Evaluating Environmental Education in Namibia

A case study of the Namib Desert Environmental Education Trust (NaDEET)

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Master's thesis

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Acknowledgements

In this study, many people supported me. At this point I would like to say thank you to all of them.

First of all I would like to thank my supervisors Dr.-Ing. Stefan Rüter and Dipl.-Ing. Frauke Lehrke for their informed advices. Also, I want to express my special gratitude to the director of NaDEET, Viktoria Keding, and NaDEET's Development Associate, Manuela Schmid, who made my stay in NaDEET possible. They made a major contribution to the organizational part of the implementation of the surveys. Furthermore, a big thank you goes to the staff members of NaDEET, Rosemarie Pauly, Martha Kambidhi, Elizabeth Lukas and Vicky Endjala, who supported me during the interviews. They interrupted their lesson with the pupils, so that I could carry out my survey with the children. In addition, they gave me a comprehensive insight into the environmental education work of NaDEET.

The cooperation of the three schools was not granted. Therefore, I would like to thank the teachers of the WJD Cloete JSS, the Windhoek International School and the N Mutschuana PS who supported the implementation of my survey in their schools. In particular, I want to mention Mr. Riegardt Smit, who enabled the survey of the pupils of the Windhoek International School.

Of course, my special gratitude goes to all the pupils who participated in my survey.

Finally, I would like to thank all my friends, who proof-read my report.

Abstract

This study deals with the evaluation of the success of environmental education in Namibia. Therefore a case study of the environmental education centre Namib Desert Environmental Education Trust (NaDEET) was carried out. The reason for this evaluation is that environmental education is becoming more and more important due to increasing environmental problems worldwide. Particularly in developing countries with harsh climatic conditions such as Namibia the impact of environmental problems leads to a reduction in quality of life of the people. As theoretical foundations for this study, a literature research on environmental problems and their causes and effects in Namibia was conducted. Water and wood scarcity were considered in more detail, since the majority of the population will be affected by these environmental problems first. Environmental education can support people to learn about these issues and help to ensure that the people participate actively in environmental protection.

In order to evaluate the strengths, weaknesses and potentials of NaDEET's environmental education work, first national and international objectives and requirements of environmental education and education for sustainable development were gathered, since no specific requirements exist in Namibia. The empirical investigation of this study is based on the objectives to raise awareness of the environment and to impart knowledge and skills that enable to achieve a participation in environmental protection.

Referring to the environmental problems of water and wood scarcity and to the great importance for Namibia to improve these, the focus of this work is to evaluate the implementation of the objectives mentioned above in the field of water and energy. NaDEET offers different programmes that deal with these issues. Since the target group of this study are children, the primary school programme and its success was examined. For this purpose, both a participant observation and a standardized survey with three different school groups were carried out. Implementing these empirical methods, it could be determined that NaDEET's programme shows success in terms of both raising awareness of the children towards the environment and imparting environmentally relevant knowledge. Moreover, NaDEET is successful in providing the children with skills which promote a sustainable lifestyle. However, it can be concluded that these results must be seen more differentiated, since the influence of NaDEET on the children depends on their living conditions. It was discovered that children from poor families apply the skills they have learned in NaDEET at home. However, from the survey also results that these children have not understood why it is important to use the resources which are available to them thriftily. The opposite was the case regarding children from prosperous families. For them, it was easy to acquire new knowledge about the environment due to their high level of education, but it was difficult for

them, to refer the sustainable life in NaDEET to their daily lives. In consequence, these children have not applied the learned skills at home. This shows that the success of NaDEET can be very different. In order to achieve success in all intents and purposes (awareness, knowledge, skills and participation) regarding a school group, the primary school programme should be individually adapted to the respective group.

In this study, recommendations for management have been developed that take into account the different living conditions and levels of education of the children in order to help enlarging NaDEET's success.

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All figures and tables, where no reference is specified, were created by the author herself. The photographs of the children and the activities at NaDEET were taken in April and May 2014.

List of acronyms

DEA	Unit of the Directorate of Environmental Affairs
EE	Environmental Education
EEIS	Environmental Education and Information Service
ESD	Education for Sustainable Development
MET	Ministry for Environment and Tourism
NaDEET	Namib Desert Environmental Education Trust
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WIS	Windhoek International School
WWF	World Wide Fund For Nature

1. Introduction

First, a short introduction is given, which includes the background of this study and a brief overview of the conceptual framework. The topics which are addressed in the background are discussed in more detail in the following chapters.

1.1. Background

The use of natural resources and the competition for scarce resources such as fresh water, land and raw materials increases worldwide (Umwelt Bundesamt 2013: www). This leads to global environmental problems such as the climate change. These environmental problems in turn threaten the availability of natural resources such as fresh drinking water and unpolluted air on which human beings depend. However, not all countries in the world are affected by environmental problems to the same extent. Africa is one of the continents which are most vulnerable to climate change due to multiple stresses and a low adaptive capacity (IPCC 2007: 27). This also applies to Namibia as a country in southern Africa.

In recent years, it became more and more apparent that environmental problems significantly increase in Namibia. These environmental problems include, for instance, the loss of biodiversity, air and water pollution, deforestation, desertification, urbanization, rapid population growth, waste and climate change (Government of the Republic of Namibia 2004: 30; 137; 164; 170). However, not all of these problems have the same impact on the quality of life of the Namibian population. The country is particularly vulnerable to environmental problems which lead to changes concerning their availability of water and biomass-fuels like wood as an energy source (Association of German Development NGOs 2006: 10). The reason for this is, that Namibia, as a very arid country, only has little water and wood resources (Government of the Republic of Namibia 2004: 25). In addition to the harsh climate, a further problem is that the major part of the population is very vulnerable to environmental changes because of their living conditions. A majority of the rural population lives in poverty (Central Bureau of Statistics, National Planning Commission 2008: 10). These people depend on the availability of cheap water and wood in their daily lives. Biomass-fuels such as wood are the main energy sources for heating and cooking in rural areas (Government of the Republic of Namibia 2004: 84). Thus due to financial reasons, it is difficult for the people to use other energy sources (Association of German Development NGOs 2006: 10).
Often the population is not informed that water and wood will become increasingly scarce, due to the consequences of increasing environmental problems (Government of the Republic

of Namibia 2004: 203). Therefore, people might not realise that their quality of life will be further affected by these decreasing resources.

Hence, it is important and necessary to inform the people of Namibia about threats that could affect their quality of life in the future. For that reason, environmental education (EE) and education for sustainable development (ESD) can be a solution. Both EE and ESD deal with current environmental problems mentioned above. However, the focus of EE is on ecological aspects, also considering sustainability. ESD also takes for example social aspects into account (Stiftung Umweltbildung Schweiz 2012: 13).

For sustainable effects, EE and ESD should begin at a childhood level, as it should be a lifelong learning process. This is important because children often represent the largest part of the population in developing countries. The results of the 2011 population census indicate that about 36.5% of the population in Namibia is less than 15 years old (Namibia Statistics Agency 2011: 28). These children should take the responsibility for the environment in the future (Agenda 21 1992: 283). Therefore it is important to sensitize children as early as possible for their environment and teach them a sustainable lifestyle.

In Namibia there are both governmental and non-governmental organisations (NGOs) who work in EE and ESD (Republic of Namibia, Ministry of Environment & Tourism 2011: www). One of the NGOs called Namib Desert Environmental Education Trust (NaDEET) deals inter alia with the sustainable use of water and energy. NaDEET's mission is to protect Namibia's environment by educating people about how to live a sustainable lifestyle. The trust especially addresses children for whom they have a well-established primary school programme (NaDEET n.y.e: www).

The Government of the Republic of Namibia control the implementation of the environmental education programmes of NGOs such as NaDEET. To verify the success of these organisations, an evaluation based on norms, standards or indicators of quality is helpful (Republic of Namibia, Ministry of Environment & Tourism 2011: www). However the government has not developed such an evaluation yet, consequently, no evaluations of environmental centres have been carried out.

As a result to the lack of an evaluation on environmental education centres in Namibia, this study aims at an exemplary evaluation of the primary school programme of the environmental education centre NaDEET. The evaluation considers strengths, weaknesses and potentials of the programme and takes into account different objectives and requirements of EE and ESD. It especially deals with the contribution NaDEET does to make children aware of the impacts of environmental problems on the availability of water and energy sources.

1.2. Conceptual framework

The structure of this study is represented by the schematic diagram below (Fig. 1). In the following, the individual processing steps of this study are explained briefly.

First, prior to the empirical investigation, theoretical foundations were compiled by a literature research. These theoretical foundations reinforce the topic about environmental problems in Namibia which was addressed only briefly in the background (cf. chapter 1.1). In this way, the impacts of environmental problems on the Namibian population and the need for EE and ESD can be better understood. In **chapter 2.1** the most important problems which affect the availability of water and wood are described.
In addition a literature research about requirements for environmental education and ESD took place. In **chapter 2.2** different national and international requirements are mentioned. Some of the requirements helped to develop criteria to evaluate the strengths, weaknesses and potentials of NaDEET's primary school programme.
Information about NaDEET is described in **chapter 3**. The information includes a description of the surroundings (demographics, access to water and energy), the aim and philosophy of the trust, the primary school programme and past researches about NaDEET. The information about the primary school programme is divided into the topics water and energy (cf. **chapter 3.3**).
The gathered information about environmental problems, requirements for EE and ESD and about NaDEET helped to create different research questions to substantiate the objective of the study. The research questions are mentioned in **chapter 4**.
In order to answer the research questions, a set of approaches was applied, which is found in detail in **chapter 5**. The approaches include a participant observation and a standardized survey. The participant observation enables an insight into the living conditions and the culture background of the children (cf. **chapter 5.1**). The focus of the observation is on the behaviour of the pupils and the staff during the primary school programme. The standardized survey in form of a longitudinal research enables to compare the opinion about NaDEET and the behaviour of the pupils before and after their visit to NaDEET (cf. **chapter 5.2**).
Both the participant observation and the standardized survey were used to investigate the strengths, weaknesses and potentials of NaDEET's primary school programme. The results of these approaches are described in **chapter 6.1** and **6.2**.
The strengths, weaknesses and potentials are discussed in **chapter 7**. Possible weaknesses can lead to recommendations for management which are explained in **chapter 8**.

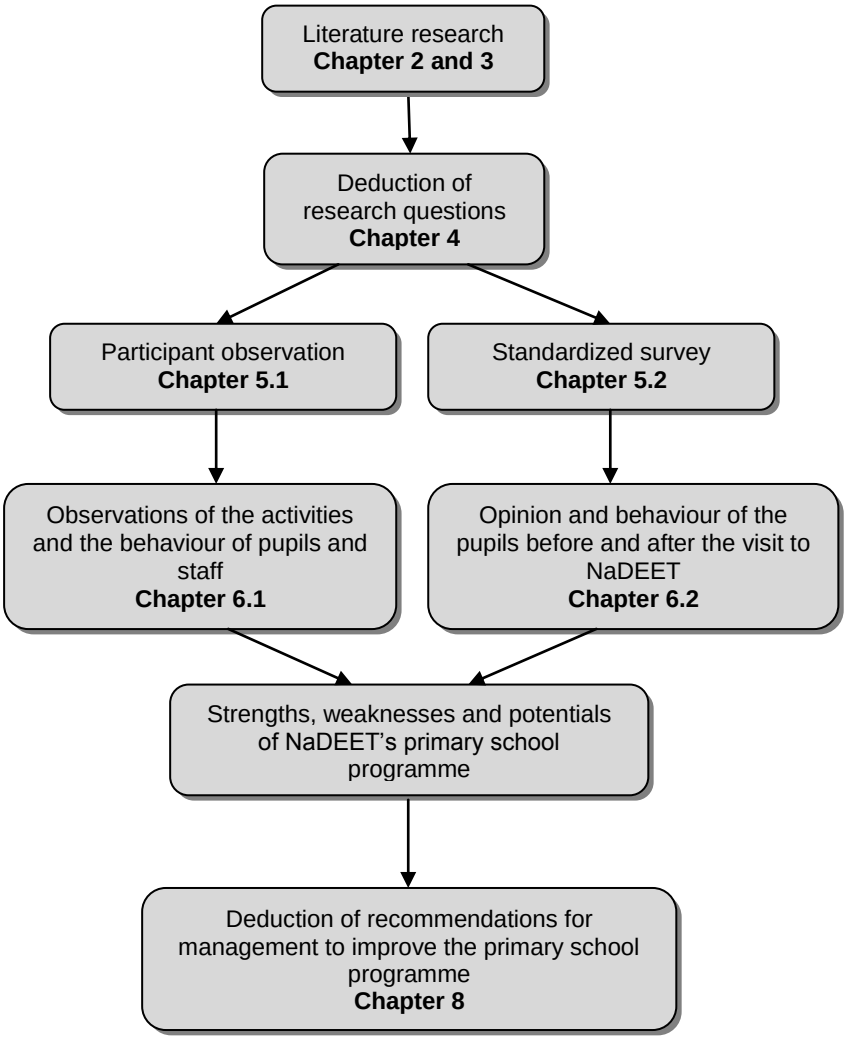


Fig. 1: Conceptual Framework Diagram

2. Need for environmental education in Namibia

The need for environmental education in Namibia results from different environmental problems which affect the quality of life of the people. These problems include water and wood scarcity. Some information about their causes and impacts is given in the following sub-chapter. Furthermore, national and international objectives and requirements of EE and ESD are described in chapter 2.2., since they were used to evaluate NaDEET's environmental education work.

2.1. Environmental problems

Water Scarcity

As the driest country south of the Sahara Desert, Namibia mainly has to contend with the problem of water scarcity (BMZ 2014: www). The average rainfall is only 258 mm per year (UNEP 2008: 256). Rainfall is extremely variable in space and time. The annual rainfall varies from 50 mm in some areas in the Centre and South of the country to over 600 mm in some areas of Zambezi in the Northeast of the country (cf. fig. 2). In comparison, Germany has an average annual rainfall of 789 mm (Deutscher Wetterdienst 2013: 8).

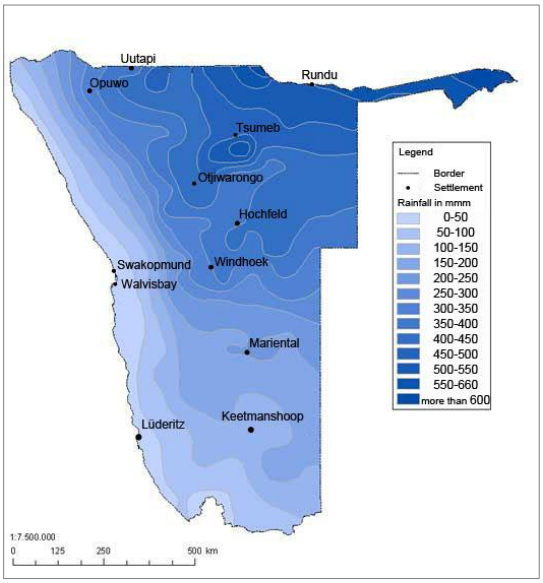


Fig. 2: Annual rainfall in Namibia (Deutsche Forschungsgemeinschaft Universität Köln 2011: www)

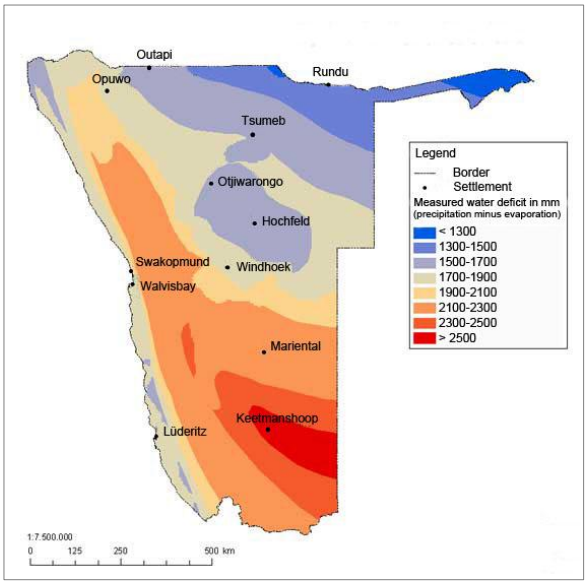


Fig. 3: Water deficit in Namibia (Deutsche Forschungsgemeinschaft Universität Köln 2011: www)

The only permanently flowing rivers (Kunene, Zambezi, Okavango and Orange) lie near to or are parts of the country's international boundaries in the North, North-East and the South (Government of the Republic of Namibia 2004: 42). So water scarcity has become a problem for all areas that are placed geographically far from the perennial water sources. This is especially the case in the central and southern parts of the country (cf. fig. 3). Therefore there is a high dependency on groundwater resources.

As a consequence, water is Namibia's most important natural resource. The lack of permanently available freshwater can be the most important limiting factor for development (Government of the Republic of Namibia 2004: 136). Namibia is predicted to suffer from complete water scarcity in 2020 because the availability of water will deteriorate due to increasing environmental problems (Ministry of Environment and Tourism 2010: 13; 17). In

particular, increasing temperatures, droughts and floods resulting from climate change will have a significant impact on the availability of water (ibid.: 13). There is the possibility that Namibia's climate will become hotter and drier. The average temperatures will increase to 2065 by one to four degrees Celsius due to climate change (ALTHUSMANN & SIGLBAUER n.y.: 87). It is expected that the rainy season will be shorter and the dry period will be correspondingly longer. Furthermore, it can be assumed that more frequent and continuous periods of drought will arise. Due to the increase of drought, deserts, like the Namib Desert for instance, will probably spread (BÖSL 2010: 9, 18). Therefore, it can be assumed that desertification will be a crucial problem in Namibia.
While some areas will become hotter and harsher others might be affected by strong rainfalls. Over the last few years the most intensive flood events recorded in more than 40 years have been struck the northern regions of Namibia (Government of the Republic of Namibia 2004: 136). In 2009 for instance, many communities were severely affected by floods, in the northern central regions, Okavango Region and the Zambezi Region (ibid.: 21). The predicted impacts of climate change lead to an increasing frequency of such natural disasters (National Disaster Risk Management Committee 2011: 6).

Besides the impacts of climate change, Namibia's limited freshwater resources are threatened by increasing stress due to population growth, rapid urbanization and economic growth (Government of the Republic of Namibia 2004: 175). The Namibian government assumes that the water consumption will increase until 2030 especially in expanding urban areas which are located far from easily accessible water sources (ibid.: 136). Namibia's current rates of urbanization are high. The government of Namibia estimates that 75% of the country's population could possibly be living in towns and cities by 2030 because life in urban areas is perceived as easier and better (Government of the Republic of Namibia 2004: 170; Central Bureau of Statistics 2010: 29).
Other environmental issues that have a negative impact on water availability are pollution and wasting of water (Polytechnic of Namibia 2001: 2). As a very arid country, Namibia is not able to afford to let any of its available safe drinking water become unusable. In addition, the country is extremely vulnerable to the effects of water pollution because of its high dependency on groundwater resources (Ministry of Environment and Tourism 2002: 37). Once it has been contaminated, groundwater is almost impossible to purify (Government of the Republic of Namibia 2004: 137). Major causes for the water pollution are industry and the improper disposal of household waste (Polytechnic of Namibia 2001: 3). Furthermore, the pollution from pesticides, excessive fertilizers and other substances is predicted to increase until 2030 (Government of the Republic of Namibia 2004: 136). Through this pollution, the access to fresh water is becoming scarce and more expensive thus development options

become increasingly limited (ibid.: 137). It can be assumed that a large part of the population might not be able to afford fresh water in the next decades.

Wood scarcity

Another problem besides water scarcity is the shortage of wood. Climate-induced, there are only few woods in large parts of Namibia (Association of German Development NGOs 2006: 10). Furthermore, the availability of wood resources in some areas decreases due to a lack of alternative fuels (ibid.: 84). There is a high dependence on firewood and charcoal as energy sources in the country (BOKO et al. 2007: 442). Wood is used for heating and cooking in most rural areas and in some urban informal settlements (cf. fig. 4) (Government of the Republic of Namibia 2004: 84).

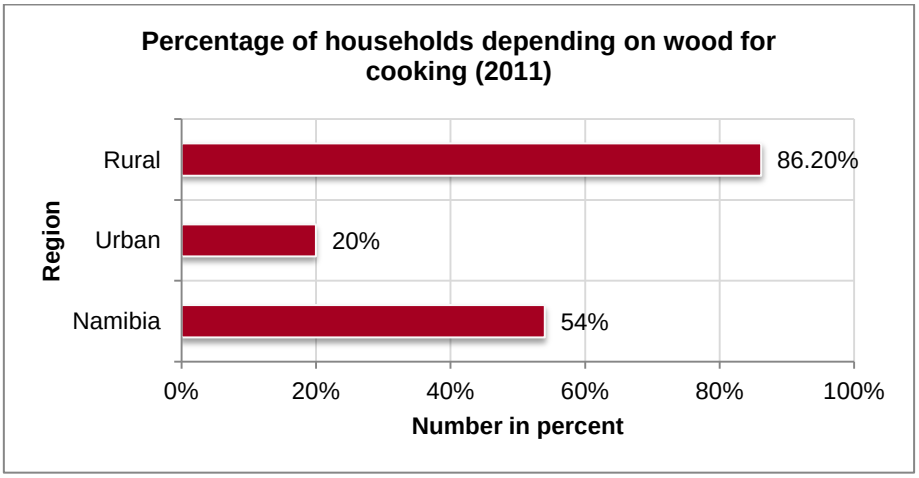


Fig. 4: Dependence on wood for cooking in Namibia (Namibia Statistic Agency 2011: 75)

Population growth and poverty have forced the Namibian population to settle on marginal land and degrade the environment through deforestation for firewood and fencing (Government of the Republic of Namibia 2004: 87). This problem will be exacerbated by the rapid population growth. The population of Namibia has grown steadily since 1921, rising from about one-quarter million persons in early 1921 through 1.8 million persons in early 2001 to 2.1 million in 2011 (National Planning Commission 2012: 2). With the population growth more and more wood will probably be needed. It is questionable if enough wood will be available in the future. So a reduction in the quality of life of the population can be assumed.

In addition, deforestation leads to further environmental problems, which also degrade the quality of human life. Further problems include e.g. soil erosion, change of the local water cycle, loss of biodiversity and increased rates of global warming (Government of the Republic of Namibia 2004: 147).

To reduce or prevent the problems, which are caused by deforestation, the search for alternative energy sources is becoming more important. However, it is questionable whether the poor people of the population can afford other energy sources such as solar energy. For this reason the Namibian government want to establish affordable technologies e.g. wood efficient stoves to reduce deforestation (ibid.: 150).

The provision of affordable technologies can be one possibility to prevent or reduce impacts of environmental problems. However, the population must be involved in the search for further solutions. Furthermore they must develop the ability to adapt to changes and take action themselves (Association of German Development NGOs 2006: 10). Adaptation might be a big challenge, especially for the poor people of Namibia. Environmental problems such as climate change will have serious consequences mainly for poor people, because they have no financial resources to adapt to threats of their livelihoods (ibid.). There is a need to mobilize and support these members of society to have the capacity to deal with climate change and other environmental problems (Ministry of Environment and Tourism 2010: 15). The Namibian government think that it is essential to increase awareness and knowledge about environmental problems (ibid.: 26). This is important to empower people to participate in the planning, development and implementation of solutions of environmental problems (ibid.: 26). Therefore EE and ESD can be helpful. One strategy of the government of the Republic of Namibia is to improve the quality of environmental education. In this way they want to ensure that all Namibians have access to natural resources and that these resources are sustainably and efficiently used to prevent environmental problems (Government of the Republic of Namibia 2004: 145).

2.2. Objectives and requirements for environmental education

The Ministry of Environment & Tourism (MET) is responsible for EE and ESD in Namibia. Within this ministry especially the Environmental Education and Information Service (EEIS) Unit of the Directorate of Environmental Affairs (DEA) coordinates the implementation of EE and environmental information. Through different programmes, projects and services EE should be provided for all Namibians. The objective of the EEIS is “to spread awareness, enhance knowledge and foster individual and collective participation and commitment” (Ministry of Environment & Tourism 2011: www). Furthermore it wants to “empower Namibians from all sectors to critically evaluate environmental information and options, to make informed decisions and to take actions that will contribute to the goal of environmental and economic sustainability” (ibid.: www). EEIS aims to achieve these goals through an action orientated EE. Consequently, environmental education centres were established to

provide a more practical and “hands-on” approach of environmental education. In this way, pupils, students and other visitors can learn something about the environment outside the traditional classroom structure (ibid.: www). Among others, the centres include Okajikona at Waterberg Plateau Park and Namutoni in Etosha National Park. In addition to these institutions there are also private and non-governmental environmental education centres in Namibia, such as Gobabeb Training and Research Centre, Cheetah Conservation Fund and the already mentioned NaDEET (cf. chapter 1.1).

The MET controls the implementation of the environmental education programmes of these non-governmental organisations. Therefore this ministry wants to develop quality indicators to regulate the development of future environmental education centres and to monitor and evaluate the operations and programmes of existing centres (ibid.: www).

There are not any indicators of quality in Namibia at the moment. But guidelines and indicators of quality for environmental education centres exist in other countries. Furthermore, there are international requirements and guidelines for EE and ESD. Some examples are described below. These examples were developed by the “Intergovernmental Conference on Environmental Education” of UNSECO and UNEP, the “World Wide Fund For Nature Germany” and the state Bavaria in Germany.

“Intergovernmental Conference on Environmental Education” of the UNESCO and UNEP

The “Intergovernmental Conference on Environmental Education” of UNESCO and UNEP took place in Tiflis in 1977. At this conference goals and guiding principles for EE were set. The orientation towards these goals and guiding principles helps towards successful environmental education programmes. The goals have been divided into different “categories of environmental education objectives” The categories are awareness, knowledge, attitudes, skills and participation (UNESCO & UNEP 1978: pp 26-27). These categories are described in more detail below and refer to the previously mentioned reference.

Awareness means to support people acquire consciousness of and sensitivity towards the environment in its totality, which also includes environmental problems.

The category **knowledge** includes helping people to acquire a basic understanding of the environment and its associated problems.

Attitudes mean to motivate people for actively participating in environmental improvement and protection. In this way they should get a set of values and feelings of the environment.

The category **skills** include supporting the people to get an opportunity to acquire competences for identifying and solving environmental problems.
At least, **participation** should be a possibility for people to be actively involved in finding solutions to environmental problems.

During the conference some guiding principles to achieve the mentioned objectives were developed. These guidelines include contents of teaching, which should be taught in environmental education centres. The following table lists some of the guiding principles which can be used for the work in environmental education centres (cf. tab. 1).

Tab. 1: Guiding principles of the Intergovernmental Conference on Environmental Education (Based on UNESCO & UNEP 1978: 27)

Guiding principles	Description
Consideration of the environment in its totality	Consider the environment in its totality - natural and built, technological and social (economic, political, technological, cultural-historical, moral, and aesthetic); emphasize the complexity of environmental problems.
Local, national, regional and international points of view	Examine major environmental issues from local, national, regional and international points of view so that pupils receive insights into environmental conditions in other geographical areas.
Focus on past, current and future environmental situations	Focus on current and potential environmental situations, while taking into account the historical perspective.
Include practical activities and first-hand experience	-
Improve the ability of the learners to work independently and think critically	Enable learners to have a role in planning their learning experiences and provide an opportunity for making decisions and accepting their consequences.
Draw attention to the causes of environmental problems	Help learners discover the symptoms and real causes of environmental problems.
Communication of environmental sensitivity knowledge and problem-solving skills	Relating to the learner's own community and circumstances.

In the following the mentioned objectives of UNESCO and UNEP are substantiated by the "World Wide Fund For Nature Germany".

"World Wide Fund For Nature Germany"

The environmental foundation "World Wide Fund For Nature (WWF) Germany" has established a plan for EE in protected areas in 1996. The concept intends to provide a unified view and basis for a reasoned approach for planning and the implementation of EE in

protected areas (Umweltstiftung WWF-Deutschland 1996: 8). The concept includes different objectives for EE which are similar to the objectives of UNESCO and UNEP mentioned above. The “WWF Germany” also divides its objectives into the categories awareness, knowledge, attitudes, skills and participation (ibid.: 72). However the categories are described in more detail. Furthermore, concrete possibilities to implement the objectives are mentioned. The following explanations refer to the “WWF-Germany” (Umweltstiftung WWF-Deutschland 1996: pp 73-84).

The first category **awareness** should serve to reduce the limits of perception of the environment to make new nature experiences possible. Children, youth and adults should perceive the nature as beautiful, likeable and mysterious. To reach this objective nature experience games, explorations, artistic examination of nature, hikes to experiences the nature and adventures camps can be used.

The second category **knowledge** should help to develop an ecological responsibility of the people. In this way the people should be able to realise and value the consequences of their own behaviour. For this purpose they should gain knowledge which they can use as an orientation to think critically about environmental problems. Therefore ecological responsibility implies specialist knowledge and the ability to think both ahead and critically. To achieve this objective, experiments, study trips, expert surveys, role plays, future workshops and exhibitions should take place.

The third category **attitude** deals with the appreciation and esteem of nature. A change of attitudes in terms of the environment can be done by adopting new opinions or changing old opinions. To persuade people it is necessary to be credible and give reasons for new opinions. To reach this objective discussions and role plays should be carried out.

The fourth and the fifth category **skills** and **participation** should serve to give an orientation for taking action and participate in decision-making processes. The people should be able to live sustainable in their households, jobs and during their free time. To achieve these objectives competitions, projects and examples can be used.

However, the WWF mentioned that no high hopes should be placed on the effects of taking action. Taking action can be difficult because of the complexity of environmental problems. Since the causes of environmental problems often lie in the past, it is difficult to understand the consequences in the present. Furthermore, the effects of taking action are often visible only in the future. Thus, the own success cannot be experienced directly. Another problem is that the situation of learning is differently to the situation of everyday life. In consequence it can be difficult for people to apply their new knowledge and learned examples for taking action in their daily life.

The next example for objectives and requirements for EE and ESD is the seal of quality “Umweltbildung.Bayern”. The state of Bavaria gives concrete details about the learning contents of EE and ESD. Furthermore, it describes key competences which are similar to the objectives of UNESCO & UNEP and “WWF Germany”.

Seal of Quality “Umweltbildung.Bayern”

The state of Bavaria tried to ensure high-quality EE, by establishing a seal of quality for EE and especially for ESD. The quality seal "Umweltbildung.Bayern" can be received by organisations, networks and self-employed EE practitioners (Bayerisches Staatsministerium für Umwelt- und Verbraucherschutz 2012: 3). It is the only seal of quality in Germany which honours a successful implementation of ESD. The aim is the transmission of values and competencies within the meaning of ESD to contribute to a sustainable society (ibid.: 5). The following explanations refer to the guidelines for applying for the quality seal "Umweltbildung.Bayern" (Bayerisches Staatsministerium für Umwelt- und Verbraucherschutz 2012: pp 2-14).

Different indicators of quality, e.g. recruitment (staff), educational opportunities, public relations and networking, were defined. Educational opportunities must include different dimensions of sustainability such as ecological, economic, social and cultural (cf. tab. 2). For the successful decoration with the quality seal “Umweltbildung.Bayern” it is necessary to include at least two of the dimensions in the ESD. The sub-points of the four dimensions cannot be clearly differentiated as some of them overlap.

Tab. 2: The different dimensions for education for sustainable development (Based on Bayerisches Staatsministerium für Umwelt- und Verbraucherschutz 2012: 11)

Ecological	**Economic**
• Sustainable use of resources • Time dimensions of the nature (ability of regeneration) • Biodiversity • Nature conservation • Ecological cycles • Renewable energies • Provision for future generations • Prevention of pollution • Waste, emissions	• Prudent economies • Material flow management • Environmental Management system • Sustainable and innovative technologies • Eco-Design • Environmental and social truth of the prices • Polluter pays principle • Regional and local marketing networks • Fair Trade • Question of guilt
Social	**Cultural**
• Promotion of human health • Equal rights to the use of natural resources • Equal rights to development • Human rights • Consideration of the interests of future generations • Democratization • Participation of all population groups in all areas of life • Living by working	• Ethical assurance • Environmental-friendly lifestyles • holistic perception of nature • local and cultural diversity of the ways to sustainable development • traditional knowledge • Dealing with time • Culture of dealing with things • Consumer awareness • Local public • International exchange

Besides the four dimensions, key competences should be communicated. For the successful decoration with the quality seal “Umweltbildung.Bayern” it is necessary to carry out at least three of ten key competences. Competences are, for example, developing **knowledge** which is liberal-minded and includes new perspectives, to look and think ahead, to **participate** in decision-making processes, to plan and act independently and to motivate oneself to **take action**.

Furthermore a precondition for the receipt of the quality seal is to use at least three participative methods which support to develop and discuss common goals and develop strategies for taking action. Participative methods can be future workshops, children’s parliament or experimental games. If all these conditions are met, an environmental educational institution can receive the seal. After three years, they have to apply for the seal of quality again.

The mentioned examples show that a lot objectives and requirements for EE and ESD already exist. In order to evaluate the work of environmental education centres in Namibia, these requirements could be used by the MET in general. In this study, they are used to evaluate NaDEET’s primary school programme.

3. Case study: Namib Desert Environmental Education Trust (NaDEET)

In the following sub-chapters NaDEET's surroundings, the objectives and philosophy of the environmental education centre and the primary school programme are described to get an idea of NaDEET.

3.1. Surroundings

NaDEET Centre

NaDEET is located in the Hardap Region, approximately 100 km south of Sesriem/Sossusvlei in a dune valley of the NamibRand Nature Reserve (cf. fig. 7).
The Centre consists of a main building including the classroom and the kitchen and of eight houses and bathrooms (cf. fig. 5 and 6). Furthermore there is a solar park and a solar deck. Six of the houses are for the pupils who usually visit NaDEET for five days and the other two houses are for teachers who accompany the pupils.

