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DECISION SUPPORT IN THE IMPLEMENTATION OF SUSTAINABLE DEVELOPMENT IN PROTECTED AREAS REGARDING ENVIRONMENTAL EDUCATION AND ECOTOURISM

DISSERTATION

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To my Ancestors for living sustainably,

To my Mother for countless opportunities, everlasting encouragement and love,

To my son Oskar for being my enlightenment and making me a better human being...

...in hope his generation will understand, cherish and protect Mother Nature.

DECISION SUPPORT IN THE IMPLEMENTATION OF SUSTAINABLE DEVELOPMENT IN PROTECTED AREAS REGARDING ENVIRONMENTAL EDUCATION AND ECOTOURISM

ABSTRACT

The thesis examines the relationships between sustainable development, environmental education and ecotourism in protected areas. Specifically, it addresses the question of how to provide decision support which would aid the decision makers in the implementation of sustainable development in protected areas. The research was structured in four research foci: decision problems in protected areas, the relationship between environmental education and sustainable development in protected areas, decision support for ecotourism, the relationship between environmental education and ecotourism. The methodology used in the research presented included: content analysis, questionnaires, semi-structured interviews, focus groups and multi-attribute decision modeling. We made an overview of decision problem and decision making in protected areas in the last decade, identified decision problems associated with protected areas and developed a classification of decision problems in protected areas. Eight case studies were conducted, four in the Republic of Slovenia and four in the State of Hawai'i, USA, within which we established collaboration with the Public Institution Triglav National Park from Slovenia and Na Ala Hele Trail and Access Program within the Department of Land and Natural Resources from Hawai'i. We developed two decision support models using qualitative decision modeling methodology DEX, as applications of the theoretical knowledge on the real case studies. The model on mountain huts infrastructure sustainability and the model on students' information perception at the educational event offer new insight in the evaluation and comparison of alternatives and provide new decision support tools for the end users. We developed a list of workable environmental education indicators for the Triglav National Park. The assessment of tourists' pro-environmental behaviour was done in two protected areas: the Triglav National Park in Slovenia and Mānoa Falls Trail in Ko'olau Mountain Watershed, Conservation District in the island of O'ahu, Hawai'i. We addressed willingness to pay for hiking at Mānoa Falls Trail and support for nature conservation. Furthermore, we proposed solutions for decision problems and dilemmas regarding ecotourism and environmental education in the Alps and Hawai'i, by also conducting the research on pro-environmental behaviour of hikers in the Triglav National Park, by comparing ecotourists' versus general visitors' pro-environmental behaviour and sustainability evaluation when making travel decisions in Hawai'i, by assessing six ecotourism operators in O'ahu, and by deriving guidelines for the future development of ecotourism in Slovenia based on the assessment of examples of good practice from Hawai'i. We investigated both mountain and island ecosystems, and provided connections through addressing common decision problems and by providing decision tools and guidelines towards their sustainable management.The most important results show that: (a) common decision problems are present in protected areas worldwide; (b) mountain and island protected areas are attractive tourism destinations and require proper management in order to balance between conservation and pressures on the resource (c) environmental education influences ones' support for nature conservation in Slovenia and Hawai'i, and ones' willingness to pay for experiencing hiking in protected areas in Hawai'i; (d) ecotourists in Hawai'i behave more pro-environmentally in comparison to general visitors; (e) ecotourism operators in Hawai'i provide environmental education as integrated part of their services. Other contributions of the thesis are: (f) classification of decision problems and decision making processes that occur in protected areas; (g) environmental education indicators for the Triglav National Park; (h) guidelines for the future development of ecotourism in Slovenia; (i) operational decision support models for mountain huts infrastructure assessment and evaluation of environmental information perception of educational workshop participants. The outcomes of this work are multidisciplinary and contribute to a better understanding of decision problems in protected areas, and relationships between sustainable development, environmental education and ecotourism.

Key words: decision support, protected areas, sustainability, environmental education, ecotourism, pro-environmental behaviour, nature conservation, indicators, models.

PODPORA ODLOČANJA PRI IMPLEMENTACIJI TRAJNOSTNEGA RAZVOJA V ZAVAROVANIH OBMOČJIH NA PODROČJU OKOLJSKE VZGOJE IN EKOTURIZMA

POVZETEK

Disertacija preučuje razmerja med trajnostnim razvojem, okoljsko vzgojo in ekoturizmom v zavarovanih območih. Natančneje obravnavamo vprašanje, kako podpreti odločitve za implementacijo trajnostnega razvoja na zavarovanih območjih. Raziskovalno delo obravnava štiri raziskovalna področja: odločitveni problemi v zavarovanih območjih, odnos med okoljsko vzgojo in trajnostnim razvojem v zavarovanih območjih, podpora pri odločanju za ekoturizem ter odnos med okoljsko vzgojo in ekoturizmom. Uporabili smo sledeče metode: analizo vsebine, vprašalnike, delno strukturirane intervjuje, razgovor v skupini in večparametrsko odločitveno modeliranje. Naredili smo pregled odločitvenih problemov in odločanja na zavarovanih območjih v zadnjem desetletju, identificirali odločitvene probleme, povezane z zavarovanimi območji, in izdelali klasifikacijo odločitvenih problemov na zavarovanih območjih. Izvedli smo osem študij, štiri v Republiki Sloveniji in štiri v ameriški zvezni državi Havaji, ter v njihovem okviru vzpostavili raziskovalno sodelovanje z Javnim zavodom Triglavski narodni park (TNP) iz Slovenije in Na Ala Hele State of Hawai'i Trail and Access Program, Department of Land and Natural Resources at City and County of Honolulu (Na Ala Hele Program za dostop in upravljanje s pohodniškimi potmi, Oddelka za zemljišča in naravne vire Mesta in okrožja Honolulu) s Havajev. Kot primera uporabe teoretičnega znanja na realnih primerih smo razvili dva modela za podporo pri odločanju z uporabo kvalitativne metodologije za odločitveno modeliranje DEX. Oba modela, model za vrednotenje infrastrukture gorskih koč iz zornega kota trajnosti in model za vrednotenje dojemanja informacij študentov na izobraževalnem dogodku, predstavljata nov vpogled v vrednotenje in primerjavo alternativ ter zagotavljata nova orodja za podporo končnim uporabnikom pri odločanju. Za Triglavski narodni park smo razvili seznam uporabnih kazalnikov za okoljsko vzgojo v parku. Študija o trajnostnem vedenju do okolja je bila izvedena na dveh zavarovanih območjih: Triglavskem narodnem parku v Sloveniji in pohodniški poti Mānoa Falls (MF) v gorskem povodju Ko'olau, ki je del zavarovanega okrožja otoka O'ahu na Havajih. Obravnavali smo, ali in koliko so pohodniki pripravljeni plačati za pohod po poti Mānoa Falls ter za podporo pri varstvu narave v TNP in MF. Predlagali smo rešitve za odločitvene dileme in podporo pri odločanju glede ekoturizma in okoljske vzgoje v Alpah in na Havajih tudi z izvedbo raziskave o okolju prijaznem vedenju pohodnikov v Triglavskem narodnem parku, s primerjavo okolju prijaznega vedenja in vrednotenja trajnosti pri odločanju glede izbire potovanja pri ekoturistih in klasičnih turistih, z evalvacijo šestih ponudnikov ekoturističnih dejavnosti na Oahu in z izpeljavo smernic za prihodnji razvoj ekoturizma v Sloveniji, ki temelji na oceni primerov dobre prakse s Havajev. Raziskali smo tako gorske kot otoške ekosisteme in ju povezali z obravnavo skupnih odločitvenih problemov in razvojem orodij za podporo pri odločanju ter smernicami za njihovo trajnostno upravljanje. Iz glavnih rezultatov sledi, da: (a) so podobni odločitveni problemi prisotni v zavarovanih območjih po vsem svetu; (b) so gorska in otoška zavarovana območja privlačne turistične destinacije, ki potrebujejo ustrezne upravljalske pristope, da bi uravnotežili varstvo narave in pritisk na okolje; (c) okoljska vzgoja vpliva na okolju prijazno vedenje posameznika v Sloveniji in na Havajih ter na posameznikovo pripravljenost, da plača za pohodniško izkušnjo na Havajih; (d) ekoturisti na Havajih se obnašajo bolj prijazno do okolja kot običajni turisti; (e) ponudniki ekoturistične ponudbe na Havajih zagotavljajo okoljsko izobraževanje kot integralni del svojih storitev. K znanstvenim prispevkom teze sodijo tudi: (f) klasifikacija odločitvenih problemov in procesov odločanja v zavarovanih območjih; (g) indikatorji za okoljsko vzgojo v Triglavskem narodnem parku; (h) smernice za nadaljnji razvoj ekoturistične ponudbe v Sloveniji; (i) delujoča modela za podporo pri odločanju za vrednotenje infrastrukture gorskih koč in vrednotenje dojemanja okoljskih informacij pri udeležencih izobraževalnih delavnic. Rezultati disertacije so multidisciplinarni in prispevajo k boljšemu razumevanju odločitvenih problemov na zavarovanih območjih in razmerij med trajnostnim razvojem, okoljsko vzgojo in ekoturizmom.

Ključne besede: podpora pri odločanju, zavarovana območja, trajnost, okoljska vzgoja, ekoturizem, okolju prijazno vedenje, varstvo narave, modeli.

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ABBREVIATIONS

ALPARC – Alpine Network of Protected Areas
ANOVA – Analysis of variance
CIPRA – International Commission for the Protection of the Alps
CS – case study
CTO – Commercial Tourism Operator
DBEDT – Department of Business, Economic Development and Tourism
DLIR – Department of Labor and Industrial Relations
DLNR – Department of Land and Natural Resources
DM – decision making
DP – decision problem
DS – decision support
DSS – decision support system
E – energy
EE – environmental education
EF – environmentally friendly
ESD – Education for Sustainable Development
EUR – Euro
FSM–MPA – fishermen and marine protected areas
GDP – Gross domestic product
H – theoretical hypothesis
h – hypothesis
ha – hectare
HEA – Hawai'i Ecotourism Association
HI – Hawai'i
HTA – Hawai'i Tourism Association
IES – Institute for Environment and Sustainability
IT – information technology
IUCN – International Union for Nature Conservation
K2 – second highest peak on Earth
km – kilometer
m – meter
mio. – million
NC – nature conservation
NP – national park
MAB – Man and Biosphere
MADM – multi attribute decision making
MCDM – multi criteria decision making
MCE – multi criteria evaluation
MF – Mānoa Falls Trail
MPA – marine protected area
(M)PA – marine and terrestial protected areas
MR – marine reserve
NAH – Na Ala Hele, State of Hawai'i Trail Access Program
NGO – nongovernmental organization
NOAA – National Oceanic and Atmospheric Administration
OECD – Organization for Economic Co-operation and Development
PA – protected areas
QR – Quick Response (codes)
RF – research focus
SCUBA – self-contained underwater breathing apparatus
SD – sustainable development
SLO – Slovenia
SPSS Statistics – Statistical Product and Service Solutions
SURS – Statistični urad Republike Slovenije (English: Statistical Office of the Republic of Slovenia)
TIES – The International Ecotourism Society
TNP – Triglav National Park

UK – United Kingdom
UN – United Nations
UNEP – United Nations Environment Programme
UNESCO – United Nations Educational, Scientific and Cultural Organization
UNCED – United Nations Conference on Environment and Development
UNWTO – United Nations World Tourism Organization
USA – United States of America
WCED – World Commission on Environment and Development
WTO – World Trade Organization
WTP – willingness to pay
WWF – World Wildlife Fund

SYMBOLS

α – significance level
df – degrees of freedom
t-statistic – ratio of the departure of an estimated parameter from its notional value and its standard error
t-test – any statistical hypothesis test in which the test-statistic follows a Student's t distribution if the null hypothesis is supported
t value – Pearson correlation coefficient
$t_{empirical}$ – t-test result based on our sample
p-value – significance level
r – Pearson correlation coefficient
$ – United States dollar
S_e – standard error
% – percentage
χ^2 – Chi Square test

1 INTRODUCTION

Protected areas (PAs) are locations that receive protection because of their environmental and cultural values, and because of their unique features or vulnerable ecosystems. They are classified into six categories according to the ecologically based International Union for Conservation of Nature (IUCN) Category System for National Parks and Protected areas (IUCN, 2013a). National parks are classified in IUCN Category II and are by definition “large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible, spiritual, scientific, educational, recreational, and visitor opportunities” (IUCN, 2013a). According to the UNEP (2013): “protected areas managed mainly for ecosystem protection and recreation”. Interrelationships between conservation and tourism in protected areas present a hot spot for scientific research (IUCN, 1994; Prato, 2001; Eagles et al., 2002; Eagles and McCole, 2004) and at the same time demand constant monitoring and new management decisions in order to balance the needs and satisfaction for both (Westmacott, 2001; Lawson and Manning, Rudolphi and Haider, 2003; 2003; Zachrisson, 2008 Zucca et al., 2008;). Protected areas can be seen as focal points where conservation and development are to be discussed and balanced in order to find synergy between the PAs’ mission and sustainable regional and landscape development as well.

Appying sustainabile development in protected areas is becoming a necessity worldwide (Brandt et al., 2013; De Santo, 2013; Elbakidze et al., 2013; Galindo-Pérez-de-Azpillaga et al. 2013; Santana-Medinaet al. 2013). Managing protected areas requires a multidisciplinary approach in finding the unique equilibrium between nature conservation goals and development that respects the needs of present generations and does not compromise the resources longterm existence and possibilities of future generations.

Three interrelated aspects must be involved in successful park management: administrative organization, managing natural and cultural resources, and managing park visitors and the tourism industry (Eagles and McCool, 2004). Simple qualitative evaluation does not provide sufficient information for objective decision making in protected areas.

The traditional paradigm of protected areas management has emphasized the conservational function of protected areas with recreation and leisure as the main human activities; the new emerging paradigm includes and emphasizes the socio-economic objectives of protected area management and development (Lockwood et al., 2006). The new paradigm needs to consider decision making with multiple objectives and applies the use of decision support tools for the stakeholders' participation in the management process of protected areas (De Castro et al., 2013).

The research problem that is being investigated within this thesis is how to achieve sustainability in protected areas through environmental education and ecotourism by applying suitable decision support. In this regard we are interested in understanding of relations between environmental education and ecotourism and their mutual impacts on sustainability in protected areas. We also seek an understanding of decision processess in PAs and investigating possible contributions of decision support models and systems.

In this thesis we choose to focus our research on island and mountain protected areas. This choice has been made due to the high island and mountain ecosystems vulnerability and the need for decision support in the implementation of sustainable development within their management. The Man and the Biosphere (MAB) Programme, an Intergovernmental Scientific Programme set by UNESCO in 1971, ”aims to set a scientific basis for the improvement of the relationships between people and their environment globally” (UNESCO, 2013). Currently the MAB Programme is structured into 14 project areas, mountain and island ecosystems are being studied in the spotlight of ”Impact of human activities on mountain and tundra ecosystems” (Project Area 6) and ”Ecology and rational use of island ecosystems” (Project Area 7) (UNESCO, 2009). These two project areas indicate that mountain and island ecosystems globally deserve protection and the attention of the United Nations, international organizations and researchers around the globe.

Due to the fact that this research has been funded by the Research Agency of Republic of Slovenia through the Young researcher program at the University of Nova Gorica, Slovenia, we focused on

the Triglav National Park (TNP). The TNP is the only national park in Slovenia, where the highest level of nature conservation is applied and maintained by the government public service Triglav National Park National Institution. The TNP covers Julian Alps and is an example of a mountain protected area.

For the island protected area study site we were looking for location that has high biodiversity, developed ecotourism and the need for sustainable management decision support. The choice of an island protected area was made based on the fact that the State of Hawai'i has very high biodiversity and is at the same time very attractive tourism destination. The combination of landscape diversity, attractive wildlife (dolphins, whales, sea turtles, coral reefs) and the cultural herritage of Hawai'i has enabled ideal conditions for sustainble tourism practices among which ecotourism is highly developed and presents a niche in the tourism industry. The research on island protected area was conducted through the Fulbright Research Fellowship grant at the University of Hawai'i at Mānoa, the island of O'ahu. We choose to conduct research on the Mānoa Falls Trail, located in the Ko'olau Mountain Watershed, Conservation District. The research site was located in the same valley as the University, enabling regular site visits and involvement of students in assisting with the experimental part of the research project.

Comparative research on mountain and island tourism has been previously published (Brown et al., 1997; Pyo, 2005). Pyo (2005) compared knowledge maps of mountain and island resort tourism destination types and Brown et al. (1997) examined tourist development based on the concepts of open access and renewable natural resources in the Maldives Islands and Nepal. Brown et al. (1997) found that both countries face similar problems regarding tourism impacts on natural, social and economic environments. The same study identified three major environmental problems occurring in mountain and island tourism destinations as a consequence of the increasing tourism industry: solid waste disposal, management of water resources and depletion of natural resources. This two literature examples support our choice of research locations, by proving mountain and island destinations are comparable in the context of tourism and their vulnerability.

Education and awareness raising activities are a precondition for ecotourism (Butler, 1992; Acott et al., 1998; Donohue and Needham, 2006; Weaver and Lawton, 2007). The International Ecotourism Society, the biggest body uniting ecotourism specialists, operators and decision makers, defined ecotourism in 1990 as "responsible travel to natural areas that conserves the environment and improves the well-being of local people" (TIES, 2013). The increasing ecotourism industry has the potential to find the balance between regional development and conservation of wildlife, their habitats, nature in general and finally contribute to better socio-economic policy shaping and environmental protection. Conflicting standpoints and arguments from ecotourism supporters and opponents have shaped changes in conceptualization and shaping the paradigms, frameworks and models (Higham, 2007). Both positive and negative evidence of ecotourism impacts are reported, orienting stakeholders towards the application of more sustainable principles by putting them into practice, monitoring their impacts and shaping better ecotourism produces and services (Gössling, 1999; Coria and Calfucura, 2012).

Mountain ecotourism is defined as "tourism that does not degrade the natural and cultural environment of mountain regions, provides economic, environmental and social benefits to mountain communities and offers a high quality experience for visitors" (Nepal, 2002). The term island tourism unites tourism activities within the islands boundaries (Jaafar and Maideen, 2012). Being geographically limited in space and space related resources; island tourism creates economic, social and environmental pressures, which lead to changes in the biotic and abiotic environment as well as socio economic structures (Carlsen and Butler, 2011). Exceeding the carrying capacity of mountain and island ecosystems causes high ecological pressure that leads to direct and indirect environmental impacts, which may irreversibly damage fragile ecosystems. The major environmental impacts of tourism in mountain and island destinations include: overcrowding, noise pollution, garbage pollution, sewage outflow, potential fire hazards, extraction of valuable sources, disruption of wildlife and introduction of invasive species, which all lead to irreversible changes in ecosystems and local society. Tropical islands face the problem of coral bleaching, due to temperature rise and changes in marine water chemistry, resulting from water pollution and excessive tourism activities (Gössling et al., 2002; Baine et al., 2007; Carlsen and Butler, 2011; Lagabrielle et al., 2011; Jaafar and Maideen, 2012; van Riper, 2012). Island ecosystems are perceived to be the most vulnerable and fragile tourism destinations (Carlsen and Butler, 2011),

while mountain vulnerability is pointed out by various researchers as well (Singh and Mishra, 2004; Brodnig and Prasad, 2010; Bharali and Khan, 2011; Gentle and Maraseni, 2012). Krüger (2005) and Weaver (2005) found islands and mountains to be more fragile and thus more vulnerable in terms of being exposed to ecotourism impacts.

The title of the thesis and the definition of the research problem used concepts that are explained in the following sections of this chapter, which form the theoretical background and the basis for defining our research goals and hypotheses.

1.1 Sustainable development concept

In 1987 sustainable development was defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" in World Commission on Environment and Development (WCED) Report (Murphy and Price, 2005). The concept has evolved since the WCED (1987) definition, notably through Agenda 21, the plan of action which emerged from the United Nations Conference on Environment and Development (UNCED) in 1992 in Rio de Janeiro, and the plan of implementation from the World Summit on Sustainable Development in Johannesburg in 2002.

According to the UNEP and UNWTO (2005: 72), sustainable development is today represented by the following three dimensions or "pillars":

- Economic sustainability, which means generating prosperity at different levels of society and addressing the cost effectiveness of all economic activity. Crucially, it is about the viability of enterprises and activities and their ability to be maintained in the long term.
- Social sustainability, which implies respecting human rights and equal opportunities of every member of society. It requires an equitable distribution of benefits, with a focus on alleviating poverty. There is an emphasis on local communities, maintaining and strengthening their life support systems, recognizing and respecting different cultures and avoiding any form of exploitation.
- Environmental sustainability, which entails conserving and managing resources, especially those that are not renewable or are precious in terms of life support. It requires action aimed at minimizing air, land and water pollution, as well as conserving biological diversity and natural heritage.

In order to deliver sustainable development, striking a balance between all three of the "pillars" is often required, while they are in many ways interdependent and can therefore be both mutually reinforcing and in competition (UNEP and UNWTO, 2005).

1.2 The ecotourism phenomenon

According to the concept of sustainable development, tourism can be sustainable if development meets the needs of present tourists and local residents while protecting future opportunities. To some degree, confusion arises between the different types of tourism (sustainable tourism, green tourism, ecotourism) and even within a single term, as incorrect usage can mislead or cause misunderstanding.

The term "ecotourism" was established in 1980s after the rise in global environmental issues and awareness of environmental damage due to the urbanization and modernizing of industries. Ecotourism supporters argued that ecotourism can become an important tool for nature conservation and economic development in the future. One of the first definitions defines ecotourism as "tourism that involves travelling to relatively undisturbed or uncontaminated natural areas with the specific object of studying, admiring and enjoying the scenery and its wild plants and animals" and "existing cultural manifestations (both past and present) found in these areas" (Ceballos-Lascurain, 1987). As to the diversity of places, cultures and contexts in which ecotourism is being practiced, the need for exceptions in this definition and scholarly research resulted in many new ecotourism definitions.

The year 2002 was designated The International Year of Ecotourism by the United Nations and according to the UNEP and WTO (2002) resulted in many successful outcomes. Initially, a global network of ecotourism specialists and practitioners from around the world was established, the Quebec Declaration on Ecotourism was created at the World Ecotourism Summit and over 50 countries have since adopted national strategies and policies on ecotourism development (Higham, 2007). The UNEP and WTO (2002) took the standpoint that ecotourism managed in a sustainable manner contributes to biodiversity conservation, alleviates poverty in rural areas and provides benefits to local and indigenous communities in or near protected areas. According to the UNEP and WTO (2002), the principles of ecotourism and sustainable tourism in general should be applied to all forms of tourism.

The World Ecotourism Summit focused on discussing and driving recommendations of future ecotourism development on the following four main themes (WTO, 2002):

- Ecotourism policy and planning: the sustainability challenge
- Regulation of ecotourism: institutional responsibilities and frameworks
- Product development, marketing and promotion of ecotourism: fostering sustainable products and consumers
- Monitoring costs and benefits of ecotourism: ensuring equitable distribution among all stakeholders.

These themes introduced a wide spectrum of processes to ecotourism industry, from planning and regulations, to products and services development and marketing, and finally monitoring. Within these processes, the environmental, social and economic developments as well as assessments by different monitoring tools and approaches are taken into account.

The UNEP and WTO (2005) made an overview of potential advantages and disadvantages of six different types of tourism in terms of sustainability, presented in the form of table. They assessed: larger resorts and hotels, or similar enterprises; medium, small and micro enterprises; community-based tourism; ecotourism enterprises; activity tourism enterprises; and cultural tourism enterprises. In Table 1 we present a section on ecotourism enterprises form the original table (UNEP and UNWTO, 2005: 65).

Table 1: *"Table 4.1: Potential advantages and disadvantages of ecotourism enterprises in terms of sustainability." (UNEP and UNWTO, 2005: 65).*

Tourism type	Potential advantages	Potential disadvantages
Ecotourism enterprises	• Growing market interest • All ecotourism products by definition should be specifically designed to minimize environmental impact, and to support conservation and communities • Suited to sensitive/protected areas	• Location in natural areas, and possibly indigenous communities, opens potential for intrusive impact • Potential to abuse term "ecotourism", with positive impacts not assured • Visitor appeal often seasonal

Ecotourism is often perceived as a counter balance to mass tourism and a solution towards greening current tourism industry. This idealistic view unfortunately fails to reach the high expectations. Firstly, ecotourism needs undisturbed places with natural and cultural heritage, which are not mass tourism destinations. Secondly, due to a lack of monitoring, incomplete environmental assessments and inadequate audits, many ecotourism destinations tend to be hazardous and even self-destructive (Tsaur et al., 2006). Thirdly, "greenwashing" confuses customers by promoting services, products or companies as "green" when they do not implement or follow good environmental practices (Rider, 2009). Ecotourism certification is rising as a potential solution to the problem of really knowing what ecotourism is and what it is not (Honey, 2002), allowing true ecotourism companies to be forerunners in showing how resource conservation and tourism can go hand in hand.

Higham (2007) identified two contrasting schools of thought: one justifies nature protection and restoration of natural environments simultaneously with opportunities for economic development, employment and empowerment of indigenous people (Hinch, 2001), the other perceives ecotourism as Western interest in economic development with serious impacts to pristine environments and communities (Hall, 1994; Wheeller, 1994; Cater, 2006).

The literature review revealed various principles and criteria that describe ecotourism, which leads to different ecotourism definitions as well. Hence, we point out ecotourism criteria and principles of some of the most reputable researchers in the field of ecotourism.

The Quebec Declaration on Ecotourism (2002: 1-2) states ecotourism should embrace the following four principles that distinguish it from other forms of sustainable tourism:

- "Contributes actively to the conservation of natural and cultural heritage,
- Includes local and indigenous communities in its planning, development and operation, and contributes to their well-being,
- Interprets the natural and cultural heritage of the destination to visitors,
- Lends itself better to independent travelers, as well as to organized tours for small size groups."

Honey (2002) identified eight elements of "authentic" ecotourism:

- travel to natural areas
- minimize impacts
- provide direct financial benefits for conservation
- provide financial benefits and empowerment for local communities
- build environmental and cultural awareness for hosts and guests
- respect local culture
- be sensitive to host country's political and social conditions
- support human rights and international labor agreements.

Donohue and Needham (2006) identify six "key tenets":

- nature-based
- preservation and conservation
- education
- sustainability
- distribution of benefits
- ethics/responsibility/awareness.

Weaver and Lawton (2007) argue ecotourism must fulfill three core criteria:

- nature-based attraction
- learning and education of visitors
- services and goods should embed all three pillars of sustainability.

Higham (2007) points out eight principles and characteristics of ecotourism after Butler (1992) and Acott et al. (1998):

- positive environmental ethics, fostering preferred behaviour
- does not denigrate the resource
- concentrates on intrinsic values
- biocentrism philosophy, not transforming the environment for personal convenience
- provides net benefits for the resource
- first-hand experience in natural environment
- gratification in the form of appreciation and education
- high cognitive (informational) and effective (emotional) dimensions, for which ecotourists and ecotour operators should prepare.

Ecotourism is a form of nature-tourism, the travel to relatively undisturbed or uncontaminated natural areas, which according to the Goodwin (1996) and Brown et al. (1997) meets these requirements: "mitigating socio-economic situation", "contributing to biodiversity conservation",

"posing a minimum threat to continuation of local culture and society", and "education to the conservation of ecosystems" (Gössling, 1999). Goodwin (1996) and Gössling (1999) present conceptual contributions to the field of ecotourism research, while Brown et al. (1997) assessed tourism development in mountain and island ecosystems. The review of ecotourism criteria and requirements according to Honey (2002), Donohue and Needham (2006), Higham (2007) and Weaver and Lawton (2007) as well as the World Ecotourism Summit themes, overview and recommendations (WTO, 2002) and the Quebec Declaration on Ecotourism (2002) we used the following five criteria in this thesis as core requirements for achieving ecotourism:

- nature conservation (biodiversity, biotic and abiotic natural characteristics)
- low impact (on social, environmental, economic environment)
- sustainability (social, economic, environmental)
- meaningful community involvement (in resource management and ecotourism operators)
- environmental education (at all levels of the society).

We take the standpoint that true ecotourism benefits local residents, conservation support, low-scale development, educational experiences of visitors and is implemented within small visitor groups. At the same time we argue that by persistently applying sustainability in multiple dimensions and levels of tourism, industry consensus between conservation and development can be achieved with benefits for humankind and the rest of nature. For example, a study on the impact of tourism on natural resources in China showed the possibility of using tourism in order to balance natural resource conservation and economic development via effective policies that encourage and help local residents to become involved in the tourism industry in order to derive both direct and indirect benefits (Li et al., 2006). In the last decade the scientific evidence of positive effects of ecotourism on different sustainable development dimensions is emerging: for instance on local economic dimensions (Ormsby and Mannle, 2006; Baral et al., 2008; Jaafar and Maideen, 2012), wildlife conservation (Cárdenas-Torres et al., 2007; Rowat and Engelhardt, 2007; Skewgar et al., 2009) and habitat conservation (Schleyer and Celliers, 2005) within environmental dimensions and social dimensions (Ormsby and Mannle, 2006; Baral et al., 2008 Reimer and Walter, 2013).

1.3 Environmental education in protected areas as the element of ecotourism

In 2002 the UNESCO was designated as the leading agency for the promotion of the Decade of Education for Sustainable Development (2005-2014), declared by the UN General Assembly's Resolution 57/254. Worldwide, many educational events followed, including conferences, application of educational initiatives, programs, web sites, projects and workshops with the focus on developing countries and youth. "The Decade is not limited to environmental education" (DESD, 2013), but education for sustainability. This thesis focuses on environmental education in protected areas, which can be perceived as being under the umbrella of Education for Sustainable Development.

The encouragement of environmental education in biosphere reserves has been a central goal of the UNESCO Man and the Biosphere Programme (MAB). The German MAB National Committee (1996) stated that it required all biosphere reserves to develop and implement criteria and contents for environmental education in their framework plans. National, regional and landscape parks as well as biosphere reserves all have the role of implementing environmental education in their existence and performance of management strategies. According to Hein and Kruse-Graumann (2005), learning for sustainability must encourage the acquisition of new, sustainable (resource-saving and prevention-based) lifestyles (consumption, mobility, living preferences, etc.) at all levels of society. UNESCO (1999) found adult learning to be an important tool in raising environmental awareness and promoting environmentally supportive action.

Environmental education is one of the five criteria that must be fulfilled in order to perform ecotourism and is the key step towards the process of understanding natural ecosystems and our role in them. The aim of environmental education is to teach and educate the public about the function of natural environments and, particularly, how human beings can manage their behaviour and ecosystems in order to live sustainably. The implementation of environmental education to society can be successfully achieved by lifelong learning, where all age groups are involved as well as special target groups (e.g. primary school children) and are taught either by official educational

programs, workshops, media, past time activities, advertisements, or in some other way. Raising the environmental awareness of society has become one of the primary goals for many international organizations (WWF, UNESCO, WCED, WCU, IES). The term “Education for Sustainable Development” (ESD) was coined by the United Nations and is now being used internationally for various educational activities that promote sustainability.

Hein and Kruse-Graumann (2005) argue that education and life-long learning are fundamental components of sustainable development, and must be supported by integrated natural and social research approaches in collaboration with participants from various groups of players. From the literature it is clear that the importance of environmental education is being recognized and discussed in scientific societies. The variety of researched topics include: environmental education in protected areas (De Carvalho et al., 1998; Soykan, 2009), educational programmes (Mayaka and Akama, 2007), development of environmental training materials (Macris and Georgakellos, 2006), for various target groups (Macris and Georgakellos, 2006; Hassan et al. 2009; Tor, 2009; Soykan, 2009), different activities such as seminars, workshops, environmental talks, exhibitions, conventions and outdoor activities (Hassan et al., 2009).

In 2009 the Alpine Network of Protected Areas (ALPARC) expanded “Joint communication Working Group of the protected areas” to include environmental education as "Joint communication and environmental education" Working Group. “Environmental education and awareness-raising targeting the general public (visitors, local residents, schoolchildren, etc.) are two key components in the Alpine protected areas' role” (ALPARC, 2009).

In Austria at the Hohe Tauern National Park Park's Mittersill visitor center developed The National Park Climate Change School project in collaboration with political decision-makers (ALPARC, 2010). The aim of the project, which presents innovation in the visitor center’s environmental education programme, is to teach children and young people how to respect the natural world, by showing children a wheel of time that indicates how the climate has changed over the last few thousands of years in the Alps. The concept of the project is based on the environmental education formula: “experience + knowledge = informed action” (ALPARC, 2010).

These cases are the best evidence that environmental education is a key issue also in protected areas of the Alpine space, and that most of its protected area managers see the importance for the implementation of sustainable development via environmental education tools. Environmental education, being one of the main principles for achieving ecotourism (Acopa and Boenge, 1998; Bottrill and Pearce, 1995; HaySmith and Hunt, 1995; Honey, 2008; Nepal, 2002; Stubelj Ars and Bohanec, 2010; Whelan, 1991), could fill certain sustainable tourism niches, particularly in protected areas and reach more people within the tourism industry.

1.4 Tourism in mountains: the shift towards ecotourism

Mountain ecosystems have ecological, recreational, educational and scientific values and a great potential for promoting green tourism in the form of natural and cultural heritage (Singh and Mishra, 2004). Mountain ecotourism is defined as “tourism that does not degrade the natural and cultural environment of mountain regions, provides economic, environmental and social benefits to mountain communities and offers a high quality experience for visitors” (Nepal, 2002). Still, many mountain tourist destinations may not qualify as ecotourism venues, since all five criteria for mountain ecotourism are not always fulfilled. Moreover, there is a difference between mountain ecotourism in developed and undeveloped countries, and some popular destinations are plagued by the perpetual problem of mass tourism.

Around the world, a number of mountain peaks (e.g., Mount Everest, K2, Annapurna in the Himalayas, Mont Blanc in Europe, Kilimanjaro in Tanzania, Machu Picchu in Peru, etc.) serve as popular destinations for mountaineers and climbers and are visited by many tourists each year. Uncontrolled numbers of tourists in vulnerable mountain environments pose a serious danger with environmental implications (Singh and Mishra, 2004). Exceeding the carrying capacity of a mountain ecosystem causes high ecological pressure that leads to direct and indirect

environmental impacts, which may irreversibly damage fragile and notable mountain ecosystems. The major environmental impacts of tourism in mountain regions include: overcrowding, noise pollution, garbage pollution, sewage outflow, potential fire hazards, extraction of valuable sources, disruption of wildlife and introduction of invasive species. Thus, although ecotourism must benefit the local community as well as the natural environment, there are dangers in promoting environmentally sensitive and undeveloped mountain areas for ecotourism. The concern for environmental conservation and willingness to promote tourism in mountain regions leads to conflicts between tourism operators, public interest groups, stakeholders and local residents, government and protected areas managers. According to Muller (1996), mountain tourism must include a participatory planning process in order to incorporate slow development, environmental friendliness, high quality, efficiency, authenticity and people-centered management. Nepal (2002) argues these requirements are particularly relevant to mountain ecotourism. Therefore, a strategic focus on the type of tourism activities, intensity, pressures and benefits should somehow be regulated and controlled; long-term planning and policies should be developed in order to preserve the vulnerable natural characteristics of the mountains while still offering ecotourism.

Storch and Leidenberger (2003) argue that recreational activities and tourism infrastructure in the Alps may greatly affect wildlife species, their distribution and abundance. They explored the effects of mountain tourism on corvids in the Bavarian Alps by comparing the corvid point-counts in the surrounding 28 popular mountain huts with high visitors' numbers and 22 similar areas with low human frequency (control areas). They concluded that mountain tourism in the Alps affected the territorial distribution of corvids, as results indicated corvids opportunistically adjusted to the availability of resources offered by tourism. These findings indicate that mountain tourism may conflict with conservational efforts for wildlife species. Kariel (1992) reports that mountain hut location and architectural aspects of their design have been a significant debate in Canada's mountain society.

1.5 Island tourism: the urge for sustainable practices and ecotrourism

Islands tend to have distinct environmental conditions and have a variety of endemic and threatened species of plants and wildlife (MacDonald and Jolliffe, 2003). Due to the distance from other terrestial ecosystems, the genetic pool of species is limited to the island's population(s), which influences development of the species and its vulnerability to environmental changes.

Tropical Islands of Indonesia, Africa, South and Middle America, Hawai'i and other isolated island chains have become desirable tourism destinations due to sea, sand and sun activities and accessibility by the global airline industry. For example, Mauritius, Seychelles, Bahamas, Galapagos, Bali and many more world-known islands attract millions of tourists per year, and are vulnerable to the environmental and socio-economic pressures that come as a side effect of the tourism industry and development. Perceived as the most vulnerable and fragile ecosystems (Carlsen and Butler, 2011), islands should have a strict policy and strategic plan regarding tourism development and tourism related goods and services.

The majority of case studies from island ecosystems focus on community involvement or peoples' values (Cárdenas-Torres et al., 2007; Mow et al., 2007; Rowat and Engelhardt, 2007; Glaser et al., 2010; Adams et al., 2011b; van Riper et al., 2012), and wildlife conservation (Rowat and Engelhardt, 2007; Berman, 2008; Skewgar et al., 2009; Lagabrielle et al., 2011; Parrott et al., 2011; Jaafar and Maideen, 2012).

Ecotourism emerges as a potential solution for tourism development in a sustainable direction with emphasis on improving the life quality of the local communities and the financial support for biological conservation. Ecotourism related topics from island ecosystems have been broadly discussed in the scientific literature over the last decade as well (Rowat and Engelhardt, 2007; Teh and Cabanban, 2007; Skewgar et al., 2009; Jaafar and Maideen, 2012). For example, Teh and Cabanban (2007) presented an *a priori* assessment for evaluation of the influence that existing biophysical conditions would have on sustainable tourism development. Skewgar et al. (2007) proposed a development of a marine reserve on an island in south Chile as mechanism for penguin habitat conservation and at the same time enhance the local community's ecotourism activity. This

case is a clear example of the need to first protect the resource and wildlife in order to continue with ecotourism activities and development. In the Seychelles the whale shark stakeholder driven co-management approach with mutual the aim to conserve the whales and promote safe ecotourism, which brings significant funds to local communities, was investigated by Rowat and Engelhardt (2007). All these publications investigate island ecotourism in a positive light, seeing the prospect of sustainability practice through ecotourism as assets for the islands' environment. Still possible negative effects of ecotourism are discussed in the literature as well, for instance, effects on yellow-eyed penguins fledging weights as a result of ecotourist's presence at the nesting sites (McClung et al., 2004).

1.6 Decision support and ecological modeling in protected areas

Complex decision problems can be successfully resolved by decision analysis (Clemen, 1997), which can also be applied in ecological modeling for complex environmental systems (Parolo et al., 2009). Both quantitative and qualitative multi-attribute modeling have been applied successfully in various domains of environmental and socioeconomic sciences, as they offer a way of deliberating decisions or conclusions that may be weighty and grounded on a micro to macro level of the addressed problem, dilemma or decision (Bohanec, 2003; Bohanec, 2012).

In general, decision support systems (DSSs) are interactive computer-based systems intended to help decision makers utilize data and models to identify and solve problems and make decisions (Sprague and Carlson, 1982; Power, 2002). Decision support systems incorporate both data and models. Generally, they support rather than replace managerial judgment; their objective is to improve the quality and effectiveness (rather than efficiency) of decisions, and they are designed to assist decision makers in decision processes of semi structured or unstructured tasks. Various decision support models have been already successfully applied in protected area management (Laukkanen, 2002; Crossman, 2007).

Our approach involves a model-based DSS (Power, 2002), which emphasizes the access to and manipulation of a model, for example, statistical, financial, optimization and/or simulation. In general, the purpose of all developed models is threefold: (1) to capture and represent expert knowledge in the form of hierarchically structured variables and decision rules that can be reviewed, discussed, published, disputed and communicated between decision analysts, field experts, stakeholders, users and other interested groups; (2) to actively assess and evaluate decision alternatives; and (3) to analyze these alternatives using decision-analysis tools, for instance, to identify the advantages and disadvantages of alternatives and analyze the effects of changes by 'what-if' and sensitivity analysis.

Decision support (DS) models have a wide variety of uses in problematic terrestrial (Prato, 2001; Laukkanen et al., 2002; Lawson and Manning, 2003; Rudolphi and Haider, 2003) and marine protected areas (Westmacott, 2001; Crossman et al., 2007). Further DS model application includes selecting the optimal location for protected areas (Crossman et al., 2007), modeling the carrying capacity of national parks (Prato, 2001), managing the wilderness recreational activity of park visitors (Lawson and Manning, 2003) and providing management approaches to balancing ecological, social and economic aspects of protected areas (Rudolphi and Haider, 2003). Rozman et al. (2009) used the DEX method, for an assessment of tourist farm service quality.

When reviewing the literature, we found examples of ecological modeling with a wide application of models dealing with environmental problems in protected areas. For example, Zachrisson (2008) developed a multi-level qualitative method for the co-management of protected areas in Sweden. Zucca et al. (2008) presented a site selection process for establishing a local park in Italy, using spatial multi-criteria analysis. In Taiwan, a multi-criteria analysis of public preferences and environmental quality was performed by Tzeng et al. (2002). In 2009, Parolo et al. published an article on a genetic algorithms model for optimizing the allocation of tourist infrastructure in the Alps. Albaladejo-Pina and Diaz-Delfa (2009) developed multinomial logit and mixed logit models for evaluating tourists' preferences for rural house stays in Spain, while Hasegawa (2009) analyzed tourists' satisfaction in Japan with a Bayesian estimation of the multivariate ordered probit model.

Many of the related works show the applicative nature of the models and are tested with case studies (Tzeng et al., 2002; Li et al., 2006; Zachrisson, 2008; Zucca et al., 2008; Albaladejo-Pina and Diaz-Delfa, 2009). We show the relevance of our research topic in nine case studies.

2 RESEARCH GOALS

The starting point of this research was to show that protected areas worldwide deal with similar decision problems. Furthermore, our primary focus was to investigate some of those problems within case studies and offer solutions for implementing sustainable development in protected areas, by means of environmental education or ecotourism research outcomes, guidelines and suggestions. The research problem that was investigated within this thesis is how we achieve sustainability in protected areas through environmental education and ecotourism by applying suitable decision support. We were intersted in understanding the relationships between environmental education and ecotourism and their mutual impacts on sustainability in protected areas. We also sought an understanding of decision processess in PAs and investigated possible contributions of decision support models and systems.

We examined relationships between sustainable development, environmental education and ecotourism in protected areas. Specifically, we addressed the question of how to provide decision support which would aid decision makers in the implementation of sustainable development in protected areas. Sustainable development is crucial and needed in all aspects of societial functioning and development. In respect to the tourism industry, it is expected that tourism in protected areas will gradually transform towards more sustainable practices including ecotourism by reducing its impacts locally and, consequently, globally as well. We took the standpoint that in order to meet the demands of ecotourism in protected areas, one of the key elements is implementation of environmental education.

The goals of this research were:

- To identify decision problems encountered by protected area managers and provide a classification of decision problem occurance in protected areas.
- To actively involve protected areas managers in the formulation of research of this thesis and conduct research that has applicable value for their management decisions.
- To develop a decision support model on the chosen case study, what will offer new insight in evaluation and comparison of alternatives and will provide new decision support tool for the end user.
- To assess the environmental education activities on the chosen protected area.
- To assess tourists' pro-environmental behaviour in a protected area.
- To examine few examples of ecotourism practices and draw recommendations for the ecotourism development in Slovenian protected areas with the emphasis on environmental education activities.

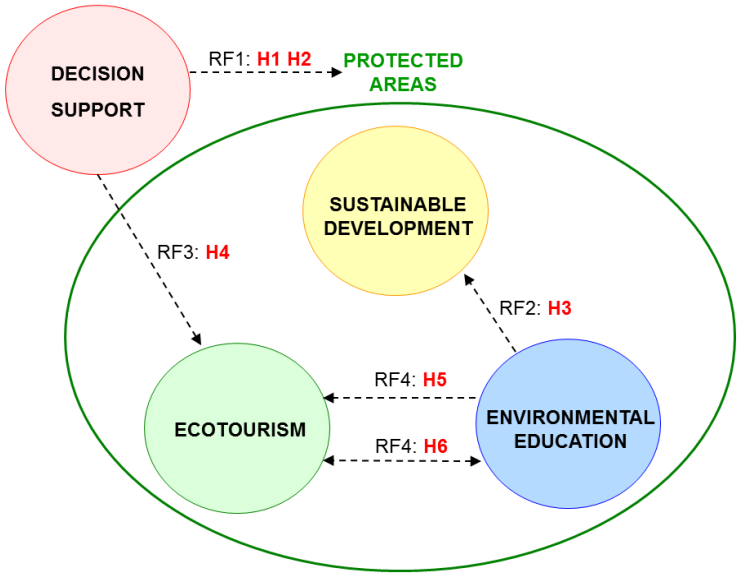

Figure 1: *The research concept.*

Figure 1 presents the concept of this research which is structured in four research foci (RF) and six theoretical hypotheses (H).

Research focus 1: Protected areas – decision problems

H1: Decision support models can be successfully applied to solving problems in managing protected areas.

The first research focus investigated decision problems in protected areas. We wish to confirm that the managers of protected areas worldwide encounter similar decision problems that need a systematic and multi attribute approach for successful solving. The main objective is to identify and develop a structure of decision problems in protected areas.

H2: Impacts of tourism within vulnerable mountain environments are measurable and it is possible to compare and to evaluate them with decision models.

We aim to test whether the impacts of tourism within vulnerable mountain environments are measurable and it is possible to compare and to evaluate them with decision models.

Research focus 2: Environmental education – sustainable development in protected areas

H3: Environmental education contributes to the implementation of SD in PA. This applies to various actors (stakeholder groups): tourists, local inhabitants, protected area managers and citizens.

The second research focus examines the relationships between environmental education and sustainable development in protected areas. The main objectives were to examine the relationship between multilayered environmental education in protected areas and the relationship between environmental education and sustainable development. H3 seeks to confirm that in order to achieve improvement in the implementation of sustainable development in protected areas, it is necessary to implement multilayered educational programs for tourists, local inhabitants, managers of protected areas and citizens.

Research focus 3: Ecotourism – decision support models

H4: Ecotourism requires proper management strategy.

In the third research focus, decision problems regarding ecotourism were investigated. H4 seeks to support the claim that quality ecotourism requires a proper management strategy. The two main objectives in this research focus are to find examples of ecotourism good praxis in the literature and evaluate the ecotourism products and services of a few ecotourism operators.

Research focus 4: Environmental education - ecotourism

H5: Environmental education about protected areas creates more opportunities for ecotourism.

H6: There are relationships between environmental education, pro-environmental behaviour and ecotourism development.

The fourth research focus examines the relation between ecotourism and environmental education, which is one of the five key concepts that are required in order to achieve ecotourism. H5 aims to test whether environmental education impacts and improves the level of ecotourism quality. Finally, H6 aims to confirm that there is a relationship between environmental education, pro-environmental behaviour and ecotourism.

The research to test hypotheses has been conducted in the Republic of Slovenia and the State of Hawai‘i, USA. Within this thesis nine case studies have been conducted in order to verify the theoretical hypothesis. Case study locations are described in section 3.1 and in the case studies in section 4.

First four case studies were conducted in Slovenia, two of them in collaboration with the Triglav National Park (TNP) management and one with the Biotechnical High School, Nova Gorica. Another four case studies were conducted at O'ahu, State of Hawai'i, United States of America. Three of these took place on the Mānoa Falls Trail, a rainforest hiking trail in the Ko'olau Mountain Watershed protected area in collaboration with Na Ala Hele, Division of Forestry and Wildlife, State of Hawai'i Department of Land and Natural Resources, and the last one in collaboration with six ecotourism operators on O'ahu.

The thesis is structured as follows: Theoretical background covers definitions and basic information of the main research fields this thesis has dealt with include: sustainable development, ecotourism, environmental education, as well as brief introductions to mountain and island tourism, the two landscapes we focused on. This chapter concluded with an overview of ecological modeling and decision support in protected areas. Chapter 3 presents the geographical locations of the case studies and describes general research methods used in the thesis. Chapter 4 contains an ontology of decision making and decision support in protected areas and eight case studies. All case studies follow the same structure: Introduction, Methods, Results and discussion, Conclusion, Relationship to the theoretical hypothesis. These are followed by a general discussion chapter (chapter 5) that provides an overview of the research presented in the previous chapter and connects the results of various case studies. Final conclusions of the thesis are presented in chapter 6. Finally, the Summary provides a short overview of the thesis and References contain all the resources used in the thesis.

In chapter 4, nine case studies conducted within this thesis are presented. To indicate the case studies we used the following abbreviations:

CS DP in PA – Case study decision problems in protected areas, section 4.1
CS TNP env. educ. – Case study of environmental education in TNP assessment, section 4.2
CS TNP huts – Case study of mountain huts infrastructure model in TNP, section 4.3
CS SLO education – Case study of environmental education in a Slovenian high school, section 4.4
CS TNP behaviour – Case study of hikers' pro-environmental behaviour in TNP, section 4.5
CS MF behaviour – Case study of hikers' pro-environmental behaviour at Mānoa Falls, section 4.6
CS MF env. educ. – Case study of environmental education infrastructure at Mānoa Falls, section 4.7
CS MF WTP – Case study of visitors' willingness to pay at Mānoa Falls, section 4.8
CS HI ecotourism – Case study of Ecotourism operators in Hawai'i, section 4.9

3 EXPERIMENTAL - GENERAL

In this chapter we describe Slovenia and Hawai'i tourism as "state of the art", the main study sites where the research has been conducted, qualitative and quantitative methods used for gathering data, and statistical analysis and decision support tool used to build models.

3.1 Study sites

3.1.1 Slovenia as a tourism destination

"Partnership for sustainable development of Slovenian tourism" is the subtitle of the Strategy for Slovenian tourism development 2012-2016, which was approved by the Government of Republic of Slovenia in June 2012. The strategy defines the vision of tourism development and is emphasizing the application of sustainability practices at all levels and areas of the tourism industry in Slovenia. Its main goal is that in 2016 Slovenia will be seen by the international community as an "excellent, green, active and healthy destination" (SRST, 2012), which will be attractive as a tourism destination as well as for making business.

The following information in this paragraph on tourism in Slovenia are from the annual Slovenian tourism organization publication "Slovenia v številkah 2011" (English "Slovenia in numbers 2011"), based on statistical data gathered by the Statistical Office of the Republic of Slovenia (Černič, 2012). In 2011, about 3.2 million tourists overnighted in Slovenia, out of which 63 % were foreign visitors. In total, there were almost 9.4 million of tourist overnights in Slovenian accommodation facilities. All these are record numbers since Slovenia gained its independency in 1991. It is estimated that in summertime many international tourists cross Slovenia by motorized vehicles on their way to their vacations on the Adriatic coast in Italy, Croatia, Montenegro, Albania and Greece. Some of those spend a day in Slovenia in order to catch a glimpse of the country's natural and cultural heritage, although they are not overnighting in Slovenia. This short experience may influence their future decisions on choosing a vacation destination, thus having the image of green, healthy and active tourism destination is important in order to also impress the bypassing tourists. The vast majority of tourists visited Slovenia during the summer season, with about a 50 % increase from May to June, even higher July and the peak of tourists in the month of August. On average tourists stayed in Slovenia for three days. The indicators number of overnights, overall number of tourists, number of international tourists showed a significant growth from previous years. Overall, 58 % of overnighting visitors were international tourists, most of them from Italy (18 %), Austria (12 %) and Germany (12 %). The majority of overnighting visitors stayed in Slovenian spa municipalities where wellness tourism is flourishing, followed by mountain and seaside municipalities. Forty seven percent of Slovenian tourists overnighted in spa municipalities. The majority of international tourists overnighted in mountain municipalities, which indicates that for international visitors the Slovenian Alps as well as the Triglav National Park present the most attractive tourism destination in Slovenia.

In Slovenia we focused on the Triglav National Park, the only national park in Slovenia that covers the Eastern Julian Alps. The Alps, a mountain range system that stretches across seven central European countries (from east to west: Slovenia, Austria, Italy, Switzerland, Liechtenstein, Germany and France), are a desirable tourism destination attracting about 60-80 million (OECD, 2007) or even 100 million (CIPRA, 2006) tourists per year. Today, we have many protected areas in the Alps in which scientific research is on-going in the topics of nature conservation (Hammer and Siegrist, 2008; Goymann et al., 2009), tourism and ecotourism (Gössling, 1999; Nepal, 2002; Singh and Mishra, 2004; Tsaur et al., 2006).

