THE IMPACT OF EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD) ON STUDENTS' ENVIRONMENTAL ATTITUDES AND BEHAVIOUR:

a case study of Kenyan Eco Schools

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List of Abbreviations

2-MEV	-	Two Major Environmental Values
BSS	-	Brookfield Secondary School
CFA	-	Confirmatory Factor Analysis
CFI	-	Comparative Fit Index
DF	-	Degree of Freedom
EA	-	Environmental Attitudes
EAI	-	Environmental Attitude Index
EB	-	Environmental Behaviour
EFA	-	Exploratory Factor Analysis
ESD	-	Education for Sustainable Development
FEE	-	Foundation for Environmental Education
GESIP	-	Green Economy Strategy and Implementation Plan
GHG	-	Greenhouse Gas
HH	-	Household
IPCC	-	Intergovernmental Panel on Climate Change
KOEE	-	Kenya Organization for Environmental Education
MLR	-	Robust Maximum Likelihood
MSELS	-	Middle School Environmental Literacy Survey
NAAEE	-	North American Association for Environmental Literacy
NIS	-	Nairobi International School
NN	-	Nearest Neighbour
OLS	-	Ordinal Least Square
PBC	-	Perceived Behavioural Control

PBL	-	Problem Based Learning
PSM	-	Propensity Score Matching
RMSEA	-	Root Mean Square Error of Approximation
SCLPSS	-	SCLP Samaj School
SD	-	Standard Deviation
SDGs	-	Sustainable Development Goals
SEM	-	Structural Equation Modelling
SMD	-	Standardised Mean Differences
SRMR	-	Standardised Root mean Square Residual
STAG	-	ST. Aloysius Gonzaga
TLI	-	Tucker-Lewis Index
TPB	-	Theory of Planned Behaviour
UNEP	-	UN Environment Programme
UNESCO	-	United Nations Educational, Scientific and Cultural Organization
USAID	-	U.S. Agency for International Development
USD	-	United States Dollar
VIF	-	Variance Inflation Factors
WHO	-	World Health Organization
WMO	-	World Meteorological Organization

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1 Introduction

1.1 Background

The world's climate is changing record-breaking fast, and it affects the Earth's interconnected ecosystems. A change in one influences the other, and humanity cannot be separated from the whole. Climate change has direct and indirect impacts on many aspects of human life and development. It endangers the realisation of, and already achieved gains towards the United Nations Sustainable Development Goals (SDG) through changing the Earth's atmosphere, land, and water bodies. Table 1 demonstrates how a change in CO2 concentration, ocean acidification, temperature, ocean heat content, sea-ice extent, glacier mass, and sea levels directly impacts 13 of the SDGs. However, it is important to note that the remaining SDGs are also affected through worsening states in the others (WMO, 2021a, p. 37). For example, in developing countries women mostly work in climate sensitive industries, such as farming, hence they are at greater risk of losing their livelihoods due to draughts and flooding caused by climate change. When poverty and hunger increase due to climate change, gender equality and access to education decrease while families need children to work, or they cannot cover educational costs. Perhaps families need to choose among their children who is sent to school, and in that case, girls are in a higher risk of missing education or being sent off for marriage (Sims, 2021, pp. 12-15).

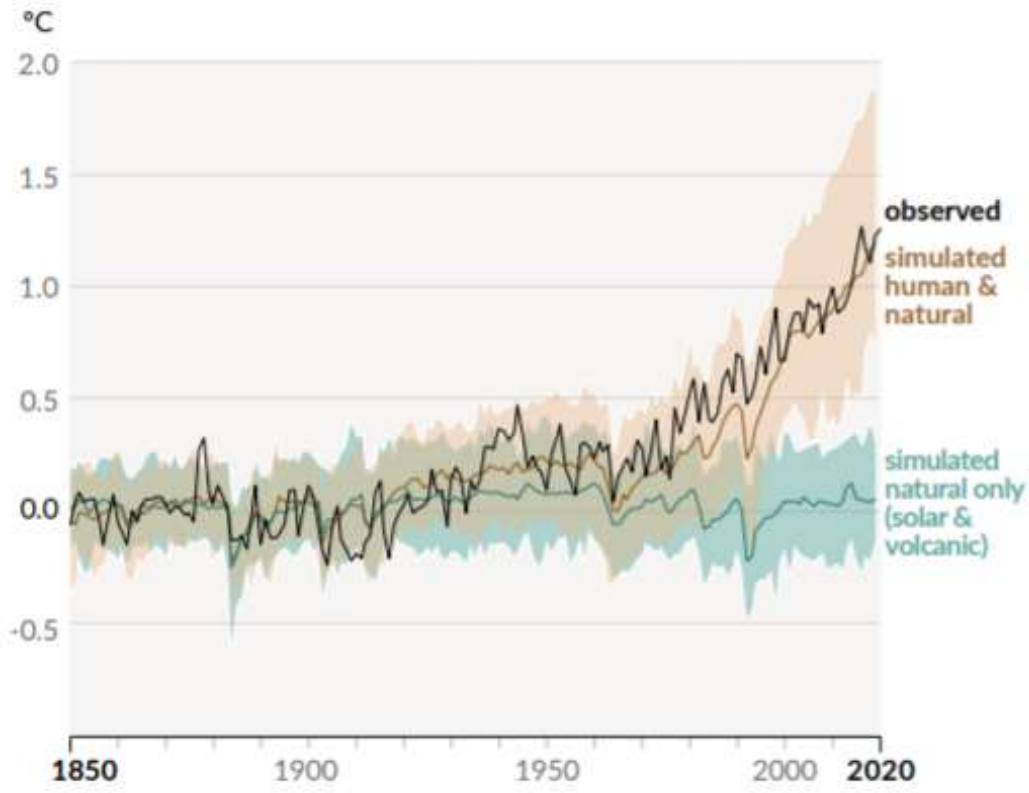
Table 1: Climate change and its interlinkages with the SDGs

	SDG 1	SDG 2	SDG 3	SDG 6	SDG 7	SDG 8	SDG 9	SDG 10	SDG 11	SDG 13	SDG 14	SDG 15	SDG 16
CO2 Concentration		XX	XX							XX	XX		
Ocean Acidification	XX	XX				XX			XX		XX		XX
Temperature	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
Ocean Heat Content	XX	XX	XX			XX			XX	XX	XX		XX
Sea-Ice Extent	XX	XX		XX						XX	XX	XX	XX
Glacier Mass Balance	XX	XX		XX	XX	XX	XX		XX	XX		XX	
Sea-Level Rise	XX	XX		XX		XX	XX	XX	XX		XX	XX	XX

Note: Interlinkages between climate change and the SDGs (WMOa, 2021, p. 6). The table demonstrates which SDGs are affected by a change in a given climate change indicator.

There is increasing evidence of human contribution to climate change, such as burning fossil fuels that cause increasing levels of greenhouse gases (GHG) that trap heat in the atmosphere (WMO, 2021b). As can be seen from Table 1, a change in temperature affects all the SDGs. The average global temperature has risen over the last decade, and it is 1.1°C higher than it was in 1850-1900. Figure 1 shows the global temperature trend during the last four decades (IPCC, 2021, p. 6).

Figure 1: Change in global surface temperature since 1850



Note: The global surface temperature has risen since 1850. According to scientists, the warming is due to human activity (IPCC, 2021, p. 6).

In addition to GHG-emission induced warming, urbanisation contributes to climate change by heating the local climate in the urban centres. Moreover, urbanisation comes with increased energy and resource consumption which further increases GHG emissions (Huang et al., 2019, p. 10). The warming from the urban expansion will affect especially the tropical zones, including sub-Saharan Africa where 13-23% of global urban expansion will occur (Huang et al., 2019, pp. 3f). These regions have low economic capacity to adapt to the warming effect (Huang et al., 2019, p. 8). By 2050, billions of urban citizens are predicted to be at a greater heat risk from urbanisation than they already are by warming from GHG emissions (Huang et al., 2019, p. 11), which alone (depending on the forecasted scenario) will increase mortality rates by 3%-13% in the tropical zones (Huang et al., 2019, p. 10).

An increase of 1.5°C of global temperature is projected to translate into more intense and frequent heavy precipitation and flooding in most regions in Africa and Asia, as well as in North America and Europe, and to more frequent and severe droughts in other areas. Global warming will also intensify tropical

cyclones and storms. At 2°C global warming and above, the predicted scenarios (from 1,5°C warming) will only intensify (IPCC, 2021, p. 24).

The impacts of climate change are felt already around the world. In the last decade, the frequency and intensity of conflict, extreme weather events and economic shocks have increased, causing economic and human life losses, as well as migration. In 2021, around 1200 lives were lost in India, 350 in China, and over 200 in Belgium and Germany due to floods. Meanwhile, in Northern America, over 600 people died as a result of heatwaves, and millions of people worldwide, particularly in Africa and Asia, continue to be affected by recurrent droughts (WMO, 2021b).

Between 2018 and 2020, 66 countries reported a total of ~319 million people who were affected by disasters each year. In economic terms, extreme weather events costed an estimated 210 billion USD in 2020 alone, which is over 25% higher than the year before (WMO, 2021b). Estimated disaster-related losses for the agricultural sectors of developing countries were over 108 billion USD between 2008 and 2018, and up to 280 billion USD at a global level. Due to the compounded effect of climate change and the COVID-19 pandemic, many countries are facing a decline in food security, and a growing number of countries are approaching famine. The number of people suffering from food crises increased from 135 million people in 2020 to 161 million by September 2021. Moreover, the global consumer food prices were the highest in six years in the first quarter of 2021 (WMO, 2021b).

The worsening environmental challenges demand an immediate change in attitudes, behaviours, and lifestyle choices. To foster the needed change, people in every continent need new skills to cut down emissions and adapt to the changing climate and its consequences (UNESCO, 2017, p. 1). Raising awareness and adaptation capacities are especially important in developing countries in the tropical zone that will suffer severely from climate change (Huang et al., 2019, p. 8). Although there are different opinions about how human behaviour is formed and can be altered (Braus et al., 2013, p. 8), the general understanding is that the more people are aware of how the environment works and are able to assess their place in it, the more likely they are to consider the environment and make better informed and sustainable decisions accounting for environmental impacts (Braus et al. 2013, p. 31). The

United Nations Decade of Education for Sustainable Development (2005- 2014) marked a decade when the global community focused their efforts on promoting Education for Sustainable Development (ESD) (UNESCO, 2014) to address the growing sustainability needs. It aims at providing learners with skills to evaluate their consumption and lifestyle choices in complex situations in terms of their current and future impacts on social, cultural, economic, and natural life (UNESCO, 2017, pp. 1-7). The largest global ESD-certification programme, the Eco Schools (discussed in more detailed in chapter 1.5), aims at responding to the sustainability education needs by supporting schools worldwide in delivering ESD, and incorporating it into the schools' day to day operations (Foundation for Environmental Education [FEE], 2019, p. 11).

1.2 Problem Statement

The Eco-Schools programme has become highly popular in the world and endorsed by many governments as a mean for ESD (Andreou, 2020, p. 40). Nevertheless, there is very little evidence-based research on Eco Schools and their impact on learners' environmental attitudes and behaviour from developing countries (Anderson, 2012, p. 197). Since the programme aims to be a model to raise sustainable future generations, it is important to understand what the impact of Eco Schools on students' environmental attitudes and behaviour is. Without sound research on Eco Schools' impact on adolescents in areas facing dramatic sustainability issues, such as Africa, it is hard for programme designers, implementers and educators to make empirically informed programming decisions (McDuff and Jacobson, 2001, p. 141).

1.3 Research Objective

The present research aims to assess whether Kenya's most prominent ESD model, the Eco Schools programme, succeeds to ignite positive environmental attitudes and behaviours among secondary school students in Kenya. Furthermore, it fills a research gap in quantitative theory-based impact evaluation on Eco Schools in Africa at the secondary education level and contributes to local and global efforts to implement ESD.

1.4 The Case of Kenya

Kenya is a suitable case study for the present thesis due to its geographical location in East Africa. The country faces several challenges in terms of sustainable development, but it has also developed policies to respond to those

problems. The most pressing sustainable development challenges that Kenya is facing due to climate change are biodiversity loss, pollution, natural disasters, food insecurity, unsustainable production and consumption, and poverty (Ministry of Education, 2017, p. iii). Kenya's population, 47,6 million in 2019 (the Republic of Kenya, 2019), is growing fast at the rate of about 1 million per year, causing constant ecological pressure and challenge in achieving the Sustainable Development Goals (Kenya, 2016, p. 9).

Kenya's economy is largely built on highly climate change sensitive, natural resource related sectors, such as tourism, agriculture, mining, forestry, fishing, wildlife, water supply and energy. These sectors contribute about 42% of Kenya's Gross Domestic Product and 70% of employment. These economic areas have already started to experience the effects of shifting rain patterns and extreme climate events like droughts which are expected to occur more and more frequently and with higher intensities (Government of the Republic of Kenya, 2016, p. 9).

It is estimated that in the medium-term climate change will have a serious negative impact on Kenya's agricultural and livestock productivity (Government of the Republic of Kenya, 2016, p. 9). Between 2008 and 2011, Kenyan farmers lost approximately 10.2 billion USD in crops and livestock (USAID, 2018, p. 2), and the first season harvest of maize of 2021, was 42-70% below the average due to prolonged droughts (WMO 2021b). Some areas such as central Kenya are predicted to become unsuitable for farming while other areas in lower elevations face losses up to 20% due to increasing heat and changing rain patterns. For example, current locations of tea farming face the risk of becoming unsuitable for farming due to heat, increasing diseases and pests putting the 787 million USD industry (in exports) at risk (USAID, 2018, p. 2).

Availability of water is likely to decrease from 586 m^3 per person annually (in 2010) to below 293m^3 by 2050, while the internationally accepted threshold is 1,000m^3 per person. Most of the water (87%) is used for irrigation, sanitation, and domestic use. Worsening droughts impact the quality of available water and hydropower production, which covers half of Kenya's domestic power. In drought years, hydropower is reduced to 40% which means power outages and supplementation from high-cost petroleum-based alternatives. More frequent and worsening floods and landslides cause a threat to energy, transportation

and building infrastructure. For instance, estimations for Mombasa, a coastal city in Kenya, predict that assets worth 4.8 billion USD will be at risk of weather hazards by 2050 (USAID, 2018, p. 3).

Moreover, the ecological challenges will have severe consequences for human health and life. The 17 million people who do not have access to decent water sources are at risk of waterborne diseases such as typhoid, cholera, hepatitis A and diarrhoea. Floods and increasing rainfalls increase the prevalence of these diseases. Finally, the country which is already witnessing stunting among 26% of children under five, is predicted to have even worse food insecurity in the future (USAID, 2018, p. 4).

Nairobi, the capital city of Kenya, suffers to a large extent from the same environmental challenges as the rest of the country. Population growth, pollution, deforestation and biodiversity loss, poor waste disposal and management and inadequate sanitation are the key environmental issues in the city. The population of the city of Nairobi is 4,4 million people (the Republic of Kenya, 2019) and it is constantly growing, resulting in the furthering of environmental degradation. Air and water pollution problems harm the citizen's health and the economy (Tibaijuka, 2007, p. 148). The main sources of air pollution are emissions from cars and industry, as well as burning charcoal and waste (Tibaijuka, 2007, p. 153). It is estimated that the annual consumption of charcoal is around 91,250 tons, which can be translated to a loss of 900 000 tons of greenwood in a year (UNEP, 2009, p. 39). Moreover, water pollution rates are 2 000 times above the WHO standards in some of the rivers in Nairobi (UNEP, 2009, p. 57). Water pollution is mainly caused by waste dumping from raw sewage, industry, and households. One cause for this waste dumping is inadequate waste management (Tibaijuka, 2007, p. 154). Finally, the problem of inadequate sanitation facilities, sewage disposal and refuse collection in the city causes water-borne diseases, poverty and environmental degradation in addition to water pollution (Tibaijuka, 2007, p. 156).

To address the developmental issues in the country, the Government of Kenya has developed a Green Economy Strategy and Implementation Plan (GESIP), aiming at "greening" the economy and making the country a middle-income country by 2030 (Ministry of Education, 2017, pp. iii, 8; the Government of the Republic of Kenya, 2016). In the GESIP, ESD is seen as a central part of quality

education, preparing learners for the green economy (Ministry of Education, 2017, p. iii). Kenya's policy on ESD mandates sustainability education to be taught in every school in the country and recognises the Eco Schools programme as an effective method in mainstreaming sustainability into education (Otieno et al., 2020, pp. 246f).

1.5 Eco Schools Programme

The International Eco Schools programme was introduced by the Foundation for Environmental Education (FEE) in Europe in 1994, to promote youth and educator engagement in addressing environmental issues and global sustainability challenges in and through decision making, mobilisation and advocacy in their local communities (Gough et al. 2020a, p. 1). The programme started with the promotion of environmental protection, as well as economic and social development among youth in primary and secondary schools (Gough et al., 2020, p. 1). Over the years, the programme has evolved into a widely recognised ESD programme (Foundation for Environmental Education [FEE], 2019, p. 6). In 2019, close to 20 million students and 1.5 million teachers from over 59 000 schools in 68 countries around the world were participating in the programme (FEE, 2019, p.11).