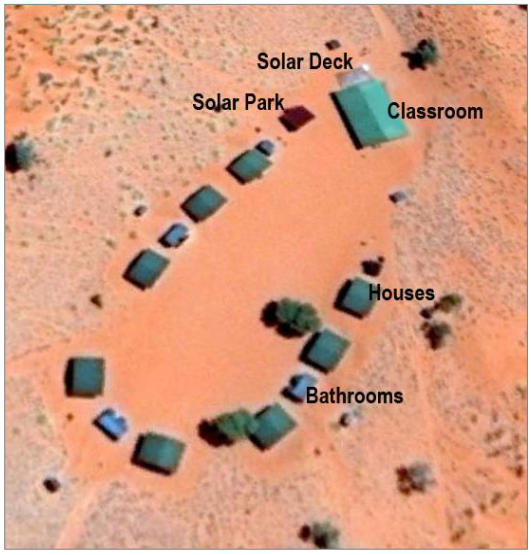


Fig. 5: Structure of NaDEET Centre (based on GOOGLE EARTH)

Fig. 6: NaDEET Centre

NamibRand Nature Reserve

The NamibRand Nature Reserve is the largest private nature reserve in southern Africa (NaDEET n.y. c: www). It is part of the Namib Desert, one of the oldest deserts in the world (ibid.). The reserve shares a 100 km border with the Namib-Naukluft National Park (with the Namib Sand Sea as a World Heritage Site) in the West and borders the Nubib Mountains in the East. It was established to help, protect and conserve the unique ecology and wildlife of the south-west Namib Desert (NamibRand Nature Reserve n.y.: www). Furthermore the aims of the NamibRand Nature Reserve are to conserve the environment for the benefit of future generation and to promote sustainable utilization (ibid.). Besides the owners of the reserve want to create a nature reserve with a healthy and functioning ecosystem without fences to facilitate seasonal migratory wildlife routes and to protect biodiversity (ibid.).
In this environment NaDEET carries out its EE and ESD.

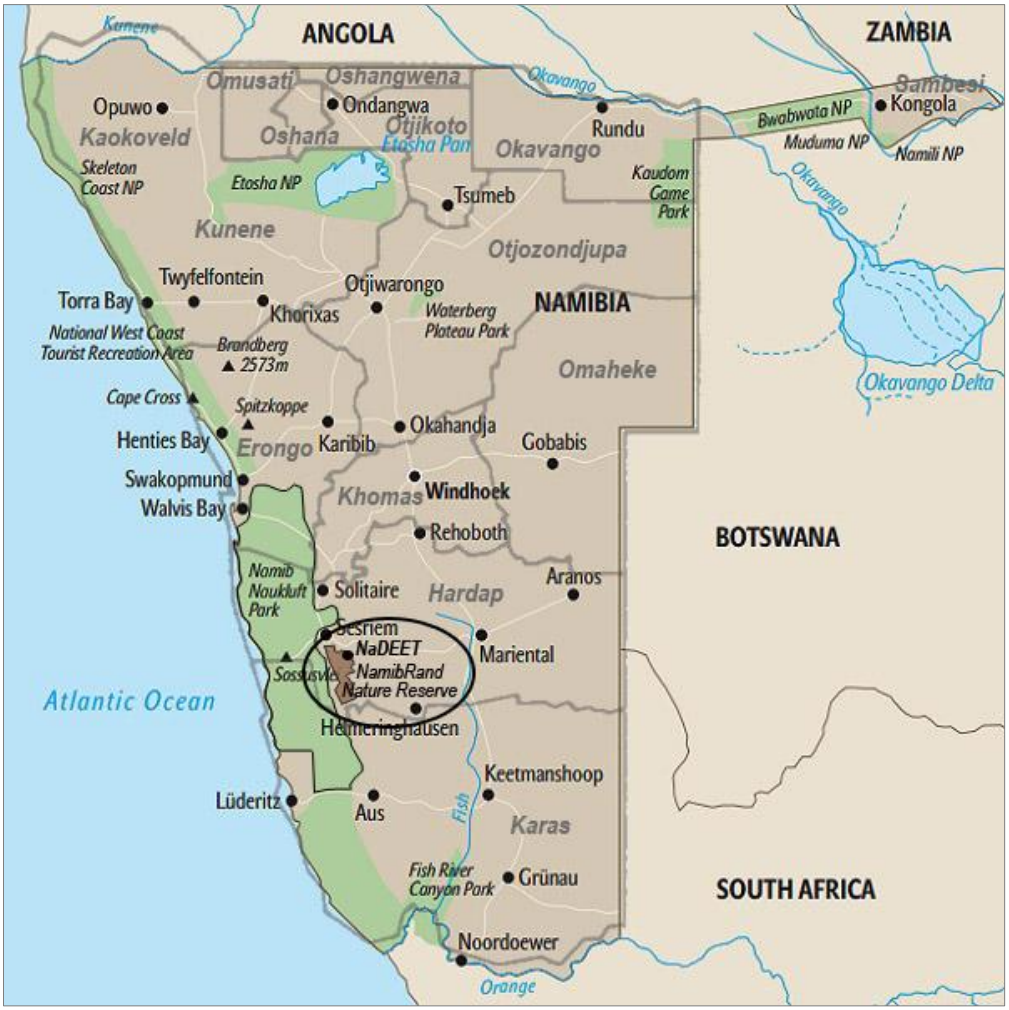


Fig. 7: Geographic location of NaDEET in Namibia, not to scale (based on Reisebüro Hildebrand AG n.y.: www)

Hardap Region - Demographics

The Hardap Region, where NaDEET is located, is home of many participants of NaDEET's programmes. It is the project area of the NaDEET's outreach programme "RUG for Sustainability" (**R**ietoog, **U**ibes and **G**ochas) for the period of three years (2014-1016) (cf. chapter 3.2).
The following numbers are from the Census 2011 and describe the Hardap Region. The census takes place every ten years (Central Bureau of Statistics 2010: 9). The whole results were announced at the end of March 2013. Thus it can be assumed that the numbers still apply today.

Hardap Region is with 79,507 inhabitants one of the least populated areas of Namibia. In comparison, the most populated regions in 2011 were Khomas (340,900 inhabitants) with the capital city Windhoek and the Ohangwena Region (245,100 inhabitants) (National Planning Commission 2012: 5; Namibia Statistics Agency 2014: iii). The population density of the Hardap Region is 0.7 people per square kilometre (Namibia Statistics Agency 2014: 3). 60% of the Hardap Region population lives in urban areas (ibid.: 4). A relatively large part of the population lives in informal housing units (shacks) (24.7%). The annual growth rate for Hardap Region was 1.5% between 2001 and 2011. Furthermore, the annual growth rate for urban areas was 4.3%, although a negative growth rate (- 1.5%) was observed in rural areas due to high migration to urban areas (Namibia Statistics Agency 2014: 13).
12% of the population is under five years, 21% between five and 14 years, 59% between 15 and 59 years and only 8 % over 60 years old (ibid.: iii). The population of Hardap Region hence has a median age of 24 years (ibid.: 5). Most of the people speak Nama/Damara (43.3% in 2011) or Afrikaans (41% in 2011) as main language in their households, only 1.7% English, which is the official language of Namibia.
43% of the population had completed their primary education and about 20% had completed their secondary education before leaving school. Only 2.7% of the population had completed their tertiary education (ibid.: 22).
65% of labour force over 15 years is employed, consequently 35% are unemployed.

Hardap Region - Access to Water and Energy

The main energy sources for lighting are the electricity from electrical mains and light from candles (cf. fig. 8). In 2011, 66% of the population had access to electricity for lighting. The main energy sources for cooking are also electricity from electrical mains and in addition, wood/charcoal from woods (approximately 45%) (cf. fig. 9). Solar energy for lighting and

cooking is hardly used (Namibia Statistics Agency 2014: iii). The graphics below show the main sources of energy in detail.

Main source of energy for lighting	Households	Population
Total	19 307	77 246
Electricity from Mains	12 803	54 206
Electricity from Generator	272	1 152
Gas	22	60
Paraffin/Kerosene	673	2 373
Wood/Charcoal from Wood	96	378
Charcoal-coal	1	11
Candles	5 092	17 826
Solar Energy	325	1 147
Other	23	93

Fig. 8: Households and population by main sources of energy for lighting, Hardap (Namibia Statistics Agency 2014: 118)

Main source of energy for cooking	Households	Population
Total	19 307	77 246
Electricity from Mains	9 396	39 193
Electricity from Generator	93	430
Gas	1 064	3 677
Paraffin/Kerosene	26	70
Wood/Charcoal from Wood	8 597	33 344
Charcoal-coal	90	365
Solar Energy	21	68
Other	20	99

Fig. 9: Households and population by main source of energy for cooking, Hardap (Namibia Statistics Agency 2014: 116)

The people from Hardap Region also use electricity for electronic devices but only to a limited extent. 71.8% of the population has access to a radio and 59.7% to a TV. Cell phones are used by 55.8% of the population and only 11.9% have access to a computer and 6.7% to internet (Namibia Statistics Agency 2014: 17).

93% of the population has access to safe drinking water (Namibia Statistics Agency 2014: iii). The main source of water for cooking and drinking is tap water inside the houses (cf. fig. 10). Furthermore many people use tap water outside their houses, public taps and boreholes with covered tanks. Some people only have access to boreholes with open tanks or rivers, dams and streams (ibid.: 120).

The biggest part of the Hardap population uses private flush toilets connected to the drains (cf. fig. 11). Besides, some people have private flush toilets connected to a septic tank or cesspools, while others have shared flush toilets which are connected to the drains (Namibia Statistics Agency 2014: 122). 35% of the Hardap population live without toilet facilities (ibid.: iii). The following graphics show in detail the main sources of water for cooking and drinking as well as for the toilet facilities.

Main source of water for cooking/drinking	Households	Population
Total	19 307	77 246
Piped Water Inside	7 534	32 526
Piped Water Outside	3 611	14 995
Public Pipe	3 266	12 680
Borehole with Tank Covered	3 556	12 397
Borehole with Open Tank	378	1 228
River/Dam/Stream	394	1 448
Canal	64	211
Well Protected	66	265
Well Unprotected	17	61
Other	421	1 435

Fig. 10: Households and population by main source of energy for lighting, Hardap (ibid.: 120)

Toilet facility	Households	Population
Total	19 307	77 246
Private Flush Connected to Sewer	7 759	33 428
Shared Flush Connected to Sewer	1 222	4 641
Private Flush Connected to Septic/Cesspool	1 167	4 798
Shared Flush Connected to Septic/Cesspool	388	1 566
Pit Latrine with Ventilation Pipe	224	951
Covered Pit Latrine without Ventilation Pipe	367	1 606
Uncovered Pit Latrine without Ventilation Pipe	164	610
Bucket Toilet	1 196	5 115
No Toilet Facility	6 737	24 217
Other	83	314

Fig. 11: Households and population by source of toilet facility, Hardap (ibid.: 122)

3.2. Objectives and philosophy

NaDEET is a small non-government and non-profit trust which was established in 2003 to provide environmental education for Namibians, regardless of income (NaDEET n.y. a: www). Their work is funded by trustees and donations (for example by an association called "*Freundschaft mit NaDEET*" or by the European Union), which gives also poor people the opportunity to benefit from NaDEET's work. The objectives of NaDEET are "to address relevant environmental issues through hands-on, experiential learning, to support the Namibian school curricula in a practical, learner-centred way and to provide the opportunity of experiencing the county's namesake - the Namib Desert - first hand, thus creating a sense of respect and responsibility for their natural environment" (ibid.). Furthermore, NaDEET want to increase awareness and knowledge but also eco-friendly attitudes and skills for Namibia's youth and educators, so that participation is promoted (ibid.).

To achieve these objectives different projects are carried out. The core project is the environmental education centre located in the NamibRand Nature Reserve. The environmental literacy (*Bush Telegraph* and "*It's Time to …*" activity and guide book series) and the outreach programmes complete the centre's activities.

At the centre, Namibians can participate in a five day hands-on, experiential, environmental education programme. Participants are mainly children from primary schools but also from secondary schools, out-of-school youth, educators or community members. Community outreach is NaDEET's newest initiative. The current outreach project is called "RUG for Sustainability". The aim is to enable less fortunate communities having access to environmental education by teaching them in their own communities. The objectives of the outreach project are "to reduce the barriers to implementing sustainable living, to improve access to environmental education and to increase sustainable living technologies usage in Namibia" (NaDEET n.y. b: www).

In every project they follow their philosophy "*We practice what we teach*" (NaDEET n.y. c: www). This is particularly evident at the facilities of the centre. Solar panels generate all of NaDEET's electricity. Thus, during the day, solar energy charges batteries for electricity at night. Besides, bucket showers and earth closets are used to save water and waste is being avoided as much as possible. The waste which is not avoidable is recycled. This also represents NaDEET's motto "*Learning & living for a sustainable future*".

3.3. Primary School Programme

Since the target group of this study is children, especially the primary school pupils and the relevant programme of NaDEET is described as follows.

The primary school programme lasts for five days. Usually the participants arrive on Monday afternoon and leave on Friday morning. Every child is part of a sustainable living team and a classroom team during the programme. The pupils of one sustainable living team sleep together in a house and share a bathroom as well as ablution facilities (cf. fig. 5). The pupils of one classroom team have to work together during class time. Every child gets a little book called "*Sustainable Living Journal*". This book contains tasks to be solved in the course of the programme.

The aim of the primary school programme is to fascinate young learners to protect the natural environment (NaDEET n.y. e: www). It shows them practical examples of how to live sustainable and promotes teamwork. A key output of this programme is to build up skills by addressing environmental problems through improving teamwork, cooperation and leadership (ibid.). The programme includes activities which are linked to the Namibian school curriculum. While the students learn about the environment and sustainability, they also gain knowledge in subjects such as English, math, sciences and life skills (NaDEET n.y. e: www). However, the main components of the primary school programme are energy, water, waste and biodiversity. Pupils get a better understanding of the topics and learn which effects it has on their lives and communities.

In consideration of the objective of this study, the components of water and energy are described in more detail in the subsequent sections.

Water

The primary school programme deals with the topic of water as water management is a priority in Namibia. The water topic is important due to the scarcity and uneven distribution of water, the increasing demand for water and the decreasing water quality and supply (cf. chapter 2.1) (NaDEET n.y. f: www). To counteract these problems, practical lessons are

used for children to learn about and implement water saving methods at NaDEET Centre (ibid.). The pupils not only learn in the classroom how they can save water, but also with practical experiences during their daily life in NaDEET. These practical experiences include reducing water wasting in the bathroom facilities by using a tank with limited water supply instead of an open tap (NaDEET n.y. f: www). The children use the water from the tank for bucket showers, brushing their teeth and washing their face and hands. They fill the water from the tank in buckets to see how much water they consume. Therefore, they get a feeling for their water consumption. Furthermore, pupils count the water use every day by using water meters at the water tanks. In this way children gain experience on how to measure their own personal water consumption (cf. fig. 12) (ibid.).

The centre has long drop toilets instead of flush toilets to reduce water consumption. In the kitchen facilities, NaDEET pays attention to a thriftily water consumption by cleaning the kitchen and dishes in small teams of pupils and reusing the water for the compost (NaDEET n.y. f: www). During water activities learners explore the water cycle (cf. fig. 13). They also study individual processes which are important in a desert environment, such as transpiration (ibid.).

Some activities which deal with the aspects mentioned above are: "*Water is Life*", "*Enviro Footprint - Water Count*", "*Measuring our Enviro Footprint*" and "*Enviro Dramas*".

Fig. 12: "*Water Count*"

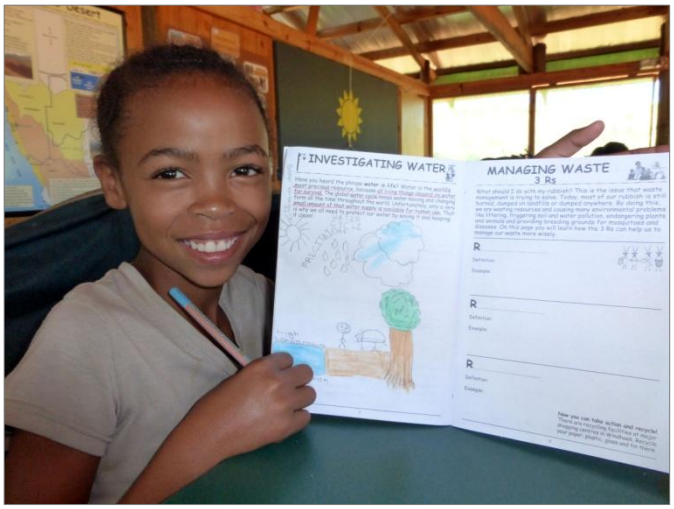


Fig. 13: "*Water is Life*" - Drawing the water cycle in the "Sustainable Living Journals"

Energy

Another topic of the primary school programme is energy, because the sustainable use of energy becomes more and more important in today's society (NaDEET n.y. g: www).

Both fossil fuels and traditional firewood are costly to many people because they have limited financial resources (cf. chapter 2.1) (ibid.). Domestic energy production is underdeveloped in

the country and imported energy sources are becoming less available (ibid.). Alternative energy sources exist, but there is a lack of awareness, distribution and skills in their correct use (NaDEET n.y. g: www). For these reasons NaDEET deals with the topic of energy by teaching children about alternative energy equipment through first-hand experience. The pupils gain knowledge, skills and confidence to use solar cookers and solar ovens (ibid.). The first-hand experiences include preparing food with a solar cooker and a solar oven (cf. fig. 15). Children learn how to correctly set up and adjust the cookers and ovens to maximize the use of solar energy (NaDEET n.y. g: www). Furthermore, the pupils are taught how solar panels function using NaDEET's Solar Park. Environmental educators explain to the participants how NaDEET's electricity is generated by solar panels and how the solar energy is used for all the electronic devices at NaDEET Centre (ibid.).

Hot water for washing dishes and bathing is created by solar water heaters. These heat water through absorption of the sunlight, the greenhouse effect and proper insulation (NaDEET n.y. g: www). The pupils learn the basics of absorption, reflection, insulation and the greenhouse effect by solar experiments (cf. fig. 14). With this knowledge they recognize similarities to the working of solar panels, cookers and ovens.

In the absence of sun, the children are shown how to use fuel-efficient stoves instead of open fires to save energy (ibid.).

Some of the activities which deal with the aspects mentioned above are called: "*Solar Cooking @ NaDEET*", "*Solar Cooking Hour for lunch and dinner*", "*Solar Electricity @ NaDEET*" and "*Power of the Sun Experiments*".

Fig. 14: "Power of the Sun Experiments"

Fig. 15: Solar Cooking

3.4. Non-governmental evaluations about NaDEET

This chapter describes researches about NaDEET that have already taken place. These include the external evaluation of Auriol Ashby and Jennifer N. Van Wyk of Ashby Associates cc and the internal Pre- and Post-Survey of NaDEET.

External Evaluation of Ashby Associates cc

In October 2013, Ashby and Van Wyk conducted an external evaluation of the three years EU-funded programme "*Environmental Education to Empower Namibian Communities to Improve their Living Conditions*" of NaDEET. The aim of the evaluation was to investigate the impact of the programme on individuals, families and communities. The programme was analysed regarding six different topics called result areas. These result areas include:

1. "Improved environmental ethic among Namibians
2. Improved knowledge and skills for environmental action taking
3. Increased access and ownership of environmental education opportunities and sustainable living technologies, especially for the most vulnerable groups"
4. Enhanced implementation and teaching of sustainable living by educators and tertiary level students in various learning settings [...]
5. Increased access and use of locally based, relevant environmental literature for Namibians, especially for children, educators and community members
6. Better protected local environment (especially water and energy resources) and improved quality of life."
   (ASHBY & VAN WYK 2013: 1).

The origin of the result areas defined by Ashby and Van Wyk could not be identified by reading their study. When asking the director of NaDEET, she explained that the result areas were from a grant proposal which NaDEET worked out for the EU (KEDING, E-Mail).

To investigate the programme Ashby and Van Wyk used different methodologies such as a participant observation during one day at NaDEET Centre, focus group discussions with 154 learners as well as key informant interviews with 13 of the NaDEET staff members, eleven teachers and eight community members of eight different communities in Hardap Region (ASHBY & VAN WYK 2013: iv). They spent two days at NaDEET Centre where they observed and interacted with a school group of Oan//ob Primary School and interviewed staff and volunteers to carry out a SWOT-Analysis (Strength, Weakness, Opportunities and Threats Analysis). Furthermore, they visited seven schools in Hardap Region (Outreach) and some community members in Maltahöhe (ibid.: 2).

By observing and doing the focus group discussions with the pupils of the Oan//ob Primary School at NaDEET Centre and other learners in their communities they could evaluate the Primary School Programme of NaDEET Centre and investigate the result areas one to three, mentioned above. The focus was on all four major learning topics of NaDEET: “Sustainable energy use and sustainable living technologies”, “Sustainable water use”, “Exploring biodiversity” and “Waste management”. The following questions were asked by Ashby and Van Wyk during the focus group discussion:

1. “When did you go to NaDEET? Has anyone been to NaDEET before that?
2. What do you remember about NaDEET?
3. Is anything you learned at NaDEET relevant to your school work? Which subjects?
4. What type of energy do you use at home? Where do you get your water from?
5. Did you apply anything you learned at NaDEET? - Probe for changes to your personal life, your family, your community or school environment?
6. What makes it difficult for you to implement NaDEET’s ideas?
7. Do you want to say or add anything?”

   (ASHBY & VAN WYK 2013: 48)

After the focus group discussion Ashby and Van Wyk summarized the most common responses with no differences between schools or ages. An interesting result of these discussions was that most of the participants remembered all four topics: water, energy, waste and biodiversity. They were able to describe some aspects of the topics and they knew that they had to save water and energy and should not litter (ASHBY & VAN WYK 2013: 6). Some of the participants transferred their new knowledge to other family members, friends or class mates but only a few of them took further action (ibid.: 11). Ashby and Van Wyk assumed that the possibility to take action is limited because pupils of primary schools have only little influence over household resources and are dependent on adults (ASHBY & VAN WYK 2013: iv). The pupils said that they would prefer making fire bricks and using the fuel-efficient stove instead of an open fire but they could not find the necessary materials (ibid.: 13). A teacher also mentioned that the pupils learned a lot but there was no long-term change in their behaviours. They could not make fire bricks because there are no waste papers in their villages (ibid.: 8). Ashby and Van Wyk concluded from these results that the effectiveness of NaDEET is influenced by living conditions and the age of the participants. Especially children from disadvantaged communities need more support for taking action from centres like NaDEET (ASHBY & VAN WYK 2013: 14). The results concluded in the recommendation to target “vulnerable communities in informal and urban settlements which have greater access to materials for recycling and are easier for NaDEET to support” (ibid.: vi).

Besides Ashby and Van Wyk identified some out-of-school youth who started a waste management project in their community. They included measures to reduce, reuse and recycle (ASHBY & VAN WYK 2013: 7).The investigation furthermore showed, that NaDEET needs to identify such participants who changed their behaviour and started some sustainable projects in their communities after their visit to the centre. A recommendation of Ashby Associate cc is to support and promote these participants in the future. They recommended NaDEET to organise a week at the Centre to target only "Environmental Champions" (ibid.: vi).

Ashby and Van Wyk interviewed the staff members of NaDEET to carry out a SWOT-Analysis. Discovered strengths of NaDEET are the location, the unique programme, successes in establishing solar usage in Namibia, a good communication, reaching more learners etc. (cf. tab. 3). One of the main results of this analysis was that the lack of time is the biggest weakness and threat to the programme. One of the staff members said "*It is the same every week - the programme is too tight*" and "[there are] *a lot of activities to squeeze in, which is made worse of the group arrives late*" (ASHBY & VAN WYK 2013: 32). Other aspects of weaknesses were for example no country-wide awareness, dependent on donations and the high turnover of staff (ibid.: 32).

Tab. 3: Examples of staff SWOT analysis of the Centre programme (Based on ASHBY & VAN WYK 2013: 32)

Strength	**Weakness**
• Location • Unique programme • Student internship programme and volunteers • Successes in establishing solar usage in Namibia • More awareness in Region • Staff dedication • Reaching goals • Good communication (x3) • Centre Programme is not dependent on financial situation of learners' families • Staff can learn from participants	• Accessing sufficient resources (x2) • No country-wide awareness • Inadequate communication between staff and groups of people visiting beforehand • Schools traveling very long distances to reach the centre so often arrive late • Dependent on donations / funding (x4) • High turnover of staff (x3) • Distance for staff to get home to their families • Time (x2) • Sustainability
Opportunities	**Threats**
• Involve local lodges, businesses during outreach – they can add resources. • Link with the Scouts of Namibia • Link with B2Gold in Otjozondjupa which is building an EE centre and has CSR programme which is supplying 400+ people with firewood from the mine clearance.	• Leaving of staff/teachers • Distance • Transport money home • Time of staff • Sustainability • Resources • Lack of funding

In a discussion after the SWOT-Analysis the staff mentioned that another problem is the language. Only one staff member spoke Nama and Afrikaans, the main languages spoken in the Hardap Region, and therefore can converse with all the participants. To use one common language is difficult as many children of the region are not confident or competent in English. Thus, Ashby and Van Wyk assumed that some of the more complex teaching contents of NaDEET may get missed when teaching in English (ASHBY & VAN WYK 2013: 34). The recommendation to NaDEET is to translate some parts of the lesson into Afrikaans (ibid.: 35).

Ashby and Van Wyk discovered many strengths of NaDEET but also some weaknesses. They made a lot of suggestions which NaDEET can use to improve their environmental education work.

Internal Pre- and Post-Survey of NaDEET

NaDEET tries to evaluate and improve their work by conducting written pre- and post-surveys with their participants. These surveys are mainly used to find out what pupils already know about environment and sustainability before their visit to NaDEET and what they learned new at NaDEET. The surveys consist of the topics water, energy, waste and biodiversity. The surveys also deal with the living conditions of the pupils. The opinions of the children regarding NaDEET are discussed only briefly. There are different questionnaires for primary and secondary schools. Only questions of the primary school questionnaire are mentioned, as this study deals especially with the primary school programme.

Questions of the Pre-Survey for primary schools are for example:

1. Does it make a difference to the environment what energy source you use to cook food?
2. Does it make a difference to the environment how much water you use every day?
3. What is the environment?
4. Name one thing that humans do that causes damage to the environment.

Questions of the Post-Survey for primary schools are for example:

1. I understand why it's important for desert creatures, like the tok tokkie beetle, to adapt to their environment. (Yes, No, Maybe)
2. What is the environment?
3. Name one thing that humans do that causes damage to the environment.
4. What were your two favourite activities at NaDEET? Why?

The pre-survey is carried out with all pupils on the first day at NaDEET Centre and the post-survey on the last day. The collected data from the surveys is entered into Excel. However, it has not been analysed yet.
The written pre- and post-surveys for pupils were started in 2011. Before that, NaDEET only did verbal feedback sessions. They started the written surveys because of the first EU grant that NaDEET received which was from 2011-2013. The reason for this was that they needed evidence to prove their results or rather their success. (KEDING, E-Mail)

4. Need for further research and deduction of research questions

As chapter 2.2 shows, there are both national and international objectives and requirements for EE and ESD. Since the EEIS of the Ministry of Environment & Tourism in Namibia has only set objectives, but no specific requirements, it is useful to orient the evaluation of an environmental centre such as NaDEET in Namibia to international or national requirements of other countries. In this case, those requirements, which serve to fulfil the objectives of the EEIS "to spread awareness, enhance knowledge and foster individual and collective participation and commitment" (Ministry of Environment & Tourism 2011: www) are particularly relevant. Especially the requirements of UNESCO & UNEP and "WWF Germany" are suitable, as the Namibian objectives comply to the largest extent with it. All of them deal with providing awareness, knowledge, skills and participation.
In addition the requirements in terms of the learning contents of the quality seal "Umweltbildung.Bayern" can be used to complete the requirements of UNESCO & UNEP and "WWF Germany". To reach the objective of this study it is necessary to choose those requirements which help to sensitize the children for the topics water and energy and to provide them with a sustainable use of it.
In the specific case of NaDEET the results of the evaluation of Ashby and Van Wyk (see chapter 3.4) can also serve as an orientation for further research. Thus, it can be checked in the course of this study whether the suggestions of Ashby and Van Wyk have been taken up and if identified weaknesses and threats had been improved. This includes, for example, the time management of the primary school programme and the problems of understanding due to a lack of language skills. Furthermore it could be exciting to investigate the assumption of Ashby and Van Wyk that the effectiveness of NaDEET is influenced by living conditions and age of the pupils and that especially children from disadvantaged communities need more support from centres like NaDEET (ASHBY & VAN WYK 2013: 14).
Furthermore it may be interesting to see whether the results of this study complete or disprove the results of Ashby and Van Wyk.

The following research questions arise from the literature research on objectives and requirements for EE and ESD and about past researches about NaDEET. The different research questions are substantiated by hypotheses.

1. Does NaDEET meet the national and international objectives and requirements for environmental education and education for sustainable development?

2. What are the effects of NaDEET's environmental education work on the pupils in terms of awareness, knowledge, skills and participation?
   2.1. Do the pupils gain new insights in terms of water and energy which they take home?

> **H_1**: *There is a significant difference in mean between the pre- and the post-survey with regard to the variable "awareness and knowledge". NaDEET has an influence on the dependent variable "awareness and knowledge".*
>
> **H_0:** *There is no significant difference in mean between the pre- and the post-survey with regard to the variable "awareness and knowledge". NaDEET has no influence on the dependent variable "awareness and knowledge".*

   2.2. How do the pupils handle water and energy at home before and after a visit to NaDEET?

> **H_1**: *There is a significant difference in mean between the pre- and the post-survey with regard to the variable "skills and participation". NaDEET has an influence on the dependent variable "skills and participation".*
>
> **H_0:** *There is no significant difference in mean between the pre- and the post-survey with regard to the variable "skills and participation". NaDEET has no influence on the dependent variable "skills and participation".*

   2.3. Do these effects lead to a sustainable use of water and energy?

3. Is the effectiveness of NaDEET's primary school programme influenced by the living conditions of the pupils?

> **H_1**: *There is a significant difference in mean between pupils with different living conditions with regard to the variable "awareness and knowledge". The living conditions of the pupils have an influence on the dependent variable "awareness and knowledge".*
>
> **H_0:** *There is no significant difference in mean between pupils with different living conditions with regard to the variable "awareness and knowledge". The living conditions of the pupils have no influence on the dependent variable "awareness and knowledge".*

H_1: *There is a significant difference in mean between pupils with different living conditions with regard to the variable "skills and participation". The living conditions of the pupils have an influence on the dependent variable "skills and participation".*

H_0: *There is no significant difference in mean between the different school groups with regard to the variable "skills and participation". The living conditions of the pupils have no influence on the dependent variable "skills and participation".*

H_1: *There is a significant difference in mean between pupils with different living conditions with regard to the variable "opinion about NaDEET". The living conditions of the pupils have an influence on the dependent variable "opinion about NaDEET".*

H_0: *There is no significant difference in mean between the different school groups with regard to the variable "opinion about NaDEET". The living conditions of the pupils have no influence on the dependent variable "opinion about NaDEET".*

4. What is the opinion of the pupils about NaDEET before and after their stay?

H_1: *There is a significant correlation in mean between the pre- and the post-survey with regard to the variable "opinion about NaDEET".*

H_0: *There is no significant correlation in mean between the pre- and the post-survey with regard to the variable "opinion about NaDEET".*

The research questions were answered by carrying out a participant observation and a standardized survey. The participant observation mainly served to investigate whether NaDEET meets the chosen objectives and requirements for EE and ESD (research question 1). The standardized survey focused on the effects of NaDEET's work on the pupils (research question 2) and on the differences between pupils with different living conditions (research question 3). Furthermore, the opinions of the pupils about NaDEET were investigated by the standardized survey (research question 4).

5. Study design

The study design includes the description of two different empirical methods which were carried out during this study, the participant observation and the standardized survey.

5.1. Participant Observation

First, the methodological approach of the participant observation is described. The reasons for the choice of this method and the advantages are mentioned. Then the individual steps of the participation observation and their implementation during this study are explained in detail.

5.1.1. Methodological approach

For this thesis the method of a participant observation was chosen. The participant observation is a method of qualitative social research. In this kind of observation the observer takes part in the daily lives of the test people. In this way the observer gets an idea of their living conditions and cultural backgrounds (GUEST et al. 2005: 14). In addition new insights can be gained which would not have been discovered for example by a non-participant observation (BRÜSEMEISTER 2008: 73).

> *"If you want to find out something about other people, you just go to them, stay awhile, take part in the daily life of the people, do what this people usually do, and get to know them better through own experience." (ethnologists, social anthropologist)*

This approach is very important for this thesis because the study takes place in an African country showing a very different cultural background than in Germany. The value of participant observation at the beginning of learning about an unfamiliar culture or social setting can be very high (GUEST et al. 2013: 80). Thus, the participant observation can help to understand the social and cultural background and the behaviours of the children of upper primary schools from the Hardap and Khomas Region in Namibia.
It can also help to interpret the results of the standardized survey because it could be easier to understand the answers of the pupils, if their culture and living conditions are known.
Another reason for the choice of participant observation is that pupils should not feel observed all the time. When they realise that they are being watched, it can be assumed that they may behave differently than they would normally do. People change their behaviour around outsiders. If there is an interest in "normal" behaviour, the observer has to stop being

someone around who is only watching from the sidelines (ibid.: 80). It can be assumed, that pupils treat a participant with more openness than a "complete observer". In consequence, more new insights can be gained.
However, the participant observation during this study was an open observation, so that both the pupils and the NaDEET staff knew of the study (BRÜSEMEISTER 2008: pp 75-76). They had to know of this study, because in addition to the participant observation, a standardized survey was conducted. Thus, the pupils were aware of the study, its background and objective. Since it was a participant observation, it can be assumed that the pupils did not feel observed even though they knew of the study.

