmental and climate variable groups.

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<sup>102</sup> To give an example from the adult literature, Van Praag & Baarsma (2005) detected a positive affiliation only between perceived noise pollution and well-being; objective nuisance appeared to have an insignificant effect.



### *“Nature Experience” and Perceptions about the Local Environment*

The findings of Chapter 5 and Chapter 6 highlighted the importance of being empirically connected with the natural world and having positive perception about local environmental quality. The former was measured by a 10-item indicator measuring students’ involvement with three main types of experience, as suggested by Kahn & Kellert (2002), i.e. direct, indirect and vicarious. The latter (positive perceptions) was based on students’ perceptions on the presence of “green” elements in their neighborhood. These predictors appeared to be positive determinants of both life satisfaction and eudaimonic well-being in both countries. Furthermore, we detected a higher level of eudaimonia among Greek students who reported that there is a garden or balcony with flowers at home, and higher levels of life satisfaction among Greek students who reported that there is a view of nature from their bedroom window.

### *Environmental Education and Green School Perceptions*

The beneficial role of green school environments and engagement in environmental education activities has been highlighted in all studies of this thesis. According to the statistical findings, being in a “green” school, proxied by students’ self-reports on the existence of a green schoolyard, is associated with higher levels of satisfaction with life as a whole and school satisfaction in both samples. In addition, English and Greek students’ satisfaction with school appears to be benefited (based again on students self-reports) by a view of nature from at least one classroom window. During the survey procedure, we noticed variations in students’ reports on the aforementioned variables within single schools and/or classrooms. Interestingly, this finding implies that perceptions are not necessarily correlated with objective conditions.

According to the findings of Chapter 7, environmental education at school may impact students’ well-being directly and/or indirectly through the enhancement of empirical connectedness with nature (as measured by the NEI index). The findings revealed a significant direct and indirect effect on all aspects of Greek students’ well-being, i.e. overall life satisfaction, school satisfaction and eudaimonia. In England, the findings suggest that participating in environmental education activities is beneficial, both directly and indirectly, for students’ satisfaction with school. On the other hand, life

satisfaction was not affected at all by environmental education, whereas only indirect effects were found to be significant in case of eudaimonia. In general, the direct impact appeared to be considerably stronger than the indirect impact across the two samples, except for the case of eudaimonia where the indirect impact accounted for a respectable percentage of the total effect.

### *Worldviews, Values, Awareness and Biocentric Reasoning*

The inclusion of attitudinal variables in the analysis served two main reasons. First, these variables worked as control factors for students with a strong inclination toward the natural environment. And second, based on relevant research with adults (Nisbet, Zelenski & Murphy 2011), we wanted to explore the impact of cognitive or affective bonding with nature on the two well-being conceptualizations. With reference to the first reason, the statistical findings suggest that the impact of empirical connectedness with nature (NEI indicator) on life satisfaction and eudaimonia remains significant when attitudinal variables are included in the models of both samples.

In relation to the second reason, significant results have been revealed only with the Greek sample. Specifically, pupils with stronger worldviews and relatively stronger biocentric reasoning (over anthropocentric reasoning) appear to be unhappier, verifying the detrimental effect of realizing the negative consequences of human activities for the natural world. On the other hand, moralistic values and environmental awareness have been found to be incremental to eudaimonic well-being. The former reveals the positive effect of “*ethical and spiritual relation with nature*” (as defined by Kellert’s typology of environmental values), whereas the latter reveals the beneficial role of being aware of serious environmental issues such as climate change and species extinction, if awareness is viewed as a proxy for deep cognitive connectedness with the natural world.

### *Location and Climate*

Location, climate and objective environmental conditions appear to have generally negligible effects on pupils’ eudaimonic well-being in both countries. In most cases, we did not manage to derive any significant effect from the OLS analyses in Chapters 5 and 6. However, some interesting effects have been revealed with reference to

subjective well-being. Specifically, in relation to local demography, the cross-country comparison demonstrated a negative association between rurality, i.e. areas with less than 10000 inhabitants (rural areas between 5000 and 10000 people, and sparse rural areas with less than 5000 people), and life satisfaction across the two samples. Additionally, a negative relationship has been detected between sparse rurality and students' eudaimonic well-being in Greek schools.