The Kenya Organisation for Environmental Education (KOEE) started implementing the Eco Schools programme in 2003 in twelve schools, and by 2018, over 1 000 primary and secondary schools were registered as Eco Schools covering all eight provinces in the country. All public and private primary and secondary schools can apply to the programme through the KOEE. After registration, the schools get support and resources to start the programme. The Nairobi region has 91 Eco Schools (14% of the total of the country) (Otieno et al., 2020, p. 245).

The Eco Schools seven-step methodology (see Figure 2) provides a framework with structure, themes, timelines, and targets for the students and teachers to achieve the schools' sustainability goals (Andreou 2020, pp. 36f). To start with, the school forms an eco-committee, a student-led group combining students, teachers, school administration, parents, members of the school board and other relevant community members. The committee plans environmental and social actions to be made to improve the school's sustainability and

communicates them to the rest of the school and community. As the next step, the committee carries out an environmental review of the current state of the school's sustainability status (Andreou 2020, pp. 37f) against the FEE's sustainability themes: Biodiversity & Nature, Climate Change, Energy, Food, Global Citizenship, Health & Wellbeing, Litter, Marine and Coast, School Grounds, Transport, Waste, and Water (FEE 2019). The review enables the school to identify and select key focus areas with the most room for improvement and develops an Action Plan to work on those themes with clear activities, indicators, timeframes, and objectives. The eco-committee is the main responsible for the monitoring and evaluation of the implementation of the Action Plan (Andreou 2020, p. 38). They must engage with the students at school as well as the community members to inform and encourage them to participate in the sustainability initiatives implemented at school and practice them at home too. By linking ESD into the curriculum, students should learn how environmental issues are part of everyday activities and linked to all aspects of life (FEE 2019).

The final step is to produce an Eco Code communicating the school's commitment to sustainability. The code functions as a reminder to sustain the implemented projects and improvement plans (Andreou 2020, pp. 38f). After going through all the steps and reaching the goals, the school can be accredited a "Green Flag", marking the school's successful implementation of the project (Andreou 2020, pp. 36f). The school must be assessed by an external evaluator before being granted the Green Flag, and to retain it, the school will be assessed annually (FEE 2019).

Figure 2: The Eco Schools seven step framework

Note: Schools enrolled in the Eco Schools Programme follow a seven steps methodology to implement their sustainability transformation plan and reach their sustainability goals (Andreou, 2020, p. 37).

The methodology of the Eco Schools programme is based on a Project Based Learning (PBL) and a whole school approach (Andreou 2020, pp. 36f). The whole school approach aims to engage the whole school community, including students, teachers, and the local community, and embed ESD into every aspect of the curriculum. At the same time, it improves the school environment to enable sustainable lifestyle and learning by doing. Students are encouraged to develop sustainable projects, so called micro-projects, by observing their living environments and innovating solutions to local problems with, and for the community (Gouch et al., 2020, p. 2). Through various micro-projects, the students develop problem-solving skills, critical thinking, reflection, and teamwork skills (PBL), while at the same time educating and inspiring members of the community (Andreou 2020, pp. 36f). At the core of the Eco-Schools programme is transformative learning, which develops learners' abilities to realistically assess their environmental footprint and make informed decisions about their behaviour (Andreou 2020, p. 32). Moreover, the aim is to make sustainable lifestyle and solutions to extend beyond the school grounds. Thus,

the programme is meant to help the schools to connect with the local communities, improve their finances through increased efficiency, promote multi-stakeholder collaboration and encourage student leadership (Andreou 2020, pp. 40f).

1.6 Research Question

By applying quantitative research methods, this thesis aims to answer the following research question: **Does the Eco Schools programme impact secondary school students' environmental attitudes and behaviour in Nairobi city in Kenya?**

As explained in the introduction, Kenya faces several ecological challenges that demand more sustainable lifestyle choices. This is why schools in Kenya are implementing the ESD policy, and why it is important to find out its impact. The present research provides insights into the effectiveness of the Eco Schools programme. It differs from many existing studies on Eco Schools in terms of its geographic context being Africa, as well as its research approach. It applies a theoretical framework which most of the other scholars studying Eco Schools have not done.

Nairobi city was selected as the research site due to its pressing sustainability challenges (the Republic of Kenya, 2019), its highest concentration of Eco Schools in the country, and the KOEE's presence in the city. The advantage of choosing Nairobi was that the KOEE was able to identify enough schools filling the criteria for the study (see chapter 4.4.1 for more details of the selection criteria), and it was easier to get access to the students in Nairobi due to the KOEE's closer connections to the schools in Nairobi, compared to other regions.

The present research is explained in more detail in the following chapters. Chapter two provides a literature review exploring where and how the topic has already been studied by other scholars and their main research findings. Chapter three introduces the theoretical background applied in the present thesis and chapter four elaborates on the research methodology used in the current research. Empirical findings in chapter five presents the research results, and chapter six summarises the thesis, discusses its findings and

limitations, as well as provides policy recommendations derived from the empirical findings.

2 Literature Review

The goal of this literature review is twofold. Firstly, to provide an overview of the existing research on the effects of environmental and sustainability education on learners' environmental attitudes and behaviour with a focus on Eco Schools programme, and adolescent students. Secondly, it highlights a research gap in quantitative theory-based research on the topic in Kenya and in Africa in general. The chapter is organised geographically to developed countries and developing countries - both outside of and within the African continent. It begins by introducing a couple of studies on Eco Schools from developed countries, after which it presents studies on environmental education programmes (similar to Eco Schools) from developing countries in Southeast Asia, before finally discussing research on Eco Schools from Africa. The chapter ends with a review of a study applying the same theoretical framework, which is used in this thesis.

2.1 Research on Eco Schools in Developed Countries

An evaluation of the Eco Schools Programme in Scotland was conducted by Pirrie et al. (2006). They evaluated how the Eco Schools programme was perceived to have succeeded in increasing pupils' environmental awareness and developing more pro-environmental behaviour in Scotland. They collected data via postal surveys from 655 schools registered in the Eco Schools programme. The respondents were mainly headteachers, teachers and deputy head teachers. To complement the data from the surveys, they asked students in eco school committees in secondary schools to fill in a questionnaire about the programme, albeit the response rate was low. The second part of the evaluation consisted of case-study research, in which key informants such as teachers and other school employees as well as students and parents were interviewed in four primary and three secondary schools. The report does not elaborate on the data analysis methods used in the evaluation. The evaluation shows that involvement in the programme was perceived to have had a favourable impact on students' environmental motivation and behaviour, but these impacts were better observed among primary school students. The

programme has challenges in engaging secondary school students and nurturing their environmental motivation. Suggested reasons for that are adolescents' better understanding of the complexity of environmental issues which causes feelings of hopelessness. Moreover, they are affected by peer pressure by their apathetic peers. In contrary, the surveyed secondary school students reported that their classmates were more likely to recycle and less likely to litter, indicating positive changes in pro-environmental behaviours among secondary school students. However, due to the low response rate the results may not reflect reality. The study also found a positive relationship between student leadership and environmentalism in secondary schools.

Boeve-de Pauw and van Petegem (2017) found similar results regarding student leadership and increased student environmental motivation. They conducted a research in Flanders on Eco Schools' effectiveness. In total 2 152 students and 1 374 teachers in 101 primary and secondary schools filled a survey measuring their environmental values, knowledge, and motivation. They used a popular Two Major Environmental Values (2-MEV) model to measure environmental values. They used multilevel regression models to identify differences between the sampled schools. Their study suggests that the Eco Schools programme increases knowledge, reduces utilisation values and enforces controlled motivation, but the authors conclude that this combination is not likely to create positive environmental behaviour. Controlled motivation supports pro-environmental behaviour but not to the extent that students would have sufficient self-determination and inner motivation to change their behaviour. Rather, it indicates that especially adolescent students need external pressure to exhibit pro-environmental behaviour. Their research findings did not show significant differences in students' environmental preservation values, but Eco School students viewed exploitation of natural resources more negatively.

2.2 Research on the Impact of Environmental Education in Developing Countries Outside of Africa

As research on Eco Schools in developing countries is limited, this subchapter presents studies from Southeast Asia exploring similar programmes and their impact on adolescent students' environmental attitudes and behaviour. To begin with, a few studies that have examined Indonesia's version of Eco Schools called "Adiwiyata" programme are discussed. The studies compared Adiwiyata

and non-Adiwiyata students' environmental literacy, comprising environmental knowledge, competence, disposition, and environmentally responsible behaviour (Astuti and Aminatun, 2020, p. 376). After these studies, Taiwanese research on Green Schools programme impacts is presented.

The first discussed study from Indonesia was conducted by Nurwaqidah et al. (2019), who investigated the differences between Adiwiyata registered national, provincial and district schools as well as non-Adiwiyata schools in terms of students' environmental literacy. They analysed students' environmental knowledge, affect, behaviour and skills with statistical methods. They collected data via surveys from 379 students in 91 junior high schools using the Middle School Environmental Literacy Survey (MSELS) and observational data. The MSELS instrument measures ecological knowledge, verbal commitment, environmental sensitivity, environmental feelings, issue identification, issue analysis, action planning, and actual commitment. Their findings indicated that overall students' environmental literacy rates were low in the target schools, but the Adiwiyata students' scores were nevertheless higher. Additionally, they found out that students' environmental literacy corresponded positively with the school's Adiwiyata status, i.e., the stage at which the school was on its journey to be acknowledged as a "Green School". Unlike research in developed countries, their results suggested that age was not a significant factor in explaining environmental literacy, but gender was. Girls were found out to be more environmentally literate than boys.

Authors Astuti and Aminatun (2020) in the second Indonesian study collected data via interviews, observations and a questionnaire developed based on an instrument by the North American Association for Environmental Literacy (NAAEE). Their sample consisted of 1 568 students from nine senior high schools in Indonesia. They assessed the students' environmental literacy domains of competence and disposition. Environmental competency refers to knowledge, and disposition refers to attitudes and intention of behaviour. They found out that Adiwiyata students had a significantly higher level of environmental competency and disposition compared to their peers in non-Adiwiyata schools.

The third Indonesian study by Nurwidodo et al. (2020) also assessed the impact of Adiwiyata programme on high school students' environmental literacy. This

study was located in Malang City, where they surveyed 275 students from public Adiwiyata and non-Adiwiyata schools from grades 10 and 11 by using the Middle School Environmental Literacy Survey (MSELS) instrument. Their results showed that Adiwiyata students had significantly higher scores in ecological knowledge, pro-environmental behaviour, and cognitive skills compared to students who were not exposed to the programme. However, surprisingly, Adiwiyata students' environmental affect scores were significantly lower than students in non-Adiwiyata schools. They also found that grade 11 students had better cognitive skills compared to their peers in other grades.

In Taiwan, Olsson et al. (2019) studied Green Schools programme delivering ESD education with similar principles to Eco Schools. Their interest was in the programme's impact on students' sustainability consciousness. They compared a total of 1 741 students in sixth, ninth, and twelfth grades in Green Schools and non-Green Schools. They measured students' sustainability knowingness, attitudes, and behaviours in relation to sustainability via surveys and used structural equation modelling in data analysis. Their findings did not show significant differences in sustainability consciousness between the Green School and non-Green School students, but sustainability behaviours seemed to be less affected by the programme compared to knowingness and attitudes. Gender differences were observed in this study as well. Girls had consistently better mean values, especially regarding environmental behaviours. Moreover, their findings indicated "a dip" in the secondary school students' sustainability consciousness at the age of 15-16. The students' results, especially in terms of sustainability behaviours, within that age group decreased compared to 12-13 years old students and rebounded again at the age of 18-19.

2.3 Research on the Impact of Eco Schools in Africa

The limited research on Eco Schools in Africa has been qualitative by nature, and its focus has been on primary schools only. Martin (2017) collected 40 compelling Most Significant Change Stories from a random sample of 25 primary level Eco Schools in Uganda, Malawi and Tanzania to identify and evaluate best practices of the programme. She did not apply a theoretical framework for her work. Students, teachers, parents, communities and local administration were interviewed, and program reports and independent consultant data were referred to. The programme was perceived to change

pupils' and communities' attitudes towards the environment and natural resources and the way they manage them. Schools and communities had taken up measures to increase food supply, preserve nature, and improve energy efficiency and water and sanitation. Through Eco School micro-projects, the community had been more engaged with the school, consequently leading to better cooperation and shared learning, but although many Eco School projects had been replicated by the community members to bring about economic and environmental benefits, the community-school learning had been limited to mostly gardening and agriculture and was not realised in every school. It is important to note that the report at discussion has some limitations to it. First of all, the publisher of the report, the Danish Outdoor Council, is also the sponsor of the programme in the targeted areas. Moreover, the aim of the report was to inform about the best practices of the programme and only the compelling stories were included in the report, thus, it only portrays the successes of the programme.

2.4 Theory-based Research on the Impact of Environmental Education

As mentioned at the beginning of this literature review, none of the above-mentioned studies has based their research on any theoretical framework, except one. Uitto et al. (2015) studied 2 361 students in ninth grade in 54 secondary schools in Finland. Like many other researchers in the field of environmental behaviour research, they applied the Theory of Planned Behaviour (TPB) to study whether students' experiences at school and different psychosocial variables (perceived control, subjective value to perform an act, and subjective norms) impact their self-reported general environmental behavioural intentions, as well as their actual behaviours. For their research, they replaced the concept of perceived behavioural control in the TPB theory with self-efficacy, which they defined as "a belief on one's own ability to complete a task, reach a goal or exert a behavior". They applied quantitative methods and used structural equation modelling (SEM). Their results showed that as the theory assumes, behaviour intention preceded behaviour well regarding certain environmental behaviours, especially in the case of recycling and saving energy if the context for those behaviours was supportive. Their findings show that overall, the students had low or moderate scores on environmental behaviours (however large variations among the respondents were observable) and their self-efficacy in terms of environmental behaviour

was low as well (students do not believe that their actions have an impact). Students with higher self-efficacy had higher scores in environmental behaviour and the general low self-efficacy might have been the reason why the environmental behaviour results were low. The main source of self-efficacy seemed to be in-school experiences, and students' active role in environmental issues in school seemed to have a positive effect on their environmental behaviour.

2.5 Conclusion of Literature Review

The literature review concludes, that generally ESD programmes have a positive effect on students' environmental knowledge, especially theoretical knowledge. Effects on environmental attitudes and behaviour on the other hand are not so unambiguous. In Africa, Indonesia and Scotland, the results of Eco Schools programme and the like have been generally positive also in terms of attitudes and behaviour (Martin, 2017; Astuti and Aminatun, 2020; Nurwaqidah et al., 2019; Nurwidodo et al., 2020; Pirrie et al., 2006), but in Taiwan and Belgium researchers have detected only marginal or no effect at all (Olsson et al., 2019; Boeve-de Pauw and van Petegem, 2017). Nevertheless, the question of ESD effects on African – and Kenyan secondary school students' environmental attitudes and behaviours is yet to be answered.

Most of the previous research has applied quantitative or mixed methods in evaluating the impacts of Eco Schools. Quantitative methods enable larger sample sizes and are more suitable in impact evaluation (Allibang, 2017, pp. 14f), thus, those methods will also be used in the present thesis. Finally, as it turned out, there is a lack of theory-based research on Eco Schools, therefore the current thesis will also add value to the scientific literature in that sense. The chosen theory for the present thesis is the Theory of Planned Behaviour as it is successfully used in many other environmental behaviour studies, such as the previously presented study by Uitto et al. (2015). The next chapter elaborates more on the aforementioned theory and provides the conceptual framework for the thesis.

3 Theory of Planned Behaviour

This chapter discusses the conceptual and theoretical framework of the thesis. First, the study's two dependent variables will be defined. Second, the Theory of

Planned Behaviour (TPB) will be explained and finally, it's relevance for the current research will be elaborated.

3.1 Environmental Attitudes

The definition of attitudes and understanding of their formation divide researchers. Many scholars have suggested their own slightly different definitions for attitudes. One definition, compatible with the Theory of Planned Behaviour, was suggested by Petty and Cacioppo, who define an attitude as "a general and enduring positive or negative feeling about some person, object or issue". According to them, attitudes differ from beliefs that are "reserved for the information that a person has about other people, objects, and issues" (Petty and Cacioppo, 1981, cited in Heimlich and Ardoin, 2008, pp. 220f). The TPB theory focuses on specific attitudes toward a given behaviour. The TPB applies the following definition of attitudes: "the degree to which performance of the behaviour is positively or negatively valued" (Ajzen, 2019).

In this thesis, attitude is defined as "a general positive or negative mental judgement towards an object", and the definition of environmental attitude (EA) is constructed as follows**: a general positive or negative mental judgement towards the natural life.**

3.2 Environmental Behaviour

Stern (2000) suggests that environmental behaviour can be understood from an impact-based point of view, in which the behaviour can be judged based on its impacts: "the extent to which it changes the availability of materials or energy from the environment or alters the structure and dynamics of ecosystems or the biosphere itself" (Stern, 2000, p. 408). The present study describes environmental behaviour as **behaviour that has direct or indirect negative or positive consequences for the environment.**

In regard to pro-environmental behaviour, this thesis applies the definition of Amoah and Addoah (2020), who describe pro-environmental behaviour as **"any human behaviour that does not hurt the environment but rather improves or preserves the environment"** (Amoah and Addoah, 2020, p. 2720). Pro-environmental behaviours include, for example, minimising the consumption of resources and energy, choosing eco-products, minimizing waste production and disposing waste correctly, avoiding fossil fuel-based transport, and keeping the environment clean (Amoah and Addoah, 2020, pp. 2720-2722).