In this study the methodological approach of the participant observation consists of three steps (cf. fig. 16). These steps are explained in the following chapters.

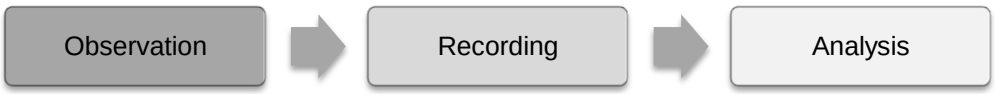


Fig. 16: Different steps of the participant observation

5.1.2. Observation

The observations took place within three weeks from 07.04.2014 to 27.04.2014.

Week one (07.04.2014 - 11.04.2014)
The environmental education work with 43 pupils of the WJD Cloete JSS was observed. WJD Cloete JSS is a school in a small rural settlement called Rietoog which is located in the Hardap Region. Rietoog has about 800 inhabitants, including about 260 pupils in pre-primary school up to grade ten (NaDEET n.y. h: www). WJD Cloete JSS is a public school. The parents do not have to pay for their children attending the school.

Week two (14.04.2014 - 17.04.2014)
The participant observation took place with 41 pupils of Windhoek International School (WIS). The WIS is a private and independent school in Windhoek, the capital city of Namibia, which is located in the Khomas Region (cf. fig. 8). It is the only school in Namibia which follows a northern academic year from mid-August to mid-June (Windhoek International School 2014: www). All other Namibian schools begin in January and finish in December.

Since it is a private school, the parents have to pay N$ 111,533 (about 7,870 €) per year for their child attending the upper primary school (ibid.).
The group from WIS left NaDEET one day earlier than school groups normally do, because it was Good Friday on 18th April.

Week three (21.04.2014 - 25.04.2014)

During this week the primary school programme with 42 pupils of N Mutschuana PS was observed. The school is located in the Hardap Region in a small settlement of a rural village called Gochas. In the settlement live about 1,000 inhabitants, including about 342 school children in primary school up to grade seven (NaDEET n.y. h: www). N Mutschuana PS is a public school. The parents do not have to pay for their children attending the school.

The pupils were observed during classes, group work and individual work inside and outside the classroom (cf. fig. 17). Besides, NaDEET staff such as the environmental educator and the centre assistant were also observed during teaching in front of the class and during the support of group and individual work. The environmental educator teaches the pupils at the centre and is supported by the centre assistant. In addition, the teachers of the different schools, who are accompanying the pupils, are present during the lessons.
The participant observation was carried out from about 8.00am to 8.00pm during the days mentioned above. During this time, especially all activities were pursued which deal with the topics of water and energy.

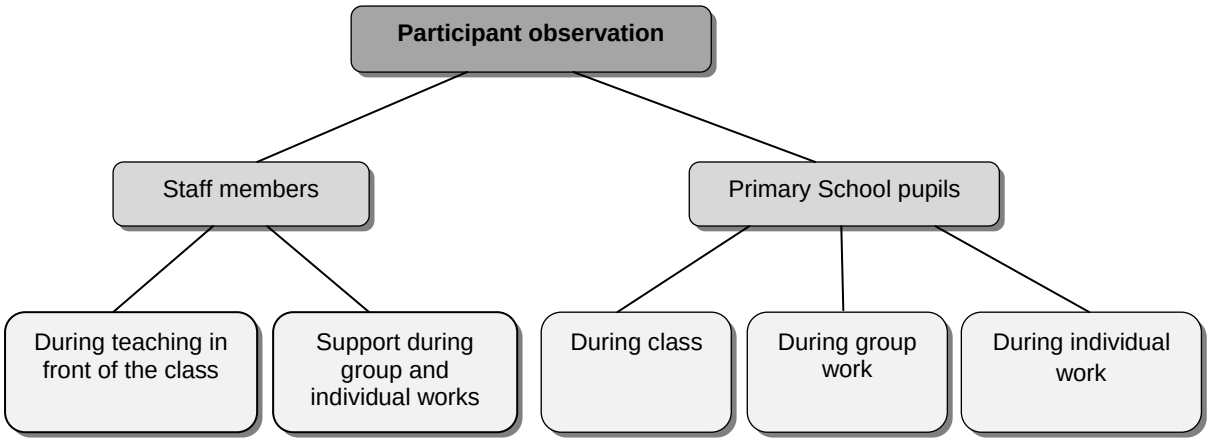


Fig. 17: Structure of the participant observation

The observation was carried out in three different forms. The researcher acted as a "complete participant", as a "participant-as-observer" or as an "observer-as-participant"

(BRÜSEMEISTER 2008: 72). It is not uncommon, that the researcher applies several observation forms during a study (ibid.).

The "complete participant" is characterized by a total participation in the field with the observed people and a very small part of a distant observation (BRÜSEMEISTER 2008: 72). This observation form was used when the support of an additional person was needed, for example during a group or an individual work. In such a situation it was often necessary to slip into the role of a centre assistant to support the children in their work.

The "participant-as-observer" mainly has the role of a participant (ibid.). This observation form was used during class time by undertaking smaller tasks, which supported the work of the educator. While small tasks were carried out, the lessons were observed from the sidelines.

The third form of the observation was the "observer-as-participant". Hereby, the researcher mainly has the role of an observer (BRÜSEMEISTER 2008: 72). This form was used during class time when the educator was teaching the pupils and it was not necessary to carry out other task or to support the educator.

By using these mixed forms, purely subjective observations could be prevented, because the observer was not only a complete participant, but also observed the activities from the side-lines (ibid.: 73).

During the observation the focus was on the verbal and physical behaviour of the staff and the pupils. In addition the interaction between both was observed (cf. tab. 4). Besides, the aim, the learning contents and the sequence of the activities were noted.

For this study, the activities were assigned to awareness, knowledge, skills and participation.

Tab. 4: Contents of observation (Based on GUEST et al. 2013: 92)

Category	Includes	Researcher should note
Verbal behaviour and interactions	Who speaks to whom? Who initiates interactions?, languages or dialects spoken	Gender, age, ethnicity, profession
Physical behaviour and gestures	What people do, who does what? Who interacts with whom? Who is not interacting?	What people's behaviours indicate about their feelings toward one another, their social rank, or their profession
Activities which deals with water and energy	Which activities take place?, aim and learning contents of the activities, sequence of the activities	Which activities include aspects of awareness, knowledge, skills and participation

5.1.3. Recording

The records are the basis for the analysis. They were carried out in the evening, directly after the end of the programme. If results would have been recorded during the day it would have disturbed the course of the programme.
Furthermore, the separately reconsidering of the observations from a distance to the observed situation can achieve more objectivity (BRÜSEMEISTER 2008: 80). Consequently, this participant observation consists of two parts, the presence in the field during data collection and the distant reflection of the observation results after the actual observation (ibid.: 75).

5.1.4. Analysis

For analysis, activities dealing with water and energy were assigned to the two categories awareness & knowledge and skills & participation. In this way it could be checked which activities NaDEET carries out to meet the objectives of EEIS, UNESCO & UNEP and "WWF Germany". Awareness and knowledge form one category, because it is not always possible to assign the activities to only one of the objectives. During activities which serve to sensitize the pupils, the pupils also gain new knowledge. The same was the case for skills and participation. Activities which serve to provide skills also serve as a basis for participating in decision-making processes. For this study, it is useful to form these two categories. However, the categories cannot be clearly separated from each other because they are related to each other.
Furthermore, the activities were analysed based on different requirements for EE and ESD (see chapter 2.2) which are necessary to reach the objectives (cf. fig. 18). Requirements have been chosen which are applicable to NaDEET and its primary school programme. The following table shows the chosen requirements based on chapter 2.2 which were used for the analysis of the observations.

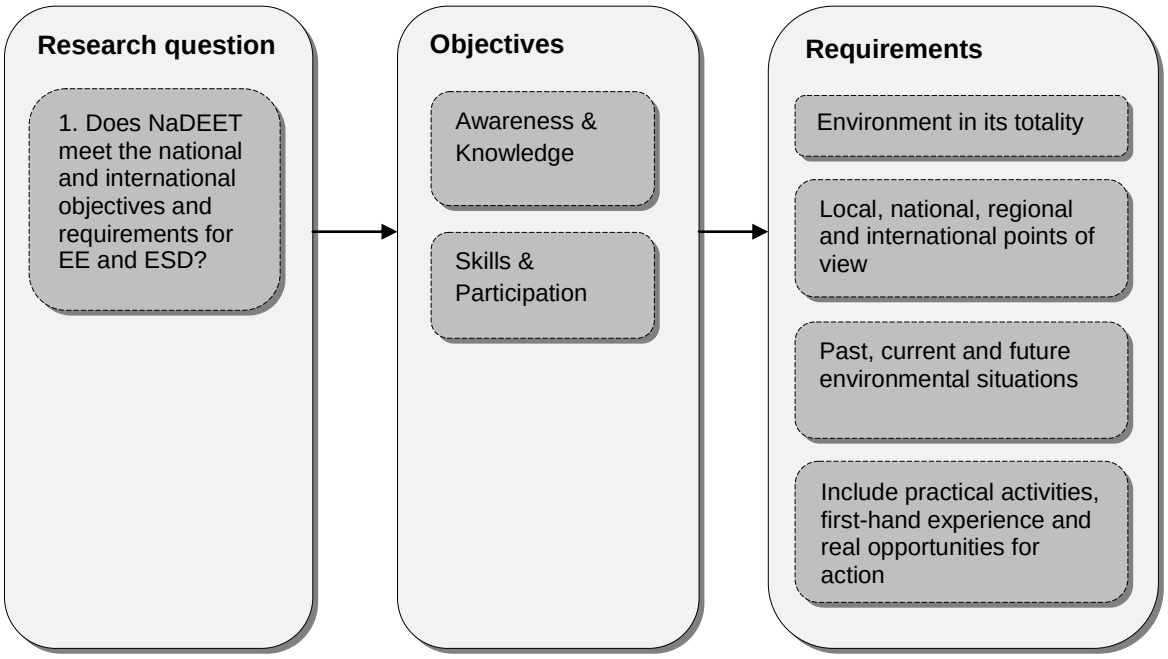


Fig. 18: Conceptual structure of the participant observation

In the following the requirements are described in detail.

Environment in its totality

The ESD should combine aspects of the economic, ecological, social and cultural field. The different aspects of every field are described in detail in chapter 2.2 (cf. tab. 3). It should be considered both the natural and the built environment. Technological aspects should be included. (Bayerisches Staatsministerium für Umwelt- und Verbraucherschutz 2012: 13; UNESCO & UNEP 1978: 11)

Local, national, regional and international points of view

Major environmental issues from local, national, regional and international points of view should be considered so that pupils receive insights into environmental conditions in other geographical areas. (UNESCO & UNEP 1978: 27)

Past, current and future environmental situations

The current and potential environmental situations should be explained, while taking into account the historical perspective. By including the past and the future, the current situation can be understood better. What was done wrong in the past and what can be improved in the future? The causes of environmental problems can be explained.

Competences can be developed such as knowledge which is liberal-minded and include new perspectives and to look and think ahead. (UNESCO & UNEP 1978: 27; Bayerisches Staatsministerium für Umwelt- und Verbraucherschutz 2012: 12)

Include practical activities, first-hand experience and real opportunities for action
The educator should show opportunities for action which refer to everyday life of the pupils. Teaching contents should be illustrated by practical examples and activities. A sustainable lifestyle should be represented. Aspects of sustainable development should be related to everyday life of the pupils. (UNESCO & UNEP 1978: 27)

Besides the comparison of the activities with the mentioned requirements, the focus was on the behaviour of the staff and the pupils.

5.2. Standardized survey

Similar to the method of participant observation, first an overview of the applied method of the standardized survey is given, before each step of the method is described in more detail.

5.2.1. Methodological approach

In addition to the participant observation, a standardized survey was conducted within this study. This survey was carried out as a written with a standardized questionnaire. Pupils who were observed during the participant observation were also part of the survey. The pupils were interviewed in small groups in the presence of the interviewer in the classroom. The groups were kept as small as possible to ensure that all pupils can get support in answering the questions. This support was necessary because problems of understanding due to different languages, cultures and living conditions arose. The pupils were only supported in understanding the questions, but not influenced by the interviewer. A single survey was not possible because of a lack of time and would have disrupted the daily routine of NaDEET's programme.
In addition, the standardized survey was conducted in form of a longitudinal study. This means that the survey has been carried out several times with the same pupils (RAITHEL 2008: 50). A longitudinal study is necessary to achieve the study's objective. To examine the weaknesses, strengths and potentials of NaDEET, it is useful to interview the pupils once before and once after their visit. In this way changes can be identified. For this purpose two questionnaires were developed which are similar for the most part.
The methodological sequence of the survey is shown in the following graphic (cf. fig. 19). The graphic gives an overview of the individual steps of the standardized survey and shows in which chapters the different steps are described. These steps of a standardized survey are explained in detail according to RAITHEL (2008: pp 25-82) and MAYER (2013: pp 58-169) in

the following chapters. Furthermore, the methodology was adapted to this study and its objective.

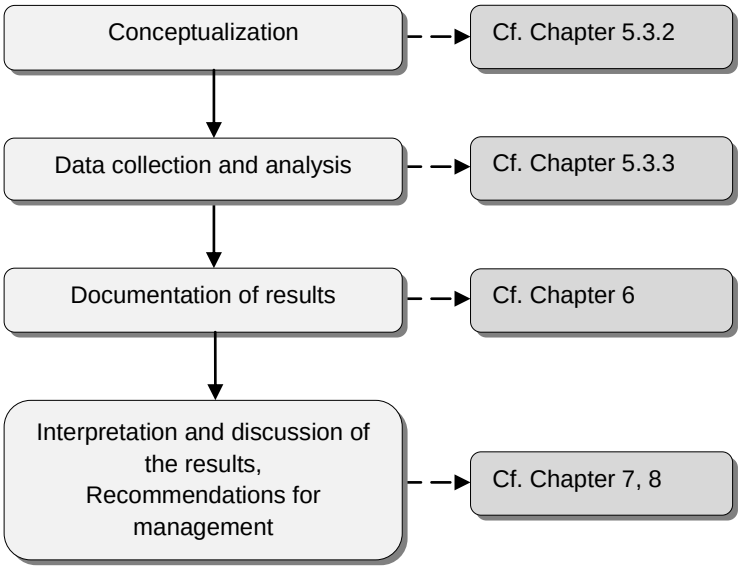


Fig. 19: Methodology sequence of the standardized survey

5.3.2. Conceptualization

Sampling design

It is often not possible to interview the statistical population in a quantitative or qualitative study. The reason for this can be a lack of time or money (RAITHEL 2008: 54).

In this study the statistical population are pupils of the three upper primary schools WJD Cloete JSS (43 pupils), N Mutschuana PS (42 pupils) and Windhoek International School (41 pupils) who visited NaDEET in April 2014 (cf. chapter 5.1.2). It was not possible to interview all of them because of a lack of time. In this case the survey requires a lot of time because of problems of understanding resulting of different languages, cultures and living conditions. Consequently, the sample must be selected so that the results of the relevant features/variables differ as little as possible from the statistical population (MAYER 2013: 60). Therefore, a simple random sampling was conducted. 20 pupils were selected from each upper primary school group at random. For this purpose, a drawing of lots was used. Care was taken to a balance of girls and boys. Since the groups had more boys than girls, eleven boys and nine girls of each group were selected at random.

Designing the standardized questionnaire

Since this is a longitudinal study, two standardized questionnaires were developed. There is a pre- and a post-questionnaire. The two questionnaires contain mostly identical questions, but also some different ones. The designing of the questionnaires was geared to answer the research questions two to four. From the research questions three main topics were derived named “Awareness & Knowledge”, “Skills & Participation” and “Opinion” (cf. fig. 20). The questions of the questionnaire can be assigned to these main topics. Thus, three different question sets result from the main topics (cf. fig. 20).

Both the pre- and post-survey contains questions of each question set.

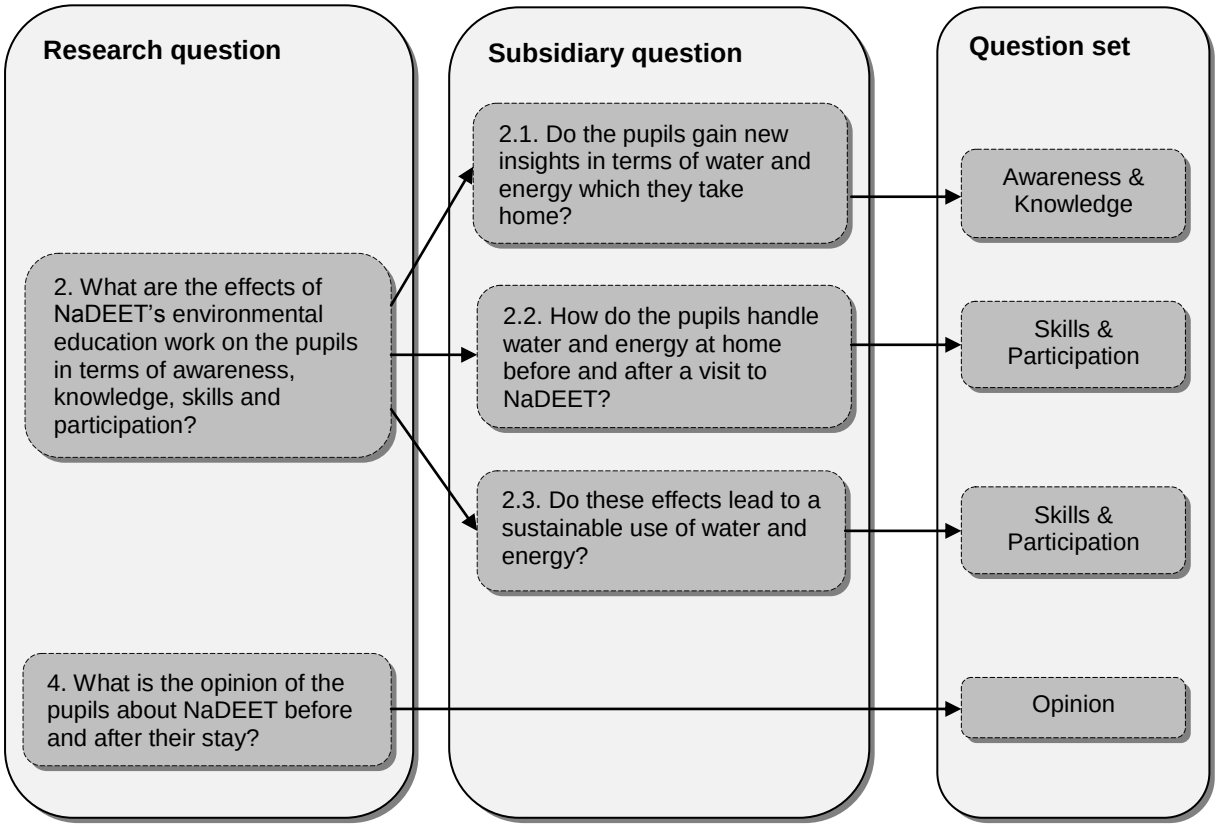


Fig. 20: Construction of the surveys in terms of content

The design of the questionnaire refers to MAYER (2013: pp 81-98) and RAITHEL (2008: pp 67-82). The questionnaire was designed according to the target group. This means that the questions were formulated simple and short. In addition, the questions were, if possible, supplemented by pictorial representations. This is intended to counteract understanding problems due to lack of English proficiency.

The questionnaires are divided into different sets of questions as mentioned above. There are closed questions, half-open questions and open questions. There are never more than five answer choices given in the closed questions, so that it remains manageable for the pupils (MAYER 2013: 92). If an exhaustive list of possible answers has not been possible the

category “Others” was added. Since the respondents have to verbalize their answer in this category, it is a half-open question (MAYER 2013: 93). Because it had to be assumed that the formulation of answers in English would be difficult for the pupils, the number of open questions without answer options was kept as low as possible. However, the most interesting insights can often be gained from open questions, because it not only receives information within specified categories (RAITHEL 2008: 70). Furthermore the open questions were used as control questions. In this way, the information obtained from a previously asked question could be checked and secured (RAITHEL 2008: 71). For these reasons, open questions were not renounced.

Likert-Scales were used as a special form of closed question. These consist of various statements with the same answer options. For the Likert-Scales, rating scales were used. Here, the respondents were asked to indicate their position on a scale for example from “*I fully agree*” to “*I strongly disagree*” (MAYER 2013: 83). Rating scales usually provide ordinal data. However, it can be assumed that the distances on a scale are perceived as equal intervals if the number of expressions is large enough (MAYER 2013: 83). This is possible with five answer choices. At the same time the choices of answers remain manageable (ibid.). By choosing an odd number of answer options with a middle category, the risk of non-response was reduced (ibid.). In addition, the Likert-Scales also include negatively formulated questions or statements. This intends to counteract a tendency of consent and the loss of attention of the pupils (RAITHEL 2008: 70). The direction of assessment was not changed in order to reduce the tendency consent, since the pupils should not be confused.

In the following the question sets are described in detail.

Introduction and icebreaker questions

Both questionnaires begin with a brief introduction about the intention of the study and a short presentation of the researcher. Attention is also drawn to the temporal extent of the survey.

In the **pre-survey**, two questions follow the introduction, which act as icebreaker questions. Questions 1 *“Have you ever been in NaDEET before?”* and 2 *“Do you know someone who was already in NaDEET?”* should allow a simple introduction to the questionnaire and show the pupils that it is not a test. Both questions are closed questions with a nominal scale (cf. tab. 5). The respondents can choose between “*Yes*” and “*No*”.

The icebreaker questions should take away the pupils fear of the survey and their responsiveness should be increased (MAYER 2013: 96). Simultaneously, the questions indicate whether the pupils already know something about NaDEET.

Icebreaker questions are not necessary for the questionnaire of the **post-survey**, since the pupils already know the situation of the survey. It can be assumed that there are no fears anymore.

Tab. 5: Icebreaker questions

Question	Form	Scale
Pre-Survey		
1. Have you ever been in NaDEET before?	Closed	Nominal
1.1. If so when?	Open	-
2. Do you know someone who already was in NaDEET?	Closed	Nominal
2.1. If so who? (Multiple answers are possible.)	Half-open	-

Opinion

The next five questions (question 3 to 6.1) of the **pre-survey** deal with the opinions of the pupils regarding NaDEET (cf. tab. 7). The aim is to find out what the pupils expect from their visit to NaDEET and if they know that they should learn something about the environment. Question 3 *"Are you looking forward to the time in NaDEET?"* and 6 *"Do you believe that the visit to NaDEET is important for you?"* are closed questions with an interval scale. The respondents can choose between "*Fully agree*", "*Partially agree*", "*Neutral*", "*Partially disagree*" and "*Strongly disagree*".

The question 5 also serves to learn something about the expectations of the pupils. Pupils should indicate their position on various expectations using a rating scale (cf. tab. 6).

Tab. 6: A part of question 5

I expect…	I fully agree ☺ 1	→ 2	→ 3	→ 4	I strongly disagree ☹ 5
fun					
free time					
to learn more about my village (town, city) and Namibia.					
to learn more about topics such as water and energy.					

The first two questions of the **post-survey** also deal with the expectations of the pupils. However, they instead aim at whether the pupils' expectations were met. These questions are supplemented by the last two questions. Question ten and eleven are open questions.

The pupils should write down, what they liked in particular and what they did not like at NaDEET.

Consequently, the questions about the expectations of the pupils and whether their expectations were met can help to answer the fourth research question (cf. fig. 23).

Tab. 7: Question set „opinion“

Question	Form	Scale
Pre-Survey		
3. Are you looking forward to the time in NaDEET?	Closed	Interval
4. Do you know why you are here? (Please write it down.)	Open	-
5. What do you expect from your stay in NaDEET?	Closed	Interval
6. Do you believe that the visit to NaDEET is important for you?	Closed	Interval
6.1. Why do you believe this?	Open	-
Post-Survey		
1. All together how do you like NaDEET?	Closed	Interval
2. Please value the following statements.	Closed	Interval
10. What did you like in NaDEET in particular? (Please write down one or two examples.)	Open	-
11. What did you not like in NaDEET? (Please write down one or two examples.)	Open	-

Awareness & Knowledge

This question set deals with awareness and knowledge of the pupils. It should be ascertained whether the students have previous knowledge before they come to NaDEET and which knowledge they take home after their visit to NaDEET. In addition it might be interesting to examine which topics in terms of environmental protection they explore further in school.

Furthermore the question set aims to find out whether the students talk about their experiences of NaDEET with their parents. When pupils talk to their parents about the topics which are taught in NaDEET, this may be a sign that they gained some awareness towards environmental problems. Therefore the pupils should answer the questions 8 “*Did you talk to your parents about your visit to NaDEET?*” during the **pre-survey** and 3 “*Have you told your parents what you have experienced in NaDEET?*” during the **post-survey**. Both questions are closed questions with a nominal scale. The questions are complemented by a sub-question, which is an open question (cf. tab. 8).

Tab. 8: Question set „knowledge & awareness"

Question	Form	Scale
Pre-Survey		
7. Have you learned something about the topic of environmental protection at your school?	Closed	Nominal
7.1. If so, about which topics in terms of environmental protection did you learn something at school? (Multiple answers are possible.)	Half-open	-
8. Did you talk to your parents about your visit to NaDEET?	Closed	Nominal
8.1. If so, what did you tell them? (Please write it down.)	Open	-
12. What do you think about the following statements? (Please value every statement.)	Closed	Interval
Post-Survey		
3. Have you told your parents what you have experienced in NaDEET?	Closed	Nominal
3.1. If so, what did you tell them? (Please write it down.)	Open	-
4. Do you think your parents listen to you?	Closed	Nominal
5. Did you talk about your visit to NaDEET at school?	Closed	Nominal
5.1. If so, what were you talking about? (Multiple answers are possible.)	Half-open	-
9. What do you think about the following statements? (Please value every statement.)	Closed	Interval

Skills & Participation

An important set of questions treats the subjects of participation (cf. tab. 10). This set of questions is the same in the **pre- and post-survey**. The aim is to find out how the pupils handle their water and energy consumption at home. Therefore, three groups of questions were designed. The first group of questions deals with the way of the pupils to cook their meals and the second group of questions takes a closer look at the way to bathe (cf. tab. 9). Both groups of questions are rating scales.

Tab. 9: A part of question 7 „*What do you and your family use to cook your meals?*"

	often 1	from time to time 2	never 3	We haven't got this at home 4
 Open Fire				

A Likert-Scale includes some statements about the usage of water and energy and some statements about environmental problems in Namibia. The statements concerning environmental problems can show whether pupils have gained new knowledge (question set "Awareness & Knowledge") and take action after a visit to NaDEET. Respondents can express their opinion on the statements on a five-point rating scale from "*Fully agree*" to

"*Strongly disagree*". There is an "*I cannot assess this*"-category, too. This category prevents that the answers are distorted by the respondents who feel forced to give an answer, even though they cannot judge the statement (MAYER 2013: pp 93-94). The pupils should value, for instance, the following statements:

- I pour dirty water away after doing the dishes.
- I leave the tap open without using the water.
- I often take a bath.
- I don't care about how much water I use every day.
- I switch off the light when I don't need it.
- My family takes a lot of wood for cooking.
-

Tab. 10: Question set „Skills & participation"

Question	Form	Scale
Pre-Survey		
9. What do you and your family use to cook your meals?	Closed	Ordinal
10. How do you bathe at home?	Closed	Ordinal
11. Do you always have enough water at home?	Closed	Nominal
12. What do you think about the following statements? (Please value every statement.)	Closed	Interval
Post-Survey		
6. Has anything changed in your everyday life in terms of using water and energy since your visit to NaDEET? (Please explain your answer.)	Closed Open	Nominal -
7. What do you and your family use to cook your meals?	Closed	Ordinal
8. How do you bathe at home?	Closed	Ordinal
9. What do you think about the following statements? (Please value every statement.)	Closed	Interval

Demographic data

The questionnaires finish with questions on the demographic data (cf. tab. 11). In this study it was necessary to collect the names of the pupils; otherwise no comparison between pre- and post-survey is possible. The pupils were made aware that their names would not be published.

Tab. 11: Demographic data

Question	Form	Scale
Pre-Survey		
a) School	Open	-
b) Grade	Open	-
c) Age	Open	-
d) Gender	Closed	Nominal
e) Where do you come from?	Closed	Nominal
What is the name of the place where you live?	Open	-
d) First Name and Surname	Open	-
Post-Survey		
d) First Name and Surname	Open	-

In preparing the questionnaire, the quality criteria of the empirical social research were followed. The quality criteria are objectivity, reliability and validity (MAYER 2013: 90; RAITHEL 2008: pp 45-49).

Objectivity

Objectivity means that the results are independent of the particular person using the questionnaires. The influence of the interviewer on the respondents must be as low as possible. An investigation is more objective, the less the respondents are influenced by the appearance, the personal opinion and wishes of the interviewer (MAYER 2013: 90).

In this study, the objectivity of the survey was ensured during the implementation by giving the same instructions to all respondents before filling out the questionnaire. By using a standardized questionnaire, the objectivity could be ensured in the evaluation, too. The objectivity of the evaluation is maximal in case of quantitative survey methods with standardized measuring instruments (RAITHEL 2008: 46). Only the open questions can lead to a reduction of objectivity during the evaluation and interpretation. Nevertheless, open questions were used because it allows a good insight into the minds of the pupils.

Reliability

Reliability requires that in a repeated application of the measuring instrument under the same conditions, the same results are obtained (MAYER 2013: 90).

Since the questions of the standardized questionnaire were formulated as clearly and understandable as possible, a certain degree of reliability can be assumed (MAYER 2013: 90).

Validity

Validity describes the degree to which the measurement instrument actually measures what it is supposed to measure (MAYER 2013: 90).

To test this pre- and post-survey on their validity, an expert validation took place (RAITHEL 2008: 48). Experts, who are familiar with the topic of this investigation, carried out a test of the validity of the questionnaires.

Pre-test

Before the main survey, a pre-test took place. This serves to test the survey instrument for its applicability, completeness, comprehensibility and quality (RAITHEL 2008: 63). Normally, a preliminary investigation is carried out by interviewing some people, who are similar to the target group, under the same conditions as in the main study. Since this survey was

conducted abroad, it was not possible to perform the pre-test in this way. A preliminary study with a group of German pupils would not have been comparable to the main study with pupils from Namibia because of the different languages, cultures and living conditions. It was not possible to perform a pre-test in Namibia because of a lack of time. Thus, the pre-test took place in form of an appraisal by other scientists and experts (RAITHEL 2008: 63).
The questionnaire was completed before the survey abroad. Comments and suggestions for improvement from other scientists and experts were accepted and incorporated. Before the questionnaire could be applied in Namibia, it was examined by staff members of NaDEET. The staff members could estimate whether the questionnaires are answerable for the pupils, because they know their languages, culture and living conditions. Thus, small changes were made to the questionnaires in Namibia. A change was, for example, the supplementing of pictures of smileys in the question groups to represent "*I fully agree*" and "*I strongly disagree*". Furthermore, the term "*last name*" was changed to "*surname*", as the term "*last name*" is not common there.

5.3.3. Data collection and analysis

Survey preparation

Since this study is a longitudinal study, it had to be ensured that pupils could be interviewed before and after their visit to NaDEET. For the **pre-survey** only little preparation was needed. The pupils could be asked directly after their arrival before the programme started in the classroom at NaDEET. The pupils were informed that they were going to be asked again in their hometowns a few weeks later. The teachers, who have accompanied them to NaDEET, were also informed because their support was needed for the post-survey.
The preparation for the **post-survey** was more difficult. The hometowns of the pupils, Rietoog, Gochas und Windhoek were in a relatively large distance to NaDEET, 200 to 433 kilometres; a spontaneous visit to the pupils was not realizable. In consultation with the director of NaDEET, it was therefore agreed, that the post-survey takes place as part of the outreach project of NaDEET. In this way, all pupils, who participated in the pre-survey, were visited and interviewed in their schools. The teachers ensured that the pupils were allowed to leave the classroom for a short time to participate in the survey.
However, this includes only Rietoog and Gochas. The Windhoek International School does not belong to the outreach project. A teacher of the school was contacted to facilitate the visit to this school.

Implementation of the survey

The pre- and post-survey with the pupils took place in April and May 2014 (cf. tab.12). The interviews were conducted on the following dates:

Tab. 12: Timetable of the standardized survey

School	Number of pupils	Pre-Survey		Post-survey	
		Date	Place	Date	Place
WJD Cloete JSS	20	07.04.2014	NaDEET	19.05.2014	Rietoog
Windhoek International School	21	14.04.2014	NaDEET	28.05.2014	Windhoek
N Mutschuana PS	20	21.04.2014	NaDEET	23.05.2014	Gochas

The **pre-survey** took place in small groups of five pupils in the classroom of NaDEET. Before the distribution of the questionnaires, the pupils were informed about the intention of the survey and were given brief instructions for completing the questionnaire. It was explained, that the survey is not a test and the pupils should express their own opinion. The survey was personally observed and the children were able to ask questions at any time if there were any problems of understanding. It was ensured that the pupils worked independently.
During the survey, some people were always present, who could speak Afrikaans and Nama, to assist with translation. These were either teachers of the pupils or NaDEET staff members. Immediately after the completion of the questionnaires, these were checked for completeness. If a questionnaire was not complete, the pupil, who did not finish the questionnaire, was advised and asked to fill in the missing answers. This took place in the presence of the interviewer. The completed questionnaires were numbered and collected in a film, which was labelled with the name of the school.
The pupils who participated in the survey received a candy as a “thank-you”.
The **post-survey** took place with the same pupils who participated in the pre-survey. The locations of the survey were the schools in Rietoog, Gochas and Windhoek. The pupils were released from class for the survey and a free classroom was made available. The course of the post-survey was identical to the course of the pre-survey. The completed questionnaires were assigned to the corresponding questionnaires of the pre-survey based on the names of the children.
The pupils who participated in the survey received some coloured pencils as a “thank-you”.