In relation to climate, we have detected one common and two country-specific effects. As expected, high maximum temperatures in July are undesirable; higher temperatures in July are negatively associated with happiness in both countries. The country-specific effects refer to the negative association between average annual wind speed and life satisfaction in Greece, and between average annual precipitation and life satisfaction in England.

Interestingly, Greek students residing in islands appear to be unhappier. A possible explanation could be the two "extremes" that are observed mainly in small islands; the isolation during the winter period on the one hand and the overcrowded summer period on the other hand. Another notable finding is the insignificant impact of "blue", as measured by "distance from sea" variable. We experimented with various "sea" variables, like proximity to sea dummies and distance from sea (in kilometers or driving minutes), but we failed to detect significant effects under all different specifications.

In Greece, the importance of local environmental quality has been verified by the positive impact of proximity to "natural beauty" areas, represented by a dummy variable taking a positive value if there is an area of outstanding natural beauty and/or "Natura 2000" within ten kilometers from students' home location, on life satisfaction. On the other hand, the impact of environmental degradation variables, i.e. proximity to airports and number of heavy pollution industries within ten kilometers from home location, appeared to be negligible.

#### *England vs. Greece: Detecting Effects' Magnitude Differences*

As we have mentioned already, the greatest percentage of life satisfaction and eudaimonic well-being variability in the two country samples is explained by the

group of socio-demographic and psychometric variables. Most of effect magnitude differences have been detected on predictors within this group. So, for example, the cross-country comparison suggests that the effect of “spending time with friends” variable on life satisfaction is greater among Greek students than English students, whereas the effect of intrinsic aspirations appears to have a relatively stronger impact on English students’ life satisfaction. Also, the effect of self-esteem on eudaimonia has been found to be significantly stronger among English students.

There are two notable outcomes with reference to environmental variables. First, the cross-country comparison did not detect any magnitude differences on the effect of “nature experience” and perceptions on “green neighborhood” across the two countries. Given that two countries with different amenities, natural, climate and cultural characteristics were compared, this outcome provides some evidence that the frequency of exposure is sufficient for achieving a certain positive influence on well-being, regardless of the type of the landscape or amenity, and the different ways – due to different cultural characteristics – that pupils perceive their affiliation with the natural environment.

Second, the comparison of environmental predictors demonstrated significant differences on the magnitude of “green schoolyard” effect on life satisfaction and eudaimonia across the two populations. In case of life satisfaction, British students with positive perceptions on the existence of a green schoolyard appear to be relatively happier than Greek students with similar perceptions. In case of eudaimonia, an interesting outcome came out of the comparison analysis. Although “green schoolyard” dummy was insignificant in the separate model analysis across the two populations, a significant difference on magnitude in favor of English pupils emerged with the joint model analysis. We suspect that the statistical significance of this variable would have been revealed with a larger dataset (and, thus, smaller standard errors) in England<sup>103</sup>.

With reference to climate variables, magnitude differences have been detected on the effect of maximum temperatures in July and annual average precipitation on life satisfaction across the two samples. Specifically, greater temperatures in July and

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<sup>103</sup> With the existing dataset, the impact of “green schoolyard” dummy on English students’ well-being has been found to be marginally insignificant (at a = 10% confidence level).

higher levels of annual precipitation appear to be more “harmful” for English students’ happiness.