3.1.1.1 Triglav National Park

The Triglav National Park is the largest protected area and the only national park in Slovenia. It is located in northwest part of Slovenia, currently covering 3 % of the country area, uniting Julian Alps' heterogeneous rough relief with deep and steep, glacially transformed river valleys and gorges (Podobnikar, 2009). The park is named after the highest summit Triglav, 2 864 m above sea level, which is also the highest peak of the Julian Alps. Mountain Triglav is a proud symbol for Slovenians, being in the national symbols and featured in the coat of arms and the national flag.

The park has high biodiversity, with some rare and endemic flora and fauna (Bizjak and Klemenc, 2004; Podobnikar and Kokalj 2007). The park borders onto Italy and is closely collaborating with a Prealpi Giulie Regional Park on the Italian side of Julian Alps. The border between the parks is a national border. In 2009 both parks received the Certificate for cross border collaboration in the fields of management, conservation and sustainable development from the Europarc Federation (TNP, 2013). As of today, the park covers the area of 838 km^2 with the principal test to preserve the natural and cultural heritage of the Julian Alps within the park borders.

The TNP is among the earliest European parks (TNP, 2012). The first proposal for nature conservation in the form of protected area in Slovenia was made by Prof. Albin Belar in 1908, who proposed a formation of natural conservation park above Komarča, which would protect part of Triglav Lakes Valley (Mihelič and Vidrih, 2006). In 1920, members of the Museum Society proposed the establishment of five protected areas in Slovenia in the document "Spomenica", following the example of other countries, where first protected areas had recently been established. In 1924, Alpine Conservation Park with the area of 1600 ha was established. Unfortunately, the The Second World War interrupted and stopped for a while the preservation and development of the TNP. In 1961, the Triglav Lakes Valley was declared as the Triglav National Park. After few decades of negotiations between government and the conservation sector the TNP borders were expanded in 1981, when a Law on the Triglav National Park was confirmed by the government (Zakon o Triglavskem narodnem parku, Ur.l. SRS, št. 17/1981). The new Law on TNP was adopted in 2010 expanding the park area by 175 ha. In 2003 UNESCO declared TNP and surrounding areas as the Julian Alps Biosphere Reserve, an internationally designated site under UNESCO's MAB programme. Today, the Triglav National Park is internationally designated as a national park and as well as a biosphere reserve, which indicates the international recognition and acknowledgement of TNP's rich biodiversity value and landscape diversity. The recognition of the Julian Alps Biosphere Reserve shows that Triglav National Park is a model region for sustainable development and an example of excellence within protected areas.

The park is managed by the Triglav National Park Public institution, which is a government run park managing body operating under the Ministry of the Environment and Spatial Planning of the Republic of Slovenia. The head of the park is a director, who coordinates the work of about 50 employees working in the Professional and Common services of the TNP Authority, Professional Ranger Service and in Informational Centers of TNP.

The Triglav National Park has three protective regimes, which define the activities allowed in the three conservation areas. The first protective regime applies to 31.500 ha of the park area, which is "primarily intended to ensure the protection of species and habitats, conservation of natural values and the development of ecosystems and natural processes without human intervention" (Arih and Marolt, 2012). The specification of the protection regimes is presented in detail in the "Management plan of Triglav National Park 2014-2023", in which 122 peaceful areas within the park are proposed, where restrictions and prohibition of use are explicitely stated (Javni zavod Triglavski narodni park, 2013). Although ecotourism is a form of sustainable tourism that embeds principles of nature conservation and passes on environmental education, we cannot assume it has only positive impacts on the environment. Further ecotourism may apply to various activities such as hiking, trekking, biking, wildlife watching, kayaking, canoeing, etc. For that reason we argue that ecotourism activities in protected areas should be carefully planned in advance and must undergo the process of authorization by protected area managers prior to their implementation. In the case of Triglav National Park we assume that ecotourism activities are the most appropriate for the area under the third protective regime, which is least strict in comparison to the other two. The

numerous evidence from the recently published scientific literature indicates that ecotourism is globaly perceived as one of the most suitable forms of tourism in national parks (Nyaupane and Poudel, 2011; Chaminuka, 2012; Jalani, 2012; Owino, 2012; Hsu and Lin, 2013).

In December 2009 the research agreement between the University of Nova Gorica and Public Institution Triglav National Park was signed in order to allow us to carry out scientific collaboration with the park management and carry out research within the park. Case studies from Slovenia have been conducted:

- At the Information Center "Triglavska Roža", the headquarters of TNP.
- On two hiking trails in TNP: The Trigavska Bistrica Trail and The Soča Trail.
- On four mountain huts infrastructure in TNP: Hut on Prehodavci, Hut at Triglav Lakes, Mountain hut at Krn Lake, Gomišček refuge.
- At the Biotechnical Secondary School, Nova Gorica, on nature conservation in Slovenia and TNP.

The locations are described in detail in the case studies they refer to (chapter 4).

3.1.2 Hawai'i as a top tourist destination

Tourism in the State of Hawai'i has been the largest economic sector since the 1960s (Mak, 2008). It represents nearly a quarter of all economic activity and employs approximately one third of the labor force. A rapid increase in the number of visitors threatens both the unique evolutionary ecology and the cultural heritage of the islands. The abundance of natural and cultural tourism assets poses challenges to the government, the tourism industry, and destination communities as to whether they can effectively balance environmental conservation and economic development.

The annual tourist count in 2007 was 7.5 million, after three years of "strong growth in 2004 (+8 %), 2005 (+9.6 %) and 2006 (+4.9 %)" (DBEDT, 2012) and according to the Department of Business, Economic Development and Tourism, it represented a high point for industry. In comparison, the total population is 1.1 million, of which the vast majority live in the urban areas of Honolulu, O'ahu. This growth also marks a transition period when the majority (62 %) of residents for the first time agreed with the statement that their "island is being run for tourists" (Mak, 2008: 35). Tourism stakeholders have an inherent interest in effective resource management and conservation of cultural heritage because these are the very assets that create conditions for the successful development of Hawai'i as a desirable travel destination.

Promotional advertising, which is run by state agencies and the private tourism industry, use images of nature that refer to intactive terrestrial and marine ecosystems. The problem is that the tourism infrastructure supporting the high use of nature tourism destinations, particularly on the island of O'ahu, is inadequate and compromises user satisfaction and safety.

Due to the topographic and biological diversity and cultural heritage of the Hawaiian Islands, an increase in the interest in alternatives to mass tourism has been noted among visitors in pursuit of place-based experiences. However, the viability of nature-based tourism and the infrastructure needed to support such activities on the island of O'ahu put the ecosystems at risk due to the projected impacts resulting from the high use of a relatively small pool of optional destinations.

A nine months Fulbright Research Scholarship for conducting research within this doctoral dissertation enabled four case studies to be conducted in the State of Hawai'i , United States of America (USA). Within the Environmental Center at the University of Hawai'i at Mānoa research collaboration with Na Ale Hele was established. The researchers and Na Ala Hele staff collaborated on conducting the research within the "Mānoa Falls Infrastructure Improvement Project", which was funded by a Hawai'i Tourism Authority grant. Case studies from Hawai'i have been conducted:

- At Mānoa Falls Trail hiking trail.
- On various locations on O‘ahu within ecotourism operators assessment. Land: Mānoa Falls Trail and Kualoa Ranch. Sea: open sea starting from Waianae harbor, open sea starting from Waikiki harbor, open sea starting from Ko Olina Marina, coastal waters from Ka’ena Point State Park.

In this thesis three case studies address management problems on the Mānoa Falls Trail. In this section we present a detailed description of the trail, its characteristics and main management challenges.

3.1.2.1 Mānoa Falls Trail

In the State of Hawai‘i the network of 117 public trails on six islands is united under the Hawai‘i Trail System. On the island of O‘ahu 43 trails and roads are under the supervision of Na Ala Hele Trail Program. The Mānoa Falls Trail is a 1.6 mile (2.5 km) commercial hiking roundtrip trail leading to the viewing area under the seventy-foot (25 m) falls through a lush rainforest, located in close proximity to Waikiki. Figure 2 shows the location of Mānoa Falls Trail on the island of O‘ahu. It is visited by 300–500 hikers daily and approximately 120.000 per year (Wong, 2012). The trail itself closely follows the Mānoa Stream through a rainforest canopy of invasive species.

Figure 2: *The location of Mānoa Falls on the Island of O‘ahu.*

The Mānoa Falls Trail had major infrastructure improvements made in 1994, when the trail was widened, steps were added on various steep parts of the trail, and stonework and boardwalks were installed. Current informative signage dates from the same year and much of it is worn-out and dilapidated (Figure 3). Despite its high use for decades, and a particular increase in the past decade, clear signs of trail maintenance are evident (clearing of the vegetation along the trail, the efforts to stabilize the trail with planks made from recycled plastic, and gravel added to steep grades in order to minimize erosion and slippage). However, the humid climate and high annual rainfall keep the trail continuously wet and muddy. On many segments of the trail, it is evident that gravel has been washed away and that soil erosion persists as a management challenge (Figure 4). Additional hazards include rock falls, flash flooding, and falling branches as identified in the 2001 trail analysis (Donoho et al., 2001).

Figure 3: *Example of a sign along the Mānoa Falls Trail.*

Figure 4: *The consequences of soil erosion on the trail.*

The pressure on the watershed rainforest compromises ecosystem services and the hikers' safety. The largest part of the trail degradation and hikers' injuries occur due to inappropriate behavior of tourists, such as leaving the trail, tree climbing, stream walking and swimming in the waterfall area. The current trail infrastructure does not offer any educational opportunities, the existing direction and hazard warning boards are old and worn out due to the humid climate.

The trail is located in the Koʻolau Mountain Watershed, Conservation District, and closely follows the Mānoa Stream. For any activity within the Koʻolau Mountain Watershed, a Conservation District Use Permit must be issued by the DLNR's Office of Conservation and Coastal Lands. Hiking is the only activity allowed on the Mānoa Falls Trail and the trail is also open to Commercial Tourism Operators (CTO) using an adequate permit. Commercial Tourism Operators are allowed to take up to 60 people on a trail daily and provide the hikers with adequate permits. The trail is managed by the Na Ala Hele (NAH) State of Hawaiʻi Trail Access Program, operating under the Department of Land and Natural Resources (DLNR). Na Ala Hele's primary management activities are constructing, restoring and maintaining trails and access roads, which is done by staff as well as by community volunteers involved in partnerships (Na Ala Hele, 2012).

3.2 Research methods: content analysis, questionnaires, semi-structured interview, focus group and mystery secret shopper

The overview of scientific publications on decision support and decision making in protected areas and identification of decision problems in protected areas was done by content analysis, a common research method in social studies for systematic and replicable identification of characteristics within the communications (Neuendorf, 2002). The analysis is considered to be objective, providing "quantitative description of the manifest content of communication" (Berelson, 1952: 18), being an often used and developing method, it has expanded to also include interpretations of latent content (Graneheim and Lundman, 2004).

Material studied through content analysis can be newspapers, articles, blogs, reports, radio or TV reports and other forms of audio visual communications. This could be done by computer driven data mining tools or by manual analysis if the pool of data is manageable. For instance, Cusick et al. (2010) made a content analysis of local media on ecotourism in the Hawaiian Islands, while Lu and Stepchenkova (2012) reported on content analysis of online reports on ecolodge experiences in Costa Rica and were used for the identification of ecotourism satisfaction attributes. In Greece, Hovardas and Korfiatis (2008) examined environmental policy regarding ecotourism forest management and environmental awareness from the article content of a local newspaper (Hovardas and Korfiatis, 2008).

We made a content analysis in terms of an overview of scientific articles from the ScienceDirect database (http://www.sciencedirect.com/) since 2003 for the purpose of decision problem identification in protected areas, section 4.1.

Surveys are quantitative tools for gaining analytical data, most often used in social studies (Kelley et al., 2003) and human dimension studies (Torkar et al., 2011). According to Kelley et al. (2003) common survey methods include questionnaires (postal, paper, on-line) and interviews (face-to-face, telephone). We used questionnaires to collect data for six case studies. In Slovenia altogether five questionnaires were conducted within three case studies. The case studies that used questionnaires in order to obtain data are described in sections 4.2 (surveyed TNP managers on a workshop), 4.4 (surveyed high school students on a workshop) and 4.5 (surveyed hikers on two hiking trails in TNP). In Hawai'i one questionnaire was conducted at Mānoa Falls Trail, data being used for the case studies 4.6, 4.7 and 4.8. All questionnaires are available as Appendixes in this thesis and are referred to from the methodology sections of the corresponding case studies.

Semi-structured interviews are frequently used in social studies with the aim of finding out from a variety of answers interviewee's expressed opinion about a researched topic and their supporting reasons (Torkar et al., 2011). A semi-structured interview, as a qualitative research tool, was used in section 4.9 in order to gain information and evaluate ecotourism operators in the island of O'ahu, Hawai'i. The business owners or managers were interviewed after a secret shopper experience of the thesis author. Detailed interviewing process is described in section 4.9, the interview is presented in Appendix I. In section 4.1.5.3 we show that using questionnaires and semi structured interviews for gaining data is a common practice in research considering decision problems in protected areas. All data used in this research is empirical reflecting real-world observations (Kelley et al., 2003).

A focus group is a type of semi structured interview where four to ten participants of the discussion express their thoughts and opinions on the topic selected by a researcher (Morgan et al., 1984). It is assumed that group discussions can generate more critical comments (Watts and Ebbutt, 1987) and let people who would be shy in taking the interview express their opinions (Torkar et al., 2011). This method was used in section 4.2 on the workshop held in TNP.

"Mystery Secret Shopper" is a method in which an anonymus and independent person gains specific information or evaluates the quality of the service or product. The evaluated party is not aware of the process, nor the identity of the mystery shopper, as the person conducting a research behaves as regular customer or consumer of their product or service. The mystery shoppers provide detailed information on their experience which must be critical and objective. Finn and

Kayande (1999) identified the advantage in having individuals who have been trained to be observant providing the assessment.

The Mystery Secret Shopper method is common in social (Gosselt et al., 2007) and medical studies (Samuels, 2009; Chaudhry, 2013), and is used to as evaluating research tool in the tourism sector as well (Anderson et al., 2001; Graham et al., 2005). According to Finn (2001), "mystery shopper method is efficient and effective instrument to gain more in-depth knowledge of the customers' perception of service delivery". Hesselink et al. (2005) found the mystery shopper method useful and valuable instrument in addition to survey methods. The advantage of this method is that its results are reflecting realistic situation, the disadvantage that interpretation of the observed content can be biased due to situational factors or personal preferences of the observer (Bardage et al., 2013).

3.3 Research methods and statistical analyses overview

The data collected by questionnaires were digitalized by Excel. The majority of the calculations and statistics were done in Microsoft Excel 2010 (section 4.2 – Case study of environmental education in TNP assessment, section 4.4 – Case study of environmental education in a Slovenian high school, section 4.7 – Case study of environmental education infrastructure at Mānoa Falls, section 4.8 – Case study of visitors' willingness to pay at Mānoa Falls). In section 4.5 (Case study of hikers' pro-environmental behaviour in TNP) statistical analyses were done in R version 2.15.3 and in section 4.6 (Case study of hikers' pro-environmental behaviour at Mānoa Falls) in SPSS version 21. The description of the tests we used and their results interpretations are in the case studies. We used t-test, ANOVA, Pearson correlation coefficient and Chi square test. In Table 2 we present the overview of research methods applied in the case studies of this thesis.

Sample sizes were determined by the situational factors. For instance in CS DP in PA we identified 115 articles that were used for further systematic evaluation. In CS TNP env.educ. 8 TNP managers participated in the focus group discussion within the workshop. For CS TNP huts we used data for four representative alpine huts from TNP to fit the data for the decision support model for the assessment of mountain huts inftastructure. In CS SLO education we evaluated data from two workshops conducted in the Biotechnical Secondary School within School Center Nova Gorica. Overall 36 highschool students participated in both workshops. The research conducted under CS TNP behaviour was based on the sample of 100 hikers. The surveying was conducted on sunny Saturdays in August in 2010 and 2012 by the TNP staff on two hiking trails in TNP. On their way back from the hike, TNP staff randomly asked hikers to participate in the study by filing a questionaire on the spot. The response rate was not evaluated. The following three case studies were conducted at Mānoa Falls (CS MF behaviour, CS MF env. educ., CS MF WTP), where the surveying process used one questionnaire. For an easier understanding of the separate case studes we divided the original questionnaire into three questionaires, as shown in the Appendices. The surveying was carried out in January 2012 by the thesis author with assistance from the University of Hawai'i at Mānoa students, volunteers and Na Ala Hele staff. The surveying was conducted over the period of two weeks, each other day in order to gain data for each day of the week (Monday to Sunday). The weather conditions on all days were favorable for hiking, from sunny to cloudy weather. The hikers were asked randomly to participate in the study on their way back from the hike during the day from 10 am to 4 pm. They were invited to fill out the self-administered questionaire on the spot. Since the number of daily hikers was monitored, we calculated the responce rates for each surveying day, which were between 27 % and 49 %. The average response rate was 36 %. The surveying process at Manoa Falls is explained in detail in section 4.6.2. At Mānoa Falls altogether 785 hikers filled the questionnaire, 22 were incorrect. For CS MF education we used 763 questionnaires and for CS MF behaviour 757 as 6 hikers did not respond to the pro-environmental behaviour questions. Willingness to pay questions were answered by 728 hikers. In the last case study CS HI ecotour we found six ecotourism operators willing to cooperate in the research by agreeing to participate in the secret shopper experience and undergo an in depth semi structured interview.

Table 2: *Systematical overview of reseach methods, research tools, statistical methods, programs, variables and sample sizes for all case studies.*

Section	Case study	Research method	Studied topic	Research tool	Statistical method	Program	Sample
4.1	CS DP in PA	qualitative, quantitative	decision problems	content analysis	/	/	115 articles
4.2	CS TNP env. educ.	quantitative	indicators	focus group, survey	descriptive	Excel	8 PA managers
4.3	CS TNP huts	qualitative	huts characteristics	from the literature, MADM	/	DEXi	4 huts
4.4	CS SLO education	quantitative	env. information perception	workshop, survey	descriptive, t-test	DEXi	36 students
4.5	CS TNP behaviour	quantitative	pro-environmental behaviour	survey	descriptive, Pearson correlation coefficient	R	100 hikers
4.6	CS MF behaviour	quantitative	pro-environmental behaviour	survey	descriptive, Chi-square test, Pearson correlation coefficient	SPSS	757 hikers
4.7	CS MF env. educ.	quantitative	interest in education	survey	descriptive	Excel	763 hikers
4.8	CS MF WTP	quantitative	willingness to pay	survey	descriptive, t-test	Excel	728 hikers
4.9	CS HI ecotourism	qualitative	/	semi structured interview, mystery secret shopper	/	/	6 ecotourism operators

The sample sizes for TNP and MF hiker studies were determined as follows. The exact number of yearly TNP visitors is not known, as there are 23 access roads to TNP and no entrance fee or traffic monitoring system is in place. The overall number of visitors to TNP is estimated to be around 2 million visitors per year (Cigale, 2010; Mrak, 2011). Pretnar and Šolar (2006) state hikers represent 18 % of tourism market in TNP. Based on this data we estimated that in TNP there are approximately 360.000 hikers per year. It is estimated that there are about 120.000 hikers at Mānoa Falls (Wong, 2012). For the sample size determination we used formulas from Krejcije and Morgan, (1970) and Bartlett et al. (2001) which both indicate that a statistically significant sample for hikers in TNP should be 384 for TNP and 379 for Mānoa Falls. The sample size at TNP was 100 hikers due to the organizational limitations of the surveying. In order to show the significance of our results in TNP (in spite of the smaller sample size) we calculated Pearson's correlation coefficient for all pro-environmental questions, visitor groups and confidence levels with chi square test. In the thesis we discuss only correlations that have been found significant. The sample size at the Mānoa Falls was between 728 and 763, which is far above the required sample size.

3.4 Decision modeling and method DEX

We took the standpoint that protected areas management and planning mainly require an interdisciplinary approach because simple qualitative evaluation does not provide sufficient information for objective decision making. Both quantitative and qualitative multi-attribute modeling have been applied successfully in various domains of environmental and socioeconomic sciences, as they offer a way of deliberating decisions or conclusions that may be weighty and grounded on a micro to macro level of the addressed problem, dilemma or decision (Jereb et al., 2003).

Decision analysis (Clemen, 1997) is an approach to solving complex decision problems and is also used in ecological modeling when dealing with complex systems. The approach is based on structuring the decision problem into smaller problems and considering the available knowledge and information on alternatives (decision options), the objectives and preferences of the decision maker and involved uncertainties. Typically, the decision process includes the development of a model that is used to evaluate and analyze decision alternatives. Various types of models are available, for instance, decision trees, influence diagrams, multi-attribute models, probabilistic models and so forth.

A suitable class of methods for the research conducted in this thesis were: MADM, which provide an evaluation of decision alternatives based on a hierarchical aggregation of multiple, possibly conflicting, criteria (Bohanec, 2012). The MADM are qualitative and quantitative. In this research we mainly carried out qualitative analyses. Consequently, we chose the method DEX, which facilitates this type of analysis, is also freely available and has a history of successful applications in similar areas (Bohanec et. al., 2013). The method DEX (Bohanec, Rajkovič, 1990; Bohanec, 2003) is a representative of qualitative multi-attribute modeling methods. In general, a DEX model consists of variables, called attributes, which are structured hierarchically. Terminal nodes of the hierarchy represent input attributes, which are aggregated through several levels of aggregate attributes into the root attribute, which represents the primary output of the model. All attributes are qualitative and can take discrete symbolic values. The aggregation of attributes up the tree is defined by decision rules.

DEXi[1] (Bohanec, 2012) is a software that implements the DEX method and offers a user-friendly construction of attributes and their structure, definition of decision rules, evaluation and analysis of alternatives, and graphical output. DEXi offers the possibility of simultaneous graphical comparison of up to six attributes between four alternatives.

In most cases, DEXi models are developed through the collaboration of experts in the given area of research, who possess know-how of the problem they wish to examine, with decision analysts, whose expertise is the modeling methodology. The process of building a DEXi model usually involves the following four steps (Bohanec, 2003): (1) identifying the attributes, (2) structuring the attributes, (3) defining attribute scales, and (4) defining the decision rules.

[1] DEXi Version 3.04 Program for multi-attribute decision making, Copyright 1999–2013. Developed in collaboration: Jožef Stefan Institute, Ljubljana, Faculty of Organisational Sciences, Kranj and Ministry of Education, Science Sport of the Republic of Slovenia. Available free of charge at: http://kt.ijs.si/MarkoBohanec/dexi.html

4 RESULTS AND DISCUSSION

4.1 Classification of decision problems in protected areas

4.1.1 Introduction

In general protected area managers deal with various decision problems. The title of this thesis indicates that the research presented within the thesis is focusing on decision support in the management of protected areas. In chapter 2.6 the theoretical background on ecological modelling and decision support in protected areas has been already addressed. The aim of this chapter is to identify decision problems in protected areas and classify them according to their characteristics.

There are a few recent reviews on research topics related to protected areas, which all contribute to the pool of interdisciplinary research literature on protected areas. The studies identify gaps in the literature, provide systematic overviews of scientific findings on particular research questions they address and draw recommendations for further research or even suggest specific management approaches. Geldmann et al. (2013) conducted a systematic review of 118 studies regarding protected area effectiveness in reducing habitat loss and population declines. Götmark (2013) made a review of 150 studies on trees, bushes and forest structure, most research areas being within the protected areas, and found that one third of the studies recommended active habitat management. In order to extract conservation recommendations, Schindler et al. (2011) reviewed 196 articles from scientific journals and books and other relevant material on nature conservation in the Eastern Rhodopes Mountains. Milad et al. (2011) conducted a review of 130 articles on climate change impacts on forest ecosystems and species in Central Europe. In 2010 Price et al. published a state of the art overview of periodical review reports of biosphere reserves, internationally designated sites under UNESCO's Man and the Biosphere programme. Reed and Egunyu (2013) conducted content analysis of 15 periodic reviews of the 11 Canadian biosphere reserves in order to evaluate management effectiveness of these protected areas. These papers point out lessons learned in biosphere reserves, present valuable information on the state of protected areas worldwide (Price et al., 2010) and recommendations on how to use these reports as learning tools for achieving better management effectiveness in terms of biodiversity conservation and sustainable development (Reed and Egunyu, 2013). The common conclusion of all these studies is that integrated and multidisciplinary approaches are necessary as well as urgent for effective protected area management, in order to deliver successful conservation outcomes. Nevertheless, all of these studies provided overviews of different research topics from protected areas, and none of them addressed decision problems that occur in protected areas worldwide.

This case study presents a systematic overview of scientific articles dealing with deliberating decisions in managing protected areas, since 2003 in the ScienceDirect database. The cross section of results gives an insight into the types and nature of the decision problems and approaches for solving them.

4.1.2 Methods

On April 26, 2013 we made a search in the ScienceDirect database (http://www.sciencedirect.com/), targeting only publications from journals, from all sources and all subjects, and searching in the last ten years' date range (2003 to 2013). Thus the articles we looked for were published since 2003. The keywords we used in the search had to be occurring in publication's Abstract, Title, and Keywords. Overall we performed six search operations. By exporting citations and abstracts from ScienceDirect, we obtained the documents for further analysis which contained Title, Author(s), Abstract and Keywords for each articles identified by the search criteria. The results are summarized in Table 3.

Table 3: *Relevant publications from the ScienceDirect database.*

Search	Keywords in publication's Abstract, Title, Keywords	Articles
1	“decision support” OR “decision making” AND “protected area”	119
2	search 1 AND “ecotourism”	2
3	search 1 AND “environmental education”	1
4	search 1 AND “ecotourism” AND “environmental education”	0
5	“ecotourism” AND “protected area”	25
6	“environmental education” AND “protected area”	15

The first search used keywords “decision support” OR “decision making” AND “protected area” and identified 119 articles. We refer to this search as “core articles”.

By using the same search parameters and adding additional keyword (a) AND “ecotourism” the ScienceDirect found two articles, (b) AND “environmental education” only one article was identified, and (c) AND “ecotourism” AND “environmental education” no article was found. These results indicate that Decision support in protected areas regarding environmental education and ecotourism is an unexplored domain. The two articles from search (a) and one from search (b) are present within the core articles.

Furthermore, in order to examine the publication rate of ecotourism in protected areas and environmental education in protected area topics, we performed the same type of search in the ScienceDirect database by using keywords (d) “ecotourism” AND “protected area”, and (e) “environmental education” AND “protected area”. Search (d) identified 25 articles, out of which 4 are identified as core articles, and search (e) found 15 articles, only 1 article being identified as a core article. The articles from (d) and (e) that are not found in the core articles did not point out decision making or decision support in the abstract and key words, or the research has not been done in the case of protected areas.

We analyzed the content of 119 articles by reading abstracts and key words and according to the information identified the following characteristics for each article: country where research has been conducted, protected area name, type of the protected area and decision problem(s) the article was dealing with. From this analysis we obtained the list of decision problems, which have been structured into twelve categories, based on the nature of the problem they are assessing. The full list of articles is available in Appendix A, indicating: article number as listed by ScienceDirect, author(s) and year of publication, country and protected area name where the research has been conducted, protected area type and decision problem(s) identified.

4.1.3 Results and discussion

From 119 articles, 4 were excluded from the analysis as they addressed decision problems irrelevant to protected areas: tree protection in the cities (101), sink source pollution model (67), beach nourishment with sand (94) and identification of contaminated sites (28). The remaining 115 articles deal with decision problems in protected areas and have been further analyzed with content analysis. We noticed a rising trend in publications since 2010, which became exponential since 2011. In 2011 altogether 12 articles were published, 21 articles in 2012 and at the end of April 2013 there were already 24 articles, indicating the number will most probably double by the end of the year 2013.

To begin with we identified four types of protected areas addressed in the articles we examined: terrestrial (PA), marine (MPA), coastal and wetland. Out of 115 articles 51 were dealing with terrestrial and 49 with marine protected areas. Two articles were addressing decision problems of wetland protected areas (Jones et al., 2012; Sadeghi et al., 2013) and one coastal PA (Zacarias et al., 2011). Four articles presented research on terrestrial and marine protected areas (Trousdale and Gregory, 2004; Crossman et al., 2007; Martínez-Harms and Gajardo, 2008; Apostolopoulou and Pantis, 2009), two on terrestrial, coastal and marine protected areas (Lagabrielle et al, 2011; LoBue and Udelhoven, 2013) and one terrestrial and coastal ecosystems (Torell et al., 2012). Four

abstracts did indicate the PA area's name and one addressed all protected areas under Natura 2000 (Jones-Walters and Čivić, 2013). From this we may conclude that research on decision support in protected areas conducted on marine and terrestrial ecosystems is equally represented in scientific articles. The vast majority of the articles present research findings from case studies, which cannot be compared directly between each other but at the same time present a valuable resource for knowledge transfer to other geographical locations with the same or related decision problems in similar circumstances.

Ten abstracts pointed out that research has been conducted on the case of national parks: Triglav National Park in Slovenia (Stubelj Ars and Bohanec, 2010), West Coast Trail in Pacific Rim National Park Reserve in British Colombia Canada (Rudolphi and Haider, 2003), Nevado de Toluca National Park in Mexico (Santana-Medina et al., 2013), Royal Chitwan National Park in Nepal (Hjortsø et al., 2006), two national parks in Greece (Jones et al., 2012), Wakatobi National Park in Indonesia (Clifton, 2013), Hinchinbrook Island National Park in Australia (van Riper et al., 2012), Bavarian Forest National Park in Germany (Gerner et al., 2011), Val Grande National Park and Strona Valley in Italy (Höchtl et al., 2005) and Yellowstone National Park in the United States (Crabtree et al., 2009). Two abstracts addressed US National Park Service work, on land use change and management strategies (Piekielek and Hansen, 2012) and scenario evaluation regarding climate change uncertainties (Cobb and Thompson, 2012). One abstract pointed out that research has been conducted around Saadani National Park in Tanzania (Torell et al., 2012).

Abstracts presented research from three biosphere reserves: Wolong Biosphere Reserve in China (Xu et al., 2006), and Calakmul Biosphere Reserve (Chowdhury, 2006) and Monarch Butterfly Biosphere Reserve (Navarrete et al., 2011), both in Mexico. Findings from three biosphere reserves are presented: the Annapurna Conservation Area in Nepal (Baral, 2012) and Great South Bay Marine Conservation Area at the South Bay of Long Island, New York, USA (LoBue and Udelhoven, 2013).

In the abstracts research conducted at two natural parks was also indicated: Paneveggio-Pale di S. Martino Natural Park in Italy (Geneletti and van Duren, 2008) and "Sierra de Guara" Natural Park in Spain (Bernués et al., 2005).

Ten abstracts did not say in which country the research had been conducted, some being conceptual or concerning global issues. Three abstracts addressed marine protected areas decision problems on the global scale (Douvere, 2008; Caveen et al., 2013; De Santo, 2013). For the remaining 102 articles the location of the research being conducted was pointed out in abstracts. Geographically we grouped the countries into seven continents: 29 articles from North America, 28 from Europe, 19 from Asia, 15 from South America, 6 from Africa, 5 from Australia and 0 from Antarctica. Six articles discussed the USA in general and five Europe in general. One abstract pointed out trilateral research conducted in Mexico, Belize and Guatemala and one bilateral research from Slovakia and Poland. The countries in which research on decision problems in protected areas has been conducted from our list are shown in Table 4.

Table 4: *Geographical locations of research presented in 116 abstracts.*

North America	**Europe**	**Asia**
in general USA 6	in general 5	Indonesia 5
California, USA 1	Italy 3	Nepal 3
Utah, USA 1	Spain 3	China 2
Canada 5	Greece 3	in Indian Ocean 2
Mexico 4	Portugal 3	Israel 1
Caribbean 2	Slovenia 2	Iran 1
Mexico, Belize, Guatemala 1	Turkey 2	India 1
Belize 1	England and UK 2	Malaysia 1
Bonaire 1	Slovakia and Poland 1	Saudi Arabia 1
Meso-America 1	Finland 1	Thailand 1
	Ireland 1	Philippines 1
South America	Germany 1	
Brazil 7	Austria 1	**Australia**
Chile 2		in general 4
Colombia 2		Fiji 1
Venezuela 2	**Africa**	
Patagonia 1	South Africa 3	**Other**
Honduras 1	Tanzania 2	in general world 3
	Kenya 1	not specified 10

The systematic cross reading of 115 abstracts and key words showed that some authors indicated few decision problems, some only one, some none. Overall, we obtained the list of 62 decision problems and structured them according to their characteristics in the following twelve groups, which we refer to as decision problem categories:

1. DEVELOPMENT
2. MANAGEMENT
3. FUNDING
4. MONITORING
5. ALTERNATIVES
6. PARTICIPATION
7. KNOWLEDGE
8. UNDERSTANDING VALUES
9. TOURISM
10. CONSERVATION
11. LAND USE
12. CLIMATE CHANGE

Decision groups' categories were further aggregated into four groups based on the dimension they are dealing with. In the first group we collated organizational decision problems regarding protected areas' development, management, funding, monitoring and evaluating alternatives or scenarios. This group was named ORGANIZATIONAL as it unites decision problems and dilemmas on the organizational level of protected area management.

The second group contains decision problems that deal with the human dimension of managing protected areas, thus being named HUMAN DIMENSION. This group includes participatory approaches, knowledge evaluation, and understanding human values, perceptions and attitudes.

The third group unites problems related to human activities in protected areas: tourism, conservation and land use. Accordingly we named this group ACTIVITIES.

The fourth group, named NATURAL UNCERTAINTIES, presents the decision problems related to natural uncertainties, dealing with climate impact being the only one addressed in 116 articles we analysed.

Using these groups, we developed a hierarchical taxonomy for the classification of decision problems in protected areas (Figure 5).

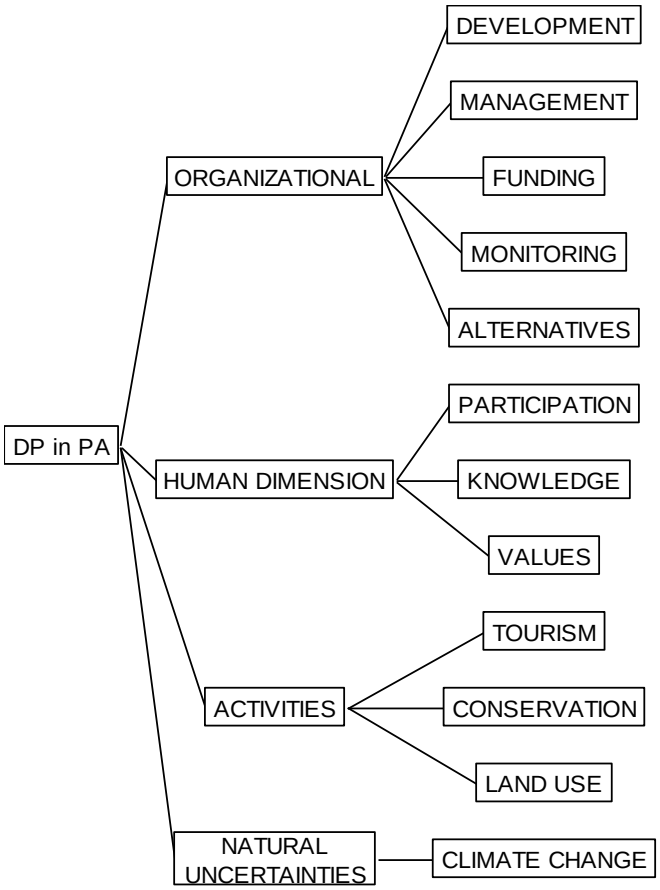

Figure 5: *The classification tree of decision problems in protected areas.*

In the following we provide a list of decision problems structured in groups and decision problem categories according to the taxonomy. In brackets we indicate the frequency of each decision problem and decision problems' category from the 115 articles based on cross reading analysis of abstracts and key words. The overall frequency of 62 decision problems in protected areas in the analyzed articles was 185. This indicates that some decision problems are discussed more often in the scientific literature. Category MANANGEMENT as well as CONSERVATION both include 10 decision problems. These two categories are the biggest DP categories according to the number of decision problems identified in this research, indicating the importance attributed to conservation concerns and management approaches in (M)PA. This finding also indicates the importance of the conservation role protected areas play globally. Here, we present and aim to overview wildlife conservation research on species conservation in section 4.1.3.5. Furthermore, in section 4.1.3.6 we present decision problems related to the fishermen stakeholder group and conclude results section with a list of decision support models and software encountered in 115 abstracts (section 4.1.3.7).

4.1.3.1 Organizational decision problems

In the group ORGANIZATIONAL we identified 26 decision problems, which we classified into five decision groups' categories:

DEVELOPMENT DECISION PROBLEMS (27) – 5 decision problems
- developing new (M)PA (4)
- managing new (M)PA (1)
- zoning (M)PA (19)
- redesigning (M)PA (2)
- expanding existing (M)PA (1)

MANAGEMENT DECISION PROBLEMS (43) – 10 decision problems
- managing (M)PA (15)
- beach management (1)
- coral reef management (2)
- forest management (15)
- managing wood biomass (1)
- deforestation (3)
- fire management (1)
- buffer zone management (1)
- wilderness areas management (3)
- livestock grazing management (1)

FUNDING DECISION PROBLEMS (7) – 4 decision problems
- funding research (1)
- funding PA (2)
- WTP (2)
- fishermen's financial behaviour (2)

MONITORING DECISION PROBLEMS (8) – 4 decision problems
- monitoring sustainability (1)
- monitoring PA management (1)
- monitoring PA ecosystems (1)
- indicators use (5)

ALTERNATIVES DECISION PROBLEMS (9) – 3 decision problems
- choice of management strategy (1)
- ranking management strategies (2)
- scenario evaluation (6)

The overall frequency of decision problems in ORGANIZATIONAL was 94. As expected, the highest DP frequency was found in category MANAGEMENT (43), within which the highest frequency was identified for DP managing M(PA) (15) and DP forest management (15). Five other DP were directly related to forest management: wilderness areas management, managing wood biomass, deforestation, buffer zone management and fire management, indicating the high rate of attention forest management attains worldwide.

Within DEVELOPMENT, the most frequent DP was finding a way for deciding upon the boundaries of protected areas, known as PA zoning. Eight articles dealt with case studies on terrestrial PA, nine on marine and two on marine and terrestrial at the same time. Obviously, making decisions on where to draw lines for PA borders are delicate and require various approaches. Providing sufficient funds for protected area management is challenging, still only four decision problems were found in the FUNDING category. Two studies addressed funding PA, tourists' willingness to pay and fishermen's financial behaviour. The problem of funding scientific research on decision support or decision making in protected areas was addressed only once. Within MONITORING category, most common approach was indicators use (5), while for the ALTERNATIVES assessment most frequent was scenario evaluation by decision support software.

4.1.3.2 Decision problems dealing with human dimension

Within HUMAN DIMENSION we united decision problems dealing with the human dimension in PA and grouped them in participation, using local knowledge and understanding values categories. The most frequent DP from the participation category are about implementing stakeholders' participation (7) and balancing co/management (5) decision problems. All six decision problems identified are directly related to participation in decision making processes regarding PA. The importance of using local knowledge when making management decisions has been recognized in the past decades and is closely related to all participative approaches. Finally, understanding local peoples' attitudes, perceptions, perspectives, social values as well as community development and their socio-economic characteristics was essential in achieving successful coexistence of humanity and pristine nature in protected areas.

PARTICIPATION DECISION PROBLEMS (23) – 6 decision problems

- public participation (5)
- participatory approach (3)
- stakeholders' participation (7)
- community participation (1)
- management of common pool resources (2)
- co-management (5)

KNOWLEDGE DECISION PROBLEMS (9) – 3 decision problems

- using local knowledge (6)
- Local Ecological Knowledge (LEK) (1)
- Traditional Ecological Knowledge (TEK) (2)

UNDERSTANDING VALUES (12) – 7 decision problems

- local people's attitudes (2)
- local people's perspectives (1)
- local people's perceptions (3)
- understanding social values (1)
- understanding community development (1)
- understanding socio-economic factors/characteristics (2)
- trust in managing (2)

4.1.3.3 Decision problems related to human activities

In the ACTIVITIES group we structured decision problems related to human activities in protected areas into categories reflecting tourism activities, conservation projects and land use in protected areas. In protected areas worldwide finding the balance between tourism development and conservation strategies is a constant and changing problem. Our study confirms the findings that conservation is a priority action in protected areas (Gaston et al., 2002), since the most frequent are DP from the conservation category (27). Attention in scientific articles was directed towards wildlife (10), floral (4) and biodiversity conservation (4). In this category we also grouped land use planning, change and fragmentation decision problems.

TOURISM DECISION PROBLEMS (6) – 5 decision problems

- tourism conflict (1)
- tourism and recreation (2)
- recreation carrying capacity (1)
- ecotourism development (1)
- ecotourism management (1)

CONSERVATION DECISION PROBLEMS (28) – 10 decision problems

- conservation planning (3)
- forest conservation (1)
- wetland conservation (1)

- coastal conservation (1)
- biological conservation (1)
- biodiversity conservation (5)
- flora conservation (4)
- wildlife conservation (10)
- reintroduction - wildlife management (1)
- corridor management (1)

LAND USE DECISION PROBLEMS (8) – 3 decision problems
- land use planning (4)
- land use change (3)
- landscape fragmentation (1)

4.1.3.4 Decision problems regarding natural uncertaint

In the group NATURAL UNCERTAINTIES we identified only decision problems related to climate uncertainties. Climate change impacts have been addressed in island (Maina et al. 2008) and mountain ecosystems (Lexer and Seidl, 2009), while global warming uncertainties were investigated only in mountain ecosystems (Safont et al., 2012).

CLIMATE DECISION PROBLEMS (5) – 2 decision problems
- global warming uncertainties (1)
- climate change impacts (4)

Aside from meteorological phenomena, we believe that in the future this group will contain decision problems related to geographical phenomena such as volcanic activity (Gregg et al., 2004; Selva et al., 2010), e.g. Hawai'i Volcanos National Park management challenges (Heggie and Heggie, 2004; Miller, 2008), and oceanographic uncertainties, e.g. tsunamis (Cochard et al., 2008) and breaking waves (Carniel et al., 2009).

4.1.3.5 Wildlife conservation

Within the CONSERVATION category ten articles discuss wildlife conservation decision problems and one reintroduction dilemma. All these also name the species or animal group, whose conservation was being concerned. In Table 5 we present the species with common and Latin name, its status on the IUCN Red List[2] of threatened species (IUCN, 2013b), country where research has been done, author(s), and year of publication. The article on Arabian sand gazelle reintroduction (Cunningham, 2013) was considered from the point of view of flora conservation.

The wildlife species are from the following classes: mammals (Kerley et al., 2003; Rastogi et al., 2013; Trisurat et al., 2012; Wanderseeet al., 2012), marine mammals (Berman, 2008; Parrott et al.,2011), reptile (Buitrago et al., 2008; Schofield et al., 2013), bird (Saura and Pascual-Hortal, 2007), insect (Navarrete et al., 2011). Two articles discussed conservation strategies for conserving groups of mammals, 41 indigenous mammal species in South Africa and 17 mammal species in Thailand. The abstract does not state which species have been considered. The abstract on sea turtle conservation does not explicitly state the sea turtle species in the evaluated projects. The IUCN Red List status was checked for the remaining species. We found that articles were evaluation conservation strategies for five endangered species (fin and blue whale, Guizhou golden monkey, Bengal tiger and Loggerhead sea turtle). The Arabian sand gazelle status is vulnerable but the concern discussed by Cunningham (2013) was in balancing between its reintroduction and impacts it would have on 80 flora species available for grazing by this gazelle.

[2] "The IUCN Red List of Threatened Species™ is widely recognized as the most comprehensive, objective global approach for evaluating the conservation status of plant and animal species." (IUCN, 2013b). Available at: http://www.iucnredlist.org/about/red-list-overview

The increase in number of articles dealing with wildlife conservation per year since 2003 is evident from Table 5. The research has been conducted in Europe, North and South America, Asia and Africa, showing that wildlife conservation is a decision problem of global importance.

Table 5: *Wildlife conservation articles, species names, their IUCN Red List status and country where research has been done.*

Author(s), year:	Species:	IUCN Red List status:	Country:
Kerley et al., 2003	41 indigenous mammal species	/	South Africa
Saura and Pascual-Hortal, 2007	Northern goshawk (Accipiter gentilis)	LC - least concern	NE Spain
Berman, 2008	Steller sea lions (Eumetopias jubatus)	NT - not threatened	USA
Buitrago et al., 2008	sea turtles	/	Venezuela
Navarrete et al., 2011	Monarch butterfly (Danaus plexippus)	NT - not threatened	Mexico
Parrott et al.,2011	fin whale (Balaenoptera physalus)	EN - endangered (threatened)	Canada
	blue whale (Balaenoptera musculus)	EN - endangered (threatened)	
	beluga whales (Delphinapterus leucas)	NT - not threatened	
	humpback whales (Megaptera novaeangliae)	LC - least concern	
	minke whales (Balaenoptera acutorostrata, Balaenoptera bonaerensis)	LC - least concern	
Trisurat et al., 2012	17 mammal species	/	Thailand
Wandersee et al., 2012	Guizhou golden monkey (Rhinopithecus brelichi)	EN - Endangered (threatened)	China
Cunningham, 2013	Arabian Sand Gazel (Gazella subgutturosa marica)	VU - vulnerable (threatened)	Saudi Arabia
Rastogi et al., 2013	Bengal tiger (Panthera tigris tigris)	EN - endangered (threatened)	India
Schofield et al., 2013	Loggerhead sea turtle (Caretta caretta)	EN - endangered (threatened)	Greece

4.1.3.6 Fishermen and MPA

Out of 49 articles that discussed decision problems regarding marine protected areas, 17 were addressing relationships between fishermen and marine protected areas, thus we found significant importance for fishermen's role when designing and managing MPA. In Appendix A in the column decision problem we used the abbreviation FSM-MPA in order to highlight this relationship. Here we present the list of 13 decision problems identified within 17 FSM-MPA abstracts and their frequencies:

- developing new MPA (1)
- zoning MPA (1)
- managing MPA (2),

- managing common pool resources (2)
- co-management (3)
- indicators use (1)
- stakeholders' participation (2)
- community participation (1)
- using local knowledge (4)
- Traditional ecological knowledge (TEK) (2)
- Local Ecological Knowledge (LEK)
- tourism conflict (1)
- fishermen's financial behaviour (2)

Decision problems from this list indicate that fishermen play an important role in managing MPA from the development phase and zoning to governing the commons (managing MPA, managing common pool resources, co-management and participation in decision making) also by using their local knowledge. We found two new terminuses within local knowledge, both emphasizing "ecological" knowledge of native people. Conflicts between tourism and fishermen arise and fishermen's financial behaviour is of importance when undertaking management decisions. In the abstracts we identified the use of indicators for monitoring changes in MPA. Geographically the FSH-MPA relation from all six continents, as discussed earlier in this chapter, is presented in scientific articles: North America (two cases from California, Caribbean), South America (five cases from Brazil, Colombia, Chile), Europe (Spain, Portugal, Mediterranean Sea), Australia (Fiji), Asia (two cases from Indonesia) and Africa (Kenya). In the abstract analysis we found the use of three other less common words when referring to fishermen: fisher folk (Pinto da Silva, 2004; Gelcich et al., 2007; Cinner et al., 2010; Perez de Oliveira, 2013; Lopes et al., 2013; Teixeira et al., 2013), fisher(s) (Gerhardinger et al., 2009), anglers (Stevenson et al., 2012). One article addressed the importance of fisherwomen's knowledge when making decisions regarding MPA co-management (Di Ciommo and Schiavetti, 2012).

4.1.3.7 Decision support software and models

Only five abstracts indicated the use of software products for decision support. Ecopath with Ecosim software was used in spatial optimization for protected areas placement (Christensen et al., 2009) and to calculate initial parameters for generic tropic model of for comparison of three coral reef slopes in relation to fishing activities (Arias-González et al., 2004). CREDOS software (The Conservation Reserve Evaluation and Design Optimisation System) offers a fully featured planning system for terrestial and marine conservation reserves (Crossman et al., 2007). Stubelj Ars and Bohanec (2010) used MADM software DEXi to model mountain huts infrastructure assessment and improvement model. Zonae Cogito software provides "easy use GIS" to support Marxan analysis in protected area design process (Segan et al., 2011). Three software products are available for free download on the WWW:

- Ecopath with Ecosim software http://www.ecopath.org/ Canada
- DEXi software http://kt.ijs.si/MarkoBohanec/dexi.html Slovenia
- Zonae Cogito software http://www.uq.edu.au/marxan/zonae-cogito-software Australia

The use of various models has been identified in 26 abstracts, three of whom are described in the previous section due to the use of decision support software (Arias-González et al., 2004; Christensen et al., 2009; Stubelj Ars and Bohanec 2010). Five abstracts describe modelling of wildlife related decisions (Romero-Calcerrada and Luque, 2006; Christensen et al., 2009; Parrott et al., 2011; Trisurat et al., 2012; Wandersee et al., 2012), three coral reefs dynamics (Arias-González et al., 2004; Schleyer and Celliers, 2005; Maina et al., 2008), three climate change uncertainties (Maina et al., 2008; Lexer and Seidl, 2009; Cobb and Thompson, 2012), three wildlife habitat management (Romero-Calcerrada and Luque, 2006; Parrott et al., 2011; Trisurat et al., 2012) and two economic issues (Thur, 2010; Adams et al., 2011b). Altogether ten models present spatial modelling problem solutions (Chowdhury, 2006; Romero-Calcerrada and Luque, 2006; Beech et al., 2008; Maina et al., 2008; Christensen et al., 2009; Crabtree et al., 2009; Adams et al., 2011b; Parrott et al., 2011; Parravicini et al., 2012; Sacchelli et al., 2013). Here we present the main purpose of the articles that highlighted the use of decision support models:

- modelling mountain huts infrastructure (Stubelj Ars and Bohanec 2010)
- decision support tool for identification of PA potential by public participation GIS approach (Anderson et al., 2009)
- opportunity costs model for fishermen by establishment of MPA (Adams et al., 2011b)
- holistic land use model for buffer zone management (Hjortsø et al., 2006)
- decision support system for spatiotemporal movements of marine mammals and port management (Parrott et al., 2011)
- framework for incorporating ecological data into algorithms for MPA design (Beech et al., 2008)
- modelling coral reef production to support decision making (Arias-González et al., 2004)
- geospatial approach for modelling complex relationships between human pressures and ecosystem status (Parravicini et al., 2012)
- model for biodiversity and climate change vulnerability assessment (Lexer and Seidl, 2009)
- multiple regression models on expert opinion on forest conservation (Baral, 2012)
- WTP model on scuba divers' WTP for access to quality recreational sites (Thur, 2010)
- spatial model for wood biomass removal and bioenergy chain development (Sacchelli et al., 2013)
- logistic regression model for local people's perceptions on monkey conservation (Wandersee et al., 2012)
- evaluation model for drainage networks and watershed features (Rogério Mantelli et al., 2011)
- spatial modelling to quantify and analyze land-change in PA (Chowdhury, 2006)
- species distribution and habitat model (Trisurat et al., 2012)
- spatial optimization for PA zoning (Christensen et al., 2009)
- predator-prey dynamic model (Salau et al., 2012)
- scenario planning evaluation due to climate change (Cobb and Thompson, 2012)
- fire growth simulation model (Suffling et al., 2008)
- model for wetland conservation (Sadeghi et al., 2013)
- predictive habitat suitability model (Romero-Calcerrada and Luque, 2006)
- bark beetle-forest management decision making model (Netherer and Nopp-Mayr, 2005)
- spatiotemporal linear ecosystem simulation model for monitoring PA ecosystems (Crabtree et al., 2009)
- two susceptibility models for establishing MPA for coral reef conservation (Maina et al., 2008)
- modelling coral reef ecotourism (Schleyer and Celliers, 2005)

Within these 26 articles, overall 28 decision problems have been identified, indicating that 45.2 % of all 62 decision problems have been addressed by the use of computer based or conceptual models. The 24 decision problems belong to all twelve decision problems' categories, proving that the modelling approach can provide decision support in all decision categories. The most frequent decision problem addressed by the modelling approach is forest management (9), followed by scenario evaluation (5), zoning (M)PA (4), wildlife conservation (3) and managing (M)PA (3). Problems of deforestation, coral reef management, biodiversity conservation and climate uncertainties occur twice each, while problems that occurred only once were: developing new (M)PA, buffer zone management, wilderness area management, fire management, corridor management strategies, managing wood biomass, ranking management alternatives, funding PA, fishermen's financial behaviour, WTP, monitoring PA ecosystems, tourism and recreation, ecotourism management, local people's perceptions, participatory approach, trust in management, wetland conservation, landscape fragmentation and climate change.