Data analysis using SPSS®

In order to analyze the collected data of the survey with IBM SPSS Statistics® every individual question of the two questionnaires was translated into a variable which received a name. Questions with multiple answer options had to be split into multiple variables with different names. Here so many variables are necessary, as there are different answers options. The answer options for each question were coded. This means that every answer was assigned to a number. For this purpose, the answers of the open questions first had to be grouped into categories. While closed questions are categorized in advance, open questions are assigned to categories after the survey (Mayer 2013: 108). In this way, it was possible to enter the data into SPSS®. After entering the data, it was necessary to check these for plausibility and completeness. The analysis of the data was carried out both descriptively and inductively. The inductive analysis serves to verify the hypotheses (cf. chapter 4). For the inductive analysis (verification of hypotheses), bivariate analysis methods were used. Difference tests and correlation tests were carried out (MAYER 2013: pp 132-133).

6. Results

In this chapter the results of both the participant observation and the standardized survey are explained. The results are arranged with regard to the objectives of EE and ESD (awareness & knowledge, skills & participation).

6.1. Participant observation

In the following the results of the participant observation are described. The activities are assigned to the different objectives of EE and ESD, awareness & knowledge and skills & participation (cf. chapter 5.2.).

It should be mentioned that all activities described below, took place with the children of WJD Cloete JSS and N Mutschuana PS. The pupils of WIS did not participate in all parts of the primary school programme. As mentioned in chapter 5.1.2 they follow a northern academic year with school years starting in August instead of January. Because of this, they only had a few months left until they moved up into grade eight (secondary school). For this reason, the environmental educator decided to mix the primary and secondary programme for the pupils of WIS. Furthermore, the pupils left one day earlier, so the programme had to be shortened.

Nevertheless, the pupils of WIS participated in the most important activities or did similar activities with a higher educational quality. If not all schools are mentioned in the description of each activity below, this means that there were no mentionable conspicuousness.

6.1.1. Awareness & Knowledge

"*What is the environment*?"

The first activity named "*What is the environment*?" is an introduction to some basic environmental problems. The pupils were made aware of these problems and new knowledge about the environment was imparted. During the game, which the children carried out in groups, they realised that there is a natural and a built environment. The environmental educator pointed out that there are living, non-living and human made things. The pupils received a bag with different materials (camel thorn pod, feather, rock, cool drink tin etc.), which they had to assign to these three categories. A few of the children had to explain their decisions (cf. fig. 21). Then they talked about the pros and cons of human made things. There was a debate about the environmental problems caused by human made things. The environmental educator explained for example that a car provides transportation, but it also creates air pollution. Or a drinking tin serves as refreshments, but can also lead to problems with rubbish if it is not recycled.

Fig. 21: Example for living things

Behaviour of the pupils and staff:

The pupils seemed interested and participated in the game. The assignment of the different materials to the categories was easy for the pupils of WIS. They did not need much time and support to do it.

The pupils of WJD Cloete JSS and N Mutschuana PS had problems to fulfil the tasks asked. They had difficulties in distinguishing between non-living and human made things. The environmental educator assumed that the pupils could not solve the task because they did not understand everything due to a lack of English proficiency. Therefore, the environmental educator has decided to repeat difficult issues in Afrikaans. The teachers of both schools supported the staff in translating into Afrikaans or Nama to ensure that the pupils understand the most important issues. But it was not clear if the lack of English proficiency was the only reason for the problems of understanding. Sometimes the pupils did not respond even

though the questions were asked in Afrikaans. Nevertheless, the environmental educator still used English and Afrikaans during the following activities.

Fulfilled requirements:

The activity deals with the environment in its totality by considering both the natural and the built environment. Furthermore the pupils learn about the environment by practical experiences. Through group work teamwork was promoted.

"*Enviro[nmental] Crisis Game*"

The next game named "*Enviro Crisis Game*" allows a closer look at environmental problems and their complexity. Environmental problems such as air pollution, deforestation, loss of biodiversity, water wasting, urbanization and rubbish were hereby playfully identified by different sounds. Fact sheets about these problems served as support to identify the sounds. Furthermore, pictures of the environmental problems were hanging on the walls of the classroom.

Fig. 22: Pupils playing the "*Enviro Crisis Game*"

The pupils played this game in groups. If they guessed a sound, a pupil from every group matched up a fact sheet and went to the picture with the corresponding environmental problem (cf. fig. 22). The environmental educator checked if the answer of the pupils was right. If it was, the environmental educator chose somebody to read out the fact sheet, if it was not, the pupils had another chance to find the corresponding environmental problem.

Behaviour of the pupils and staff:

The game was too difficult for the children of WJD Cloete JSS and N Mutschuana PS. They needed a lot of time to read the fact sheets and could not assign the sounds to the environmental problems. Maybe some of them did not read the fact sheets because their English was not good enough or they did not have enough time to read it. The difficulty to assign the sounds to the correct environmental problem was comprehensible because it was not always possible to identify the sounds. In addition, some of the sounds were not clearly assignable to only one environmental problem.

However, the pupils were supported by the environmental educator and the centre assistant. Even if the game was not easy, it can be assumed that the children made new experiences

and were made aware of problems which they did not know before. In addition, they had fun doing the game.

Fulfilled requirements:
The activity deals with ecological aspects such as biodiversity, waste, emissions and air pollution. Many environmental problems are addressed. This activity also took place in group work and thereby promoted teamwork.

"*Enviro[nmental] Dramas*"

The activity called "*Enviro Dramas*" addresses not only environmental problems but also social problems in Namibia. Social problems are, for instance, poverty, food insecurity, unemployment, increasingly dysfunctional family life, alcoholism, HIV infection and violence (Government of the Republic of Namibia 2004: 111). As NaDEET Centre focuses on environmental issues the problems listed above are not handled with highest priority but they help to explain environmental threats within their broader context. For this game, the environmental educator defined topics which then will be presented by the pupils in a short play. Possible topics could be rubbish, biodiversity, water and energy as environmental problems but also food or health as social problems. The topic health could deal with the high alcohol consumption in Namibia and how unhealthy it is for the people. The pupils got some time during the day to prepare their "*Enviro Dramas*".
This game took place with the pupils of WJD Cloete JSS, WIS and N Mutschuana PS.

Behaviour of the pupils and staff:
The preparation and presentation of the dramas were very difficult for the children of WJD Cloete JSS and N Mutschuana PS mainly due to their struggle with the English language. In addition, it was unusual for them to be creative and to think up something new. The teachers of the pupils mentioned that they had never done something like this at school. Maybe the pupils would have needed more instructions for a better course of the plays. Furthermore, they were very shy and did not dare to speak in front of all of the others. Perhaps the pupils could have gotten more support from the environmental educator and the centre assistant.
Most of the pupils of the WIS were very distracted and did not take the game seriously. They were very loud and it can be assumed that they did not understand the meaning of neither the social nor the environmental problems. The few pupils, who took the dramas seriously, had no chance to present them. Since most of the pupils were not quiet at the environmental educator's request, the staff did not have the patience to reprimand the pupils.

Fulfilled requirements:

During this activity the environment in its totality was included by dealing with environmental and social aspects. Biodiversity, prevention of pollution and waste were addressed as environmental aspects. Promotion of human health was included as social aspect. It is possible to deal with aspects of other fields such as economy or culture because the activity can be arranged very flexible.

"Solar Electricity @ NaDEET"

Besides the social problems also technological aspects in terms of alternative energies sources are covered at NaDEET. The technological aspects are very important at NaDEET Centre because all of the centre's electronic devices work with solar energy. During the day, solar energy charges batteries for electricity at night (NaDEET n.y. g: www).

The primary school programme therefore includes the activity "*Solar Electricity @ NaDEET*" which deals with the technological aspect of solar energy at the Solar Park at NaDEET Centre. The Solar Park produces the solar electricity and is an information centre. The environmental educator explained how the solar panels work and for what purpose they can be used (cf. fig. 23). The environmental educator highlighted that the solar energy does not pollute the air. Attention was drawn to the fact that solar panels are expensive, but once they are installed the produced energy does not cost anything. Furthermore, the pupils could inform themselves about solar energy at the Solar Park. The pupils could read on different boards about NaDEET and how to produce electricity with solar energy (cf. fig. 24).

Fig. 23: Educator with the pupils at the Solar Park

Fig. 24: Information board

Behaviour of the pupils and staff:
The pupils seemed to be interested. They listened to the environmental educator and asked questions about the solar panels. Unfortunately, it is impossible for most families of the pupils of WJD Cloete JSS and N Mutschuana PS to afford solar panels. However, the children are made aware and gain new knowledge of solar energy and new technologies which they did not know before.

Fulfilled requirements:
The environment in its totality was considered by dealing with environmental and economic aspects. Environmental aspects including air pollution and economic aspects of sustainable and innovative technologies were mentioned. The pupils got an idea of how new technologies can be used to improve the environmental situation of the future.

"Biodiversity Dune Walk"

During a three-hour "*Biodiversity Dune Walk*" the pupils learned something about the local geography especially about the NamibRand Nature Reserve and the surrounding mountains. The origin of the red dune sand was demonstrated. Even though, the dune walk mainly addressed the topic of biodiversity. The pupils were also taught important facts about water and how to handle it. They should understand that indigenous animals and plants can survive in the desert because they "save" food and water which they already have, instead of trying to get more. This should be related back to humans and our continuous demand for more instead of saving what we already have.

Behaviour of the pupils and staff:
The pupils of WJD Cloete JSS and N Mutschuana PS were interested in the different animals and plants and in their ability to save water. The information, given by the environmental educator, was new to them. In consequence they gained knowledge about local and regional conditions and living and non-living things in the environment. Besides the learning outcomes, they had a lot of fun playing in the dunes.
For the pupils of WIS the dune walk seemed to be exhausting. They complained about the heat and the length of the dune walk. It gave the impression that they had no interest in the animals or were afraid of them. Some of them shouted "*Kill this animal!*". It seemed that the environmental educator and the centre assistant only worked with a small group of interested pupils. Other pupils left the group following their own path instead of joining the group. Many pupils were very loud and the environmental educator and the centre assistant could not attract their attention.

Fulfilled requirements:
The pupils gained new knowledge about local environmental conditions. They learned basic facts about the Namib Desert. Furthermore, the children experienced the biodiversity of the desert and learned the sustainable use of water by adapting strategies of animals and plants. In this way the activity includes ecological and economic aspects.

"Water is Life"

The activity "*Water is Life*" deals with international environmental conditions. The water resources on Earth are topic of this activity. Using a world map, pupils demonstrated where water can be found. The environmental educator showed the availability of fresh water for human consumption by using a 30 litre water container, a white painted one litre water bottle and a bottle cap. On the basis of the bottles the relation between frozen, salty, dirty and fresh water availability of the world can be shown. Pupils were made aware that humans can drink only a very small part of the earth's water and that it is therefore important to save fresh water. It was also pointed out that Namibia has only a little amount of fresh water in comparison to for example its neighbour state, Botswana, and other countries of the world. The environmental educator explained the reasons for that. The main reason is the Benguela current in front of the coast of Namibia which is responsible for the low precipitation in the country. It was not explained how much fresh water is available in other countries, therefore the pupils did not have a comparison with environmental conditions in other countries. Environmental problems of other countries of the world were not described.

Behaviour of the pupils and staff:
It seemed to be a new experience for the pupils of WJD Cloete JSS and N Mutschuana PS to look at a world map. It was difficult for them to show where water can be found on Earth. They were surprised when they saw the little amount of fresh water which is available for the humans. It was obvious that the students had learned new facts about water.

Fulfilled requirements:
The activity deals with local, national, regional and international points of view because the fresh water availability of Namibia, its neighbour states and the whole earth is addressed. However, the focus mainly is on Namibia, while only little information was given about other countries.

"Make Your Own Water Cycle"

The activity deals with the principles of condensation, transpiration and evaporation. First the environmental educator explained the water cycle. Including the pupils, the staff member drew the water cycle on the whiteboard in front of the class. Then every child had to draw their own water cycle in their "*Sustainable Living Journals*" (cf. chapter 3.3).
After drawing the water cycle the pupils got jars and went outside in the dunes. The environmental educator asked the pupils to put pieces of plants for example leafs into their jars and close them. Then they should expose their jars to the sun. After a while the children should control their jars. They could see water drops in the jars and concluded from this that the plants had lost water. In this way they were taught the principle of transpiration.
In addition, pupils set up an experiment using petroleum jelly to mimic the effect of a waxy layer on a plant's leaf to prevent transpiration. Two different leaves on the same plant were chosen. One of the pupils applied petroleum jelly to one of them. Then plastic bags were placed around the leaves and closed with a band. After a few hours, the children could find water drops in the plastic bag of the leaf without the waxy layer. In the bag where petroleum jelly was applied on the leaf no water drops were found. In this way, they experienced how the waxy layer reduces the water loss of the plant.

Behaviour of the pupils and staff:
The activity took place with WJD Cloete JSS and N Mutschuana PS. Most of the pupils made every effort to draw their own water cycle. They liked to work with coloured pencils and took the tasks seriously. The water cycle on the whiteboard in front of the class was a good orientation for the pupils. However, the children did not get enough time from the educator to accomplish this task. Pupils of both schools were interested and had fun collecting pieces of plants and hiding their jars from other groups in the dunes. Sometimes they did not listen to the environmental educator and the centre assistant because they were busy with collecting plants. But they were surprised about their results and interested in the explanations about it.

Fulfilled requirements:
The first part of the activity allowed the pupils to be creative and to do something on their own. The last part of the activity was very practical and enabled first-hand experiences. In this way, the pupils learned about an important ecological cycle.

"Environmental Problems Around Us"

The activity "*Environmental Problems Around Us*" deals with past, current and future environmental problems. The pupils did this activity in groups. Each group received three posters and should discuss about the figures which could be seen on them. The posters are named "*Are you living a low carbon lifestyle*?", "*100 years ago vs. today*" (cf. fig. 25 and 26) and "*Life without adaptation vs. life with adaptation*". The pupils could see differences between sustainable and unsustainable lifestyles. Furthermore they could see the living situation 100 years ago in comparison to today. The pupils explained what they can see on the different posters. The ideas of the pupils were collected on a whiteboard in front of the class. Identified problems were wasting, cutting down trees, open fire, smoke, pollution (air/water), dead animals and plastic bags. Solutions of the problems, which the pupils could find on the posters, were solar energy, rainwater harvesting, bicycle, cloth bags, education, working together and planning. The environmental educator asked the children if they wanted to go back, to the time 100 years ago. They had to explain their answers. Most of them did not want to live in the past but they wanted to take some good things from the past into the future.

In this context the environmental educator explained the term sustainable development. It was mentioned that most people like progress (cell phones etc.), but that they had to develop things in a sustainable way and think about the future.

Based on the pictures below it was easy for the children to recognize environmental problems.

Fig. 25: Poster "100 years ago" (KEDING 2009: 3)

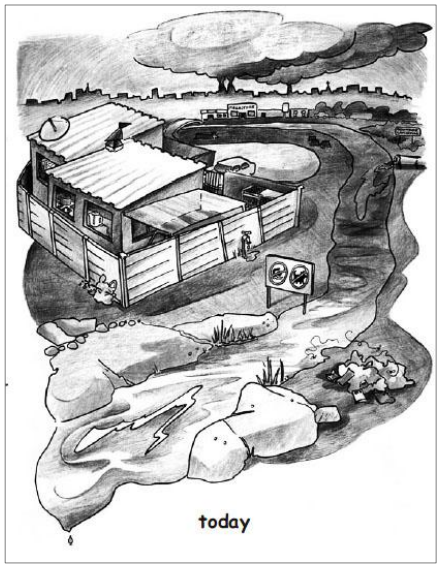


Fig. 26: Poster „Today" (KEDING 2009: 3)

Behaviour of the pupils and staff:

The pupils of WJD Cloete JSS and N Mutschuana PS were interested in the different lifestyles and environmental situations. They compared it and were proud when they found the differences between a sustainable and unsustainable lifestyle or between today and 100 years ago. First they were reserved, but when one child started describing the posters, more and more pupils were willing to tell their interpretations of the illustrations.

Fulfilled requirements:

The activity deals with past, current and future environmental situations. Through the direct comparison of present and past environmental situations, environmental problems were obvious. Without this comparison, it might be difficult for the pupils to imagine past situations. Furthermore, the sustainable use of resources and prevention of pollution, waste and emission as ecological aspects were included. Attention was drawn to economic aspects such as sustainable and innovative technologies. In this way the environment in its totality was considered.

"Power of the Sun Experiments"

The aim of the "*Power of the Sun Experiments*" is to explore the light and heat energy created by the sun. The pupils learned about the basic principles of solar energy that makes solar cooking, solar heaters and solar electricity work. The activity enables a hands-on opportunity to explore the basic principles of solar energy and energy efficiency. During the experiments the pupils learned that the sun is the original source of all energy, keeps the earth warm and makes life on earth possible. It provides light and thermal energy which can be converted into other forms of energy and stored.

The activity includes five stations with five different topics. The topics are "*Conduction and Insulation*", "'*Greenhouse Effect*", "*Absorption and Reflection*" (cf. fig. 27), "*Bundling"* (cf. fig. 28) *and "Waste Energy*". The activity took place in groups. Each group started at a different station and rotated through all the other stations. The pupils carried out every experiment with the help of a supervisor (e.g. environmental educator, centre assistant, teacher). They had to write down their results.

Fig. 27: „Absorption and Reflection“ experiment

Fig. 28: „Bundling“ experiment

Behaviour of the pupils and staff:

The pupils of WJD Cloete JSS and N Mutschuana JSS had fun during the practical part of the experiments. But they needed a lot of time to note down the results after doing the experiments. The pupils were interested in the experiments, but not all of them understood the explanations of every principle which was taught during the execution. In addition most of the pupils were not able to write down their results because of a lack of language skills. But the supervisors of every station tried their best to support the pupils in understanding and noting the results. There were sheets with every difficult word so that the pupils could copy the words they could not write. Another problem besides the lack of language skills was the lack of time. The pupils did not have enough time to carry out the experiments. Many pupils could not finish writing down their results because they had to go to the next station.

Fulfilled requirements:

The experiments were practical and enabled first-hand experiences. They provided a basic understanding of alternative technologies such as solar cookers and solar ovens.

6.1.2. Skills & Participation

“Solar Cooking @ NaDEET”

This activity consists of two parts, an introduction to the alternative energy equipment, which includes solar cookers, solar oven, fuel-efficient stoves and hot boxes, and cooking for breakfast, lunch and dinner using this equipment. The aim is that the pupils apply the solar energy concepts learned in the “*Power of the Sun Experiments*” to practical examples that

were used throughout the programme. The first part of the activity was a brief tour of the alternative energy equipment at NaDEET Centre. The children saw the equipment, learned their names, their functioning and principles of operation, and discussed the environmental and economic benefits of the equipment (cf. fig. 29). This was important because they needed the knowledge about the equipment for the second part of the activity. The pupils had to cook their own meals by using the solar cooker and solar oven during the day (cf. fig. 30). In the morning when there was no sun the children used the fuel-efficient stove for preparing their breakfast. For the fuel-efficient stoves recycled firebricks were used which were produced from waste paper. During cooking the pupils were supported by the staff members of the kitchen (e.g. kitchen manager).

Fig. 29: Introduction to the solar cookers

Fig. 30: Cooking with solar ovens

Behaviour of the pupils and staff:

Most of the pupils of WJD Cloete JSS and N Mutschuana PS had a lot of fun cooking the food. They were proud of their own meals. The pupils mentioned that they liked the food. Everybody helped to prepare the food, both girls and boys. The children were well supported by their teachers.

The pupils of WIS seemed to be interested in the alternative energy equipment but struggled to prepare their own meals. They were not supported by their teachers and they did not listen to the NaDEET staff. The pupils said that they did not like the food.

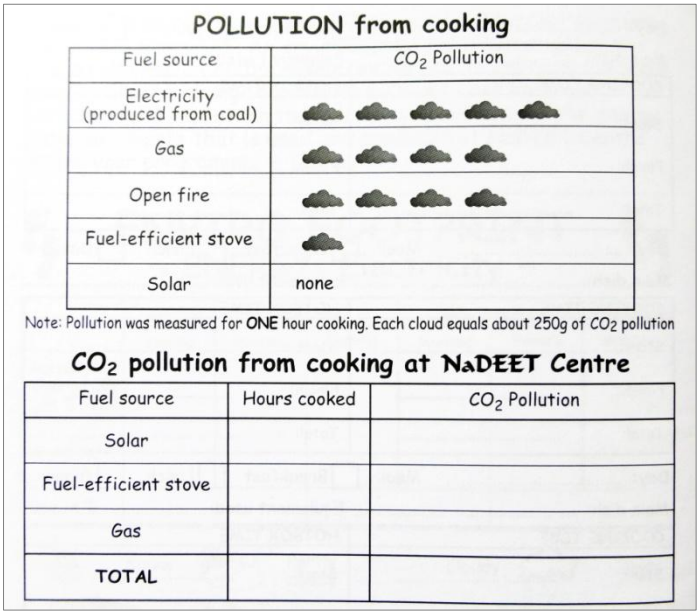
Fulfilled requirements:

The activity was very practical. The pupils learned how to use the solar alternative cooking equipment by first-hand experience. They could experience alternative technologies to cook meals without polluting the air. They could apply their new knowledge which they gained during the "*Power of the Sun Experiments*".

The usage of solar cookers and ovens could be an opportunity for action which refers to everyday life especially of the pupils of WJD Cloete JSS and N Mutschuana PS.

"Measuring our Enviro[nmental] Footprint"

"*Measuring our Enviro Footprint*" includes to measure electricity consumption, cooking hours, air pollution produced from cooking, water consumption and the amount of produced waste during the programme. Since the focus of this study is on energy and water, waste was not considered in detail.



POLLUTION from cooking

Fuel source	CO_2 Pollution
Electricity (produced from coal)	☁☁☁☁☁
Gas	☁☁☁☁
Open fire	☁☁☁☁
Fuel-efficient stove	☁
Solar	none

Note: Pollution was measured for **ONE** hour cooking. Each cloud equals about 250g of CO_2 pollution

CO_2 pollution from cooking at NaDEET Centre

Fuel source	Hours cooked	CO_2 Pollution
Solar		
Fuel-efficient stove		
Gas		
TOTAL		

Fig. 31: Table to write down the CO_2 pollution from cooking (DRUMM & KEDING 2013: 15)

To measure the electricity consumption the centre assistant checked the solar electricity batteries with the pupils in the evening and in the morning. The pupils noted the battery charge in percent and calculated the difference. They got support from the environmental educator and the centre assistant in doing so.

After cooking breakfast, lunch or dinner the kitchen staff noted which equipment was used for cooking and how long it took. At the end of the week the pupils calculated how much CO_2 pollution was produced by the group through cooking. The CO_2 pollution was noted in pollution clouds according to the chart provided (cf. fig. 31).

The water consumption was measured every day at the same time. The environmental educator and the centre assistant accompanied the pupils to their bathrooms. There they looked at the water level of the cold water tanks and noted the cold water consumption of the pupils by subtracting the current number from the number of the last day. Furthermore, they went to the hot water tanks behind the bathrooms and the pupils had to learn how to read a water meter. After reading the water meter the pupils calculated their hot water consumption by subtracting the number of the last day from the current number.

Back in the classroom the water consumption of every house group and of the main building was added up. The educator used an overhead projector. In this way everyone could follow the calculations. The result was the total water use of the whole group.

Behaviour of the pupils and staff:

The pupils of WJD Cloete JSS and N Mutschuana JSS had problems to understand how to calculate their energy and water consumption. Often there was not enough time to explain it again. Furthermore, they needed support in adding and subtracting. However, they got a sense of their energy and water consumption. At the first day at NaDEET they used a lot of water, but they reduced their water consumption during the next days. Some girls even got angry noticing that the boys were wasting their water to cool off. They regarded the water count as a competition between the house groups and were proud when they had used the lowest amount of water.

The pupils of WIS had no problems in calculating their energy and water consumption. But most of them were loud during calculating in class. When the pupils realised that the environmental educator made a mistake on the overhead projector while calculating the whole water consumption, they corrected her. In this case, the environmental educator did not correct the wrong number because time was short and she could not concentrate due to the high level of noises. It seemed that she was under pressure. The pupils became angry because the environmental educator ignored them and did not correct the wrong numbers. The teachers of the WIS could not ensure that their pupils were quiet and the teachers, apart from one of them, did not support the NaDEET staff. Furthermore, most of the pupils did not seem interested in saving water.

Fulfilled requirements:

The activity was very practical. The pupils learned to save water and how to measure their own energy and water consumption by first-hand experience. Furthermore, they experienced real opportunities for action. However it is questionable how the pupils could apply the methods of saving water in their daily lives.

6.1.3. Summary

The table below shows a summary of the activities and how they fulfil the different requirements. A check mark means that the activity complies with the requirements, while a cross means the opposite. The evaluation shows that NaDEET meets all requirements through its programme. The focus is on considering the environment in its totality and including practical activities and first-hand experiences. Furthermore, NaDEET shows real opportunities for action especially through the use of alternative energy equipment and water saving methods. In this way, a sustainable lifestyle was represented. The table shows (cf. tab. 13) that NaDEET treats past, current and future environmental situations only during one activity. The same applies to local, national and international points of view.

Tab. 13: Overview of the activities and requirements

Activity	Requirements			
	Environment in its totality	Local, national, regional and international points of view	Past, current and future environmental situations	Practical activities, first-hand experience and real opportunities for action
What is the environment?	✓	✗	✗	✓
Enviro Crisis Game	✓	✗	✗	✓
Enviro Dramas	✓	✗	✗	✓
Solar Electricity @ NaDEET	✓	✗	✗	✓
Biodiversity Dune Walk	✓	✗	✗	✓
Water is Life	✗	✓	✗	✗
Make Your Own Water Cycle	✗	✗	✗	✓
Environmental Problems Around Us	✓	✗	✓	✗
Power of the Sun Experiments	✓	✗	✗	✓
Solar Cooking @ NaDEET	✓	✗	✗	✓
Measuring our Enviro Footprint	✓	✗	✗	✓

During the observation of the various school groups, a difference between the schools from rural areas and the private school from Windhoek was noticeable. It became apparent that the pupils of WIS get a good education at their school, which allows them to understand difficult concepts. A major advantage of these pupils was that they speak English very well. It can be assumed that they understood most of the teaching contents, which NaDEET taught. However, a major obstacle for a successful run of the programme was the attitude of most of the pupils towards NaDEET. Most of the children expressed no willingness to adapt to the simple and sustainable lifestyle. Furthermore, it seemed that they did not respect the staff members. For the staff, it was therefore very exhausting to maintain the normal course of the programme. It was noticeable, that the mood of the pupils as well as of the staff was getting worse during the week.

The implementation of the programme with the children of WJD Cloete JSS and N Mutschuana PS was the opposite. There were great difficulties in teaching the pupils due to a lack of English skills and background knowledge in subjects like mathematics. Sometimes the course of the programme was interrupted because the children needed a lot of time to solve tasks. However, the children seemed always interested in the activities and derived pleasure from their time at NaDEET. They were willing to adapt to the sustainable lifestyle. Sometimes the children did not listen to the staff because they were not able to concentrate for a long period. But they respected the authority of the staff and responded to warnings to be silent.

6.2. Standardized survey

The analysis of the standardized survey helped to investigate the strengths, weaknesses and potentials of NaDEET's primary school programme in terms of promoting awareness, knowledge, skills and participation. Therefore different analyses were carried out.
The chapter is divided into the descriptive analysis and in further analysis (difference- and correlation-tests) with SPSS®. Interesting findings from the descriptive analysis are reviewed in more detail by using various tests of the statistic programme.

6.2.1. Descriptive analysis

Before the results in terms of awareness, knowledge, skills and participation are described, demographic data and some information about the use of water and energy of the children are considered.

6.2.1.1. Demographics

The 61 pupils of the three primary school groups are between 10 and 16 years old (cf. fig. 32). The average age is 12.57 years. The group of WIS was a homogenous group in terms of age and current academic grade. 20 of the 21 students of the WIS are at the age of 12 to 14 years. All of them are in grade seven.
15 of the 20 pupils of the group of N Mutschuana PS are at the age of 12 to 14, but not all of them are in grade seven, some of them are in grade six. Only a few of the 20 pupils of N Mutschuana PS are 11 years old and are in grade five or six.
The group of WJD Cloete JSS was a heterogeneous group in terms of age and current academic grade of the pupils. Eight of the 20 pupils are under the age of 12 years and are in grade five or six. Only ten children are between 12 and 14 years old. Not all of them are already in grade six or seven, some still are in grade five. Furthermore, the group included two children who are older than 14 years and are in grade seven.

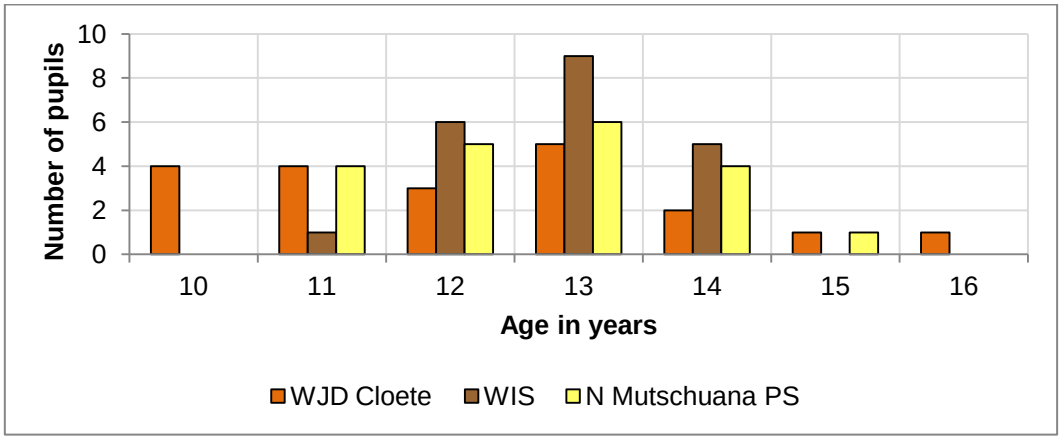


Fig. 32: Distribution of age (n=61)

Figure 33 shows, where the pupils come from. A distinction was made between city, town, village and farm. The four different forms of settlements were not distinguished based on facts such as the number of inhabitants. For this study, it is important to know if the children live in urban or in rural areas. Therefore, it was suitable, to let the pupils estimate themselves, whether they live in a city, a town, a village or on a farm. In order to verify their decisions, the children should also write down the name of their home town.

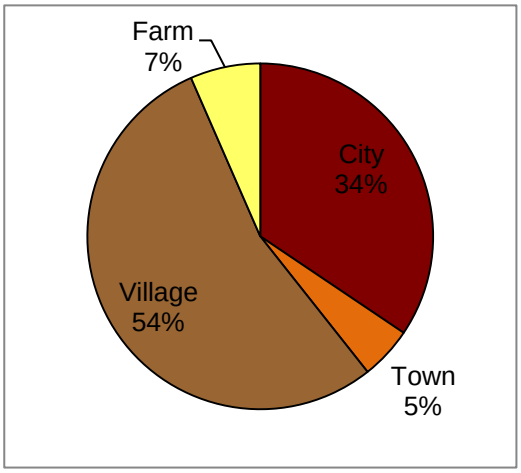


Fig. 33: Home of the pupils (n=61)

54% of the pupils come from villages. These villages are Rietoog and Gochas, where WJD Cloete JSS and N Mutschuana PS are located. 7% live outside the villages on farms. In conclusion, 61% of the children come from rural areas. Two pupils of WJD Cloete JSS and N Mutschuana PS wrote down that they come from towns such as Maltahöhe (6,000 inhabitants) and Keetmanshoop (18,900 inhabitants). However, Maltahöhe is usually not considered as a town in Namibia. All pupils of WIS (34%) chose that they come from cities. Most of them noted Windhoek as their hometown. In addition, a few students also mentioned the district in which they live for example Olympia, Ludwigsdorf and Dorado Park. These are some of the prosperous districts of Windhoek. Four of the children come from other African countries such as Angola (Luanda, Lubango) and Burkina Faso.

Use of water and energy

In order to address the effects of NaDEET on awareness, knowledge, skills and participation of the pupils in terms of water and energy, first it is necessary to describe the current practices of the pupils towards water and energy in their daily lives. Therefore, a group of questions which handles the cooking habits[1] of the pupils and a group of questions which takes a closer look at the way to bathe[2] were used (cf. chapter 5.3.2.).

Table 14 shows that most of the pupils always use an electric stove or an open fire to cook their meals at home. Gas stoves are used by some of the pupils as well, but most of them (62.3%) do not have a gas stove at home. Alternative ways of cooking such as fuel-efficient stoves or solar cookers and ovens are scarcely used. About 90% of the pupils do not have alternative energy equipment at home.