## **8.2. Study Limitations and Ideas for Future Research**

The current study is constrained by several important limitations, which can be used as starting point for future research idea. First, as in most cross-sectional studies, it is unavoidable to completely eliminate endogeneity issues. Endogeneity may arise from fuzzy causal relationships (which are very likely to occur when studying broad concepts such as life satisfaction and eudaimonia) and omitted variable bias. It would be unrealistic to expect that it is possible to control for all basic factors that affect self-reported well-being in the short or long-term. In order to minimize the bias, as we have described already in the previous chapters, we relied upon well-established past research for the selection of the variables that were included in the analysis. Future research might consider employing a natural experiment technique to address the problem of endogeneity. Second, related to the nature of cross-sectional studies again, the findings of the current thesis are snapshots of actual behavior at a certain point of time. This may be particularly problematic in research with children and adolescents, where constant changes and personality developments are observed within very short periods of time. It could be beneficial to employ a longitudinal study that would allow observing developmental trends over a long period of time.

Third, some basic objective individual and regional-level variables have not been included in the analysis, due to specific time and budget constraints of the study and the limited availability of public statistics mainly in Greece. For example, we did not manage to collect objective data about students’ objective information about their family situation (family wealth or status), living environment conditions (deprivation indices for example) and school performance. At a regional-level, we have not included objective measures of environmental quality and climate, such as air and noise pollution data and average hours of sunshine. In addition, given that participants’ postcodes are not available, we could not proceed with an analysis at a higher spatial resolution. The availability of higher level spatial data would offer the opportunity, among others, to investigate how well-being varies across various within-country regions.

Fourth, the study offers only a broad evaluation of empirical exposure to the natural world and involvement with environmental activities. From a policymaking perspective, it would be constructive to explore what is the impact of specific elements of experiential relationship with the natural world on specific “groups” of non-adult populations. For example, we have not explored the potential impact of vicarious experience or a specific environmental education activity (gardening for example) across different age groups. Also, we have not controlled for students with different cultural background, so we could explore how the relationship between natural contact and well-being varies with reference to within-country different cultural characteristics.

And fifth, the study has not included students attending primary schools, technical schools, and children who have quitted post-compulsory education. In order to achieve higher generalizability of the results among non-adult populations in general, it would be useful to extend the analysis by including the aforementioned groups. However, in case of primary school students, the survey design and the content of the questionnaire would be a major challenge, whereas accessing non-school students would require a strong budget.

### **8.3 Methodological and Policy Implications**

To conclude, we describe some basic methodological and policy implications of the outcomes of this thesis. Regarding methodology, we developed a short, 7-item scale, based on Waterman et al.'s (2010) 21-item QEWB tool, and tested its properties with two samples of different language and cultural backgrounds. The findings suggest that the scale is suitable for capturing children and adolescents' eudaimonia; it performs well in terms of internal consistency and validity in both samples. It appears that the modified version, given its properties and short length, offers the possibility for an efficient and quick assessment of eudaimonia. This is particularly helpful for studies with multiple objectives, where time and space constraints do not allow the employment of lengthy surveys.

From a policy making perspective, as we have discussed in various parts of this thesis, the investigation of the impact of nature on non-adult positive functioning has received

considerably little attention in the research agenda. Here, it has been shown that there are sufficient reasons to include a “nature” dimension in any kind of policy aiming at increasing children’s well-being. Although the study does not offer suggestions on specific policy interventions, it has shown that increasing frequent contact with the surrounding environment and having positive perceptions about the quality of the local environment can be beneficial for well-being<sup>104</sup>. Certainly, there are some relatively easy and “inexpensive” ways to achieve it, such as organizing a leisure trip with school, keep local green spaces clean and safe, promote environment-related media productions, and provide incentives for parental involvement (free family visits to natural history museums for example).

The fact that life satisfaction and eudaimonia should be viewed as two distinct conceptualizations of subjective well-being informs policy that the eudaimonic dimension should not be underestimated when considering environment-related interventions. Based on the available literature (mainly with adults), there is good evidence linking the natural environment with higher levels of happiness. However, the current findings show that nature may have a positive impact on the promotion of a fulfilling life and optimal psychological functioning as well. Valuable benefits might occur from attempts to link specific aspects of affiliation with nature on specific aspects of eudaimonic well-being (such as vitality, autonomy and purpose in life). The development of proper tools for the evaluation and monitoring of children’s eudaimonia would be a major challenge in this case. In educational policy, the outcomes of this thesis suggest that policy makers should by all means promote the employment of environmental education programs and activities at school. As we show, it can work as a path leading to multiple “forms” of well-being.