3.3 Theoretical Approach

As explained at the end of the literature review, the theoretical approach for the present thesis is the Theory of Planned Behaviour (TPB). It is one of the most prominently used theories in environmental behaviour research (Heeren et al., 2016, p. 617) and used by other scholars (Uitto et al., 2015) in a similar research, thus, it fits well into the context of the present thesis.

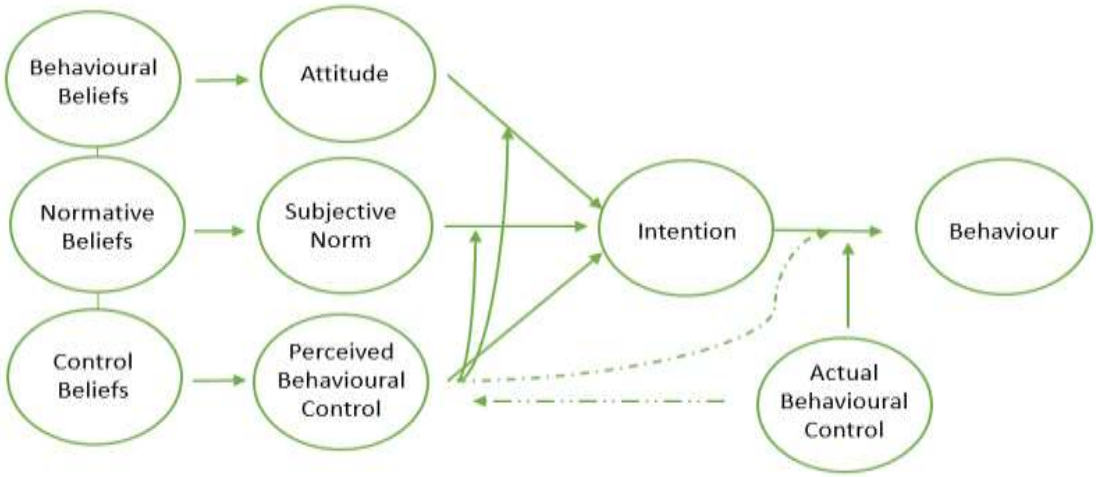
In essence, the TPB theory suggests a multi-layered process with three functions that precedes a performance of a given behaviour (see Figure 3). According to the TPB theory, attitudes, subjective norms, and perceived behavioural control are the functions upon which a *behaviour intent* is formed. This concept is fundamental to the TPB theory that postulates that a behaviour intent has a direct causal link to an actual performance of a given behaviour (Ajzen, 2012, p. 450).

In the TPB, the first function of behaviour intent: attitude, is defined as “the degree to which performance of the behaviour is positively or negatively valued” (Ajzen, 2019). The second function: subjective norm is conceptualised as the external social norms by important others (people whose opinions and expectations matter for the individual) which pressure to behave in a certain way. However, the subjective norm does not necessarily coincide with the attitude toward a given behaviour. Sometimes a person may hold negative attitudes toward a behaviour, but due to the pressure to comply with the expectations of important others, she/he may choose to perform the behaviour. The same applies the other way around when a person chooses not to behave in a certain way because of other people, although his/her attitudes alone would be favourable towards performing the behaviour (Ajzen, 2012, p. 443). The third function: perceived behavioural control (PBC) is based on the person’s assessment of their actual control over the behaviour, i.e., the perception of their ability to execute the given behaviour successfully. The concept is similar to the concept of self-efficacy. The higher the PBC over a given behaviour, the more it contributes to the intention to behave. Conversely, the less a person believes that she/he is able to behave in a particular manner (low perceived behavioural control), the less likely they have an intention to do so (Ajzen, 2012, pp. 446f; 2019).

All three functions are built upon beliefs that result from observations, learned knowledge, and previous experiences. However, instead of being fixed, the beliefs can change over time when a person is exposed to new information and experiences. The beliefs can be divided in three categories: 1) *behavioural beliefs*, i.e., beliefs and outcome evaluations towards certain behaviour, 2) *normative beliefs*, i.e., the perception of how other people expect and tell the individual to behave, and 3) *control beliefs*, i.e., a feeling of one's own skills and control over a given behaviour (Ajzen 2012; 2019).

Even though the theory assumes a strong causal relationship from the behavioural intention to actual behaviour, it does not claim it to be unbreakable (Ajzen, 2012, p. 449). Besides a favourable intention, people also need sufficient behavioural control to perform the behaviour successfully (Ajzen, 2019). An actual behaviour control refers to the internal and external factors which either enable or prevent a behaviour. The level of behavioural control depends on the extent that people possess the requisite internal factors: information, intelligence, mental and physical skills and abilities to perform the behaviour, as well as external factors, such as financial and physical resources and social support to perform the behaviour and overcome any external obstacles. The stronger the behavioural control is, the more likely a person who has an intention to act will behave as intended. When the control is high, intentions of behaviour should be enough alone to predict the actual behaviour but the more the degree of control decreases, the less predictable the behaviour gets. The behavioural intentions and behavioural control in combination influence the performance of a behaviour (Ajzen, 2012, pp. 445f).

Figure 3: Theory of Planned Behaviour Diagram



Note: Attitude, subjective norm, and perceived behavioural control are formed from beliefs and have a causal relation to behaviour intent, which in turn translates to actual behaviour, especially if supported by the actual behaviour control (Ajzen 2019).

Although not explicit in the model, the theory entails a feedback loop from performed behaviour back to the beliefs underlying each of the affecting domains (attitudes, norms, and perceived control) from which the intention to behave is constructed. The performed behaviour may be conducted successfully yielding expected results, but it can also generate unexpected and even negative results. It may receive negative or positive responses from other people, or the action might turn out to be more or less difficult to perform than anticipated. The received feedback will shape the person's attitudes, subjective norms and perceived behavioural control, consequently affecting the intention to carry out that behaviour in the future (Ajzen, 2014, p. 131). Moreover, unlike critics of the theory claim, TPB acknowledges that people are not rational, and the expectations considering all the three functions constructing the intention to behave may be inconsistent with the reality (Ajzen, 2012, p. 451). However, as Ajzen (2012) points out, usually beliefs reflect the real world relatively well (p. 133).

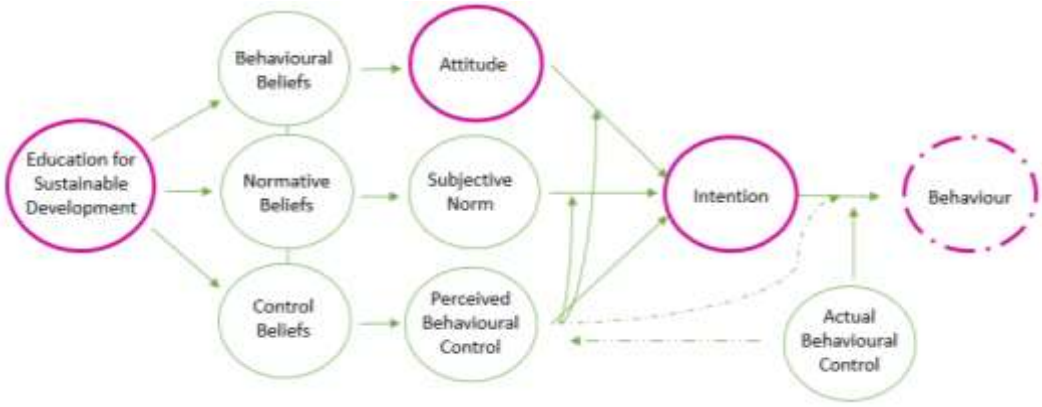
3.4 Application of the Theory of Planned Behaviour in the Current Study

Applying the TPB model, it can be assumed that the Eco Schools programme affects students' environmental behaviour through all four aspects in the TPB. Firstly, students in Eco Schools are exposed to environmental and sustainability information and experiences from which they develop their *behavioural beliefs* and furthermore develop positive *attitudes towards a pro-environmental*

behaviour. Secondly, teachers are expected to promote positive environmental attitudes and behaviour, affecting students' *subjective norms*. Thirdly, through "greening" the school environment and making the school itself sustainable (e.g., establishment of school garden or other small scale farming initiatives as well as recycling facilities) together with micro-projects at school and the "learning by doing" pedagogical approach (Otieno et al., 2020) the students' *perceived behavioural control,* as well as *actual behavioural control* regarding pro-environmental behaviour strengthen.

Due to the scope of this thesis, only a few variables of interest were selected from the model to be investigated (see Figure 4). These variables are exposure to ESD in Eco Schools (independent variable), attitudes (dependent variable 1), and behaviour (dependent variable 2). The operationalisation of the variables is discussed in the next chapter (4.1).

Figure 4: Application of the TPB model and variables of interest



Note: The variables of interest of this thesis are ESD, attitudes and behaviour regarding environment. Based on the TPB, it is expected that the ESD in Eco Schools shape students' behavioural beliefs through which they construct positive attitudes towards the environment, which in turn are one of the building blocks of behavioural intentions, translating to observed environmentally positive behaviours.

Based on the theory, the following hypothesis is postulated: **Students studying in Eco Schools have more pro-environmental attitudes and behaviours than students in schools following a regular ESD curriculum.** The hypothesis will be tested by applying relevant quantitative research methods explained in the next chapter.

4 Methodological Approach

The hypothesis is tested empirically with quantitative research methods. The subsequent chapter provides an overview of the research methods applied in

the present thesis. Based on the theoretical framework of the thesis, it is expected that education, practical experience and enabling facilities shape students' attitudes and perceived behavioural control, consequently affecting the Eco School students' environmental attitudes (EA) and environmental behaviours (EB) positively.

4.1 Operationalisation of Variables

To answer the research question, the variables had to be operationalised, i.e., it had to be decided how to quantitatively measure EA and EB. The independent variable "Eco School exposure" was measured with a dummy scale with values 1=student in an Eco School and 0=student in a regular school. In the development process of EA and EB indicators, Eco Schools programme coordinators in Kenya and the Netherlands were consulted.

An Environmental Attitudes Inventory (EAI) tool by Milfont and Duckitt (2010) guided the development of the indicators to measure EA. The EAI measures EA holistically and it is tested and proved for validity and reliability. Originally, the EAI consists of twelve scales[1] (p. 82), but based on the recommendations by the Eco Schools coordinators and the preference to control the length of the questionnaire, the current thesis utilised only ten of them to describe EA:

1) Enjoyment of nature,

2) Support for interventionist conservation policies,

3) Environmental Movement Activism,

4) Conservation motivated by anthropocentric concern,

6) Environmental fragility,

7) Altering nature,

8) Personal conservation behaviour,

9) Human dominance over nature,

[1] The twelve scales of EA in the EAI tool: 1) Enjoyment of nature, 2) Support for interventionist conservation policies, 3) Environmental Movement Activism, 4) Conservation motivated by anthropocentric concern, 5) Confidence in science and technology, 6) Environmental fragility, 7) Altering nature, 8) Personal conservation behaviour, 9) Human dominance over nature, 10) Human utilization of nature, 11) Ecocentric concern, and 12) Support for population growth policies (Milfont and Duckitt, 2010).

10) Human utilization of nature, and

11) Ecocentric concern.

One indicator, a statement describing a respective EA was developed for each scale. Therefore, the EA section of the questionnaire consisted of ten EA indicators.

The selection of themes and development of indicators for the EB scale was guided by the prevailing environmental issues in Nairobi and the everyday environmental behaviours and decisions available for adolescents living in the city. The following EB themes were selected to be included in the research:

1) Water,

2) Waste,

3) Energy,

4) Food,

5) Consumerism,

6) Chemicals, and

7) Environmental activism.

As in the case of EA, statements describing various environmental behaviours for each EB theme were developed.

Both, EA and EB were measured from the level of students' agreement with the respective statements with Likert-Scales from 1 (strongly disagree) to 6 (strongly agree). Likert scales were chosen due to their popularity in surveys and consequent understandability (Allibang, 2017, p. 33). All the EA and EB indicators can be viewed in the questionnaire in Annex A.

After developing the indicators, values for the dependent variables EA and EB had to be constructed by computing EA and EB scores from the respective indicator values obtained with the Likert Scales. This was done with Confirmatory Factor Analysis (more details in chapter 4.6). Acquisition of numeric values for EA and EB for each study subject enabled comparison of EA and EB between Eco and non-Eco School students, and through the comparison, it was possible to estimate whether one group had higher values

compared to the other. This method is known as the "*with and without approach*".

4.2 With and Without Approach

The main challenge of an impact evaluation is to forecast what would have happened if the beneficiary of the programme would not have been exposed to it. What would the state of his/her wellbeing be like at a given moment if the programme would have not been implemented, and how much of the change in his/her wellbeing can be attributed to the programme (Leeuw and Vaessen, 2009, p. 27; Khandker et al., 2009, p. 22). One attempt to evaluate the programme impacts is a before-and-after comparison, in which the outcomes of the treated are measured pre-and post-treatment, and the measured change in the outcomes is considered as the impact of the treatment. However, this method comes with an attribution bias. Since there can be countless uncounted factors in addition to the treatment affecting the outcomes measured after the treatment, it is impossible to tell the actual treatment effect (Khandker et al., 2009, p. 24; Leeuw and Vaessen, 2009, p. 27).

To avoid the attribution bias, the current thesis evaluates the impact of the Eco Schools programme on students' EA and EB by applying a quasi-experimental "with and without approach", also called the "treatment/control group comparison" approach. It is a suitable method to evaluate an impact of a treatment/programme in a situation where the treatment has already started and it is impossible to obtain information on a counterfactual, i.e., to observe the outcomes of the project on beneficiaries had they not been participating in it (Roni et al., 2019, p. 19). The "with and without approach" can eliminate the attribution bias by establishing a comparison group for the treatment group which mimics a counterfactual (Leeuw and Vaessen, 2009, p. 27; Khandker et al., 2009, p. 25).

To successfully determine the effect of the programme, the comparison group has to be statistically equivalent, i.e., as similar in terms of their characteristics to the treatment group as possible to reduce or eliminate selection bias, i.e., differences between treated and non-treated groups before the treatment (Khandker et al., 2009, p. 23). The challenge is that only observable characteristics can be controlled for, and unobservable characteristics, such as family influence, remain uncounted for and may create a bias (Roni et al., 2019,

p. 19). If a good comparison group is successfully established, it is possible to compare the EA and EB of Eco School students (treatment group) with non-Eco School students (control group) and infer the attributable impact from the difference between the outcomes of the two groups. Quasi-experimental research design, such as the “with and without approach”, is enabled by quantitative research methods (Roni et al., 2019, p. 19).

4.3 Quantitative Research Methods

Contrastingly to qualitative research methods, quantitative methods enable assessing outcomes against counterfactual or alternative ones (Khandker et al., 2009, p. 19). Quantitative research operates with numeric data and enable processing larger sample sizes. Therefore, they are considered to give more reliable and accurate results, which can be generalised if the research methods are applied correctly (Allibang, 2017, pp. 14f). With quantitative methods, ambiguous and hard to measure concepts like EA and EB can be transformed into numeric scores for comparison and statistical tests, which enable the assessment of the effects of the independent variable(s) on the dependent variable(s) (Roni et al., 2019, p. 10). Additionally, with quantitative research methods, the data from treatment and comparison groups are comparable because it is obtained with a standardised measurement, such as a questionnaire asking each student the same questions (Roni et al., 2019, p. 10). To find out whether the Eco Schools programme has a positive impact on students’ EA and EB, quantitative primary data was collected from students in Eco Schools and non-Eco Schools.

4.4 Data Collection

The data were collected during September and October 2021 in Nairobi city with a help of five enumerators with a good command of English and Swahili (the local language in Kenya). The enumerators were identified by the KOEE and trained for the job. The training took place at the KOEE office and lasted for two days. The support of enumerators was justified due to challenges imposed by the COVID-19 pandemic in getting sufficient time in the schools to carry out the survey by a single person. Due to the pandemic, the schools had little time to spend on this study.

Each school was first approached by a KOEE Eco Schools coordinator, and after receiving a positive response, a meeting was held, in which the research

was introduced to the principal. During the introduction meeting, the data collection dates were agreed upon and parental consent forms were left for the students' parents to sign in the schools that required them. On the day of the data collection, the students were interviewed one-on-one. The interview started with an introduction explaining the purpose of the research, as well as the student's rights to refuse or withdraw from the research. After getting oral consent from the student, the researcher/enumerator started reading out loud questions from an electronic questionnaire on her mobile phone and filling it out based on the student's answers.