4.1.4 Conclusion

We made an overview of articles investigating “decision support” or “decision making” in “protected areas” published on ScienceDirect since 2003 by cross reading their abstracts and key words. We are not aware of any similar literature review in this domain. The results indicate the importance and variety of decision problems in protected areas. In 115 abstracts 62 decision problems have been identified, which we classified in twelve decision problem categories and four decision groups (Figure 5). Furthermore, we described the main characteristics of all four decision groups and provided a decision problem’s frequency of occurrence for all problems structured in the twelve decision problem categories. We highlighted wildlife conservation, fishermen and marine protected areas problems as particularly important and frequently addressed problems, and finally presented the decision support software and models used and developed in this domain.

Our findings show that most decision problems in protected areas are concerned with management and conservation (ten DP identified in each category). The most frequently addressed decision problems are zoning PA (19) from DEVELOPMENT, managing (M)PA (15) and forest management (15) from the MANAGEMENT group, and wildlife conservation (10) from the CONSERVATION group. Obviously deciding upon (M)PA boundaries was difficult and takes the attention of many stakeholders and researchers as well. Further management of any kind of protected areas requires a management strategy and regime that includes monitoring and performance assessment. Habitats in protected areas that deserved most attention in terms of management decision problems are forests, followed by wildlife conservation.

The use of four different decision support software products was described in the abstracts, two for (M)PA zoning (Zonae Cogito and CREDOS), one for processing ecological data as well as (M)PA zoning (Ecopath with Ecosim software) and one for building MADM qualitative models (DEXi). Perhaps more software were used and described in the articles, but were not pointed out explicitly as “software” in the abstracts. The modelling approach was described by 26 abstracts and addressed decision problems from all twelve decision problem categories.

We observed an exponentially rising trend in the number of articles published per year since 2011, which indicates that decision problems in protected areas are gaining attention by research bodies and are becoming an important debate issue in scientific fields. Journals with the most articles on decision support and decision making in PA are Marine Policy (18), Ocean & Coastal Management (15), Journal of Environmental Management (11), Biological Conservation (10), Journal for Nature Conservation (8), Ecological Modelling (7), Landscape and Urban Planning (6) and Applied Geography (6). Eight journals contained 2-4 articles from the researched domain and eleven journals had only one article.

4.1.5 Relation to the thesis

4.1.5.1 Key articles in relation to the thesis and mountain/island articles

In this section we present key articles identified in the search of 119 articles that are of importance for this thesis, as containing one of the key words: “ecotourism” or “environmental education” being in the thesis title, or “mountain” or “island” defining ecosystems case studies that this thesis focussed on. In Appendix A, the cells with article numbers as sorted by ScienceDirect are coloured: green for the key articles dealing with “ecotourism”, blue for the key article dealing with “environmental education” and red for the articles excluded from the research.

As evident from Table 3, ScienceDirect identified only two articles on “ecotourism” and “decision support” OR “decision making” AND “protected area” (Stubelj Ars and Bohanec, 2010; Nahuelhual et al., 2013). By searching for “ecotourism” in all abstracts and key words one more article with a focus on ecotourism was identified (Schleyer and Celliers, 2005). Key words “Environmental

education" were identified in one abstract (Buitrago et al., 2008). In the following paragraphs we present these four key articles and their relationship to this thesis.

Nahuelhual et al. (2013) developed a methodological framework for identifying areas for recreation and ecotourism at local level, based on GIS data and participatory approach. The spatial assessment study evaluates recreation and ecotourism as ecosystem service on Chiloé Island, Southern Chile. Indicators for recreation and ecotourism potential and opportunities were developed and tested for six recreational activities (trekking, kayaking, climbing, bird watching, horseback riding and mountain biking) in 16 land cover types. This study provided a decision support model for decision making for land-use planners regarding recreation and ecotourism development. The research area evaluated in this article was on Chiloé Island located in Chiloé Archipelago of Southern Chile that has various landscapes, from mountain peaks to seashore, with a range of land covers. This is an example of "mountains in the island ecosystem", which is similar to the research locations in Hawai'i (Island of O'ahu).

Schleyer and Celliers (2005) made an assessment of species in coral communities at Kosi Reef in South Africa and suggested zoning for ecotourism use according to the vulnerability of coral reef communities in order to prevent the potential damage by the (eco)tourism industry, mainly by SCUBA and snorkel divers and underwater photographers. The reefs are partly protected within two marine reserves, only the central part of the reefs being accessible to public and ecotourism use. The article presents modelling initiative to provide a decision support for MPA management and ecotourism development. In Hawai'i snorkelling and SCUBA diving are very popular recreational activities for the islanders as well as tourists. We may say that snorkeling is on a "must-do list" of every tourist that visits the Hawaiian Islands. The research approach of Schleyer and Celliers (2005) may be applied in Hawai'i as well, since coral reefs have high recreational value in Hawai'i (Cesar and van Beukering, 2004). For instance, Hanauma Bay Nature Reserve once had flourishing coral reef communities that were significantly damaged by daily overpreassure from people at the bay in the 1990s (Honolulu.gov, 2013).

Schleyer and Celliers (2005) and Nahuelhual et al. (2013) focused on identifying optimal geographical locations for ecotourism activities by providing decision support tools. Nahuelhual et al. (2013) were seeking for optimal sites for recreation and ecotourism in relationship to geographical characteristics of the study area, while the research of Schleyer and Celliers (2005) is more conservation oriented. These two articles provide decision support tools (modelling initiative by Schleyer and Celliers (2005) and a methodological framework by Nahuelhual et al. (2013)) for ecotourism development in island and mountain environments (Nahuelhual et al., 2013) and marine environment (Schleyer and Celliers, 2005). These prove there is a high potential for ecotourism in two study sites as evaluated in the articles, and indicate that island and mountain landscapes are attractive for ecotourists and other responsible travellers. These speak in favour of choosing mountain and island ecosystems as the research focus of this thesis.

Buitrago et al. (2008) give an historical overview of conservational efforts to protect sea turtles and their habitat in Venezuela and delivers a critical review of achievement indicators for conservation goals over the 20th century. Within a full chapter the article delivers information on environmental education and awareness raising activities about sea turtle conservation for various stakeholder groups: the general public in regional coastal towns, coastal guard military personnel, fishermen, elementary school children, school teachers, tour industry operators and to lesser extent tourists. Educational material in the shape of fliers, brochures and posters have been developed, four posters with a sea turtles conservation message achieved broad in-country distribution. As a solution towards improving public awareness towards sea turtles and nature conservation Buitrago et al. (2008) argue for including nature conservation as a subject in the curriculum of formal education.

Schleyer and Celliers (2005), Buitrago et al. (2008) and Nahuelhual et al. (2013) articles were related to the research conducted in this thesis in the following contexts: first, they focuss on island and mountain ecosystems as well, second, they provide a decision support for protected area management and environmental education and third, all three articles focused on nature conservation (landscape by Nahuelhual et al. (2013), coral reefs by Schleyer and Celliers (2005), turtles by Buitrago et al. (2008)), which is investigated in this thesis as well.

The four key articles identified in the ScienceDirect database by protocol explained in Table 3, also included our own article, published from section 4.3 of this thesis (Stubelj Ars and Bohanec, 2010). We developed a decision support model for mountain huts infrastructure assessment, which can be used for designing new huts and remodelling or improving the existing ones. The model evaluates mountain huts energy and supply sources, waste management, accessibility and availability as well as mountain pathways characteristics. Utility functions of the model were in favour to green management and hut's characteristics, arguing that anthropogenic infrastructure in the mountains should be sustainable and environmentally friendly in order to promote ecotourism development. The model was tested in the case study of four mountain huts in Slovenian Alps.

As this thesis specifically addressed mountain and island ecosystems, we made an additional search for related research publications from the pool of 115 articles. By searching for "mountain" in all 119 abstracts and their key words we identified five articles, while by searching for "island" nine articles were found.

Five articles investigated decision problems in mountain environments. Lexer and Seidl (2009) investigate biodiversity in the context of stakeholder driven climate change vulnerability assessment framework for mountain forests in Austria by using biodiversity indicator-based bottom-up assessment and evaluating possible climate change scenarios. Bernués et al. (2005) studied the livestock grazing impacts in the management and conservation of mountain pasture resources in a Sierra de Guara natural park, Spain. Safont et al. (2012) presented an environmental impact assessment within a biodiversity conservation project focussed on global warming treats of habitat loss for mountain vegetation in Pantepui, Venezuela. Netherer and Nopp-Mayr (2005) developed predisposition assessment system for evaluating potential forests hazards of bark beetle infestation in the High Tatra Mountains in Slovakia and Poland. All four articles, similar to this thesis, focused on nature conservation in mountains (Bernués et al., 2005; Netherer and Nopp-Mayr, 2005; Lexer and Seidl, 2009; Safont et al., 2012). The article on mountain huts infrastructure assessment in the Slovenian Julian Alps was already described in this section as an "ecotourism" key article and is presented in its full content in chapter 4.3. Decision problems addressed in "mountain" articles: tourism and recreation, scenario evaluation, managing PA, climate change impacts, biodiversity conservation, flora conservation, forest management, livestock grazing management, land-use change, global warming uncertainties and preventing habitat loss.

Nine articles focused on decision problems of island ecosystems. Adams et al. (2011b) discussed and modeled opportunity costs to fishermen from their displacement by the establishment of marine protected areas in Fiji. Mow et al. (2007) investigated the management of common pool resources in the case of fishermen on the Columbian Archipelago of San Andres in Caribbean. Glaser et al. (2010) investigate Indonesia coral reefs management and find effective non formal ways of marine area protection practices by islanders based. Both articles (Mow et al., 2007; Glaser et al., 2010) emphasized the value of local knowledge and traditional use of marine resources. The study in the Netherland Antilles evaluated WTP of scuba divers accessing quality recreational sites (Thur, 2010). The study by van Ripper et al. (2012) examined recreationists' social values for better spatial planning and management decision making in the Hinchinbrook Island National Park, Australia. Lagabrielle et al. (2011) developed a method for integration of biodiversity conservation and habitat restoration in land use planning on islands in the case of the Western Indian Ocean. Mangubhai et al. (2012) investigated the co-management of a coral reef marine PA in Eastern Indonesia. Maina et al. (2008) modeled climate change influence on coral reef bleaching in the Western Indian Ocean and estimated the susceptibilities of coral reef systems. Finally, an example of a successful restoration and conservation project was presented from Great South Bay, Long Island, New York (LoBue and Udelhoven, 2013). Five out of nine articles focused on coral reefs as valuable sources of primary production and fish biomass, finding solutions for their protection and conservation (Maina et al. 2008; Glaser et al., 2010; Thur 2010; Adams et al., 2011b; Mangubhai et al., 2012). Two articles discussed fishermen related decision problems (Mow et al., 2007; Adams et al., 2011b). Decision problems addressed in "island" articles: fishermen's' financial behaviour, management of common pool resources, using local knowledge, wilderness areas management, land-use planning, co-management and climate change uncertainties.

Nine island and five mountain oriented articles showed that island and mountain ecosystems are vulnerable and under protection worldwide, also, that similar decision problems occurred in them

and that similar environmental, social and economic challenges arose in their management. From the lists of decision problems in mountain and island ecosystems we identified similar problems regarding climate change and land use. It appears that scientists are investigating climate change impacts on mountain and island ecosystems in various parts of the world.

4.1.5.2 Decision problems investigated in the thesis

From the list of 62 identified decision problems in protected areas we investigated 12 decision problems and one additional decision problem. Sections 4.1–4.9 present eight case studies that address several decision problems each. Here, we present the list of 12 decision problems and thesis case study abbreviations assigned after the decision problem they addressed:

- managing PA – CS TNP huts, CS TNP behaviour, CS MF WTP, CS MF behaviour.
- choice of management strategy – CS TNP huts
- ranking management strategies – CS TNP huts
- scenario evaluation – CS TNP huts
- indicators use – CS TNP env. educ.
- WTP – CS MF WTP, CS MF behaviour, CS TNP behaviour
- using local knowledge – CS MF env. educ.
- local people's attitudes – CS TNP behaviour, CS MF behaviour, CS MF WTP, CS MF env. educ.
- tourism and recreation – CS TNP behaviour, CS TNP huts, CS MF behaviour, CS MF WTP, CS MF env. educ.
- ecotourism development – CS MF behaviour, CS HI ecotour
- ecotourism management – CS HI ecotour
- conservation (biological, biodiversity, wildlife, floral) we refer to as nature conservation – CS TNP behaviour, CS MF behaviour.

The case study "CS SLO education" investigated environmental education influence on high school students, decision problem addressed being environmental education influence.

In Figure 6 we show the placement of decision problems addressed in this thesis in the classification tree of decision problems in protected areas. Some of the problems we addressed are scarcely addressed in the pool of 115 analysed articles, for instance ecotourism development (1), WTP (2), local people's attitudes (2). Some other decision problems we addressed were the most frequently addressed decision problems in their decision problem categories (e.g. managing M(PA) (15), indicators use (5) and using local knowledge (6)). This shows that we did not focus only on the least investigated decision problems in protected areas, as it might be expected. The choice of decision problems we addressed were related to the following.

First, we wished to examine decision problems from the ORGANIZATIONAL, HUMAN DIMENSION and ACTIVITIES decision problem categories. From the ORGANIZATIONAL group we addressed decision problems on MANAGEMENT, FUNDING, MONITORING and ALTERNATIVES category. We did not address any decision problem from the DEVELOPMENT category, since it would require conducting research that would include the establishment of a new protected area. From the HUMAN DIMENSION group we focused on KNOWLEDGE and VALUES categories, since the PARTICIPATION category includes decision problems regarding participatory approaches, management of common pool resources and co-management, which are all outside the scope of this thesis. In the ACTIVITIES group we choose decision problems from the TOURISM and CONSERVATION categories, which are, as we previously argued, two confronting activities groups protected area managers strive to balance. We did not address decision problems from the LAND USE category, nor from the NATURAL UNCERTAINTIES group. We addressed one decision problem per category except in the following three categories: from the ALTERNATIVES category we addressed all three decision problems, from the TOURISM category we addressed three from five decision problems and finally from the category CONSERVATION we addressed the decision problem of nature conservation, which subsumes four specific decision problems (biological, biodiversity, wildlife and floral conservation).

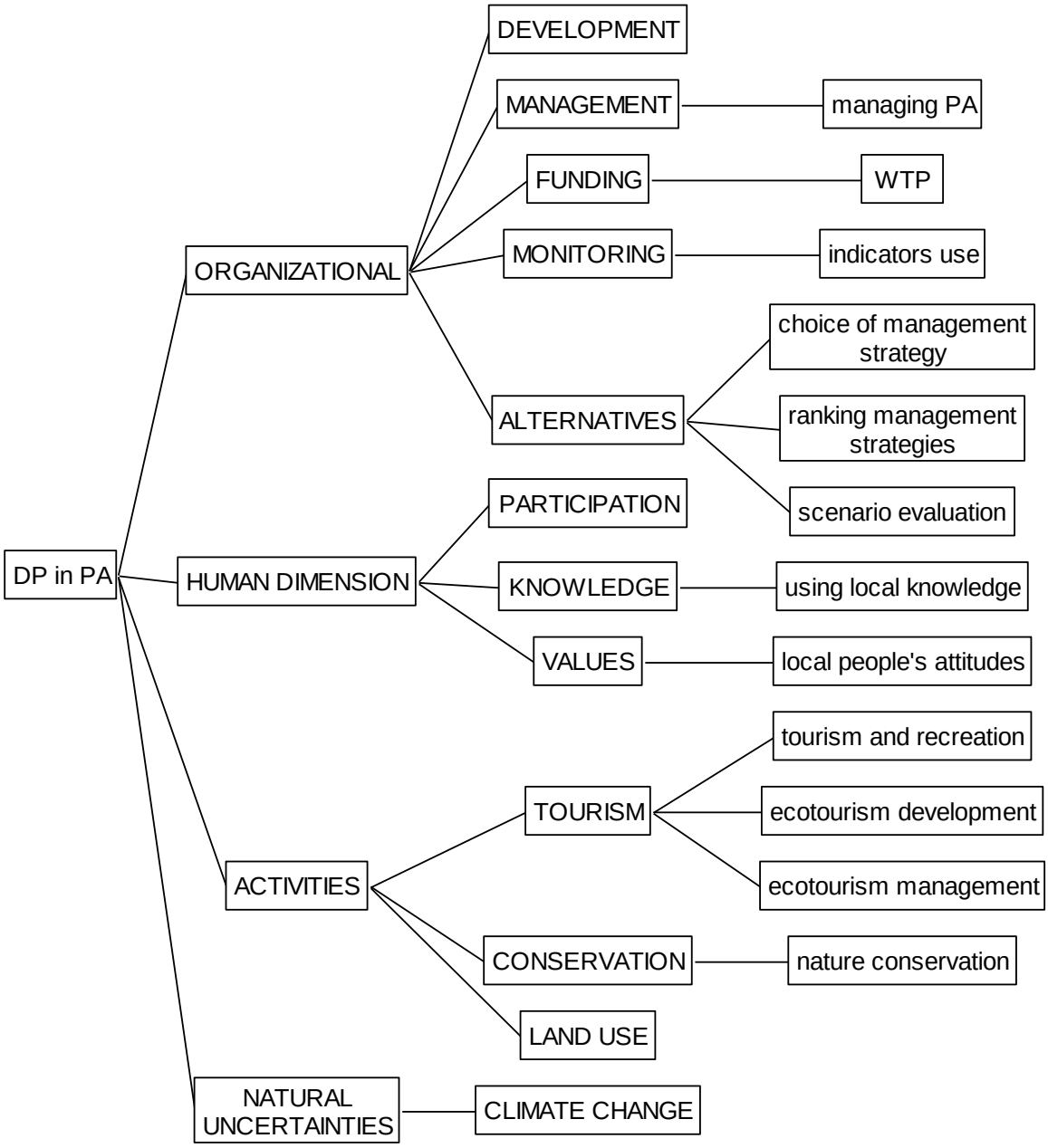

Figure 6: *Decision problems address in this thesis in the classification tree of decision problems in protected areas.*

Second, the choice of the Triglav National Park research location in Slovenia was logical due to the fact it is the largest protected area and the only national park in Slovenia. This influenced the choice to examine the environmental education and ecotourism related decision problems in the mountain environment. The opportunity to conduct the research on the island of O'ahu in Hawai'i led us to establish a collaboration with Ha Ala Hele and directly contribute to our survey results from their Mānoa Falls Trail Infratsructure Project. The location of Mānoa Falls and previous research experience from Slovenia shaped the choice of decision problems investigated in Hawai'i.

Third, the involvement of protected areas managers from the Triglav National Park in Slovenia and Na Ala Hele in Hawai'i partly shaped and influenced the choice of research locations and investigated decision problems tailored to their needs and mutual interest in order to produce

research outcomes that can be seen as a valuable source of new knowledge protected areas managers can use for their future decision making.

Fourth, Hawai‘i Ecotourism Association is the first and only ecotourim organization at the national level in all USA states, which indicates that ecotourism is the most advanced in the State of Hawai‘i in the USA. This provided us with the possibility to address decision problems related to ecotourism, conduct research on ecotourism in Hawai‘i and later provide guidelines for ecotourism development in Slovenia, based on the lessons learned in Hawai‘i.

4.1.5.3 Data sources for the research projects

The abstract analysis revealed that 14 articles used survey as an instrument for gaining research data, 12 articles used interviews, out of which 5 were semi-structured (Gelcich et al., 2007; Apostolopoulou and Pantis, 2009; Gerhardinger et al., 2009; Baral, 2012; Perez de Oliveira, 2013), one key informant (Bown et al., 2013), on in-depth (Hagerman et al., 2010;) and one study used group interviews and individual interviews (Lopes et al., 2013). Only one abstract presented the use of group discussions as a source of data (Xu et al., 2006). This proves that surveys as well as interviews are credible tools for gaining research data. Data from geographic information system (GIS) or program tools based on GIS layers were considered in 18 abstracts.

4.1.5.4 Relation to the thesis hypotheses

This systematic literature review shows the relevance of decision support and decision making in protected areas in the scientific literature over the last decade. We made an overview of published articles on the ScienceDirect database in this research domain and identified a list of 62 decision problems, classified them and structured in a decision tree. The findings from this case study supported theoretical hypothesis H1 that decision support models can be successfully applied to solving problems in managing protected areas. Thus, we confirm H1. Based on the overview of the geographical locations of articles on decision problems (Table 4) and specifically on wildlife conservation decision problems (Table 5) we proved that similar decision problems occur in protected areas worldwide.

4.2 Assessment of environmental education indicators in the Triglav National Park, Slovenia (Stubelj Ars, 2013b)

The aims of this case study were to make an overview of environmental education in TNP and to develop a workable set of indicators for environmental education in TNP. This case study has been developed together with TNP managers. Decision problems addressed in this case study are indicators use, tourism and recreation, using local knowledge and local people's attitudes.

4.2.1 Introduction

Environmental education unites formal and informal education on ecological systems and their dynamics, environmental problems, interrelations of human-environmental interactions and their effects on social, cultural and economic development. The aim of environmental education is to educate people about environmental topics and issues, in order to raise their awareness, so that they adopt more responsible attitudes and behaviour towards the environment by making informed choices. According to ALPARC (2013), "environmental education and awareness-raising targeting the general public (visitors, local residents, schoolchildren, etc.) are two key components in the Alpine protected areas' role". In the past, a series of workshops on mountain environmental education have been organized by ALPARC and the "Mountain Environmental Education" Working Group is operating under ALPARC organization. The high importance of environmental education in the Alps led us to develop and assess environmental education indicators in the Triglav National Park. Indicators are tools that meet the criteria of policy relevance, analytical soundness and measurability (Briassoulis, 2001) and can quantify changes, monitor performance and provide a framework for setting targets (Hunter and Green, 1995; Crabtree and Bayfield, 1998).

The study on hikers' pro-environmental behaviour in TNP revealed that previous enrollment in environmental education activities is strongly correlated to a willingness to pay for environmentally friendly goods and services (Stubelj Ars, 2013a). Tsaur et al. (2006) found that interpretative service based on environmental education could help tourists develop more awareness in conserving and protecting resources. Thus, we argued that an increase in environmental education activities in the park will consequently influence local and tourist behaviour and contribute towards more environmentally friendly behaviour and nature conservation. Monitoring of environmental education in the park can be provided by the use of indicators. Indicators should be used in order to support the framework for setting development targets and investment decision making regarding environmental education.

We focused on answering the following research questions. Which are the most important environmental education indicators from the TNP managers' perspective? Are environmental education indicators already being in use in TNP? What is the trend for the indicators that are identified as essential? The indicators derived in this study aim to evaluate environmental education impacts and performance in view of their implementation in TNP.

4.2.2 Methods

In order to obtain information on the environmental education structure in TNP and data on indicator importance and measurability, we organized the workshop "Environmental education in Triglav National Park" that was held in May 2010 in the headquarters of TNP. It lasted approximately 4 hours with a short break, divided in three conceptual parts and moderated by a decision support specialist and environmental scientist.

In the first part, eight TNP managers presented themselves and their work in the park related with environmental education. In the short questionnaire we collected data on their working position in the park, involvement in park's environmental education activities, target groups they work with, attendance on previous educational events and current experience in dealing with environmental education indicators (Appendix B). This was followed by a focus group with a one hour open

discussion on environmental education activities in the park. Protected areas managers presented their views on various environmental education activities, efforts and experiences in the implementation of environmental education within the park.

The second part of the workshop aimed at identifying the structure of environmental education in the park, organizational layers of environmental education in the park and ongoing educational activities.

In the third part of the workshop the managers answered a questionnaire “Environmental education indicators” (Appendix C). The list of environmental education indicators was based on a thorough review of the TNP publication “Pubic Institution Triglav National Park 2008-2009” (TNP, 2010) and the TNP web page. Eight protected area managers evaluated indicator importance and measurability in TNP based on their first-hand experience in implementing environmental education within the park. The importance of the indicators was measured on a three-folded scale as: essential (3), desirable (2), insignificant (1). Managers used the measurability parameter to indicate which indicator data were being collected in TNP and which indicators, according to their experience, were already in use in TNP,.

The workshop was concluded with a focus group discussion on decision problems regarding environmental education implementation that managers had encounter in TNP.

4.2.3 Results and discussion

This section is structured as follows: first, we present the TNP managers’ experience with environmental education, followed by managers’ view of the structure of environmental education in TNP, and the list of managers’ main decision dilemmas on the implementation of environmental education in the park. Furthermore, we present an assessment of environmental education indicators in detail.

4.2.3.1 Triglav National Park managers’ experience with environmental education

Overall eight TNP managers attended the workshop, from those, three were from professional services, two were park rangers, one was head of professional service, one was from the Information Center and one manager was working on a project. Five managers had more than seven years of experience working in TNP, two others more than three years and one was recently employed on the project. The head of the professional service “Education and Nature Conservation education” (Slov. “Služba za izobraževanje in naravovarstveno vzgojo”) had been working in the park for 24 years and contributed significantly to the workshop discussions.

The seven managers were actively involved in planning environmental education activities and nature conservation educational activities. The same number of managers were actively involved in the implementation of environmental education activities. All of them, except the manager working on a project, work in the field as well, the park rangers spending 100 % of their working hours in the field and the rest spending on average 10-60 % of their time in the field. The seasonal weather changes were reflected in managers spending significantly more time in the field from May to October.

Managers worked with various stakeholder groups within implementation of environmental education in the park. Two key properties were identified for grouping stakeholders groups the managers work with: age and origin. The age property contains the following groups: preschool children, primary school children, high school youth, youth and students, adults 25-40 years, adults 40-60 years, adults 60 years and more. The original groups were: park inhabitants, tourists from Slovenia and foreign tourists. All the managers worked with local inhabitants as well as with primary school children. Four managers delt with the preschool and high school population as well.

Five managers worked directly with Slovenian tourists in the park and three managers with tourists from other countries. All managers communicated with foreign tourists in English and three of them

also in German. Aside from the English language, Italian, Serbian and Croatian, and Spanish were additionally used as a second or third foreign language by three managers.

Table 6 reflects the TNP managers' involvement in environmental education activities. The data show that a vast majority of managers guide tours and educate school groups in the field (6 managers), followed by conducting guided tours for organized groups on the park's hiking trails (5 managers). Four managers are involved in education and field work with local inhabitants, four in guided tours and education of preschool groups and four in general guiding in the park. Three managers are working on tourists' education in the field and within organized workshops.

Table 6: *TNP managers' involvement of environmental education activities.*

Environmental education activities in Triglav National Park	**Managers**
Organization and realization of events in Information Center "Triglavska Roža"	3
Organization and realization of events in Information Center TNP in Trenta	2
Guided tours of organized groups on park's hiking trails in TNP	5
Guided tours of organized groups in TNP	4
Guided tours and education of pre-school groups in the	4
Guided tours and education of school groups in the field	6
Education for pre-school groups in Information Center "Triglavska Roža"	2
Education for school groups in Information Center "Triglavska Roža"	3
Field work with local inhabitants	4
Field work with tourists (park visitors)	3
Educational workshops for local inhabitants	4
Educational workshops for tourists (park visitors)	3

As education and training of employees is essential for the quality of their work, we asked the workshop participants about their educational experiences while working in the park. All managers attended organized educational activities for park managers while working in TNP, three of them on multiple occasions. Altogether five managers met with planning and the implementation of environmental education topics within the organized educational activities. Four managers have undergone special training for protected areas managers (e.g. training for park rangers). All managers except one that started the working position recently have visited "Visitor Centers" in other Alpine protected areas.

4.2.3.2 The structure of environmental education in TNP

TNP has a strong educational mission, implementing environmental education in a network of activities within the park's infrastructure: Information Center TNP Bled, Information Center TNP Trenta Lodge, Pocar Farm, Info Point Kobarid, Slovenian Alpine Museum and six educational hiking trails (Figure 7) as well as organized activities and events. The "Department for education and nature conservation education" and "Information and educational service" are two bodies within that focus solely on educational mission of the park. At the same time many other TNP professional services' employees work on educational projects and implement environmental education in their everyday work. The main activities that focus on environmental education in the park include (TNP, 2010):

- designing and implement a variety of educational programs for all age groups (with the focus on children and youth)
- actions of getting to know about park
- awareness raising activities
- preparation of publications
- exhibitions
- public relations.

Occasionally TNP organizes educational workshops for tourism operators and tourism employees in the park, with an emphasis on nature conservation and presentation of the Public Institution Trigav National Park work.

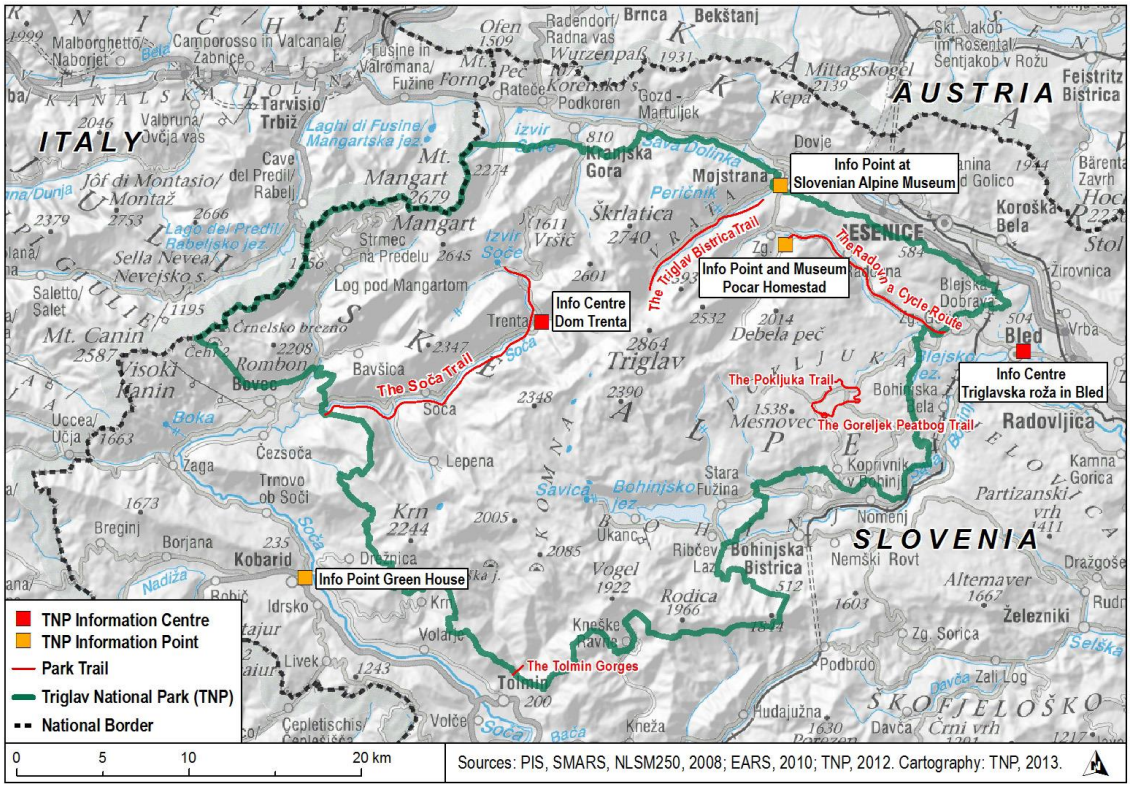

Figure 7: *Triglav National Park environmental education information centers and educational hiking trails.*

Within open discussion between eight TNP managers, decision support specialist and environmental scientist three levels of environmental education in TNP were identified:

- structural level,
- park governance,
- activities in the park.

TNP managers highlighted the following groups under a structural level: age of the target population, interests of tourists and local inhabitants, topics discussed, formal/informal events, organizational educational events, seasonal education and geographical education, based on the location of the event (e.g. on the hiking trail). At this level, environmental educational is structured according to the target groups age and interest, which aside from age groups, differs significantly between tourists and local inhabitants. Environmental education varies accpording to the topics it is focusing on as well as whether the event is formal or informal. The education also differs regarding to the season and the geographical location where it takes place. Finally, all educational events have an organizational dimension level as well, which has to be evaluated in terms of service quality and the events' implementation.

According to the park governance, environmental education was grouped in: Informational Centers, TNP web site, field work, guided tours, collaborations and publications in the literature. This level reveals the governance levels in which TNP is implementing environmental education activities. The Information Center Triglavska Roža is located in Bled and serves as TNP headquarters as well, while Information Center TNP in Trenta is located in the Trenta Valley a few kilometers from the source of the Soča River. Both Informational Centers are places where managers, local inhabitants and tourists meet, not merely on physical level but through a cross section of interests and activities. The centers provide various educational exhibitions, photo galleries, a common

space for lectures, meetings and workshops, shops with books and local products and finally tourist information. Information on TNP web site is available in Slovenian, English and German languages, however, the majority of information about current events is in the Slovenian language. On the park's web site information are structured under three sections: "Get to know", "Experience" and "Understand", each having many subsections that lead visitors to the information. The annual number of TNP web site visits exceeded 59.000 visitors in 2012, out of that 81 % of domestic and 19 % of foreign web site visitors (Markun, 2013). Field work is an essential part of the TNP work, which includes working with various stakeholders, on the parks' infrastructure and on gathering of data. It occurs at different locations in the park and in various seasons. In the summer season guided tours are often organized for target groups and tend to have a distinct educational note. Collaborations within management sections and park inhabitants as well as representatives of stakeholder groups are an important part of educational activities. The publications on various themes from the park in the literature are a crucial form of environmental education in and out of the park borders.

At the park activities level, events and activities were grouped in: the summer festival called "Belar days", summer camps, summer cultural events, educational events, workshops, market of local products, family program, activities in Informational Centers, publishing and public relations. In this category the park managers have structured educational activities in the park according to their types. Since 1999 each summer on European Day of Parks TNP organizes "Belar days", called after Dr. Albin Belar who proposed the conservation of Alpine Lakes Valley in 1906. The educational summer days are organized on The Soča trail; lately children from Slovenia, Austria, Italy and Croatia have enjoyed this event. Other environmental educational events are ongoing in summer camps and during many cultural events in the summertime. During the whole year markets of local products, family program, activities in Informational Centers are ongoing, workshops are being organized for particular target groups according to their needs in the park. Publishing about parks activities and outcomes of the TNP work are important messengers of the educational efforts made in TNP. Public relations present parks' standpoints, views, work and ongoing efforts in the national and international media.

In Figure 8 we show the structure of environmental education in TNP as identified by the TNP managers at the workshop. Publications in the literature and TNP publishing as well as activities in Information Centers are overlapping in the levels of park governance and activities in the park.

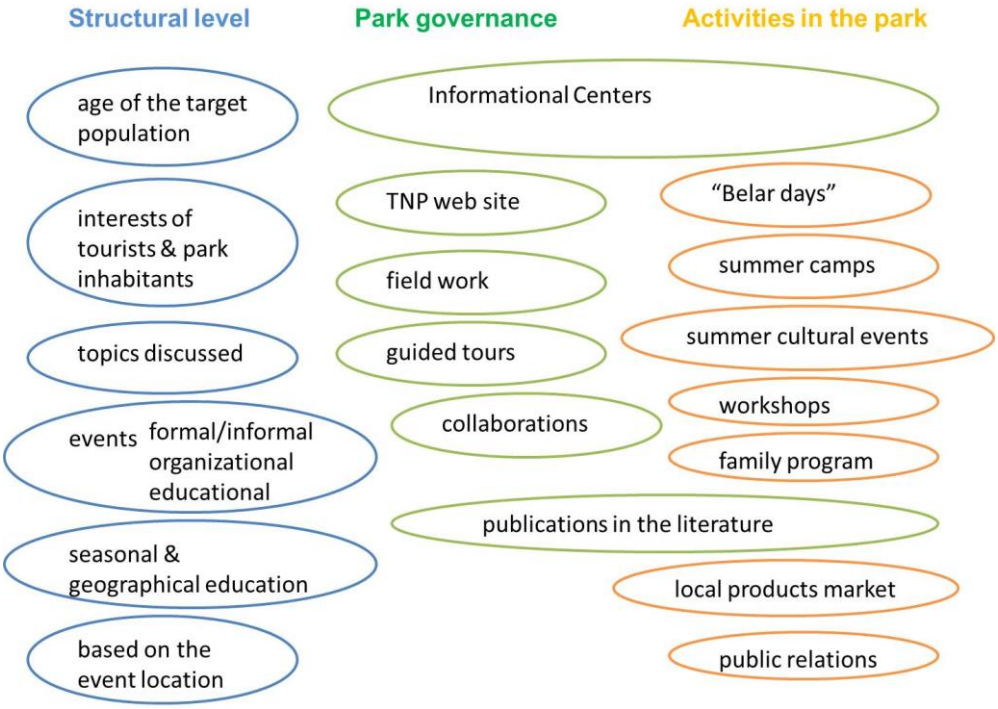

Figure 8: *Environmental education structural levels in Triglav National Park.*

4.2.3.3 Environmental education decision dilemmas

There is a need for a strategic plan for the implementation of environmental education on national level, in which the role and importance of environmental education would be determined. As the only national park in Slovenia, TNP managers feel they should present a model of good practice at the national level. The strategy is needed for the development of infrastructure for environmental education (educational information points and educational trails in the park) and the development of a strategy on how to use this infrastructure in terms of working directly with people. This raises the question of financing the educational programs. Aside from national funding there is a need to join synergies of different stakeholders and services and focus all of them on strategic planning for the implementation of environmental education. In this process the organizations that directly work in nature should be involved (mountaineering, hunting, fishing organizations). Managers find it important to balance the environmental education activities between visitors and inhabitants. Making decisions and shaping new educational programs is a challenge in itself.

Main decision dilemmas managers encountered were: Will the work bring results? How efficient is their work? How much it is in the domain of the park to conduct particular activities? After those questions it comes to the dilemma, how to balance with the resources TNP has, and what can be done within using these resources? Who should they target with environmental education?

Managers took a standpoint that environmental education should receive more attention and funding. They find a need for strategic decision making towards attributing greater attention to environmental education in terms of orientation and material support. All managers emphasized that for environmental education direct connection with nature is essential, and education should take place in the natural environment as much as possible. In their opinion, each park is partly experimenting with the implementation of environmental education. In TNP each center has its own mission: the Information Center "Triglavska Roža" in Bled connects with the environment by offering cultural events for various park visitors and inhabitants; the Information Center TNP in Trenta acts as a classical informational point, with exhibitions and presentation of what the park has to offer to the visitors.

4.2.3.4 Assessment of environmental education indicators

Based on the "Pubic Institution Triglav National Park 2008-2009" (TNP, 2010) and park's web site overview (TNP, 2012) the list of 89 indicators was compiled. Adopting the terminology of the sustainability indicators study of Choi and Sirakaya (2006) we grouped the indicators in the following dimensions, based on the type of information they refer to: Direct environmental education (15 indicators), Events (3), Projects (3), Questionnaires (2), Guiding (3), Publications (12), Work (9), Professional events (6), Promotion (10), Collaboration in the Alps (5), Courses (2), Visitors (10), Funds (7) and Eco category (2).

We asked workshop participants to evaluate each indicator's importance on the three-value scale: essential (3), desirable (2), not significant (1). The managers also indicated which data are already collected or already being in use in TNP. The question on measurability of the indicators in TNP was not answered by two managers.

In a short questionnaire conducted at the very beginning of the workshop only two out of eight TNP managers stated they were using indicators in order to measure the investment in environmental education activities. Concerning the indicators source of information they stated questionnaires conducted in TNP and data provided by the Alpine Association of Slovenia.

4.2.3.5 Environmental education indicators importance and measurability

We calculated the averages and standard deviations for the indicator's importance. The maximum average was 3 for seven indicators and the minimum 2.13 for one indicator. Due to the fact that all indicators have been evaluated between desirable (2) and essential (3), all indicators are suitable candidates for use in the future. We ranked the indicators according to their importance averages

and clustered them in five groups (Table 7). In the following discussion we used the number of indicators in brackets to refer to the indicators being in a certain group or dimension.

Table 7: *Indicators grouped in five groups based on their importance averages.*

Groups	Importance averages	Number of indicators
1	3	7
2	2.99 - 2.76	15
3	2.75 - 2.51	42
4	2.50 - 2.26	23
5	2.25 - 2.00	2

4.2.3.5.1 Group 1: 7 essential indicators

From the list of 89 environmental education indicators seven indicators were identified as essential by all workshop participants (average mark 3):

1. Number of environmental workshops for children,
2. Number of primary schools that collaborate with TNP,
3. Number of Junior Rangers in TNP,
4. Number of EU calls on which TNP applied,
5. Number of EU projects in implementation,
6. Number of environmental workshops for local inhabitants,
7. Number of thematic days (e.g. Wednesday's nights).

In the following we refer to those as “essential indicators”. By evaluating the list of essential indicators we drew the conclusion that: special attention is given to the education of children and youth (indicators 1, 2 and 3), EU projects present an important funding source (4 and 5), the educational workshops for local inhabitants are of most importance (6), as well as thematic days (7) which are open days for the public and combine various groups of visitors according to their interests, age and origin.

In this group five indicators are directly or indirectly linked to environmental education (1, 2, 3, 6 and 7), all of them involving people in educational activities or events. These five indicators belong to the dimension Direct environmental education. The two other indicators focus on EU projects from the dimension Funds, thus we concluded that applying for EU funding calls and later implementation of EU projects in TNP are of high importance and bring significant international recognition to TNP. In order to illustrate the essential indicators used in TNP, we present actual figures of four essential indicators in 2000 and 2009 in Table 8.

Table 8: *Values of essential indicators in 2000 and 2009.*

Essential indicators (number of essential indicator)	**2000**	**2009**
Number of primary schools that collaborate with TNP (2)	14	16
Number of environmental workshops for children (1)	*	67
Number of thematic days (e.g. Wednesday's nights) (7)	13	74
Number of Junior Rangers in TNP (3)	from 2002	every year + 10
Number of lectures on the field (indicator in use)	59	23

The Number of primary schools that collaborate with TNP has risen from 14 in 2000 to 16 in year 2009. In the park there are six municipalities, but only one primary school in Soča, which is a branch of Bovec primary school. This indicates that 13 schools outside TNP borders collaborate with TNP. For the year 2000 data on theNumber of environmental workshops for children is within the Number of lectures in the field (indicator already being in use in TNP), thus, we do not have

exact data for year 2000. Still, we can suggest that it would have been at least 36 or more, since in 2009 there were 23 lectures in the field. According to this calculation the indicator Number of environmental workshops for children shows the rise in the number of workshops. Number of thematic days (e.g. Wednesday's nights) has risen by more than 5 fold in 9 years. This trend shows the popularity and variety of the thematic days organized in the park. The Junior Ranger program, which is being conducted in some other Alpine national parks as well, is a success in TNP involving and educating youth from the park or it's immediate surroundings on conservation and sustainable management of the park. The program started in 2002 in TNP, and the number of Junior Rangers in TNP continues to rise with the trend of 10 new Junior Rangers per year on average.

4.2.3.5.2 Group 2: 15 indicators

In the second group there are 15 indicators (2.99–2.26 average marks). First 5 indicators (8–12) show that TNP managers find the TNP web page a very important source of information and connection to everyone who visits the web page. The first three are focused on web page visitors, followed by two indicators on number of news and contributions published on TNP web page.

8. Number of TNP web page visitors,
9. Number of national TNP web page visitors,
10. Number of international TNP web page visitors,
11. Number of news published on TNP web page,
12. Number of contributions published on TNP web page.

The next section shows 4 indicators (13–16) that describe collaborations with TNP: kindergartens, secondary schools, NGO's and foreign national parks.

13. Number of kindergartens that collaborate with TNP,
14. Number of secondary schools that collaborate with TNP,
15. Number of NGO's collaborating with TNP (e.g. CIPRA),
16. Number of other national parks abroad collaborating with TNP.

Indicators 17 and 18 are related to environmental workshops of various target groups and training of youth living in TNP within the program Junior Rangers.

17. Number of environmental workshops for target groups (e.g. highland farmers, cheese producers, hunters…),
18. Number of training courses for Junior Rangers.

The last four indicators from this group could not be clustered. They evaluate ongoing research, photo exhibitions, action events and volunteers' working hours.

19. Number of ongoing research projects,
20. Number of photo exhibitions,
21. Number of action events (e.g. Clean Slovenia),
22. Number of volunteers' working hours.

4.2.3.5.3 Group 3: 42 indicators

The third group of indicators contains 42 indicators (2.75–2.51 average marks). Six indicators are related to the TNP employees (23–28). These describe the number of employees in TNP and those in the Department for Environmental Education, and four educational events employees might attend (workshops, consultations, round tables and meeting of Alpine PA managers). From this cluster of indicators that directly evaluate TNP employees' involvement in professional educational events we concluded they are all very important.

23. Number of employees in TNP,
24. Number of employees in Department for education and EE in TNP,
25. Number of workshops attended by TNP employees,
26. Number of Alpine PA managers' meetings attended by TNP employees,
27. Number of consultation events attended by TNP employees,
28. Number of round tables attended by TNP employees.

Promotion of TNP has been evaluated by five indicators in group 3 (29–33). Promotional events are of crucial importance to the park presence on the tourism market and in attracting visitors to the park. Promotion by the media is perhaps equally important since todays' modern pace of life media plays an important role in everyone's life and affect our everyday lifestyle. The promotional products are mainly used as gifts and souvenirs that tourists in TNP buy for momentos or presents. TNP has developed a series of products with the TNP logo, local craftsmen's souvenirs and publications on TNP with very attractive photographs. All these are sold in TNP souvenir shops located in the Information Centers and in tourist offices in the park. Number of press conferences was evaluated as an indicator for the park's promotion, since press conferences are official events where information on park management standpoints, work, and involvement in various issues is presented to the media, local communities and furthermore the society.

29. Number of TNP promotion events on the fairs in Slovenia,
30. Number of TNP promotion events on the fairs abroad,
31. Number of TNP promotions in media (TV, radio, newspapers, internet...),
32. Number of sold TNP's promotion products that are on the market,
33. Number of press conferences in TNP.

We assumed the funding for park management is a challenging task, thus all four indicators describing annual finance availability were grouped in this section as annual finances availability for operation of Public Institution TNP (34), for environmental education (35), from EU sources (36) and from donations and sponsorships (37).

34. Annual finances available for operation of PI TNP,
35. Annual finances available for EE,
36. Annual finances available from EU sources,
37. Annual finances available from donations, sponsorships.

Publications about TNP have promotional as well as an educational message. Four indicators on publications about topics related to TNP have been evaluated in this group according to their importance.

38. Number of publications, published by TNP,
39. Number of publications on EE,
40. Number of magazine publications (e.g. TNP magazine),
41. Number of publications, written by TNP employees.

TNP is being partly funded by projects, thus the number of calls for project work, national and international projects in TN are of significant importance.

42. Number of calls for project work,
43. Number of projects in TNP,
44. Number of international projects in TNP.

The number of visitors in the park was monitored with overnights data. By definition a park visitor is person who sleeps at least one night in the park, while a park tourist is anyone who comes to enjoy a park at least for few hours in a day. There are no exact data on tourists in TNP, since there are 23 access roads to the park and no entrance fee, but the number is estimated to be about 2 million tourists per year. Overnights in TNP in general and per municipality are relevant indicators for evaluating visitors stay in the park, origin and flow.

45. Number of national visitors in TNP,
46. Number of overnights in TNP,
47. Number of overnights in TNP in municipalities.

The following three indicators describe additional student work force in summer season (49 and 50) as well as calls for voluntary work (48). Student summer work is common in Slovenia and TNP has a tourist peak in summer months, having a need for additional seasonal work force.

48. Number of calls for voluntary work,
49. Number of calls for student work in the summer season,
50. Number of working students in the summer season.

Conferences are important meeting places where scientific work and ideas are presented and shared. Three indicators describe TNP employees' attendance on national and international conferences, showing the attendance importance in terms of bridging the managers and getting them on track with up to date research in protected areas.

51. Number of conferences attended by TNP employees,
52. Number of national conferences attended by TNP employees,
53. Number of international conferences attended by TNP employees.

Furthermore, we presented four groups of two indicators which have been evaluated in the third group as of their importance. The first two indicators describe the number of children (54) and adults (55) involved in environmental education. Two indicators describe collaboration with other PA in Slovenia (56) and abroad (57), two describe the number of courses conducted in TNP (58) and courses for TNP managers (59), two describe guided tours, indicator 60 for target groups and indicator 61 thematic guided tours, and two describe the number of "eco" activities and "eco" events in TNP (62 and 63).

54. Number of children involved in EE
55. Number of adults involved in EE

56. Number of other PA in Slovenia collaborating with TNP,
57. Number of other PA abroad collaborating with TNP,

58. Number of courses conducted in TNP,
59. Number of courses for TNP managers,

60. Number of guided tours for target groups (e.g. on greenways),
61. Number of thematic guided tours,

62. Number of "eco" activities in TNP (e.g. eco-farming),
63. Number of "eco" events in TNP (e.g. eco-market).

The indicator 64, which describes number of environmental workshops was the only environmental workshop indicator in this group.

64. Number of environmental workshops for youth.

4.2.3.5.4 Group 4: 21 indicators

In the fourth group 23 indicators were clustered with the range of 2.50–2.26 average marks. The biggest indicators' cluster describes number of books and magazines in the TNP library (65 and 66) and number of articles published in national and international scientific literature (67 and 68).

65. Number of books in TNP library,
66. Number of magazines in TNP library,
67. Number of articles published in national scientific literature,
68. Number of articles published in international scientific literature.

One way to bring environmental education, nature conservation and other environmental projects closer to the broader public is by publishing leaflets about project aims, efforts and outcomes. All these have been evaluated by three indicators addressing the number of projects in environmental education in TNP (69), number of leaflets on environmental education and number of leaflets on nature conservation or environmental projects in TNP (71).

69. Number of projects on EE,
70. Number of leaflets on EE (e.g. waste separation),
71. Number of leaflets on nature conservation / environmental projects in TNP.

Three indicators evaluate the promotion of TNP by the number of TNP's promotion products on the market (72), number of shops that sell TNP promotion products (73) and number of sold TNP calendars (74).

72. Number of TNP's promotion products that are on the market,
73. Number of shops that sell TNP promotion products,
74. Number of sold TNP calendars.

Again, we presented four groups of two indicators which have been sorted within the forth group as to their importance. The first indicators described the TNP employees who have been seminar and diploma thesis tutors (75 and 76). Two indicators carry information on the number of questionnaires conducted among park visitors (77) and local inhabitants (78). The indicator regarding conferences for PA managers organized by TNP (79) and the number of conference lectures given by TNP employees (80) are also included in this group. The number of all visitors to TNP (81) and international visitors (82) were placed in the fourth group as well.

75. Number of seminar tutors employed in TNP,
76. Number of diploma thesis tutors employed in TNP.

77. Number of questionnaires done among park visitors,
78. Number of questionnaires done among local inhabitants.

79. Number of consultations/conferences/round tables in TNP organized for PA managers,
80. Number of conference lectures by TNP employees.

81. Number of TNP visitors,
82. Number of international visitors in TNP.

Five indicators could not be clustered with any other indicator from this group according to their content. These included numbers of: annual finances available from national sources (83), environmental workshops for adults (84), calls for employees in TNP (85), employees hours dedicated to EE in TNP (86) and number of organized international events in TNP (87).

83. Annual finances available from national sources,
84. Number of environmental workshops for adults,
85. Number of calls for employees in TNP,
86. Number of employees hours dedicated to EE in TNP,
87. Number of organized international events in TNP (e.g. free climbing championship).

4.2.3.5.5 Group 5: 2 indicators

Finally, the last group contains only two indicators (2.25–2.00 average marks), which are not as important as other indicators. These two indicators are not related to each other, first presenting number of conference publications (88) and second organized recreational activities (89).

88. Number of conference publications (abstract, poster),
89. Number of organized recreational activities (e.g. trekking).

4.2.3.6 Summary of environmental education indicators assessment

In Table 9 we show the indicator importance results clustered in five groups according to their indicator importance and type of information they convey.