Tab. 14: "*What do you and your family use to cook your meals?*" (In percent; n=61)

	often	from time to time	never	We haven't got this at home.
Open Fire	**32.8**	**44.3**	3.3	19.7
Gas	18	18	1.6	62.3
Electric	**42.6**	**27.9**	3.3	26.2
Fuel-Efficient-Stove	1.6	4.9	3.3	90.2
Solar	1.6	3.3	1.6	93.4

As mentioned in chapter 2.1., the dependence on firewood for cooking and heating is a major problem in Namibia. The frequent use of open fires, especially in rural areas, can lead to environmental problems and a reduction of the quality of life of the Namibians. For this reason, the following pie charts describe the use of open fires for cooking in more detail (cf. fig. 34). The charts show a comparison between the use of open fires in urban and in rural areas. It is apparent that most of the pupils and their families, who come from rural areas, often or sometimes use open fires for cooking. Only a few children, who live in villages or on farms, never use open fires (3%) or do not have a fireplace at home (5%). In contrast, 42% of the pupils from urban areas do not have a fireplace for cooking. The pie charts show that firewood is a major energy source for the children and their families from rural areas, while the pupils from urban areas mainly use other energy sources for cooking. This result refers only to the children and their families interviewed in this study. It is not representative and therefore does not apply to all Namibians. But the results are similar to those of the Census 2011 (cf. chapter 2.1.; fig. 4) and give an idea about the living conditions of the pupils.

[1] "*What do you and your family use to cook your meals?*"
[2] "*How do you bathe at home?*"

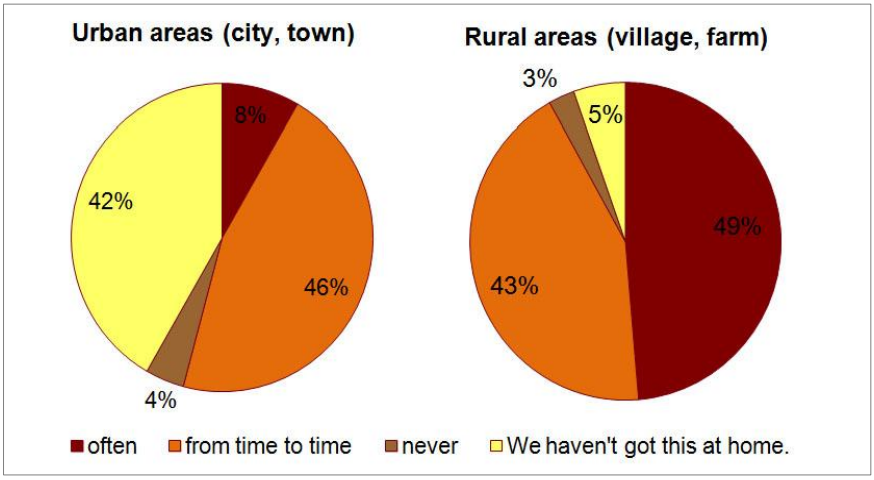


Fig. 34: Use of open fire for cooking; comparison between pupils from urban and rural areas (n=61)

In addition, the use of firewood is not only dependent on whether the people live in rural or urban areas. It can be assumed that other variables, such as the income, could have a big influence on the energy source which people use for cooking. According to the Government of the Republic of Namibia, many people are forced by poverty to use firewood as an energy source (cf. chapter 2.1.). Therefore, the dependence on firewood can give a hint about the financial situation of the children's families.

Besides the dependence on rare firewood, the water scarcity can also be a problem which reduces the quality of life of the Namibians (cf. chapter 2.1.). To understand how the interviewed children deal with water, it is necessary to know if they are affected by water scarcity. Therefore they should answer the question "*Do you always have enough water at home*?". Six of the 61 children answered the question in the negative. These six pupils come from rural areas (Gochas).

Also important is the question which opportunities are available for the children to wash themselves or rather which sanitary facilities exist at their homes (cf. tab. 15). 67.2% of the pupils have a bathtub at home. Most of them use it either often or only sometimes. A few of them never use it. 57.4% have a shower at home. Most of them often take a shower. Only a few of them use it either from time to time or never. A bucket bath is available to 55.7%. Most of them use it often or sometimes. Nobody has a bucket shower at home.

Tab. 15: "*How do you bathe at home?*" (in percent; n=61)

	often	from time to time	never	We haven't got this at home.
Bathtub	**32.8**	**23**	11.4	32.8
Shower	**39.3**	14.8	3.3	42.6
Bucket shower	0	0	0	100.0
Bucket bath	**27.9**	**24.6**	3.2	44.3

Previous experiences of NaDEET

In addition to the information about how the pupils deal with water and energy, it is also important to know if the children were informed about the work of the environmental education centre before their visit to NaDEET.[3] Therefore it is necessary to know if the pupils were at NaDEET for the first time[4] and if they know other people who have already visited NaDEET.[5]

All pupils answered that they visited NaDEET for the first time. But 51 of the 61 children know someone else who has been to NaDEET before. Most of the 51 pupils (55%) have a friend who visited NaDEET. Many children (33%) have a family member who was at NaDEET. Only a few of the children know a teacher (7%) or an acquaintance (5%) who was a participant of NaDEET's programme. Since the WJD Cloete JSS sent groups of pupils to the environmental education first time in 2008, the WIS in 2005 and the N Mutschuana PS in 2011, it is comprehensible that most of the children know friends, family members, teachers and acquaintance who were already at NaDEET (KEDING: E-Mail).

The following chart shows that approximately half of the pupils were informed in advance that they should learn about the environment and sustainable living at NaDEET (cf. fig. 35). This includes pupils from all three schools. Other children only knew that they should learn something new, but not what exactly. This answer was given by the pupils of WJD Cloete JSS and N Mutschuana PS. About ten pupils shared the opinion that they were at NaDEET to improve their team spirit. The chart below shows that this response was only given by pupils of the WIS. Only a few children could not specify a reason for their visit to NaDEET. The results show that the three school groups received different information about the reason for their visit to NaDEET. It can be assumed that pupils of the WIS received other information than the pupils of the other two schools. For the WIS it seemed to be important that their pupils strengthen their team spirit. WJD Cloete JSS and N Mutschuana PS seem to give their pupils less concrete information about NaDEET.

[3] "*Do you know why you are here? (Please write it down.)*"
[4] "*Have you ever been in NaDEET before?*"
[5] "*Do you know someone who already was in NaDEET? If so who? (Multiple answers are possible.)*"

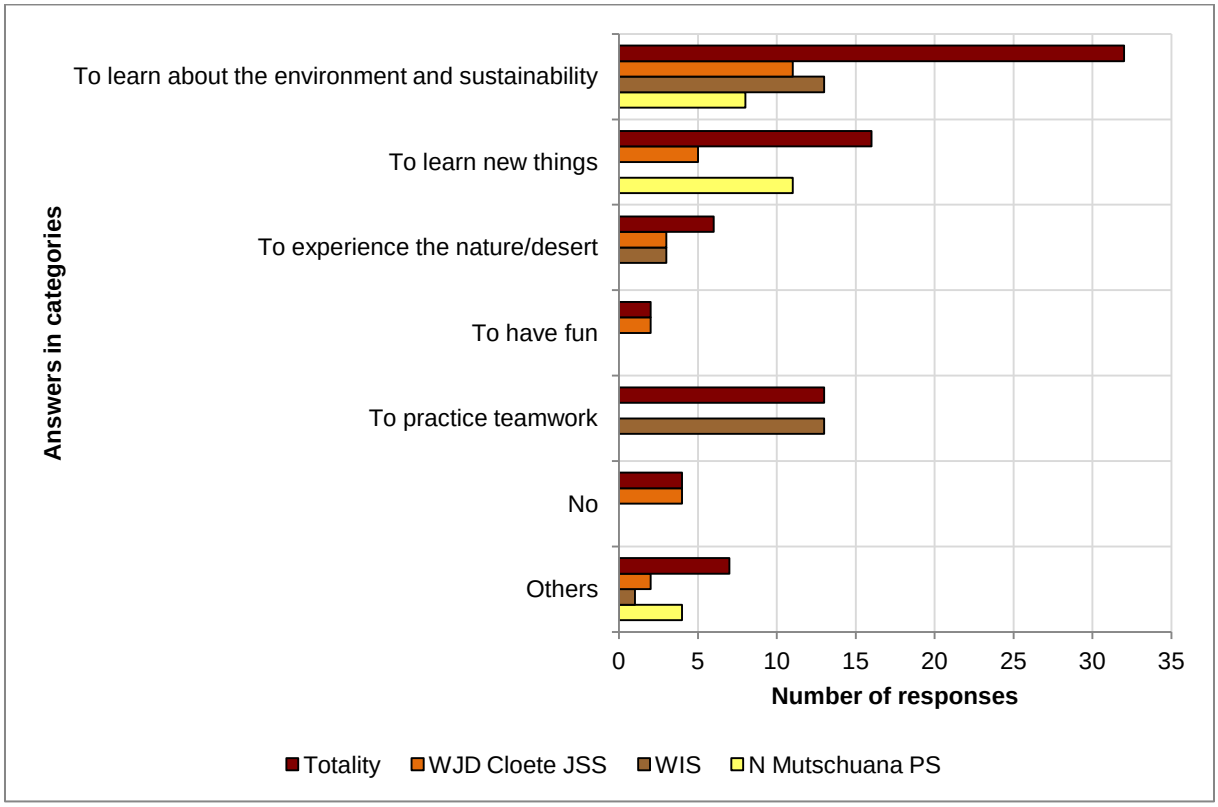


Fig. 35: "*Do you know why you are here?*" (n=61)

Summary and advice regarding the further analysis

With regard to the research question 2, it is pointed out that the following analysis of the data focuses on the differences between the pre-and post-survey. Furthermore, the analysis considers the differences between pupils with different living conditions and their influence on NaDEET's programme (research question 3). The demographic data and the information about the use of water and energy mentioned above show that the living conditions of the children of WJD Cloete JSS and N Mutschuana PS are very similar because both groups come from small villages in rural areas. However, the living conditions of the WIS pupils seemed to be very different in comparison to the other two school groups because most of them come from more prosperous districts of the capital city Windhoek. The findings of the participant observation support this assumption that there are differences between the school groups based on different living conditions. Therefore, in the following analysis the various school groups are considered in order to investigate, if the effectiveness of NaDEET's programme is influenced by the living conditions of the children.

The data were also examined for differences arising from the different ages and sexes of the children. No interesting insights resulted from this analysis, which may be relevant for this study. Consequently, the distinction between age and gender is no longer considered.

6.2.1.2. Awareness & Knowledge

In this chapter, NaDEET's support of the children to acquire awareness and a basic understanding of the environment in its totality is analysed. Therefore, it is necessary to first describe the **level of education** of the pupils in terms of environmental protection which results from the data of the pre-survey.[6] It is important to know, how much the pupils already learn about environmental protection at school, since it can be assumed that it is easier for NaDEET to teach the children about environmental issues if they already have basic knowledge. However, the focus of this chapter is on the comparison between the results of pre- and post-survey to investigate if the pupils gain **new insights in terms of water and energy** which they take home (cf. research question 2.1.). Attention is also paid to the **differences between the school groups** (cf. research question 3).

Level of education in terms of environmental issues

The pupils were asked if they have learned something about environmental protection at school. Almost all pupils (95%) answered the question in the affirmative. To substantiate this question, the pupils chose which topics in terms of environmental protection they have already learned at school. This was a half-open question. The pupils were able to select four given answers (cf. fig. 36) and note further topics under the category "*Others*". Five children of N Mutschuana PS mentioned a further topic named "*Keeping the environment clean*". The chart below shows, that the pupils know all of the four given topics in terms of environmental protection. The most frequently chosen topics are "*saving water*" and "*plants and animals*". Over a half of the 61 interviewed children said, that they learned something about these topics at school.
It is obvious, that only a few pupils of WJD Cloete JSS selected the topics "*environmentally friendly energy sources*" and "*recycling waste*" in comparison to the pupils of the other two schools.

[6] "*Have you ever learned something about environmental protection at your school? If so, about which topics in terms of environmental protection did you learn something at school?*"

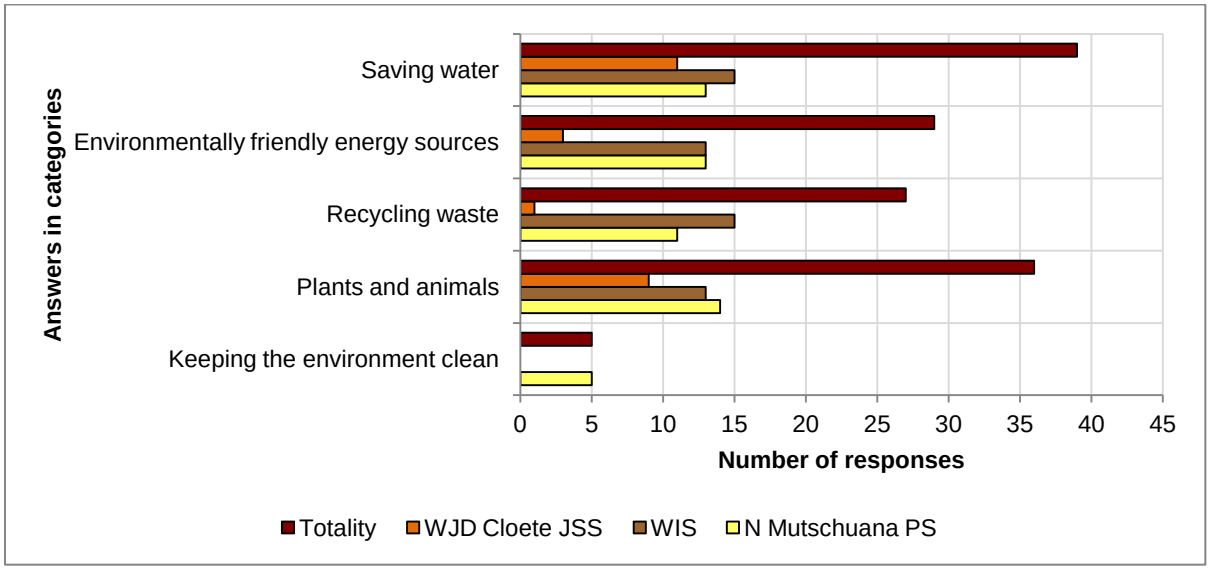


Fig. 36: "*If so, about which topics in terms of environmental protection did you learn something at school? (Multiple answers were possible.)*" (n=61)

New insights into environmental issues

After a short overview of the existing knowledge of the pupils, now it should be investigated if the pupils have gained new knowledge during their stay at NaDEET. It is considered whether the children have understood some important key messages from NaDEET. This includes for example the message that the people of Namibia have to save water and wood because both resources are becoming increasingly scarce due to environmental problems. It is necessary that the pupils understand why they should protect their environment. The knowledge of environmental problems enables the pupils to think critically and to be active in environmental protection.

For this purpose, attention is paid to some statements about the knowledge of the environment in general and about specific knowledge about the climate condition, the wood- and the water scarcity in Namibia.[7] The pupils valued these statements on a five-point rating scale ("*fully agree*" = 1 to "*strongly disagree*" = 5) both during the pre- and the post-survey. In this way, the knowledge of the pupils relating these statements can be checked before and after the stay at NaDEET. In addition they could chose the answer option "*I cannot assess this*.", if it was not possible for them for various reasons to value a statement. But this answer option was not included in the analysis of the data, because it cannot be assigned to the rating-scale. The option was treated as "no response". Thus, the number of the pupils (n) which is represented in the following charts shows how many pupils chose this option.

[7] "*What do you think about the following statements? Please value every statement: I think that the people of Namibia have enough water to live; I believe that there is enough wood in Namibia; I don't know much about our environment; I think it will be getting hotter in Namibia*."

Comparison between pre- and post-survey

In the chart below, the approval or disapproval of the pupils before and after their visit to NaDEET regarding the four statements is presented (cf. fig. 37). For this purpose, a comparison between the mean values is used. The higher the mean value, the lower is the approval of the statement. The mean values are used to provide a better overview of the results. Thus, the comparison between pre- and post-survey is easier and differences can be identified more quickly. The red points in the chart (cf. fig. 37) represent the mean values of the pre- survey; the orange points show the mean values of the post-survey. In order to highlight diversity of given answers, the standard deviation in form of error bars is shown. This form of graphical representation is also used in some graphics of the following chapters.

The chart shows that the differences between pre- and post-survey regarding the statements "*I don't know much about our environment.*" and "*I think that the people of Namibia have enough water to live.*" are the highest. The points which represent the mean values are far apart from each other. Related to the pre-survey the mean value of the first statement is 2.98. A mean value of 3.6 results from the post-survey. In consequence, the approval of this statement decreases. This means that more pupils in average said that they know more about their environment after the time at NaDEET. The approval also decreases regarding the statement "*I think that the people of Namibia have enough water to live.*" While the result of the pre-survey is a mean value of 2.22, a mean value of 2.93 results from the post-survey. The convictions that all Namibians have enough water available decreases after the time at NaDEET.
Regarding the other two statements there are no conspicuous differences in mean between the pre- and the post-survey. The differences seem to be very small. In addition, there is a negative trend discernible in terms of the statement "*I think it will be getting hotter in Namibia.*" The approval of this statement decreases. Since the rise in temperature is a proved trend for Namibia (cf. chapter 2.1.), the pupils are wrong when they refuse the statement. However, as the value of the post-survey is still under a mean value of 2, this also means an agreement with this statement.
As it is not possible to conclude from the descriptive analysis, if the differences between pre- and post-survey are significant, this is examined in more detail in chapter 6.2.2.1.

Figure 37 also shows the standard deviation (s) in form of error bars. The standard deviation indicates how typical a mean value is for all measured values (MAYER 2013: 120). In the interval which the standard deviation shows lie 95% of all answers. The lower the standard deviation and the smaller the interval, the better the mean value characterizes the distribution

of the data (ibid.: 120). In this case, the values of the standard deviation are very high. The reason for this may be the relatively small sample size of 61 interviewed children. Thus, the individual answers of the children have a large effect on the distribution of the data.
In addition, the statements were answered very opposing by the pupils.
The highest values of the standard deviation are reached by the statement "*I think that the people of Namibia have enough water to live.*" This means that the pupils value this statement very differently. With regard to the other statements there are some similarly high standard deviations.

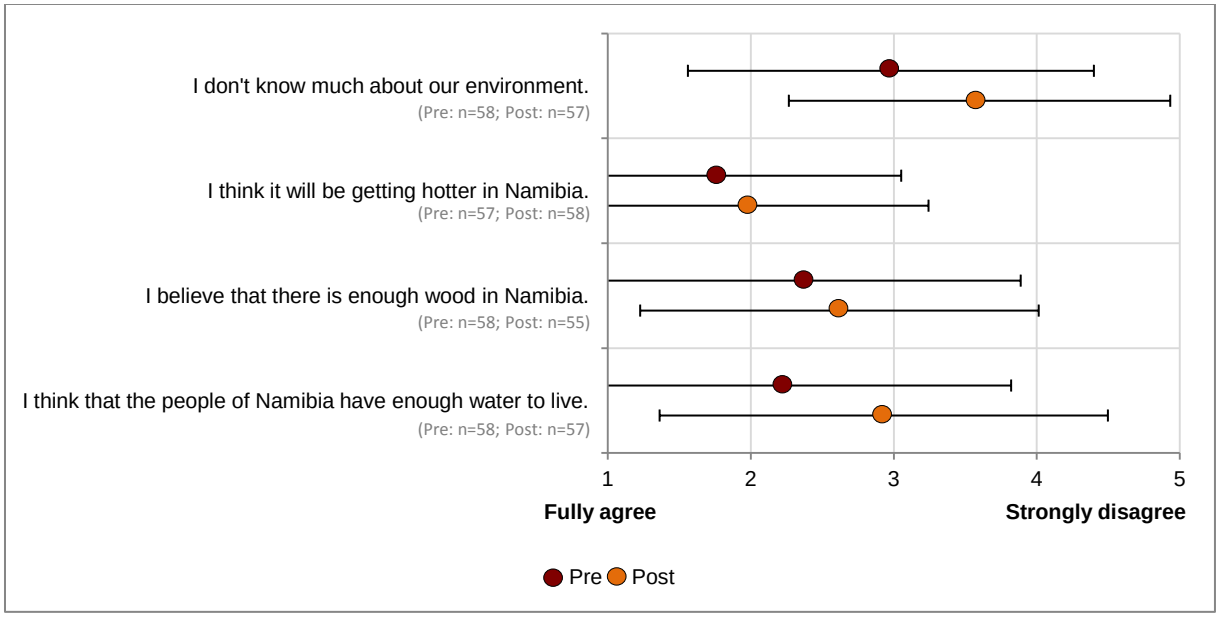


Fig. 37: Descriptive analysis "Awareness & Knowledge": "*What do you think about the following statements? Please value every statement.*" Divided into pre- and post-survey (in mean values)

Comparison between the three school groups

As in the bar chart above the totality of all interviewed pupils was considered, next, the differences between the individual school groups will be discussed. Again, the mean values are used to enable not only a comparison between the school groups, but also a comparison between pre- and post-survey. The higher the mean value, the lower is the approval of the statement. The line chart below shows the results (cf. fig. 38). The standard deviation is not specified to provide a better legibility of the line cart. However, it should be noted at this point, that the standard deviation values are very high. Since the individual groups are considered now, **n** is even smaller so that the effect of opposing responses is higher.
Looking at the mean values of the WJD Cloete JSS group no big differences between pre and post-survey are visible. The route of the line has shifted only slightly. The same applies to the group of the N Mutschuana PS. The difference between the mean values of the pre-

and the post-survey with regard to one statement is never greater than one. In contrast, the mean values of the WIS group show a big difference regarding the statements "*I believe that there is enough wood in Namibia.*" and "*I think that the people of Namibia have enough water to live.*" There are differences between the mean values of the pre- and the post-survey which are greater than two. Especially the mean values of the post-survey are very high in comparison to those of the other two school groups. This means, that the pupils of WIS expressed a much greater disapproval of the statements after the visit to NaDEET than the other children. Since the increasing wood and water scarcity are proved trends for Namibia (cf. chapter 2.1.), the pupils of WIS are right when they refuse these two statements. Through further analysis with SPSS® (cf. chapter 6.2.2.1.), it must be investigated whether the differences are significant or only arose by chance.

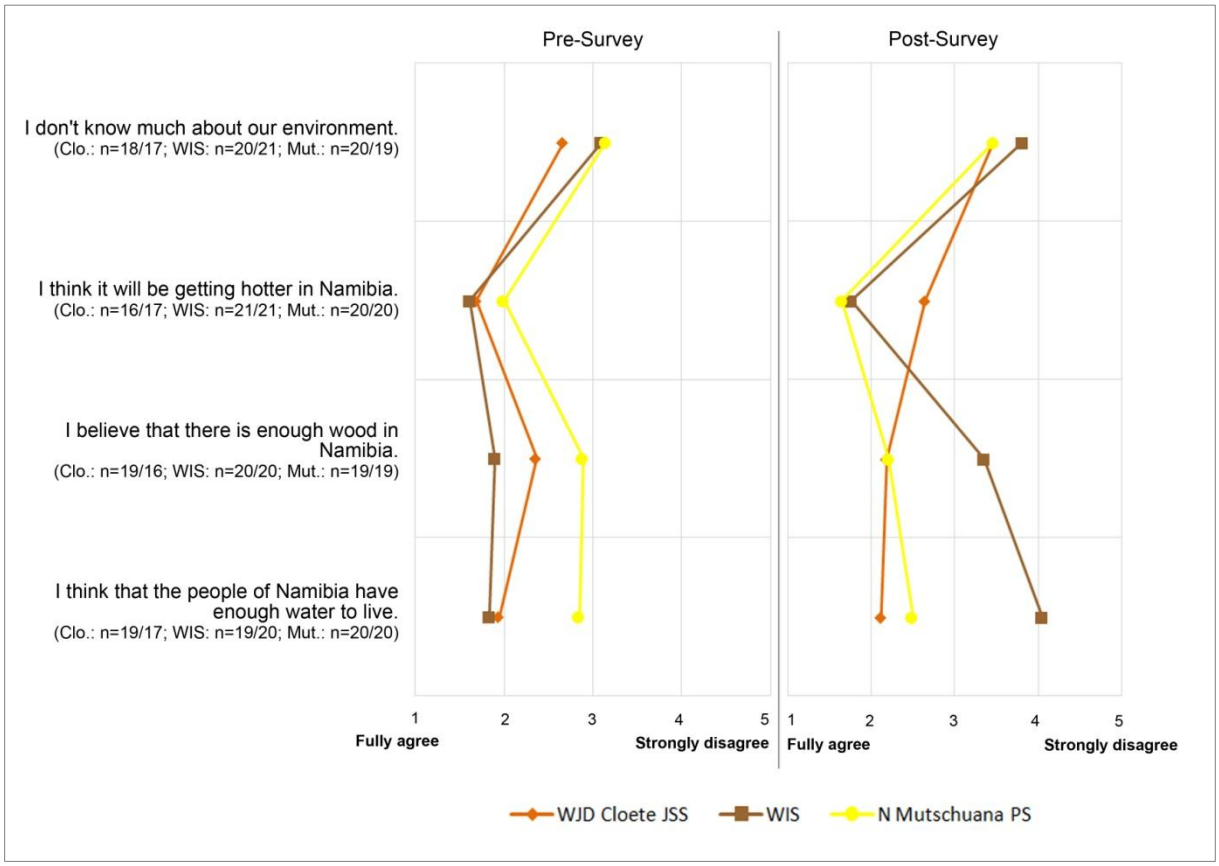


Fig. 38: Descriptive analysis "Awareness & Knowledge": "*What do you think about the following statements? Please value every statement.*" Divided into school groups (in mean values)

Disclosure of the knowledge about the environment

Whether the children have gained new knowledge was investigated by the approval or disapproval of several statements as mentioned above. However, it is also interesting to examine what aspects the pupils perceived as the most exciting. A sign for this can be the topics about which the children talk to their parents at home. The children were asked both before and after their visit to NaDEET what they told their parents about NaDEET.

Comparison between pre- and post-survey

90% (55) of the interviewed children answered in the affirmative the question if they told their parents of their intended stay in NaDEET.[8] These pupils wrote down about which topics regarding NaDEET they talked to their parents at home.[9] This is an open question, which the children should answer before their visit to NaDEET. Since it is an open question, the answers were assigned to different categories.
Considering the results of this question (cf. fig. 39), it is most interesting to determine if the pupils told their parents about the intention of the environmental education centre to teach them about environmental issues.

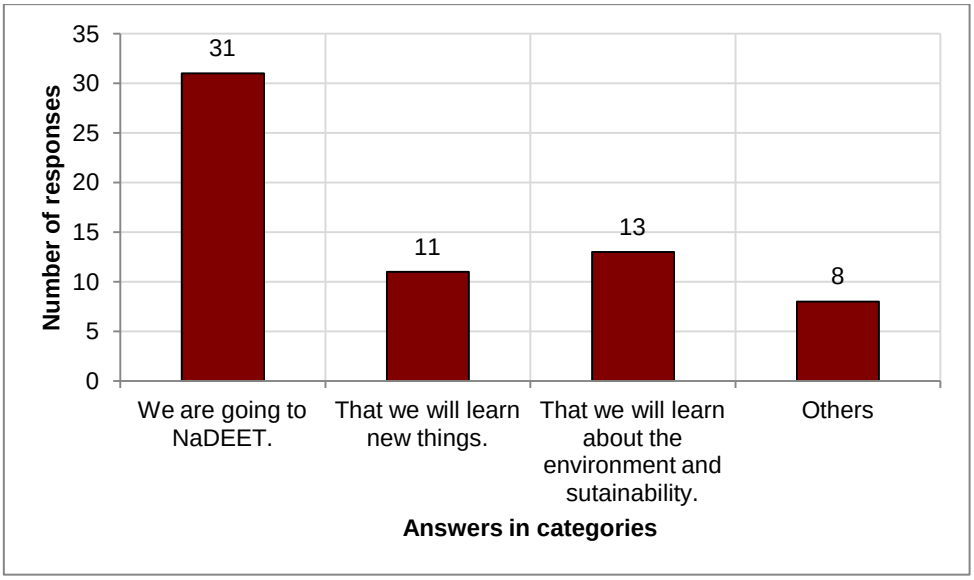


Fig. 39: Descriptive analysis: "*If so, what did you tell them?*" (n=55)

Before their visit, the 61 pupils mentioned to their parents only 13 times environmental issues regarding NaDEET (cf. fig. 39). The environmental education centre is represented 11 times

[8] "*Did you talk to your parents about your visit to NaDEET?*"
[9] "*If so, what did you tell them? (Please write it down.)*"

as a place where children can learn something new. The term "*something new*" was not explained any further by the pupils. However, most of the children did not talk about the reason for the journey to NaDEET. They only informed their parents about their stay at the environmental education centre, so that they knew where their children were.

After the visit to NaDEET, the pupils were asked again if they told their parents about NaDEET. Only two of them did not talk to their parents about their experiences at the environmental education centre.
In contrast to the results of the pre-survey, there are many responses in terms of environmental issues (cf. fig. 40).

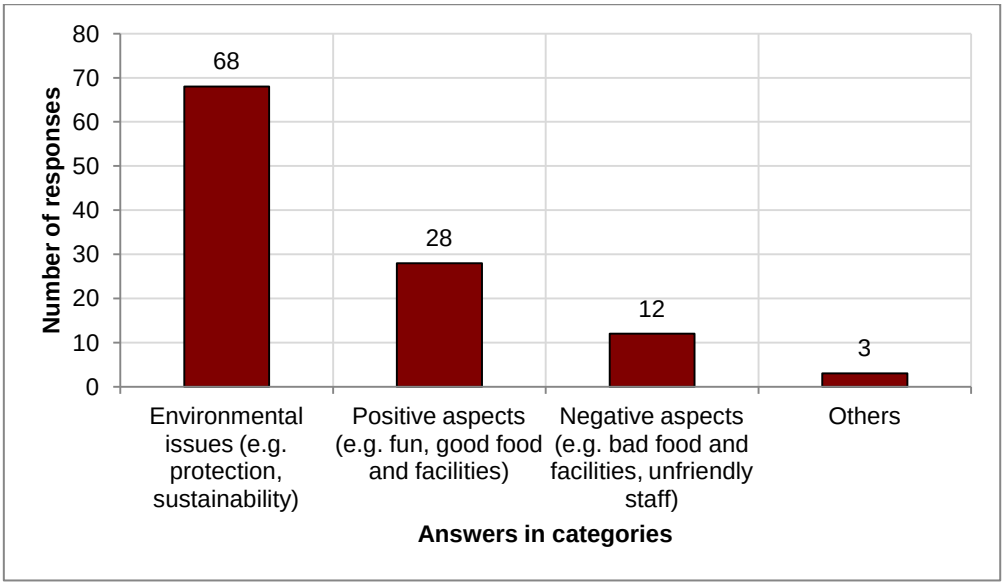


Fig. 40: Descriptive analysis: "*If so what did you tell them?*" (n=59)

Most of the pupils told their parents about environmental issues such as environmental protection (saving water and energy), environmental problems or alternative energies (solar energy).

"I told them that I learned how to save water and how to use solar energy in NaDEET. I also learned about human made, living and non-living things. I also learned about animals and plants."
(Questionnaire 9, WJD Cloete JSS, 14 years old, f.)

Many answers are similar to those mentioned above. The terms environment, water and energy can be found often in the answers. Besides, many positive aspects about NaDEET were mentioned. This includes for example the good food and facilities or the fun which the children had during their stay. There were also some negative responses. A few pupils did not like the food, the facilities and the staff.

In addition to this question, the pupils have indicated if they believe that their parents listened to them when they talked about their experiences at NaDEET. Only four of the 61 children answered the question in the negative.

Comparison between the three school groups

At this point, differences between the three school groups need to be indicated. Therefore it is considered how the 13 responses of the pre-survey and the 68 responses of the post-survey regarding environmental issues are distributed to the several school groups. The other conservation topics (positive aspects etc.) are not included in this part of the analysis because it should be investigated if the children made aware of environmental issues. The chart (cf. fig. 41) shows a comparison between the pre- and the post-survey regarding the responses of environmental issues. It is obvious that the pupils of WJD Cloete JSS and N Mutschuana PS told their parents much more about environmental issues than the WIS pupils did after their visit to NaDEET. By both school groups, there were around 30 responses for environmental issues, while there were only seven responses by the WIS pupils.

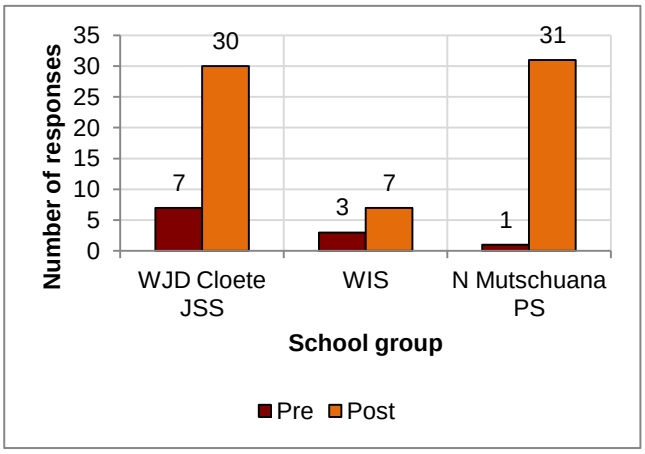


Fig. 41: Descriptive analysis: Responses regarding environmental issues (n=61)

6.2.1.3. Skills & Participation

In this chapter the results which are intended to answer the question of how the pupils use water and energy before and after their visit to NaDEET (cf. research question 2.2.) are described. In this way, it can be investigated if NaDEET teaches their pupils skills to counteract environmental problems such as water and wood scarcity. The skills can help the children to become actively involved in environmental protection.
Moreover, differences between the three school groups were considered, as in chapter 6.2.1.2., to answer research question 3 (cf. chapter 4).

The children were asked if they changed something in their daily lives in terms of water and energy consumption after their visit to NaDEET. Since the pupils should give a reason for their answers, an open question was used. Therefore, multiple answers were possible, so

the chart below does not show the number of pupils, but the number of different responses by the pupils. In order to address the differences between the school groups, not only the totality of all interviewed pupils is considered, but also the individual groups.