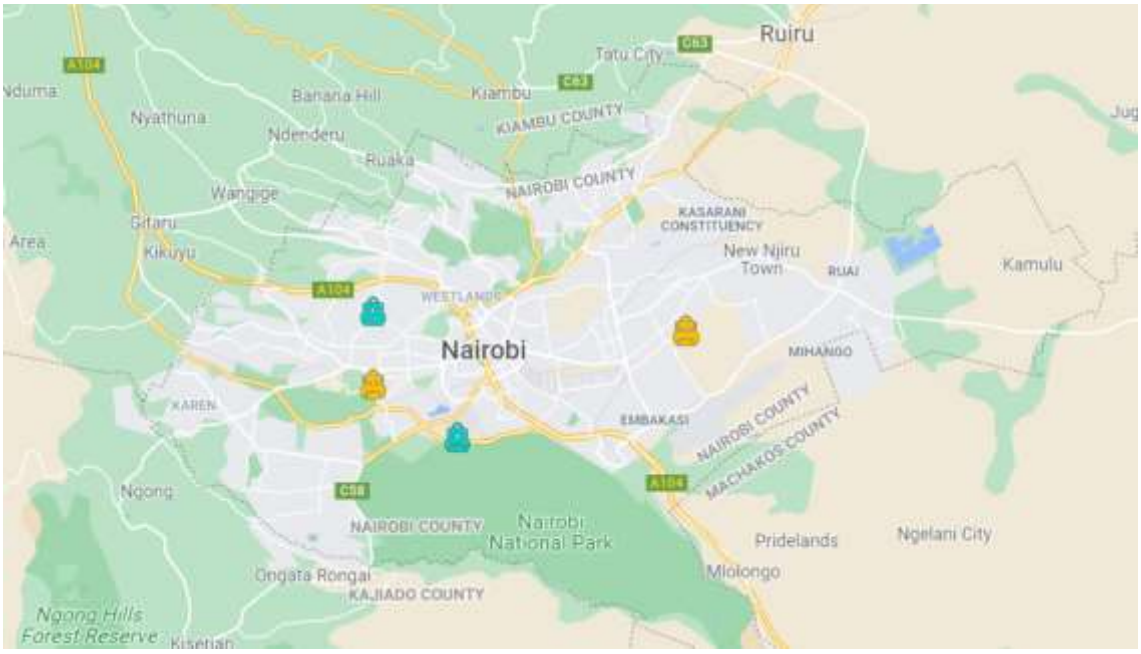
4.4.1 Sampling

Unfortunately, the establishment of a random sample of schools was not possible due to limited number of available schools, thus, the sample was collected by convenience sampling. The KOEE was asked to identify the schools with the following criteria:

- private day schools,
- mixed genders
- similar socio-demographic characteristics, and
- located in Nairobi.

The KOEE has less cooperation with secondary schools compared to primary schools, thus, it turned out to be challenging to find the secondary schools that would all fit into the given criteria. However, eventually four schools – two Eco Schools: Nairobi International School (NIS) and SCLP Samaj School (SCLPSS), and two non-Eco Schools: ST. Aloysius Gonzaga (STAG) and Brookfield Secondary School (BSS) were found and included in the study. Figure 5 shows the locations of the schools on a map. Eco Schools are marked with green and non-Eco Schools with yellow icons.

Figure 5: School locations in Nairobi city.

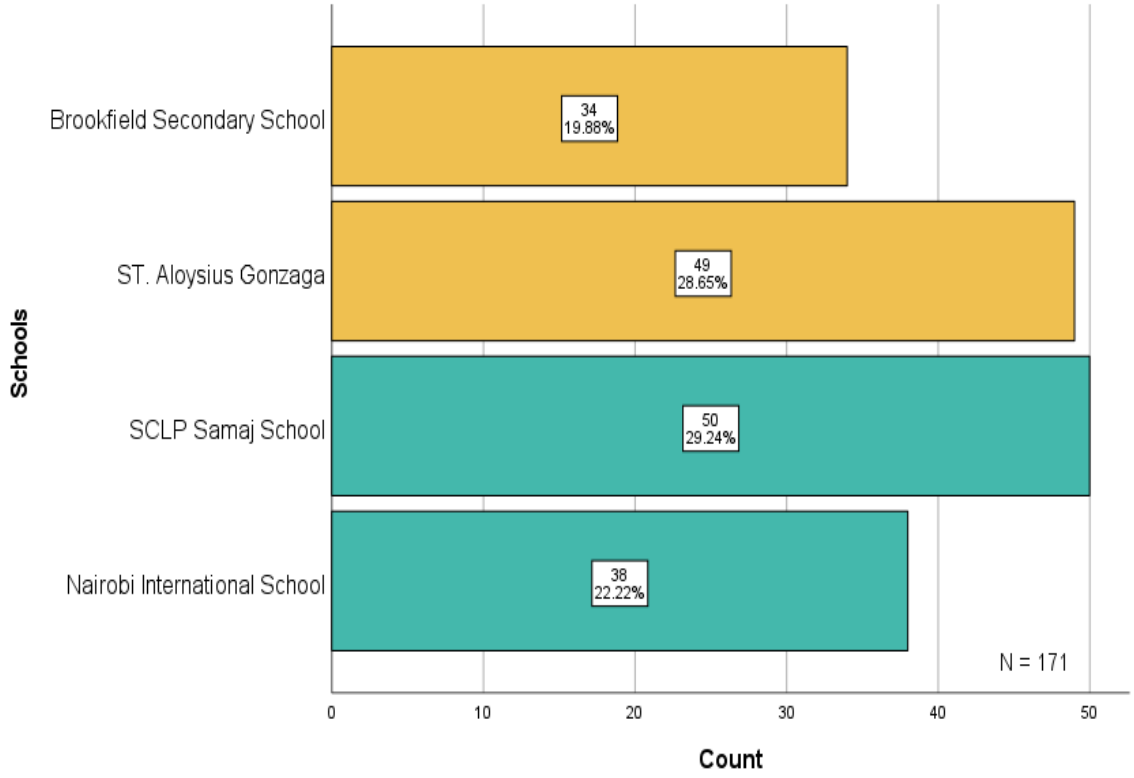


Note: The map marks the locations of the research schools in Nairobi city. Eco Schools are marked with green and non-eco schools are marked with yellow.

In each school, 50 students from classes covering ~17 to ~18 years old students were invited to take part in the study. According to the initial plan, those students were meant to be selected randomly from school attendance lists, but in most of the schools, this was not possible. In the NIS, all the students (38) whose parents gave their consent in year 12 and 13 classes were interviewed. In SCLPSS, a random sample of 60 students was established to cover up the low participation numbers from the NIS. However, due to absenteeism, the sample size from the SCLPSS was 50 students, and some of the students in the sample were invited to participate by the students who were part of the initial random sample. STAG was the only school where the random sampling succeeded, however, due to absenteeism the sample fell short by one student making the total number of students from that school 49. The BSS had only 55 students in the class of interest, thus, every one of them took parental consent forms home, but on the day of the data collection, only 34 students

were available. Figure 5 summarises the share of students in each target school.

Figure 6: Research schools



Note: Total number of students per each school and their proportion in percentages of the total sample. Eco Schools are marked with green and non-eco schools are marked with yellow.

4.4.2 Questionnaire

The data was collected with an interviewer-administered, closed-ended electronic questionnaire developed for the purpose of the current thesis. In a closed-ended questionnaire, the respondents select their answers from a predefined set of options. The benefits of this type of questionnaire are that it is easy and cheap to collect responses in numeric data for statistical analyses (Allibang, 2017, p. 33). The downside, however, is that it limits responses and doesn't enable gathering extra data, such as why the respondent answered as they did (Allibang, 2017, p. 33). Nevertheless, this data collection method was sufficient to satisfy the research interest of the present study. The full questionnaire is found in Annex A.

The final questionnaire consisted of three parts: 1) sociodemographic information, 2) environmental attitude, and 3) environmental behaviour. The first

version of the questionnaire was reviewed by professionals in the field of environmental research for content validity, Mr. Shimon Ginzburg, a Project Evaluation Officer at the FEE, and Mr. Gordon Butt, a retired environmental consultant.

Furthermore, it was checked for cultural and context appropriateness with consultants from the KOEE. To test the questionnaire's functionality in terms of language, understandability, layout, and finishing time, a pilot study was conducted with 10 students in Brookfield Kayole Secondary School, a school similar to those sampled for the actual research. The respondents of the pilot test, as well as the enumerators interviewing them were asked to provide feedback of the understandability and the feel of the questionnaire items. The questionnaire was refined based on the feedback and the final version was made digital with a SurveyMonkey software.

4.5 Data Preparation

First, the data was entered to Excel and variables were coded. Values for negatively worded questionnaire items no. 11, 14, and 18 in the EA section in the questionnaire (see in Annex A) were reversed (Pallant, 2005, p. 79) to correspond with the rest of the items (6 being the most environmentally friendly response). After that, EA and EB scores were obtained with factor analysis (more details in chapter 4.6). Table 2 shows the coding of each variable in the data with more details.

Table 2: Variable coding

Variable Name	Variable Coding	Variable Details
Socio-demographic items		
Age	N/A	Metric Variable
Attendance	N/A	Metric Variable
Household size	N/A	Metric Variable
Household education level	1 = Other / I don't know 2 = Primary school	The highest level of education obtained by one or more household member

	3 = High school 4 = Vocational training 5 = Diploma 6 = Undergraduate 7 = Post-graduate	
Gender	0 = Male, 1 = Female	Nominal Variable
Nationality	0 = Kenyan, 1 = Other	Dummy variable since there was not any foreign group that would stand out a lot in numbers.
Hobbies:		Open ended question asking students to list their hobbies.
Sports	0 = No, 1 = Yes	e.g., playing football, dancing, etc.
Arts	0 = No, 1 = Yes	e.g., painting, singing, etc.
Enjoyment	0 = No, 1 = Yes	e.g., watching TV, listening to music, etc.
Domestic work	0 = No, 1 = Yes	e.g., cooking, gardening, etc.
Independent Variable: Dummy		
Eco School participation	0 = No, 1 = Yes	Dummy treatment variable. Coded as 1, if a student studies in an Eco School.
Dependent Variables: Metric		
Environmental Behaviour	N/A	Metric variable derived from Likert Scale questionnaire items with CFA
Environmental Attitude	N/A	Metric variable derived from Likert Scale questionnaire items with CFA

Note: The table presents the variable coding used in the subsequent statistical tests and analyses.

The size of the total collected sample was 176 students, and after cleaning the data from observations with missing values, the final sample size was 171 students. Dropping the cases was a good alternative to handle the missing values in this case, since the number was small and the missing values occurred randomly in the data (Tabachnick & Fidell, 2013, p. 97). As can be

seen from Table 3, the cleaned sample included 88 Eco School students (51.5%) and 83 non-Eco School students (48.5%). In the Eco Schools, 39 students reported belonging to an eco-committee (22.8% of the total sample). The next step was to determine the right data analysis methods to explore the data structure and to compare the treated and untreated groups of students, in order to find out the treatment effect on the Eco School students' EA and EB.

Table 3: Distribution of students in the Eco and non-Eco Schools.

Treatment/Control				
	Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Non-Eco School	83	48.5	48.5	48.5
Eco School	88	51.5	51.5	100.0
Total	171	100.0	100.0	

Note: The total sample was 171 students including 83 non-Eco School students and 88 Eco School students.

4.6 Data Analysis

Statistical software R, IBM SPSS, and Stata were used to analyse the data. The "with and without approach" was implemented by dividing the sample into two groups based on Eco School programme exposure (an independent dummy variable) and then comparing the outcomes of the dependent variables: EA and EB of the two groups. As mentioned before, a Confirmatory Factor Analysis (CFA) was applied to reduce the data dimension to two variables (i.e., EA and EB) representing the most meaningful information contained in the database (factor scores). The scores were then used as continuous quantitative values for the dependent variables in further analyses (Grice, 2001, p. 430). For the purpose of this research, the CFA was chosen because EA and EB ("latent factors" in CFA terms) were already established and there was no need to explore the interrelationships among the set of variables in the questionnaire, as it is the goal in Exploratory Factor Analysis (EFA), another method of factor analysis to obtain factor scores (Pallant, 2005, p. 172). The EFA is often used in the early stages of a research to develop a questionnaire, whereas CFA is used later in the research process to confirm hypothesis or theories related to the

underlying variable structure (Pallant, 2005, p. 172). Because the observed indicators in the data did not follow a continuous and multivariate normal distribution, a Robust Maximum Likelihood (MLR) estimation method in CFA was chosen over a maximum likelihood estimation method (Li, 2016, p. 936).

After obtaining two continuous dependent variables, descriptive statistics were drawn from the total sample to describe the data. Different statistical tests were applied for different variable types to explore differences between the groups. For categorical variables (e.g., gender and hobbies), a Pearson's chi-squared test was applied (Pallant, 2005, pp. 287f), and for continuous metric variables (age, school attendance, and household size), the detection of differences started with a Levene's test. It tests for homogeneity of variance and determines whether a parametric t-test for independent samples, or a Welch two sample t-test should be used. The former in the case of homogenous variance (i.e., equal variance) and the latter in case of heterogenous variance (i.e., unequal variance) (Pallant, 2005, p. 198). In case the data was not normally distributed and did not fill the assumption of parametric tests for homogeneity of variance, a non-parametric Mann-Whitney U test was employed (Pallant, 2005, p. 198). Instead of comparing means (as t-tests do), it compares medians of two independent groups. By creating ranks of the scores on the continuous variable, it evaluates whether the two groups differ significantly and whether the individuals in both groups belong to the same population (De Vries and Meys, 2012, p. 444; Pallant, 2005, p. 291). The Mann-Whitney U test was used to test the null hypothesis of the thesis, due to results of non-normal data distribution detected by Shapiro-Wilk normality test.

After finding out whether there were differences between the two groups' socio-demographic characteristics and their EA and EB, linear regression, or Ordinal Least Square (OLS) regression analyses were conducted to understand the relationships between the independent and dependent variables. This enabled to assess how a change in one independent variable affects the dependent variable while holding all other independent variables constant (Frost, 2019, p. 38). Linear regression models are the most common ones and suitable for continuous dependent variables (Frost, 2019, p. 410). Bi-variate regression analyses were conducted to estimate the relationships between treatment and

dependent variables EA and EB, and multiple linear regression analyses were applied to identify other explanatory variables for the dependent variables.

For the regression results to be reliable, the data has to meet a few assumptions: absence of multicollinearity and heteroscedasticity, linear function form, and normal distribution. To test for the first two assumptions, a Breusch-Pagan test, and Variance Inflation Factors (VIF) were run. The Breusch-Pagan test tests for heteroscedasticity of the data, which means that the observations are scattered unequally and are not following equally the regression line. In OLS, heteroscedasticity is a problem because OLS assumes constant variance (homoscedasticity) of residuals or error terms (Frost, 2019, p. 285). In the case of heteroscedasticity in the data, robust standard errors should be included in the regression model. The second assumption, multicollinearity, can be detected from a correlation matrix and with Variance Inflation Factors (VIF) (Frost, 2019, p. 300). Multicollinearity means that variables in a regression model are too highly correlated with each other (Tabachnick and Fidell, 2013, p. 122), therefore they contain redundant information (Tabachnick and Fidell, 2013, p. 123). Multicollinearity violates the assumption of OLS that independent variables are independent. If independent variables are too strongly correlated, the regression model cannot reach its goal in estimating the relationship between each independent variable and the dependent variable. To eliminate the problem, one of the highly correlated variables should be omitted (Frost, 2019, p. 296). The third and fourth assumptions, linear function form and normal distribution, are expected to be met for the purpose of the regression analysis of this thesis.

To complement the results from the regression analyses, a Propensity Score Matching (PSM) was applied to estimate the treatment effects on EA and EB. It allows comparison between treated and non-treated groups by creating a propensity score for each observation in the data set, i.e., a score for predicted probability of being treated (Austin, 2011, pp. 400, 403). In this case, the probability of being enrolled in an Eco School. The propensity scores are estimated from logit or probit regressions, in which observed baseline characteristics (socio-demographic variables) are used to regress the treatment status. After obtaining the propensity scores, treated and untreated individuals in the data set are matched based on their propensity scores (Austin, 2011, pp.

400, 405). The matching aims to establish a covariate balance between the treated and control groups' covariate distributions (Belitser et al., 2009, p. 1115). By comparing differences in the outcomes of the matched subjects, the average treatment effect can be calculated. The PSM enables unbiased estimates of average treatment effects if two conditions are met. First, the conditional independence or unconfoundedness assumption, stating that the model should include all variables that affect treatment assignment and outcome, and second, common support or overlap condition assumption, requiring that the treated and untreated subjects have similar values in the covariates in the model (good balance in the model). So that for the value of a given covariate, the observation can belong to either group. When these two assumptions are met, the treatment assignment can be considered strongly ignorable and independent of the potential outcomes (Austin, 2011, p. 403; Heinrich et al., 2010, pp. 15f). The next chapter presents the empirical findings of the thesis.

5 Empirical Findings

This chapter presents the empirical findings of the thesis. It begins with descriptive statistics drawn from the sample and presents the findings from the statistical tests described in the previous chapter under the subchapter *"*Data Analysis*"*. Finally, it answers the research question and discusses about limitations to the research.

5.1 Dependent Variables Environmental Attitudes and Environmental Behaviour

In order to determine the effect of Eco Schools programme on students' EA and EB, the values in the EA and EB sections in the questionnaire had to be transformed into one single score for each. Confirmatory Factor Analysis (CFA) was applied to compute factor scores for each student in terms of his/her EA and EB to make further statistical analyses.

The CFA was conducted using the "lavaan" package in the statistical software R. The CFA model fit measures are presented in Table 15 of the Annex B. Since the aim of the CFA was only to obtain the factor scores, the fit of the model was not relevant for further analyses, thus, no attempts were made to improve the model fit. All the factor loadings were low, but most of them were

statistically significant (Figure 11 in Annex B). EB scale was better measured with the respective items with only two items without statistical significance, whereas the factor loadings of six items in EA scale were not statistically significant. Items 14 (“Factories should be required to pollute less, even if it means that things would cost more money.”) and 9 (“People have every right to change and manipulate nature to serve human needs.”) had the highest factor loadings (0.60 and 0.50) in the EA scale. In the EB scale, the items with the highest factor loadings (0.58, 0.58, 0.56, and 0.56) were item 21 (“If I have a piece of paper/juice box/food wrapping/etc. in my hand, I carry it to a waste bin rather than throw it to the ground.”), item 29 (“I pay attention to the chemicals used in products and choose the most natural ones.”), item 19 (“I spend my free time outdoors.”), and item 28 (“I conserve fuel by walking, cycling, or travelling by bus over a private car.”). All items had positive relationships with their respective latent factors except item 30 (“I am passionate about seeking information about environmental problems.”) with a factor loading of -0.08.