Table 9: *Indicators importance overview trough indicators' groups and dimensions.*

Indicators' dimension (Number of indicators)	**Indicators' group based on averages**				
	1	2	3	4	5
Indicators' importance averages	3.00	2.99 - 2.76	2.75 - 2.51	2.50 - 2.26	2.25 - 2.00
Direct environmental education (15)	5	4	3	3	
Events (3)		3			
Projects (3)			2	1	
Questionnaires (2)				2	
Guiding (3)			2		1
Publications (12)			4	7	1
Work (9)		1	6	2	
Professional events (6)			6		
Promotion (10)			5	5	
Collaboration in the Alps (5)		2	3		
Courses (2)			2		
Visitors (10)		5	3	2	
Funds (7)	2		4	1	
Eco category (2)			2		

Direct environmental education indicators are present in groups 1–4. One third of them were evaluated as essential indicators being in the group 1 (average 3). Other two essential indicators are from the dimension Funds and focus on EU calls for projects and implementation of EU projects. Based on that, we concluded that direct environmental education indicators as well as EU funding are essential for evaluation of environmental education implementation in TNP.

In group 2 (averages 2.99–2.76) indicators from the following dimensions were entered: Visitors (5), Direct environmental education (4), Events (3), Collaboration in the Alps (2), Work (1). Accordingly, indicators for monitoring visitors, events and collaboration in the Alps were of high importance.

We argued that events in TNP are of very high importance for the implementation of environmental education in TNP since, in general, people are attracted by events and these may be used as outreach opportunities to the broader public. Events attract tourists to the park and at the same time present a possibility for the promotion of local products, services and culture.

From Table 9 we see that 42 indicators are clustered in group 3 (averages 2.75–2.51), corresponding to the 47.2 % of the indicators being tested. In the third group indicators from all

dimensions are present except from dimension Events, which have all been sorted in group 2 and dimension Questionnaires which have all been sorted in the fourth group.

Indicators group 4 (averages 2.50–2.26) contains 23 indicators from eight indicator dimensions. It is important to emphasize that in this group are: 7 out of 12 Publications indicators and 5 out of 10 Promotion indicators.

Indicators Number of conference publications (abstract, poster) and Number of organized recreational activities (e.g. trekking) have been found less important than the 97.7 % of all indicators. These two indicators have been sorted to group 5 (averages 2.25–2.00).

Finally, we should state that environmental education indicators are already in use in TNP, but currently there is no publication available that would offer the overview of the indicators in use. At the workshop TNP managers evaluated 37 out of 89 suggested indicators as already being measured in TNP or data that are being collected for their assessment, which corresponds to 41.6 % of the assessed indicators. Based on this result we concluded that even though data for environmental education indicators are being collected and are in use in TNP, a systematic approach is needed in order to use the full capacity of this analytical method.

4.2.3.7 Additional environmental education indicators proposed by TNP managers

At the end of the questionnaire space was provided for additional indicators TNP managers had found important for evaluating environmental education in the park. Altogether 12 additional indicators were suggested as listed below:

1. Collecting of public opinions from the media,
2. Collecting of public opinions from individuals,
3. Collecting of public opinions of random people,
4. Collecting of public opinions of people who collaborate with the park,
5. The cataster (land registry) data on the area of land being used in traditional ways,
6. Number of preserved natural sources in TNP,
7. Age of population in TNP,
8. Educational level of population in TNP,
9. Number of offences issued by Park Rangers,
10. Number of warnings issued by Park Rangers,
11. Questionnaires for measuring opinions of workshop participants,
12. Questionnaires for measuring opinions of events participants.

The first four indicators focus on collecting public opinions (from media, individuals, random people and people who collaborate with the park), two indicators assess parks inhabitants age and educational level, two indicators focus on Park Rangers' activities (issued offences and warnings), two indicators on questionnaires for measuring opinions of workshop and events participants. Finally, two indicators have been suggested: The number of preserved natural resources (indicator 6) in TNP and the cataster (land registry) data on the area of land being used in traditional ways (5).

4.2.4 Conclusion

This study provided an overview of environmental education activities in TNP and grouped them in three levels: structural level, park governance, activities in the park. Main decision problems managers encounter in relation to the implementation of sustainable development in the park were identified. First-hand experience of TNP managers provided us with a valuable insight into environmental education activities and implementation in the park as well as an expert evaluation of environmental education indicators assessment.

The indicators being developed and tested in this study fall in the following indicators' categories: direct, analytical, objective as they refer to quantitative data, measuring the influence on people

and indirectly to their environmental, socio-economic environment, having integrated main dimension and being local, since they evaluate environmental education in TNP. However, having the potential to be implemented in other protected areas in Slovenia and even in other protected areas in other Alpine countries, the spatial scale of environmental education indicators developed and assessed in this study might grow to be national or even global.

The results indicated that all 89 suggested indicators are at least desirable. Out of 89 environmental education indicators the analysis revealed 7 essential environmental education indicators, 5 evaluating direct environmental education in the park and 2 evaluating European funding sources. A comparison of the 4 essential indicators according to data from the years 2000 and 2009 has been performed showing a significant increase in environmental education activities in TNP over the years, i.e. increase in number of (a) primary schools collaborating with TNP, (b) environmental workshops for children, (c) youth involvement in the Junior Rangers program, (d) thematic days in the park. Our results demonstrated that some environmental education indicators strongly focused on environmental education for children and youth have already been in use in TNP.

This case study presents the first stage for developing a systematic monitoring program for environmental education in TNP. First, we proposed that TNP should have an annual evaluation of all environmental education indicators for the past year and set the goals for the future investment in environmental education for the following year and long term, e.g., five years from now. This projection would help the managers decide on which direction to work. Concurrently, making a strategic plan on achieving the short and long term goals is equally important. Thus secondly, we propose a strategic plan to be written by focusing on essential indicators (7) and second indicators group (15), which would state what are the future expectations, investments to be made and desired outcomes. Thirdly, stakeholder groups identified from essential indicators (children, primary school a child from the park and it's close surrounding, Junior Rangers, local inhabitants) should be involved in the assessment as well as in the strategic plan. This would involve finding out stakeholders opinion, desires and satisfaction, with the aid of questionnaires, semi structured interviews, focus groups, and applying a participatory approach in managing environmental education in the park. By finding out what these groups find more and what less relevant would help TNP managers develop environmental education programs and activities tailored to the stakeholders' needs and desires. Described feedback should be used to fit the information and make decisions on the first and second stage of the environmental education monitoring and development.

However, this study provides a complete workable compilation of indicators for further assessment of environmental education implementation in TNP, with a possibility to be applied to other protected Alpine areas as well. The study provides valuable information for TNP managers and other stakeholders that are involved in the implementation of environmental education activities in protected areas in Slovenia and abroad.

4.2.5 Relation to the thesis

Hypothesis H3 states that environmental education contributes to the implementation of SD in PA and applies to various stakeholder groups. This case study partly confirmes H3 by the following: Results confirm that environmental education in TNP is targeting various stakeholder groups: park managers, local inhabitants (with emphasis to children and youth), and tourists. The Republic of Slovenia citizens act in the role of local inhabitants as well as tourists in TNP. Park managers in TNP are also being educated in the form of formal training, workshops for protected area managers and by attendance at conferences and visiting other protected areas in the Alps.

4.3 Towards the ecotourism: A decision support model for the assessment of sustainability of mountain huts in the Alps (Stubelj Ars and Bohanec, 2010)

The aim of this study was to develop a decision support tool for providing decision support in implementation of sustainable development in protected areas. We choose four mountain huts in the Triglav National Park, as mountaineering is very popular in the Alps and presents pressure to the vulnerable mountain ecosystems. Further Slovenian mountain huts mostly date from the early to middle 20th century and most of them are in need for renovation. Decision problems addressed in this case study are managing PA, choice of management strategy, scenario evaluation, ranking management strategies and tourism and recreation.

4.3.1 Introduction

Tourism can be a powerful tool for successful economic development on a local and national scale. As global warming and other natural phenomena affect the quality of life around the globe, the question arises: how can tourism be made more environmentally friendly while remaining an interesting and attractive experience for consumers? The answer may lie in ecologically sustainable tourism (ecotourism), which primarily focuses on the experience of natural areas and the fostering of environmental and cultural understanding, appreciation and conservation (Ecotourism Australia, 2008).

According to Kariel (1992), mountain huts have diffused from a core area in mountain areas to the major climbing and hiking areas over the last centuries. Mountain huts have evolved into environmentally alien structures, but are, on the contrary, practical and functional for climbers and mountain hikers.

Another study that focuses on mountain hut infrastructure was performed in the Swiss Alps on the Monte Rosa mountain hut (almost 3.000 m above sea level). Goymann et al. (2008) investigated the construction of a modern hut to replace the old hut dating from 1894 from an environmental perspective. Through its resource- and energy-friendly construction and subsequent operation, the target of the project was to build a mountain hut that is 90 % energy self-sufficient. Extensive environmental assessment was performed in order to minimize the environmental impact of the new mountain hut already in the planning phase. The authors concluded that, in the new hut, energy demands will increase mainly due to the wastewater purification system, but the total greenhouse gas emissions will decrease by more than two-thirds per night (Goymann et al., 2008; Archicentral, 2009). The article by Goymann et al. (2008) indicates the need for mountain hut infrastructure renovation in the Alps and serves as a new benchmark for the modern architecture and excellent environmental performance of mountain huts. Singh and Mishra (2004) argue that, in many cases, tourist accommodation in mountains is inadequate for peak seasons. This implicates an urgent need for studies, models and plans to improve accommodation infrastructure in mountain areas worldwide.

We take the standpoint that achieving quality ecotourism requires the design and implementation of a proper management strategy and regime. The management strategy involves a number of crucial decision-related questions such as how to (a) best apply biodiversity conservation actions, (b) balance natural resource exploitation, (c) arrange and manage the infrastructure, (d) simultaneously achieve the assistance of the locals and satisfaction of tourists and (e) supplement the lack of finances.

From these questions, we specifically address the problem of infrastructure management in protected mountain regions. We found it challenging to develop a new approach to evaluating mountain huts and future planning using a multi-attribute decision model that would be applicable to different mountain huts by slight adjustments according to either the chosen hut or mountain environment properties or to the decision makers' policy. We expect the developed model will fulfill the goals established in the decision-making process of investors, managers and, consequently, (eco)tourists.

The oldest mountain hut in Slovenia, Koča na Klemenči jami (1 208 m above sea level), dates from 1954, but was originally built in 1832 and first served as a shepherd's hut and summer shelter for sheep. This hut's date of origin and infrastructure is comparable to the Monte Rosa mountain hut in the Swiss Alps, which is being totally replaced by a new modern and environmentally friendly mountain hut (Goymann et al., 2008). Many other mountain huts in the Slovenian Alps have similar origins and require technical improvements to support the numbers of tourists that seek accommodation in the mountains in summertime.

The developed decision support model was designed to evaluate the management of mountain huts in Slovenian Alps. The goal is to offer a tool for improving hut management and implementing environmentally friendly infrastructure elements in mountain huts to achieve quality ecotourism.

4.3.2 Methods

Methodologically, the approach is based on multi-attribute modeling: the model includes an extensive set of parameters that provide an in-depth evaluation of the ecotourism infrastructure in mountains. These parameters (formulated as attributes in the model) are organized into two submodels: infrastructure of mountain huts and infrastructure of mountain pathways in the Alpine region. The model is hierarchical, multi-attribute and qualitative, and offers the possibility of performing an assessment of mountain huts in operation. The assessment is carried out according to expert-defined decision rules and provides a new methodology for evaluating alternative management plans. In this case study, we describe the model in detail and illustrate its practical applicability with a case study of four selected mountain huts in Slovenia.

In our case, the problem is formulated as follows. We wished to examine the management of mountain huts in the Alpine region. For this purpose, we developed a model that enables the evaluation of mountain huts and the analysis of all the parameters we use to describe the huts. The model is used to analyze the positive and negative features of mountain hut infrastructure and management. We designed the model to assess the present state of the art and find suggestions for potential improvements to the management of Alpine mountain huts in order to achieve a lower environmental impact and, consequently, offer more environmentally friendly mountain tourism. The four mountain huts that comprise the sample in our case study represent the four alternatives of mountain huts in Slovenian Alps. Methodologically, we followed the approach of model-based decision support: we developed a model for the evaluation and analysis of mountain huts in DEXi (section 3.2).

4.3.2.1 Model structure

Our model, Management of mountain huts in Triglav National Park (MOUNTAIN HUT for short), consists of 64 hierarchically structured attributes (Figure 9). The 34 basic attributes are presented as the terminal leaves of the tree and are aggregated into higher tree levels by the decision rules.

The model consists of two submodels, represented by two subtrees in Figure 9, which address the infrastructure of the mountain huts and mountain pathways, respectively. The submodel "mountain huts" describes their infrastructure organization (sources as anthropogenic inputs in the mountain environment and waste products as outputs of anthropogenic activity in the mountains) and infrastructure capacity. The attribute sources includes energy, heat, fresh water and necessary supplies. Waste products aggregates the attributes waste management and wastewater management. The attribute infrastructure capacity integrates the attributes describing the accessibility of the mountain huts by roads and pathways and capacity availability, which describes the dormitory and dining room capacities of the huts, as well as the natural capacity of the pathways and peaks in the particular mountain environment. The second submodel "mountain pathways" describes the properties of marks (signs, information tables, signposts, directions) and pathways that lead to the particular mountain hut.

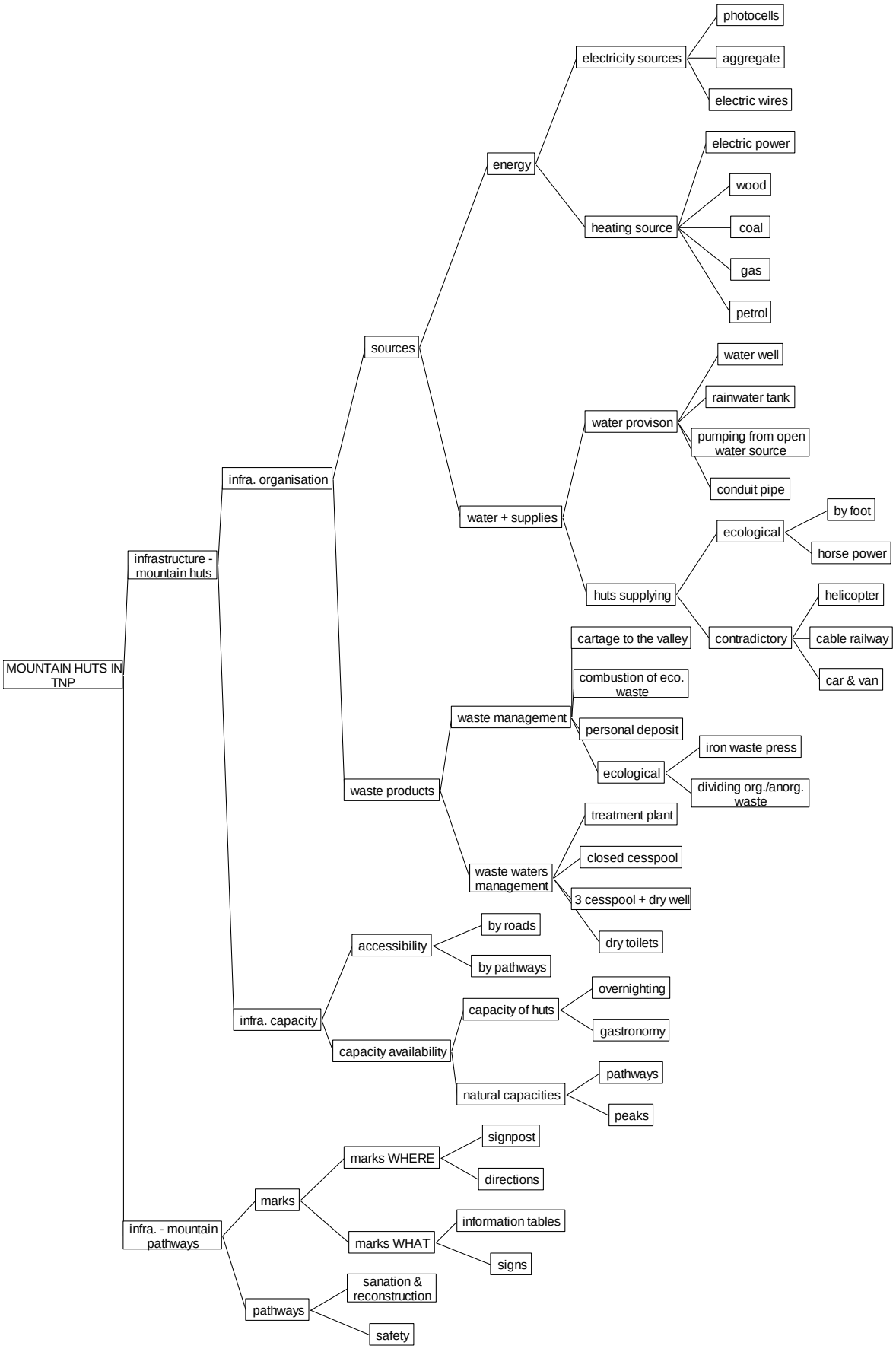

Figure 9: *The structure of the "Management of mountain huts in TNP" model.*

4.3.2.2 Value Scales

All attributes in the model are described by discrete and symbolic value scales: they can take discrete descriptive values, which are represented by words. In our model, we used a maximum five-grade value scale ("UNACCEPTABLE", "BAD", "MIDDLE", "GOOD", "VERY GOOD") for the root attribute, which represents the main evaluation results. For the basic attributes in which we entered the data about the huts, we used two-grade value scales (e.g., YES, NO). The whole model contained nine different value scales (Table 10), as we adjusted the value scale to every specific attribute.

Table 10: *Value scales used in the model.*

	Value scale
1	**UNACCEPTABLE, BAD,** MIDDLE, **GOOD, VERY GOOD**
2	**BAD,** MIDDLE, **GOOD, VERY GOOD**
3	**BAD,** MIDDLE, **VERY GOOD**
4	**BIG**, MEDIUM, **SMALL**
5	**NOT MANY**, FEW, **MANY**
6	**IN NEED**, **NO NEED**
7	**BAD**, **GOOD**
8	**YEA**, **NO**
9	**NO**, **YES**

All the scales in Table 10 are ordered preferentially, from bad (negative) values on the left-hand side to good (positive) values on the right-hand side. It should be noted that the scales numbered 8 and 9 have the same values (no and yes), but are ordered differently. In the DEXi software, this difference is clearly visible because, by convention, good values are colored green, negative red, and neutral black. In this paper, for example, in Table 10, we denote bad and good values with **bold** and ***italic*** typeface, respectively.

4.3.2.3 Decision rules

In a DEXi model, decision rules define the aggregation of values in the direction from basic attributes (terminal nodes) toward the outputs (aggregate attributes and, particularly, the root node). For each attribute that aggregates two or more other attributes in the model, the decision maker defines a table that specifies the value of the former attribute for all combinations of values of the latter attributes.

In our model, all decision rules were designed from an environmentalist perspective, following the viewpoint that the natural environment of protected areas should be preserved as much as possible in its original state. In spite of mountain tourism activities, the values and natural phenomena of the area should be conserved where tourists hike, enjoy nature and overnight. As mentioned before, two of the five concepts that define ecotourism are being treated in our model: low impact on (natural) environment and sustainability. It is also important to note that all national parks have special policy regimes that forbid some actions in the particular protected area (e.g., flower collection, fire lighting, disturbing of wild animals). In discussion (section 4.3.3.2) we explain how the model can be used by different stakeholders involved in the process of decision making in order to evaluate economic, social and environmental dimensions of sustainability.

To illustrate decision rules, let us take the subtree electricity source (the topmost branch in Table 11). This subtree assesses the ecological friendliness of the hut's electricity sources. The assessment depends on the availability of three sources: photocells, aggregate and electric wires; these are represented by three "yes no" input attributes. Therefore, decision rules, which are shown in Table 11, specify the value of the electricity source for all the $2^3 = 8$ combinations of values for photocells, aggregate and electric wires. The table clearly shows that photocells are considered the most environmentally friendly, while electric wires are much less preferred. Since

some huts may have a combination of all three electricity sources, the table provides assessments for all possible combinations.

Table 11: *Example of decision rules for the attribute electricity sources.*

	Photocells	Aggregate	Electric wires	Electricity sources
1	NO	NO	YES	**BAD**
2	NO	NO	NO	**BAD**
3	NO	YES	YES	**BAD**
4	NO	YES	NO	MIDDLE
5	YES	NO	YES	MIDDLE
6	YES	NO	NO	**VERY GOOD**
7	YES	YES	YES	MIDDLE
8	YES	YES	NO	**VERY GOOD**

4.3.2.4 Study area of the case study

We present a case study based on four mountain huts in the Slovenian Alps. The developed decision support model carries out an assessment of the current state of the art and proposes possible management strategy improvements regarding the infrastructure of the huts.

For the case study, we chose four mountain huts in the Slovenian Alps. All the four huts are located in the Julian Alps in TNP, located from 1 385 m to 2 182 m above sea level. In the selection, we wanted to keep the number of huts reasonably low in order to allow a detailed analysis. As this was the first application of the model, which was primarily aimed at the verification and demonstration of its performance, we included popular and well-known huts. Furthermore, we wanted to facilitate a meaningful in-depth comparison of huts.

Consequently, we selected two pairs of huts. The first pair (Hut P and Hut T) is located in the Triglav Lake Valley, which is one of the most beautiful and oldest preserved natural habitats in Slovenia (the first preservation act dates in 1918). Triglav Lakes Valley is located in the heart of TNP and contains seven beautiful mountain lakes, each of which presents a unique ecosystem and features various endemic species. The second pair of huts is located in the western part of TNP: Hut K is on the edge of the Krn Lake (the largest Slovenian mountain lake) and Hut G just beneath the top of the Krn mountain. The huts in each pair are within a walking distance of about half a day, which means that some mountaineers visit both mountain huts from one pair in the same day or in two days, by using one to rest and another to overnight.

Table 12: *Mountain hut properties: name, altitude, dormitory and dining room capacities.*

Mountain hut	Name	English name (translation)	Altitude (m)	Dormitory capacity	Dining room capacity
Hut P	Koča na Prehodavcih	Hut on Prehodavci	2 071	39	40
Hut T	Koča pri Triglavskih jezerih	Hut at Triglav Lakes	1 685	200	150
Hut K	Planinski dom pri Krnskih jezerih	Moutain hut at Krn Lake	1 385	170	75
Hut G	Gomiščkovo zavetišče	Gomišček refuge	2 182	50	30

All the huts offer room and board for mountaineers and trackers. Information regarding the huts' dormitory capacity, dining room capacity and position is given in Table 12 and Figure 10 shows their geographical position in TNP. All the huts are in the first category of mountain huts (Alpine Association of Slovenia, 2008) and are located in area recognized is Slovenia as Sites of Community Importance. Three of the four huts can be supplied only by a helicopter, like the Monte Rosa mountain hut (Goymann, 2008).

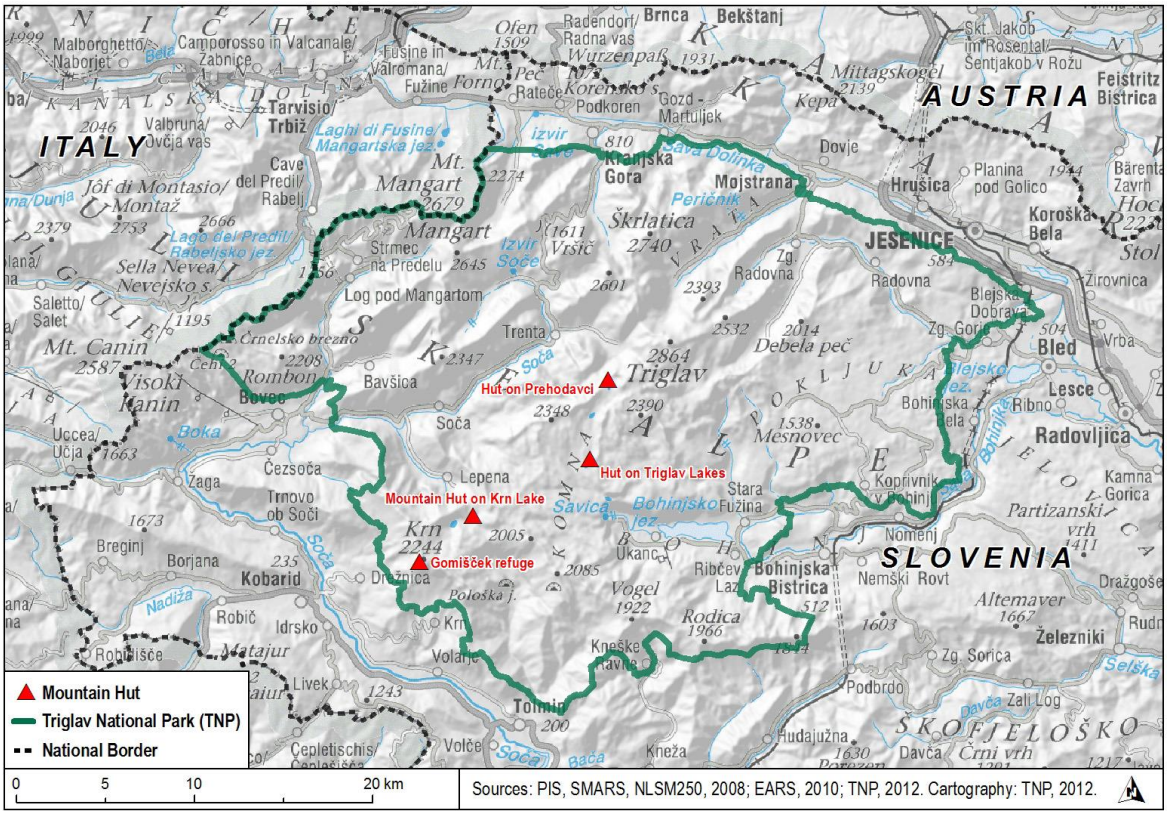

Figure 10: *Four mountain huts in Triglav National Park.*

Specifically, all huts have the following attributes: (1) the hut is in the mountains above the upper forest line; (2) the hut is at least one hour walking distance from the last traffic road (it is not reachable by car); (3) the hut has simple equipment; (4) the food menu is simple; (5) the hut offers comfortable overnights for one or two nights; (6) the hut is supplied occasionally (only when it is open and when food supplies diminish); (7) beds are mostly in common rooms; (8) the hut is open only in the summer season (winter beds are available in some huts), (9) all huts are within the Biosphere Reserve Julian Alps which is also recognized as Site of Community Importance (SCI) (Bizjak, 2008). As none of the huts is reachable by vehicle, all supplies and outputs have to be transported by another means, mainly helicopter. According to Šolar (1997), all these huts have a very high visitor rate in the summer season. Weakly fluctuations in the number of visitors are visible at the beginning of the summer and in September, when peak numbers appear on the weekends.

4.3.2.5 Data

The data for the present study were collected from two sources. The first source is the study "Environmental analysis of mountain huts in Triglav National Park 1992" (Šolar, 1997). In this study, the infrastructure properties of 34 mountain huts in TNP were assessed to obtain an overview of the status of hut infrastructure in the Slovenian Alps. The data collected included the data on electricity sources, heating sources, huts supplying, fresh water sources, waste management and wastewater management. However, as this study is fairly old and some huts have undergone changes in the infrastructure, we collected new data from a second source: interviews with the four mountain hut suppliers. Short interviews were conducted in August 2008, in which we collected information on water supplies, waste disposal and road infrastructure. This data is shown in Figure 11 in rows that correspond to basic attributes (that is, terminal nodes of the tree, which are printed in normal typeface in Figure 11).

4.3.3 Results and discussion

4.3.3.1 Mountain huts assessment and ranking

Our model's evaluation of the four huts yielded the results shown in Figure 11 in rows corresponding to aggregate attributes (printed in bold). The row labeled "MOUNTAIN HUTS" presents the overall assessment: Hut P was evaluated as "very good", Hut T and Hut G as "good", and Hut K as "middle". This means that the management of Hut P was evaluated as the best among the four alternatives.

Figure 11 shows intermediate evaluation results that correspond to all the aggregate attributes in the model, providing a very detailed evaluation profile of all the huts. Given this profile, it becomes easy to drill down the model, investigate the partial assessments, compare them with each other, assess the good and bad characteristics of each hut and perform other analyses. For example, when comparing Hut P (evaluated as "very good") with Hut K (evaluated as "middle"), we can see that 14 out of 24 aggregate attributes that can take the value "very good" have actually been evaluated as "very good" (58 %) for Hut P. By contrast, Hut K has only 8 (33 %) of the possible "very good" values.

In the following, we present detailed evaluation results focusing on (a) the infrastructure of the mountain huts and mountain pathways, their organization and capacity; (b) their sources of electrical energy, heat, water and supplies; (c) waste management in the mountain huts; and (d) mountain hut organization.

The results are presented using radar charts produced by the DEXi decision modeling program. The charts enable a graphic comparison of the combination of three, four, five or six selected attributes. The shape of the chart (regular triangle, rectangle, pentagon or hexagon) presents the coordinate system whose border corresponds to the best possible evaluation of the corresponding attribute. The chart shows the combination of the evaluations for the chosen attributes for each mountain hut.

Figure 12 shows the overall assessments of all huts together, presenting the overall evaluation (MOUNTAIN HUTS) and the evaluations of the three topmost infrastructure attributes in the model (see Figure 9). From Figure 12, we can see that Hut P has the best possible marks for the chosen four attributes, which means this hut has a very good overall management and hut infrastructure properties. On the contrary, Hut K received the lowest marks of all four huts. The infrastructure of mountain pathways is evaluated as "good" for Hut T and "very good" for the other three huts. The infrastructure capacity is a weak point for Hut K, so its managers should strive to improve this feature.

In Figure 13, we compare the energy sources (for electricity and heating), water and hut supply. Hut P is evaluated as the best, Hut K as the worst, while Hut T and Hut G have the same mark (area) although they have different values for electricity and heating sources.

All the huts were evaluated as "middle" for water provision. Here, we should emphasize that none of the huts has water well nor a conduct pipe connected to the valley. Water comes from a rainwater tank or from an open water source. Therefore, all the huts can further improve their water provision.

It is clear that none of the huts has a very good way of being supplied. Three huts use only helicopter, while Hut K uses a cable railway and car or van. Both helicopter and cable railway have a strong impact on the natural environment; therefore, hut supply has not been evaluated as "very good" for any of the huts.

Hut G has "middle" heating sources, while the other three huts have a "very good" heating source. Hut P and Hut G use photocells as their electricity source, while the other huts use either aggregate (Hut K) or the combination of aggregate and photocells (Hut Z).

Evaluation results

Attribute	Hut P	Hut T	Hut K	Hut G
MOUNTAIN HUTS	*VERY GOOD*	*GOOD*	MIDDLE	*GOOD*
mountain huts	*VERY GOOD*	*VERY GOOD*	**BAD**	*GOOD*
organisation	*VERY GOOD*	*VERY GOOD*	MIDDLE	MIDDLE
sources	*VERY GOOD*	MIDDLE	**BAD**	*VERY GOOD*
energy	*VERY GOOD*	MIDDLE	MIDDLE	*VERY GOOD*
electricity sources	*VERY GOOD*	MIDDLE	MIDDLE	*VERY GOOD*
photocells	*YES*	**NO**	**NO**	*YES*
aggregate	*YES*	*YES*	*YES*	**NO**
electric wires	*NO*	*NO*	*NO*	*NO*
heating source	*VERY GOOD*	*VERY GOOD*	*VERY GOOD*	MIDDLE
electric power	**NO**	**NO**	**NO**	**NO**
wood	**NO**	**NO**	**NO**	**NO**
coal	*NO*	*NO*	*NO*	*NO*
gas	*NO*	*NO*	*NO*	**YES**
petrol	*NO*	*NO*	*NO*	*NO*
water + supplies	MIDDLE	MIDDLE	**BAD**	MIDDLE
water provison	MIDDLE	MIDDLE	MIDDLE	MIDDLE
water well	**NO**	**NO**	**NO**	**NO**
rainwater tank	*YES*	**NO**	**NO**	*YES*
pumping from open water source	**YES**	**YES**	**YES**	*NO*
conduit pipe	*NO*	*NO*	*NO*	*NO*
huts supplying	MIDDLE	MIDDLE	**BAD**	MIDDLE
ecological	MIDDLE	MIDDLE	**BAD**	MIDDLE
by foot	**NO**	**NO**	**NO**	**NO**
horse power	*YES*	*YES*	**NO**	*YES*
contradictory	MIDDLE	MIDDLE	MIDDLE	MIDDLE
helicopter	**YES**	**YES**	*NO*	**YES**
cable railway	*NO*	*NO*	*YES*	*NO*
car & van	*NO*	*NO*	*YES*	*NO*
waste products	*VERY GOOD*	*VERY GOOD*	*VERY GOOD*	**BAD**
waste management	*VERY GOOD*	*VERY GOOD*	*VERY GOOD*	**BAD**
cartage to the valley	*YES*	*YES*	*YES*	**NO**
combustion of eco. waste	**NO**	**NO**	**NO**	**NO**
personal deposit	*NO*	*NO*	*NO*	*NO*
ecological	*YES*	*YES*	*YES*	*YES*
iron waste press	*YES*	*YES*	*YES*	*YES*
dividing org./anorg. waste	*YES*	**NO**	*YES*	*YES*
waste waters management	MIDDLE	MIDDLE	MIDDLE	MIDDLE
treatment plant	**NO**	**NO**	**NO**	**NO**
closed cesspool	*YES*	**NO**	*YES*	*YES*
3 cesspool + dry well	**NO**	*YES*	**NO**	**NO**
dry toilets	**YES**	**YES**	*NO*	*NO*
capacity	*VERY GOOD*	*VERY GOOD*	**BAD**	*VERY GOOD*
accessibility	*VERY GOOD*	*VERY GOOD*	MIDDLE	*VERY GOOD*
by roads	*NO*	*NO*	**YES**	*NO*
by pathways	*YES*	*YES*	*YES*	*YES*
availability	MIDDLE	MIDDLE	**BAD**	MIDDLE
capacity of huts	MEDIUM	**BIG**	**BIG**	MEDIUM
overnighting	MEDIUM	**BIG**	**BIG**	MEDIUM
gastronomy	MEDIUM	**BIG**	**BIG**	MEDIUM
natural capacities	MIDDLE	*VERY GOOD*	MIDDLE	**BAD**
pathways	FEW	*MANY*	FEW	**NOT MANY**
peaks	*MANY*	*MANY*	*MANY*	**NOT MANY**
mountain pathways	*VERY GOOD*	*GOOD*	*VERY GOOD*	*VERY GOOD*
marks	*VERY GOOD*	*VERY GOOD*	*VERY GOOD*	*VERY GOOD*
where	*VERY GOOD*	*VERY GOOD*	*VERY GOOD*	*VERY GOOD*
signpost	*GOOD*	*GOOD*	*GOOD*	*GOOD*
directions	*GOOD*	*GOOD*	*GOOD*	*GOOD*
what	MIDDLE	*VERY GOOD*	*VERY GOOD*	MIDDLE
information tables	**BAD**	*GOOD*	*GOOD*	**BAD**
signs	*GOOD*	*GOOD*	*GOOD*	*GOOD*
pathways	*VERY GOOD*	MIDDLE	*VERY GOOD*	*VERY GOOD*
sanation & reconstruction	*NO NEED*	*NO NEED*	*NO NEED*	*NO NEED*
safety	*GOOD*	**BAD**	*GOOD*	*GOOD*

Figure 11: *Evaluation of the four mountain huts.*

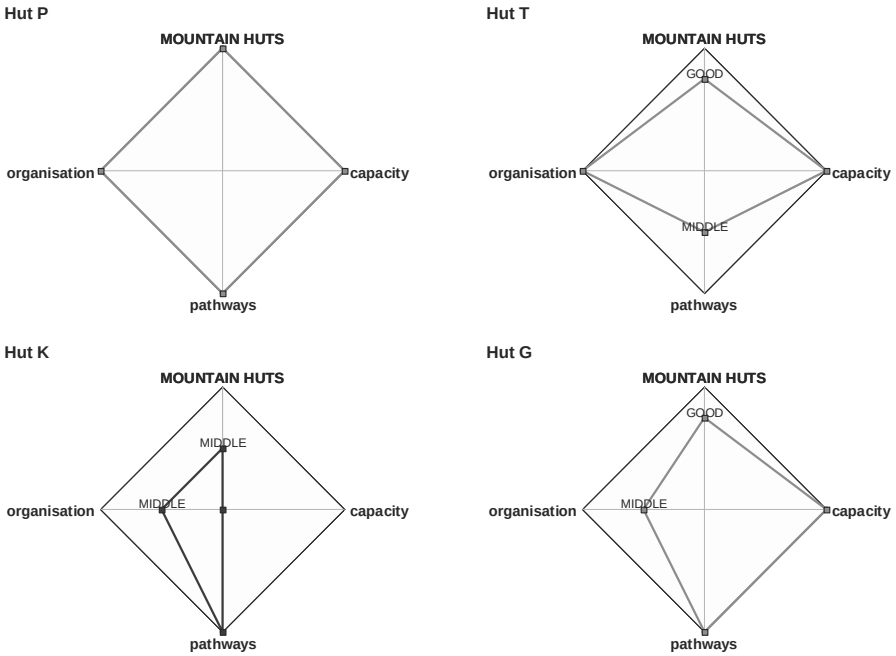

Figure 12: *Evaluation of huts with respect to: Management of mountain huts in TNP, infrastructure organization, infrastructure capacity and infrastructure of mountain pathways.*

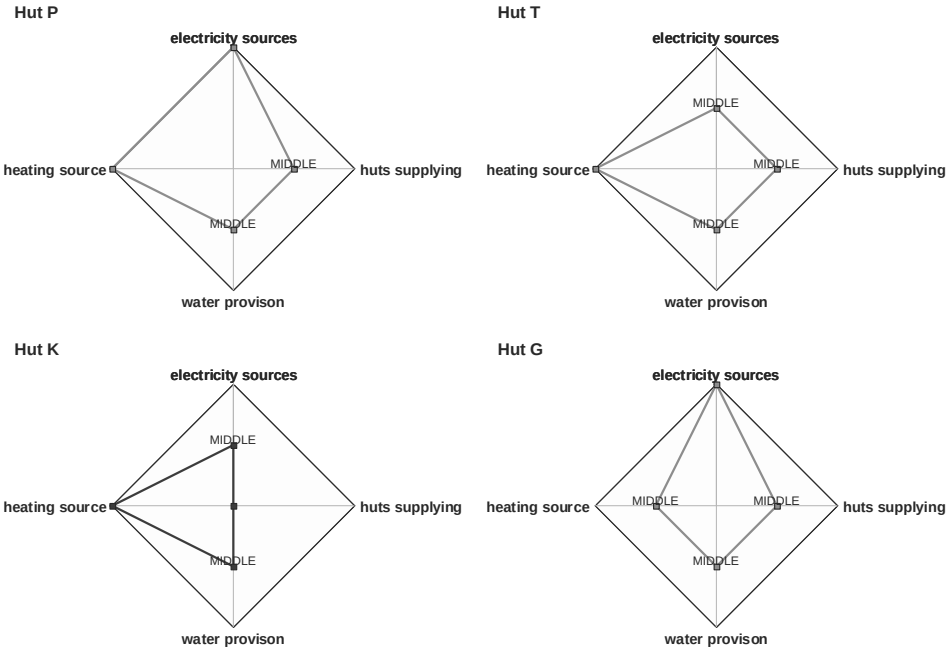

Figure 13: *Evaluation of huts with respect to sources: electricity sources, heating sources, water provision, huts supplying.*

Figure 14 presents the assessments of the huts' waste management. Hut P and Hut K have a far better system of waste management than the other two huts. In particular, Hut G has a very small area covered by the polygon, indicating the need to improve its waste management and use more environmentally friendly ways of disposing waste.

It is important to note that, due to TNP regulations, none of the huts may have a personal deposit or combust their waste on the park's territory. In our case, all the assessed huts observed these regulations.

Three huts ship their waste to the valley. Of those, three use a helicopter to supply the huts, so on its return trip to the valley, the helicopter takes their waste. All the huts use an iron press to reduce the volume of cans and other hard waste. In addition, three huts divide their organic and inorganic waste, another step towards more ecological waste management.

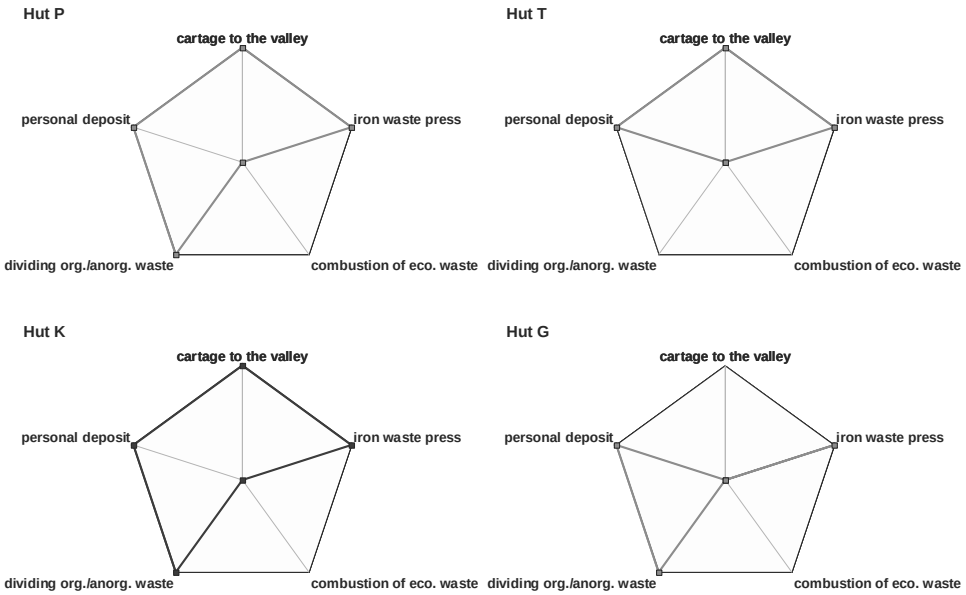

Figure 14: *Evaluation of huts with respect to waste management: cartage to the valley, combustion of ecological waste, personal deposit, iron waste press, dividing organic/inorganic waste.*

Figure 15 refers to the organization of infrastructure and compares the topics discussed in sections (b) and (c): sources and waste products. Again, Hut P was evaluated as 'very good'. Hut T was evaluated "middle" for sources and "very good" for waste management, which combine to make a "very good" evaluation of infrastructure organization. Both Hut K and Hut G have "middle" infrastructure organization but different values for sources and waste products. Hut G should improve its waste management, while Hut K should introduce more environmentally friendly sources (electricity, heating sources, water and supplying methods) into its operation.

Finally, in Table 13, we present the ranking of huts with respect to some selected attributes. We selected 15 aggregate attributes that occur at the topmost level of the model. A partial ranking of huts with respect to each selected attribute is shown in the corresponding rows of Table 13. From this table, we can clearly see the ranking of alternatives for the chosen attribute. In Table 13, we can see that Hut P scored the highest value for all attributes.

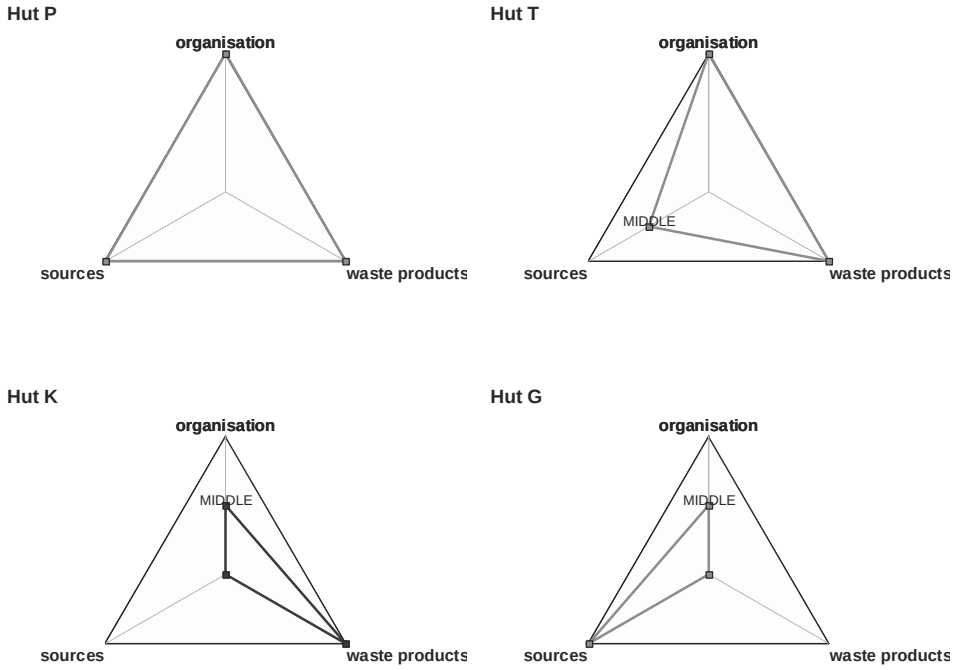

Figure 15: *Evaluation of huts with respect to infrastructure organization: Comparison of sources and waste products.*

Table 13: *Ranking of the assessed mountain huts for the chosen attributes.*

Model level	**Attribute**	**Ranking of the huts**
Main	Mountain huts	Hut P (very good) **>** Hut T and Hut G (good) **>** Hut K (middle)
1	Mountain huts (submodel 1)	Hut P and Hut T (very good) **>** Hut G (good) **>** Hut K (bad)
2	Organization	Hut P and Hut T (very good) **>** Hut K and Hut G (middle)
3	Sources	Hut P and Hut G (very good) **>** Hut T (middle) **>** Hut K (bad)
3	Energy	Hut P and Hut G (very good) **>** Hut T and Hut K (middle)
4	Water + supplies	Hut P and Hut G and Hut T (middle) **>** Hut K (bad)
3	Waste products	Hut P and Hut K and Hut T (very good) **>** Hut G (bad)
4	Waste management	Hut P and Hut K and Hut T (very good) **>** Hut G (bad)
4	Wastewater management	All Huts (middle)
2	Capacity	Hut P and Hut T and Hut G (very good) **>** Hut K (bad)
3	Accessibility	Hut P and Hut T and Hut G (very good) **>** Hut K (middle)
3	Availability	Hut P and Hut G and Hut T (middle) **>** Hut K (bad)
1	Mountain pathways (submodel 2)	Hut P and Hut K and Hut G (very good) **>** Hut T (good)
2	Marks	All Huts (very good)
2	Pathways	Hut P and Hut K and Hut G (very good) **>** Hut T (middle)

4.3.3.2 Results interpretation

We developed a qualitative multi-attribute model for assessing the management of mountain huts and tested it on four mountain huts in the Triglav National Park in Slovenia. We agree with the recommendation of Goymann et al. (2008) that the present state of any mountain hut should be carefully evaluated before new methodology is applied in its renovation and rebuilding. Decisions should be made based on detailed studies of possibilities. Here, decision support systems are

welcome and may improve the decision process and contribute to the generation of energy and ecologically sustainable mountain huts.

Our results indicate that the developed model can be used successfully for this task, as it provides both overall evaluations (at the root of the model) and detailed evaluation profiles (within the model). The model allows differences between the huts to be identified and compares them on different levels of organization. The ranking of huts can take place at almost any level of the model, and good and bad characteristics of huts can be easily identified. Hence, the best practice could be extracted from the examples of huts that have maximal values for a particular attribute. On this basis, better hut planning and management could be proposed. On the other hand, the identified bad characteristics can motivate further improvement of a hut's infrastructure and management. Such analysis can contribute to lowering the impact on the environment and attracting more tourists by offering an unpolluted healthy mountain experience. In a study of tourist preferences for rural house stays, seven factors were identified as influencing the tourists' choice of vacation indoor location: natural surroundings, intrinsic rural characteristics, size and type of the building, quality of equipment, services and activities offered (Albaladejo-Pina and Diaz-Delfa, 2009). We believe these same factors also influence mountaineers' choice of mountain hut; therefore, it is essential to know the optimal characteristics of the hut and its placement in the environment.

In our research we took the standpoint in which environmental sustainability concept is being emphasized by building decision rules from environmentalists' viewpoint, as we were interested in investigating how sustainable management and environmentally friendly planning of mountain huts can contribute to ecotourism in the mountains. However, sustainable development is a complex phenomenon that includes economic, social and environmental dimensions (Agenda 21, 1992). As hard as it seems, all three concepts should be balanced in order to achieve sustainable development. Environmental impact assessment should therefore address all the three concepts and include all interested parties: investors, managers of protected areas, huts' managers, local inhabitants, end users – mountaineers, hikers, alpinists, tourists. In reality, different stakeholders have different interests and preferences. To take into account these differences, different decision support models could be developed with slight alteration of decision rules for different stakeholder groups. In this way, we would obtain different models, which would yield different results according to the preferences of the stakeholders group and their interest in social, economic or environmental sustainability. These different sets of evaluations could finally be either compared between stakeholder groups or aggregated into an overall evaluation of infrastructure management strategies.

Even though we focused our study on protected areas and specifically mountain huts, we believe that the applicability of our approach and developed model is much broader. For example, it may as well apply to Sites of Community Importance (SCI), which combine nature conversation with sustainable tourism development. European Commission Habitats Directive (92/43/EEC) defines SCI as "a site which, in the bio geographical region or regions to which it belongs, contributes significantly to the maintenance or restoration at a favorable conservation status of a natural habitat type or of a species and may also contribute significantly to the coherence of Natura 2000 and/or contributes significantly to the maintenance of biological diversity within the biogeographic region or regions concerned". In the Alpine region there are 1,496 SCIs (Sundseth, 2009). In Slovenia, 23 habitat types, 9 animal and 5 plant species are being listed in SCI under Natura 2000 (Bizjak, 2008). The Julian Alps are listed as the Site of Community Importance, therefore all mountain huts in TNP, including the ones we assessed by our model, are within the SCI area. Actually, different protection statuses might be valid for the same location. For example, the four huts from our study are at the same time located in the national park, Site of Community Importance, Natura 2000 area and biosphere reserve (Julian Alps).

Goymann et al. (2008) argue that the behaviour of mountain hut keepers and visitors is crucial in the overall environmental impact of tourism on the mountain environment. We argue that, by improving the sustainability of operation and infrastructure of mountain huts, the goals of ecotourism are better fulfilled, and, consequently, the environmental consciousness and education of visitors is improved.

4.3.4 Conclusion

The model we developed is flexible in the sense that its hierarchical structure and rules enable small adjustments to be made for its application to other potential case studies in the Alpine region and extraction of know-how from the assessed examples. In this way, the model contributes to the integration of sustainable tourism infrastructure development and educational tools to improve the understanding and hence performance of ecotourism in the Alps.

Regarding the changes and arrangements that have a quick impact on the improvement of environment, we propose actions in the following sectors: electricity, huts supplying, waste and wastewater management. Photocells should be installed on all mountain huts, as they provide electricity and hot water with no emission to the environment. Currently, the helicopters are supplying almost all mountain huts and also transport solid waste into the valley. Still, the flights should be restricted to the minimum and flown in a way that disturbs mountain wildlife as little as possible. Wastewater management should be improved by building environmentally friendly treatment plants and lowering the amount of water used per guest. The waste should be divided into organic, which can be composted, and inorganic, which should compacted as much as possible for easier transportation to the valley.

In the future, we plan to use the presented model to conduct additional analyses that include all 34 mountain huts in TNP. We plan to extend the study by using other analytical methods offered by the DEXi software: plus-minus analysis, selective explanation and sensitivity analysis (by combining different weights between submodels). We also wish to conduct a comparison of mountain hut management for the segmented groups of mountain huts, that is, after clustering them according to different attributes such as height, dormitory capacity and geographical location. The results of the analysis will be used for the evaluation of the present state of infrastructure in the Slovenian Alps. Our aim is to propose indicators for the improvement of Slovenian mountain hut infrastructure in general and for the huts specifically, in order to lower the impact of Alpine tourism on the mountain environment. Further model possibilities also include its extensions and adaptations in order to address (1) different stakeholder groups (investors, managers of protected areas, local inhabitants, end users) and (2) different nature-protection contexts (protected areas, SCI, Natura 2000). Ultimately, we hope that our new methodology will be used for evaluating the state of art and decision making on mountain huts infrastructure improvement and renovation in wider Alpine space, and perhaps also in other comparable mountain environments worldwide.