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<sup>104</sup> It should be underlined again that causal paths cannot be established in cross-sectional studies and, thus, conclusions are suggestive. However, as we have mentioned in Chapter 4, the fact that children are not fully independent in the selections of spaces and activities may mitigate reverse causality biases.

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## APPENDIX B



### SURVEY QUESTIONNAIRE

#### The influence of the natural environment on secondary school students' well-being



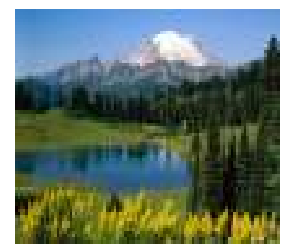
The main goal of this study is to examine the influence of various aspects of the natural environment on school students' well-being. For the purposes of the analysis, we would like to ask you to complete the following questionnaire. It consists of three main parts: (i) Natural Environment, (ii) Well-being, and (iii) Background Information. The questionnaire has been reviewed and approved by LSE Research Ethics Committee. Please note:

1. It should take no more than 20 minutes to complete.
2. This is not a knowledge test. There are no correct or wrong answers. We are interested in your opinions and experiences.
3. The completion of the questionnaire is anonymous and voluntary. The results will remain confidential and will be used solely for the purposes of this research.

The success of the study is highly dependent on your contribution; therefore, your participation is very valuable. Please feel free to answer the questions with honesty and spontaneity.



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*London School of Economics & Political Science*  
*Department of Geography & Environment*



## A. Natural Environment

### A1. Attitudes and Beliefs

Note: The more you agree with the statement, the higher the number you circle. For example, in statement 1 ("People are treating nature badly"), circle "1" if you "strongly disagree", "2" if you "disagree", "3" if you "neither agree nor disagree", "4" if you "agree", and "5" if you "strongly agree."

**1. People are treating nature badly.**

Strongly disagree    1    2    3    4    5    Strongly agree

**2. The life of plants and animals is of the same value of the life of humans.**

Strongly disagree    1    2    3    4    5    Strongly agree

**3. Nature is strong enough to handle the bad effects of our modern lifestyle.**

Strongly disagree    1    2    3    4    5    Strongly agree

**4. The world would not suffer if species like snakes and mosquitoes became extinct.**

Strongly disagree    1    2    3    4    5    Strongly agree

**5. There is nothing wrong with sports such as horse racing or hunting that require intense training of animals.**

Strongly disagree    1    2    3    4    5    Strongly agree

**6. People should respect the natural environment because:**

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
<i>a. Nature's value is unique; nobody has the right to damage it.</i>	1	2	3	4	5
<i>b. It must be kept "clean" in favour of future generations.</i>	1	2	3	4	5



7. "Love" is an emotion that people should feel only for other people, not for animals.

Strongly disagree    1    2    3    4    5    Strongly agree

8. I feel that the most important role of the natural environment is to satisfy human needs (food, water, etc.).

Strongly disagree    1    2    3    4    5    Strongly agree

9. I would be willing to volunteer to help resolve environmental issues.

Strongly disagree    1    2    3    4    5    Strongly agree

10a. Please indicate how worried you are about the consequences of the environmental problems today on:

	Not at all worried	A little bit worried	Indifferent	Worried	Very worried
<i>a. Plants</i>	1	2	3	4	5
<i>b. Animals</i>	1	2	3	4	5
<i>c. Personal health</i>	1	2	3	4	5
<i>d. Health of future generations</i>	1	2	3	4	5
<i>e. Health of people in other places of the world</i>	1	2	3	4	5
<i>f. Health of people in the community where you live</i>	1	2	3	4	5

10b. How worried are you about the following global environmental problems? (Please circle DN if you are not familiar with the meaning of the term).