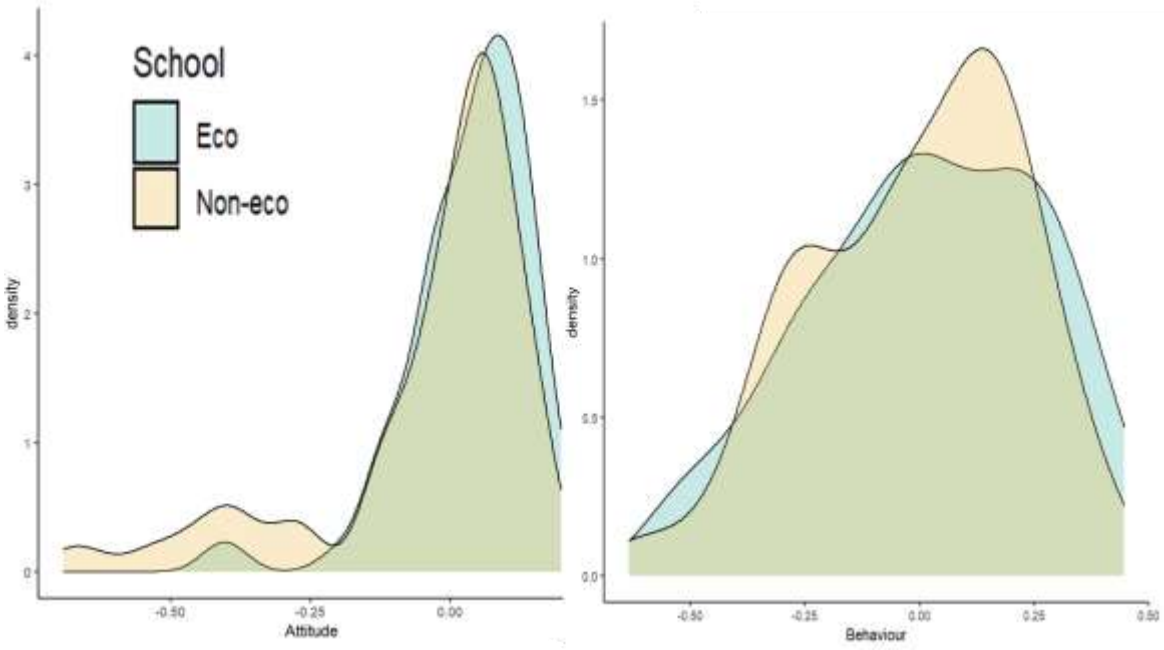
As mentioned, regardless of the limitations in the CFA model fit, the factor scores were obtained with it. Most commonly, factor scores are calculated using a regression method, and this is the default method also in the “lavaan” R package. By using a multiple ordinary least squares regression it predicts each study subject’s “factor score based on their observed variable performance” (Logan et al., 2019, p. 7). After obtaining the scores from CFA, the dependent variables EA and EB were continuous and statistical tests to compare differences between Eco School and non-Eco School students were possible (Table 4). When depicting the EA and EB distributions of Eco and non-Eco School students (Figure 7), it can be detected than non-Eco students seem to have a higher density of low values in EA compared to Eco students, but the EB distribution seems to be similar in both groups.

Table 4: Descriptive statistics for environmental attitudes and environmental behaviour

	Mean	SD	Min.	Max.
Environmental Attitudes				
Eco	0.033	0.110	-0.42	0.20
Non-Eco	-0.037	0.191	-0.69	0.17
Environmental Behaviour				
Eco	0.012	0.253	-0.54	0.45
Non-Eco	-0.009	0.232	-0.64	0.40

Note: The table enables comparison of EA and EB between Eco and non-Eco School students (N = 171).

Figure 7: EA and EB distribution between Eco and non-Eco students



Note: The histograms show how the values for EA and EB were distributed between Eco (green) and non-Eco (yellow) students (N = 171).

5.2 Descriptive Statistics for Socio-Demographic Variables

Table 5 presents the mean, standard deviation, minimum and maximum values of the total sample and Eco and non-Eco School students for the metric variables in the data.

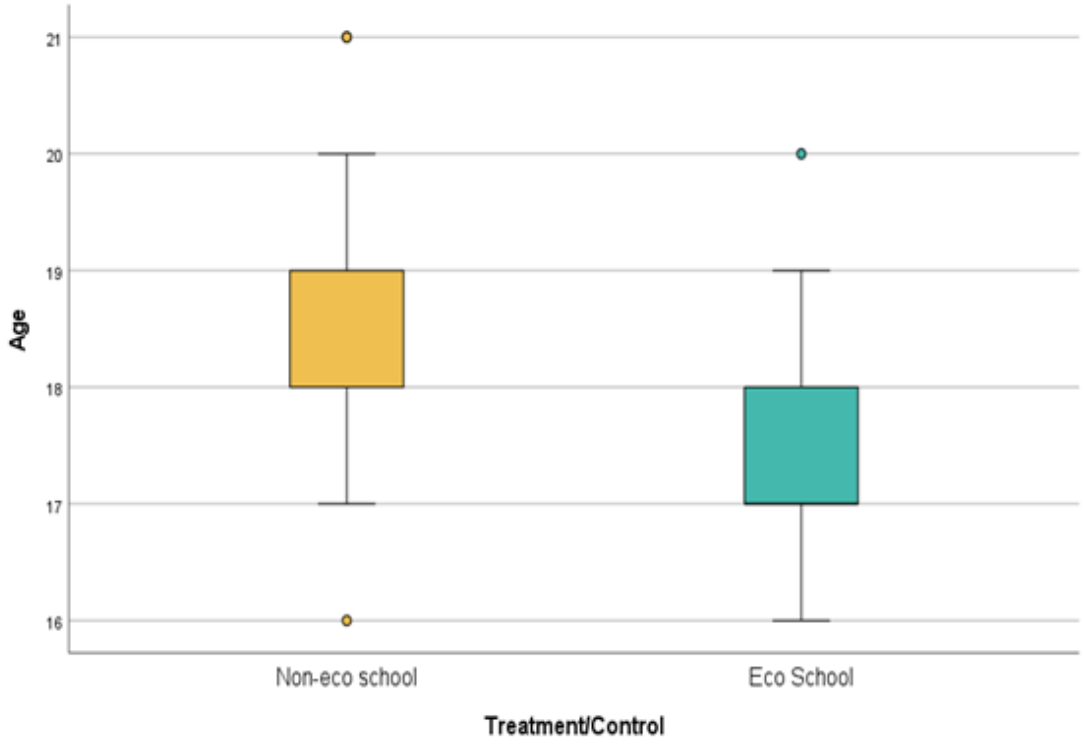
Table 5: Descriptive Statistics: Total sample, Eco, and non-Eco students by metric variables

Variable	Mean	Median	Stand. Dev.	Min	Max
			Total Sample		
Age	17.66	18	1.058	16	21
School Attendance	5.39	5	0.512	4	6
Household size	3.20	3	1.570	0	10
Household education level	4.96	6	1.886	1	7
			Eco School		
Age	17.16	17	0.801	16	20
School Attendance	4.98	5	0.150	4	5
Household size	3.36	3	1.306	1	8
Household education level	5.97	6	1.402	1	7
			Non-Eco School		
Age	18.19	18	1.041	16	21
School Attendance	5.82	6	0.387	5	6
Household size	3.02	3	1.801	0	10
Household education level	3.89	3	1.746	1	7

Note: The table presents the mean, median, standard deviation, and minimum and maximum values for the metric variables (N=171).

Students' age ranged from 16 to 21 years old with a mean value of 17.66 years in the total sample (Table 5). Most of the students were 17 (36.8%) and 18 (37.4%) years old. Levene's test showed an equal variance between the groups in terms of age (significance 0.055), and the following independent sample t-test showed a significant difference in the mean scores for age of Eco and non-Eco School students (significance level <0.001). Overall, Eco School students were younger than non-Eco students (Figure 8).

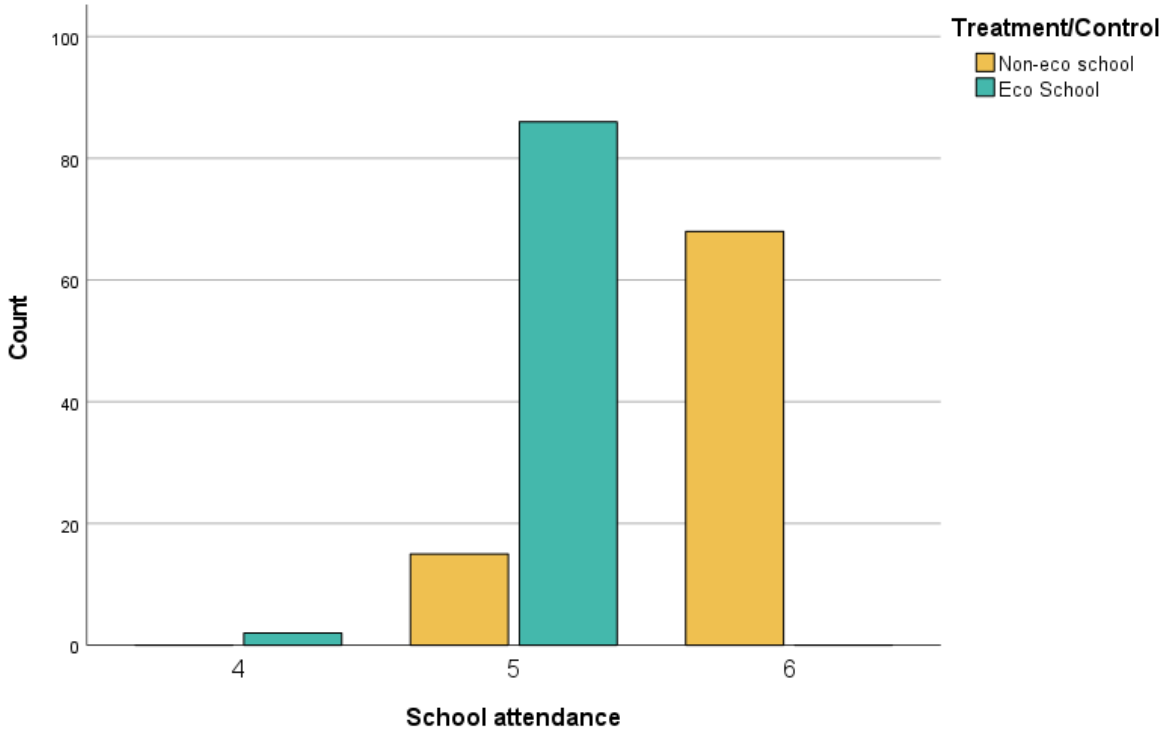
Figure 8: Age distribution between Eco and non-Eco students.



Note: A boxplot comparing the age distribution between Eco and non-Eco School students (N = 171). Eco School students marked with green and non-Eco School students with yellow. The Eco School students are about a year younger than the non-Eco School students.

In terms of school attendance, i.e., how many days per week students attend to school, there was a difference between Eco School students, who mainly come to school five days per week, and non-Eco School students, whose attendance varied from 5 to 6 days per week (see Table 5 and Figure 9). Levene's test showed unequal variance for the two groups and Welch Two sample t-test confirmed that the difference was statistically significant with a p-value 0.00.

Figure 9: School Attendance



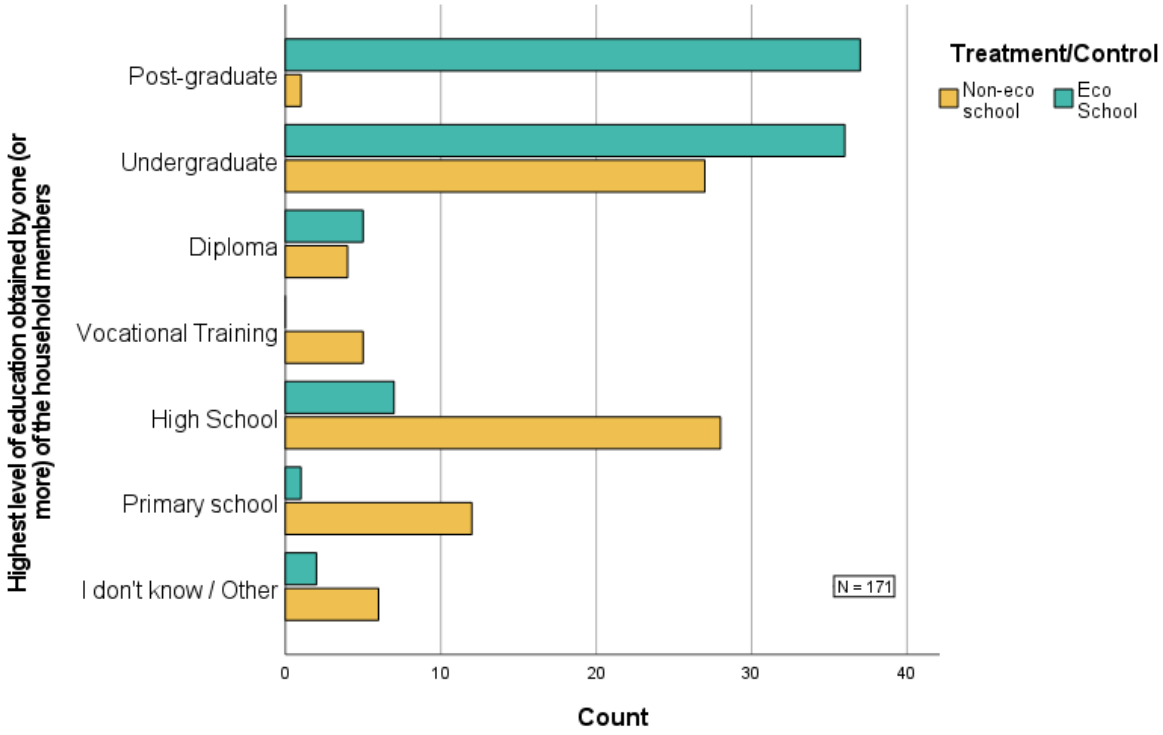
Note: School attendance comparison between Eco (green) and non-Eco (yellow) students (N = 171). Eco School students attend to school 5 days in a week, whereas non-Eco School students attend mostly six days in a week.

Most of the students (74.8%) in the sample lived with 2 to 4 people. Non-Eco school students have a wider range in terms of a household size compared to Eco School students varying from living alone to household of ten people (Table 5). There are also more non-Eco students living with only one other person. Levene's test showed an unequal variance in household sizes between the two groups (p-value 0.00). According to the Welch two sample t-test, the difference between Eco and non-Eco School students' household sizes is not statistically significant (p-value 0.162).

Table 5 shows that students in the total sample came from households where at least one of the household members had obtained a higher-level education (median: 6 = undergraduate). However, when comparing the education level in the households of Eco School and non-Eco School students, the Welch two sample t-test showed statistically significant differences in household education levels between students from the different groups with a p value 0.001. The detected difference can be observed from Figure 10. Eco School students are

living with people with higher level of education (median: undergraduate) compared to non-Eco School students (median: high school).

Figure 10: Household education level



Note: Comparison of education level of Eco and non-Eco School students' households. Eco School students are marked with green and non-Eco School students with yellow (N = 171). Eco School students live mostly in households where at least one household member has obtained an undergraduate or post-graduate degree, and non-Eco School students live in households with mostly high school and undergraduate degrees.

The gender distribution in the total sample was 101 females (59.06%) and 70 males (40.94%). When splitting the students into Eco School and non-Eco School students based on gender, the share of females in the former is 67.05% and 50.6% in the latter group (Table 5). According to the Chi-Squared test, the difference in the proportion of girls and boys in the two groups is statistically significant (p-value 0.42).

Most of the students in the total sample were Kenyans (144 students), but the share of non-Kenyan students was not equally distributed between Eco and

non-Eco Schools (Table 6). According to the Chi-Squared test with a p-value of 0.00, the groups differ with a statistical significance in terms of nationality.

Table 6: Gender and Nationality

	Total Sample	Eco Schools	Non-Eco
Gender			
Female	101	59	42
Male	70	29	41
Nationality			
Kenyan	144	66	78
Other	17	22	5

Note: The table shows the gender and nationality distribution between Eco (green column) and non-Eco (yellow column) students (N = 171). Eco School sample consisted of more females than males, whereas the gender distribution was almost equal in non-Eco Schools. Eco School sample included more foreigners than non-Eco School sample.

Eco School and non-Eco School students have mostly the same hobbies. According to Pearson's Chi-squared test, only arts was appreciated differently between the two groups, with a p-value of 0.01. The differences in the rest of the hobbies: sports, entertainment, and domestic work, with respective p-values of 0.89, 0.76, and 0.16, were not statistically significant between the two groups.