4.3.5 Relation to the thesis

This case study proves that impacts of tourism within vulnerable mountain environments are measurable and it is possible to compare them and to evaluate with decision models. This confirms H2. The mountain hut infrastructure assessment model also supports H1 as an example of decision support model being successfully applied to solving mountain huts decision problems in protected areas.

4.4 Environmental information perception at a high school workshop

The aim of this case study was to develop a decision support tool that enables the user to compare and evaluate highschool students' knowledge before and after an educational event. The Decision problem addressed in this case study environmental information perception was measured. This decision problem was not identified in the case study on decision problems in protected areas (section 4.1). This indicates why this case study was a novelty in this research field.

4.4.1 Introduction

It is generaly believed that environmental education influences a positive change in environmental behaviour (Pooley and O'Connor, 2000). Environmental information perception is a step in the process of gathering environmental information and building it into an individual's value system, which develops as environmental awareness and further impacts on one's behaviour. "The ultimate aim of education is shaping human behavior." (Hungerfort and Volk, 1990: 8). We found the publications on perception of environmental topics rather scarce. For example, Alaimo and Doran (1980) evaluated students' perception of environmental problems, while Garavaglia et al. (2012) evaluated tourists' perception of climate changes on landscape diversity in Italian Alps.

In 2007 the Slovenian Ministry for Education and Sport adopted the "Guidelines for education for sustainable development from pre-school to university education". Consequently, environmental education gained in recognition and started the path towards being integrated into the formal schooling system in Slovenia.

The goals of this case study were to assess the effects of environmental education, carried out through a workshop, on a high school student population and develop a computer driven model for the evaluation of students' knowledge from written tests. In order to examine environmental information perception, two workshops "Protected areas and the Alpine world in Slovenia" were conducted in the Biotechnical Secondary School within the School Center Nova Gorica, Slovenia. The workshops had the same content and procedure, and took place on May 2008 and September 2012, respectively. The aims of the workshops were the following:

- To evaluate the existing knowledge of high school students on the topic of nature conservation and the state of art in Slovenian Alps.
- To examine the environmental information perception of high school students after the workshop on a specific topic.

We used surveying as a tool in order to obtain information before (at time 0) and after (at time 1) the workshop on nature conservation with examples from TNP. Altogether 40 high school students attended the workshops. A qualitative multi-attribute decision making model was built with the aim to evaluate the perception of environmental data of the high school students. The applied methodology was based on multi-attribute modeling, supported by the multi-attribute software DEXi, which was used to build an integrated rule-base model to evaluate students' environmental information perception. The model is hierarchical, multi-attribute and qualitative.

The following hypotheses have been addressed in this study:

h1: Male students had higher information perception and performed better in the tests. (This hypothesis was based on the results from Bolger and Kellaghan's (1990) study on gender differences in scolastic achievement).

h2: Students who had previously visited TNP had better test results at time 0 and time 1.

h3: Students that had been encouraged towards discovering nature by the workshop obtained better final test results.

h4: Students that come from households that run private agricultural business have better final test results than the rest of the group.

h5: Visit to natural destinations (Triglav National Park, Škocjan Caves or Postojna Cave) has a strong influence on test results.

h6: Students that have showed a significant improvement in test results from time 0 to time 1 have visited at least one of the nature conservation destinations in Slovenia: Triglav National Park, Škocjan Caves or Postojna Cave.

4.4.2 Methods

4.4.2.1 Workshop and questionnaire

This is a longitudinal study, data collected in more than one point in time with the aim to illuminate the direction of observed variables (Kelley et al., 2003) and a panel study, data being collected on the same sample. Analytical data for evaluation research were collected with the aid of questionnaire. The surveying took part at the very beginning of the workshop and at the end of it. In the questionnaire part I the students were asked demographic questions and 14 core questions which were evaluating their existing knowledge on nature conservation in general and Slovenian Alps. The 14 core questions had multiple choice answers, but only one choice was correct. On the questionnaire sheets students were instructed to choose the correct answer by circling it. In the questionnaire part II students were asked again the same 14 core questions and 4 additional questions related to their interest in TNP, Alps and the workshop. The questionnaire part I and part II were on separate sheets and were handed to students separately. Therefore students were unable to see or correct their answers from questionnaire part I while answering questionnaire part II. Both parts of the questionnaire are in Appendix D. The core questions of the questionnaire were designed in accordance to the developed model in order that each question fits one final attribute of the model. The data for the model were obtained from answers on 14 core questions, correct answer being equal to 1 point, wrong answer or no answer being equal to 0 points.

The workshop took place in morning hours and lasted approximately 45 minutes, what is equivalent to 1 school hour (Table 14). The lecture presented information that had direct answers to all 14 core questions. Hypothetically the student that would have no knowledge on time 0 and would have 0 points on pretesting, could answer correctly on all 14 questions after following the lecture carefully. The lecture slides were visual, containing mainly pictures and key words related to the spoken theme. Aside from looking and reading slides, students had to listen to the lecturer in order to follow the lecture and learn. The slides were deliberately made more visual, as we wished to obtain students' attention at all times of the lecture.

Table 14: *Time frame of the workshop activities.*

Time frame (min)	Activity
45	Whole workshop
3	Introduction
5	Questionnaire – part I – demographics and nature related
10	Questionnaire – part I – 14 core questions at time 0
30	Lecture
10	Questionnaire – part II – 14 core questions at time 1
2	Questionnaire – part II – 4 questions on student interest

4.4.2.2 The model for evaluation of students' information perception

4.4.2.2.1 Model structure

The hierarchical model consists of two submodels Protected areas – information from the workshop and Alps in Slovenia, which together covered the full content of the workshop. Variables called attributes were hierarchically structured into the model. The values of the attributes were aggregated by decision rules. The model consisted of 14 initial attributes (these correspond to the core questions from the questionnaire) which were grouped into seven aggregated attributes structured in four hierarchical levels (Figure 17).

4.4.2.2.2 Value scales

The whole model contained five different value scales (Table 15), as we adjusted the value scale to every specific attribute of the model. All scales in Table 15 are ordered preferentially, from bad (negative) values on the left-hand side to good (positive) values on the right-hand side. It should be noted that in the case where we evaluated whether the student answered the question correctly or not, we used 0 for false and 1 for correct answer. In the next level we summed up the correct answers by aggregating three attributes (questions) in the case of Nature protection and Natural richness, and by aggregating four attributes in the case of Basic information and Workshop information (Figure 17). Therefore, in the first case the maximum score was 3, while in the second it was 4, in Table 15 value scale 3 as 0-3+.

Table 15: *Value scales used in the environmental education model.*

	Value scale
1	nothing, little, something a lot, all
2	nothing, little, something a lot
3	0,1,2,3+
4	0,1,2,3
5	0,1

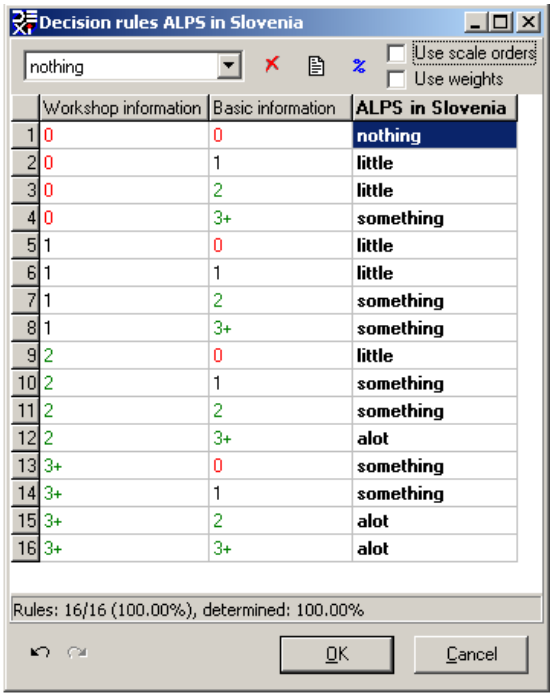

Figure 16: *Example of decision rules for the attribute Alps in Slovenia.*

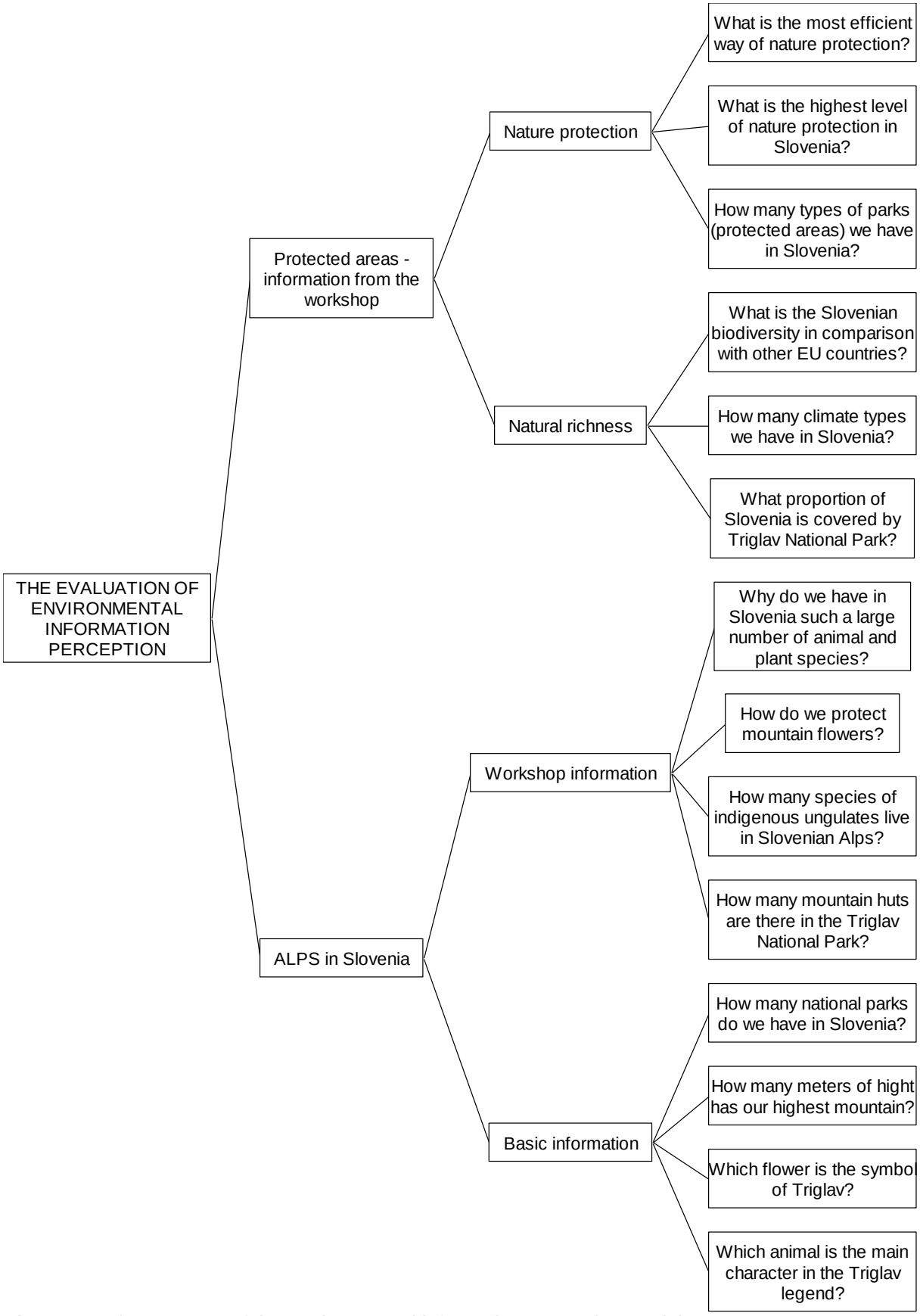

Figure 17: *The structure of the Environmental information perception model.*

4.4.2.2.3 Decision rules

Decision rules for the attributes of: Nature protection, Natural richness, Basic information, Workshop information were obtained simply as a sum of the numerical numbers regarding whether student's answers on the questions from the last levels were correct or false.

In the next level the attributes Protected areas - information from the workshop and ALPS in Slovenia were obtained by adding the numerical values into qualitative values. The example of decision rules is presented on the Figure 16 in which attributes Basic information and Workshop information are aggregated in the attribute ALPS in Slovenia.

4.4.2.3 Three nature conservation attractions in Slovenia

In the questionnaire we asked students if they had already been to the Škocjan Caves, Postojna Cave or Triglav National Park. All three selected nature conservation destinations feature unique natural and cultural heritage attributes and have a strong educational mission.

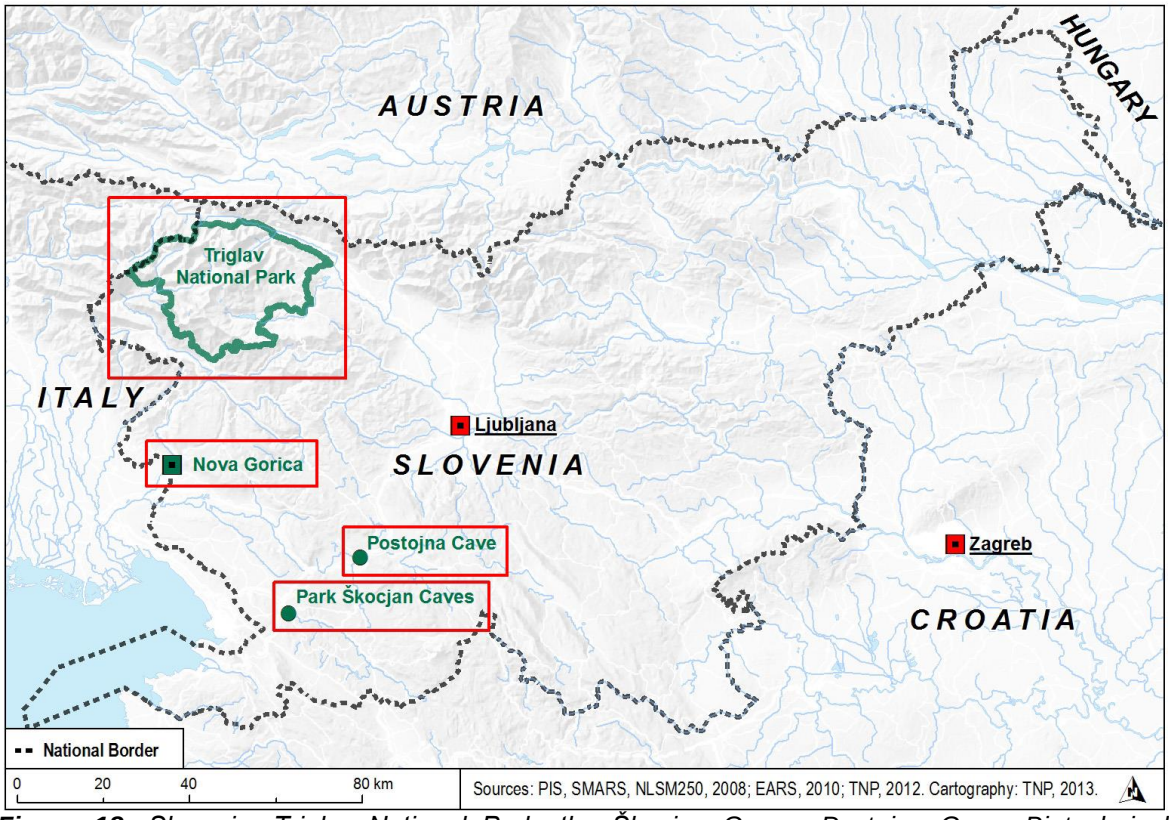

Figure 18: *Slovenia, Triglav National Park, the Škocjan Caves, Postojna Cave, Biotechnical School.*

The Škocjan Caves is Regional Park covering 413 ha in Western Slovenia and aside from surface terrain includes of system of caves, the Reka River and an underground world of karstic ecosystem. The Škocjan Caves were signed into the UNESCO World Heritage Site in 1986 as first monument form the classical karst and Slovenia, became regional park in 1996, underground wetland under Ramsar Convention in 1999 (Peric, 2002) and Karst Biosphere Reserve (MAB) in 2004 (Škocjan Caves, 2013). In the park 64 inhabitants have permanent residence and are included in co-management decisions regarding activities in the park. The regional park mission is to preserve and conduct research on natural and cultural heritage, ethnological and architectural characteristics and cultural landscape and to ensure conditions for adequate regional development.

The park performs various educational and awareness raising activities and thematic events for tourists and local inhabitants.

Figure 18 presents location of the Biotechnical Secondary School, Triglav National Park, Škocjan Caves and Postojna Cave. Postojna Cave is 21 km long cave system with a 3.7 km double track railway that runs through some parts of the cave, taking visitors and researchers through limestone passages, galleries and halls that feature stalactites, stalagmites and other underworld sculptures made by water in the limestone. This cave is considered the cradle of the speleobilogy discipline, due to early discoveries of underworld species, the olm (Proteus anguinus) being the only European vertebrate living exclusively underground. Proteus Vivarium, whose processor Speleobilogy Station was founded in 1930, presents many underground species and adds to the experience of visiting Postojna Cave's underground world. Postojna Cave is one of the most famous tourism attractions in Slovenia, having over 34 million visitors in 200 years of karst tourism (Postojna cave, 2013). Public access to Postojna Cave and the Škocjan Caves is limited, some areas of the cave systems are accessible only for research purposes.

4.4.3 Results and discussion

4.4.3.1 Students' profile

We evaluated the results from 36 students, since four questionnaires had been filled out incorrectly. At the time of the survey all students were in the first or second year of their study program, being between 15-17 years old. Students' educational background was from the following educational programs: 17 agricultural technicians, 5 horticultural technicians and 5 bakery technicians, 4 nature conservation technicians, 3 food processing technology technicians and 2 gardeners. In the sample there were 19 male and 17 female students.

Overall, 32 came from the countryside (88.9 %), out of that 20 (55.6 %) students came from a household that runs private agricultural business. The majority lived at home (86.1 %). The vast majority 88.9 % of students have siblings, on average 1.6 brothers and sisters.

Only three students were members of the Slovenian Alpine Society, one was a scout and one was involved in the sport club. Slightly more than half of the students had already been to TNP (58.2 %).

Data revealled students' relation to the TNP, the Alps and the workshop showed the following results. Almost half of the students (48.6 %) expressed the interest in learning more about the Alps. Overall, 77.8 % students would like to go to TNP within an organized activity from the school and 35.3 % would like to enroll in the TNP youth program. Half of the students had been encouraged towards discovering nature through the workshop.

4.4.3.2 Students' performance

The average test score was 7.1 points at time 0 and 10.9 at time 1. The scores at time 0 were on a scale from 3 to 10 points, while at time 0 from 5 to 14 points. All but one student improved their test scores at time 1.

Only five students obtained the maximum test score at time 1. The profile of these students revealled that all of them had previously visited TNP, The Škocjan Caves and Postojna Cave except one student who had not been yet to Postojna Cave. All five stated that the workshop encouraged their interest in discovering nature. Their average test score at time 0 was 8 points. All students came from countryside and had siblings. They were enrolled in three different educational programs: agricultural technician, horticultural technicians and nature conservation technician.

4.4.3.3 The model

The data were put in the model for each student at time 0 and time 1. The input data correlated with the 14 core questions responses before the lecture (educational event) and after it. Since we used data of 36 students we had 72 input data sets in the model.

Here we present the evaluation of student's information perception on the example of a student MM at time 0 and time 1. In Figure 19 a comparison of the evaluation results of environmental information perception for student MM before the lecture (at time 0, marked as MM0) and after the lecture (at time 1, marked as MM1) is presented. At time 0 the student MM answered incorrectly on six different questions. After the lecture at time 1 the student MM answered incorrectly only for one question, which indicated that his environmental information perception was high. It is obvious from the models' top level evaluation that MM gained information from the lecture as at time 0 his knowledge level was evaluated as **a lot** and after the lecture at time 1 as **all**. From the lower level of the model it is seen that MM's knowledge at time 0 was evaluated as **something** and after the lecture as **a lot** for attribute Protected areas – information from the workshop and attribute ALPS in Slovenia.

Attribute	MM0	MM1
THE EVALUATION OF ENVIRONMENTAL INFORMATION PERCEPTION	***alot***	***all***
Protected areas - information from the workshop	something	***alot***
Nature protection	***2***	***3***
What is the most efficient way of nature protection?	***1***	***1***
What is the highest level of nature protection in Slovenia?	**0**	***1***
How many types of parks (protected areas) we have in Slovenia?	***1***	***1***
Natural richness	***2***	***3***
What is the Slovenian biodiversity in comparison with other EU countries?	**0**	***1***
How many climate types we have in Slovenia?	***1***	***1***
What proportion of Slovenia is covered by Triglav National Park?	***1***	***1***
ALPS in Slovenia	something	***alot***
Workshop information	***2***	***3+***
Why do we have in Slovenia such a large number of animal and plant species?	**0**	***1***
How do we protect mountain flowers?	***1***	***1***
How many species of indigenous ungulates live in Slovenian Alps?	***1***	***1***
How many mountain huts are there in the Triglav National Park?	**0**	***1***
Basic information	***2***	***3+***
How many national parks do we have in Slovenia?	**0**	**0**
How many meters of hight has our highest mountain?	***1***	***1***
Which flower is the symbol of Triglav?	**0**	***1***
Which animal is the main character in the Triglav legend?	***1***	***1***

Figure 19: *Comparison of the evaluation results of environmental information perception for student MM at time 0 and time 1.*

Figure 20 presents the comparison of the environmental information perception for two different students. The students MR and NB results at time 0 and time 1 are shown for four attributes from the third level of the model. First of all Figure 20 shows that both students gained information at the lecture and improved their knowledge on the topic of nature conservation and Slovenian alpine world. From Figure 20 it can be clearly seen how the environmental information perception resulted in knowledge improvement for every specific attribute. For instance, student MR improved in knowledge on Nature protection, Basic information and Natural richness, while his knowledge on Workshop information stayed unchanged. On the contrary, student NB improved their knowledge in all four groups of the questions, and gained maximum score of points on Nature protection, Basic information and Workshop information. By comparing the students' answers at time 1 it is seen that student NB had more knowledge than student MR. The developed model offers the possibility to graphically compare the results of the questionnaire on any desired level for more students at the same time, at time 0 or time 1.

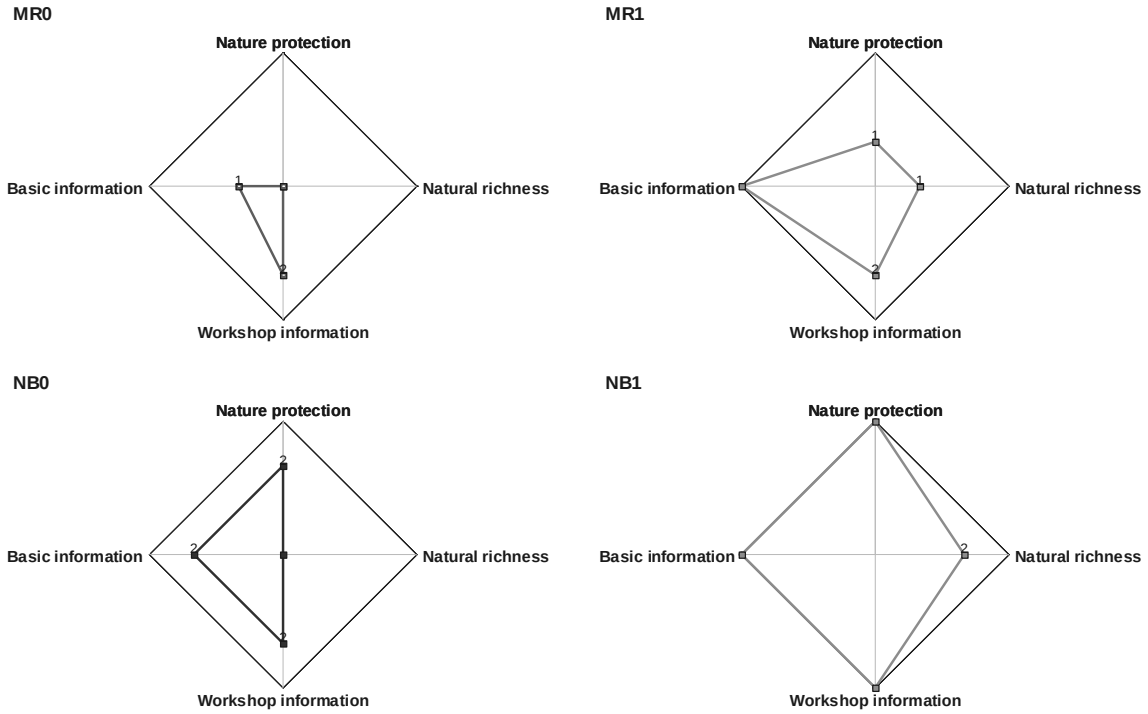

Figure 20: *Comparison of the environmental information perception for students MR and NB at time 0 and time 1, for the attributes Nature protection, Natural richness, Basic information, Workshop information.*

4.4.3.4 Hypotheses testing

h1: Male students had higher information perception and perform better in the tests.

The t-test of the samples show the change in female and male results at time 0 and time 1 are significantly different, meaning they are not stochastic events and they are the result of influence of an educational factor. Data analysis showed that there was no significant difference in test score improvements between female and male students.

The statistical analysis showed that there is no difference in the final test scores between female and male students. But at the same time, the value of t-test obtained for considering samples was very close to critical value (t-statistic is 0.94 at p-value 0.35). Finally, we concluded that we cannot confirm or reject h1. In order to reject or confirm h1, we should increase the sample size.

h2: Students that have previously visited TNP had better test results at time 0 and time 1.

The statistical analysis of the samples showed the change in students that visited TNP and students that had never been to TNP results in time 0 and time 1 are confidently different, meaning they are not stochastic events and they are the result of the influence of an educational factor. The educational factor had a strong influence on both student groups. The statistical analysis showed that there was no significant difference in test scores at time 0 and time 1 between students that visited TNP and students who had never been to TNP. Thus, we rejected h2.

h3: Students who had been encouraged towards discovering nature through the workshop obtained better final test results. We assumed they had followed the workshop carefully and learned more than the rest of the group.

The statistical analysis of the samples showed the change in the discovering nature group and no curiosity group results in time 0 and time 1 are confidently different, meaning they are not stochastic events and they are the result of the influence of an educational factor. Data analysis

showed that we have confident difference between the averages. As we have to reject the hypothesis concerning the equivalence of knowledge, we can conclude that h3 is truthful.

h4: Students that came from households that run private agricultural business had better final test results than the rest of the group.

We had a significant difference between the averages. The educational factor has strong influence for concrete student group. Based on t-test analysis we cannot confirm h4, thus we have to reject it. As it is close to critical level, we should increase the sample sizes in order to have significant conclusion for this considered situation.

h5: Visit to natural destinations (Triglav National Park, Škocjan Caves or Postojna Cave) had a strong influence on test results.

The ANOVA analysis showed that we cannot reject the hypothesis that averages are equal to each other. The factor (visiting nature conservation destinations) does not have a strong influence on students' test results at time 0 or time 1.

h6: Students who showed a significant improvement in the final test scores had visited at least one of the nature conservation destinations in Slovenia: Triglav National Park, Škocjan Caves or Postojna Cave.

The maximum improvement students made in the test was 7 points, which is a half of the maximal test score. We defined improvement in test scores for 6 and 7 points, as significant improvement in the final result. Out of 35 students 10 made a significant improvement in the final test score, 6 students for 7 points and 4 students for 6 points. We supposed that those students had been more interested in the workshop topic due to their previous visit to one of the popular nature conservation destinations in Slovenia.

The results showed that all but one student had visited at least two nature conservation destinations in Slovenia, thus h6 was rejected. Albeit, the analyzed data show that 90 % of students that made significant improvement in the test have previously been to the Škocjan Caves and Postojna Cave. This might be due to the relatively short distance between the school and two cave systems (both are located within 1 hour drive by car, 63 km to Škocjan Caves and 59 km to Postojna Cave).

Seventy percent of students have already visited both caves and TNP. All students that had previously been to TNP and a student that had not been to any of the chosen nature conservation destinations expressed a desire to visit TNP with an organized activity with the school they attend. The vast majority of students (80 %) from significant improvement group stated that workshop encouraged them to discover nature. We concluded that that visiting nature conservation destinations, such as protected areas, increased students' interest in nature.

4.4.4 Conclusion

The results indicated that the majority of students improved their knowledge on nature conservation and Alpine space in Slovenia after following the workshop lecture. Within the h1, h2, h3 and h4 statistical analysis showed that an educational factor had a significant influence on the test results of selected groups of students. By performing t-test at p-value 0.05 we came to the following conclusions: There was no significant difference between female and male students' final test results. Students that previously visited TNP did not have better test results than students that have never been to TNP. Students that had been encouraged towards discovering nature by the workshop obtained better final test results. There was no significant difference in the final test results between the students that came from households that run private agricultural business and other students. Visiting nature conservation destinations does not have a strong influence on students' test results. However, 90 % of students that showed improvement in the final test scores for 6 or 7 points had visited at least two of the nature conservation destinations in Slovenia.

The model we developed provided new insights into the qualitative evaluation of information perception of high school students, as the proposed methodology enables objective and critical assessment and compressibility between the student's knowledge before and after the educational event. The model enables the comparison of results for one to six attributes between up to four students simultaneously.

The model provides an overall assessment of knowledge levels and at the same time provides an insight into study areas where a particular set of questions are aggregated. When evaluating the test results, teachers usually do not look at every student's test result for the student's weak areas but give final grade based on the sum of points the student obtained by answering all test questions. The DEXi model enables identification of areas in which a student has good knowledge and areas for which additional studying is needed. For instance, when testing overall knowledge in mathematics from high school, the test questions can be subdivided and grouped into arithmetic, algebra, geometry and analysis fields in model sublevels. The graphical results comparison that DEXi provides can be used by teachers for visual presentations on students' learning progress.

Based on the example of the DEXi model designed for evaluation of environmental information perception assessment within the workshop as environmental education event, we suggest similar models can be built for various students or events for participants' information perception or knowledge assessments. The model can be used as well with only one set of data, e.g. after the event for comparison between the students or participants.

Having a larger sample of students may have influenced the t-tests significance of h4 and h5. At the time, repeating the workshop on another sample of students from the same school was not feasible.

Finally, these research outcomes have lead us to conclude that educational events in highschool situations present an effective way for environmental information perception of highschool students and may successfully contribute to the environmental education of event participants.

4.4.5 Relation to the thesis

The outcome of the case study on environmental education information perception of high school students fulfills the thesis research goal to assess the environmental education activity outcomes on the chosen protected area topic. The findings from this case study relate to our theoretical hypothesis H3. Within this research we proved that environmental education for high school students we tested (citizens) had significant influence on their knowledge on environmental topics addressed by the educational event. This supports the H3 statement. Furthermore, based on this case study outcomes we suggested that investments in environmental education (for instance workshops for high school students) impact on the improvement of sustainable development in protected areas (reflected in students' knowledge, attitude and eventually pro-environmental behaviour), as addressed in H3.

4.5 Evaluation of hikers' pro-environmental behavior in Triglav National Park, Slovenia (Stubelj Ars, 2013a)

The aims of this study were to identify demographic characteristics of hikers in TNP and evaluate their pro-environmental behaviour. Decision problems addressed in this case study are tourism and recreation, managing PA, WTP, local people's attitudes and nature conservation.

4.5.1 Introduction

Managing protected areas in the Alps is a challenging and complex task that involves eight European countries and various international bodies, non-governmental organizations (NGOs), scientists, activists and other stakeholders united in the commitment to preserve the natural and cultural heritage within the Alpine mountain ecosystems. According to ALPARC (2013): "environmental education and awareness-raising targeting the general public (visitors, local residents, schoolchildren, etc.) are two key components in the Alpine protected areas' role".

Environmental education and awareness-raising activities lead to environmental knowledge, a subcategory of environmental awareness and a precondition for pro-environmental behaviour (Kollmuss and Agyeman, 2002). Pro-environmental behaviour refers to behaviour that harms the environment as little as possible (Kollmuss and Agyeman, 2002), or even benefits it (Steg and Vlek, 2009).

Environmental education and environmental knowledge indirectly influence pro-environmental behaviour by shaping environmental values and attitudes (Fietkau and Kessel, 1981), which are also shaped by social norms, cultural traditions and family customs. Changes in values lead to changes in decisions, thus leading to changes in behaviour. However, behaviour decisions are also influenced by other external and situational factors.

Regarding formal education as obtained through high school, college, university and graduate studies, it has been shown that the higher a person's education, the more extensive his or her knowledge about environmental issues. According to Smrekar (2011) and Kollmuss and Agyeman (2002), individuals' level of education plays an important role in their pro-environmental behaviour and attitudes regarding environmental issues. Individuals should be aware of the influence of their lifestyle on the living space and environment (Urbanc and Fridl, 2012), and consequently act in an appropriately responsible manner. According to Hassan et al. (2009), outdoor activities that include environmental education increase public environmental awareness of environmental protection. In the study conducted by Arnberger et al. (2012), 59 % of the people surveyed identified environmental education as the main function of national parks, which emphasizes the importance of national parks in rising environmental awareness.

This case study presents a study of pro-environmental behaviour assessment, which aims at enhancing knowledge of hikers' attitudes and behaviours in the Alps, and thus contributes to managing the Alpine region in particular (Slovenia) and in general.

Smrekar (2011), Malnar (2002), and Rajecki (1982) emphasize the difference between people who truly act environmentally friendly and those who only "talk the environmentally friendly talk". We used a questionnaire to measure hikers' behaviours, not intentions or attitudes, and examined the following topics: hikers' pro-environmental behaviour at home, willingness to pay (WTP) for environmentally friendly goods and services, prior environmental education experience and involvement in nature conservation. Using the respondents' demographic information and understanding their behaviours at home regarding waste and energy, willingness to pay, environmental education experience and background, as well as affinity for conservation support, we propose recommendations for implementing sustainable and educational activities in tourism offers, to make activities more sustainable, educational, attractive and satisfying for park visitors and local inhabitants. The study took place on two popular greenways, non-motorized trails predominantly used for recreation and to enjoy nature, in Triglav National Park. Educational viewing stations worldwide have become an integrated part of greenway infrastructure, offering

users various information. Following Feinsinger et al. (1997), Davis (2002), Jensen (2002), and Ribeiro and Barao (2006), who find the role of greenways decisive for public environmental education, we focus on assessing hikers' pro-environmental behaviour in TNP and the educational role of greenways.

4.5.2. Methods

For the surveying process we chose two popular greenways in Triglav National Park that closely follow Alpine rivers and present the natural and cultural heritage of the park on information boards and posts: Pot Triglavske Bistrice (the Triglavska Bistrica Trail) at 46.41° N / 13.84° E and Soška pot (the Soča Trail) at 46.41° N / 13.74 °E.

The Triglavska Bistrica Trail starts at the entrance of the Vrata valley and runs up the valley to the Triglav North Face. Most of the trail follows the river Triglavska Bistrica and meets the road that runs through the valley only in several short sections. The trail is 10 km long. The Soča Trail is a 20 km nature trail that takes visitors through the Trenta valley along the Soča river from its source toward the town of Bovec. The Soča Trail connects the old Trenta paths and peaceful sections of the valley. On the Triglavska Bistrica Trail and the Soča Trail, hikers can tailor their visits to specific times and purposes. Visitors can just look at the parts of the trail they find the most interesting. Both trails are marked with TNP information posts and boards set up at several points along the trails. The locations of the two study sites in the Julian Alps in TNP are shown in Figure 21.

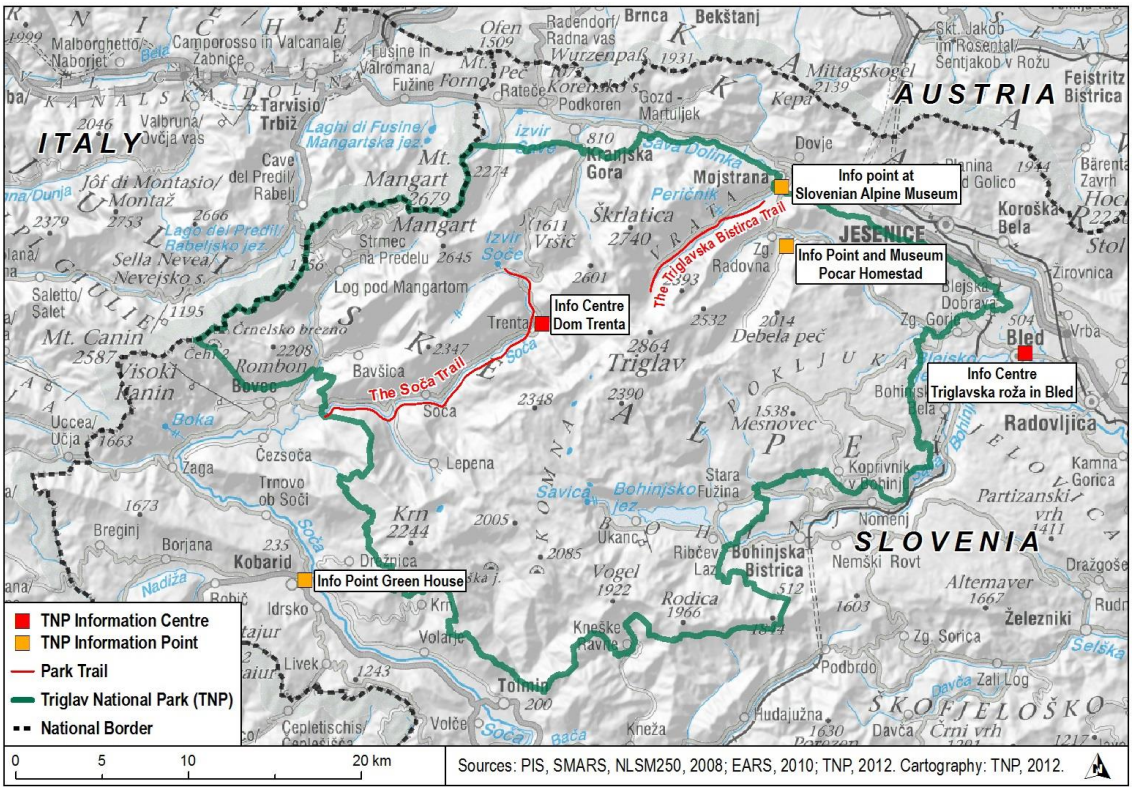

Figure 21: *Triglav National Park with the Soča and Triglavska Bistrica trails and the surveying locations.*

The questionnaire was conducted during the summer season, in August 2010 and 2012, by the TNP staff. They were instructed to approach park visitors, briefly explain the aim of the questionnaire and ask for participation in the study. Visitors were asked to fill in the questionnaire after they had finished their hike, while taking a break or waiting for the rest of their group. Participants were chosen randomly on sunny Saturdays. Participants filled in the questionnaire and gave it back to the staff on the spot. The questionnaire had two sections and took about five minutes to complete (see Appendix E). The first part addressed visitors' demographic data, whether they came with another visitor or in a group or alone, time spent in the park, reason for

visiting the park, and reason for choosing the specific greenway. The second part consisted of 10 questions asking about self-reported behaviour. On each hiking trail, 50 correctly completed questionnaires were collected, making an overall sample of 100 participants.

The responses were statistically analyzed with R, free software for statistical computing. Pearson's correlation coefficient represents the strength of linear association between two variables (Burnham, 2012) and was used to identify the correlations between pro-environmental questions and visitor groups. For the sample size of 100, at the significance level 0.05 for the two-tailed test, the critical value for Pearson correlation coefficient is ±0.1946 (Critical Values for Pearson's Correlation Coefficient). As of that we tested the significance of the correlations with $r \leq -0.2$ or $r \geq 0.2$ by applying Pearson's chi-square test for two-way contingency tales, as done in the case of Canadian hikers by Légaré and Haider (2008). In the article we discuss only correlations that had $r \leq -0.2$ or $r \geq 0.2$. at p-value < 0.1. Originally we aimed to conduct a paperless questionnaire by using internet-based software, which proved unfeasible due to the lack of internet connections on the hiking trails. The sample size is small, but for a pilot study provides useful information. In the near future we plan to augment the number of questionnaires and extend the study to all Alpine countries.

4.5.3 Results and discussion

4.5.3.1 Who hikes the Alps?

The respondents' demographic characteristics are shown in Table 16. Out of 100 respondents, 59 were from Slovenia and 41 from other European countries. The majority of non-Slovenian hikers were from the Czech Republic, followed by hikers from Italy, Austria, Germany, the United Kingdom, Poland, Belgium, Spain, the Netherlands, Hungary and France.

The questionnaire also examined how many days the visitors were spending in the park. Overall, 92 respondents answered this question. One respondent noted he would spend 20 days and one 90 days in the park. The remaining 90 answers ranged from 1 to 11 days. We grouped all answers as follows: 31 % of respondents spent 1 day; 25.5 % spent 2–3 days, which can be correlated with weekend trips; 14.5 % spent 4–6 days, which is more than an extended weekend and less than a week; and 29 % spent 7 days or more in the park.

Table 16: *Demographics of hikers in Triglav National Park, reasons for visiting the park and hiking on a greenway, and hiker's company on the greenway. Since some hikers did not answer all questions we calculated the number of overall responses to each question and used this number as a total sample for the statistical analysis for each particular question. (*multiple answer question)*

Hikers' demographics	**N**	**%**
Origin	99	100.0
Visitor	91	91.9
Park resident	8	8.1
Country of origin	100	100.0
Slovenia	59	59.0
Europe (other than Slovenia)	41	41.0
Gender	96	100.0
Male	44	45.8
Female	52	54.2
Age range	99	100.0
under 18	6	6.1
18 – 24	10	10.1
25 – 30	17	17.2
31 – 40	21	21.2
41 – 50	18	18.2
51 – 60	19	19.2
61 – 70	8	8.0
71 or more	0	0.0
Level of education	100	100.0
High school	6	6.0
College	34	34.0
Undergraduate degree	29	29.0
Graduate school	18	18.0
Graduate or professional degree	8	8.0
Doctorate	5	5.0
Visiting the park for	96	100
Vacation	48	50.0
Weekend trip	14	14.6
A day in nature	31	32.3
Organized activity	3	3.1
Reason for visiting the greenway	99	*
Educational opportunity	4	4.0
Recreation	39	39.4
Enjoy nature	64	64.6
School trip or excursion	2	2.0
Leisure and pleasure	21	21.2
Curiosity	6	6.1
Came to the greenway with	98	100
Organized group	2	2.0
Alone	18	18.4
As a couple	42	42.9
With parents	7	7.1
As family with children	13	13.3
With grandchildren	2	2.0
Friends	14	14.3

4.5.3.3 Correlations between pro-environmental behaviour questions and visitor groups

To identify correlations between pro-environmental behaviours and visitor groups, we calculated the Pearson correlation coefficient for 10 pro-environmental behaviour questions and the following visitor characteristics: country of origin, origin, gender, age (three groups: up to 30 years, between 31 and 49 years of age, and age 50+), education (two groups: low [up to undergraduate degree] and high [bachelor, master, and doctoral degree]), reason for visiting TNP, and days spent in the park. By applying the chi square test for correlations identified by the Pearson correlation coefficient as $r \leq -0.2$ or $r \geq 0.2$, we identified 13 significant correlations (Figure 22).

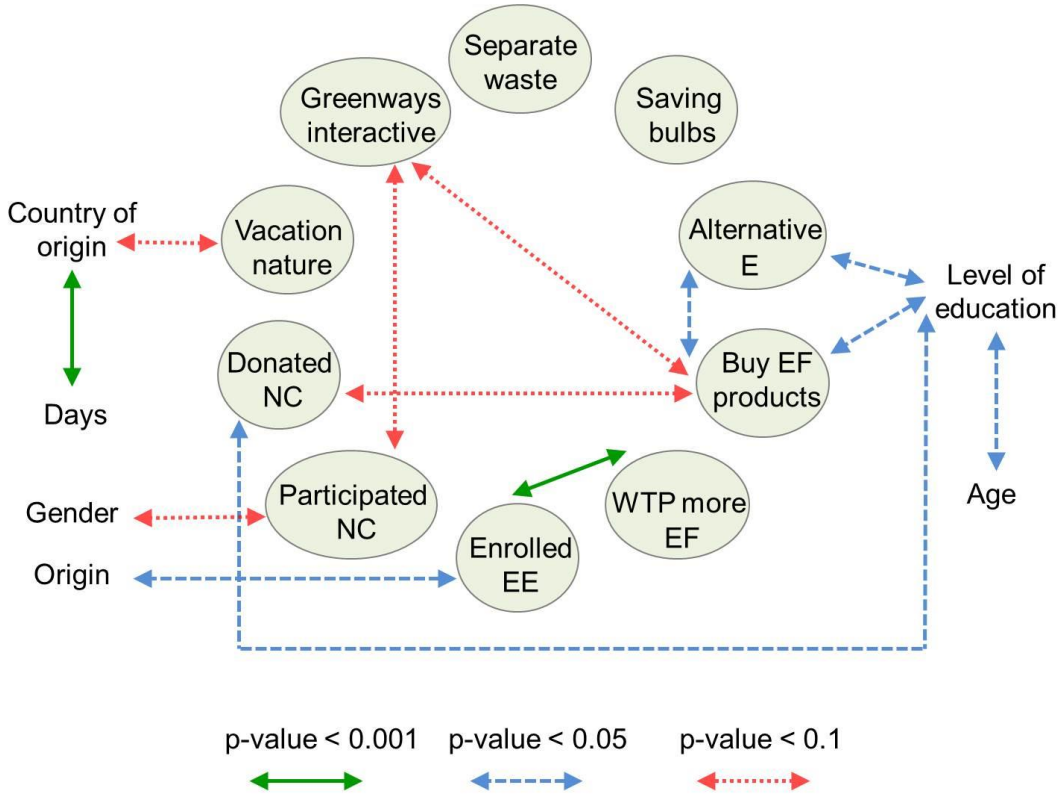

Figure 22: *Results of the cross-reference test on correlations between pro-environmental behaviour and visitors groups.*

Different significance levels calculated with Pearson's chi-square test are pointed out by using various dash styles for arrows indicating significant correlations. Solid arrows indicate correlations with p-value < 0.001, dashed arrows indicate correlations with p-value < 0.05 and dotted arrows indicate correlations with p-value < 0.1. Thus the most significant are values indicated with solid line arrows, followed by dashed arrows, the least significant being dotted arrows' correlations.

All significant correlations were small, except for a medium correlation between using alternative energy sources and buying environmentally friendly products ($r = 0.32$, p-value = 0.011) and a strong correlation between willingness to pay more for environmentally friendly goods and services and previous enrolment in environmental education activities ($r = 0.61$, p-value < 0.001). Education level was significantly correlated to using alternative energy sources, buying environmentally friendly products, donating to conservation projects and age. Respondents' origin (visitor, park resident) was significantly correlated with enrolment in environmental education, and gender was significantly correlated with participation in conservation projects. The involvement of hikers who are park residents in environmental education activities was twice as high as park visitors' involvement. Men participated in conservation projects at a higher frequency than women. Respondent's country of origin was significantly correlated with choosing a vacation location based on nature preservation characteristics and days spent in the park. Respondents from other

European countries evaluated the nature preservation characteristics of the area when choosing vacation locations more often than Slovenians.

Based on the correlations shown on Figure 22, we conclude that (a) vacation location may indirectly influence days spent in the park and (b) age may indirectly influence using alternative energy sources, buying environmentally friendly products, donating to conservation projects, finding greenways' interactive educational tools and participating in conservation projects. Our results partly corroborate Poljanar (2008), who studied 100 inhabitants living near three protected wetland areas in Slovenia. Their results show that public awareness of wetlands and attitudes toward wetland conservation in Slovenia are affected by socio-demographic characteristics. The same study revealed that 66 % of the respondents see living in protected areas as an advantage; this attitude was influenced by the respondent's level of education.

4.5.3.2 Pro-environmental behaviour assessment

One of our goals was to investigate hikers who use TNP in terms of their environmental awareness. To evaluate the respondents' pro-environmental behaviour and awareness, we asked eight questions grouped as follows (see Table 17): (a) pro-environmental behaviour at home (questions 1 – 3), (b) willingness to pay for environmentally friendly goods and services (questions 4 and 5), (c) environmental education experience and involvement in nature conservation (questions 6 – 8), and (d) choice of vacation destination and greenways as educational tools (questions 9 and 10). Some questions had only Yes / No choices for an answer while others had a three-item scale (No / Partly / Yes).

Table 17: *Pro-environmental behaviour questions and assessment.*

Pro-environmental behaviour questions	No (%)	Partly (%)	Yes (%)	N
1. Do you separate waste at home?	6.1	24.2	69.7	99
2. Do you buy energy saving lightning bulbs?	6.0	20.0	74.0	100
3. Do you use alternative energy sources?	58.6	21.2	20.2	99
4. Do you buy environmentally friendly products?	16.1	40.9	43.0	93
5. Are you willing to pay more for services / products from environmentally friendly suppliers?	25.5	–	74.5	94
6. Have you ever been enrolled in environmental education program/training / workshop / activity?	63.3	–	36.7	98
7. Have you participated in nature conservation projects?	49.5	–	50.5	99
8. Have you ever made a donation for nature conservation project?	55.3	–	44.7	94
9. Do you choose location of your vacation based on nature preservation characteristics in the area?	15.2	51.5	33.3	99
10. Do you find greenways as interactive tools for environmental education?	9.0	23.0	68.0	100

The results indicate that the majority of respondents separate waste and use energy-saving light bulbs at home. Yet only 20.2 % of them use only alternative energy sources, 21.2 % use some and 58.6 % depend on conventional energy sources. The 2011 Eurobaro-meter study on "Attitudes of European citizens towards the environment" showed that 66 % of Europeans separated most of their waste for recycling: 79 % of Slovenians also did, sharing third place with Ireland and the United Kingdom after Luxemburg (87 %) and France (82 %). Our study indicates that 69.7 % of respondents separate waste, which compares well with the Eurobarometer study and with a study on residents' relationship to waste, which showed that 59.5 % of surveyed Slovenians were willing to pay modest monthly contributions to clean up illegal dumps (Smrekar, 2012).

Almost 84 % of respondents buy environmentally friendly products, and 74.5 % are willing to pay more for services and products from environmentally responsible suppliers. Eurobarometer (2011) stated that 72 % of Europeans (73 % in Slovenia) buy products labeled as environmentally friendly for environmental reasons, showing a generally high level of commitment to protecting the environment. Our results suggest that the majority of visiting consumers in TNP value products made in protected areas, support environmentally friendly suppliers and are willing to spend money on environmentally friendly and eco-labeled products.

Only 36.7 % of respondents had enrolled in environmental education programmes, trainings or workshops. This issue was examined since in Europe there are many environmentally oriented activities and events (Konrád, 2012), which reflect the urge to educate people about important environmental issues, to reconnect with nature and to live more healthily and responsibly. Half of the respondents participated in conservation projects and 44.7 % donated money for conservation. Bednar-Friedl et al. (2009) found that 35 % of tourists in Hohe Tauern National Park were willing to pay for species conservation programmes. Therefore public environmental education stresses the importance of conservation and creates opportunities for people to become directly involved in conservation projects.

One third of respondents chose the location of their vacation based on nature preservation characteristics in the area, and 51.5 % chose a vacation destination location only partly based on those criteria. This suggests that 84.8 % of the respondents evaluate to some extent the protection status of an area when planning and choosing a vacation destination.

In assessing the greenways and environmental education, 68 % of respondents agreed greenways were interactive tools for environmental education, and 23 % partly agreed. The fact that more than two thirds of respondents thought the greenways were interactive educational tools indicates that greenways in TNP have an educational effect on hikers and consequently contribute to their environmental education, which indirectly influences their pro-environmental behaviour.

4.5.3.4 Addressing research questions

Is pro-environmental behaviour at home related to age and level of education?
Ninety-eight respondents answered the first three pro-environmental behaviour questions in the questionnaire, which evaluated people's behaviour at home. The respondents who behaved pro-environmentally were older than 50 years, with a higher level of education compared with the total sample and the group who behaved somewhat pro-environmentally. At the same time, statistical analysis revealed a significant small correlation between level of education and use of alternative energy sources ($r = 0.21$, p-value = 0.037), as well as for age and level of education ($r = 0.21$, p-value = 0.038) (Figure 22). Thus we conclude that age and the level of education influenced a respondent's level of pro-environmental behaviour at home.