	Not at all worried	A little bit worried	Indifferent	Worried	Very worried	DN
<i>a. Climate change</i>	1	2	3	4	5	
<i>b. Ozone layer depletion</i>	1	2	3	4	5	
<i>c. Species (plants and animals) extinction</i>	1	2	3	4	5	
<i>d. Deforestation</i>	1	2	3	4	5	

11. According to *your opinion*, how *severe* are the following *environmental issues* in the *community where you live*?

	Not at all severe	A little severe	Moderately severe	Severe	Very severe
<i>a. Air pollution</i>	1	2	3	4	5
<i>b. Noise/Traffic</i>	1	2	3	4	5
<i>c. Water pollution (lakes, rivers, sea, etc)</i>	1	2	3	4	5
<i>d. Neighbourhood condition (garbage in the streets, lack of green places, etc.)</i>	1	2	3	4	5
<i>e. Crime/Security issues</i>	1	2	3	4	5

## A2. Environmental Behaviour

12. How frequently do you engage in the following?

	Never/Rarely	A few times	Several times	Often	Very Often/Always
<i>a. Recycling paper, glass, or plastic</i>	1	2	3	4	5
<i>b. Leaving water running during teeth brushing</i>	1	2	3	4	5
<i>c. Picking up trash from the ground and putting it in bins</i>	1	2	3	4	5
<i>d. Turning off the lights when leaving the bedroom for a while</i>	1	2	3	4	5

### A3. "Empirical" Contact with Nature

**13. I live in a neighbourhood with many natural features (parks, lakes, trees, flowers, etc).**

Not at all/Very few      1      2      3      4      5      Many

**14. How often do you go out in nature (forests, mountains, sea, etc.)?**

	Never	Rarely	Once or twice a year	Several times a year	Many times a year
<i>a. Simple visit/excursion or leisure trip</i>	1	2	3	4	5
<i>b. Outdoor activities/sports (trekking, hiking, climbing, rafting, skiing, etc.)</i>	1	2	3	4	5

**15. Do you have access to a garden, or balcony with flowers at your home?**

Yes

No

**16. Does your school have a green space where you can relax or exercise?**

Yes

No

**17a. Do you have a view of nature (garden, park, tree, etc.) from your bedroom window?**

Yes

No

**17b. Do you have a view of nature (garden, park, tree, etc.) from at least one classroom window?**

Yes

No

**18. Do you have a pet (dog, cat, bird, etc)?**

Yes

No

19. How *often* are you going to the *following places* for *various activities* such as sports, walking or playing with friends, etc.?

	Never	Rarely	Once or twice a week	Several times a week	Very Often/Everyday
<i>a. Gym or other indoor sport clubs/spaces (except for swimming pools)</i>	1	2	3	4	5
<i>b. Indoor or outdoor swimming pool</i>	1	2	3	4	5
<i>c. House garden or green backyard</i>	1	2	3	4	5
<i>d. Inside home (PC games, etc.)</i>	1	2	3	4	5
<i>e. Outdoor sport areas (football or tennis court etc.)</i>	1	2	3	4	5
<i>f. Shops/Shopping Centres/Cafeterias</i>	1	2	3	4	5
<i>g. Neighbourhood park/green space</i>	1	2	3	4	5

20. How many *times* have you *visited* the following *places* during the past?

	Never	Once	At least once	Several times	Many times
<i>a. Natural History Museum</i>	1	2	3	4	5
<i>b. Botanical gardens (e.g. Kew gardens )</i>	1	2	3	4	5
<i>c. National parks and reserves (e.g. Wildlife Trust parks)</i>	1	2	3	4	5
<i>d. Aquarium or Zoos</i>	1	2	3	4	5
<i>e. Environmental education centres (e.g. Canterbury, Bromley etc.)</i>	1	2	3	4	5

21a. Have you ever *participated* in an *environmental education* activity (project, seminar, fieldwork, etc.) with your *school*?

- Yes, at least once
- No, but I am currently participating
- Yes, once
- No

21b. If "Yes", when was it (you may tick more than one choice)?