Regarding the totality of all interviewed pupils it becomes apparent, that most of the responses (45) refer to a sustainable use of water and energy after the visit to NaDEET (cf. fig. 42). In consequence, many children wrote down that they try to use less water and energy. Responses which were classified under the category "*I try to use it in a sustainable way*." are for example:

- *"When we arrived at Rietoog I told my mom and my big brother that they should not use so much water and energy*." (Questionnaire 14, WJD Cloete JSS, 11 years old, m.)
- "*Before I went to NaDEET I didn't know how to save water and how to use solar cookers but since I came back from NaDEET I saved a lot of water.*" (Questionnaire 15, WJD Cloete JSS, 13 years old, m.)
- "*We used little water for washing clothes. We didn't waste water at home now.*" (Questionnaire 49, N Mutschuana PS, 13 years old, f.)

However, in this context the problem of social desirability must be taken into account. It can be assumed that some children gave these answers, because they knew that this response is considered positively. It is questionable if the pupils actually deal more economically with water and energy. However, the result can indicate an approximate direction in terms of the sustainable consumption of water and energy.
In contrast, there are four responses which say "*I waste even more now*.". The chart below shows, that all four of these responses were given by pupils of the WIS. Furthermore, some children mentioned that they changed nothing after their visit to NaDEET.
The large number of responses in the category "Others" can be explained by the fact that many children of the N Mutschuana PS replied that they recycle waste at home since their visit to NaDEET. These responses were summarised under the category "Others", because the question aims at changes with regard to the water and energy consumption of the children. Altogether, no big differences between the responses of the three school groups are visible.

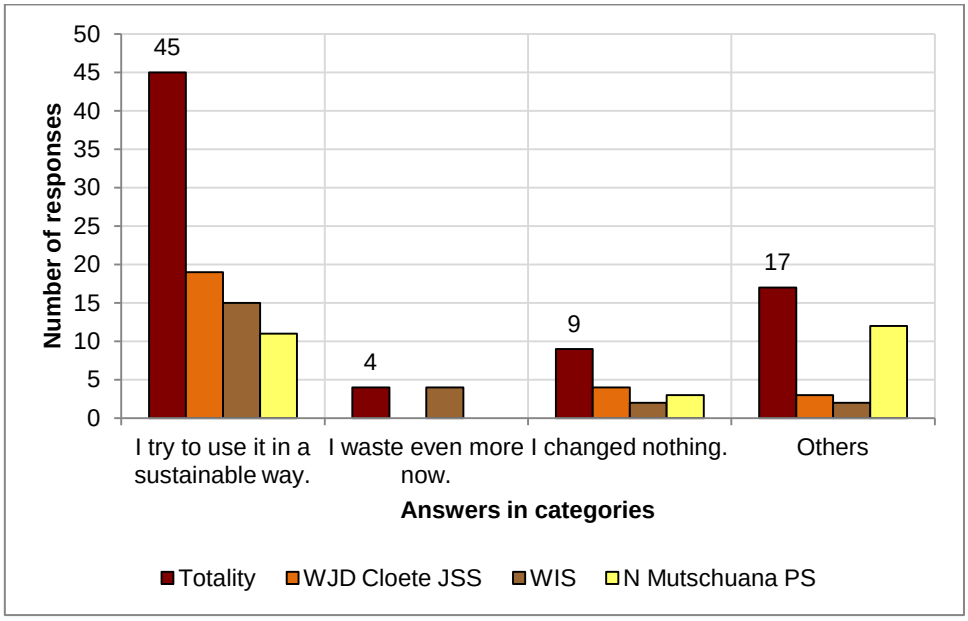


Fig. 42: Descriptive analysis: "*Has anything changes in your everyday life in terms of using water and energy since your visit to NaDEET? Please explain your answer.*" (n=61)

Based on the valuation of various statements, the changes regarding the water and energy consumption between pre- and post-survey can be considered in more detail. The pupils valued eleven different statements from "*fully agree*" (1) to "*strongly disagree*" (5). In addition, they could chose the answer option "*I cannot assess this*.", if it was not possible for them for various reasons to value a statement. But this answer option was not included in the analysis of the data. The reason for this is mentioned in chapter 6.2.1.2. For the presentation of the results, the mean values are used for the same reasons mentioned in chapter 6.2.1.2. In addition, the standard deviation is given in form of error bars.

Comparison between pre- and post-survey

First the totality of all interviewed pupils is described (cf. fig. 43). Considering the several statements only a few big differences between pre- and post-survey are visible. The first statement "*I pour dirty water away after doing the dishes.*" shows the greatest difference between pre- and post-survey in comparison to the other statements. The mean value of the pre-survey is 1.25 and of the post-survey 1.93. This means, that the approval of this statements decreases. Since the pupils are right when they refuse this statement, a positive trend can be listed. However, the mean value of the post-survey with 1.93 still shows a high agreement, even if the approval decreases in comparison to the pre-survey.
In contrast, other statements with a high difference between pre- and post-survey show a negative trend. This includes the statement "*My family waters their garden at lunchtime.*". The mean value of the pre-survey is 3.75 and of the post-survey 3.08. This means, that the

approval of this statement increases. Since water is wasted when the garden is watered during the hottest part of the day, the pupils are wrong when they agreed with this statement. However, regarding this statement, it must be taken into account that many students define the term “garden” differently. During the implementation of the survey, it became apparent that especially the pupils of WJD Cloete JSS and N Mutschuana PS could not imagine a garden, because they do not have one at home. Therefore, 37.7% of all pupils chose the answer option “*I cannot assess this*.”. Other statements show a negative trend as well. This includes for example “*I leave the tap open without using the water*.” (pre: 4.47; post: 4.31) and “*I don’t care about how much water I use every day.*” (pre: 3.88; post: 3.64). With regard to both statements the approval should actually decreases instead of increases. But the differences between pre- and post-survey are very small.

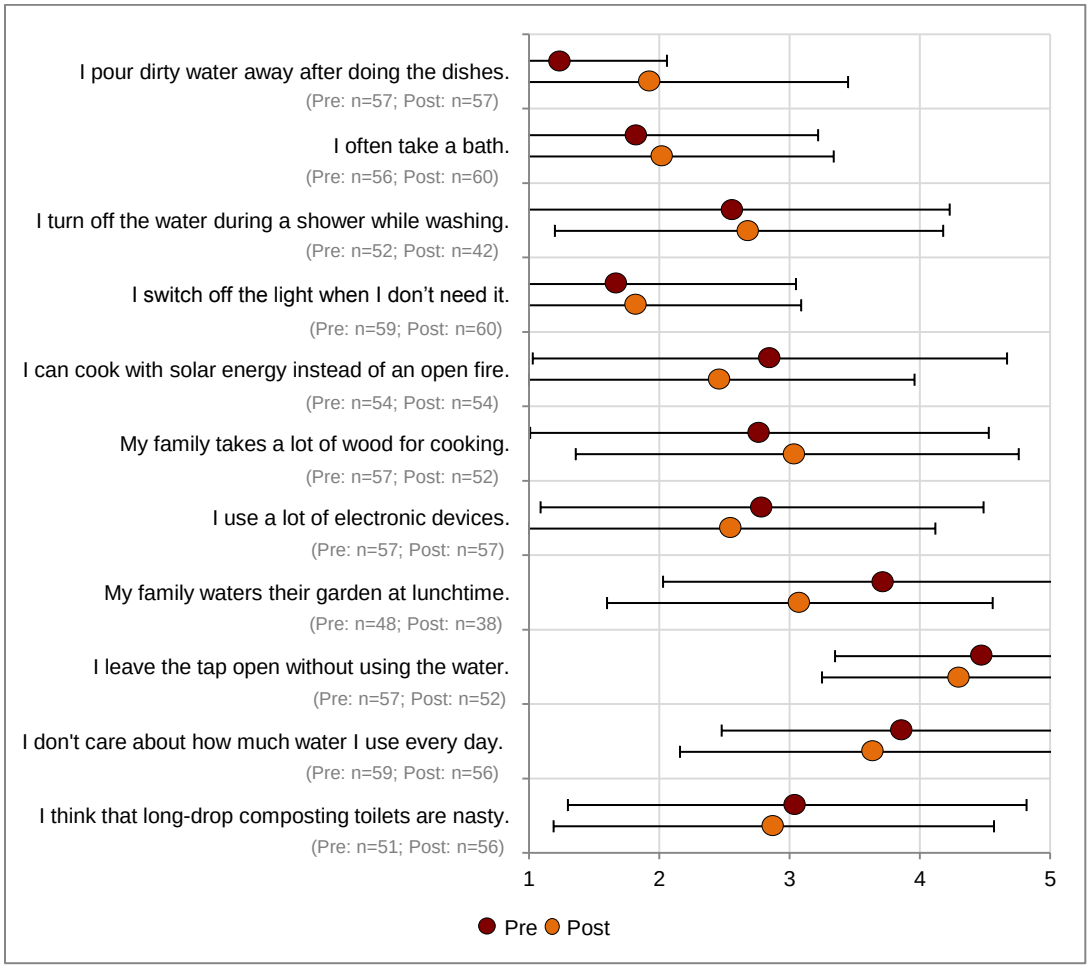


Fig. 43: Descriptive analysis “Skills & Participation”: “*What do you think about the following statements? Please value every statement.*” Divided into pre- and post-survey (in mean values)

Considering the whole chart (cf. fig. 43), there are more negative trends between the pre- and the post-survey than positive trends. As it is not possible to conclude from the

descriptive analysis, if the differences between pre- and post-survey are significant and influenced by NaDEET, this is examined in more detail in chapter 6.2.2.1..

Figure 43 also shows the standard deviation. The smallest standard deviation regarding the statements is 0.81 and the greatest is 1.82. Again, the reason for the high values of the standard deviation could be the relatively small sample size of 61 interviewed children and the very opposing responses of the children.

Comparison between the three school groups

Considering the line chart below, some differences between the school groups can be identified (cf. fig. 44). Most of the differences become apparent from the comparison between both rural schools with the WIS. The greatest differences are visible regarding the statement "*My family takes a lot of wood for cooking.*" While the pupils of the WIS on average refused this statement (both during the pre- and post-survey), the pupils of the other schools agreed with the statement. The greatest approval with this statement expressed the children of the N Mutschuana PS with a mean value of 1.95 (post-survey). This result corresponds to the responses of the children from rural areas who said that they mainly use open fires for cooking (cf. chapter 6.2.1.1.; fig. 34). The children of WJD Cloete JSS and N Mutschuana PS also agree with the statement "*I switch off the light when I don't need it.*" The greatest approval with this statement was expressed by the children of the N Mutschuana PS with a mean value of 1.05 (pre-survey). The pupils of the WIS show the greatest disapproval with regard to this statement. The value of 2.67 is close to the value of three, which means a neutral attitude towards the statement.
In contrast, the children from Windhoek approved of the statement "*I use a lot of electronic devices.*" The other pupils refused this statement with mean values greater than three. However it must be taken into account that the assessment to this statement can be highly subjective. The definition of "*a lot of*" depends in this context on how many electronic devices are available at home. If many electronic devices are present at home, they are perceived quickly as "the most natural thing in the world" and are hardly noticed.
Besides the differences between the school groups there are similarities as well. For instance, all pupils expressed a relatively high disapproval in terms of the statement "*I leave the tap open without using the water.*".

Considering the changes between pre- and post-survey regarding every individual school group, there are only some small differences visible (cf. fig. 44). The most positive changes become obvious by the children of the WJD Cloete JSS while the data of the other two

schools show many negative changes after the visit to NaDEET. If the observed differences are really significant and are influenced by the different living conditions or by NaDEET's programme, must be investigated further.

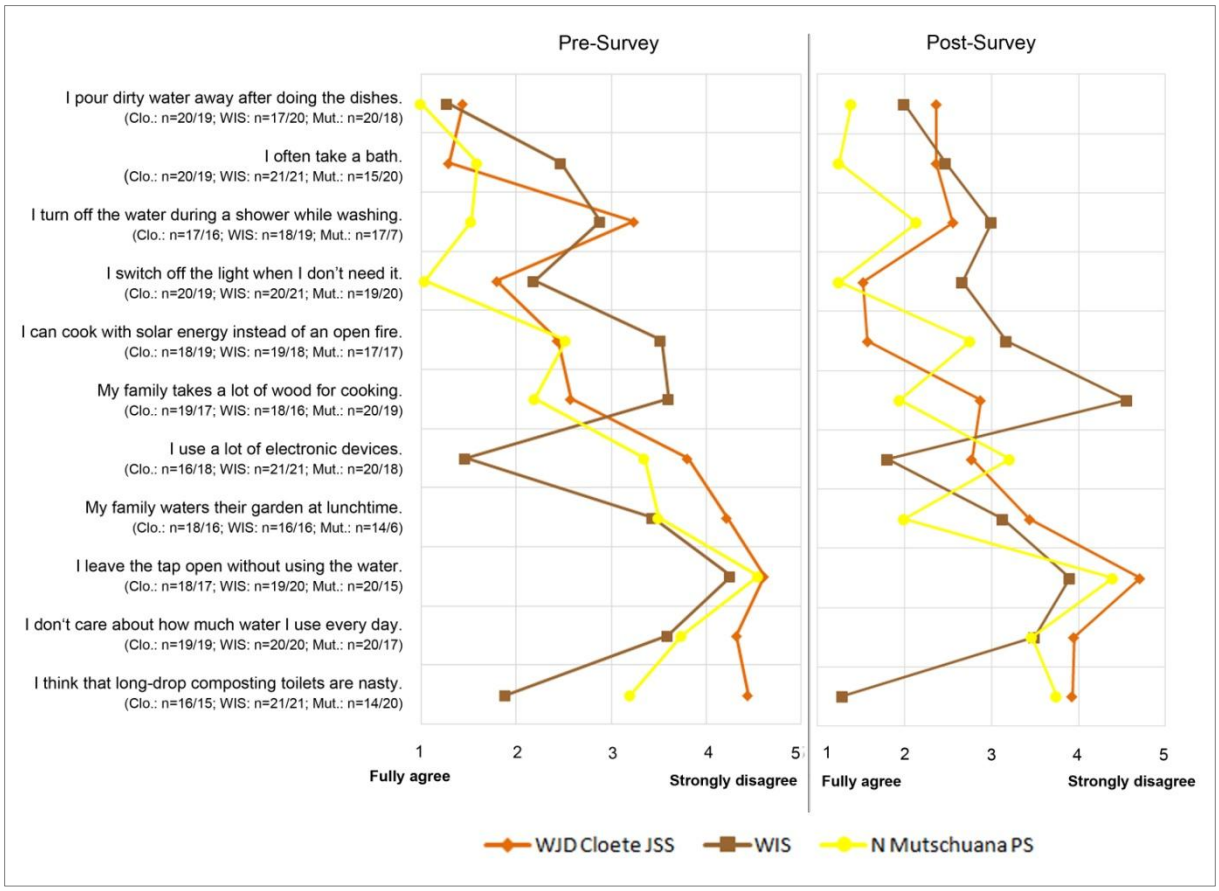


Fig. 44: Descriptive analysis "Skills & Participation": "*What do you think about the following statements? Please value every statement.*" Divided into school groups (in mean values)

6.2.1.4. Opinion

In this chapter the opinions of the children regarding NaDEET and the primary school programme are described. The opinions include the expectations of the children towards NaDEET before their stay as well as the opinion about NaDEET after their visit. As in the previous chapters, the changes between pre-and post-survey are considered as well as the differences between the school groups.

First the expectations of the children towards NaDEET are discussed (cf. fig. 45). For this purpose, the children answered the question if they look forward to the time in NaDEET. This is a closed question with five answer options ("*fully agree*", "*partially agree*", "*neutral*", "*partially disagree*" and "*strongly disagree*"). The bar chart below shows the results of this

question. The chart represents the totality of all pupils, but also the answers of the individual schools in percent.

Considering the totality it is obvious, that most of the pupils (84%) have been looking forward to NaDEET (cf. fig. 45). Only five children partially agreed (8.2%). Three pupils (4.9%) showed a neutral attitude towards NaDEET and two pupils (3.3%) were not happy about their visit to the environmental education centre. These ten children who did not chose the category "*fully agree*" come from the WIS. Thus, 100% of the pupils of WJD Cloete JSS and 100% of the pupils of N Mutschuana PS were happy about the upcoming visit to NaDEET, while the WIS pupils had different opinions.

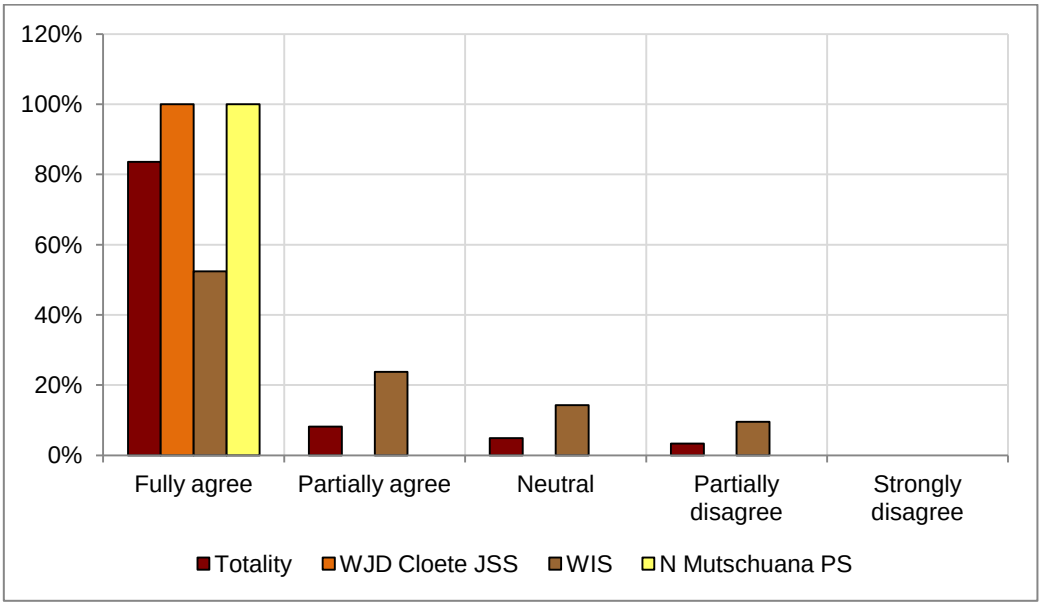


Fig. 45: Descriptive analysis: "*Are you looking forward to the time in NaDEET?*" (in percent; n=61)

During the post-survey, a similar question was asked. The pupils should answer how they like NaDEET. This is also a closed question with a five-point rating scale ("*very well*", "*well*", "*neutral*", "*badly*" and "*very badly*"). In this way the comparison between both questions is possible to examine the connection between expectations and the opinion after the visit.

At a glance, it is obvious that the distribution of responses is similar to the distribution of responses in the chart above (cf. fig. 45).

Considering the totality of all interviewed pupils (cf. fig. 46), more than half of the children (63.9%) liked NaDEET very much. But this includes only the pupils of WJD Cloete JSS and N Mutschuana PS. Most of the children of the WIS chose the answer options "*well*" (47.6%). Five pupils showed a neutral attitude towards NaDEET and another five pupils did not like the visit to the environmental education centre. One of the WIS pupils said that the time in NaDEET was "*very badly*".

In consequence, with regard to both questions, the answers of the WIS pupils are more negative than those of the other children. It can be assumed, that there is a correlation between the expectations (pre-survey) and the opinion about NaDEET after the visit (post-survey). It seems that the expectation towards NaDEET is the independent variable and the opinion about NaDEET is the dependent variable. Whether this correlation is significant or caused by chance can be investigated by further analysis with SPSS® (cf. chapter 6.2.2.3.).

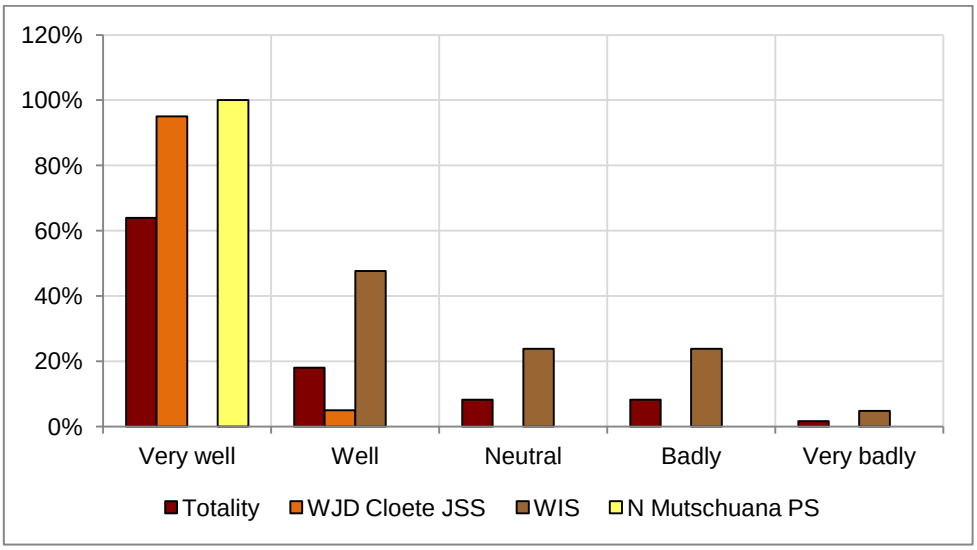


Fig. 46: Descriptive analysis: "*Altogether how do you like NaDEET?*" (in percent; n=61)

Considering figure 46, the question of the reasons for the good or bad opinion about NaDEET after the stay there arises. Using a Likert-Scale, the reasons for the opinions of the children should be examined in more detail. The pupils valued different statements on a five-point rating scale ("*fully agree*" to "*strongly disagree*"). The results are described using the mean values of every statement. The linear diagram below shows the valuation of the statements of every single school group (cf. fig. 47). It is obvious, that the mean values of the WJD Cloete JSS and the N Mutschuana PS are very similar, since the lines are quite close to one another. The pupils refuse negative statements about NaDEET and approve of the positive statements. For instance, they expressed with a mean value of 1 that all of them had a lot of fun in NaDEET and they want to visit NaDEET again (mean values of 1.2 and 1.05). Only one bigger difference between both school groups is visible regarding the statement "*My expectations weren't fulfilled*."

In contrast, the line of the WIS group shows a different course. The mean values differ plainly from those of the other school groups. Towards the most positive statements about NaDEET the pupils show in average a neutral to negative attitude. Negative statements about NaDEET are not so clearly refused as by the other children. But the WIS pupils partially agreed with the statements that they learned new things and gained new insights about the

topics water and energy. However, they expressed with a mean value of 3.71 that they do not want to visit NaDEET again.

Further tests with SPSS® can verify, whether the differences between the school groups which result from this chart are significant or arise by chance.

Fig. 47: Descriptive analysis: "*Please value the following statements.*" Expectations divided into school groups. (in mean values; n=61)

Besides the closed questions described above, the pupils could write down what they liked[10] and what they did not like in NaDEET[11] in form of open questions. Due to these open questions, one child could mention several aspects regarding different topics. The various answers were summarised in categories to provide a better overview of the data.

First the positive aspects about NaDEET are considered. 54 of the 61 interviewed children mentioned that they liked in particular the environmental and sustainable living activities (cf. fig. 48). These activities include for example cooking with solar energy, saving water and learning about animals and plants. Furthermore many children (34) mentioned the evening and fun activities as positive aspects. These can be for instance dune boarding, star gazing and scorpion hunting. A few children (14) wrote down that they liked the facilities (bathrooms, houses etc.) and the food. Another ten pupils liked some of the staff members.

[10] "*What did you like in NaDEET in particular? (Please write down one or two examples.)*"
[11] "*What did you not like in NaDEET? (Please write down one or two examples.)*"

Altogether, for this study it is interesting in particular, that most of the children liked the environmental and sustainable living activities.

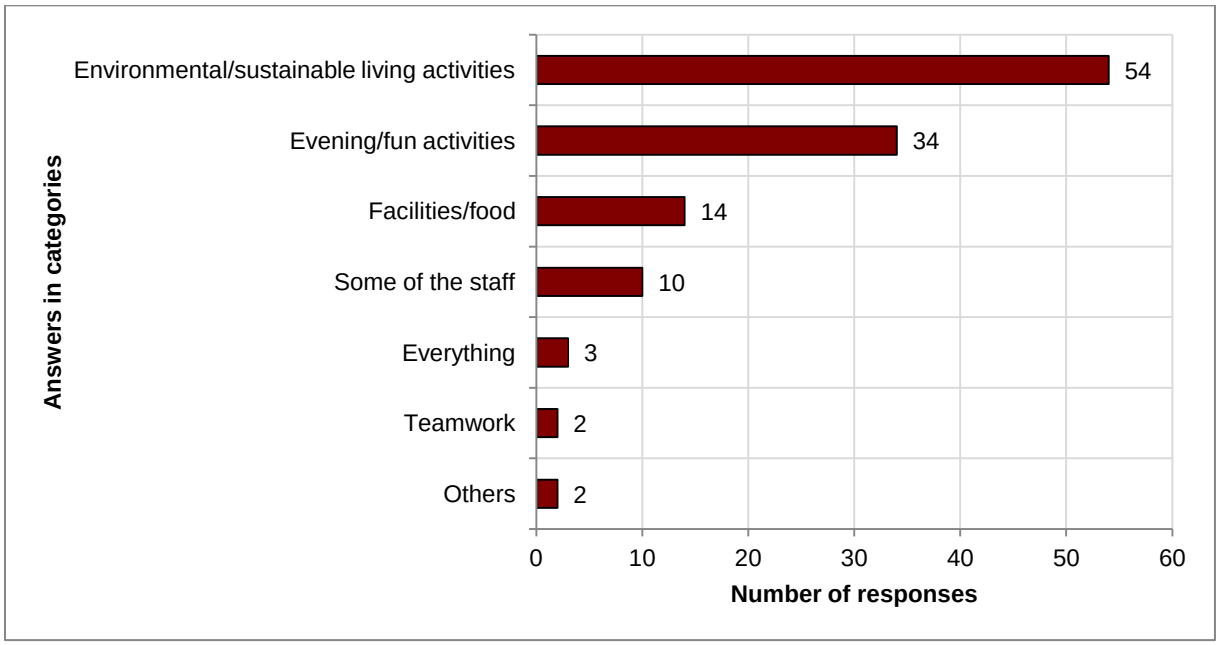


Fig. 48: Descriptive analysis: "*What did you like in NaDEET in particular? (Please write down one or two examples.)*" (n=61)

The following graphic shows three selected examples for positive statements about NaDEET (cf. fig. 49).

Fig. 49: Examples of positive statements about NaDEET

Besides the positive aspects about NaDEET, some negative aspects were mentioned as well. The aspect disliked the most are the wild animals (cf. fig. 50). These include insects,

scorpions, spiders but also leopards. The leopards were mentioned only by the pupils of the N Mutschuana PS. At this point it must be noted that during the time when the group of this school visited NaDEET, the tracks of leopards were discovered nearby the Centre. Although the children were told that there is no risk for them, they were afraid.

Besides the wild animals many children mentioned the facilities and food (16) and some of the staff (15) as negative aspects. These answers were only given by the pupils of the WIS. The same applies for the answers about the weather conditions, the lack of privacy and the lack of network. Only the WIS pupils complained about these aspects. In contrast, 15 children of WJD Cloete JSS and N Mutschuana PS said that there was nothing they did not like.

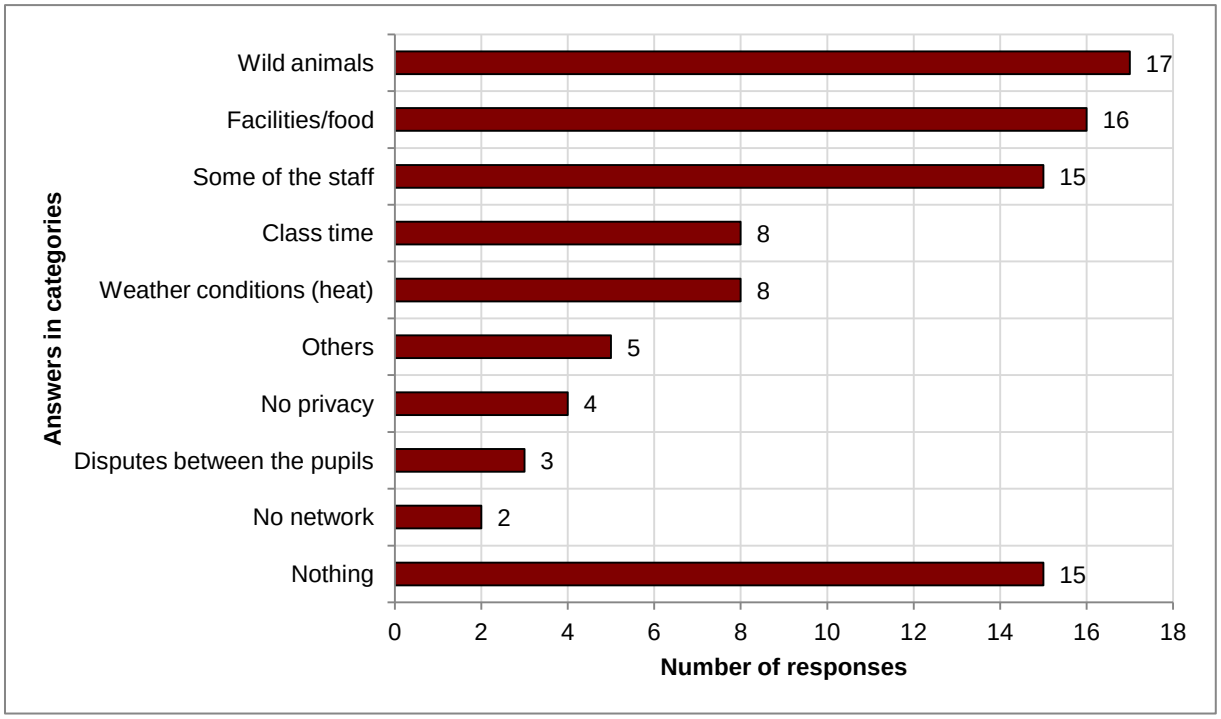


Fig. 50: Descriptive analysis: "*What did you not like in NaDEET? (Please write down one or two examples.)*" (n=61)

The following graphic shows three selected examples for negative statements about NaDEET (cf. fig. 51).

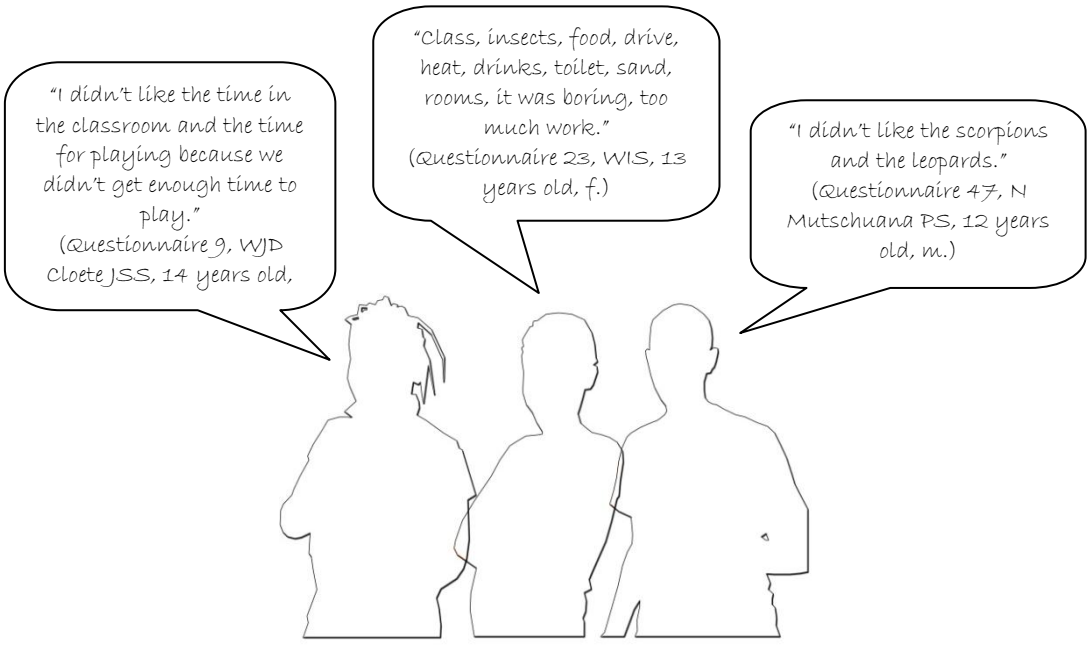


Fig. 51: Examples of negative statements about NaDEET

6.2.2. Difference- and correlation-tests

After the descriptive analysis, difference- and correlation-tests are carried out using SPSS®. In this way, the differences and correlation between pre- and post- survey and between the school groups which result from the descriptive analysis are investigated in more detail. In addition, the tests help to verify the hypotheses (cf. chapter 4). For this purpose, non-parametric tests were used, because the data of this standardized survey are not normally distributed.

6.2.2.1. Awareness & Knowledge

Comparison between pre- and post-survey

From the descriptive analysis results that the differences between pre- and post-survey regarding the statements "*I don't know much about our environment.*" and "*I think that the people of Namibia have enough water to live.*" are the greatest. Now this assumption is verified using SPSS®.

For this purpose, it was calculated, if the mean values of the four statements are significantly different between pre and post-survey. Therefore, the Wilcoxon-Test of SPSS® was used. Generally, this type of test is used to investigate differences between groups regarding a test

variable before and after a treatment. By comparing the mean values it can be checked whether the treatment (in this case NaDEET) has an influence or not. The influence of the treatment can be assessed based on the error probability (p) or rather the significance level, calculated by the Wilcoxon-Test. In this study the common significance levels are used to classify the results (cf. tab. 16).