Is willingness to pay for environmentally friendly goods and services related to education level?
Question 5 (Table 17) was answered positively by 74.5 % of the respondents. In the sample of respondents who are willing to pay more for environmentally friendly goods and services, compared with those who are not, 10.2 % more respondents had a higher level of education. We conclude that respondents with higher levels of education are more likely to be willing to pay more for environmentally friendly goods and services. Our results corroborate studies in which educational level was recognized as a predictor of tourists' willingness to pay (Lindberg 1991; Bowker et al. 1999; Reynisdottir et al. 2008; Wang and Jia 2012). In the study conducted by Kontogianni et al. (2001), higher educational level and interest in environmental conservation predicted a positive response to the payment principle question and higher willingness to pay.

Do level of education and enrolment in environmental education activities affect support for nature conservation?
To answer this research question, we combined the answers on questions 7 and 8. Table 18 shows that 21 respondents support conservation projects by participating and donating, and 27 respondents do not support nature conservation. The remaining 45 respondents support

conservation through only one activity; 25 only participate, and 20 respondents only donate. We clustered the respondents in three groups: support (participated in and donated to conservation projects), partly support (participated in or donated to conservation projects), and do not support (had never participated in or donated to conservation projects). For all three groups, we evaluated the respondents' enrolment in environmental education activities and level of education, as presented in Table 18. Previous enrolment in environmental education has a significant correlation with support for conservation (p-value = 0.069).

Table 18: *Level of education and involvement in environmental education in relation to support for nature conservation.*

Nature Conservation	**Level of education**		**Enrolment in EE**		**Answers**
Hikers' groups	Low (%)	High (%)	Yes (%)	No (%)	93
	p-value = 0.028		p-value = 0.069		
Support	47.6	52.4	57.1	42.9	21
Partly support	80.0	20.0	34.1	65.9	45
Do not support	70.4	29.6	26.9	73.1	27

More respondents in the support group had enrolled in environmental education activities than the other two groups. Furthermore, more respondents in the partly support group had enrolled in environmental education activities than respondents in the do not support group. Regarding the level of education, more than half of the respondents in the support group had higher education. Our results suggest that education level is a significant predictor of respondents' support for nature conservation (p-value = 0.028). We also observed a significant correlation between level of education and donations for conservation projects (r = 0.28, p-value = 0.012), see Figure 22. Thus our findings support the view that respondents who are better informed about nature and species conservation are willing to pay more for these benefits (White at al., 2001; Bandara and Tisdell, 2004).

Do the nature preservation characteristics of a specific area influence the choice of vacation destination?

According to Ewald (2001), beautiful scenery is a prerequisite for tourism, while Della Dora (2012) states that tourists are mainly after an encounter with cultural otherness or pristine nature. To examine this issue, we asked respondents whether nature preservation characteristics influenced the respondent's choice of vacation destination (Table 17, question 9). Only 15.2 % of respondents said that they did not choose their destination based on nature preservation characteristics. The majority of respondents, i.e., 84.8 %, chose their holiday location at least partly based on nature preservation characteristics such as scenic beauty and conservation. We conclude that the respondents value natural scenic beauty, which is being preserved under TNP management. Our results corroborate findings from Lindemann-Matthies et al.'s (2010) study conducted on visitors' aesthetic preference for a Swiss Alpine landscape. A study of tourists in TNP (Cigale et al., 2010) revealed that 85.6 % saw a "peaceful and clean environment" as the park's biggest value, followed by "beautiful scenery" (84.3 %) and "recreation" (73 %). Our study findings are in agreement with Cigale et al.'s (2010) results on the importance of natural beauty in TNP. Figure 22 shows the significant correlation between days spent in the park and respondents' country of origin (r = 0.2, p-value = 0.001); the latter is correlated to the question on the choice of vacation location (r = −0.22, p-value = 0.087).

4.5.4 Conclusion

This study contributes to valuable insights into TNP hikers' profiles, behaviours and decision making. The most common hiker found in TNP is thus an adult visitor couple with a high school or college degree who visited the park for a vacation to enjoy nature, followed by recreation and a combination of leisure and pleasure activities. We found that a higher level of education has a positive impact on respondents' pro-environmental behaviour at home, mainly the use of alternative

energy sources, preference for environmentally friendly products, willingness to pay for environmentally friendly goods and services, and support for conservation, in particular, donating to conservation projects.

Our results indicate that formal education enhances environmental awareness and promotes pro-environmental behaviour. The study findings for level of education and respondents' pro-environmental behaviour corroborate a study conducted in Ljubljana (Smrekar, 2011) on people's willingness to take part in solving environmental issues, which found that people with higher education (university degrees and higher) are more environmentally friendly than less educated groups.

Hikers in TNP are largely aware of the importance of preserving and protecting the natural environment, and the rate of detecting problems in the environment is relatively high (Mrak, 2011). According to Eurobarometer 2011, protecting nature is the third most important thing people perceive when talking about the environment (17 %). Among all 27 European countries, Slovenians have the highest concern for the quality of life where they live (54 %), and between one-tenth and one-fifth of Slovenians live and promote the idea of environmentally friendly behaviour (Smrekar, 2012).

In this study, more than 90 % of the respondents identified greenways as interactive tools for environmental education. This response indicates that greenways play an important educational role in national parks by attracting hikers' attention and providing educational material on local heritage and ecological phenomena. The assessment of greenways as interactive educational tools is correlated with participating in conservation projects and buying environmentally friendly products. Our results corroborate finding that interpretative service based on environmental education could help tourists develop more awareness in conserving and protecting resources (Tsaur et al., 2006).

We found a strong and significant correlation between involvement in environmental education activities and willingness to pay more for environmentally friendly goods and services. Poljanar (2008) states that the best method for improving public awareness of and attitude toward wetland conservation involves organizing educational activities in the form of workshops in protected areas, schools, and other institutions. Our study findings indicate this method is applicable in TNP as well.

We conclude that nature's intrinsic value is recognized and valued, since almost 85 % of the respondents evaluated nature preservation characteristics when choosing vacation destinations. This finding is important for tourism development and marketing in protected Alpine areas. Our findings agree with those of Cigale et al. (2010) that the majority of tourists visit TNP to enjoy nature. Therefore we conclude that the pristine nature of the Slovenian part of the Julian Alps, the natural and cultural heritage as well as peace and biodiversity abundance attract tourists to the park and probably to other protected areas in the Alps.

Based on these findings and literature review, we provide the following five suggestions for managers of protected areas in the Alps:

1. Develop sustainable waste management and promote green energy initiatives by providing bins to separate different types of waste, information on energy consumption and on the importance of using energy and resources in sustainable ways.

2. Promote environmentally friendly goods and services by supporting local businesses, local crafts, traditional cuisine and heritage. Eco-labels for local products should guarantee their source and quality. An example of good practice is the development of a label for local culinary foods in the Austrian Alps: "So schmecken die Berge".

3. Enhance environmental education activities for locals and tourists through active participation (programmes, trainings, workshops). Tourists involved in active education while on vacation are likely to cherish and remember it for a long time, since direct experiences in situ have been found to have a stronger influence on people's behaviour (Rajecki, 1982).

4. Promote support for conservation by offering one-day participation in projects. Advertise donations for conservation and give yearly feedback on project progress. Adoption programmes are an alternative approach to nature conservation that is lacking in the Alps.

5. Organize free guided tours on greenways, which will offer additional insights into environmental problems, local values and the importance of conservation. These tours should be led by protected areas staff or adequately trained local volunteers, a common practice in American parks managed by the U.S. National Park Service. The tours always have large numbers of tourists and are unique and memorable educational opportunities.

Regarding future work, we hope to conduct surveys in various Alpine countries and call for research partners to conduct a comparative survey in national parks in Austria, Germany, France, Switzerland, Liechtenstein, Italy and Monaco. The idea is to survey 400 people per country, for a total of 3.400, and perform an international comparative study on pro-environmental behaviour to explore cross-cultural differences between hikers in the Alps. A larger sample size would help identify stronger and more significant correlations between pro-environmental behaviour and visitor groups. These results would present a valuable decision support resource for managing Alpine protected areas as well as for shaping sustainable industry and policies in the Alps.

4.5.5 Relation to the thesis

The results of this case study prove that involvement in environmental education influences pro-environmental behaviour. We indirectly proved that environmental education contributes to implementation of sustainability in protected areas, which was tested on local inhabitants and tourists from various European countries within this case study. As of that here we partly confirm H3. This case study examined the correlations between environmental education and pro-environmental behaviour. Among 13 significant correlations identified in this case study, we found a strong correlation between willingness to pay more for environmentally friendly goods and services and previous enrolment in environmental education activities ($r = 0.61$, p-value < 0.001). As of that, we partly confirm H6.

4.6 Pro-environmental behaviour evaluation of self-defined ecotourists and general visitors at Mānoa Falls Trail on O‘ahu, Hawai‘i

The aim of this case study was to identify ecotourists at the Mānoa Falls hiking trail and compare their pro-environmental behaviour with the rest of the hikers that we refer to as general visitors. Decision problems addressed in this case study were managing PA, WTP, local people’s attitudes, tourism and recreation, ecotourism development and nature conservation.

4.6.1 Introduction

Within this case study we presented a comparative study in orderto support the research presented in the previous section on hikers’ pro-environmental behaviour in TNP, Slovenia. We asked the hikers at Mānoa Falls Trail, one of the most popular rainforest hiking trails in Hawai‘i, the first eight pro-environmental behaviour questions from Table 17. As Hawai‘i is considered to be an ecotourism destination, we included a set of six sustainability questions. The first three questions addressed ecotourism, of which the first two served to identify ecotourists, and the third to investigate tourists’ perception of Hawai‘i as ecotourism destination. Questions four and five identified tourists’ affinity to volunteer time or donate money for the wellbeing of the Mānoa Falls Trail. The last question evaluates sustainability issues people consider when making travel decisions. These six questions were revised from the project conducted by students in an ecotourism course at the University of Hawai‘i at Mānoa (Cusick, 2013) and were therefore named sustainability questions despite the fact that they address concepts different to sustainability.

The approach of asking visitors to identify themselves as ecotourists or non ecotourists had been used previously in academic research. Two Taiwaneese studies posed similar questions as ours in order to identify self-defined ecotourists in the Taroko National Park (Tao et al., 2004: “Do you think of yourself as and ecotourist?”; Tao et al., 2010: “The respondents were first asked if they had heard of the concept of “ecotourism” and, if so, whether they considered themselves to be an ecotourist.”). A study on internal and external motivation factors of ecotourists used the question “Do you consider yourself as and eco-tourist?” in the electronic survey aimed at ecotourists worldwide (Poupineau and Pouzadoux, 2013). The studies conducted by Tao et al. (2004; 2010) addressed the group of visitors identified as ecotourists as “self-defined ecotourists”. The study conducted by Poupineau and Pouzadoux (2013) refers to the self-defined ecotourists as “ecotourists”.

The first attempt to compare the researchers’ perceptions of ecotourism and respondents’ perceptions of variables influencing ecotourists’ characteristics on a single sample was done by Tao et al. (2004) in Taroko National Park, Taiwan. The authors made a comparison between designated ecotourists, identified by clustering based on the strong affinity to learning about nature, wilderness/undisturbed areas and time spent in the park, and self-defined ecotourists in Taiwan. The ecotourists groups were of similar sizes: 39.3 % of all the visitors were designated as ecotourists, while 39.1 % of all visitors were self-identified as ecotourists. In total, both ecotourists’ groups were overlapping in 47 %, meaning that almost half of ecotourists from both groups were at the same time self-defined and designated ecotourists. Both groups add up to 60 % of the sample, leaving only 40 % of visitors in non-designated ecotourist and non-self-defined ecotourist categories. The differences in the approaches for the identification of ecotourists indicated that the results must be interpreted in the light of the reserch method used for the initial identification of ecotourists.

Based on the fact that we used a self-definition approach and by following the example of Tao et al. (2004 and 2010), we addressed ecotourists in this case study as “self-defined ecotourists”. Accordingly, we also use the term ecotourist, which in this case represents our sample of self-defined ecotourists.

By calculating Pearson’s chi-squared test between pro-environmental and sustainability questions and visitors’ characteristics we identified significant differences in visitors’ behavior and their characteristics. We also identified significant correlations between self-defined ecotourists’ and

general visitors' characteristics and their pro-environmental behaviour and some sustainability questions by calculating Pearson correlation coefficients. Furthermore, we examined whether self-defined ecotourists are behaving more pro-environmentally and do they evaluate more often sustainability issues when making travel decisions.

4.6.2 Methods

This case study was conducted at Mānoa Falls (section 3.1.2.1). The authors conducted a questionnaire among 785 hikers over the course of two weeks in January 2012. The questionnaire was designed with the aid of experts in the field of resource management, three Na Ala Hele's employees. The questionnaire was carried out with the assistance of students in a course on research methods, at the University of Hawai'i at Mānoa, as well as with the help of several volunteers and staff members from the Na Ala Hele Program. A pavilion with chairs and a table was located approximately 100 yards (90 m) from the trailhead. A State of Hawai'i Division of Forestry and Wildlife banner was hung by the pavilion, providing official information about the survey in progress, so that the hikers could be sure that the facility had not been set up for commercial purposes.

The principal researcher carried out a workshop for all volunteer assistants in order to ensure continuity in the process of (1) inviting hikers to participate in the survey, (2) explaining the purpose of the survey, and (3) providing the participants' informative responses to questionnaire inquiries. The size of the research team ranged from two to six members at any given time and was present at the site from 10 a.m. to 4 p.m. Records of the number of hikers were taken on an hourly basis and the survey was conducted on each day of the week over a two-week period in order to quantify the user traffic by hour and day, particularly on weekdays and weekends, when the differences in the number of tourists and residents using the trail would be evident. Additional data on the number of visitors was collected at a parking lot managed by the Paradise Park Inc. This data provided additional information on the number of vehicles coming into the area between 9 a.m. and 5 p.m.

The questionnaire included a set of questions specifically requested by the Na Ala Hele staff in order to provide information concerning the preparation of the 2012 renovation project that included infrastructure improvements of the trail itself, as well as the replacement of informative signage, funded through the Hawai'i Tourism Authority grant awarded to Na Ala Hele.

The questionnaire is available in Appendix F. From 785 questionnaires collected at the research site, 22 were found to be incorrectly completed and 6 did not answer sustainability questions. Therefore, we excluded those 28 respondents and analyzed 757 questionnaires by SPSS version 21. First, we observed the visitors' characteristics: origin (visitor, resident), gender, age (three groups: up to 29 years, between 30 and 49 years of age, and age 50+), education (two groups: low [up to undergraduate degree] and high [bachelor, master, and doctoral degree]) and tourists type (self-defined ecotourists, general visitors). Second, we calculated the Pearson chi square test to identify significant differences between the pro-environmental behaviour questions and sustainability questions, and variables describing personal characteristics (e.g. three age groups). In Appendix G we presented only significant dependences between variables with p-value < 0.05. Third, as already done in section 4.5 we calculated Pearson's correlation coefficient in order to identify the correlations between pro-environmental questions and visitor groups. For the sample size of 500, at the significance level 0.05 for the two-tailed test, the critical value for Pearson correlation coefficient is ±0.0875 (Weathington et al., 2012). We used the critical value for the sample size 500 though our sample size was bigger. We tested the significance of the correlations with $r \leq -0.0875$ or $r \geq 0.0875$ by applying Pearson's chi-square test for two-way contingency tales, as done in the case of Canadian hikers by Légaré and Haider (2008) and Slovenian hikers' by Stubelj Ars (2013a). Here we discuss only correlations at p-value < 0.05 and p-value < 0.01. The results obtained on our ecotourists' sample are compared to the findings of other studies that assessed ecotourists' characteristics and behaviours in the past.

4.6.3 Results and discussion

4.6.3.1 Identifying ecotourists in Hawai‘i

Wight (1993) states that ecotourists can not be defined neither by the products in which they show interest nor by their motivations, as products and motivations overlap with those of other tourists types. Our standpoint was that a true ecotourist must know what ecotourism is and should identify himself or herself as an ecotourist. Therefore, we asked two questions: (a) Are you familiar with the term ecotourism? (b) Do you consider yourself an ecotourist? (Appendix F). Overall 62.2 % of visitors stated they knew the meaning of the term ecotourism and 37.3 % considered themselves as ecotourists. Our results were in accordance with the study of Tao et al. (2010) in which 70.8 % of visitors were familiar with the term ecotourism and 39.1 % thought of themselves as ecotourists.

In our case only visitors who answered on both questions with “Yes” were evaluated as self-defined ecotourists, as only those fulfilled our two conditions for being an ecotourist. Out of 757 hikers surveyed at Mānoa Falls Trail, 222 were identified as self-defined ecotourists. This corresponds to 29.3 % of our sample and indicates that almost 10 % of visitors identified themselves as ecotouriststst without knowing what ecotourism is. Since hiking at Mānoa Falls is considered to be a “must do” hike on O‘ahu, we assumed that our sample reflects the characteristics of ecotourists and general visitors to the island of O‘ahu.

In Table 19 we showed the basic personal characteristics of self-defined ecotourists and general visitors at the Mānoa Falls. There were no significant differences between these two groups in their personal characteristics. Among self-defined ecotourists both genders were equally represented, there were only 3.6 % more male self-defined ecotourists than females. Regarding age, self-defined ecotourists were equally distributed among three age groups (18-29, 30-50, 51-more years), almost 35 % of them being younger than 30 years of age. Overall, 67.8 % of self-defined ecotourists had a lower educational level, having a college degree at maximum. Our findings on the ecotourists profile at the Mānoa Falls, Hawai‘i, were in line with The International Ecotourism Society ecotourists profile: predominant age range from 35-54 years old, gender distribution at about 50 % for each sex, 82 % college graduates (Agrawal and Baranwal, 2012). The predominantly lower educational level of self-defined ecotourists we found does not corroborate with the finding that ecotourists have a higher level of education (Ballantine and Eagles, 1994; Honey, 2002). Finally, we found that at Mānoa Falls there are almost three times more visitors to Hawai‘i than local residents. Similarly, Tao et al. (2004) found the majority of self-defined and designated ecotourists were young male visitors.

Table 19: *Self-defined ecotourists’ and general visitors’ personal characteristics.*

Characteristic		**Self-defined ecotourists**		**General visitors**	
Gender	Male	99	51.8 %	208	46.2%
	Female	92	48.2 %	242	53.8%
	Total	191	100.0 %	450	100.0 %
Age	18-29	76	34.9 %	179	37.4%
	30-50	74	33.9 %	203	42.4%
	51-more	68	31.2 %	115	24.0%
	Total	218	100.0 %	497	100.0 %
Education	Low	145	67.8 %	367	69.9%
	High	69	32.2 %	158	30.1%
	Total	214	100.0 %	525	100.0 %
Origin	Visitor	153	74.3 %	348	73.9%
	Resident	53	25.7 %	123	26.1%
	Total	206	100.0 %	471	100.0 %

4.6.3.2 Significant correlations between tourists' characteristics and their behaviour

In SPSS we identified significant differences in pro-environmental behaviour and sustainability practice among visitors' tourist type, gender, level of education, age and origin (Table 20). For a self-defined ecotourist and general visitors comparison we found a significant difference in thirteen out of fourteen questions. The only question that did not show a significant difference was on donating money for the wellbeing of Mānoa Falls. This indicates that self-defined ecotourists at the Mānoa Falls do behave differently from general visitors. In the case of gender differences, a significant difference was found regarding willingness to pay for environmentally friendly goods and services (WTP more FE) and donation for nature conservation projects (Donate for NC). The level of education was found to have a significant impact on separating the waste, donation for nature conservation projects, knowing what term ecotourism means, and donating money for the wellbeing of Mānoa Falls. Age played a significant factor in separating the waste, being enrolled in environmental education projects, workshop or activity (Enrolled EE), knowing the meaning of ecotourism, volunteering and donating for the wellbeing of Mānoa Falls. The significant difference between visitors and Hawaiian residents was observed in following behaviours: using alternative energy sources, being enrolled in environmental education, participating in nature conservation projects, volunteering at and donating money for the wellbeing of Mānoa Falls and considering sustainability issues when making travel decisions.

We found that donating money for nature conservation projects (Donate for NC) was significant for four out of five visitor characteristics: tourist type, gender, education and age. Self-defined ecotourists, male, higher educated and older visitors donated significantly more for nature conservation projects.

The following behaviours were significant for three visitor characteristics: separating waste, being previously enrolled in environmental education activity, willingness to volunteer and donating for the wellbeing of Mānoa Falls and knowing what ecotourism is. Self-defined ecotourists, higher educated visitors and older visitors separated waste significantly more than other groups. Self-defined ecotourists, visitors younger than 30 years old and HI residents were enrolled in environmental education activities significantly more than others. Self-defined ecotourists, visitors younger than 30 years and residents showed a significant difference in willingness to volunteer for the wellbeing of Mānoa Falls. Higher educated visitors, visitors younger than 30 years and residents were willing to donate money for the wellbeing of Mānoa Falls significantly more than other visitor types. The significant difference in knowledge of ecotourism term was identified in self-defined ecotourists, higher educated visitors and visitors older than 51 years of age showed. Here we must note that knowing what ecotourism is was one of our two preconditions for being addressed and evaluated as self-defined ecotourist in this study.

Four behaviour types were found to be significant for two visitor groups. Self-defined ecotourists and HI residents use significantly more alternative sources. Self-defined ecotourists and female visitors are WTP significantly more for environmentally friendly goods and services. Self-defined ecotourists and Hawai'i residents participated in nature conservation projects significantly more than other visitor groups. The same two groups (self-defined ecotourists and residents) showed a significant difference in considering sustainability issues when making travel decisions.

Behaviours that were significant for self-defined ecotourists only, were using energy saving bulbs and considering Hawai'i an ecotourism destination. Considering themself an ecotourist was significant only for self-defined ecotourists though this was the second of our two preconditions for being addressed and evaluated as self-defined ecotourist in this study.

The exact numbers and frequencies on all behaviour characteristics with significant differences for given visitor characteristics are available in Appendix G. In this case study we focused on the interpretation of self-defined ecotourists' and general visitors' pro-environmental behaviour and their sustainability choices when making travel decisions.

Table 20: *Significant differences in pro-environmental behaviours and sustainability decision making according to visitor characteristics.*

P-values for pro-environmental behaviour and sustainability questions, and visitor characteristics.					
Behaviour / Characteristic	Self-defined ecotourist	Gender	Education	Age	Origin
	yes/no	male/female	low/high	3 groups	visitor/resident
Separate waste	0.001		0.046	0.008	
Saving bulbs	0.012				
Alternative E	0.01				0.001
Buy EF products	> 0.001				
WTP more EF	> 0.001	0.035			
Enrolled EE	> 0.001			0.009	0.001
Participate in NC	> 0.001				> 0.001
Donate for NC	> 0.001	0.035	0.011	0.002	
Know ecotourism	> 0.001		0.002	> 0.001	
Self ecotourist	> 0.001				
Hawai'i eco destination	> 0.001				
Volunteer for MF	0.02			> 0.001	> 0.001
Donate money to MF			0.02	> 0.001	
Sustainable travel	> 0.001				0.014

4.6.3.3 Are self-defined ecotourists behaving more pro-environmentally?

In Appendix G Table 35 shows results for all tourists (Total) and separately for general visitors and self-defined ecotourists for eight pro-environmental questions and six sustainability questions. Figure 23 shows the differences between self-defined ecotourists and general visitors.

We have pointed out the following sigificant differences between self-defined ecotourists and general visitors:

- Self-defined ecotourists separate waste more often than general visitors. Overall 75 % of self-defined ecotourists fully separate waste and almost 21 % separate waste partly, leaving only 3 % who do not separate waste. Among general visitors 12 % do not separate waste at all.
- The rate of self-defined ecotourists that use energy saving bulbs is 82.6 %, while 8 % less of general visitors do the same.
- Up to 31 % of self-defined ecotourists use alternative energy sources comparing to 20 % of general visitors.
- Almost 60 % of self-defined ecotourists buy environmentally friendly products, and 32 % of self-defined ecotourists buy them partly. On the other hand about 40 % of general visitors buy EF products and 42 % buy them partly. This indicates self-defined ecotourists are buying more ecolabeled products.
- Up to 80 % of self-defined ecotourists are willing to pay more for environmentally friendly goods and services, while only 63 % of general visitors answered positively on WTP more for EF question.
- Almost 48 % of ecotoursts have been previously enrolled in environmental education program, training, workshop or activity comparing to 31.4 % of general visitors.
- Almost 57 % of self-defined ecotourists participated in nature conservation project in the past, while only 34 % of general visitors got involved in nature conservation projects.

- Slightly more than 67 % of self-defined ecotourists donated for nature conservation projects in the past, while only about 45 % of general visitors supported nature conservation by donating money.
- 46 % of general visitors consider Hawai‘i an ecotourism destination, while this fraction almost doubles in case of self-defined ecotourists. Overall 10.8 % of self-defined ecotourists partly consider Hawai‘i as ecotourism destination, while only 4.5 % of self-defined ecotourists do not consider Hawai‘i as ecotourism destination.
- Exactly 29 % of self-defined ecotourists are willing to donate their time, skills and power by volunteering for the wellbeing of Mānoa Falls, while only 17.7 % of general visitors would do the same.
- Almost 70 % of self-defined ecotourists consider sustainability issues when making travel decisions, in comparison to 43 % of general visitors who consider sustainability as well.
- Overall 83.8 % of self-defined ecotourists consider Hawaiian Islands are an ecotourism destination.

From these eleven significant differences, we concluded that self-defined ecotourists behave more pro-environmentally. Our results concurr with Tao et al. (2004) who found that self-defined ecotourists had stronger pro-environmental attitudes. We found self-defined ecotourists to be more sensitive to sustainability issues when making travel decisions. Based on this we concluded that self-defined ecotourists' behaviours result in a lower ecological footprint in comparison to general visitors. Self-defined ecotourists are buying environmentally friendly products and are willing to pay more for them, which correlates with the results of Poupineau and Pouzadoux (2013) showing that 59 % of ecotourists are willing to pay from 0 to 10 % more for environmentally friendly goods and 30 % of ecotourists are ready to pay between 11-20 % more. Self-defined ecotourists in Hawai‘i also have more environmental education experiences, support nature conservation by participation and donation, are willing to donate money and volunteer for the wellbeing of places they enjoy. Finally, self-defined ecotourists choose their vacation destination based on the sustainability practice and characteristics of the location, which we evaluated in the next section.

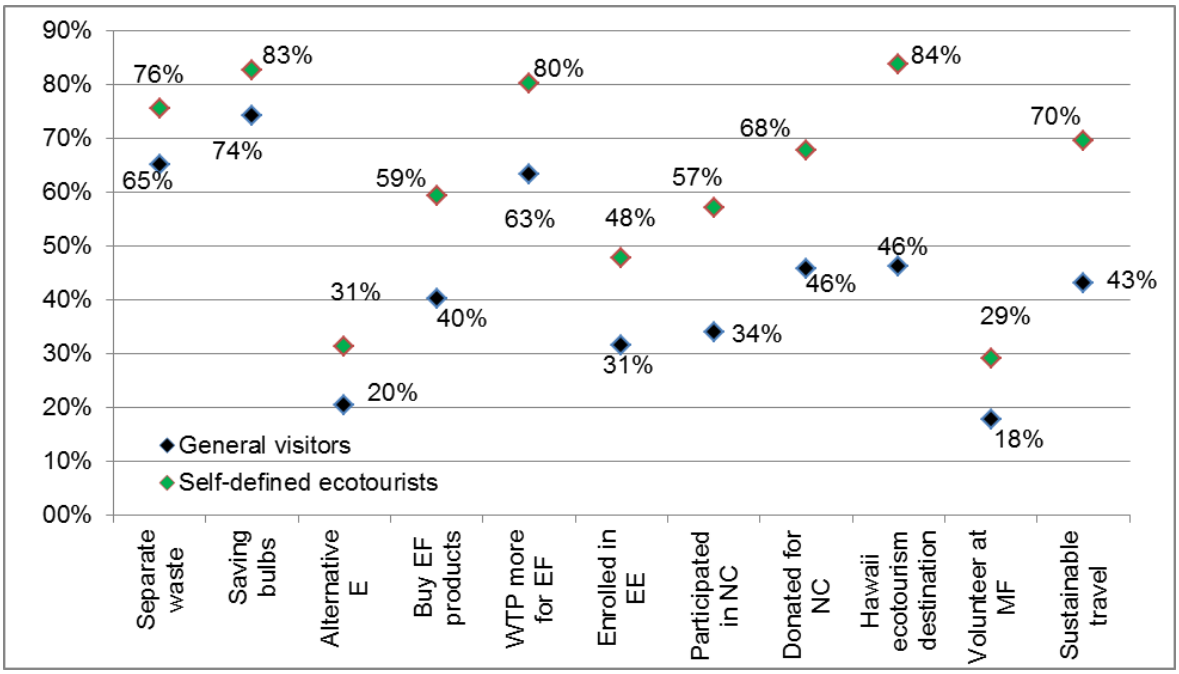

Figure 23: *Differences between general visitors and self-defined ecotourists.*

4.6.3.4 Considering sustainability when making travel decisions

The question considering sustainability issues when making travel decisions had six variables to choose from and an option to write other things visitors considered when making travel decisions: transportation, accommodation, food choices, recreational activities, scenic beauty and

biodiversity, and climate. The difference between self-defined ecotourists and general visitors was very high, as evident in Appendix G Table 35. General visitor frequencies of offered variables was at maximum 20.7 for transportation % and minimal for accommodation (13.5 %). On the contrary, self-defined ecotourists considered climate at lowest rate (25.2 %) and scenic beauty and biodiversity at the highest with the rate of 41.4 %. Only 19.4 % of general visitors considered scenic beauty and biodiversity of the destination when making travel decisions. This shows a difference in self-defined ecotourists' values and an affinity for the pristine and diverse natural places they choose to visit. Food choice seem to be more important for self-defined ecotourists for about 10 %, indicating that self-defined ecotourists are more interested in gastronomic experiences and good food quality than general visitors. The difference between the importance of recreational activities was more than 14 %, leading us to conclude that self-defined ecotourists are more active on vacation and planning recreational activities on vacation, while making travel decisions from home. For self-defined ecotourists and general visitors the level of sustainability regarding transportation was more important than accommodation. Surprisingly, climate does not seem to have a big impact on making travel decisions and is the least important factor for self-defined ecotourists. Overall almost 11 % of self-defined ecotourists considered all sustainability issues from our list when making travel decisions, compared to 3.4 % of general visitors. Poupineau and Pouzadoux (2013) found that ecotourists would like to make more eco-responsible following features of their vacation destinations: accommodation (22 %), transport (20 %), food consumption (19 %), activities (19 %), material consumption (11 %), and respect for natural areas (9 %). In comparison to this study, self-defined ecotourists in Hawai'i were more concerned about accommodation, tranportation and food choices.

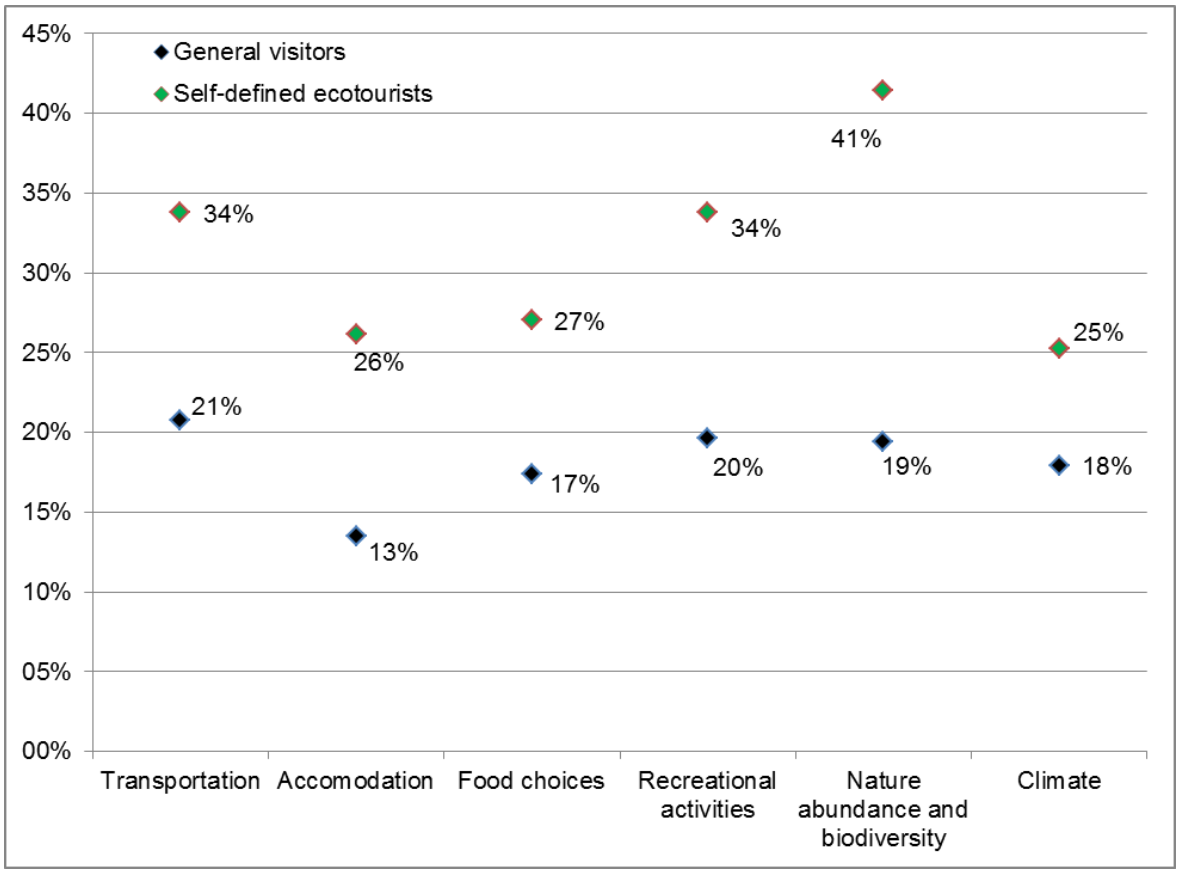

Figure 24: *Characteristics of the vacation location in terms of sustainability considered by self-defined ecotourists and general visitors when making travel decisions.*

Self-defined ecotourists considered, with decreasing importance: scenic beauty and biodiversity, recreational activities, transportation, food choices, accommodation, climate. General visitors considered with decreasing importance: transportation, recreational activities, scenic beauty and biodiversity, climate, food choices, accommodation. These findings draw us to the conclusion that there are big differences in the perception of destination characteristics when making a decision

upon the choice of the vacation destination, as well as the difference in values and travel choices between self-defined ecotourists and general visitors.

Table 21: *Considering sustainability when making travel decisions.*

Sustainability - travel decisions	**Tourists**		
	Conventional (535)	Self-defined ecotourists (222)	Total (757)
All of them	3.4 %	10.8 %	5.5 %
Transportation	20.7 %	33.8 %	24.6 %
Accommodation	13.5 %	26.1 %	17.2 %
Food choices	17.4 %	27.0 %	20.2 %
Recreational activities	19.6 %	33.8 %	23.8 %
Scenic beauty and biodiversity	19.4 %	41.4 %	25.9 %
Climate	17.9 %	25.2 %	20.1 %

4.6.3.5 Correlations between pro-environmental behaviour questions and visitors' characteristics

In order to identify significant correlations between pro-environmental behaviour and visitor groups, we calculated the Pearson correlation coefficient for eight pro-environmental behaviour questions and the visitor characteristics.

Table 22: *Significant Pearson correlation coefficients for visitors' groups and pro-environmental behaviours. ** Correlation is significant at the 0.01 level (2-tailed), * Correlation is significant at the 0.05 level (2-tailed). Medium correlations are indicated in bold typeface.*

Pearson correlation coefficient matrix	Separate waste	Saving bulbs	Alte-rnative E	Buy EF products	WTP more EF	Enrolled EE	Parti-cipated NC	Donated NC	Tourist type
Origin			0.14**	0.09*		0.12**	0.14**		
Gender									
Age								0.17**	0.16**
Education	0.09*							0.10*	0.12**
Tourist type	0.13**				0.18**	0.15**	0.21**	0.22**	
Separate waste									
Saving bulbs	**0.30****								
Alternative E	0.15**	0.19**							
Buy EF products	0.24**	**0.32****	0.25**						
WTP more EF	0.17**	0.17**		**0.34****					
Enrolled EE	0.13**		0.11**	0.21**	0.24**				
Participated NC	0.10**		0.17**	0.17**	0.16**	**0.52****			
Donated NC	0.16**	0.10**	0.10**	0.19**	0.23**	**0.31****	**0.38****		

We identified 41 significant correlations, out of that: 2 correlations between visitors' characteristics, 9 correlations between visitors' characteristics and pro-environmental behaviours and 30 correlations between pro-environmental behaviour patterns themselves. In Table 22 we show 39 correlations, except the correlation between visitors' age and origin ($r = -0.19$, p-value < 0.01) and correlation between visitors' age and level of education ($r = -0.18$, p-value < 0.01). We did not present all the correlations graphically as in the case of hikers' pro-environmental behaviour in TNP (section 4.5, Figure 22), since 41 correlations could not be transparently presented in a single figure.

Nine correlations between visitors' characteristics and pro-environmental behaviours were weak (small). Among 30 correlations between pro-environmental behaviour themselves 24 are of weak strength and six medium (in Table 22 indicated in bold). Medium correlations are proved between:

- separating waste and using energy saving bulbs ($r = 0.30$, p-value < 0.01)
- buying environmentally friendly products and using energy saving bulbs ($r = 0.32$, p-value < 0.01)
- buying environmentally friendly products and willingness to pay for environmentally friendly goods and services ($r = 0.34$, p-value < 0.01)
- being enrolled in environmental education activities and participation in nature conservation projects ($r = 0.52$, p-value < 0.01)
- donating for nature conservation projects and being enrolled in environmental education activities ($r = 0.31$, p-value < 0.01)
- donating for nature conservation projects and participation in nature conservation projects ($r = 0.38$, p-value < 0.01).

From Table 22 it is evident that 10 correlations were proven between Donate NC and first seven pro-environmental behaviour (Separate waste, Saving bulbs, Alternative E, Buy EF products, WTP more EF, Enrolled EE, Participated NC) and between age, educational level and tourist type. Donating for nature conservation projects was found to have the most correlations. On the contrary gender was not correlated with any of the behaviour or visitors' characteristics. This was the only variable without significant correlations. The number of significant correlations indicates the high complexity of the correlations between pro-environmental behaviour and visitors' characteristics, though most of the behaviors are weakly correlated between each other ($-0.30 < r \leq -0.0875$ or $0.30 > r \geq 0.0875$).

4.6.4 Conclusion

This case study presented a novel research on self-defined ecotourists in Hawai‘i and their pro-environmental behaviour. We found that almost 30 % of hikers at the Mānoa Falls Trail to be self-defined ecotourists and identified their main characteristics: self-defined ecotourists were almost equally distributed among gender and all three age groups, almost 68 % of self-defined ecotourists had a colleague degree at the maximum, slightly more than 73 % of self-defined ecotourists were visitors to the State of Hawai‘i. Based on these data we concluded that Hawai‘i is an attractive ecotourism destination, as the share of self-defined ecotourists-visitors was three fold higher than local self-defined ecotourists.

Furthermore, we identified significant differences in pro-environmental behaviour and sustainability practices according to visitors' types (self-defined ecotourists, general visitors), gender, level of education, age and origin. Regarding tourists' type we proved significant differences for all behaviour and sustainability questions except Donate money to MF. Regarding the level of education, visitors' behaviour were significantly different in separating waste, donation for nature conservation projects, knowing the meaning of the term ecotourism and donating money for the wellbeing of Mānoa Falls. Our results indicated that visitors and residents are willing to contribute to the wellbeing of Mānoa Falls by volunteering and donating money. Willingness for volunteering was found to be significantly different between tourists' type, age and origin: self-defined ecotourists, people younger than 30 years of age and Hawaiian residents were willing to volunteer more. Willingness to donate money was significantly different for age, education groups, and origin: the most generous in terms of donating money for wellbeing of Mānoa Falls were people from the age group 30-50 years of age, people with a higher educational level and Hawaiian residents. No

significant difference was found between willingness to donate to Mānoa Falls from self-defined ecotourists and general visitors. This should be valuable information for Na Ala Hele management in making further decisions on trail management and nature conservation at and around the trail.

In this case study we calculated the Pearson correlation coefficient to identify significant correlations between pro-environmental behaviour and visitors' characteristics. We identified 41 significant correlations, from that: 2 correlations between visitors' characteristics themselves, 9 correlations between visitors' characteristics and pro-environmental behaviours and 30 correlations between pro-environmental behaviour themselves. Five correlations had medium strength, the remaing 36 were weak. The high number of correlations identified indicated the complexity of the investigantions in pro-environmental behaviours. The results on significant correlations between pro-environmental behaviour and visitor groups from this case study were compared to the results on hiker's pro-environmental behaviour in Slovenia (section 4.5) in the general chapter discussion.

Finally, the results showed that self-defined ecotourists behave significantly more pro-environmentally (Figure 23, Table 35 and Table 22) and consider sustainability issues more when making travel decisions (Table 21 and Figure 24). This proves that ecotourism contributes to the sustainable development of the destination. We found that the results of this research to be applicable to ecotourists in Hawai'i. Our results correlate with Tao et al. (2010) who found that self-defined ecotourists have slightly stronger pro-environmental attitudes than general national park visitors.

4.6.5 Relation to the thesis

This case study confirmed hypothesis H6. In this case study we identified self-defined ecotourists and compared their pro-environmental behaviour and consideration of sustainability issues when making travel decisions with the sample of general visitors. We proved that self-defined ecotourists behave more pro-environmentally and thus have a lower ecological footprint. The significant difference, found in self-defined ecotourists' and general visitors' enrollment in environmental education, from which we concluded that there were relationships between environmental education, pro-environmental behaviour and ecotourism development.

4.7 Environmental education infrastructure on tropical rainforest hiking trail, Mānoa Falls Trail

The aims of this case study were to investige hikers' interest in learning about relevant environmental topics while hiking at the Mānoa Falls Trail and propose an educational content and design infrastructure. This case study was developed with Na Ala Hele staff as a decision support instrument for the "Mānoa Falls Infrastructure Improvement Project" funded by the Hawai'i Tourism Authority. Decision problems addressed in this case study: tourism and recreation, used local knowledge and local people's attitudes.

4.7.1 Introduction

The tourism industry in many tropical destinations, for instance Hawai'i (Pratt, 2011), Galapagos (Nicholls and Hooper, 2006; Baine et al., 2007; Economist, 2010), Costa Rica (Alpízar, 2006; Bernard, 2009), Madagascar (Ormsby and Mannle, 2006), Belize (Ramsey and Everitt, 2008), flourishes in terms of the number of visitor and contributes significantly to the countries' economies by creating employment opportunities and tax revenues, but at the same time contributes to the degradation of natural environments. Implementation of best sustainable practices may ameliorate further environmental degradation and facilitate ecological restoration, which may enrich nature tourism destination experiences of visitors and residents alike. One of the ways to minimize impacts of tourism in these destinations could be by providing tourists with attractive environmental education opportunities that could be incorporated to their experience as travelers. These may trigger within them more interest in nature conservation, respect for the natural and cultural environment they are visiting and activate more pro-environmental behaviour intentions.

We take the standpoint that environmental education is a key concept for raising the level of environmental awareness of people and contributes towards a behavioral shift to pro-environmental behaviour, which consequently leads to a more sustainable lifestyle (Figure 25, Education for sustainability).

Figure 25: *The conceptual model for environmental education to sustainable lifestyle pathway and its application on the case of hiking trails.*

In this case study we present the application of our argument on the case of hiking trails. The public can obtain information on environmental issues from a kiosk, placed at the entrance and from the viewing stations along the trail. By reading the available information, hikers can learn about the phenomena presented and find out how to take care of the environment, which raises their literacy regarding the nature and culture of the place they are experiencing and finally their environmental awareness. In the next step, the hikers are expected to behave sustainably on the trail, incorporating their experience as pro-environmental behavior in their value system. The ultimate goal is to add a piece to the puzzle of people's sustainable lifestyle and resource conservation. The potential added values of environmental education application by means of establishing educational trail infrastructure along hiking trails are: interactive experiences, awareness raising, responsible behavior and educated hikers. In the next two sections we discuss the possible implications of results by making recommendations concerning the content of environmental education infrastructure.

This case study suggested that the implementation of environmental education directed at both tourists and residents can contribute to the "green" practices promoted by the advocates of sustainable development and ecotourism. On the trail a few commercial tour operators take tourists on organized hiking tours on a daily basis and advertise as eco or ecotourism companies. The rainforest environment with many attractive flora species is attractive in terms of ecotourism hiking potential and opportunity, as defined in the key article by Nahuelhual et al. (2013).

4.7.2 Methods

The location of this case study is described in section 3.1.2.1 and the surveying process is described in 4.6.2. This case study is based on the data collected by the questionnaire available in Appendix H. Out of 785 questionnaires collected at the research site 22 were found to be incorrectly completed and were thus not taken into account. Therefore, the number of questionnaires used in the analysis was 763.

4.7.3 Results and discussion

4.7.3.1 The characteristics of hikers and their perspectives

Among a total of 785 people surveyed, 494 had hiked other trails in Hawai‘i and 23 % of those identified themselves as Hawai‘i residents. This suggests that 77 % of the visitors who hiked the Mānoa Falls Trail had also hiked other trails on the islands. In total, 73.3 % of the hikers came to the Mānoa Falls for the first time. Half of those surveyed indicated that the primary reason for hiking was to experience nature, followed by their plans to see the waterfall, participate in an outdoor physical activity, and to spend time with a friend. Only 6 % of the hikers listed culture as the reason for their hiking to the Mānoa Falls.

Table 23**:** *The demographics of the hikers and the information on hiking experience. Since some hikers did not answer all questions we calculated the number of overall responses to each question and used this number as a total sample for the statistical analysis for each particular question. (*denotes a multiple answer question)*

Hikers' demographics and responses	**Total sample**	**%**
Gender:	635	
Male	304	47.9
Female	331	52.1
You are:	709	
Visitor	495	69.8
Hawai'i Resident	174	24.5
Military	54	7.6
Age range:	707	
under 18	14	2.0
18-24	93	13.2
25- 30	143	20.2
31-40	172	24.3
41-50	103	14.6
51-60	117	16.5
61-70	53	7.5
71 or more	12	1.7
Educational level completed:	734	
High school	133	18.1
College	210	28.6
Undergraduate degree	163	22.2
Graduate school	64	8.7
Graduate or professional degree	117	15.9
Doctorate	47	6.4
Visiting Hawaiian Islands for: *	537	
Vacation	452	84.2
Professional reasons	59	11.0
Outdoor recreation experiences	52	9.7
Organized activities	18	3.4
Came to the Mānoa Falls Trail: *	748	
With an organized group	12	1.6
Alone	47	6.3
As a couple	238	31.8
With friend(s)	300	40.1
With parent(s)	55	7.4
As family with children	120	16.0
With grandchildren	3	0.4
Dog	19	2.5
Other	21	2.8
Primary reason for hiking: *	737	
Physical exercise	196	26.6
Outdoor activity	281	38.1
Experience nature	364	49.4
Traditional/cultural	43	5.8
Spend time with a friend	129	17.5
See the waterfall	345	46.8
Other	2	0.3
Took on a trail: *	723	
Backpack	386	53.4
Water	562	77.7
Food	194	26.8

Continues…

…Continuation of Table 22: *The demographics of the hikers and the information on hiking experience.*

First Aid Kit	39	5.4
Cell phone	492	68
Map	102	14.1
Rain gear	57	7.9
Flashlight	36	5.0
Whistle	20	2.8
Walking stick	83	11.5
Bug repellent	263	36.4
Sunscreen	218	30.2
Other	79	10.9
Accessed the trail by:	761	
Car	526	69.1
Bus	87	11.4
Bike	13	1.7
Walked	93	12.2
Taxi	10	1.3
Tour operator van	18	2.4
Other	14	1.8
Learned about the Mānoa Falls Trail: *	573	
Word of mouth	301	52.5
Trail guidebook	193	33.7
Internet	169	29.5
Hotel/visitor activity desk	44	7.7
Tour operator	10	1.7
Government office	1	0.2
Other	127	22.2
Was the information accurate?	742	
Yes	660	88.9
No	28	3.8
Not sure	54	7.3

For the source of information for destination choices, word of mouth was an important means of finding out formal and informal information. Over half of the questionnaire respondents indicated that they had found out about the Mānoa Falls Trail by word of mouth, further 34 % had obtained the information in guide books, 30 % from the Internet sources, and 22 % from other sources, presumably friends and family. It was of great interest that only 8 % of the respondents had found out about the Mānoa Falls Trail from a hotel or visitor activity desk and less than 2 % had found out about the trail from tour operators. An overwhelming majority, nearly 90 %, indicated that the information they had received from any source was deemed to be accurate. It is evident from Table 23 that we also asked the hikers about their level of education, the means of transport used to come to the end of the Mānoa Valley where the trail begins, as well as about the hiking equipment that the hikers carried. As expected, the vast majority (84.2 %) of respondents visited the Hawaiian Islands for vacation, followed by 11 % who had come for professional reasons. An outdoor recreation experience was a reason for visiting for 9.7 % and 3.4 % came to Hawai‘i for organized activities. The total number of answers used to calculate the percentage for a particular question answer is evident from the "Total sample" in all tables in this section.

4.7.3.2 Environmental education component

The hikers were asked whether they would like to learn more while hiking the trail. The second question asked the visitors to choose what they would like to learn while on the trail. The following eight topics were suggested in agreement with the Na Ala Hele: Plants along the trail, Water lifecycle and stream ecology, Cultural importance of the valley, Hawaiian history, Geology of Hawai‘i, Native flora and fauna, Invasive species and Erosion and trail maintenance.

Despite the fact that 44 % of the hikers provided a positive response to the question of whether or not they were interested in learning more information along the trail, 91 % of whom responded to subsequent questions indicating that information should be available along the trail in some form of signage or viewing station (Table 24).

The questionnaire takers responded favorably to the range of topics as presented in Table 24. These topics provided a basis for creating texts and images that would inform the users and provide take-away messages that further develop environmental ethics. It is perhaps of even higher importance to decide on what kind of signage content is relevant and informative and, on the other hand, still remain aesthetically appealing in order to attract and maintain the viewers' attention. The findings from Table 24 are further acknowledged when proposing the topics outline on viewing stations along the trail (Figure 26) Overall 96 % percent of hikers said they had noticed the signage along the trail. The boards provide the following information: Trail head name, Other trails, Landslide occurrence warning, Restoration area, Hazardous and warning signs, Directions. At the time of investigation there was no trail map and no distance indicator or mile markers along the trail (Donoho et al., 2001).

Table 24: *Interest in learning along the trail.*

Would you like to learn more information along the trail?		
	Answers	**%**
Yes	324	44.0
No	262	35.6
Not sure	150	20.4
Total sample	736	96.5
Which of the following would you like to learn about while hiking the trail?		
Plants along the trail	526	75.9
Water lifecycle and stream ecology	193	27.8
Cultural importance of the valley	248	35.8
Hawaiian history	288	41.6
Geology of Hawai'i	219	31.6
Native flora and fauna	373	53.8
Invasive species	177	25.5
Erosion and trail maintenance	161	23.2
Everything above	54	7.8
Total sample	693	90.80

The general condition of the trail was estimated to be 2.9 on the scale 1–4, 1 being poor, 2 fair, 3 good and 4 very good, though 54.7 % of hikers evaluated the trail's condition as good. Only 19 % of hikers rated the trail as very good, 3.1 % evaluated the trail's condition as poor and 23.3 % as fair. 92.5 % of hikers stated that the trail needs improvement.

4.7.3.3 Environmental education infrastructure design

The water from the Mānoa stream is impotable and there are no drinking water resources at either the beginning or along the trail. The vast majority of the hikers take their own drinking water on the hike. The results revealed that after water, the most common items brought by 68 % of respondents were cell phones. This data indicates that cell phones can be effectively incorporated into the educational infrastructure planned, for example in audio-guided tours and Quick Response Codes (QR codes) at selected sites along the trail. Thanks to the wide diffusion of smart phones around the world, the popularity of QR codes is growing rapidly as well (Shin, 2012). Nearly all smart phones support apps for scanning QR codes (Louho, 2006), which offer interactivity by

displaying text, connecting to wireless network or opening a webpage in the telephone's browser. The use of smart phone technology has already been implemented in sections of the exhibits of the University of Hawai'i's Lyon Arboretum, which allow visitors to access online information regarding specific species in their collections. It is also possible to view the information within QR codes in various foreign languages, e.g. Japanese, Chinese, Thai, Korean and Spanish, which reflects the source regions of Hawai'i's tourism market.