5.3 Differences in EA and EB Between Eco and non-Eco School Students

To decide on the proper statistical analysis to test the hypothesis "*Students studying in Eco Schools have more pro-environmental attitudes and behaviours than students in schools following a regular curriculum.*", the EA and EB data distributions had to be checked for normality with a Shapiro-Wilk test. The test concluded that the data were non-normally distributed in both variables with p-values lower than 0.05 (Table 7).

Table 7: Normality test for EA and EB data

	Shapiro-Wilk		
	Statistic	DF	Sig.
Environmental Attitude	0.800	171	<0.001
Environmental Behaviour	0.977	171	0.005

Note: Shapiro-Wilk test of normality was conducted for EA and EB data (N = 171). P-values (Sig.) lower than 0.05 indicate non-normal distribution. Both of the variables were non-normally distributed.

Due to the non-normality in the data, a Mann-Whitney U-test, a non-parametric test to test for differences in outcomes between two independent groups was applied. According to the test, the Eco Schools students' EA was significantly higher compared to students in non-Eco Schools (significance value 0.027). However, no significant differences between Eco School students' and non-Eco School students' EB were found (see Table 8). Therefore, based on the Mann-Whitney U-test, the hypothesis is confirmed in terms of EA but rejected for EB. Students studying in Eco Schools have more pro-environmental attitudes, but not behaviours than students in schools following a regular curriculum.

Table 8: Test for differences in Eco and non-Eco School students' environmental attitudes and behaviour

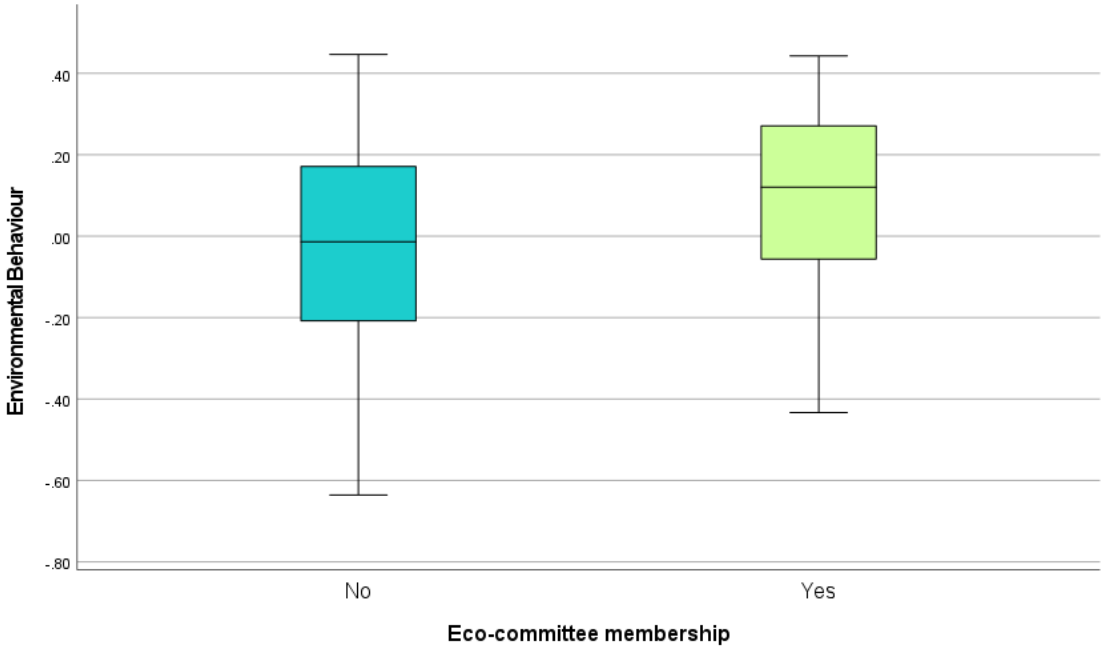
	Environmental Behaviour	Environmental Attitude
Mann-Whitney U	3441.00	2935.00
Wilcoxon W	6927.00	6421.00
Z	-0.652	-2.216
Asymp. Sig. (2-tailed)	0.514	0.027

a. Grouping Variable: Treatment/Control

Note: Results from Mann-Whitney U-test to compare differences between Eco and non-Eco School students' EA and EB. Significance values (Asymp. Sig. (2-tailed)) lower than 0.05 indicate a statistically significant difference between the two independent groups. The test revealed a statistically significant difference between Eco and non-Eco School students' EA (with significance value 0.027), but no difference in terms of the two groups' EB (significance value 0.514), (N=171).

When EB of eco-committee members and non-eco-committee members in Eco Schools were compared, eco-committee members were found to have higher EB (Figure 11). Significance level of 0.981 from a Levene's test indicated equal variance, so an independent sample t-test was carried out. It showed that the difference in the eco-committee members' and other students' EB was statistically significant (p-value of 0.037). To further explore the relationships between the independent and dependent variables, and to find out which independent variables influence EA and EB, simple and multiple regression analyses were carried out.

Figure 11: Eco-committee members' and non-eco-committee members' EB



Note: 1 Students in Eco Schools were asked whether they belong to the eco-committee of their schools. Non-eco-committee members are marked with blue on the left side of the figure, and students in the eco-committees are presented in the green box on the right side. Eco-committee members have higher EB compared to other students in the Eco Schools (N = 88).

5.4 Regression Analyses

To further explore the EA and EB of Eco and non-Eco students, and to determine whether the Eco Schools programme has an impact on the variables, both, bi-variate and multiple regression analyses were conducted. To begin with, the data was explored for possible outliers for both dependent variables. EA had 15 outliers and EB did not have any. Outliers may distort the results from regression analyses (Pallant, 2005, p. 143), so the subsequent analyses were run with and without the outliers to see whether they affect the outcomes noticeably.

5.4.1 Bi-Variate Regression Analysis

To test whether the Eco Schools programme has an influence on the dependent variables: EA and EB, bi-variate regression analyses were run between treatment and EA, and treatment and EB (Table 9). In terms of EA, the regression results showed a significant impact of the treatment (Eco Schools programme) with an R-squared value of 0.05 and a p-value of 0.003. It turned out that the model improved when the outliers in EA were included. With the outliers, the analysis showed a significant treatment effect, but without them, no

treatment effect on EA was detected. For EB, the regression did not show any significant effect of the treatment (R-squared: 0.002, and p-value: 0.556).

Table 9: Bi-variate regressions

Independent variable Dependent variable	Treatment EA	Treatment EB	EA EB	Eco-committee EB
Estimate	0.071 **	0.021	0.136 ****	0.113 *
Std. Error	0.023	0.037	0.029	0.248
t-value	3.011	0.589	4.579	2.113
R-Squared	0.050	0.002	0.119	0.049

Signif. Codes: < 0 “ **** ”, < 0.001 “ *** “, < 0.01 “ ** “, < 0.05 “ * ”

Note: Bi-variate regressions between treatment and EA, treatment and EB, EA and EB, and eco-committee membership and EB. A p-value lower than 0.05 indicates a significant effect. The R-Squared value indicates how much of the variation in the dependent variable is explained by the dependent variable, e.g., 5% of the variation in EA can be explained by the treatment, and 11,9% of the variation in EB can be explained by the variation in EA.

If Eco School participation does not explain variation in EB, could EA influence EB? According to the TPB theory, education influences beliefs based on which a person forms his/her attitudes. Attitudes on the other hand precede behaviour. In other words, a person performs – or does not – a given behaviour based on his/her attitudes (together with social norms and behavioural control) towards that action. To test this linear relationship, a third bi-variate regression was run for attitudes and behaviour. The results showed a significant relationship with an R-squared value of 0.119 and a p-value of 0.000 (Table 9). The regression results are in line with the TPB theory and show that ESD does not directly influence behaviour but could do it indirectly through attitudes.

Finally, the effect of eco-committee participation among Eco School students on EB was tested with a simple regression. The findings revealed that being a member of an eco-committee predicted higher EB scores (R-squared value of 0.049 and p-value of 0.038). According to the model, 5% of the variation in EB was explained by the eco-committee membership. The results of the bi-variate regressions show that treatment affects EA, and EA and active participation in the programme affect EB. However, based on the R-squared values, it can be concluded that these models do not explain the whole picture. Therefore, the

next step was to run multiple regression analyses to find out which other variables could explain EA and EB.

5.4.2 Multiple regression analyses

Multiple regression analyses were applied to identify the variables that might influence students' EA and EB in addition to Eco School exposure. Socio-demographic items in the questionnaire (Annex A) were used as explanatory variables in multiple regression analyses, with the dependent variables EA and EB. First, to statistically test for multicollinearity, the Variance Inflation Factor (VIF) was computed for each variable. The VIF showed that "treatment" and "schools" variables had multicollinearity (VIF = 10.658 and 5.480). After omitting the "schools" variable due to multicollinearity (VIF value over 5) as the literature suggests (Frost, 2019, p. 306), the problem of multicollinearity was solved, and the remaining explanatory variables in the full regression model were: Eco School exposure (code: Treatment.control),

- Age,
- Eco-committee membership (code: committee),
- Gender,
- Nationality,
- Attendance,
- Hobbies (Sports, Arts, Entertainment, and Domestic work,
- Household size (code: HH.size), and
- Highest level of education obtained by one or more household members (code: HH.education).

Then a regression model for each dependent variable including all the available explanatory variables was tested. After that, variables that had little explanatory power (low coefficients) were omitted. Various models were tested to find the best fitting model. A p-value smaller than 0.05 was considered statistically significant. Multiple regression analyses resulted in similar results with and without outliers in the EA variable, thus, the outliers were left in the model. All the regression models were tested for multicollinearity with the VIF, and multicollinearity was not detected in any of the models. Moreover, the assumption of homoscedasticity was met (Table 16 in Annex C).

Table 10 presents the full regression models and the final, best-fitting regression models for EA and EB. The full regression analysis for EA (AA model) showed that treatment and attendance were important variables to explain EA. The same variables remained as predictive variables in the final model for EA after testing several alternative models (AB). The results indicated that in addition to Eco Schools programme, the number of days a student attends school contributes positively to his/her environmental attitudes.

Based on the TPB theory, EA was added as an independent variable in the regression model for EB. As it can be seen in Table 7, when comparing (BA) and (BB), the model was improved. The Adj. R-squared raised from 0.05 to 0.13, and the p-value decreased from 0.07 to 0.00. Therefore, the EA was kept in the following regression models as an explanatory variable for EB. According to the results of the full model (BB), as well as the best-fitted regression model (BC), the treatment is not a statistically significant variable to explain EB. According to the final model (BC), nationality and sport hobbies are significant explanatory variables for EB.

Table 10: Multiple Regressions

	Environmental Attitudes		**Environmental Behaviour**		
Explanatory variables	Full Model (AA)	Final Model (AB)	Full Model (BA)	Full Model (BB)	Final Model (BC)
Treatment	0.123 (0.012 *)	0.136 (0.003 **)	0.041 (0.592)	-0.020 (0.781)	-0.071 (0.092)
EA				0.503486 (0.000 ****)	0.51234 (0.000 ****)
Age	-0.0186 (0.145)	-0.020 (0.110)	0.000 (0.979)	0.009 (0.609)	
Eco-Committee	0.029 (0.381)	0.024 (0.441)	0.095 (0.076)	0.080 (0.116)	0.072 (0.147)
Gender	-0.029 (0.254)	-0.018 (0.442)	0.032 (0.427)	0.048 (0.226)	0.047 (0.192)
Nationality	-0.058 (0.098)		0.106 (0.058)	0.135 (0.012 *)	0.131 (0.011 *)
Attendance	0.106 (0.011 *)	0.112 (0.005 **)	0.076 (0.248)	0.022 (0.721)	

Sports	0.038 (0.142)	0.041 (0.092)	0.101 (0.016 *)	0.081 (0.041 *)	0.078 (0.046 *)
Arts	0.0257 (0.337)		0.051 (0.231)	0.038 (0.348)	
Entertainment	0.008 (0.749)		0.075 (0.061)	0.071 (0.062)	0.066 (0.070)
Domestic work	0.049 (0.217)		0.056 (0.370)	0.031 (0.597)	
HH. size	0.005 (0.498)		0.017 (0.151)	0.015 (0.199)	
HH. education	0.005 (0.520)		-0.016 (0.196)	-0.018 (0.117)	
Adj. R-squared	0.110	0.112	0.047	0.137	0.145
F-statistic	2.751	4.587	1.705	3.092	5.147

Signif. Codes: < 0 “ **** ”, < 0.001 “ *** “, < 0.01 “ ** “, < 0.05 “ * ”

Note: The table presents the full multiple regression models on the left-hand side columns and the final models on the right-hand side columns for both EA and EB. The middle column in the EB section shows the multiple regression model when EA was added as an explanatory variable. The p-values for each coefficient are included in the parentheses below the coefficient.

To conclude, according to the results from the regression analyses, the Eco Schools programme has an impact on secondary school students’ environmental attitudes, and through the attitudes, the programme could indirectly influence students’ environmental behaviours. However, at the moment, that influence is not significant since no difference between Eco and non-Eco School students’ EB was detected. In addition to the Eco Schools programme, students’ environmental attitudes are also positively influenced by school attendance. These variables together explained 11 % of the total variance in EA, and in the final regression model for EB, 14,5 % of the total variance was jointly explained by environmental attitudes, nationality and sport hobbies. The positive value of the regression coefficient suggests that students from other nationalities have more pro-environmental behaviours than local students. Moreover, the regression model shows that playing sports has a positive effect on environmental behaviours.

5.5 Propensity Score Matching

To improve the robustness and complement the findings from the regression analyses, a Propensity Score Matching (PSM) was conducted. The PSM was conducted with "MatchIt" R package. Various PSM models were tested and compared to find the best balance. Both, logit, and probit regressions were run with nearest neighbour, full, and optimal matching methods, with and without a calliper. The best model for matching individuals in the treatment group (i.e., Eco School students) with individuals in the comparison group (i.e., non-Eco School students) was a logit model with nearest neighbour matching without replacement, and with a calliper of 0.3. Without replacement, an untreated individual in the data set can be matched only once with a treated one (Austin, 2011, pp. 405).

Logit regression was used to calculate whether a variable has a positive or negative effect on the probability of participation in the treatment (i.e., Eco Schools programme). Results of the logit model for the treatment assignment are presented in Table 11. According to the results, older students have a lower probability to participate in the programme, and the probability of studying in an Eco School increases with the education level in a student's household.

Table 11: Logit Equation for Participation in the Eco Schools programme

Dependent Variable: Enrolment in an Eco School		
Age	-1.932 ***	(-3.337)
Gender	-0.286	(-0.295)
Nationality	0.472	(0.424)
Attendance	-22.760	(-0.013)
Sports	0.543	(0.582)
Arts	-0.022	(-0.023)
Entertainment	-0.018	(-0.022)
Domestic work	1.605	(0.842)
HH. size	-0.275	(-1.230)
HH.education	0.752	(2.835)

*Note: The logit equation for participation in the treatment. Significance is marked with the coefficients, p-values < 0.001 **, and < 0 ***. Z-statistics in parentheses.*

The best balance in the data was achieved with nearest neighbour (NN) matching (Table 17 in Annex D). The balancing property of the propensity score

was satisfied with the selected covariates. In NN matching, the treatment and comparison observations are matched together according to the proximity of their propensity scores. The subjects with propensity scores nearest to each other are matched. Setting a calliper means that subjects from treatment and comparison groups must have propensity scores within a pre-specified distance to be able to be matched (Austin, 2011, pp. 406). A calliper of 0.3 reduced the number of matches but ensured better quality matches. This was important because the data was not perfectly balanced. Despite multiple attempts with different tests, in the best case, the data reached the balance only in terms of two variables (Figure 12 in Annex D). Another factor contributing to the low number of matches was the low overall sample size. By applying the aforementioned model, 10 matches were made (Table 12).

Table 12: Matching results

	Treated	Control
All	88	83
Matched	10	10
Unmatched	73	78
Discarded	0	0

Note: The table presents the number of matched students in the treatment (Eco School) and in the control (non-Eco School) groups. With the nearest neighbour matching, ten students from both groups were able to be matched.

Nevertheless, the results from the PSM support the results from the regression analyses (Table 13). Students' participation in the Eco Schools programme has a statistically significant effect on their EA but not on EB, given that no unmeasured covariates influenced the participation in the Eco Schools programme. Therefore, based on the empirical findings, it can be concluded that the Eco Schools programme has a statistically significant impact on students' environmental attitudes, but does not directly impact on their environmental behaviour. However, since attitudes was found to be a statistically significant variable in explaining environmental behaviour, the programme could influence also students' environmental behaviour through shaping students' attitudes. The next chapter concludes the thesis with a short summary of the research and discussion of its empirical findings. Additionally,

policy recommendations risen from the findings and recommendations for further research are discussed.

Table 13: PSM treatment effect estimation on environmental attitudes and behaviours

	t test of coefficients	
	Environmental Attitude	**Environmental Behaviour**
	p-value	p-value
Treatment effect	0.001 **	0.086

*Note: Treatment effect estimates on EA and EB after propensity score matching. Significant codes (marked after the coefficients): < 0 " **** ", < 0.001 " *** ", < 0.01 " ** ", < 0.05 " * ".*

6 Conclusion

With climate change, Kenya, among other developing countries, is under increasing pressure to start adapting to and mitigating climate change and its detrimental effects on the achievement of the SDGs. To address the problem, Kenya has developed a Green Economy Strategy and Implementation Plan (GESIP) with the aim to secure sustainable economic growth and development without exhausting natural resources. In the education field, Kenya's policy on ESD acknowledges the Eco Schools programme as an effective method in delivering sustainability education on all education levels. Since the programme is recognised in the ESD arena in Kenya, it was important to estimate its efficacy. This thesis was set out to investigate the programme's impact with the following research question: does the Eco Schools programme impact secondary school students' environmental attitudes and behaviour in Nairobi city in Kenya?