- Key stage 1
- Key stage 2
- Key stage 3
- Key stage 4
- Key stage 5

22. Have you ever *participated* in the following *environmental activities*?

	Yes, with school	Yes, but NOT with school*	No
<i>a. Nature exploring (grassland, pond, or river exploring for example)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>b. Fauna &amp; Flora investigation</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>c. Art in nature (painting, photography etc.)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>d. Bird watching</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>e. Gardening</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>f. Tree planting</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>g. Recycling</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>h. Park/Green areas cleaning</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>j. Writing a paper (alone or with others) about an environmental topic</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>k. Environmental Education Centres visits (Canterbury, Bromley for example)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

\* For example: with friends, family, environmental NGO, etc.

#### A4. Environmental Knowledge

**23. Which of the following animals are endangered in Great Britain?**

- Golden eagle       Polecat       Red squirrel       Red fox  
 I do not know

**24. Which of the following is non-renewable source of energy?**

- Geothermal energy       Natural gas       Solar energy       Wind power  
 I do not know

**25. "Climate Change" is mainly the result of the increased levels of carbon emissions (CO2) released in the atmosphere because of the daily human activity.**

- Yes                                       No                                       I do not know

**26a. Do you read articles or books about the natural environment?**

Never/Rarely      1      2      3      4      5      Very often

**26b. Do you watch films or documentaries about the natural environment?**

Never/Rarely      1      2      3      4      5      Very often

## B. Well-being

### B1. Satisfaction with Various Life Domains

These six questions ask about your satisfaction with different areas of your life. Circle the best answer for each.

**27. I would describe my satisfaction with my overall life as:**

- a) Terrible
- b) Unhappy
- c) Mostly dissatisfied
- d) Mixed (about equally satisfied and dissatisfied)
- e) Mostly satisfied

**28. I would describe my satisfaction with my family life as:**

- a) Terrible
- b) Unhappy
- c) Mostly dissatisfied
- d) Mixed (about equally satisfied and dissatisfied)
- e) Mostly satisfied
- f) Pleased
- g) Delighted

**29. I would describe my satisfaction with my friendships as:**

- a) Terrible
- b) Unhappy
- c) Mostly dissatisfied
- d) Mixed (about equally satisfied and dissatisfied)
- e) Mostly satisfied
- f) Pleased
- g) Delighted

**30. I would describe my satisfaction with my school experience as:**

- a) Terrible
- b) Unhappy
- c) Mostly dissatisfied
- d) Mixed (about equally satisfied and dissatisfied)
- e) Mostly satisfied
- f) Pleased
- g) Delighted



**31. I would describe my satisfaction with myself as:**

- a) Terrible
- b) Unhappy
- c) Mostly dissatisfied
- d) Mixed (about equally satisfied and dissatisfied)
- e) Mostly satisfied
- f) Pleased
- g) Delighted

**32. I would describe my satisfaction with where I live as:**

- a) Terrible
- b) Unhappy
- c) Mostly dissatisfied
- d) Mixed (about equally satisfied and dissatisfied)
- e) Mostly satisfied
- f) Pleased
- g) Delighted

**B2. "Deeper" Satisfaction/Eudaimonia**

This questionnaire contains a series of statements that refer to how you may feel things have been going in your life. Read each statement and decide the extent to which you agree or disagree with it. Try to respond to each statement according to your own feelings about how things are actually going, rather than how you might wish them to be.