In the study concerning the influence of mobile learning on students' environmental awareness, the use of mobile phone technologies resulted in better environmental awareness and consideration for environmental problems (Uzunboylu et al., 2009). We argued that the majority of hikers who use smart phones would also increase their environmental awareness and literacy if QR codes and other means of mobile learning would be available at viewing stations along hiking trails.

The advantages of using the technology and the innovations in the construction field strongly suggested that reaching large audiences at a site, such as the Mānoa Falls Trail, is cost-effective. For example, twice as much information can be placed on a message board simply by using vertical layouts accessible from both sides rather than having a board placed at a horizontal angle. Vertical layouts provide more information on the same area of signage while allowing hikers to gather on both sides of the viewing station. Another cost-effective measure in order to ensure the longevity of signage is using recycled plastic boards for framing and posts and positioning signs vertically in order to increase precipitation runoff under rainforest conditions.

We have suggested the use of proverbs in the Hawaiian language, accompanied by translations into English, as a link to the cultural wisdom of the Hawaiian elders (kupuna). For instance, the Hawaiian proverb "I ka wā ma mua, ka wā ma hope" means that the future and the past are intimately connected, "in order to move forward it is necessary to know where one comes from" Taum (2010: 34). Having this proverb on a viewing station would emphasize the importance of the identity of the place and of its origin, and that the elders' wisdom contributes to solutions for the future. To trigger the hikers' critical thinking, a simple question or two should be asked on each topic at viewing stations. The hikers would be able to find the answer to a question by discussing it with the members of their hiking group or their engagement with the environment they are experiencing which would provide them with the answer. It is possible to link the viewing station topics by writing the correct answer on the next viewing station. Another option is to provide the hikers with an answer between the lines in the text presented on a viewing station itself. By providing the viewing stations with additional adjuncts, such as "listen to bird song in the forest" or "observe the shape of the tree on your left", the educational experience becomes more interactive and adds another valuable dimension to the hiking experience. Activities of this kind would also lead to further interaction with other hikers as well as with the environment. Table 25 indicates our recommendations regarding the content and design of viewing stations and lists their positive impacts on the hiking community as well as on the maintenance of the trail's infrastructure. These reccomendations are based on the survey results, experience of Na Ala Hele staff from designing signage and viewing station in Hawai'i and previous research on greenways infrastructural design and trail assessment in Slovenia (Arsenijević, 2006).

Table 25: *Recommendations for the content and design of viewing stations.*

Viewing stations recommendations		**Positive impacts**
Design	Recycled materials	Environmentally friendly
	Vertical layout	Longer lifespan
	Two-sided informational boards	Twice as much information on the given area
Content	QR codes, mobile learning	IT application, more content, multilingual content
	Proverbs written in the Hawaiian language	Connection to local heritage
	Questions and tasks	Interactive experiences

Although the vegetation along a large part of the Mānoa Falls Trail is a mix of invasive species, the opportunity still exists to provide information relevant to the place in the context of its natural and cultural history, particularly given the high use of the trail and its potential to increase environmental

literacy among visitors and residents. Based on the results of the hikers' interest in learning about the topics presented in Table 25 and correlated to the findings of Agrusa et al. (2010) concerning the tourists' interest in the Hawaiian culture, we proposed pairing two topics on a single viewing station, as shown in Figure 26. The content of the information on the four viewing stations would be classified as: (1) Resource conservation, (2) Sense of place and heritage, (3) Ecological restoration and (4) Topography and trail management.

The main kiosk near the entrance to the trailhead might display a map of the Mānoa Falls Trail with the information regarding the services and the trail's infrastructure, including restrooms and solid waste receptacles, distance markers (in miles and kilometers), the locations of viewing stations along the trail, estimated time intervals between the viewing stations, hazard warnings, regulations and suggested activities such as bird watching and taking photographs, and, finally, the trail's connections to the Honolulu trail network.

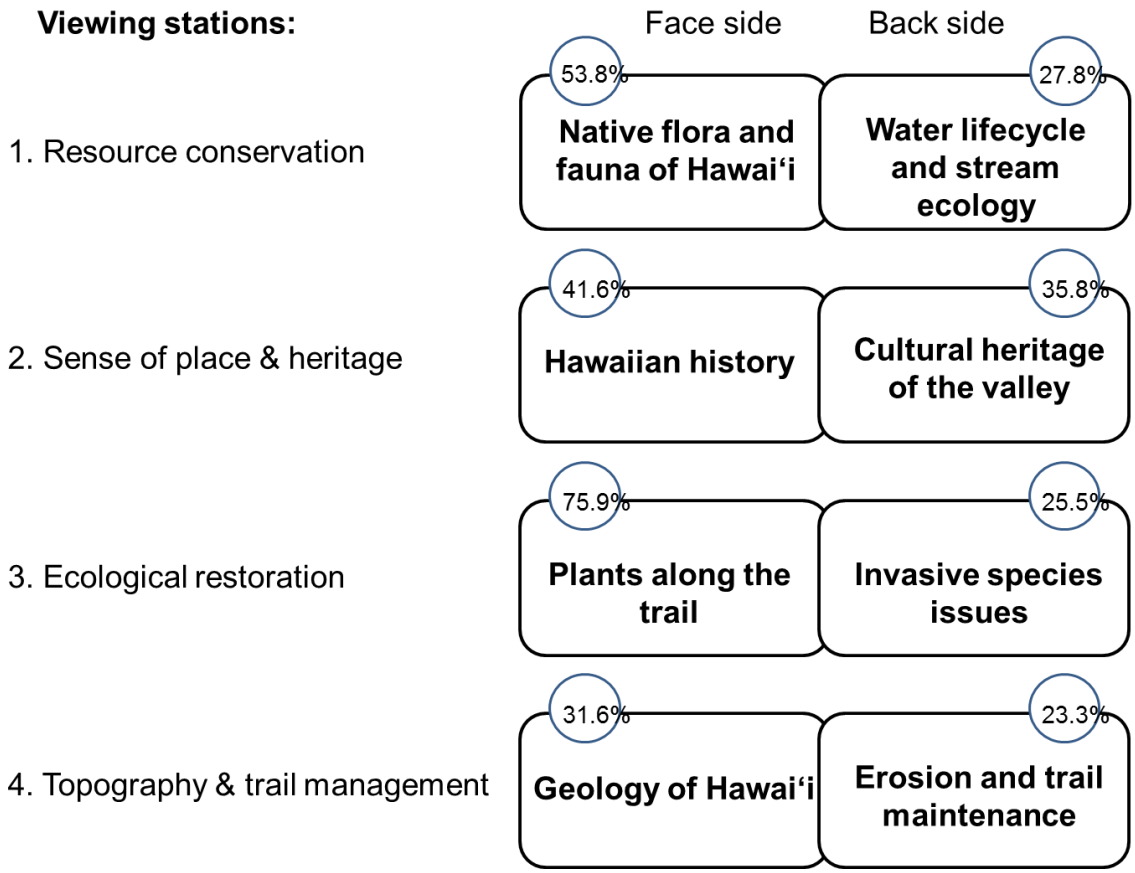

Figure 26: *The degree of the visitors' interest in environmental topics and recommendations for viewing stations and the entrance kiosk.*

According to Nicol (2002a, 2002b, 2003), outdoor education can contribute to education about sustainability. The Mānoa Falls Trail itself, with appropriate educational infrastructure, could become a valuable educational resource for outdoor education in primary and secondary education in the Mānoa Valley, a suburban residential neighborhood of over 30,000 people, and a home to the University of Hawai'i flagship campus, numerous public and private educational institutions. Brookes (2002, 2003) called for outdoor education to pay careful attention to particular regions, communities, and their histories and be more responsive to local situations. We proposed the topics: Cultural importance of the Mānoa Valley and the History of Hawai'i to be precisely presented within the Sense of place and heritage viewing station content (Figure 26, viewing station 2). The residents' support for resource conservation is driven by the residents' resources and their cultural identity and stimulated by their awareness of environmental protection, which is raised by suitable education (Tsaur et al., 2006). Consequently, we have argued that the viewing stations on the Cultural importance of the Mānoa Valley and the History of Hawai'i would contribute

significantly to the residents' identity, and consequently offer the residents support in further resource conservation processes.

4.7.4 Conclusion

The results of this study quantified the current use of the Mānoa Falls Trail, the demographics of the hikers (gender distribution, origin, age span, education level of education), as well as their reasons for visiting Hawai'i and their perspectives regarding their hiking activity.

We identified the hikers' interest in learning while engaged in walking the trail. Overall 89 % of the hikers chose at least one of the topics they would like to learn about while hiking. This proves that recreation and education can be successfully combined in one's free or leisure time. The hikers showed most interest in the Plants along the trail and Native flora and fauna, followed by their interest in Hawaiian history and Cultural importance of the valley. This indicates the visitor's interest in the unique natural as well as specific cultural heritage of Hawai'i.

We therefore, proposed recommendations for an environmentally friendly educational infrastructure design with a longer lifespan appropriate for a humid rainforest environment. Based on the study findings that 68 % of the hikers had a mobile phone with them while hiking and due to the latest developments in modern smart phone technology, we propose QR codes and mobile learning techniques to be available at viewing stations, along with the access to a multilingual content, which we believe innovative in trail design scientific literature. We argued that the Mānoa Falls Trail may be successfully incorporated in local schools' curricula as it is proven that outdoor education can contribute to sustainability education, sustainable living and environmental education (Nicol 2002a, 2002b, and 2003).

The current Na Ala Hele's management actions at the Mānoa Falls Trail are driven by the questionnaire results. Our reccomendations will be taken into account when designing viewing stations. The content of the viewing stations will be presented according to the results on the hikers' interest in topics as shown in Figure 26. The results of this research inform managers and facilitate the development of effective environmental education initiatives that enrich the user's experiences and contribute to the sustainable management of nature tourism destinations in the State of Hawai'i and potentially to other natural destinations in protected areas.

The State of Hawai'i is an internationally recognized mass tourism destination, largely dependent on the quality of the natural environment in order to maintain its market share. While promotion of consumerism is still the dominant issue in advertising for the visitors of Hawai'i, an increasing environmental awareness raises the likelihood of nature tourism as a growing element of the Hawaiian vacation other than the traditional sun and surf activities. We have argued in favor of ecotourism and other forms of nature tourism development, which all include an educational component and may affect the visitors' perception of environmental protection and create the need for biodiversity conservation.

4.7.5 Relation to the thesis

This case study supports hypotheses H4 and H5, both related to environmental education and ecotourism (research focus 4). We developed a proposal for modern environmental education infrastructure on a hiking trail, within an on-going project and evaluated hikers' interest in learning while on the trail and interest in environmental education topics. These findings support H4 confirming that ecotourism requires an appropriate management strategy, environmental education being an essential part of ecotourism products and services. This case study supports H5 as well, which states that environmental education, either on or about protected areas, improves (creates more opportunities for) ecotourism quality.

4.8 Willingness to pay for hiking at Mānoa Falls Trail

The aim of this case study was to make an assessment of hikers willingness to pay for hiking at Mānoa Falls. This case study was developed in association with Na Ala Hele staff as a decision support for the "Mānoa Falls Infrastructure Improvement Project". The decision problems addressed in this case study were tourism and recreation, managing PA, WTP and local people's attitudes.

4.8.1 Introduction

Financial self-sufficiency of protected areas is crucial for their long-term sustainability (Hearne and Salinas 2002). In the majority of cases, entrance fees represent the main source of income that protected areas generate and thus contribute significantly to their budget and affect their management decisions. The willingness to provide financial support for nature conservation is, thus, closely related to the satisfaction of visitors (Shultz et al., 1998; Ross and Wall, 1999). According to Adams et al. (2011a), being more knowledgeable about certain environmental issues influences the respondents' willingness to pay an entrance fee in order to improve the current situation.

Hearne and Salinas (2002) argued that financial self-sufficiency of protected areas is crucial for their sustainability, since public funds are limited or even decreasing, turning out to be insufficient to maintain the same level of quality of the environment on the sites and to achieve sustainable management (Eagles et al., 2002). In the majority of cases, entrance fees represent the main source of income generated by a protected area thus makeing a significant contribution to their budget and affect management decisions.

Willingness to pay in order to use outdoor recreation facilities and to visit natural attractions has been assessed in various case studies around the globe. As they vary greatly in their contextual aspects, comparison between the studies is in many cases, limited (Reynisdottir et al., 2008). Factors used to assess one's WTP also vary across the studies. The study conducted by Lindberg (1991) shows that the following factors are likely to influence the WTP for national parks: age, income, educational level, the fulfillment of one's expectations and the existence of substitute parks and recreation sites.

Education level was recognized as a significant predictor of tourists' WTP (Lindberg, 1991; Bowker et al., 1999; Reynisdottir et al., 2008; Wang and Jia, 2012). Highly educated individuals were found to be more likely to support the fee-paying policy for natural attractions (Bowker at al., 1999). This is possibly due to their broader general awareness or other factors that distinguish this group from other individuals.

The willingness to support nature conservation financially is closely related to visitor satisfaction (Shultz et al., 1998; Ross and Wall, 1999). Tourists have been found willing to pay higher entrance fees hence the money goes to biodiversity conservation and environmental protection (Wang and Jia, 2012). In the case of the Annapurna conservation area, the most common explanation for WTP a higher entrance fee was the desire to better protect the environment (Baral et al., 2008). In the study conducted by Kontogianni et al. (2001), higher educational levels and an interest in environmental conservation were found to predict a positive response to the payment principle question and higher WTP. According to Adams et al. (2011a) previously being more knowledgeable about certain environmental issues influenced the respondents' willingness to pay entrance fees in order to improve current facilities. Based on the findings from all these studies related to the visitors' level of environmental awareness, the level of education and the concern for protecting the environment were evident reasons for being willing to pay more in order to access natural attractions.

4.8.2 Methods

This case study was conducted at Mānoa Falls (section 3.1.2.1). The data have been collected with the aid of the questionnaire from Appendix H, the surveying process has been already described (section 4.6.2).

4.8.3 Results and discussion

4.8.3.1 Willingness to pay to hike the Mānoa Falls Trail

According to the survey results, 70 % of the hikers arrived by private car. Paradise Park, a for-profit business with a snack shop, restroom facilities, and a restaurant is located prior to reaching the Mānoa Falls trailhead, several hundred meters further on along a road in a poor condition. According to the data provided by the Na Ala Hele, the busiest months on the Mānoa Falls Trail are June, July and August, which overall correlates with the tourism industry as well as with the numbers of vehicles parked at the nearby private parking lot. Figures from the past several years indicate a monthly average of as many as 3700 individuals who paid $5 (United States) dollars in order to park their vehicles in a parking lot rather than using free parking in Mānoa neighborhoods (Wong, 2012). It is likely that having to pay for parking has an impact on the users' willingness to pay an entrance fee to hike the trail.

The average amount that the hikers were willing to pay was estimated to be $3.96. The majority of the hikers were willing to pay $5 for hiking (33.7 %), followed by $3 by 20.1 % of visitors and $1 by 14.6 % (Table 26). Only 5.3 % hikers were willing to pay more than $5 to hike the Mānoa Falls Trail. Altogether, 47 % of hikers were willing to pay at least $3.

Table 26: *Data showing the willingness to pay and statistical variables for all hikers, visitors and residents. (Se – standard error by Wolfram Math World).*

WTP	**N**	**%**	**Visitors**	**%**	**Residents**	**%**
$1	106	14.6	73	16.5	33	35.1
$3	146	20.1	119	26.9	27	28.7
$5	245	33.7	212	48.0	33	35.1
$7	12	1.6	12	2.7	0	0.0
$10	27	3.7	26	5.9	1	1.1
WTP ($1-10)	536	73.6	442	79.9	94	53.7
not WTP not hike	192	26.4	111	20.1	81	46.3
Total sample	728		553		175	
Mean ($)	3.96	(Se 0.09)	4.15	(Se 0.1)	3.07	(Se 0.19)
Median ($)	5		5		3	
Standard deviation ($)	2.13		2.14		1.82	
Skewness	0.72	(Se 0.11)	0.73	(Se 0.12)	0.49	(Se 0.25)
Kurtosis	1.17	(Se 0.21)	1.22	(Se 0.23)	0.32	(Se 0.49)

With t-test we checked the Null hypothesis concerning the equivalence of averages. The analysis of visitor and resident samples shows that $t_{empirical}$=5.01, with p-value < 0.001. The critical value for 0.01 % significance level is 4.0. This means that with the small significance level we had to reject the Null hypothesis, thus we can conclude that there was a significant difference between the averages.

In total, 26.4 % of respondents, 46.3 % of whom were residents and 20.1 % state visitors, answered that they would not hike, if they had to pay a fee (Table 26). This suggests that a fee is a management tool to lower the number of users to some extent and thus lower the environmental impact on the trail, concurrently deaccelerating the erosion process. Furthermore, surveyed respondents indicated a willingness to pay an additional user fee should it go towards trail maintenance and conservation efforts at the site. However, imposing entrance fees to natural attractions is a controversial issue worldwide (Reynisdottir et al., 2008). This concern may be even more pronounced in the context of historical land use practices in Hawai'i, as it raises concerns over the commercialization of places that happen to have become tourist destinations (Webster, 2001; Blackford, 2001; Mak, 2008; Taum, 2010).

4.8.3.2 Implications of the willingness to pay results

As the level of education of an individual is recognized as predicting factor for WTP (Lindberg, 1991; Bowker et al., 1999; Reynisdottir et al., 2008; Wang and Jia, 2012) we calculated the average WTP for each education level group (Table 27) and analyzed the education level – WTP relations by dividing the hikers into three groups according to their WTP (Table 28).

Table 27: *Average willingness to pay for groups of various levels of education.*

Level of education	Average WTP ($)	Hikers WTP (%)	Average WTP ($)
High school	3.97	74.40	3.84
College	3.70	70.50	
Undergraduate	3.86	70.60	
Graduate school	4.27	75.00	4.31
Graduate or professional	4.37	70.10	
Doctorate	4.28	61.70	
Total sample	4.08	70.40	

Graduate or professional degree holders had the highest average WTP ($4.37). The most generous in terms of WTP for enjoying the Mānoa Falls Trail were hikers with graduate school education (75 %). Finally, we compared the average WTP for the higher education group (graduate school, graduate or professional degree and doctorate) to the average WTP of hikers with high school, college and undergraduate education. The average WTP in the higher education group was almost $0.50 higher. Surprisingly, among the hikers holding a doctoral degree, only 61.7 % were willing to pay for hiking, which means that almost 40 % of them would not go hiking if they had to pay.

Table 28: *Level of education and willingness to pay relation.*

Level of education – WTP	WTP 1–3$		WTP 5$		WTP 7–10$	
	N	%	N	%	N	%
High school	43	17.5	48	20.2	8	21.1
College	76	30.9	66	27.7	7	18.4
Undergraduate	56	22.8	54	22.7	5	13.2
Graduate school	22	8.9	20	8.4	6	15.8
Graduate or professional	38	15.4	33	13.9	11	28.9
Doctorate	11	4.5	17	7.1	1	2.6
Total sample 522	246		238		38	

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school, graduate or professional degree and doctorate) to the average WTP of hikers with high school, college and undergraduate education. The average WTP in the higher education group was almost $0.50 higher. Surprisingly, among the hikers holding a doctoral degree, only 61.7 % were willing to pay for hiking, which means that almost 40 % of them would not go hiking if they had to pay.

Table 28 shows that 31 % of hikers in WTP $1–3 as well as 29 % of hikers from the WTP $5 group hold a college degree, while 29 % of hikers with the WTP $7–10 have a graduate or professional degree. The results in Table 27 and Graduate or professional degree holders had the highest average WTP ($4.37). The most generous in terms of WTP for enjoying the Mānoa Falls Trail were hikers with graduate school education (75 %). Finally, we compared the average WTP for the higher education group (graduate school, graduate or professional degree and doctorate) to the average WTP of hikers with high school, college and undergraduate education. The average WTP in the higher education group was almost $0.50 higher. Surprisingly, among the hikers holding a doctoral degree, only 61.7 % were willing to pay for hiking, which means that almost 40 % of them would not go hiking if they had to pay.

Table 28 indicate that the level of education affects one's WTP and that people with higher education are willing to pay more for hiking the Mānoa Falls Trail. These results are in accordance with other studies which examined the level of education as a predictative factor for one's WTP (Lindberg, 1991; Bowker et al., 1999; Reynisdottir et al., 2008; Wang and Jia, 2012) and discovered that a higher level of education is reflected in a higher WTP (Bowker, 1999; Kontogianni et al., 2001).

Since willingness to pay has been closely related with the visitors' satisfaction (Shultz et al., 1998; Ross and Wall, 1999), we were convinced that the WTP for hiking the Mānoa Falls Trail will increase following the construction of a new trail entrance, an information kiosk and four viewing stations.

In Hawai'i there is a practice of charging lower fees to Hawaiian residents, commonly known as the "kama'aina" discount or rate (Mak, 2008). This originates from the fact that the Hawaiian residents to a certain extent already pay to the State for using the "States' goods and services" through taxation. In Hawai'i, kama'aina rates are also applicable to military personnel. For instance, Table 29 represents entrance fees to most common nature-related attractions on the island of O'ahu, which all share an educational mission and run various educational programmes in the form of various activities. Only the Diamond Head State Monument charges equal entrance fees to all hikers, regardless of their origin.

Table 29: *Entrance fee rates for visitors and residents charged by some of the most popular attractions on the island of O'ahu, Hawai'i.*

Attraction (Admission for adults)	**Visitor ($)**	**Kama'aina / Military ($)**
Waimea Falls Park	15	10
Honolulu Zoo	14	8
Waikiki Aquarium	9	6
Hanauma Bay Nature Preserve	7	0
Diamond Head State Monument	1	1

Parking fees are charged separately and regardless of visitors' origin, the Diamond Head State Monument charges $5 per car and Hanauma Bay $1 per car. Our study showed that paying for parking facilities does affect one's WTP entrance fee. In the case of the Mānoa Falls Trail, parking is provided by an independent party in agreement with the trail management and represents an example of good practice from which visitors, managers and the Paradise Park benefit. However, a proportion of stakeholders, for example the residents of Mānoa Valley, disapprove of the payable parking policy.

According to the Paradise Park Inc. visitor data for January 2012, there were at least 12,631 visitors on the trail who parked their vehicles at the provided parking facility. We estimated that if

only 47 % of those hikers paid $3 for hiking the trail, this would generate a sum of $18,289.98. It is important to stress that this calculation only takes into account the hikers who came to the Mānoa Falls by car, there were an additional 30 % of hikers who used other means of transport or walked to the trail entrance from their neighborhoods.

We suggested that the concept of the kama'aina rate should to be introduced in the situation of the Mānoa Falls Trail, if and when entrance fees are introduced. Moreover, the Individual Annual Pass and the Family Pass for frequent hikers should also be available.

During the survey period, many of the hikers expressed a higher willingness to pay if the money would go towards nature conservation, which corresponds to the Wang and Jia study findings (2012) and may be correlated to the desire to enhance environmental protection (Baral et al., 2008). More people complained that they had already paid for parking and that this influenced their WTP for hiking.

A portion of funds that would be generated by charging entrance fees should be used to provide free on-site guided tours, organized by the management staff. This is in fact already an established practice in some of the USA's national parks. This action would contribute to the environmental literacy of visitors and residents and offer a unique experience to hikers by providing them with the information from experts first hand.

4.8.4 Conclusion

Our study offers an insight into the hikers' willingness to pay for hiking the Mānoa Falls Trail. The results indicated that the introduction of entrance fees should to be taken into consideration by the respective management body. The mean WTP for the Mānoa Falls turned out to be closest to $4. We propose the contingent valuation method to be used in the next survey to be carried out and also advise the appropriate stakeholders to become involved in decision-making process concerning the introduction of entrance fees.

We identified entrance fees as potential revenue raizer for managing the trail. Based on the analysis of the level of education-WTP relationships, we proved that more educated individuals are willing to pay more for hiking the Mānoa Falls Trail. Willingness to pay entrance fees differs significantly among the visitors (79.9 %) and the residents (53.7 %). The WTP arithmetic mean value was $1 higher for visitors than residents. Furthermore, the t-test showed that we have a significant difference between the residents' and visitors' WTP averages. For these reasons as well as due to the common practice of charging lower entrance fees for residents and military personnel in Hawai'i, we proposed the application of kama'aina and military rates and predict that the introduction of fees would, to a certain extent, decrease in the number of hikers. In case fees were introduced, we suggested the provision of free educational hiking tours, organized by the management staff as an added value to the Mānoa Falls Trail hiking experience. A moderate entrance fee for using the hiking trails in protected areas should be considered by resource managers as it may significantly contribute to the management budget and facilitate better trail maintenance and safety.

The ways to minimize further degradation of the Mānoa Falls rainforest resource include but are limited to: teaching visitors to behave more sustainably on the trail by means of environmental education, by the introduction of entrance fees the annual number of visitors might decrease. The use of a portion of funds created by entrance fees for trail maintenance stonework and other infrastructure improvements for erosion prevention would lead towards minimizing the resource erosion.

4.8.5 Relation to the thesis

In addition to the research on hiker's pro-environmental behaviour (CS MF behaviour) and interest in environmental education topics for designing educational infrastructure on the trail (CS MF env.educ.), we also questioned hikers willingness to pay for hiking Mānoa Falls Trail. This case study contributed to research on willingness to pay for natural attractions in the recreation research

domain. Here we addressed funding PA and WTP decision problems identified in section 4.1 and investigated as well by other authors (Togridou et al., 2006; Reynisdottir et al., 2008; Park et al., 2010; Thur, 2010). Willingness to pay relates directly to decision making by tourists and influences management decisions of protected area managers.

4.9 Ecotourism operators in Hawai‘i

The aims of this case study were to conduct an assessment of several ecotourism operators, gain “know how” of their businesses and provide ecotour oprators with feedback information on the intergration of environmental education within their products and services. Decision problems addressed in this case study were ecotourism development and ecotourism management.

4.9.1 Introduction

In this case study we made an overview of the ecotourism industry “state of the art” in the State of Hawai‘i and evaluated some of the ecotourism operators on the island of O‘ahu. Our aim was to learn from “best practice” examples of ecotourism operators and propose a transfer of know-how on ecotourism into the Slovenian environment, where ecotourism is currently in a developing stage.

Hawai‘i has a rich natural and cultural heritage which are in most cases closely interconnected and thus cannot be enjoyed, investigated or interpreted separately. Living on one of the most isolated island chains, Hawaiians lived sustainably and coexisted with nature. The historical changes Hawai‘i faced after the 18th century had strong impacts on the government of their kingdom and cultural practices of Hawaiians. Today, the cultural heritage of Hawai‘i remains respected by everyone, people with Hawaiian ancestry being strongly connected to their past and culture. Thus respecting local peoples, their culture and customs is necessary part of ecotourism. The attractive Hawaiian natural and cultural environment offers excellent conditions for marine and terrestrial outdoor activities, which are present in the ecotourism niche.

Hawai‘i Ecotourism Association (HEA) was established in 1994 as volunteer-run, nonprofit organization with a mission to “protect Hawai‘i’s unique environment and culture through the promotion of responsible travel and educational programs, aimed at the public and visitor industry, related to ecotourism issues” (Annette Kaohelaulii in Cave, 2013). In 1994 the definition of ecotourism was formed: “Ecotourism in Hawai‘i is an economically, socially and environmentally sustainable activity that responsibly and authentically connects visitors with Hawaii’s natural and cultural landscapes resulting in beneficial exchanges among these landscapes, the host community, and the visitor” (Hawai‘i Tourism Authority, 1994). Today the Hawai‘i Ecotourism Association defines ecotourism as “nature and culture based tourism that is ecologically sustainable and supports the wellbeing of local communities” (Hawai‘i Ecotourism Association, 2013).

The Hawai‘i Ecotourism Association developed a Peer Review Process in 2006 in order to recognize ecotourism companies for their commitment to sustainable travel and at the same time assist visitors to distinguish true ecotourism operators in the market of many outdoor activities, some advertising as “eco” or “green”. This was the first step in developing the first ecotourism certification in USA. The review assessed operators’ environmental conservation efforts, cultural and historical stewardship, contributions to local community and their education and training (HEA, 2013). In 2011, the second phase of Certification for Ecotourism Operators began, leading to the recognition of the first ecotourism operators from four Hawaiian Islands. The 13 operators that passed the review were recognized by HEA ecotourism certificate for a two year period (2011–2013): three operators were awarded with the gold HEA certificate, seven with silver and three with bronze. From these, five operators were operating on the island of O‘ahu, three on Maui, and three on Hawai‘i and one in Kauai. The last operator has its branches on O‘ahu, Maui and Hawai‘i. They offer various outdoor activities: wildlife watching, biking, hiking, submarine ride, sailing, snorkeling, diving, kayaking, excursions, horse riding etc. In 2013, the Hawai‘i Ecotourism Association continued with the certification program. In the third phase the certificate renewal of companies that had already been granted inaugural certification for the period 2011–2013 were reviewed and new HEA members were invited to participate in the certification evaluation. The current certification process consists in three sections. Initially, the operator describes the natural experiences it offers and how its business contributes to conservation and local communities. The company’s sustainability plan has to be written as well. In the second secion the operator makes a self-assessment of environmental management, staff, interpretation, visitor education and marketing. In

the third phase a qualified third-party evaluator reviews the operator application and conducts a site visit in order to verify the information provided by the operator. The businesses that pass the review are rewarded by HEA with an official seal of certification, which can be used in marketing purposes and material. The certificate seal is a proof that operator meets standards of a sound and true ecotourism provider and contributes to sustaining Hawai'i's natural and cultural heritage.

In development of this case study we used as a key the published study by Jaafar and Maideen (2012), who examined the ecotourism products and activities offered in four Malasyan Islands. The authors found that the attractiveness of the environment provides the suitable location for the ecotourism related activities and attracts large number of tourists. We took the perspective that the same criteria applied to Hawai'i.

The companies working towards sustainability should implement environmental management in their objectives, goals and strategies, integrate stakeholders'' interest and their representatives in their management decisions, define financial goals and performance in accordance with environmental objectives (Vagasi, 2004). In this case study we assessed the environmental and social sustainability of the six ecotourism operators from the island of O'ahu, Hawai'i.

4.9.2 Methods

In this case study we used two qualitative research methods in order to evaluate ecotourism operators in Hawai'i on the island of O'ahu: the mystery secret shopper method and in-depth semi structured face-to-face interviews. The thesis author participated in ecotourism tours described in this section as a mystery secret shopper and afterwards interviewed one of the leading persons from the ecotourism company. We combined the descriptive and analytical research approaches, uniting their findings in order to ensure the correct interpretation of the information gained from interviews and draw more complex conclusions.

The interview used three types of questions: introductory, specification and direct (Kvale, 1996). The interview started with the introductory question: "When did your ecotourism company started and how was the interest for the ecotourism business developed?" All other questions were specific or direct questions. The semi structured interview contained 28 questions, one introductory and 27 other questions were structured according to the time and theme they were questioning: pre ecotour activities, environmental education on tours, visitors' relation and satisfaction, post ecotour activities and sustainability practice. At the conclusion of the interview we discussed main decision related problems ecotourism operators were encountering running their business. The original interview is available in Appendix I. Later in the analysis we grouped the questions in seven research fields: ecotourism in Hawai'i standpoint, environmental education on tours, biological conservation aspect on tours, involvement in the community, actions on lowering the company's impacts, sustainability practice of the company and relationships with visitors and their visitors'receptiveness. The questions, excluding the introductory question, were structured as shown in Figure 27.

The purpose of the research was explained to the ecotourism operator manager or company's owner. The purpose of the interview was explained to the interviewee as well, if that was a person other than the person who approved the conduct of the research. The face-to-face semi structured interviews took approximately 45 minutes after the secret shopping experience. The interviews were not recorded; the interviewer took notes from the interviewee answers. After the interview interviewees were thanked for their cooperation and were asked if they have any further remarks that were relevant to the topic examined. All interviewees were cooperative and talkative.

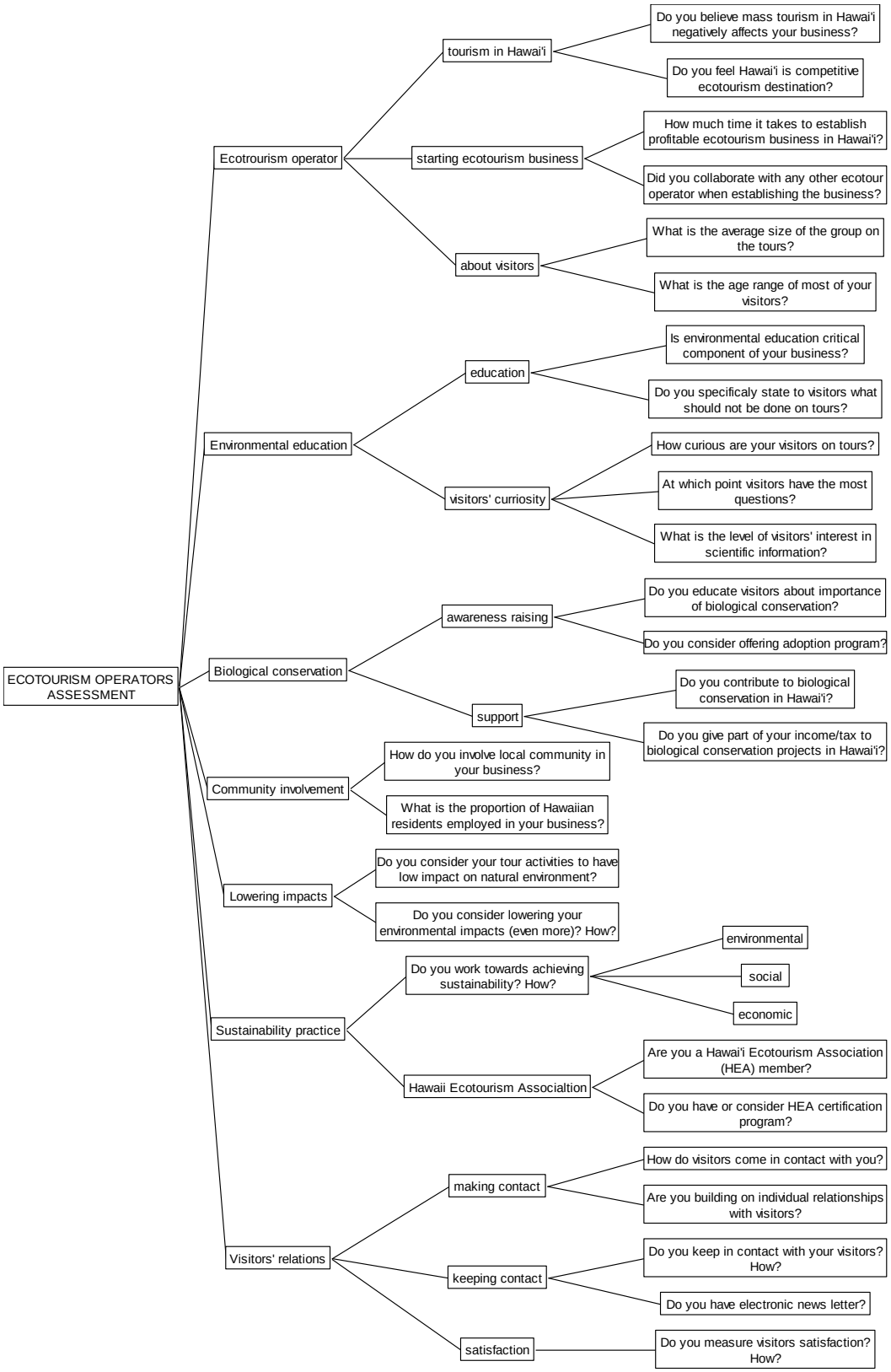

Figure 27: *Questions from the interview of ecotour operators, structured by research fields.*

Jaafar and Maideen (2012) collected data for their research by the means of surveying ecotourism operators and supported by in-depth interviews, the respondents were owner-managers actively involved in the ecotourism business, as was the case for our interviews. Another ecotourism operators' assessment study also used in semi-structured face-to-face interviews in order to obtain

accurate information on operators' safety management practices and perceived risk of visitors' injury while on the tours (Bentley et al., 2010).

In this study we did not refer to visitors as ecotourists, as being an ecotourist is much more than choosing environmentally friendly business operator or outdoor activity advertised as ecotourism. However, we were confident that some of the visitors who choose these ecotour operators were true ecotourists. The ecotourists profile and assessment was conducted in section 4.6 of this thesis.

4.9.3 Results and discussion

Overall six ecotourism operators were included in the ecotourism operators' assessment, all of which offered different experiences. Table 30 shows the operators' type, activities they offer, when the business was established, how many people were employed by the company and the maximum number of visitors on each tour. The first two operators did not have HEA certification, first one holding critical opinion towards it, and uncertain of what benefits it would bring to the business. The second operator was interested in proceeding with the HEA Ecotourism Certification program in the next available round. Operators 3–5 obtained HEA Ecotourism Certificate in 2011: ECO-marine and ECO-active holding silver certificates, ECO-submarine holding a gold certificate.

The ECO-sail operator is a supporter and partner in Dolphin SMART program (NOAA, 2013), which promotes dolphin conservation by tourism operators by applying these five behavior traits:

- **S**tay back 50 yards form dolphins
- **M**ove away cautiously if dolphins show signs of disturbance
- **A**lways put your engine in neutral when dolphins are near
- **R**efrain from feeding, touching or swimming with wild dolphins
- **T**each others to be Dolphin SMART.

In 2013 the ECO-marine operator became a part of the Responsible Whale Watch Partnership, by Planet Whale, whose guidelines are based on five principles of responsible whale watching (Planet Whale, 2013):

- Operator publicizes and uses guidelines for safe approach to whales and dolphins.
- Trip is a valuable learning experience.
- Trip meets the expectations of visitors.
- Trip minimizes the impacts on marine environment.
- Operator's own research work or support for nature conservation.

Table 30: *Ecotourism companies information.*

	Operator	**Activities**	**Established**	**Employed**	**Visitors/tour**
1.	ECO-hike	Hiking	2000	4	8
2.	ECO-snorkel	Snorkeling	2011	2	8
3.	ECO-marine	Dolphin, whale watching	1996	7	6 and 13
4.	ECO-submarine	Submarine ride	1988 in HI	?	45
5.	ECO-active	Various activities	1985	185	20
6.	ECO-sail	Sailing, dolphin watching	2000	?	40

All three recognition programs/certificate: dolphin SMART, Planet Whale Responsible whale watch partnership and Hawai'i Ecotourism Association Certificate, are renewable and issued on an annual basis, regarding reassessment and fee payment by the operators. The operators can use the logo on their web site, promotional material and on the amenities they use for their operation. Figure 28 shows all three logotypes.

Figure 28: *Logo types of the Hawai'i Ecotourism Association, dolphin SMART and Planet Whale Responsible whale watch partnership.*

4.9.3.1 Ecotourism operators' characteristics, performance and attitudes

The ecotourism operators' assessment was conducted through the in-depth semi structured interview and secret shopper experience. The results on operators characteristics were revealed in the interview, performance practices and attitudes towards the natural and social environment of Hawai'i, biological conservation and visitors are presented in seven subsections (indicated in italic font), each based on at least two sub sections containing two or three questions from seven research fields except community involvement and lowering impacts, which have two questions.

4.9.3.1.1 Ecotour operators

Tourism in Hawai'i

Four ecotourism operators said mass tourism does not negatively affect their business; one pointed out that that applies "as long as we are able to control it". Another operator expressed the opinion that mass tourism negatively affects the environment and consequently ecotourism as well. Another operator asserted that mass tourism affects their business indirectly, mainly by degradation of the land and sea, degradation of the coral reefs and increasing amounts of rubbish.

Three operators found ecotourism to be a competitive industry in Hawai'i. One operator said it is competitive in terms of location and "not really competitive" in terms of ecotourism industry and quality of the services. Two operators believed ecotourism could be more competitive but it was not, one of them added "I feel ecotourism should catch on more here. We should be in the forefront of ecotourism lands. (Hawai'i is on medium to low on a scale of good ecotourism destination.)"

Starting an ecotourism business

The question on how much time is needed to establish profitable ecotourism business two operators answered at least one year, one answered two years similar to any start up, one two to four years and shared the same opinion that establishing profitable ecotourism business takes years.

None of the ecotourism operators collaborated with any other operator at the time of starting their business. Only one company shared the links and experience with the companies they admired from abroad and looked for support within the Hawai'i Ecotourism Association. Another said they were forerunners in ecotourism and that others looked after them. The third said they have a policy not to collaborate with others from the same industry.

About visitors

The average size of the visitor group differs from ecotourism to ecotourism operator, based on the activity or tour type they offer and capacity of the vehicles used for the tours. The smallest group number indicated in the interviews was six visitors, although at times tours contained less visitors due to situational factors. The maximum number of visitors was 48.

The average visitors' age groups that choose ecotourism operators assessed in this study varied from activity to activity. One operator said he has visitors of all age groups, the remaining five operators indicated the age window in which most of their visitors were. Two operators said most of their visitors were in their forties. The overview of all answers indicated that the most visitors who decided in favour of ecotourism activities on O'ahu were between 25 and 55 years of age.

4.9.3.1.2 Environmental education

Education

All six ecotour operators stated that environmental education was a key or critical component of their business. One operator said "environmental education is number one, beside safety and having a good time". Another operator said "educational aspect is good: as more people have more education change in behaviour occurs". The third operator believes that the more he and his staff explained to people about their business environmental choices, better chances were that visitors would choose the same company again. All tours offered information through narrations on environmental history, sustainability of the land and sea and conservation of Hawai'i natural and sometimes cultural heritage.

All operators specifically stated to their visitors what should not be done while on the tour. All three operators operating on the sea explicitly explained acceptable behaviour around sea turtles and dolphins and stated the animals should not be approached too closely, touched or fed. All of them also explained proper behaviour around the reef as well (no touching of the reef, no walking, standing in the water allowed only on the sand). The hiking tour operator used the phrase "take only photos, leave footprints" to explain the visitors how to behave and one marine operators used "take only memories, leave only bubbles".

Visitors' curiosity

All of the operators made an introductory speech at the very beginning of the tour, passing on basic information about the tour schedule, expected wildlife encounters, safety and required visitors' behaviour. Thee operators said their visitors' had many questions. One that concentrates on small visitors' groups said the whole experience was very interactive, questions arising all the time. One operator said his company visitors were well travelled, with different jobs and interesting hobbies thus they learn a lot form their visitors too. The exception was a small group operator who commented that occasionally people seem uninterested in verbal communication, wanting to focus on the (audio) visual experience and pure enjoyment of nature. At other times their visitors were very curious, posing all kinds of questions.

When asking at which time of the experience visitors have most of the questions we obtained different answers. All operators said most of the questions arose during the tour, some before and some afterwards. One operator considered that children have questions all the time, much more beforehand to fill their expectations before the actual experience, alternately, adults have most of their questions after the experience (e.g. entering the water).

The interest of visitors in scientific information was different and varying to individual guests and ecotourism experiences. One operator said there are a lot of scientific questions asked in common language, another said the interest of the visitors was very high. One operator said the visitors sometimes state they choose their company because they have a "marine scientist on board" and they want to hear the information from an expert in marine biology or due to their children's interest in science.

4.9.3.1.3 Biological conservation

Awareness raising

Four ecotour operators educated their visitors about the importance of biological conservation. One company explained about the efforts being made in Hawai'i and what are people doing to preserve the environment. Another said they had educational speech when they observed dolphins. The third operator explained that his company has not developed the land they own leaving it in the state Hawaiians used it traditionally. They also passed the message on to the visitors that they could contribute through their pro-environmental behaviour in preserving the natural beauty of Hawai'i. The fourth operator said they choose to take low visitors numbers on a tour as a wise conservation approach, so that the impacts on the environment become minimal and the experience more authentic. Two ecotourism operators did not directly educate visitors about the importance of biological conservation, but mentioned it occasionally. One explained that people on vacation do not want to hear adverse topics, worries concerning wildlife management problems and possible extinction of species. Five of the ecotour operators did not consider offering an adoption program for wildlife species. One company maintained an adoption program in the past, but no longer offers it.

Support

All the ecotourism operators contributed to the biological conservation of Hawaiian natural heritage. The means of support were: education of people concerning the importance of biological conservation, making sure visitors behave properly with regard to the environment and safety issues while on the tour, involvement of the operator's staff on various boards dealing with local conservation and issues related to the environment, by being a supporter of the Dolphin SMART program and through organizing various educational outreach programs for local people. Two of the operators contributed to biological conservation projects in Hawai'i also by donations; one gives a yearly contribution to Nature Conservancy, another donates to the University of Hawai'i and other organizations that aid people in need, for example, Habitat for Humanity, Easter Seals and Make-A-Wish Foundation. This operator expected his employees to volunteer five hours per month for a local organization or event of their choice. One operator offered a local stewardship program, community work service, facilities for a local hula (traditional Hawaiian music and dance) group and community events. They had also adopted elementary schools and offered support for Big Brothers Big Sisters organization. All of the operators occasionally offered free tours for various stakeholder groups and research purposes as in the case of this thesis.

4.9.3.1.4 Community involvement

All ecotour operators employed Hawaiian State residents, the percentage of employees with Hawaiian ancestry varied from none to 90 %. One of the operators said they would love to have more local people involved in their business but very few apply.

Three ecotourism operators directly involved the local community in their business operation. The first occasionally provided free tours for children in need; had discount prices for school groups, and their employees were involved in local NGO's, nonprofit organizations and projects. The second had an educational outreach program for local people while the third operator, who employed 90 % of local people with Hawaiian ancestry, had many community based programs and supported the community in various ways. Two of the operators did not involve the local community in their business, the last offered on line marine biology classes, which were free to anyone who registered.

4.9.3.1.5 Lowering impacts

Five ecotour operators considered their tour activities had a low impact on the natural environment. Some were very cautious about their visitor's behaviour and emphasize the importance of behaving pro-environmentally and respectfully towards the environment and local culture. One operator said their operation does not have low impact on the environment, but that they will consider making improvements as technology advances. Five operators said they are considering performance improvement of their business, so that it would become even more sustainable and have lower impacts; three were planning investments in more environmentally friendly vehicles. One operator said its business was sustainable from the creation.

4.9.3.1.6 Sustainability practice

Four operators were members of the Hawai'i Ecotourism Association, three held the HEA Ecotourism Certificate. Two operators were considering joining the certification program in the future, within the next round certification. One operator had been a HEA member in the past, but was no longer and did not intend to undertake the certification process as in his opinion he was "skeptical about the HEA being qualified to qualify my business".

All ecotour operators thought their business was working towards all three pillars of sustainability. Those three that held the HEA Certificate had a Sustainability Plan which was required for the process of ecotourism operator assessment for the HEA certificate accreditation. One ecotour operator said it was essential to make sure money gained by their business stays on the island, some of them commented that resource conservation was essential as it provided their business with the attractive natural environment they operated within and held attraction for their clients (wildlife, natural beauty). They were aware that conservation must be proactive, so the resources will be available for their business operation in the future. In terms of social sustainability, five out of six operators provided direct benefits to the local environment and communities they worked in. Operators emphasized education of their employees and visitors as well as minimizing impacts by education and examples of best practice.

4.9.3.1.7 Visitors' relations

Making contact

The clients of ecotour operators came in contact with the ecotourism business by numerous ways, which included: hotel personnel, hotel vendors, the Internet, travel agencies, travel guides, newspaper articles, magazine write ups, consumer print media, travel writers and the media (films, photo-shoots, and commercials). One operator said their visitors also came from optional tour companies. Another indicated that their clients came mostly through word-of-mouth on the island and TripAdvisor®, the web portal on which travelers are able to post their reviews and opinions about accommodation, restaurants, tourism locations, travel experiences and other travel/related content.

Five operators said they were building on personal relationships with their customers. The operator said they are trying to build personal relationships with customers, although due to the larger number of people in the group, it was not possible to do so with all visitors, only with some that showed particular interest in the educational component of the tour or through conversation with the tour guides. The operator offering a variety of activities and employing the largest number of people said their employees were trained to present themselves in the introduction and work on building personal relationship withclients. The operators who had up to eight visitors per tour said they and their guides remembered the names of all of the visitors by the end of the tour.

Keeping contact

Four operators remained in contact with their visitors by Facebook page, email, Skype or blog and one by specially designed interactive web site. The fifth operator stayed in touch with some visitors by email particularly with those that show interest in keeping in contact after the tour. The sixth operator did not stay in contact with customers. None of the operators has an electronic newsletter, which would be available to people who already took the tour and wished to obtain occasional news on the activities in Hawai'i.

Visitors' satisfaction

Five operators measured their visitors' satisfaction by some means. Only one company conducted a visitors' satisfaction survey and made monthly reports as a part of the management process and used that information for long term planning and management decisions. One small business operator personally asked clients about their satisfaction with the experience. The other three companies used: suggestion card, comments, questionnaires, mystery shoppers, personal contact, concierge's desks, TripAdvisor®, and likes on the Facebook page.

4.9.3.2 Secret shopper experience

The secret shopper method helped the thesis author envision the ecotourism experience in Hawai'i and enabled interview results to be interpreted accordingly to the context of the ecotourism operators' business. All tours took between 2–3.5 hours from the start to completion.

On all ecotourism tours the visitors seemed interested and enjoyed the experience. The vast majority of the visitors were from USA and Canada, ECO-hiking tour taking all Japanese visitors on the tour. More enthusiasm was noticed from visitors in small groups. All visitors were on time for the tour start, during the tour some visitors loudly expressed their opinion about visiting Hawai'i to people they met on the tour and reasons for choosing a particular ecotourism tour. It appeared that visitors found social interaction with other visitors and even tour guides as an important part of the experience. This observation corroborates with Lu and Stepchenkova (2012) in finding that ecotourists enjoy meeting "great people traveling through from all over the world". Also, this vivid interaction between visitors who met on tour might be due to cultural reasons or situational factors not assessed in this study. On all six tours the author observed visitors' enjoyment during the tour and satisfaction after it.

All ecotourism operators showed respect and kindness to the visitors, a way of Hawaiian "aloha" (attitude or way of life where love, respect and positive attitude towards all are present) and were available for additional questions and information before, during and after the tour. The level of stewardship was very high on all tours, showing the professional approach ecotourism operators had towards their customers and contributing to the quality of the ecotourism experience.

The ECO-operator who put the most emphasis on environmental education on the tour and added the greatest personal observation was the ECO-hiking operator. The tour was filled with interesting information on the environment where it took place and even demonstrations on invasive plants. Perhaps the small group size (7 hikers) added to the quality of the tour experience. Hiking is perhaps the most common outdoor activity anywhere in the world, thus not being something you can do only in Hawai'i and some other places (e.g. dolphin watching, sailing, snorkeling). This indicates that the guides attitude and interest in attracting visitors' attention and amusing them with storytelling might be more important than the ecotourism activity itself.

On some tours the storytelling on environmental education did not have sufficient interaction which connected the all parts of the experience (in introduction at the beginning of the tour, during the tour, end of the tour). This could be improved by having standards and staff training in terms of teaching them to attract visitors' attention and amuse them with storytelling or/and demonstrations.

The secret shopper method was implemented only once per operator, in this situational factors had most probably influenced the overall experience (e.g. seeing wildlife or not or naturalist

interpretation) and conclusions the author derived from the experience. The overall impression after the secret shopper experience and the owners-managers interview was that all assessed ecotourism operators were acting responsibly. Thus, we concluded that they all present examples of best practices for ecotourism in Hawai'i regardless of whether holding a Hawai'i Ecotourism Association Certificate. However, we believe that the HEA certification process puts the operator on a higher level, by having them obtain sustainability plan and assessing various areas of business performance and management. In the future we proposed that all tourism operators who market as "eco" or offer "ecotourism products and services" have to obtain the HEA Certificate or they should be banned from using the work ecotourism of prefix eco in order to avoid greenwashing and misleading visitors to Hawai'i. In order to achieve this goal, the policy makers would have to be involved in the process of developing ecotourism in terms of writing the rules of who can market "ecotourism" in the legislation at the state level and collaborating with Hawai'i Ecotourism Association.