The TPB theory was applied to explain how the programme could impact the EA and EB of the students. Guided by the TPB theory, it was expected that the sustainability education in Eco Schools would generate positive EA in the students by increasing their knowledge about environmental issues. Through positive EA, the students would engage in pro-environmental behaviours. Therefore, it was hypothesised that students studying in Eco Schools have more pro-environmental attitudes and behaviours than students in schools following a regular curriculum.

Two Eco Schools and two non-Eco Schools in Nairobi were selected for this research. The schools had to fill in criteria in order to be comparable to each other. Each school selected to this research had to be a private, mixed gender day school located in Nairobi city, with students sharing similar socio-demographic characteristics with the students from the other schools selected for this study. In total, 171 secondary school students from the four schools filled in a survey aimed at measuring their EA and EB. The survey instrument was a structured digital questionnaire that generated quantitative data. Therefore, quantitative research methods were applied to analyse the data. The study applied the "with and without approach", in which the total sample was divided into two groups, Eco School students (88 subjects) and students in regular schools (83 subjects). Then the two groups were compared to each other to find out whether there was a difference in the EA and EB outcomes of the students. The main data analysis methods used in the thesis were regression analysis and PSM.

6.1 Discussion

Despite the common criteria for all the research schools, the descriptive analyses established a disparity between the measured socio-demographic characteristics of the Eco School and non-Eco School students. The analyses showed significant differences between the two groups in terms of age, gender, school attendance, household education level, nationality, and participation in arts as a hobby. The sample of Eco Schools had more girls and non-Kenyan students, and the students were about one year younger than in the non-Eco Schools. Additionally, the Eco School students attended school five days a week, whereas most of the non-Eco School students attended six days a week. The reason for the socio-demographic differences between the schools was the KOEE's weaker connections to secondary level education. It turned out that in Nairobi, the Eco Schools programme is more prevalent in primary level education, making it challenging to find the schools filling the criteria.

The empirical findings of the thesis showed that the mean values of the Eco School students' scores for EA and EB were higher compared to the students in non-Eco Schools. Nevertheless, the difference was statistically significant only in terms of EA. Therefore, the hypothesis is partly confirmed. Students studying in Eco Schools have more pro-environmental attitudes than students in schools

following a regular curriculum, but there is no difference in terms of EB. Results of research on Green Schools programme in Taiwan (Olsson et al., 2019) are in line with this finding. In this study, significant differences in sustainability consciousness between Green School and non-Green School students were not found. As mentioned earlier, OLS regressions and PSM were conducted to answer the research question.

The regression analyses and the PSM gave evidence of a positive treatment effect on EA. This corresponds with previous research findings from Indonesia, where Nurwaqidah et al. (2019), Astuti et al. (2020), and Nurwidodo et al. (2020) have studied an Indonesian environmental education programme similar to Eco Schools, and its impacts on students' environmental knowledge, competence, disposition, and environmentally responsible behaviour. These studies found positive programme effects on the way students perceive the environment. In addition to the Eco Schools programme, the findings from the multiple regression analysis of this thesis suggest that school attendance has a positive impact on students' EA. Potentially, students who attend school more, are also exposed to the programme more, consequently improving their EA.

However, unlike the studies in Indonesia (Nurwaqidah et al., 2019; Nurwidodo et al., 2020) that found positive programme effects also on EB, the regression analyses applied in the present study did not detect treatment effects on students' EB. Nevertheless, EA was a significant variable in predicting EB. This finding supports the TPB theory. According to the theory, behaviour is a consequence of positive attitudes, social norms and perceived and actual behavioural control. New information and personal experiences can shape attitudes through behavioural beliefs. When people judge nature positively, it's one of the enabling factors for behaviour that does not hurt the environment, but even improves it. Nevertheless, in order to perform a given behaviour, also the other factors recognised in the TPB framework must be favourable for it. The TPB theory suggests that education does not have a direct impact on behaviour, but the impact is rather indirect through attitudes and perceived behavioural control. More precisely, theoretical knowledge can change attitudes, whereas skills training can change perceived behavioural control (Ajzen, 2012; Ajzen, 2019). The chain from education to perceived behavioural

control was shown by Uitto et al. (2015), who studied Finnish students' self-efficacy and environmental behaviours using the TPB theoretical framework. In their case, they changed the concept of perceived behavioural control to self-efficacy, which is close to behavioural control. They defined self-efficacy as a person's belief in his/her ability to complete tasks, reach goals or perform behaviours. According to their results, self-efficacy predicted EB. The students with higher self-efficacy had also higher scores in EB.

In addition to EA, the results of the multiple regression indicated that sports hobbies and students' nationality explained EB. The hobby variable "sports" included activities such as playing football and other team sports, swimming, dancing, hiking, etc. This variable has not been found to be important in predicting EB in previous studies. The suggested explanation for the relationship between sports and EB is that sports bring people to green areas since most sports are performed outdoors. Spending time outside, experiencing enjoyable moments through sports outdoors, and contact with nature could promote pro-environmental behaviour. Moreover, sports teach discipline, which could also be an enabling factor in following rules, and for example, keeping nature clean. In addition to sports, nationality was shown to have explanatory value on EB. According to the results, coming from abroad seemed to have a positive impact on EB. For this variable, it is harder to offer an explanation. Perhaps religion could affect EB, for instance, some religions prohibit eating meat. It could also be that students from abroad are exposed to other types of information about the environment, affecting their EB. Moreover, some might come from countries with a generalised pro-environmental behaviour. Or perhaps immigrants living in Kenya have lower economic status and can't afford to use, e.g., a car, or they save money by eating less meat or buying goods used, and that is translated into pro-environmental behaviour in this study.

According to the PSM logit model results, older students had a lower probability to participate in the programme. The mean age in the Eco School sample was about one year lower than in the non-Eco School sample, despite the efforts made to have students of the same age. The result of unequal probability of participation might reflect a sample bias in the thesis, the failure of capturing students from the same age group, or a shortcoming of the programme to

include all school grades in the school. According to the Eco Schools description, the programme covers the whole school, so students in all grades should be equally involved. Therefore, all students in an Eco School should have equal chances of participation in the programme.

The PSM logit model also showed that the probability of studying in an Eco School increases with the education level in a student's household. Eco School students are living with people with a higher level of education (median: undergraduate) compared to non-Eco School students (median: high school). Although all the schools in the sample were private schools, there is a possibility that the Eco Schools are more expensive and only families with higher-level education can afford to pay the school fees or live in the neighbourhoods where the Eco Schools are located. Maybe more affluent schools are more likely to register in the programme. The Eco Schools in the sample were located in more affluent areas of the city. Another explanation can be that highly educated parents could have more positive EA and EB themselves and seek to send their children to Eco Schools.

The results from the PSM were consistent with the results from the regression analyses showing that the Eco Schools programme has a positive impact on students' EA, but no programme effects were detected on EB. Based on the sample in the present thesis, the answer to the research question is that the Eco Schools programme is effective in improving students' environmental attitudes but falls short in generating pro-environmental behaviours in the students. These findings are consistent with the previous research in Taiwan by Olsson et al. (2019), whose results indicated that students' behaviours were less affected by the Green Schools programme compared to knowingness and attitudes. Findings of Boeve-de Pauw and van Petegem (2017) also agree with these results. Their research concludes that the Eco Schools programme increases students' knowledge, reduces utilisation values and enforces controlled motivation, but that is not likely to translate into positive EB. Explained by the TPB theory, and supported by the empirical findings of this thesis, it is suggested that the Eco Schools programme could have an impact on students' EB through EA, as the regression analysis showed that EA was statistically significant in explaining EB. Nevertheless, there seems to be

something missing, since the Eco School students' EB was not higher than their peers in non-Eco Schools despite their higher EA. For a sustainable future, the students must have pro-environmental behaviours in addition to positive EAs. So how to explain the programme's lack of impact on students' EB?

As mentioned earlier, the TPB theory postulates that in order for a behaviour to occur, all the components in the framework have to be supportive of the behaviour. If the supportive and enabling conditions for pro-environmental behaviour are absent, a person is less likely to perform pro-environmental behaviours, even if one's attitudes would be positive towards the environment. In TPB terms, these conditions are referred to as "perceived behavioural control", and "actual behavioural control". These include perceived and actual skills, resources and facilities available for people to execute a given behaviour. Perhaps these enabling conditions are lacking, hindering the students' EB. Nairobi suffers from various environmental problems caused by human activity. People cut trees for charcoal, they dump their waste into the nature and rivers or burn it, and they drive cars that release black smoke into the air creating air pollution (the Republic of Kenya, 2019; Tibaijuka, 2007, p. 153; UNEP, 2009, p. 39). Partially, these behaviours are the consequence of the lack of alternatives for a more pro-environmental lifestyle. Insufficient waste management is the main cause for dumping waste and burning it (Tibaijuka, 2007, p. 154). Eco Schools may generate pro-environmental attitudes and intentions to behave in an environmentally friendly way, but the lack of enabling facilities and infrastructure in Nairobi and/or in the schools could prevent the intended pro-environmental behaviour. For example, even if one would have an intention to recycle, it might be very difficult or even impossible to do so due to lack of recycling facilities and poor waste management. Additionally, the individuals recycling might be discouraged and give up on the pro-environmental behaviour due to feelings of hopelessness when seeing other people around them dumping their waste into nature.

The feelings of hopelessness have been associated with the lack of EB by previous research (Pirrie et al., 2006), which found that adolescents were hard to be engaged in the Eco Schools programme and to be motivated by it. They suggested that adolescents understand better the environment and feel

hopeless in front of complex environmental issues. Moreover, their involvement decision in the programme is affected by unmotivated peer pressure. Olsson et al. (2015) found a strong correlation between students' self-efficacy and EB. Overall, students had low to moderate EB, as well as self-efficacy, i.e., students did not believe that their actions have an impact. Students' general low self-efficacy was suspected to be the reason why the EB results were low. Their findings established that in-school experiences and students' active role in environmental issues in school were the main sources of self-efficacy, and self-efficacy had a positive effect on students' EB. Students with higher self-efficacy had also higher scores in EB. The empirical findings of this thesis also showed that active participation in the programme has a positive impact on EB. There was a significant difference in EB between eco-committee members (who are the most actively involved in the Eco Schools programme activities) and the rest of the students in Eco Schools. Regression analysis showed that eco-committee membership predicted higher EB scores. Boeve-de Pauw and van Petegem (2017) found similar results regarding student leadership and increased students' environmental motivation.

The final component of the TPB theory that must be discussed when exploring reasons why the programme is not effective in affecting the students' EB is the concept of "social norms". Besides favourable attitudes and behavioural control, people also need social support to perform and to overcome possible obstacles for pro-environmental behaviours. Based on the results of Martin (2017), good family and community engagement seemed to bring about good programme results. Her study found that the Eco Schools programme had positive effects on pupils' and communities' attitudes towards the environment and natural resources, and their habits of managing them had improved. The aspect of social influence was also brought up by Boeve-de Pauw and van Petegem (2017) in their study, concluding that external social pressure was needed in order for students to engage in pro-environmental behaviours.

6.2 Limitations

In order to properly interpret the results of this research, its limitations should be taken into account. First, there is a possibility of a response bias that may occur when EA and EB are measured through self-reported values. A possibility of a desirability bias exists, i.e., the respondents over-report their EA and EB due to

social desirability (White and Raitzer, 2017, p. 361). However, this limitation must be accepted because acquiring observational data was not feasible within the scope of the present thesis. Nevertheless, a homogeneous effect of social desirability between the analysed groups can be assumed.

Another factor to be considered in the research design is the utilisation of enumerators in the data collection. When using enumerators, the researcher gives away a degree of control over the research. Enumerators could have been an asset and/or a threat to the research. On one hand, if the enumerators have an impact on the research subjects' answers in one way or another, e.g., diverting from the questionnaire and changing the meaning of questionnaire items, they affect the authenticity of the data. On the other hand, they were able to explain the questionnaire items to the students in the local language and possibly get more accurate responses. To make the most out of the enumerators and eliminate errors in the data, only local enumerators were recruited, and they were sufficiently trained and rewarded for the work. Moreover, despite the questionnaire validation by the local partner KOEE and the Eco Schools programme developer FEE, the CFA revealed that there is a possibility that the items in the survey instrument did not measure the latent factors EA and EB in a fully representative manner.

Finally, when interpreting the empirical results, one must be conscious of the limitations in the data that might cause bias in the results. First, the sample was not random, therefore, the findings cannot be generalised. Second, the EA data distribution was not equal between the Eco School and non-Eco School students, thus violating the Mann-Whitney U-test assumption of similar data distribution between independent treatment and comparison groups (Roni et al., 2019, p. 67). Third, regression results may be biased because the treatment and comparison groups were not statistically equivalent. Finally, PSM results were drawn from a low number of matches, and the data was not perfectly balanced. Moreover, unobservable characteristics, such as family influence, remained uncounted for in this study and may create a bias (Roni et al., 2019, p. 19). Due to these limitations, it was decided that different data analysis methods should be used to support each other. The empirical findings from each analysis are in line with each other, as well as with the theoretical framework of the thesis, supporting the reliability of the findings.

6.3 Implications of the Findings and Policy Recommendations

Inducing pro-environmental behaviours in learners is a complex issue. The results of the present thesis show that even though EA predict EB, positive EA alone does not translate into EB. Nevertheless, since the Eco Schools programme has a positive effect on students' EA, it is recommended based on the findings of this thesis to expand the programme to more schools.

The Eco Schools methodology builds upon a whole school approach, aiming at involving the entire school and the surrounding community into the programme activities and incorporating the ESD into the whole curriculum. The whole school approach also includes the development of the school environment to enable a sustainable lifestyle and learning ESD by doing. Students are encouraged to implement sustainability projects, which would support their active learning (Gouch et al., 2020, p. 2). The approach can be applied to the TPB theory, and it is supported by it since all the components found in the TPB are covered in the approach. Therefore, the programme should succeed in generating pro-environmental behaviours in the students. However, based on the empirical results of this thesis, the whole school approach model does not seem to work in terms of EB. Therefore, the programme should try to enforce the whole school approach, for example, by paying attention to the other components in the TPB theory underlying behaviour.

To target students' perceived and behavioural control over EB, the programme could focus on teaching practical skills and how to apply theoretical environmental knowledge in their daily lives. Moreover, the existence of available resources and facilities for students to practice pro-environmental behaviours at school should be evaluated and improved if needed.

The programme should also increase student participation in its activities to fight against the possible feelings of the so-called environmental hopelessness among the students. Perhaps the presence of Eco Schools content in every study subject could be assessed and enforced. Group tasks and school projects should relate to environmental issues regardless of the subject. In this way, not only eco-committee members, but all the students in the schools would be more actively involved in the programme activities. By being involved in

environmental projects, the students would gain practical knowledge and confidence supporting the realisation of pro-environmental behaviour.

More effort could be put also towards improving the schools' social culture related to pro-environmental behaviour. The environmental school projects could also help in this regard. When students engage in environmental projects, they develop a sense of ownership over them and would most likely exert pressure on their peers to respect their work. Together with student engagement and continuous support by teachers and school personnel, the schools could develop social norms and school culture supporting EB.

But not only students' social surroundings at school, but also out of school should be encouraging for pro-environmental behaviour. Perhaps the programme could place more effort on parental/home inclusion in the programme. As previous research in East Africa implies (Martin, 2017) active community engagement in Eco Schools' micro-projects had improved EB at school and in the communities. This is an especially interesting suggestion to think about since these results were seen in the same African region and cultural setting as where Eco Schools Kenya operates.

Finally, it was found that sports had a positive impact on EB. Perhaps the programme could explore ways to engage students in sports activities or otherwise encourage students to participate in sports and spend time outdoors. Maybe the programme could establish safe spaces and sports facilities for students and community members to play sports. Physical activity would also support students' health, subsequently contributing towards SDG 3, "Good health and well-being". An important issue to note when making adjustments to the programme, however, is to allocate sufficient resources for monitoring and evaluation of the results of the adjustments.

The Eco Schools are not responsible alone to fight the climate crisis. The empirical findings of this thesis showed that the schools following the regular ESD curricula fall behind the schools with a special focus on environmental education in terms of developing positive EA among students. Therefore, ESD policy should be strengthened and enforced. The Government of Kenya should

take measures to support the implementation of the ESD policy in every school in the country.

The enabling conditions for EB should be realised also outside of the school premises so that the students would have the possibility to practice environmentally sound behaviours in and outside of school. Otherwise the impact of ESD will not reach beyond the school campus. For example, the public waste management should be improved to support recycling. Public awareness-raising in line with the GESIP and the ESD policies could also be initiated to remind the students and their families about their environmental responsibilities and why it is important to practice EB, as well as to inform them about the available means of EB.

6.4 Future Research

To support the findings of this thesis, qualitative research should be carried out to further explain how students perceive and describe their EA and EB. A study with more focus on identifying the factors hindering students' EB. Moreover, the current state of the whole school approach in Eco Schools should be assessed. Based on the findings of this thesis, further research could focus on detecting the programme's effects on the other concepts included in the TPB theory (i.e., subjective norm and behavioural control) that contribute to behaviour.