Tab. 16: Depiction of significance levels (based on MAYER 2013: 130)

Error probability	Term	Symbol
p > 0.05	not significant	ns
p ≤ 0.05	significant	*
p ≤ 0.01	very significant	**
p ≤ 0.001	highly significant	***

The chart below shows that there is a significant difference in mean between the pre- and the post-survey regarding the statement "*I think that the people of Namibia have enough water to live.*" (cf. fig. 52). The significance level is smaller than 0.05. In consequence, the error probability is smaller than 5%. This means that only in less than 5% of all cases, the knowledge of the pupils about the water availability in Namibia does not depend on the treatment NaDEET. Consequently, NaDEET has in approximately 95% of all cases an influence on the knowledge about the water availability. Since the approval of the statement decreases after the visit to the environmental education centre, NaDEET has a positive influence.

Regarding the other statements, no significant differences between pre- and post-survey can be identified. Obvious differences were occurred by chance.

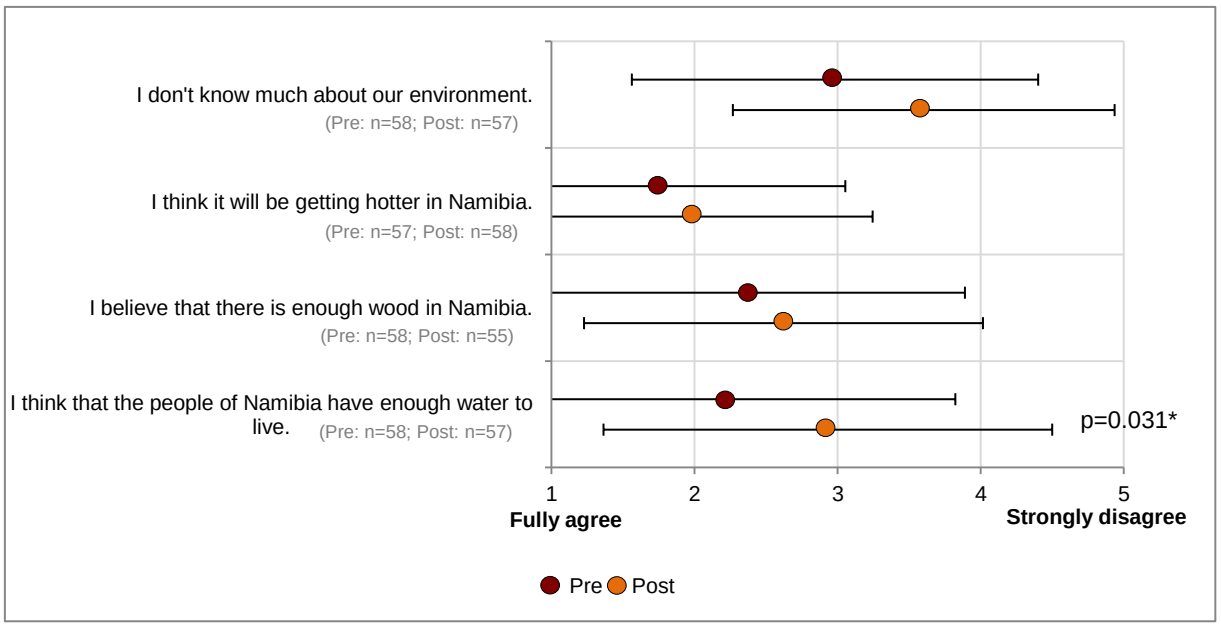


Fig. 52: Inductive analysis: "*What do you think about the following statements? Please value every statement.*" Divided into pre- and post-survey (in mean values)

Comparison between the three school groups

Since the differences between the school groups and the influence of their living conditions on NaDEET's primary school programme should be investigated, it was calculated, whether the mean values of the four statements are significantly different between the three school groups. Therefore, the Kruscal-Wallis-Test of SPSS® was used. The mean differences of more than two different samples can be checked with this test.

First, it was calculated whether there were differences between the school groups in the valuation of the four statements during the **pre-survey** or not. However, no significant differences were determined.

When using the data of the **post-survey**, significant differences with various significance levels between the school groups were determined regarding three statements (cf. fig. 53). The pupils of the WIS expressed a significantly higher disapproval to the statements "*I believe there is enough wood in Namibia.*" and "*I think that the people of Namibia have enough water to live.*" than the other two schools. Thereby they demonstrated that they know about the water and wood scarcity in Namibia.

Another significant difference exists regarding the statement "*I think it will be getting hotter in Namibia.*" Since this is a proved trend for Namibia (cf. chapter 2.1.), the pupils of WIS and N Mutschuana PS are right when they agree with this statement. The WJD Cloete JSS pupils' responses differ significantly from those of the other pupils. They express a less strong agreement with this statement.

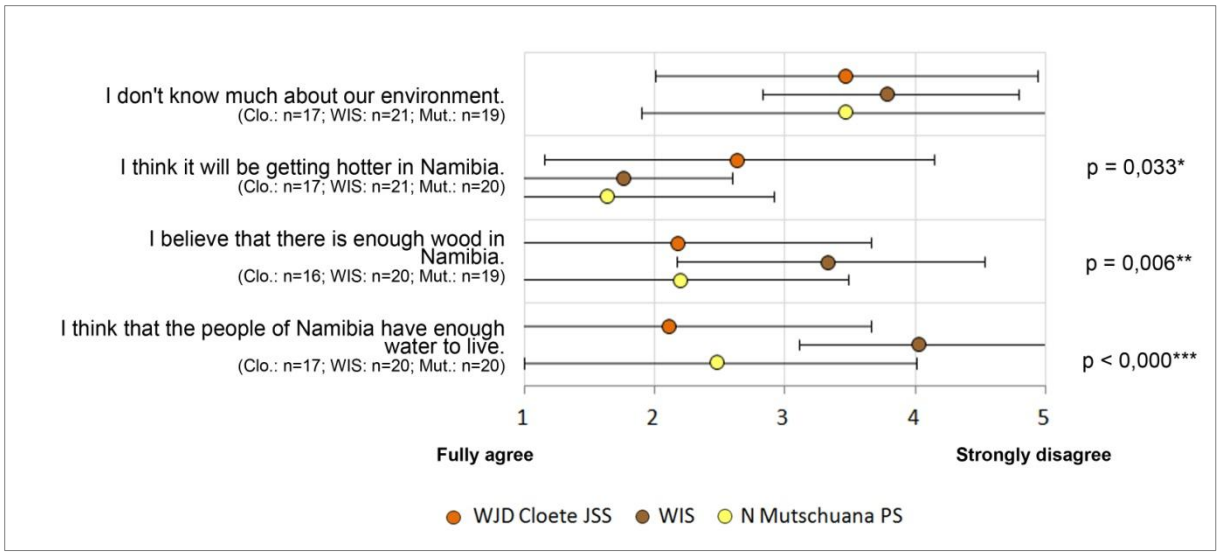


Fig. 53: Inductive analysis: "*What do you think about the following statements? Please value every statement.*" Post-survey, divided into school groups (in mean values)

Having proved that there are significant differences between the groups with regard to the knowledge, it is interesting to investigate if the knowledge of the various school groups differs

between pre- and post-survey. In the comparison between pre- and post-survey regarding the knowledge only the totality of all three school groups was considered (cf. fig. 52). Now, the differences of each individual school group between pre-and post-survey should be investigated (cf. fig.54). In this way it can be examined, on which school group NaDEET has the most influence in terms of the knowledge. For this purpose, the Wilcoxon-Test was used.
The analysis of the data of WJD Cloete JSS and N Mutschuana JSS reveals that there are no significant differences between the pre- and the post-survey. In consequence, NaDEET has no influence on the knowledge of the pupils.
In contrast, the analysis of the data of WIS reveals that there are two highly significant differences ($p \leq 0.001$) between the answers of the pre- and the post-survey. It is evident that the knowledge of the WIS pupils regarding the topics water and wood scarcity has improved after a visit to NaDEET. The environmental education centre has a positive influence on the children's knowledge.

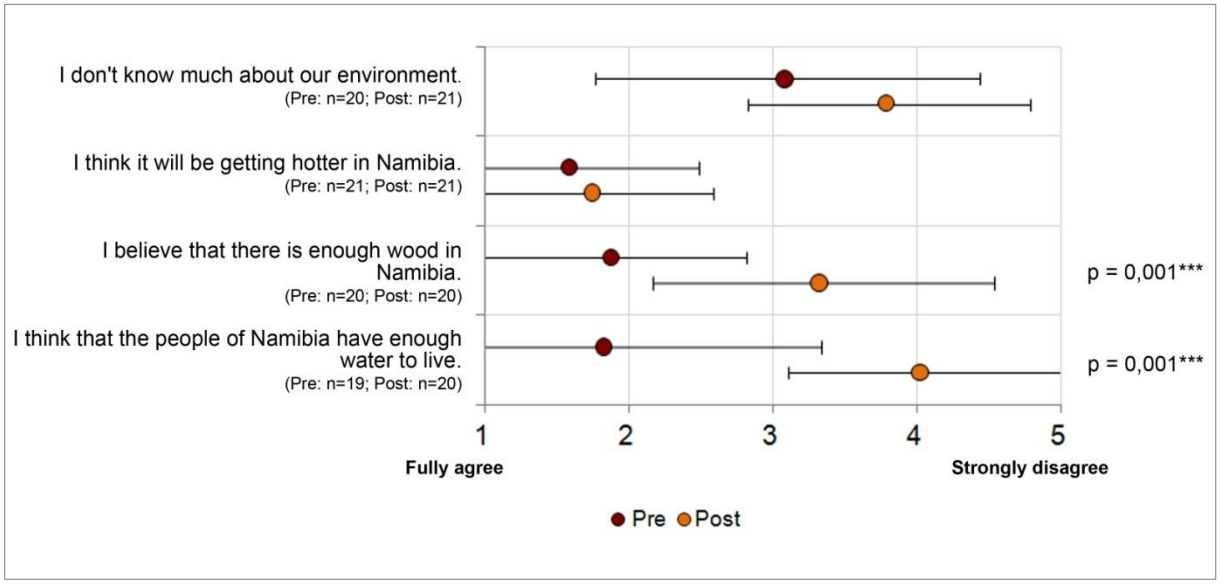


Fig. 54: Inductive analysis: "*What do you think about the following statements? Please value every statement.*" WIS school group, divided into pre-and post-survey (in mean values)

6.2.2.2. Skills & Participation

In chapter 6.2.1.3., the valuation of different statements about the use of water and energy by the pupils was described. Differences between the pre- and the post-survey were considered as well as differences between the responses of the several school groups.

Comparison between pre- and post-survey

Only one big difference between pre- and post-survey in comparison to the other statements could be identified during the descriptive analysis. This was the case regarding the first statement "*I pour dirty water away after doing the dishes.*"
Using SPSS® (Wilcoxon-Test) the differences between pre- and post-survey in terms of all statements were examined in more detail. The Wilcoxon-Test verified the assumption of the descriptive analysis that there is only one significant difference. The mean values of the statement "*I pour dirty water away after doing the dishes.*" differ significantly between pre- and post-survey. The significance level is "very significant" with a p-value of 0.002. Since the Wilcoxon-Test investigates whether a treatment has an influence or not, p=0.002 means that NaDEET has an influence on the sparingly use of water during doing the dishes.
All other statements are not listed again, as there are no significant differences.

Comparison between the three school groups

From the descriptive analysis resulted, that most differences can ascertained by the comparison between the schools from rural areas (WJD Cloete JSS, N Mutschuana PS) and the school from the capital city (WIS).
Using the Kruscal-Wallis-Test the differences between the schools are considered in more detail. This test identified many significant differences.
First the results of the analysis of the **pre-survey** are described (cf. fig. 55). The mean values of the three school groups differ significantly with regard to six of eleven statements. Only these six statements are shown below. Regarding the four statements "*I often take a bath.*", "*I think long-drop composting toilets are nasty.*", "*I use a lot of electronic devices.*" and "*My family takes a lot of wood for cooking.*" the valuation of the WIS pupils differ significantly from those of the other children. In terms of the statements "*I turn off the water during a shower while washing.*" and "*I switch off the light when I don't need it.*" the valuation of the N Mutschuana PS pupils differ significantly from those of the other pupils.
The results show that the children of the capital city have a very different lifestyle in comparison to the children from rural areas. Based on the chart, it can be assumed that they use more water and energy at home.

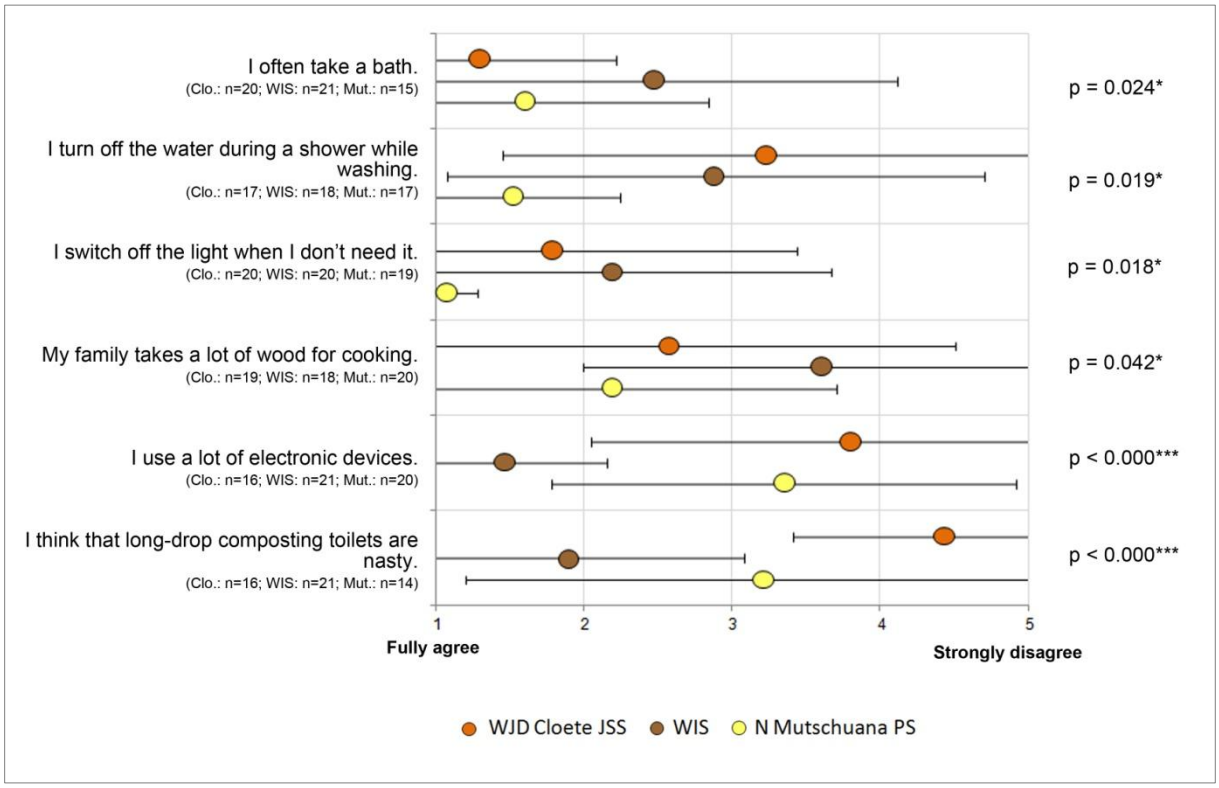


Fig. 55: Inductive analysis: "*What do you think about the following statements? Please value every statement.*" Pre-survey, divided into school groups (in mean values)

The comparison between the school groups regarding the **post-survey** shows similar high differences as the pre-survey between the school groups from rural areas and the school group from the capital city (cf. fig. 56). The Kruscal-Wallis-Test identified even more significant differences as during the analysis of the pre-survey (cf. fig. 55). Seven of the eleven statements show significant differences between the school groups. The differences cannot be ascertained only by the same statements as in the pre-survey.

Altogether, a negative impression of the WIS pupils is recognizable. In comparison to the other children they use much more electronic devices and it is not self-evident for all of them to switch of the light when it is not needed. Furthermore, the disapproval of the statement "*I leave the tap open without using the water.*" could be larger. The fact that the families of the WIS pupils do not take a lot wood for cooking can be explained by taking figure 34 of chapter 6.2.1.1. into account. Most of them do not cook with an open fire at home. In consequence, they do not need a lot of wood for cooking.

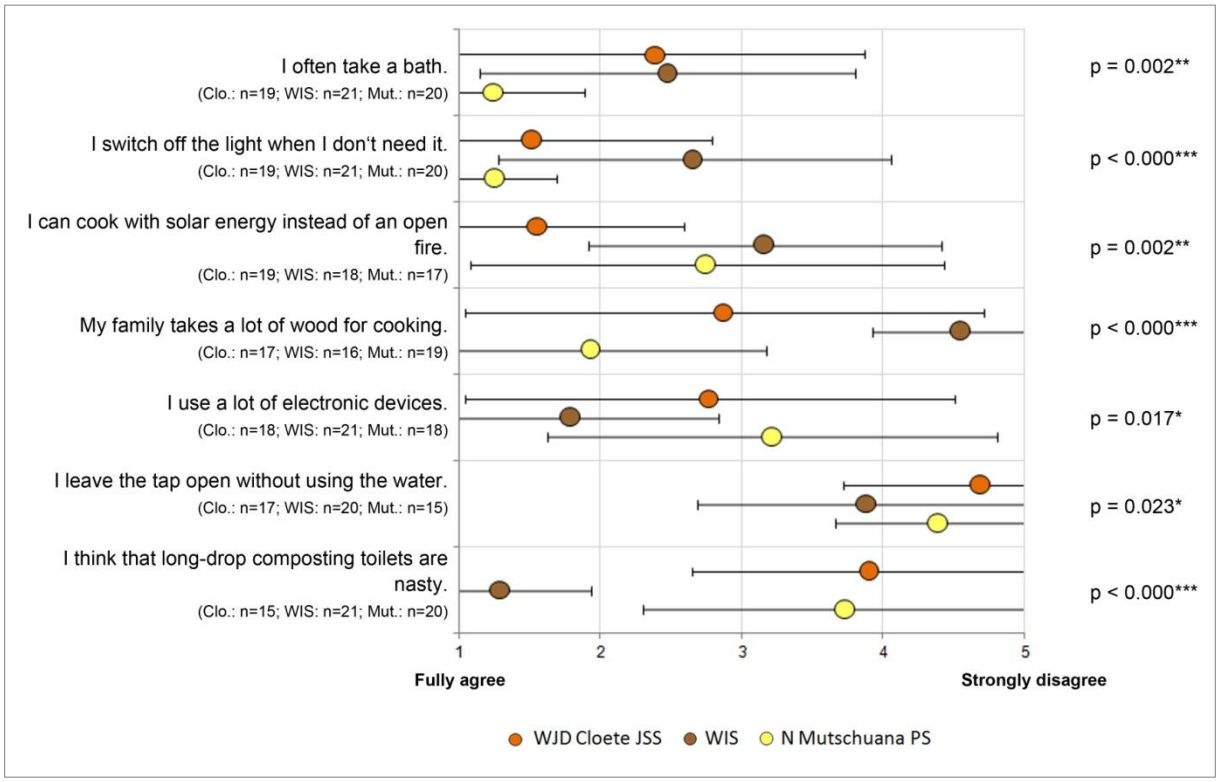


Fig. 56: Inductive analysis: "*What do you think about the following statements? Please value every statement.*" Post-survey, divided into school groups (in mean values)

Having proved that there are significant differences between the groups with regard to the use of water and energy, it is interesting to examine whether the water and energy consumption of the individual school groups differ between pre- and post-survey or not. By the comparison between pre- and post-survey regarding the "skills and participation" only the totality of all three school groups was considered. Now, the differences of each individual school group between pre-and post-survey should be investigated. In this way it can be examined, on which school group NaDEET has the highest influence in terms of the skills and participation. For this purpose, the Wilcoxon-Test was used.

The Wilcoxon-Test identified significant differences between pre- and post-survey only for the WJD Cloete JSS (cf. fig. 57). In terms of the other two schools no significant changes between pre- and post-survey could be ascertained. Consequently NaDEET has no influence on the WIS and N Mutschuana pupils regarding water and energy consumption.

The valuation of the children of the WJD Cloete JSS shows three significant differences between pre- and post-survey. This includes two positive changes and one negative change. The approval of the statements "*I pour dirty water away after doing the dishes.*" and "*I often take a bath.*" decreased. This means that the children save more water after their visit to NaDEET, even if the 2.37 mean values still represent an agreement with the statements.

The approval of the statement "*My family waters their garden at lunchtime.*" increases. This is a negative change. But as mentioned before, this statement must be considered with caution.

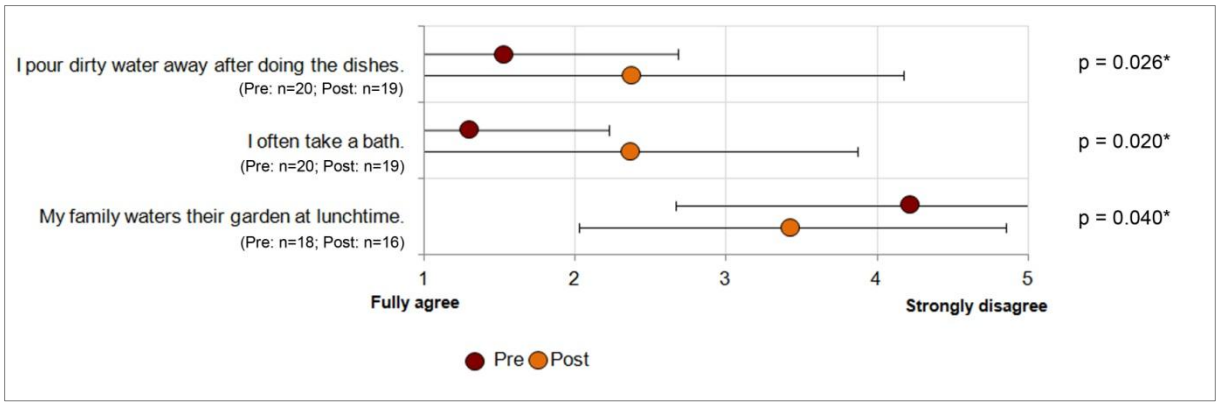


Fig. 57: Inductive statistics: "*What do you think about the following statements? Please value every statement.*" WJD Cloete JSS, divided into pre- and post-survey (in mean values)

6.2.2.3. Opinion

Comparison between pre- and post-survey

From the descriptive analysis regarding the opinion of the children about NaDEET resulted, that there could be a correlation between the independent variable expectations of the pupils towards NaDEET before their visit and the dependent variable opinion about NaDEET after the stay there. The assumption is investigated by considering the linear correlation of the data in a scatter diagram (cf. fig. 58). Furthermore, the rank correlation coefficient R of Spearman is used to examine whether the correlation is significant. Since the data is not normally distributed, the Spearman-Test was carried out.

Considering the following scatter diagram it becomes evident that there is a linear correlation between the expectations towards NaDEET and the opinion about NaDEET after the visit.

For a better understanding of this scatter diagram, it is pointed out that points are represented larger if data pairs lie on top of each other. The more frequently a data pair occurs, the greater the points.

The diagram shows that the linear correlation is positive, because relating the most data pairs applies, that a high value of one of the variables corresponds to a high value of the other variable, just as a low value of one variable can be assigned to a low value of the other variable.

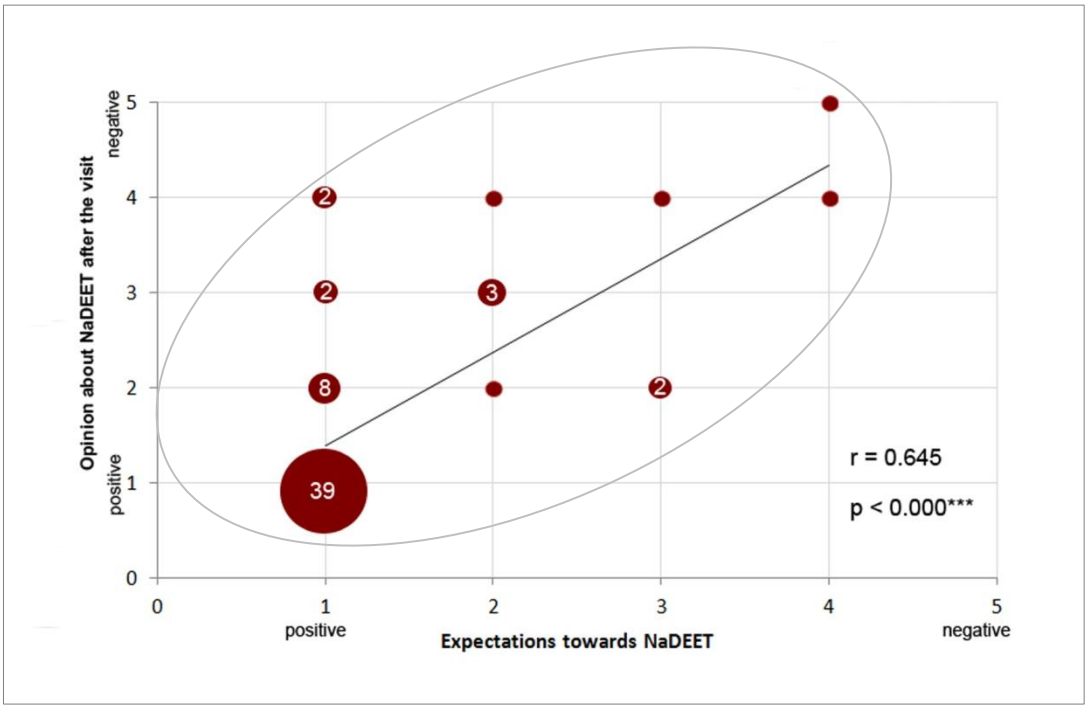


Fig. 58: Linear correlation between the variables "*expectations towards NaDEET*" and "*opinion about NaDEET after the visit*" (n=61)

From the Spearman-Test results, that the correlation coefficient (r) is 0.645. The correlation coefficient is always between -1 and +1, while -1 means a strong negative correlation and +1 means a strong positive correlation (FRIESE et al. 2010: 143). Thus, r = 0.645 shows a positive correlation between both variables. In addition, the correlation coefficient can be interpreted as a measure of the effect size. The effect size indicates how important the correlation is between two variables. To interpret the correlation coefficient, Cohen's conventions are used (COHEN 1988: pp 77-81). According to Cohen, a correlation coefficient of 0.645 means a large effect (r = 0.10 small effect, r = 0.30 medium effect, r = 0.50 large effect) (COHEN 1988: pp 77-81). A large effect expresses a strong correlation between the two variables.

However, it cannot be only concluded from the correlation coefficient of 0.645 whether a statistical correlation exists or not (UNIVERSITY OF ZURICH 2010: www). The value must also differ significantly from 0 (ibid.). SPSS® shows automatically the p-value during the calculation of the correlation. SPSS® calculated a significance value of p < 0.000. The correlation can be considered as highly significant. This means on the one hand, that the probability, that the opinion about NaDEET is positive after a visit, increases, if the expectations towards NaDEET are positive. On the other hand the probability, that the opinion about NaDEET is negative after a visit, increases, if the expectations towards NaDEET are negative.

Comparison between the three school groups

The descriptive statistic showed that there are big differences between the answers of the pupils from the different schools in terms of the questions "*Are you looking forward to the time in NaDEET?*" and "*Altogether how do you like NaDEET?*". Using the Kruscal-Wallis-Test it was investigated if these differences are significant. The Kruscal-Wallis-Test identified high significances between the mean values of the three school groups regarding both questions (cf. fig. 59). Both questions show a significance of $p < 0.000$. It is obvious that these results arise from the pupils of WIS who gave on average more negative responses than the other children.

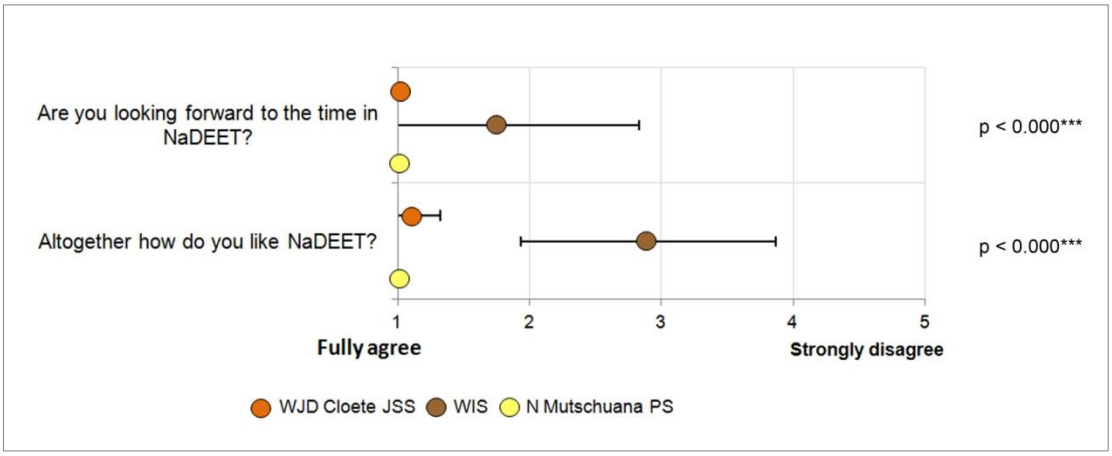


Fig. 59: Inductive analysis: "*Are you looking forward to the time in NaDEET? Altogether how do you like NaDEET?*" Divided into school groups (in mean values; n=61)

In chapter 6.2.1.4., the reasons for the positive or negative valuations of NaDEET were described in more detail. It was obvious that the pupils of WJD Cloete JSS and N Mutschuana PS showed greater satisfaction with NaDEET than the WIS pupils. While the school groups from rural areas agreed to positive statements about NaDEET, the WIS pupils valued those statements neutral to negative. Whether these differences are significant or arise by chance, was ascertained by using the Kruscal-Wallis-Test. The table below shows the results (cf. tab. 17). In terms of every statement there is a significant difference between the several school groups. Most of the statements reach the level of highly significance.

Tab. 17: Inductive analysis: "*Please value the following statements.*" Expectations (n=61)

Statement	Error probability	Symbol
I had a lot of fun in NaDEET.	0.000	***
I have learned a lot new things.	0.000	***
I want to visit NaDEET again.	0.000	***
I know more about the topics water and energy now.	0.000	***
The staff was nice in NaDEET.	0.000	***
I have learned things I didn't know before.	0.000	***
It was boring in NaDEET.	0.000	***
My expectations weren't fulfilled.	0.020	*
I didn't feel very good there.	0.001	***
I would recommend NaDEET to my friends.	0.000	***
I didn't understand everything they told me in NaDEET	0.005	**

Including the descriptive analysis it can be assumed that the significant differences arise from the answers of the WIS compared with the responses of the other two school groups.

7. Discussion

The discussion is based on the research questions of this study (cf. chapter 4). In addition, the hypotheses are considered and help to answer the research questions.

7.1. Fulfillment of the national and international objectives and requirements for EE and ESD

Does NaDEET meet the national and international objectives and requirements for EE and ESD?

NaDEET's primary school programme offers a variety of activities, which serve to fulfil the objectives in terms of awareness, knowledge, skills and participation.
Before the activities will be discussed, first it must be mentioned that the environmental education centre already meets the objective of making the children aware of the environment through its **location at the edge of the Namib Desert** and due to the sustainable construction techniques used at the site. The children experience their environment only by staying and living close to nature at the centre. In this way limits of

perception are reduced and new nature experiences are possible independently from the activities which are carried out during the stay.
In addition, activities such as the "*Dune Walk*" improve the perception of nature. The pupils learn that they can discover many different things and make new experiences if they take notice of their environment.
Besides, there are many activities which have the priority to impart knowledge about the environment to the children. The pupils learn important basic knowledge during different experiments to understand the principles of alternative energies like solar energy. Furthermore, they are taught about the water availability of the earth. In this way NaDEET enables the pupils to understand how important water is as a resource for human beings. Through imparting knowledge in terms of the topics water and energy, NaDEET supports the children to think critically about related environmental problems and to understand the causes and consequences of those.
During the participant observation it became obvious that NaDEET places great emphasis on imparting skills to save water and energy. NaDEET's motto "*We practice what we teach.*" already expresses that they not only teach the knowledge about saving resources but also practice it themselves. By implementing methods to save water and energy in the Centre, they convey skills to the children how to handle water and energy in a sustainable way. The children see with their own eyes what it means to reduce water and energy consumption. Through everyday cooking with solar energy and the daily monitoring of the water and energy consumption, the pupils receive action orientations for their everyday lives. These action orientations can contribute to the ability that the children can actively participate in environmental protection.
In consequence, from the participant observations results, that NaDEET meets the national and international objectives of EE and ESD of the EEIS, the UNESCO and UNEP and the WWF Germany.

NaDEET does not only meet national and international objectives but also concrete requirements for EE and ESD.
By making the children aware of the environment, imparting knowledge and skills in terms of saving water and energy, NaDEET takes the environment in its totality into account. Economic, ecological and social aspects are considered. The children learn that there is a natural and a built environment and that both are connected with each other. Furthermore, NaDEET shows how the environmental situations were in the past and could be in the future and what the advantages and disadvantages of the different situations are. The pupils learn how their behaviour can influence future environmental situations. Most of the mentioned teaching contents are taught by practical activities and first-hand experiences.

During most activities the focus is on local, regional and national points of view. This must be considered both positive as well as negative. On the one hand the pupils gain new knowledge about their home town and their direct surroundings which enables the children to better understand the environmental situation of their native country. On the other hand it is difficult for the children to value the environmental situation in their country because they have no comparison to other countries. Considering only Namibia, the availability of water and wood does not appear as dramatic as if this would be compared with the availability of the same resources in other countries.
The view of the "big picture" is missing. How can the environmental situation of Namibia be valued in comparison to other countries? How does the climate change influence other countries? Do other countries take action against climate change? Can Namibia copy preventive steps against the climate change from other countries? The discussion of these sample questions would include more international perspectives into the lessons.