**33. I find I get intensely involved in many of the things I do each day.**

Strongly disagree    1    2    3    4    5    Strongly agree

**34. I believe I know what my best attributes are and I try to develop them whenever possible.**

Strongly disagree    1    2    3    4    5    Strongly agree

**35. I feel best when I'm doing something worth putting a great deal of effort.**

Strongly disagree    1    2    3    4    5    Strongly agree

**36. I can't understand why some people want to work so hard on the things that they do.**

Strongly disagree    1    2    3    4    5    Strongly agree

**37. I believe it is important to know how what I'm doing fits with purposes worth pursuing.**

Strongly disagree    1    2    3    4    5    Strongly agree

**38. When I engage in activities that involve my best attributes, I have this sense of really being alive.**

Strongly disagree    1    2    3    4    5    Strongly agree

**39. I find that a lot of the things I do bring out my personality.**

Strongly disagree    1    2    3    4    5    Strongly agree

**40. It is important to me that I feel fulfilled by the activities in which I engage.**

Strongly disagree    1    2    3    4    5    Strongly agree

**41. If something is really difficult, it probably isn't worth doing.**

Strongly disagree    1    2    3    4    5    Strongly agree

### **B3. Future Aspirations**

The following statements are related to the goals you may have for the future. Rate each item by circling how important each goal is to you.

*In the future, it will be very important for me:*

**42. To choose what I do, instead of having people decide for me.**

Not at all important    1    2    3    4    5    Very important

**43. To have people in my life who will accept me as I am, no matter what.**

Not at all important    1    2    3    4    5    Very important

**44. To be in good physical shape.**

Not at all important    1    2    3    4    5    Very important

**45. To feel good about my abilities.**

Not at all important    1    2    3    4    5    Very important

**46. To have many expensive possessions (large fortune).**

Not at all important    1    2    3    4    5    Very important

**47. To overcome the challenges that life presents me.**

Not at all important    1    2    3    4    5    Very important

**48. To be admired by many people.**

Not at all important    1    2    3    4    5    Very important

**49. To assist people who are in need, and asking nothing in exchange.**

Not at all important    1    2    3    4    5    Very important

**50. Help the world become a better place.**

Not at all important    1    2    3    4    5    Very important

**51. To have a couple of good friends that I can talk to about personal issues.**

Not at all important    1    2    3    4    5    Very important

**52. To keep up with fashion in hair and clothing.**

Not at all important    1    2    3    4    5    Very important

## C. Background Information

53. You are:

Girl  Boy

54. Your year of birth is:

1992  1993  1994  1995  1996  1997  1998  1999

55. What is your school stage this year?

Key stage 3, Year 7  Key stage 3, Year 8  Key stage 3, Year 9  
 Key stage 4, Year 10  Key stage 4, Year 11  Key stage 5, Year 12  
 Key stage 5, Year 13

56. Please tick your *three* favourite school subjects:

Art and Design  Geography  
 Modern Foreign Languages  Music  
 Citizenship  History  
 Design and Technology  Information & Communication Technology  
 Physical Education  English Literature  
 Mathematics  Science  
 Other/s:.....

57a. Have you taken (or currently taking) a GCSE or equivalent certificate?

Yes  No

57b. If you answered "Yes", have you taken any of the following GCSE (or equivalent certificate) subjects?

Biology  Environment Science  Geography   
Geology

58a. Where do you *live today* and *how long* have you been in this area? For example:  
*London Paddington, 12 years\**

Area: \_\_\_\_\_ Years of Residence: \_\_\_\_\_

58b. Were you living in *another place in the past*? If yes, where and for how long? If not, please skip this question. For example: *Uppingham, Rutland,, 3 years\**

Area: \_\_\_\_\_ Years of Residence: \_\_\_\_\_



61a. How *often*, approximately, are you *involved* in the following *activities each week*?

	Never/Rarely	A few times	Several times	Often	Very often
<i>a. Homework</i>	1	2	3	4	5
<i>b. Extra-curricular reading</i>	1	2	3	4	5
<i>c. Hobbies and activities (music, painting, dancing etc.)</i>	1	2	3	4	5
<i>d. TV watching</i>	1	2	3	4	5
<i>e. Searching internet sites</i>	1	2	3	4	5
<i>f. Playing computer and other electronic games</i>	1	2	3	4	5
<i>g. Going out with friends</i>	1	2	3	4	5

61b. Finally, write up to three activities that you frequently do during the school holidays:

Activity 1:

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Activity 2:

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Activity 3:

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**THANKS A LOT!**