Moreover, having a larger sample size, more balanced data in terms of students' observable characteristics, a wider sample of schools, another data collection instrument, and assessing other explanatory variables for EA and EB, as well as different age and social groups and geographical locations, could add value for the future programme evaluation. Furthermore, studies that account for other dimensions of the topic, such as guardians' EA and EB and how they influence the students' EA and EB need to be undertaken. Since the parents are recognised in the Eco Schools methodology, their inclusion in the programme should be measured in further research.

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Annex A

Environmental attitudes and behaviour survey

Interviewer's checklist

Read carefully before the interview.

- Explain the main aim of your survey by reading the introductory text.
- Always be polite and don't insist *(the interviewee has the right to not answer to some questions).*
- Be aware of your body language and your appearance.
- Read all questions clearly and note the answers.
- Fill out the questionnaire based on the interviewee's answers. Make sure you tick the correct box *(only one tick per scale)*. If you are not sure, confirm from the interviewee whether you understood/heard correctly. Do not hand out of the questionnaire to the interviewee at any point.
- Make sure there is no missing data *(except if the interviewee has declined to answer some question)*.
- Only one answer (tick) per question.
- Adhere to the COVID-19 regulations: wear a mask throughout the interview and the whole stay at the school, wash your hands frequently, etc.

Name of the Interviewer _____

Place of the Interview _____

(Date and time were recorded automatically by SurveyMonkey)

Introduction:

Hello, my name is _____, my colleagues and I are conducting research about students' environmental attitudes and behaviour in Nairobi. You were randomly selected to participate in the survey, so I would like to interview you. I will not ask your name for the survey. The interview takes about 10 minutes. Participation is voluntary. You don't have to answer any question you don't feel comfortable with, and you can stop the interview at any point without any negative consequences. Would you like to participate?

NO → Ok, that's not a problem. Thank you for your time.

YES → Thank you. If you are ready, let's start.

<table>
<tr><td></td><td>I will start by asking some basic questions about you and your family.</td><td></td></tr>
<tr><td>1</td><td>(In case of an Eco School): Are you a member of an eco-committee?</td><td>Yes ___ No ___</td></tr>
<tr><td>2</td><td>How old are you?</td><td></td></tr>
<tr><td>3</td><td>Gender</td><td>Female__ Male__ Other __</td></tr>
<tr><td>4</td><td>What is your Nationality?</td><td></td></tr>
<tr><td>5</td><td>How many days a week do you attend school?</td><td>_____</td></tr>
<tr><td>6</td><td colspan="2">What are your hobbies? (What do you do on your free time?)</td></tr>
<tr><td>7</td><td colspan="2">Who do you live with? How old are they? What are their occupations? What are their highest level of education?
<table>
<tr><th>No.</th><th>Relation to you
(e.g., mother, father, sister, cousin, uncle etc.)</th><th>Age</th><th>Occupation
e.g., self-employed/student/doctor/teacher/etc., or I don’t know)</th><th>Highest level of Education
1. Elementary/primary school
2. High school
3. Vocational training
4. Diploma
5. Undergraduate school (university 1st degree)
6. Post-graduate school (master’s, PhD)
7. I don’t know</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td></td><td>Next you will hear a series of statements about your opinions. Please assess how well the statement describes you and how much do you disagree or agree with the statement on a scale from 1 to 6. Number 1 stance for “strongly disagree” and number 6 stance for “strongly agree”.</td><td>Strongly disagree (1) Strongly agree (6)</td></tr>
<tr><td>8</td><td>I like to spend time in the nature (e.g., in the forest, mountains or fields).</td><td>1 2 3 4 5 6</td></tr>
<tr><td>9</td><td>Factories should be required to pollute less, even if it means that things would cost more money.</td><td>1 2 3 4 5 6</td></tr>
<tr><td>10</td><td>I would like to support an environmental organisation by volunteering or donating money.</td><td>1 2 3 4 5 6</td></tr>
<tr><td>11</td><td>People’s wellbeing is more important than the wellbeing of plants and animals.</td><td>1 2 3 4 5 6</td></tr>
<tr><td>12</td><td>If people do not change their environmental habits, we will soon experience a major natural disaster.</td><td>1 2 3 4 5 6</td></tr>
<tr><td>13</td><td>I believe that my own actions have consequences for the environment.</td><td>1 2 3 4 5 6</td></tr>
<tr><td>14</td><td>People have every right to change and manipulate nature to serve human needs.</td><td>1 2 3 4 5 6</td></tr>
<tr><td>15</td><td>Turning forest over to farmland for cultivation should be stopped.</td><td>1 2 3 4 5 6</td></tr>
</table>

16	Cutting down trees for charcoal and raw materials for industry without planting new ones is wrong and should be stopped.	1 2 3 4 5 6
17	All wild animals should be protected.	1 2 3 4 5 6
18	I would choose to move by a car or pikipiki even if public transport would be comfortable and safe.	1 2 3 4 5 6
	Next you will hear a series of statements about your behaviour. Please assess how well the statement describes you and how much do you disagree or agree with the statement on a scale from 1 to 6. Number 1 stance for "strongly disagree" and number 6 stance for "strongly agree".	Strongly disagree (1) Strongly agree (6)
19	I spend my free time outdoors *(e.g., hiking, walking in the forest, camping, etc.).*	1 2 3 4 5 6
20	I use water as little as possible *(e.g., I collect rainwater and use it at home, I take quick showers, I turn off a dripping/flowing tap if no one is using it)*	1 2 3 4 5 6
21	If I have a piece of paper/juice box/food wrapping/etc. in my hand, I carry it to a waste bin rather than throw it to the ground.	1 2 3 4 5 6
22	I utilise old paper / scrap paper for notes, etc.	1 2 3 4 5 6
23	I use a reusable water bottle.	1 2 3 4 5 6
24	I try to look ways to reuse things rather than throwing them away.	1 2 3 4 5 6
25	I conserve electricity *(e.g., I switch off the lights when leaving the room empty, I switch off the TV if no one is watching it, I turn off electrical equipment if no one is using them)*	1 2 3 4 5 6
26	If I can choose, I eat vegetarian food *(non-meat food)* over meat food.	1 2 3 4 5 6
27	I prefer to buy goods *(such as clothes, furniture, appliances)* second hand rather than buying them new.	1 2 3 4 5 6
28	I conserve fuel by walking, cycling, or travelling by bus over a private car.	1 2 3 4 5 6
29	I pay attention to the chemicals used in products and choose the most natural ones *(e.g., personal hygiene products, make-up and cleaning products).*	1 2 3 4 5 6
30	I am passionate about seeking information about environmental problems *(e.g., climate change, biodiversity loss, overgrazing and deforestation, or increasing water scarcity).*	1 2 3 4 5 6
31	I encourage other people *(e.g., family and friends)* to live in an environmentally friendly way *(e.g., to separate waste, to buy items second-hand, to conserve energy, or to use public transportation)*	1 2 3 4 5 6
32	I engage voluntarily with an environmental organisation, or participate in community clean-ups or volunteer work etc.	1 2 3 4 5 6
	In the last two questions, I ask you to evaluate your behaviour at school and at home separately. (NOTE FOR INTERVIEWER: If they don't have facilities to perform a behaviour, then the response will be translated to 1.)	
33	I put my food waste into a compost. At school:	1 2 3 4 5 6

	At home:	1 2 3 4 5 6
34	I separate wastepaper, bottles, plastic, food, and other waste each in different recycling (waste) bins. At school: At home:	 1 2 3 4 5 6 1 2 3 4 5 6

Annex B

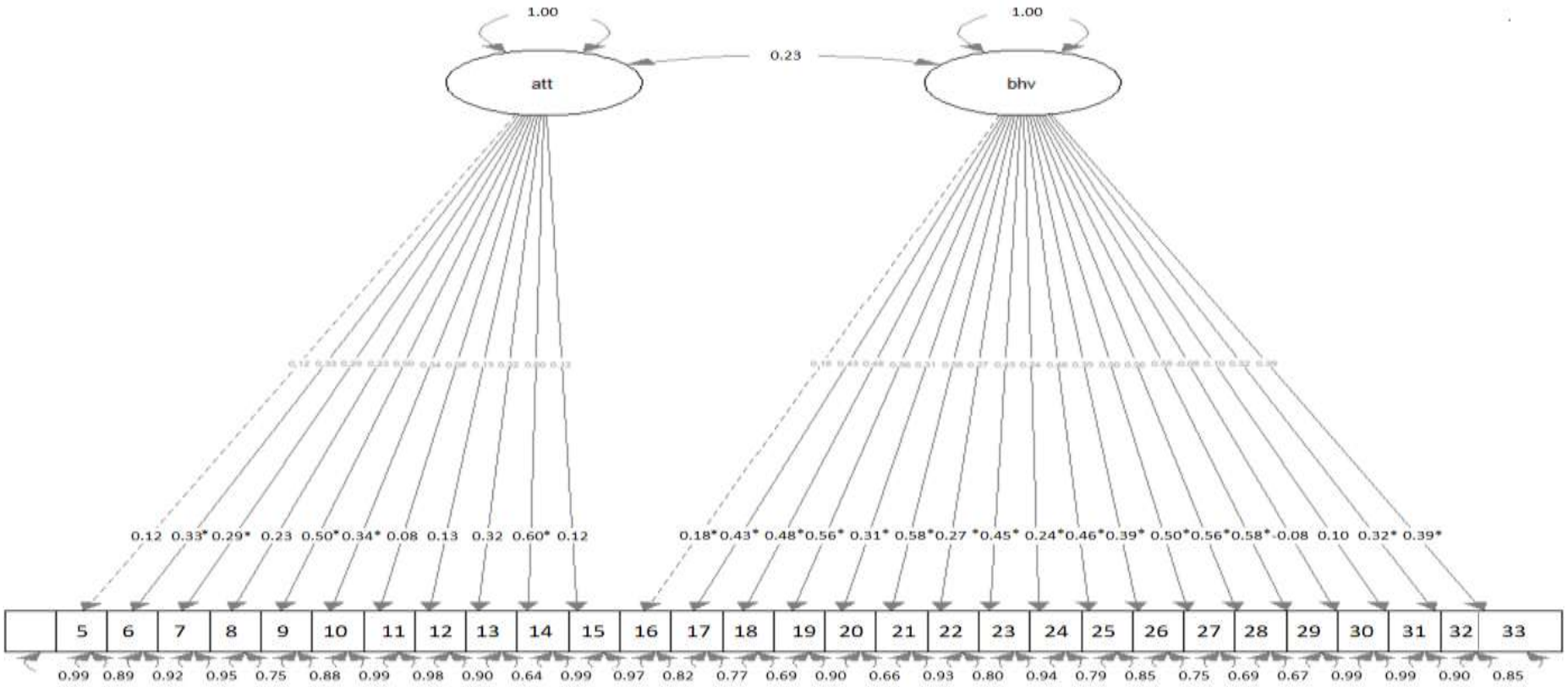
Confirmatory Factor Analysis

Table 14: CFA fit measures

Fit measures of the CFA model	
Chi squared	0.000
Comparative Fit Index (CFI)	0.604
Tucker-Lewis Index (TLI)	0.573
Standardised Root mean Square Residual (SRMR)	0.085
Root Mean Square Error of Approximation (RMSEA)	0.056

Note: Recommended values for good model fit: Chi squared (> 0.05); CFI (≥ .95); TLI (≥ .95); SRMR (≤ .08); and RMSEA (≤ .06) (Brown, 2013, p. 156).

Figure 12: Path diagram of the two-factor model



*Note: The model is a correlated two factor solution with variance standardization method, in which the two latent factors EA (att) and EB (bhv) correlate with each other (0.23) and their variances are fixed to 1.00. Questionnaire items (rectangles) 5 to 15 load to EA, and items 16 to 33 load to EB. Standardised factor loadings and their significance are indicated with lines between the latent factors and the questionnaire items. Significance level of the factor loading = *p < .05. All the questionnaire items can be seen in their full format in Annex A.*

Annex C

Test for heteroscedasticity

Table 15: Breusch-Pagan test for heteroscedasticity

Breusch-Pagan test		
Data	Environmental Attitude	Environmental Behaviour
BP	10.492	10.246
df	11	12
p-value	0.4867	0.5943

Note: To test for heteroscedasticity, a Breusch-Pagan test was run for EA and EB data. The test showed a p-value greater than 0.05, thus, the data was homoscedastic and met the assumption of homoscedasticity.

Annex D

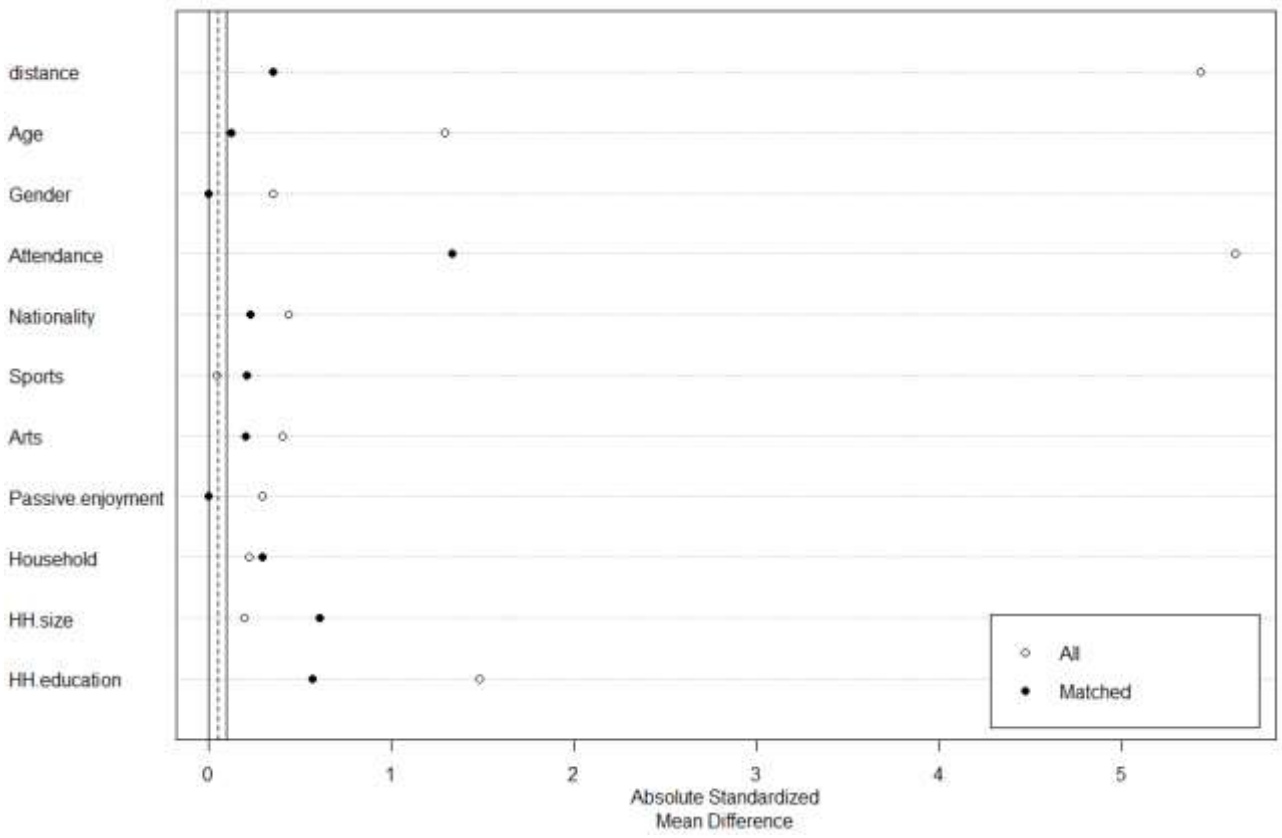
Propensity Score Matching

Table 16: Covariate balance assessment with Standardised Mean Differences (SMD) before and after matching

	Unmatched			Matched		
	Treatment	Control	SMD	Treatment	Control	SMD
Age (mean)	17.159	18.192	-1.291	18.300	18.200	0.351
Gender	0.670	0.506	0.349	0.700	0.700	0.000
Nationality	0.250	0.060	0.438	0.300	0.200	0.230
Attendance	4.977	5.819	-5.617	4.800	5.000	-1.334
Sports	0.636	0.614	0.045	0.600	0.500	0.207
Arts	0.465	0.265	0.402	0.400	0.300	0.200
Entertainment	0.443	0.590	-0.296	0.500	0.500	0.000
Domestic work	0.136	0.060	0.221	0.000	0.1000	-0.291
HH. size	3.284	3.024	0.198	4.200	3.400	0.609
HH.education	5.965	3.891	1.480	5.000	4.200	0.570

Note: The balance of the PSM model is assessed with the Standard Mean Deviation values. Values closer to 0 indicate a perfect balance. Values over 0.1 indicate imbalance. In the applied model, covariates "gender" and "entertainment" reached a balance with a value 0.000.

Figure 13: Covariate balance plot based on Standardised Mean Differences (SMD)



Note: The plot visualises the balance before (white dots) and after (black dots) matching. Area between two solid lines mark the area of SMD 0 and 0.1, which is the accepted range of values marking a good balance. In the applied model, covariates "gender" and "entertainment" reached a balance with a value 0.000.