Altogether, the research question can be answered in the affirmative. **NaDEET fulfils all requirements** by the primary school programme, although some aspects are treated less than others.

7.2. Effects of NaDEET's environmental education work

7.2.1. Awareness & Knowledge

Do the pupils gain new insights in terms of water and energy which they take home? Is the effectiveness of NaDEET's primary school programme influenced by the living conditions of the pupils?

To answer the research question, the school groups must be considered individually, because the consideration of the totality of all pupils shows that the knowledge of the children about environmental issues has hardly changed after the stay at NaDEET. Only with regard to the knowledge about the water availability in Namibia a positive change can be determined. However, considering the individual school groups it is obvious that also this positive change is only attributable to one school group, namely the WIS pupils. The knowledge of the pupils of the WJD Cloete JSS and N Mutschuana PS in terms of every environmental topic, which was treated during the surveys, did not change. But the children of the WIS have gained new insights not only into the topic of the water availability but also into the subject of wood availability. They have learned that both water and wood are scarce

resources in Namibia. These findings may be an important basis for dealing sustainably with the available resources. If this is the case is discussed in the next chapter.

The reason for the result, that only the WIS pupils gained new insights into environmental topics during the visit to NaDEET, may be the **different levels of education** of the pupils of the three schools. However, no significant differences between the school groups regarding the knowledge of the environmental topics could be determined before their stay at NaDEET. Pupils from all three schools reported that they had already learned about saving water and environmentally friendly energy sources in school. Only some pupils of WJD Cloete JSS never learned about alternative energy sources. But the previous experiences of all three school groups seem to be very similar according to the results of the pre-survey. However, the participant observation showed that the pupils of WIS have a higher level of education in general. In comparison to the other pupils their math and English skills were significantly better. These skills enabled them to solve tasks faster and to remember new knowledge better. Since the WIS is a private school, the children get a much better education. The visit to the school in Windhoek in the context of the post-survey confirmed this impression.

Especially the English skills make the understanding of NaDEET's teaching contents easier for the children. While there were no problems of understanding by the WIS pupils, it was obvious that the other children did not understand many issues due to a **lack of English** proficiency. From the participant observation results, that many pupils of the WJD Cloete JSS and N Mutschuana PS were not able to follow the lessons. This observation is also reflected in the results of the survey. At this point it must be emphasized positively that the environmental educator also repeated difficult teaching contents in Afrikaans.

In addition to the lack of English skills, the **lack of time** contributed to the fact that the pupils of WJD Cloete JSS and N Mutschuana PS did not understand many environmental issues. During the participant observation it became obvious that the children needed a lot of time to fulfil their tasks. Due to the lack of English and math skills they needed much more time to solve a task conscientiously. Because of the time pressure the children sometimes could not finish a task. The pupils showed willingness to solve the tasks, but sometimes the time and the individual support of every child was missing. Also Ashby and Van Wyk have identified the lack of time as a major weakness of NaDEET in their study (cf. chapter 3.4.). They determined that the programme is too tight and includes too many activities. If more time would be available, the children could be better supported by solving their tasks.

The WIS pupils did not need individual support. They seemed to feel unchallenged, although they even participated in some activities of the secondary programme. They were bored and showed no willingness and motivation to fulfil the tasks. Nevertheless, they gained new knowledge in NaDEET.

Regarding the reception of new knowledge it became apparent that the WIS pupils are at an advantage. However, it was also examined by the surveys whether the children share their knowledge with their parents or not. It could be determined that the pupils of WJD Cloete JSS and N Mutschuana PS told their parents much more about environmental protection than the children of the WIS. The children talked about saving water and energy. This was rarely the case regarding the pupils from Windhoek. It seems as if the pupils of the two rural schools did not understand the reasons and the background knowledge of saving resources. Nevertheless, they know that the sustainable use of water and energy is important. At least it seems to be important for them to tell their parents about it. The pupils of the WIS have understood why it is important to deal sustainably with resources. However, they do not consider it to be so important that it appears reasonable to them to tell their parents about it. Consequently, it can be assumed that the pupils from Windhoek gained new knowledge but they have not internalized the importance of this knowledge for their own behaviour. They could not be sensitized sufficiently for their environment and the protection of it.
From the explanations it can be concluded, that the following alternative hypotheses, which were drawn up in chapter 4, can be accepted.

H_1: *There is a significant difference in mean between the pre- and the post-survey with regard to the variable "awareness and knowledge". NaDEET has an influence on the dependent variable "awareness and knowledge".*

H_1: *There is a significant difference in mean between pupils with different living conditions with regard to the variable "awareness and knowledge". The living conditions of the pupils have an influence on the dependent variable "awareness and knowledge".*

It became apparent, that there are significant differences regarding awareness and knowledge of the pupils between the post- and the pre-survey. However, NaDEET cannot influence every school group in terms of the knowledge about environmental issues, since only the WIS pupils gained new knowledge in terms of the water and wood availability in Namibia. But with regard to the pupils from rural areas, NaDEET achieved the objective to make the children aware of their environment. This shows that there also are significant differences between the three school groups. It is obvious that the different living conditions of the pupils, especially the level of education, have an influence on their ability to gain new knowledge. It can be noted that all children have taken something positive from the time in NaDEET.

7.2.2. Skills & Participation

How do the pupils handle water and energy at home before and after a visit to NaDEET? Is the effectiveness of NaDEET's primary school programme influenced by the living conditions of the pupils?

Already from the results of the pre-survey (cf. chapter 6.2.1.1.) it became apparent that there are major differences between the children from poorer rural and prosperous urban areas in terms of the use of water and energy. The rural areas include the WJD Cloete JSS and N Mutschuana PS, while the WIS is located in an urban area. In particular, the regular use of firewood for cooking is an indication of the financial situation of the families of the interviewed children. Especially in rural areas the families depend on firewood as an energy source. From the survey results, that the families of the WJD Cloete JSS and N Mutschuana PS pupils often use an open fire for cooking, while the families of the WIS pupils mainly cook with electric stoves. But the children from Windhoek also declared to use an open fire from time to time. At this point it must be mentioned that the children from rural and urban areas have a different understanding of the usage of an open fire. This results from the observation of the children in NaDEET and their hometowns. While the children from Rietoog and Gochas depend on wood for cooking because of financial reasons, it can be assumed that the children from Windhoek do not use an open fire in their everyday life. Probably, they only use open fires in their free time for fun.

The statement of the children from rural areas about the regular use of open fires is supplemented by their response that their families need a lot of wood for cooking. This is not the case in the families of the children from Windhoek. Considering the dependence on firewood as a sign for poverty (cf. chapter 2.1.), it follows that the pupils of WJD Cloete JSS and N Mutschuana PS live in families who have limited financial resources.

Other results of the survey support this assumption. The WIS pupils wrote down that they use many electronic devices and usually do not care about saving energy. The opposite was the case for the children from Rietoog and Gochas. The observations of the children confirm that these children use less energy, because they do not have many electronic devices. Their families also use light sparingly, because they cannot afford to waste energy. This cannot be applied to the water consumption of the children. Both the children from rural and urban areas reported that they often take a bath and that they do not always care about low water consumption while showering. However, it can be concluded from the different living conditions of the children that they interpret the term "*often*" differently in this context. For some children "*often*" may mean that they take a bath once a week, while meaning several times a day for others. The same applies to the use of electronic devices mentioned above.

Children, whose parents are prosperous, may consider a Smartphone, a tablet PC, a laptop, a MP3-Player, a Play Station etc. as "*a lot of*" electronic devices, while children of disadvantaged families may think that they use "*a lot of*" electronic devices when their family have an old cell phone. Thus, the statements of the pupils must always be considered with caution.

Before discussing the results of the post-survey, it must be mentioned that the statements made in this chapter, do not apply to each and every child. Of course there are always exceptions. Some interviewed pupils from Windhoek also have a thrifty lifestyle, as well as there are families from Gochas and Rietoog, who waste resources in spite of their financial situation. To give a better overview, the individual school groups are considered on average.

In the following the changes in terms of the water and energy consumption of the pupils after their stay at NaDEET are discussed.
The results of the post-survey showed that only the pupils of one of the three schools changed their water consumption after their visit to NaDEET. The pupils of the WJD Cloete JSS said that they bathe less frequently. Furthermore, they expressed that they did not always pour dirty water away after doing the dishes. Perhaps, they reuse it for watering plants.
In terms of the other two school groups no significant changes could be investigated. A reason for this result can be that it is questionable to which extent the children have an influence on the households of their families. It is possible that it is difficult for the children to enforce changes in the household of their parents. Ashby and Van Wyk have already considered this possibility during their study (cf. chapter 3.4.). This leads to a need of further research. In terms of further studies, it would be useful to deal with the target group of adults. It could be investigated whether the adults reduce the consumption of water and energy in their home after a stay in NaDEET or not. However, it is not certainly, that greater successes can be achieved with regard to adults, since it is difficult for people in general to apply their learned skills in their daily lives. For that, the WWF described various reasons which are mentioned in chapter 2.2.

The descriptive analysis of an open question reveals another possible reason for the result that many children did not use less water and energy after the time in NaDEET. However, this reason only applies to some pupils of the WIS. In relation to these pupils, the question arises if they are actually willing to change their lifestyles. While most of the pupils of the rural schools wrote down, that they try to live in a sustainable way, a few children from Windhoek noted that they waste even more water and energy deliberately after the visit to

NaDEET. From the answers an act of defiance can be concluded. The results of the survey regarding the topic "*opinion about NaDEET*" showed that these children did not like NaDEET and therefore they do exactly what NaDEET did not want to achieve.

"I still use the same amount of water as before; you can't tell us what to do. Do you pay our electricity bills?" (Questionnaire 38, WIS, 12 years old, f.)

"Yes I waste more water now!" (Questionnaire 35, WIS, 13 years old, f.; questionnaire 21, WIS, 12 years old, f.)

These quotes above describe the behaviour of some pupils of the WIS. Nevertheless, many of the children from Windhoek also wrote that they are trying to live more sustainably.
The act of defiance could also result from the observation that it was difficult for the children from Windhoek to adapt to sustainable living in NaDEET, since **the differences to their normal everyday life are very large**. They had to do without their electronic devices. They could not use their cell phones because they had no reception. The children should care about their water consumption and had no water tap, they could just turn up. They had to share a room with several children and they had to cook their own meals with solar energy. This was a big change for the children to which they could not get used to. It is comprehensibly that the children do not want to implement all these things in their daily lives because this would mean a reduction in their quality of life. The children do not see any advantage for themselves in living more sustainably. In particular, the benefits of a sustainable lifestyle are often difficult to recognize because sometimes the own success cannot experienced directly since the effects of taking action in environmental protection are often visible only in the future (cf. chapter 2.2., WWF).
Some of the children from rural areas had no problems to adapt to the sustainable lifestyle in NaDEET. The children are used to share a room with other family members. Not all of them have running water at home. Some of them mentioned that they did not have enough water at home. None of the children brought a cell phone or other electronic devices to NaDEET. Consequently, the sustainable way of life did not restrict the children's habits. Thus, it also depends on the living conditions of the children if it is difficult or easy for them to adapt to a sustainable life in NaDEET. For children who know how to deal with a small amount of water and energy due to the financial situation of their families, it may be easier to live sustainably. But if the children have a lot of resources available, there is no necessity for them to save these. For the poorer children and their families the sustainable lifestyle may help to improve their quality of life, since they could save the little amount of money they have.

A further reason which concerns all pupils, no matter of their living conditions, could be that the time in NaDEET was too short. It was not possible to affect a lasting influence on the behaviour of children in such a short time. The children are influenced by their surroundings and their parents and must have a strong character to live more sustainably contrary to the behaviour of their parents. It is questionable to which extent NaDEET can leave its mark on the children. For this reason, the outreach project of NaDEET seems to be very useful. Although this study does not address the outreach project in particular, an insight into the project could be obtained. During the outreach project with three communities, inter alia Rietoog and Gochas, children, teenager and adults are taught over a period of three years. The participants come several times to NaDEET and the NaDEET staff visit the communities periodically. In this way NaDEET has a greater influence on the behaviour of the people in terms of a sustainable lifestyle.

Nevertheless, the primary school programme is successful, even if the successes are small. The results of the survey show that some of the pupils learn important skills in terms of saving water. Considering the statement of the WWF that, in particular, it is difficult to achieve the objectives regarding skills and participation (cf. chapter 2.2.), NaDEET can be proud when they have managed to encourage some children to save water.

Furthermore, from the survey results that similar to the influence of NaDEET on the children's knowledge, the influence on the skills in terms of saving resources also depends on the living conditions of the children. In consequence, the following two alternative hypotheses can be accepted.

H_1: *There is a significant difference in mean between the pre- and the post-survey with regard to the variable "skills and participation". NaDEET has an influence on the dependent variable "skills and participation".*

H_1: *There is a significant difference in mean between pupils with different living conditions with regard to the variable "skills and participation". The living conditions of the pupils have an influence on the dependent variable "skills and participation".*

Do the effects lead to a sustainable use of water and energy?

From the explanations above results that most effects of NaDEET's primary school programme on the children are sustainable. This includes the children from Rietoog who learned to save water by bathing less and reusing dishwater. However, it must be also mentioned that some WIS pupils wrote down that they waste more water after the visit to

NaDEET. However, these results must be considered with caution, since it is not certain whether the responses of the children correspond to the reality.

7.2.3. Opinion

What is the opinion of the pupils about NaDEET before and after their stay? Is the effectiveness of NaDEET's primary school programme influenced by the living conditions of the pupils?

The answer of this research question leads to the conclusion that there is a linear correlation between the expectations of the children towards NaDEET and the opinions of the children about NaDEET after their visit there.
If the pupils have been looking forward to visit NaDEET, they also had on average a more positive opinion about NaDEET after their stay. This is mostly applicable to the pupils of the WJD Cloete JSS and N Mutschuana PS. Although the children had to learn a lot of new knowledge about the environment and a sustainable life, which was often laboriously for them, they were always motivated and took a positive view of NaDEET. They have quickly adapted to the life in NaDEET and rarely complained. The survey shows that there was hardly anything that they did not like in NaDEET. The only negative comment frequently mentioned was the fear of wild animals. Especially at night, many children have not felt safe at the Centre. By the observations of the children and talking with them, it became obvious, that the children are convinced that all wild animals are dangerous for humans and threaten them. NaDEET endeavors to change these views. But, since the children copied the fear of the wild animals from their parents, it was difficult to convince them of the opposite. NaDEET should continue to try to ensure that the children have no fear at the Centre.
Apart from the **lack of sense of security**, there were hardly any negative comments about NaDEET. The children liked the environmental activities, the facilities, the food and the staff. The satisfaction can be attributed to the living conditions of children. Since the children have to cope with little material goods at home, they are modestly. They were happy about little things and about everything not available for them at home. Furthermore, the children had an incredible energy that was particularly evident during the three-hour dune walk. They used every free time to let off steam in the dunes. Due to this motivation and joy in participating in NaDEET's programme it was a pleasure to work with the children. Both the children and the staff were happy about the common time at the end of the week.

This does not apply to the WIS pupils. After one or two days it became evident that both sides, the children and the staff, were unhappy with the course of the programme. The WIS

pupils expressed a neutral to negative attitude towards NaDEET. The results of the surveys confirm this observation. The opinion of the children about NaDEET has become progressively worse during the course of the week. The children were dissatisfied with the overall situation. This included the food, the drinks, the houses, the sanitation facilities etc. The sustainable lifestyle especially in terms of the sanitation facilities appeared unhygienic and uncomfortable. The differences between NaDEET and the home of the children seemed to be too big to get used to the simple life during such a short time. Due to the general discontent, the mood was bad and the teaching was difficult. It was obvious that the pupils could not see a link between the learned knowledge and skills and their everyday life.

In consequence, from the participant observation and the standardized surveys results that both alternative hypotheses regarding the “opinion” of the pupils can also be accepted.

H_1: *There is a significant correlation in mean between the pre- and the post-survey with regard to the variable “opinion about NaDEET”.*

H_1: *There is a significant difference in mean between pupils with different living conditions with regard to the variable “opinion about NaDEET”. The living conditions of the pupils have an influence on the dependent variable “opinion about NaDEET”.*

In the following table are the strengths and weaknesses, arising from the results and their discussion, summarized. The strengths and weaknesses do not apply to the programme in general rather they are related to the respective school group that participates in the programme.

Tab. 18: Strengths and weaknesses of NaDEET’s primary school programme

Strengths	Weaknesses
Location in the dunes at the edge of the desert	Lack of time during the course of the programme
Environmental/sustainable living activities	Problems of understanding due to teaching in English
Evening/fun activities	Lack of sense of security
Achieving objectives and requirements of EE and ESD	Different levels of education were not considered sufficiently
Imparting skills in terms of saving water and energy by first hand experiences (e.g. solar cooking)	Lack of transferability of learned skills to everyday life
Imparting knowledge about wood and water scarcity	

8. Recommendations for Management

The participant observation and the standardized survey identified in addition to some strengths also some weaknesses. These weaknesses include the lack of time during the course of the programme, problems of understanding due to a lack of English skills of the pupils, problems of understanding due to different levels of education and a lack of transferability of learned skills to the everyday life. In the following, recommendations for management are described, which can serve to improve the mentioned weaknesses and show the potentials of NaDEET. These are merely theoretical proposals that need to be tested for their applicability in practice.

As in chapter 7 explained, NaDEET's success or influence on the children in terms of gaining new knowledge and skills depends on the living conditions of the children. In consequence, it can be recommended to adjust the programme individually to the respective school groups. This does not mean that the whole programme needs to be changed, minor adjustments may be sufficient. In order to make appropriate adjustments, the staff members should receive sufficient information about the group in advance. How does the everyday life of the children look like? Which external influences leave their mark on the children? Which school do the children attend? Is it a governmental or a private school? Which conclusions can be drawn about the level of education of children?
During a staff meeting those and similar questions could be discussed. Of course the staff can never know what to expect exactly but they can get an idea of the expected school group. Subsequently, small changes should be made to adapt the programme to the school group.
In terms of groups like the WJD Cloete JSS and N Mutschuana PS it should be considered to remove some of the activities from the course of the programme, so that there is more time to deal with the remaining activities without time pressure. In this way the children can get more time to work on their tasks. The children should not have the feeling of being under pressure. They should get the chance to understand and to solve every task with the support of a staff member when needed. The reduction of the programme can be a way to reduce the time pressure and to improve the individual support of the children without having to hire additional staff. As more time is available for an activity, perhaps problems of understanding due to a lack of English skills or due to different education levels can be also improved or solved. The environmental educator and the centre assistant have more time to repeat the teaching contents and to support the children. First it may seem that it is a shame to remove some activities from the course of the programme, but perhaps in hindsight it becomes obvious that more can be achieved with less.

For groups like the pupils of the WIS, other changes have to be made. The programme should include activities with more references to the everyday life of the children of wealthy families. It can be assumed, that in this way the attention of the pupils can be attracted.
First the children have to learn, that the resources which are available for them are not a natural course of action. They must learn to esteem these resources because not every child has the good fortune to have so many resources available. Next, the environmental educator must show them that they can save water and energy without reducing their quality of life. The children can live more sustainably without relinquishing something. Some example measures are given below. The measures are divided in energy saving methods (*green*), water saving methods (*blue*) and other methods (*yellow*).

Low-energy bulb: Low-energy bulbs have an up to 70 to 80 percent lower electricity consumption than conventional light bulbs. They do not lose energy through the emission of heat. An alternative to the low-energy bulbs are LEDs. (RESET n.y. a: www)

Connector strip with a power button: Many electronic devices cannot be turned off. They are always in standby mode and waste permanently energy. With this kind of a connector strip they can be turned off. (RESET n.y. a: www)

Air-conditioning: It is comfortable and useful to have air-conditioning. However, it should be made sure that all windows are closed when it is used. In this way the efficiency can be increased and the energy consumption can be reduced. (WESPER AIRWELL n.y.: www)

Bicycle: It saves energy and reduces air pollution to go by bicycle instead of by car. Furthermore it is good for health.

Laptop: Compared to a desktop PC with a screen a mobile PC with comparable features and performance uses on average 70 percent less power. The energy-saving mode should be adjusted so that the PC saves energy when it is switched on but not in use. (PRESSE- UND INFORMATIONSAMT DER BUNDESREGIERUNG 2014: www)

Water saving shower heads: Using this kind of a shower head the water consumption can be reduced by half without noticing it. Generally the shower should be preferred, since it consumes significantly less water than the bath tub. (RESET n.y. a: www)

Cistern with a water saving button: A cistern helps to reduce water consumption per load from 9 to 6 liters, using a cistern with a water saving button the water consumption is reduced even to 3 liters. (RESET n.y. a: www)

Green Apps: The use of smartphones and related apps has greatly increased. Meanwhile, there are also increasingly apps that encourage to save energy, to search for traffic connections or information on the life cycle assessment of products in supermarket shelves. (RESET n.y. b: www)

The examples show, that it is possible to save water and energy with new technologies. In this way, a more sustainable lifestyle is possible without a loss of comfort. Furthermore, the different possibilities mentioned above are not too expensive. If the children would learn such water and energy saving measures in NaDEET, they might also tell their parents about it. Together, it would be easy for them to implement the measures at their homes.

In addition to the traditional water and energy savings measures for the household, the children can use their smartphones for learning about sustainability. The children can find many green apps in the app stores or on the Internet in general. Maybe the pupils can be made aware of their environment and sustainability when they are allowed to use their electronic devices such as their smartphones instead of going without it, because it is not imaginable for the children to be out of range like in NaDEET. Similarly, it is also not imaginable for them to use an earth closet or to have no running water in the bathroom like in NaDEET. These differences are too big compared to their everyday lives. Although these measures are much more sustainable, however they have no purpose if the children cannot implement them at home.

In terms of groups like the WJD Cloete JSS and N Mutschuana PS the water and energy saving measures of NaDEET are practical, since there is a reference to their everyday life due to their living conditions. For these groups, the above-mentioned measures are not eligible.

The measures described above are only examples of how NaDEET's programme could be better adapted to the individual school groups. It would be worthwhile to further elaborate the measures and implement them by appropriate activities.

9. Methodological critique

The first step of this study, the literature research on environmental problems in Namibia, was very helpful to understand why it is important to deal with environmental education in this country.

In hindsight, the stay in NaDEET could have been better prepared. This applies in particular to the standardized survey. Although the implementation of the standardized survey was arranged with the director of NaDEET, however more information could be gathered about the children in the run-up to the surveys. In this way, the questionnaires could have been better adapted to the children and their English skills. For instance, the answering of the Likert-Scales proved too difficult for the children with a lack of English proficiency. It took a lot of time to go through the statements with the children and to rephrase the statements in the case of understanding problems. Furthermore, in terms of some statements, for example "*My family waters their garden at lunchtime*.", the reference to the everyday lives of the children was missing. Many of the children do not have a garden at home or they do not know what time the garden is watered. To avoid the inclusion of such statements in the questionnaire, more information about the living conditions of the children would have been necessary. In addition, it would be practical to avoid vague formulation in terms of quantities and frequencies, for instance "*a lot of*" or "*often*". The analysis of the data showed that children who have grown up under various living conditions interpret such formulations very differently. It would be better if the children write down specific numbers or they can choose between specific categories of quantities or frequencies.

In contrast to the Likert-Scales, the answering of the open questions should be emphasized positively. This was easier for the children because they only had to understand one question instead of many different statements. They could formulate the answers in their own words. Thus, the responses of the children, whose English was not very well, were not as detailed as the answers of the other children, but they were useful and interesting for the evaluation. In addition, the responses gave a good insight into the lives of children. As expected, without the open questions important information would have been lost. However, more information about the children would also help to be able to interpret the responses of the pupils better.

By implementing the post-survey in the hometowns of the children, it was possible to get a small insight into the living conditions of the children from Rietoog, Gochas and Windhoek. But the children were mainly seen in their schools and not at their homes. It would have made sense to visit the children at their homes and to experience how they live and how they use water and energy. Therefore it would have been necessary to ask for the parent's permission, if the children are allowed to be visited at their homes. Overall, much more time and organizational effort would have been needed for visiting the children at their homes. This was not possible within this study. But for further studies, it would be very interesting to see which facilities and electronic devices are available for the children and which skills the children implement at home to save water and energy after a visit to NaDEET. In this way, the problem of social desirability could be avoided, since the children's responses could be compared with the impression of their daily lives which can be made during the visit of their homes.

Considering the results of the survey the problem of the high values of the standard deviation must be mentioned. As described in chapter 6.2.1., the high values results from the small sample size. Especially in terms of children it is useful to investigate a larger sample size. The analysis of the surveys has shown that children tend to give extreme answers. These extreme responses have, in the case of a small sample size, a large impact on the distribution of the data. In the case of a larger sample size, the extreme responses have a less strong effect. Therefore, it can be recommended for further studies that a larger number of children should be interviewed. For this purpose, however, a greater amount of time connected with a longer stay in NaDEET is necessary.

Since in this study only a brief insight into the work of NaDEET could be obtained, the described recommendations for management can only serve as a guideline to improve the environmental education work of NaDEET. Whether the proposed measures are realizable, must be judged by the staff and tested in practice.

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Attachment

A: Questionnaire of the pre-survey

B: Questionnaire of the post-survey

To examine the detailed answers of every individual child in terms of the open questions and the present thesis in digital form, please view the attached CD.

Attachment A: Questionnaire of the pre- survey

Hello!

My name is Carina Holtwerth. I'm from Germany. I visit NaDEET for two month and want to know more about it. Besides I would like to learn more about your life in Namibia and your stay in NaDEET. Here you can help me. I would like to ask you a few questions about your visit to NaDEET. It will take about ten minutes. I would be glad, if you could help me!

1. Have you ever been in NaDEET before?

Yes ☐ No ☐

1.1. If so when? _____

2. Do you know someone who was already in NaDEET?

Yes ☐ No ☐

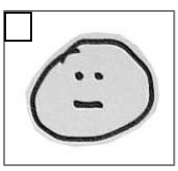
2.1. If so who? (Multiple answers are possible.)

Family ☐
Friend ☐
Acquaintance ☐
Teacher ☐
Others _____ ☐

3. Are you looking forward to the time in NaDEET?


Fully agree


Partially agree


Neutral


Partially Disagree


Strongly disagree

4. Do you know why you are here? (Please write it down.)

_____

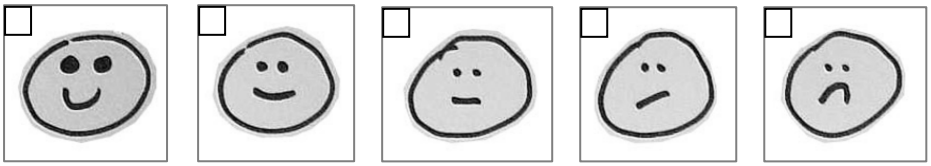
_____

_____

5. What do you expect from your stay in NaDEET?

I expect…	I fully agree ☺ 1	→ 2	→ 3	→ 4	I strongly disagree ☹ 5
fun					
free time					
to learn more about my village (town, city) and Namibia.					
to learn more about topics such as water and energy.					
to meet new people.					
to learn how to live environmentally friendly.					
to play with my friends.					

6. Do you believe that the visit to NaDEET is important for you?



Fully agree | Partially agree | Neutral | Partially disagree | Strongly disagree

6.1. Why do you believe this? (Please explain.)

_____

_____

_____

7. Have you learned something about the topic of environmental protection at your school?

Yes ☐ No ☐

7.1. If so, about which topics in terms of environmental protection did you learn something at school? (Multiple answers are possible.)

Saving water ☐
Environmentally friendly energy sources ☐
Recycling waste ☐
Plants and animals ☐
Other topics _____ ☐

8. Did you talk to your parents about your visit to NaDEET?

Yes ☐ No ☐

8.1. If so, what did you tell them? (Please write it down.)

_____

_____

_____

Now it would be nice if you could tell me something about your life at home →

9. What do you and your family use to cook your meals?

	often 1	from time to time 2	never 3	We haven't got this at home 4
 Open Fire				
 Gas				
 Electric				

 Fuel-Efficient Stove				
 Solar				

10. How do you bathe at home?

	often 1	from time to time 2	never 3	We haven't got this at home. 4
 Bathtub				
 Shower				
 Bucket Shower				
 Bucket Bath				

11. Do you always have enough water at home?

Yes ☐ No ☐

12. What do you think about the following statements? Please value every statement.

	I fully agree ☺ 1	→ 2	→ 3	→ 4	I strongly disagree ☹ 5	I cannot assess this. 6
I pour dirty water away after doing the dishes.						
I leave the tap open without using the water.						
I often take a bath.						
I don't care about how much water I use every day.						
I think that long-drop composting toilets are nasty.						
I turn off the water during a shower while washing.						
My family waters their garden at lunchtime.						
I switch off the light when I don't need it.						
I use a lot of electronic devices.						
I can cook with solar energy instead of an open fire.						
I think that the people of Namibia don't have enough water to live.						
I believe that there is enough wood in Namibia.						
I don't know much about our environment.						
I think it will be getting hotter in Namibia.						
My family takes a lot of wood for cooking.						

Finally, I want to ask you something about yourself.

a) School: _____ **b) Grade:** _____ **c) Age:** _____

d) Gender: male ☐ female ☐

e) Where are you from?

City ☐ Village ☐
Town ☐ Farm ☐

What is the name of the place where you live?

The last thing I need is your name because I want to interview you once again a week after you visit to NaDEET. Except for me, no one will see your name.
I wish you a nice time in NaDEET! I hope we will see us again at your school or home.

d) First name: _____ **Surname:** _____

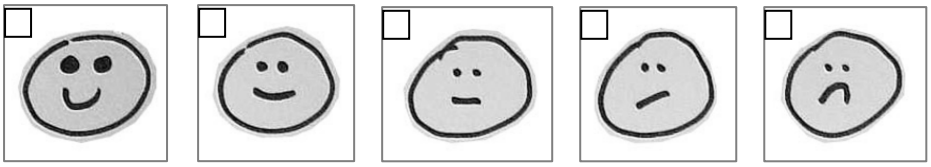
Thank you that you participated in my survey! ☺

Attachment B: Questionnaire of the post-survey

Hello!

My name is Carina Holtwerth. I interviewed you in NaDEET some time ago. Today I want to ask you about your visit in NaDEET again. It will take about ten minutes. I would be glad, if you could help me!

1. Altogether how do you like NaDEET?



Very well | Well | Neutral | Badly | Very badly

2. Please value the following statements.

	I fully agree ☺ 1	I agree → 2	Neu-tral → 3	I dis-agree → 4	I strongly disagree ☹ 5
I had a lot of fun in NaDEET.					
I have learned a lot of new things there.					
I want to visit NaDEET again.					
I know more about the topics water and energy now.					
The staff was nice in NaDEET.					
I have learned things I didn't know before.					
It was boring in NaDEET.					
My expectations weren't fulfilled.					
I didn't feel very good there.					
I would recommend NaDEET to my friends.					
I didn't understand everything they told me in NaDEET.					

3. Have you told your parents what you have experienced in NaDEET?

Yes ☐ No ☐

3.1. If so, what did you tell them? (Please write it down.)

_____

_____

_____

_____

4. Do you think that your parents listened to you?

Yes ☐ No ☐

5. Did you talk about your visit to NaDEET at school?

Yes ☐ No ☐

5.1. If so, what were you talking about? (Multiple answers are possible.)

Saving water ☐
Environmentally friendly energy sources ☐
Recycling waste ☐
Plants and animals ☐
Other topics _____ ☐

Now I want to learn something more about your life at home.

6. Has anything changed in your everyday life in terms of using water and energy since your visit to NaDEET? Please explain your answer!

Yes ☐ No ☐

_____

_____

_____

7. What do you and your family use to cook your meals?

	often 1	from time to time 2	never 3	We haven't got this at home 4
 Open Fire				
 Gas				
 Electric				
 Fuel-Efficient Stove				
 Solar				

8. How do you bathe at home?

	often 1	from time to time 2	never 3	We haven't got this at home. 4
 Bathtub				
 Shower				
 Bucket Shower				
 Bucket Bath				

9. What do you think about the following statements? Please value every statement.

	I fully agree ☺ 1	I agree → 2	Neu-tral → 3	I dis-agree → 4	I strongly disagree ☹ 5	I cannot assess this. 6
I pour dirty water away after doing the dishes.						
I leave the tap open without using the water.						
I often take a bath.						
I don't care about how much water I use every day.						
I think that long-drop composting toilets are nasty.						
I turn off the water during a shower while washing.						
My family waters their garden at lunchtime.						
I switch off the light when I don't need it.						
I use a lot of electronic devices.						
I can cook with solar energy instead of an open fire.						
I think that the people of Namibia have enough water to live.						
I believe that there is enough wood in Namibia.						
I don't know much about our environment.						
I think it will be getting hotter in Namibia.						
My family takes a lot of wood for cooking.						

10. What did you like in NaDEET in particular? (Please write down one or two examples.)

_____

_____

_____

11. What did you not like in NaDEET? (Please write down one or two examples.)

_____

_____

_____

_____

The last thing I need is your name. Except for me, no one will see your name.

First name: _____ **Surname:** _____

Thank you that you participated in my survey! ☺

Affirmation in lieu of an oath

I hereby declare in lieu of an oath that I wrote the available Master thesis myself only by using the indicated references and assistant data and that all passages of the thesis which derive from other sources, either word-for-word or in general sense, are being marked as such. The thesis has not been presented to any other examination authority in the same or a similar form.

Hanover, 17.11.2014,

Carina Holtwerth