4.9.4 Conclusion

4.9.4.1 Ecotourism operators' assessment overview

Many authors have agreed that mass tourism negatively affects Hawaiian natural, social and economic environments (Liu and Var, 1986; Shera and Matsuoka 1992; Craik, 1995; Darowsky et al., 2006) although the majority of ecotourism operators did not find it negatively affecting their business. Some had concerns about mass tourism impacts on the natural environment which attracts visitors to Hawai'i and is a precondition for "travelling to relatively undisturbed or uncontaminated natural areas", as stated by one of the first ecotourism definitions (Ceballos-Lascurain, 1987). The ecotourism industry in Hawai'i is competitive and according to some operators should become much more competitive in the future. It takes at least one year for an ecotourism start up venture to become profitable, the majority of operators found this time to be longer. The startups in ecotourism should have some support from others with similar experiences. Ecotourism in Hawai'i is not currently a competitive industry, showing future space for its growth and improvement of offer quality. Visitor groups on ecotourism activities varied according to the experience characteristics and vehicle capacities, thus we discovered that it would be more appropriate to assess the guide-visitor ratio. The majority of visitors who choose ecotourism are between 25 and 55 years of age.

Environmental education was important part of ecotourism businesses in Hawai'i. All the operators were passing environmental information to their visitors, making their tours educational and concurrently interactive. Emphasis was also placed on educating visitors concerning appropriate behaviour on the tours trying to keep both clients and wildlife safe and making the lest impact possible on the environment. Visitors that choose ecotourism operators assessed in this case study showed a high level of curiosity and interest in scientific information regarding experiences encountered on the tour.

Four operators educated their clients on the importance of biological conservation, none offered an adoption program. We think that ecotourism experiences offer ideal circumstances to increase people's interested in biological conservation and consequently in supporting wildlife research, conservation projects and institutions. For example, the Hawai'i Wildlife Fund offers adoption of Hawaii's endangered and protected species (sea turtles, monk seals, dolphins, whales, or coral reefs). With regard to ecotourism, the Pacific Whale Foundation, who also holds a Hawai'i Ecotourism Certificate, offered an adoption program for whales, dolphins and turtles. All of the ecotourism operators contributed to the biological conservation of Hawaiian natural heritage by educating visitors and various other activities. Two operators also contribute by donating money to NGO's which conduct nature conservation projects.

The integration of some ecotourism operators with the local community is very high. However, others do not involve the local community in their business at all, which is contary to one of the ecotourism principles, saying that social sustainability must be achieved by providing benefits for local communities.

Five ecotour operators believe their business activities had low impacts on the environment, the other five are considering ways to lower their environmental impacts. Half of the ecotour operators held the Hawai‘i Ecotourism Association Certificate and have a Sustainability Plan for their business performance. All of the operators held the opinion that their business worked towards environmental, social and economic sustainability.

Visitors get in contact with ecotour operators by many ways. It was obvious that TripAdvisor as well as world-of-mouth have strong effects on peoples' decision making regarding the choice of the activity and operator they decide on. The majority of the operators maintain contact with their visitors, mainly by modern information technology and the Internet. Visitors' satisfaction was measured by five ecotourism companies by very various means; only one company had developed a visitors' satisfaction monitoring questionnaire and uses that for visitors' satisfaction evaluation and long term planning.

According to Jaafar and Maideen (2012) the most popular ecotourism activity on the Malasyan Islands was snorkeling. We took the understanding that snorkeling was also one of the most popular activities in Hawai‘i as well, since many tourism companies offered combination tours which included a snorkeling experience. Also a top destination and a must do in Hawai‘i is a visit to Hanauma Bay Nature Reserve, which attracts above 3000 visitors per day, who all come to experience snorkeling and admire the coral reefs in the protected waters of the bay. From the six ecotourism operators assessed in this study, one was a snorkeling operator and two others also integrated snorkeling into their tours. Overall, half of our sample had snorkeling as a part of the ecotourism experience.

All ecotourism operators expressed concern about conservation of the Hawaiian environment, as all of them were aware that their business depends on the attractiveness of the place. If everyone involved in the Hawaiian tourism industry would held the same concern, Hawai‘i would be more sustainable and more oriented towards conservation of its natural and cultural heritage. The same concern was identified in the ecotourism operators study from Malaysia (Jaafar and Maideen, 2012).

4.9.4.2 The state and fate of ecotourism in Hawai‘i

In depth interviews offered a detailed investigation of environmental sustainability for ecotourism operators' and ways environmental education, biological conservation and the community were integrated within their business.

Our results indicated that ecotourism operators on O‘ahu assessed in with this case study were run by professionals who all share a passion for nature conservation of the Hawaiian Islands. All of them realize that their business operation depends on the wellbeing of nature in Hawai‘i, since their customers are interested in a unique, unforgettable and educational outdoor experience in the beautiful natural environment of Hawai‘i. We found that the HEA certification program was valued by ecotourism operators, which indicated that the Hawai‘i Ecotourism Association contributed to the development and shaping of the ecotourism industry in Hawai‘i.

In the year 2011 DBEDT identified 65.5 % of repeaters in Hawai‘i, that is, tourists that had already visited Hawai‘i in the past (DBEDT, 2011). This indicated visitors' satisfaction with Hawai‘i as tourism destination is very high. Undoubtedly, one of the key reasons is the unique natural beauty of the Hawaiian Islands, the unique combination of natural and cultural heritage, favorable climate with pleasant weather conditions and ample outdoor activities. Thus, we argued that tourism policy makers should invest into more sustainable practices for tourism in Hawai‘i, by financially supporting organizations that work towards preservation and conservation of the natural and cultural heritage of Hawai‘i.

Based on the descriptive observations gained from the secret shopper methodology we concluded that all ecotourism experiences, assessed in this research, were actually uniting several different nature based activities. Environmental education and information on Hawaiian culture was present in all ecotourism activities. The nature conservation in Hawai‘i was also addressed on all ecotours.

For instance, aside from environmental education ecotourism experiences united other activities as well: ECO-snorkel: snorkeling, marine biology class; ECO-sail: sailing, snorkeling, dolphin watching, environmental education; ECO-hike: hiking, bird watching, environmental education; ECO-marine: open sea ride in a marine vessel, dolphin and whale watching; ECO-submarine: submarine ride, underwater marine world observation; ECO-activities: offers horseback riding, jungle expedition, sea pond excursion, hula (Hawaiian traditional singing and dancing) class and many more. Food in the form of full lunch or diverse snacks was part of the package on snorkeling, sailing, dolphin and whale watching ecotours.

Our investigation lead us to conclude that most favorable ecotourism operator offered experience for small groups, was owner-operated or family-operated, implemented storytelling on the natural and cultural heritage of Hawai'i with an emphasis on environmental education, cared for the wellbeing of the environment and wildlife, added a personal note of its guides and employees and finally strived for the quality of the service and satisfaction of all visitors. These characteristics defined the ideal ecotourism operator, who acts as a steward of the environment it lives and workedin, respected local culture and passed his attitudes to his visitors by environmental education and good example.

Our findings correlate with those of Jaafar and Maideen (2012), who stated that the most appropriate ecotourism business model for small and medium island chalets would be a "small local business community". We argued that the same should apply for all ecotourism businesses; regardless of the location wherein they take place.

The coordination among stakeholders directly and indirectly involved in the ecotourism industry should be encouraged and enhanced in order to provide better opportunities for ecotourism recognition in Hawai'i and its development. Networking between supporters of ecotourism from various sectors, profiles and backgrounds should be the base for making joint efforts towards better ecotourism conditions, certification and niche marketing. Our study outcomes supported the findings of Jaafar and Maideen (2012) from Malaysia that in Hawai'i there is also a clear need for the government to contribute to developing State's ecotourism policy.

4.9.4.3 Visitors' satisfaction with ecotourism

Tourists' satisfaction is a domain in tourism industry research which has attracted the attention of researchers over the last few decades. Obviously visitors' opinion and "take home message" influences very much to the industry's operation and success. Page and Dowling (2002) argued that satisfaction was also essential for the long term success of ecotourism products.

We believe that all ecotourism operators, with the exception of the one that uses visitors' questionnaires on a monthly basis for assessment of their work and long term planning, should devote more attention to their visitors' satisfaction level. For instance, the Department of Business, Economic Development and Tourism releases quarterly reports on Hawai'i visitors' satisfaction ratings. This indicates the level of concern the Hawaiian government has towards visitors' satisfaction monitoring and their influence on management decisions at the State level. Visitor Satisfaction and Activity survey "measures the opinions of visitors, regarding their satisfaction with Hawai'i as a visitor destination" (DBEDT, 2013d). The questionnaire contains 26 questions, over six pages and is also available online. The statistical analysis was made based on the assessment of visitors from four major market areas: US West, US East, Canada and Japan by mailing visitors after they have returned home from their trip to Hawai'i. The respondents were selected based on completed Domestic In-Flight Survey forms for US citizens and Departure Survey forms for international visitors. The response rate for the 2012 first quarter report, the period our research conducted at Mānoa Falls Trail, was from 28.3 % for US visitors and 34.3 % for Japanese and Canadian visitors, taken from a total of 4022 questionnaires.

The Visitors Satisfaction Monitoring Report contained indicators: overall satisfaction of visitors' most recent vacation to Hawai'i, exceeded expectations, likelihood to recommend Hawai'i, likelihood to revisit Hawai'i, not likely to revisit Hawai'i, reasons for not revisiting Hawai'i. The report

also monitors: individual island experience, trip planning cycle and information source for trip planning.

We suggested that the visitors' satisfaction on ecotourism experiences could be assessed at the level of HEA, by applying the same evaluation and monitoring system to all HEA certificate holders and eventually all businesses in Hawai'i that market true ecotourism products and services. This would allow them to obtain quality data for the quantitative and qualitative overview of visitors' satisfaction levels regardless of which ecotourism activity they choose in Hawai'i and would contribute to a better understanding of visitors' desires. Ultimiately, this would allow the improvement of ecotourism operators' performance and consequently attract more visitors to choosen ecotourism services and products. We believe the funding for this monitoring should be awarded by the Hawai'i Tourism Authority, operating under DBEDT, as ecotourism in Hawai'i represents an important niche for tourism development with minimized environmental and social impacts, as well as contributions towards preserving Hawaiian natural and cultural heritage.

The new qualitative method for evaluation of ecotourists satisfaction of an ecological experience has been recently developed by Lu and Stepchenkova (2012) on the basis of ecotourists TripAdvisor® comments on their experiences in Costa Rica. The authors developed a list of 26 satisfaction attributes which were structured into seven categories: ecological setting, room, nature, service, food, location, value for money. We found this innovative method suitable and proposed a modest change in attributes used and added new attributes in order to measure visitors' satisfaction on ecotourism tours as well. We proposed 20 attributes structured into five categories, out of which 12 were the same as in the original study, 2 are modified and 6 were new attributes.

The categories and attributes for measuring visitors' satisfaction with ecotourism experience, the number in brackets after the category of attributes indicates number of attributes in it:

1. Ecotourism experience settings (4):
- Vehicle and/or equipment amenities – modified attribute
- Ambience
- Ecofriendliness
- Other guests

The category Ecotourism experience settings evaluates visitors' satisfaction with the vehicle or equipment amenities, ambience in which tour took place, ecofriendliness of the whole experience and the satisfaction from the presence of other guests they met on the tour. Lu and Stepchenkova (2012) found that ecotourists enjoyed meeting other open minded and environmentally friendly people.

2. Nature (4):
- Nature-based activities
- Natural attractions
- Weather
- Seeing wildlife – new attribute

In the category Nature, the satisfaction of a nature-based activity, natural attractions seen on the tour and weather conditions was measured, as originally by Lu and Stepchenkova (2012). We added the attribute "Seeing wildlife", since many of the ecotourism operators in Hawai'i promote their tours with the possibility to see and observe wildlife (most commonly turtles, dolphin, whales, tropical fish and corrals). Some operators also offered a free tour, if the wildlife was not seen while on the tour. We hold the standpoint that actual seeing wildlife fulfills expectations and influences the overall satisfaction with the ecotourism experience.

3. Service (4):
- Customer service
- Tour/guide service
- Extra service
- Reservation process

Four attributes for evaluating visitors' satisfaction with an overall service from the ecotourism tour are the same as in the methodology by Lu and Stepchenkova (2012), which originally had six attributes.

4. Food (4):
- Food quality
- Food quantity – new attribute
- Food service – new attribute
- Local products – new attribute

As the four out of six evaluated ecotourism operators in Hawai'i offer a meal or snack during or after the tour, we argue that aside from quality, food quantity, service and origin influence the visitors' satisfaction as well.

5. Value for money (4):
- Tour rates – modified attribute
- Group discount – new attribute
- Would do it again – new attribute
- Food and drinks

Finally, the last category groups attributes which evaluate the value for money people paid for the tour. Since there are repeaters in Hawai'i, we added attribute "Would do it again". Also, when travelling as family with children paying the entire price for all tour participants can be costly and is some cases unaffordable. We noticed that some ecotour operators in Hawai'i offered various prices for families with children and group discounts, thus we added the attribute "Group discount".

The ecotourism operators' assessment revealed four out of six operators' measured their visitors' satisfaction by some means. As everyone used their own strategy or method in measuring visitors' satisfaction, it was difficult to compare or monitor the satisfaction levels due to the operators' related changes. Due to that we argued that visitors' satisfaction attributes for ecotourism operators proposed in this section could be used to design a single questionnaire, based on which ecotourism operators could adjust their services and improve visitors' satisfaction and with that increase the probability that future repeaters in Hawai'i will choose their service again.

4.9.5 Relation to the thesis

This case study confirms H4, saying that ecotourism requires a proper management strategy and regime. All ecotourism operators had a clear managing regime, knowing exactly why and how they attracted visitors and provided quality ecotourism services. In this case study we also showed that environmental education had important role in ecotourism and it created more opportunities for ecotourism. Thus, our research findings support H5.

5 DISCUSSION - GENERAL

5.1 Overview of contributions of the thesis

The addressed research problem was how to achieve sustainability in protected areas through environmental education and ecotourism by applying suitable decision support. Here, we present how the results of the nine case studies conducted under this thesis research achieved and contributed towards the wider picture of sustainability in protected areas. The research conducted within this thesis contributed to the pool of knowledge on sustainable development in protected areas in the areas of decision support, environmental education and ecotourism. The CS DP in PA (section 4.1) provided a review of decision problems in protected areas and approaches towards solving them at the macro level. Therefore, it contributes to the pool of knowledge on decision making and decision support in protected areas.

Figure 29 shows how each of the other eight case studies contributed to sustainable development in protected areas. The dashed colored arrows indicate the area in which the case studies contribute to the sustainable development in protected areas: decision support, environmental education and ecotourism.

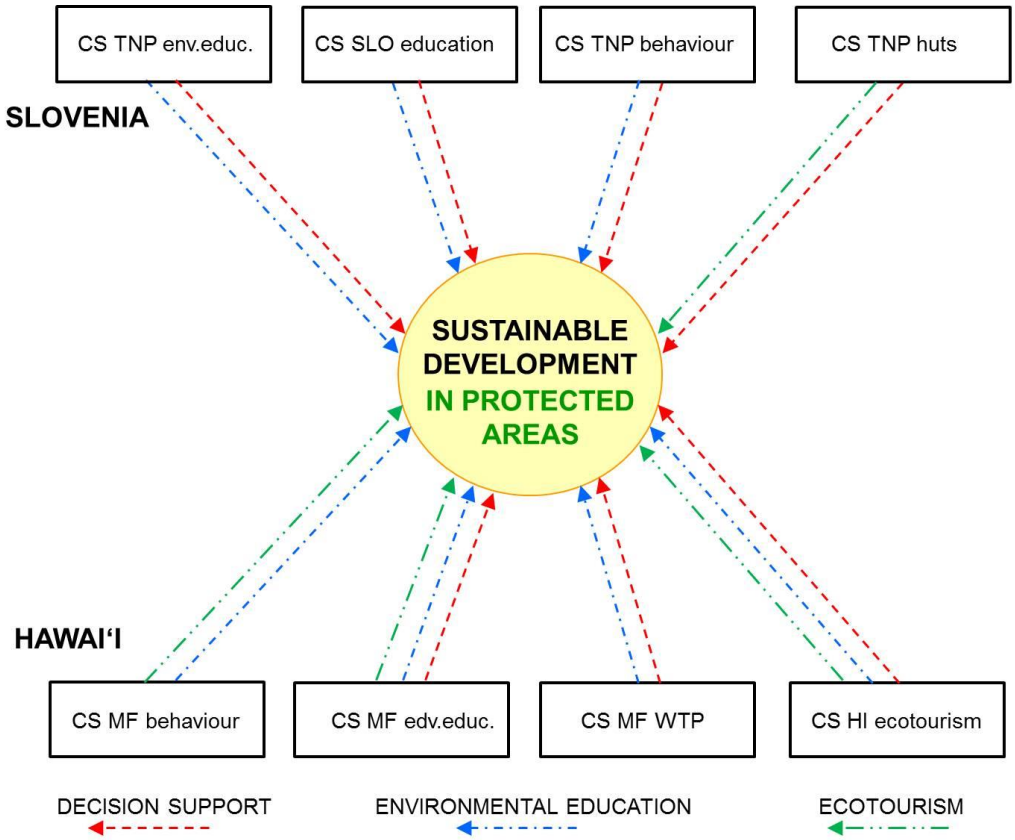

Figure 29: *Case studies' contributions to sustainable development in protected areas.*

Our research findings demonstrate that decision support can be successfully applied in various protected areas, that environmental education is a very important component for protected area management and that ecotourism activities promote environmental education, have lower impacts on the environment and contribute to the general sustainability of the environment in which they are implemented.

Although our research focused on the Triglav National Park in Slovenia and Mānoa Falls in Hawai'i, some of the lessons learned can be transferred from one environment to another and some may be applied to other protected areas as well. From Figure 29 it can be seen that environmental

education was addressed in seven case studies: three in Slovenia and four in Hawai'i. We showed that environmental education is multilayered, targets various stakeholder groups and impacts on one's behavioural intentions:

1. In CS TNP env.educ. we developed indicators for the assessment of environmental education in the park and evaluated indicators in terms of their importance. The outcomes from this case study can be used by TNP managers: to deliberate future decisions on the implementation of environmental education activities in the park, to help staff in planning and organization of these activities, and finally to argue for future funding needed for the educational mission of the park.
2. In CS SLO education we developed a decision support tool in order to test the learning impact of educational workshop participants. The tool is applicable for various stakeholder groups and educational events; it is easily modified as desired. We showed that educational events in highschool present an effective way for environmental information perception of highschool students and may successfully contribute to the environmental education of event participants.
3. In CS TNP behaviour we showed that the level of education impacts on ones': pro-environmental behaviour at home, willingness to pay for environmentally friendly goods and services, and support for nature conservation. Our results indicated that formal education enhances environmental awareness and promotes pro-environmental behaviour.
4. In CS MF behaviour we showed that the level of education has a significant impact on a range of pro-environmental behaviour: separating waste, donation toward nature conservation projects, knowing what the term ecotourism means, and donating money for the wellbeing of Mānoa Falls.
5. In CS MF env. education we identified a high level of interest in learning about nature while hiking. We presented recommendations for environmentally friendly educational infrastructure design with the use of QR codes and mobile learning techniques made from materials that allow for an extended lifespan in a humid rainforest environment.
6. In CS MF WTP we investigated hikers' willingness to pay for hiking at Mānoa Falls. In terms of education we found that the most generous hikers had graduate or a professional degree. Many hikers expressed greater willingness to pay if the money would go towards nature conservation.
7. In CS HI ecotourism we investigated how environmental education is incorporated into ecotourism products and services. All six ecotour operators that participated in this research confirmed that environmental information was integrated into their business activities, making their tours both educational and interactive.

Figure 29 shows that ecotourism was addressed in four case studies: one in Slovenia and three in Hawai'i. We demonstrated that ecotourism was more environmentally friendly than conventional tourism, the major form of tourism general visitors aim for, and thus contributes to the implementation of sustainable development in protected areas:

1. In the light of promoting ecotourism in the mountains we developed the decision support model that promotes sustainable mountain huts infrastructure (CS TNP huts). The decision rules of the developed model for the assessment of mountain huts infrastructure were based on minimizing the huts impact on the environment.
2. At Mānoa Falls Trail we identified ecotourists and found self-defined ecotourists behave more pro-environmentally than general visitors. From this perspective we indirectly showed that ecotourism is more sustainable than conventional tourism.
3. Furthermore, we proposed that educational infrastructure should be installed along the hiking trail, which would offer environmental education opportunities for hikers as well as make Mānoa Falls more suitable for ecotourism activities.
4. In CS HI ecotourism we conclude that ecotour operators respected all principles of ecotourism and in this way contributed to the natural and social environment they work within. Consequently, they promote the sustainable development of the tourism sector.

Decision support was provided in seven case studies. Within two case studies we developed multi attribute decision support models applying DEX methodology (CS TNP huts, CS SLO education). In CS TNP behaviour we provide five suggestions for managers of protected areas in the Alps. Decision support in CS TNP env. educ. was achieved by providing TNP managers with a workable set of indicators for environmental education. CS MF env.educ. and CS MF WTP outcomes have applicable information for Na Ala Hele staff, who manage the Mānoa Falls Trail. Finally, in CS HI ecotourism we provided feedback information to ecotour operators based on the secret shopper evaluation. Based on our experience and the study of Lu and Stepchenkova (2012), we proposed the use of 20 attributes in order to measure visitors' satisfaction on ecotourism tours. The decision support we provided is aimed to aid the decision process of different decision makers (protected areas managers, educational workshops organizers, mountain huts managers and ecotourism operators). Some outcomes from these case studies can be used by the Triglav National Park and Na Ala Hele managers in deliberating future decisions on the implementation of environmental education activities in their protected area, staff engagement in planning and organization of educational events, and finally to augment future funding for the educational mission of the park. The outcomes from the research conducted within this thesis has proved that environmental education plays important role in protected areas in Slovenia and Hawai'i and is an integral part of ecotourism. The research outcomes on self-defined ecotourists and the assessment of ecotourism operators in Hawai'i are important for understanding the current state of ecotourism and the future planning and development of the ecotourism industry in Hawai'i.

5.2 Thesis outcomes - connecting the case studies

The multidisciplinary approach of the thesis resulted in the pool of nine case studies, one based on the literature review, four from the research conducted in Slovenia and four from the research conducted in the State of Hawai'i. The research undertaken in Slovenia was mainly oriented towards hypotheses from the research focus 1 (Protected areas – decision problems) and research focus 2 (Environmental education sustainable development in protected areas). Research from Hawai'i was ecotourism oriented, contributing to the hypotheses from research focus 3 (Ecotourism – decision support models) and 4 (Environmental education – ecotourism) (Figure 31). We proved all six theoretical hypotheses each by at least two case studies, through the use of qualitative and quantitate methods and with the aid of two statistical programs (R and SPSS).

Here, we discuss the implications of the thesis outcomes by connecting the results obtained from various case studies.

We made an overview of the 119 articles published in the last decade in the knowledge domains of "decision making" and "decision support" in "protected areas" (CS DP in PA, section 4.1). We identified 62 decision problems occurring in terrestrial, marine, coastal and wetland protected areas, and structured them in twelve decision group's categories according to their characteristics: "development, management, funding, monitoring, alternatives, participation, knowledge, understanding values, tourism, conservation, land use and climate change". Figure 4 shows further aggregation into four groups: organizational, human dimension, activities and natural uncertainties. This is a novel classification of decision problems in protected areas and makes a contribution to the pool of knowledge in protected area management domain.

The high number of decision problems identified in categories "management" and "conservation" indicated the importance of the conservation role protected areas have, which is the main function of protected areas according to the old paradigm. The Management category had highest frequency of decision problems addressed, stressing the importance of management approaches and strategies applied in governing protected areas worldwide. From the list of decision problems in protected areas, it was obvious that involvement of all stakeholders is essential; the co-management approach is leading the way towards future management options for protected areas. Furthermore, in this thesis we addressed 12 decision problems (section 4.1.5.2) within the following eight case studies.

In order to prove theoretical hypothesis H2 we built a multi attribute decision support model for the assessment of mountain hut infrastructure in terms of its environmental sustainability (CS TNP huts, section 4.1). The model can be used to assess and compare the sustainability of the existing huts and to evaluate potential infrastructure improvements by comparing various alternatives. One of the anonymous reviewers from the Journal of Environmental Management stated: "The model can be seen as original contribution, since the model is unique per se". Additional verification and adaptation of the model is expected to be undertaken in collaboration with the Alpine Association of Slovenia, within future infrastructure improvements of selected mountain huts in Slovenia.

In this thesis we tried to address environmental and socio-economic dimensions of sustainability. We achieved that by assessing various decision problems in protected areas and particularly in the assessment of ecotourism operators in Hawai'i, which are expected to contribute to the wellbeing of local people as well as the natural environment they operate within. The concept of environmental sustainability was addressed in the case of mountain huts (CS TNP huts, 4.3). Environmental and social sustainability were addressed with regard to managing and operating an ecotourism business in Hawai'i (CS HI ecotourism, 4.9). Economic sustainability was addressed by assessing a willingness to pay for hiking at the Mānoa Falls Trail (CS MF WTP, 4.8).

We established research collaboration with Triglav National Park, Slovenia and Na Ala Hele, Hawai'i, and through which the goal to conduct research that will also have applicable value for protected area managers was fulfilled. In December 2009, the research agreement between the University of Nova Gorica and the Public Institution Triglav National Park was signed in order to allow us to carry out scientific work within and around the park. Research collaboration with Na Ale Hele was established in December 2012 in order to conduct research within the "Mānoa Falls Infrastructure Improvement Project" funded by the Hawai'i Tourism Authority. The data for CS MF behaviour (section 4.6), CS MF env. educ. (4.7), CS MF WTP (4.8) were collected by the use of a questionnaire that also contained questions on visitors safety and perception of the trail condition, not assessed within this thesis.

Environmental education was addressed in six case studies: CS TNP env.educ. (section 4.2), CS SLO educ. (4.4), CS TNP behaviour (4.5), CS MF behaviour (4.6), CS MF env.educ. (4.7) and CS HI ecotourism (4.9). Two case studies were ecotourism oriented: CS MF behaviour (4.6), CS HI ecotourism (4.9). The CS TNP huts (4.3) and CS MF env.educ. (4.7) correlated to and thus partly contributing to the ecotourism research of this thesis. CS MF WTP (4.8) addressed the economic dimension of the Mānoa Falls Trail sustainability.

Figure 31 shows the relationships between research foci, theoretical hypotheses and case studies. Torkar et al. (2011) identified the growth of case studies as a research methodology in human dimension studies concerning nature conservation, due to the growing need for knowledge transfer or know-how from best practices in addressing human-nature relationships. The case studies presented in this thesis generated outcomes to support the thesis theoretical hypothesis and contribute to the pool of knowledge in the research fields of environmental education, ecotourism and management of protected areas. The knowledge transfer is suggested in the case of ecotourism development in Slovenia, based on the findings from assessing self-defined ecotourists' profiles and their pro-environmental behavior and the professionalism of ecotourism operators in Hawai'i.

The overview of educational activities in the Triglav National Park revealed the network of activities and events organized by the park that focus on public environmental education, targeting various stakeholder groups in the park and park visitors. The emphasis was given on the education of children and youth (CS TNP env. educ., section 4.2). In CS SLO educ. (4.4) we proved that education in the form of workshops enhanced student's knowledge. In this case study we developed a decision support tool for the evaluation of students' knowledge before and after the educational event together with a qualitative evaluation of information perception. The model also enables simultaneous graphical comparison between up to six students on various levels of knowledge by comparing scores they obtained in the test before or after the learning process. We found that students that had been encouraged towards discovering nature by the workshop obtained better final test results. Although the case study on students' perception was conducted on a relatively small sample, our findings indicated that visiting nature conservation destinations, such as protected areas, increased students' interest in nature. These case study findings

suggested that investments in environmental education have an impact towards improvement of sustainable development in protected areas. As an example, Abdullah et al. (2011) reported that "environmental education in Malaysia is applied across the curriculum at both primary and secondary levels for all subjects". They found that environmental education should be infused in the curriculum in-depth, by teaching environmental education based on the current environmental issues in various school subjects. We argued that environmental education should become integrated part of primary and secondary schools' curriculum worldwide, as such teaching to all young residents of the planet may shift value systems, attitudes and finally behavior that would lead us all towards more environmentally friendly lifestyles and a healthier environment. Our findings correlate with Orams (1997), who argued that a structured education program is needed in order to produce long lasting changes in tourists' behavior.

In collaboration with Triglav National Park the list of workable environmental education indicators were developed with the input of eight TNP protected area managers (CS TNP env. educ., section 4.2). The work on the implementation of the indicators and development of environmental education monitoring in Triglav National Park was, however, beyond the scope of this thesis, although it set the basis for systematic environmental education assessment. Further work should be conducted in order to progress with the use of indicators' in the park.

The research on hiker's pro-environmental behaviour in the Triglav National Park (CS TNP behaviour, 4.5), revealed that hikers previously enrolled in environmental education activities were willing to pay more for environmentally friendly goods and services. This correlation was strong ($r = 0.61$) and significant ($p\text{-value} < 0.001$). We also found that previous enrolment in environmental education had a significant correlation with support for conservation ($p\text{-value} = 0.069$) and concluded that hikers with higher levels of education were more likely to be willing to pay more for environmentally friendly goods and services. We learnt that the nature preservation characteristics of a specific area influenced the choice of vacation destination at least partly for as much as 84.8 % of Triglav National Park hikers. Altogether 13 significant correlations were proved.

The research on hiker's pro-environmental behaviour at Mānoa Falls (CS MF behaviour, 4.6) revealed (a) significant differences between tourists' characeteristics and their behaviour (b) 41 significant correlations between those and (c) sustainability consideration by ecotourists and general visitors were validated in relationship to their travel decision making. All correlations were of small strength except six correlations with medium strength and very high significance level ($p\text{-value} < 0.01$). The strongest correlation was found between enrollment in environmental education activities and participation in nature conservation projects ($r = 0.52$). Donation towards nature conservation projects was correlated to participation in nature conservation projects ($r = 0.38$) and enrollment in environmental education activities ($r = 0.31$). Buying environmentally friendly products was correlated to using energy saving bulbs ($r = 0.32$) and a willingness to pay for environmentally friendly goods and services ($r = 0.34$). The last medium strength correlation was proved between separating waste and using energy saving bulbs ($r = 0.30$). Within the research conducted at the Mānoa Falls Trail, we asked hikers if they would like to learn more on the trail and furthermore, what would they like to learn about from the list of eight topics (CS MF env.education, section 4.7). Overall, 89 % of the hikers chose at least one of the topics they would like to learn more of while hiking, proving that recreation and education can be successfully combined into one's leisure time. We drew recommendations for an environmentally friendly educational infrastructure design along the trail with a longer lifespan in a humid rainforest environment. QR codes and mobile learning techniques were suggestions to be implemented at the viewing stations, with the access to multi lingual content. In Figure 30 we showed that Na Ala Hele staff followed our advice on integrating QR codes on tables along the trail. We supported the findings by Togridou at al. (2006), who ascerted that managers of protected areas should be encouraged to design environmentally-oriented visitor programmes in order to encourage visitors' actions and decisions regarding environmental conservation. These findings, and the proposed educational infrastructure, could be applied to mountain pathways as well, which were assessed as a submodel in the mountain huts MADM model (CS TNP huts, section 4.3). In the model, one of the endleaves (attributes) was "educational tables" which were exactly the same feature addressed in CS MF env.educ. (4.7). Here we indicate another parallel and possible knowledge transfer between the research conducted in Slovenia and Hawai'i.

Figure 30: *The informative signage at the Mānoa Falls Trail beginning, dating from 1994 (left), and a new table with QR code indicating work in progress on the trail in fall 2012 (right).*

Ecotourism was investigated at the Mānoa Falls Trail by identifying ecotourists and their characteristics (CS MF behaviour) and by assessing six ecotourism operators on Oʻahu (CS HI ecotourism, 4.9). Ecotourism refers explicitly to a product niche (UN and WTO, 2002).

At Mānoa Falls we found almost 30 % of hikers to be self-defined ecotourists. The gender distribution was almost equal among self-defined ecotourists and all three age groups were equaly represented. The level of education was found to be lower than expected based on the literature findings that ecotourists have higher level of education in comaprisson to general visitors. We found that Hawaiʻi was considered an attractive ecotourism destination, as only about 27 % of the self-defined ecotourists were Hawaiian residents and the remaining three quarters were visitors to the State. We proved significant differences between self-defined ecotourists and general visitors' behaviour for all eight pro-environmental questions and five out of six sustainability questions. The most significant difference regarding sustainability questions was found between self-defined ecotourists' and general visitors' appreciation of scenic beauty and biodiversity (22 % more in case of self-defined ecotourists). This was also the most commonly considered sustainability issue when making travel decisions by the self-defined ecotourist group and is in line with ecotourism definitions that define ecotourism as "travel to undisturbed natural places" that embeds other ecotourism principles also. Our results indicated that self-defined ecotourists behave significantly more pro-environmentally and considered numerous sustainability issues when making travel decisions. All these findings indicated that self-defined ecotourists have a lower ecological footprint and contribute to the development of the destination by willing to pay more for environmentally friendly goods and services and by buying environmentally friendly products. Consequently, we take the standpoint that ecotourists contribute to the sustainable development of the destinations they visit and places within which they live. We believe our study revealed new insight into ecotourist behaviour as according to Kerstetter et al. (2004: 492) "little is known about the behavior of ecotourists".

The ecotourism operators' assessment revealed that environmental education was a key component of all ecotourism operators who participated in this study. This correlates with the Quebec Declaration on Ecotourism (2002), Donohue and Needham (2006), Weaver and Lawton (2007) and Higham (2007) criteria and principles on learning and educating ecotourism visitors. The level of their visitors' curiosity was high, as though they are seeking for educational experiences while on vacation. All ecotourism operators assessed work towards educating their clients and made their services educational, interesting and amusing (CS HI ecotourism, 4.9). At the beginning of the tours, all of them instructed the clients on appropriate behaviour while on the tour and what should not be enacted (e.g. touching wildlife, standing on the reef). All ecotourism

operators had a clear vision regarding their business development and their pathway towards ensuring environmental and social sustainability for their business. Half of the businesses assessed had Hawai'i Ecotourism Association Certification and two were considering application to the process of certification. Two ecotourism operators who among other activities provided dolphin watching and or whale watching activities were in the Dolphin SMART program or are in the Responsible Whale Watch Partnership. This demonstrates that ecotourism operators also find value in certification labels and are working towards making their business recognizable by the HEA certification, Dolphin SMART program and/or Responsible Whale Watch Partnership. We took the understanding that ecotourism services should be limited to small sized groups, embed within an interpretation of local culture and nature from an environmental education perspective, involve local communities, limit environmental and social impacts, and finally contribute to biological conservation. In our opinion these features characterized ideal ecotour operators and distinguish them from "greenwashers", who merit profit more than the environment.

At the Mānoa Falls Trail we also assessed hikers' willingness to pay for hiking at the Mānoa Falls Trail. The results showed that 79.9 % of Hawai'i visitors and 53.7 % of residents were willing to pay a hiking fee, the mean WTP for the Mānoa Falls Trail turned out to be close to $4US. The WTP arithmetic mean value was $1 higher for visitors than residents. Based on the analysis of the level of education-WTP relationship, we proved that more educated individuals were willing to pay more for hiking the Mānoa Falls Trail. Some hikers indicated a willingness to pay a higher user fee should it go towards trail maintenance and conservation efforts at the site. The entrance fee was identified as potential revenue raizer for managing the trail. Albeit, our study was a preliminary assessment of WTP for hiking Mānoa Falls Trail, further decisions regarding imposing the entrance fee should be based on the contingent evaluation method and appropriate stakeholders participation in the decision-making process.

Unlike the USA where the visitors have to pay for visiting national parks visiting Triglav National Park in Slovenia is free of charge. There are 23 access roads into Triglav National Park (Šolar, 2007) which makes it hard to monitor the flow of traffic in general and visitors in the park. However, imposing entrance fees to natural attractions is a controversial issue worldwide (Reynisdottir et al., 2008) and should require detailed assessment and stakeholders' participation in decision making processes. Dispite this, we hold the opinion that applying a modest fee for driving in the park should be considered by the governing body. This fee could apply only to a specific group e.g. motor bikers, who are very often in the park during the summer, enjoying panoramic drives through the pristine alpine environment of TNP. The fee would provide additional funds for park management and might work towards minimizing impacts on the environment as well, by lowering the traffic volume in the park.

The hikers' pro-environmental behaviour assessment in the Triglav National Park showed that previous enrolment in environmental education had a significant correlation with personal support for conservation, by donation and participating in nature conservation projects. The same was proved in the case of the Mānoa Falls pro-environmental behaviour assessment. Self-defined ecotourists at Mānoa Falls showed a significantly higher level of support for nature conservation by participating in and donating to nature conservation projects in comparison to general visitors. According to the responses to our WTP questionnaire at Mānoa Falls Trail, people were willing to pay higher entrance fees to natural attractions if the money contributes towards nature conservation. According to the basic ecotourism requirements, ecotourism and nature conservation should go together hand in hand. In the case of ecotourism operators on O'ahu, Hawai'i, four out of six operators educated their visitors on the importance of biological conservation. All contribute to the biological conservation of Hawai'i natural heritage in some form, for example, environmental education, educational outreach programs and supporting biological conservation projects most commonly attributed. Two out of six operators donated annually to Nature Conservancy and the University of Hawai'i.

The pro-environmental assessment conducted at the Mānoa Falls Trail (section 4.6) was based on the first eight pro-environmental questions from the assessment conducted in TNP (section 4.5). As a result, we have the possibility to directly compare the figures on identified correlations in both locations, in spite different sample sizes and statistical programs used for the analyses. We identified the same six correlations between some behavior and tourists' characteristics at the Mānoa Falls Trail and Triglav National Park (Table 31).

At Mānoa Falls more local residents were previously enrolled in environmental education programs compared to visitors in the case from Slovenia, more European visitors were enrolled in environmental education activities in comparison to Slovenians. In Hawai'i and Slovenia the level of education increased with age. Furthermore, our results suggested that education level is a significant predictor of respondents' support for nature conservation in the case of Hawai'i and Slovenia. Thus, our findings supported the view that respondents who are better informed on nature and species conservation issues were willing to pay more for these benefits (White at al., 2001; Bandara and Tisdell, 2004; Stubelj Ars, 2013a).

Table 31: *Pearson correlation coefficient (r) and significance level (p-value) for the correlations identified at Triglav Natonal Park and Mānoa Falls Trail.*

The same correlations between pro-environmental questions and visitors' characteristics identified in Slovenia and Hawai'i		
Statistical program	R program version 2.15.3	SPSS version 21
Sample size	100	757
Pearson correlation coefficient	$r \leq -0.20$ or $r \geq 0.20$	$r \leq -0.0875$ or $r \geq 0.0875$
Correlations between/ identified at	Triglav National Park, N=100 (Stubelj Ars, 2013a)	Mānoa Falls Trail, N>500 (p-value < 0.01)
Origin – Enrolled EE	r = - 0.24, p-value = 0.044	r = 0.12
Age – Level of education	r = 0.21, p-value = 0.038	r = 0.18
Level of education – Donated NC	r = 0.28, p-value = 0.012	r = 0.10
Alternative E – Buy EF products	r = 0.32, p-value = 0.011	r = 0.25
WTP more EF – Enrolled EE	r= 0.61, p-value < 0.001	r = 0.24
Donated NC – Buy EF products	r = 0.23, p-value = 0.083	r = 0.19

Correlations have different strengths and significance levels. At Mānoa Falls all six correlations had a very high significance level (p-value < 0.01), most probably due to the much larger sample size in comparison to the research undertaken in TNP. All correlations found at Mānoa Falls were of weak strength ($r \leq 0.30$). In TNP correlation between Alternative E – Buy EF productss was of medium strength ($0.30 \leq r \leq 0.50$) and relatively high significance (p-value < 0.01) and WTP more EF – Enrolled EE correlation was of strong strength ($0.50 \leq r$) and very high significance (p-value < 0.001). These differences in the strength of two correlations may be due to different cultures and behavioral patterns of European tourists and tourists at Hawai'i, which are predominantly visitors from the USA and Canada. Other situational factors were also very likely to impact on the results. However, based on these findings we may conclude that tourists in Triglav National Park showed stronger correlation between willingness to pay more for environmentally friendly goods and services and previous enrollment in environmental education programs, workshops or activities than tourists at the Mānoa Falls Trail. We also found a slightly stronger correlation between the use of alternative energy sources and buying of environmentally friendly products in Slovenian visitors than in Hawaiian visitors. The correlation between donation to nature conservation projects and purchasing environmentally friendly products in TNP visitors was of low significance (p-value = 0.083), but still used in this comparison, as the research outcomes of the study on pro-environmental behaviour in TNP had previously been published in a scientific journal.

Our study identified a notable difference between general visitors and self-defined ecotourists in expenditure patterns (buying environmentally friendly products and willingness to pay for environmentally friendly goods and services) which supported Cook et al. (1992) finding that "green" travelers were willing to spend on average 8.5 % more for services and products provided by environmentally responsible suppliers.

In this thesis we collaborated with representatives of five stakeholder groups: protected area managers (CS TNP env.educ, all case studies conducted at Mānoa Falls Trail), tourists from Slovenia (CS TNP behaviour) and Hawai'i (CS MF behaviour, CS MF env.educ.), local inhabitants from both countries (CS TNP behaviour, CS MF behaviour), high school students in Slovenia (CS SLO education) and ecotourism operators from Hawai'i (CS HI ecotourism).

To conclude, Jaafar and Maideen (2012) stated that "exploring ecotourism products and activities in relation to small and medium businesses can contribute new knowledge to tourism research". In

this regard we believe our research on ecotourism operators (section 4.9) and self-defined ecotourists at Mānoa Falls Trail (4.6) contributed to new knowledge in the field of ecotourism research, other case studies, with the exception of sections 4.1 and 4.2 contributed to the pool of research knowledge concerning tourism in protected areas. The case study on decision problems in protected areas (4.1) presents a review and an innovative classification of decision problems in protected areas, thus contributing to the multidisciplinary field of protected area management research. CS TNP env. education (4.2) was specifically designed and conducted in order to aid the managers' evaluation of environmental education in Triglav National Park with the set of indicators. This research aspect has a practical application, which is often lacking in bridging science and decision making in real life situations.

5.3 Lessons learned, transfer of "know-how"

The research for this thesis was conducted in Slovenia and Hawai'i. Based on the synthesis of the case studies contributions presented in section 5.1 we demonstrated how lessons learned can be transferred from one environment to another. Initially, we presented the decision problems addressed in this thesis in Slovenia and Hawai'i. In Table 32 we showed decision problems, the information on geographical locations where research on decision problems had been conducted, and the number of case studies per each decision problem. First, we might point out that half of decision problems were addressed in Slovenia and in Hawaii: managing PA, tourism and recreation, local people's attitudes, nature conservation and WTP. The most frequently addressed problems were: tourism and recreation (5), managing PA (4), local people's attitudes (4). Decision problems related to ecotourism were addressed only in Hawai'i, due to the fact that ecotourism is an already developed market niche in Hawai'i. Furthermore, the Hawai'i Ecotourism Association has united the stakeholders who share an interest in running existing ecotourism business in Hawai'i and in ecotourism in general. Six decision problems were addressed only in one case study: ecotourism management, using local knowledge, indicators use, scenario evaluation, choice of management strategy, ranking management strategies.

Table 32: *Addressed decision problems and thesis case studies locations.*

Decision problem	Slovenia	Hawaii	No of CS
managing PA	x	x	4
choice of management strategy	x		1
ranking management strategies	x		1
Scenario evaluation	x		1
indicators use	x		1
WTP	x	x	3
using local knowledge		x	1
local people's attitudes	x	x	4
tourism and recreation	x	x	5
ecotourism development		x	2
ecotourism management		x	1
nature conservation	x	x	2

At a first glance Hawai'i and Slovenia might seem totally different and incomparable mainly due to the geographical and cultural differences, we indicated, however, similarities between these two countries and their tourism industries from facts and figures. We found many similarities between Slovenia and Hawai'i and have ascerted that knowledge transfer is possible between these two environments. Table 33 shows the basic characteristics of Republic of Slovenia and State of

Hawai'i and tourism related information we found relevant for tourism industry comparison and ecotourism development.

Table 33: *The comparison between Slovenia and Hawai'i.*

Characteristics	**Slovenia**	**Hawai'i**
Full name	**Republic of Slovenia**	**State of Hawai'i**
Area	20.273 km2	16.637 km2
Residents	2.052.496	1.360.301
Main city	Ljubljana	City and County of Honolulu
Main city's residents	279.898	953.207
Climate	alpine, submediterranien, moderate, continental	Tropical (with microclimate types)
Highest peak	Triglav 2 865 m	Mauna Kea 12 796 ft
Sea line	46.6 km	all around
Forests	58 % (1.186.104 ha)	(109.000 ac)
Parks	44	52
National parks (IUCN category II)	1: Triglav National Park	2: Hawai'i Volcano National Park, Haleakalā National Park
Cultural heritage	archeological sites, local heritage	indigenous people, Hawaiian history and culture
Natural heritage	very high	very high
Biodiversity	hot spot in Europe	hot spot in the world, many endemic species
Landscape diversity	very diverse	very diverse
GDP	35.639 mio. EUR	66.991 mio $
GDP on resident	17.364 EUR	48.727 $
Average monthly pay	1524.65 EUR	3.166,89 $
Share of the combined effects of tourism on GDP	12 %	15.9 %
Number of visitors	3.217.966	7.174.397
Number of international visitors	2.036.652	2.047.106
Number of domestic visitors	1.181.314	5.127.291
Average visitors stay (days)	2.9	9.45
Number of overnights	9.388.095	67.8 mio*
Number of overnights by international visitors	5.463.931	
Number of overnights by domestic visitors	3.924.164	
Total number of beds	118.817	4.787.415
Maximum hotels' occupancy	70.7 %	73.4 %
Average hotels' occupancy	43.1 %	59.4 %
Data Source	Černič, 2012; SURS.	DBEDT 2013a, DBEDT 2013b, DBEDT 2013c, DLIR, 2013.

The first thing of note was that the Hawaiian Islands differ considerably in population density and infrastructure between themselves. Both countries are relatively small, have numerous landscape features from sea level to high mountains, different climatic zones, very high biodiversity, many protected areas and vivid cultural heritage. In Hawai'i and Slovenia water is potable from the tap. Perhaps this is a very good indicator for the quality of the both environments. Hawai'i is unique in terms of having an active volcano on the island of Hawai'i, one of the few places in the world where

tourists can experience volcanic activity. The tourism industry is flourishing in Hawai'i, and considered one of the world top tourism destinations, thus contributing significantly to Hawai'i's GDP, but also to the islands decision problems and challenges the State is facing. Waikiki, the tourism and shopping district of Honolulu, is "often perceived to suffer from congestion and overcrowding", although the study on tourism's benefits, overcrowding and environmental problems showed that 58 % of Waikiki residents did not find Waikiki overcrowded with people and 51 % found Waikiki overcrowded with hotels (Sheldon and Abenoha, 2001).

Regarding economic indicators, in 2011 the GDP in Hawai'i was about 1.4 times higher than Slovenian GDP. The average monthly salary was almost 1.6 times higher in Hawai'i in comparison to the average monthly income for Slovenian citizens. It is important to note that the cost of living is also much higher in Hawai'i, although fuel prices are still lower than in Slovenia.

In 2011 more than 7.1 million visitors enjoyed Hawai'i and stayed on the islands on average for 10 days, making an overall figure of 76.8 million visitor days or overnights (DBEDT, 2013d). During the same year, in Slovenia there were slightly more than 3.2 million visitors with the average stay of 3 days and a total of almost 9.4 million overnights. In both countries the share of international tourists was 2 million, while Hawai'i was visited by 5.1 million and Slovenia by almost 1.2 domestic visitors. The maximum hotel capacity was similar in both countries, 70.7 % in Slovenia and 73.4 % in Hawai'i; the average hotel occupancy was significantly higher in Hawai'i reaching 59.4 % while Slovenia recorded 43.1 % average in hotel occupancy. The share of combined effect of tourism on national GDP was 12 % in Slovenia and 15.9 % in Hawai'i. We found the difference between the combined effect on national GDPs in Slovenia and Hawai'i (3.9 %) rather small, when Hawai'i seems to be a "world top tourism destination" and Slovenia is a "new destination, being discovered by tourists". The explanation has several possibilities: first, the methodology in arriving at the estimates may be entirely different and hence may have led to the results at hand and second, for Hawai'i, although tourism is the mainstay of the economy, other sectors such as the federal government (in particular defence), and real estate are also significant contributing factors (Leung, 2013; Tian et al., 2013).

The tourism challenge Hawai'i is facing is how to maintain tourism revenue and at the same time minimize tourism impact that increases environmental damage. The main challenge Slovenia is encountering is how to implement sustainable development into its tourism growth strategy, by developing and promoting itself as a "green destination". Both countries wish to attract more tourists and at the same time preserve their unique natural and cultural heritage.

Based on the research outcomes from the case studies conducted in Hawai'i, we provided guidelines for ecotourism development in Slovenia. Firstly, we argued that the formation of an Ecotourism Association would unite tourism operators, academics and tourism professionals, and supporters of sustainable life-style and pro-environmental behaviour was necessary for ecotourism development and planning in Slovenia. This should be a first step towards forming an ecotourism governing body that would be able to apply for national and international funds and guide the ecotourism sector's development. In this process the use of good examples from other countries that have developed ecotourism industry as well as a certification program should be followed.

We hold the opinion that protected areas are especially suitable for the development of ecotourism, thus we argued that tourism services in Triglav National Park should be directed towards sustainability with the long term goal of transforming all tourism activities and services in the park towards ecotourism. Mrak (2011) made an overview of the hiking and trekking potential in Triglav National Park in terms of planning for the sustainable development of adventure recreation in protected areas.

Outdoor activities that are already present on Slovenian tourism market could fill the ecotourism niche if managed in sustainable way by embedding principles of ecotourism (Honey, 2002) in their operation: kayaking, rafting, hiking, trekking, sailing, paragliding, wildlife watching (bears, birds, alpine ibex), turn skiing and snowboarding in winter. All of these activities, with the exception of sailing are actually also currently present in Slovenian protected areas. However, at the moment very few of these activities are being run as ecotourism companies or promoted as eco.

Based on the results of this case study we propose the following guidelines should be taken into consideration when developing an ecotourism offer in Slovenia:

- Minimize impacts on natural and social environments.
- Promote nature conservation and habitat protection.
- Interpretation and environmental education should be integrated into ecotourism tours.
- Ensure involvement of local people in co-management processes.
- Employ local people.
- Motivate employees to undertake several hours of community work or nature conservation per month.
- Donate free tour rides or a portion of revenue to the community or Slovenian nature conservation NGOs.
- Contribute directly and indirectly to biological conservation.
- Connect ecotourism with culinary and vinyard tourism, which are already well established in Slovenia.
- Group size should be limited to less than 14 persons and in accordance to the activity, not to compromise people safety or natural and social environment.

In 2011, the share of international visitors to Slovenia was 18 % Italians, 12 % Germans and 12 % Austrians. Accordingly, ecotourism tours should be available in English, German and Italian languages in order to facilitate international tourists. In Slovenia almost all citizens younger than 50 years of age speak the English language. The guides should be at least bilingual.

In the conclusions from the CS HI ecotourism (section 4.9.4.3) we proposed the unified visitor satisfaction evaluation method for the ecotourism operators in Hawai'i. Similar attributes can be used as guidelines and points of reference in the development of Slovenian ecotourism products and services and shaping ecotourism businesses.

The landscape of Hawaiian Islands differs between the islands themselves, and is significantly different in comparision with landscape types found in Slovenia. From the topographic point of view the mountains in Slovenia and Hawai'i are very different in geological formation, the slope degree and vegetation. Although hiking and mountaineering are among the most popular outdoor recreational activities in Hawai'i and Slovenia, we may say Slovenia has a longer culture of mountaineering and has a network of 176 mountain huts (out of that 37 in TNP) that offer basic accommodation and most frequently, simple cooked food and beverages. In Hawai'i this type of mountain hut does not exist. In spite of that the middle class single family houses in Hawai'i face similar challenges as mountain huts in Slovenia, as most of the houses are made of wooden materials or are wooden prefabricated houses. In this regard the decision support model for the assessment of sustainability of mountain huts may be applied for an assessment of housing infrastructure in Hawai'i. For instance, Hawai'i has the highest electricity rates in the USA (Cocke, 2011) and since 2010 the trend of Hawaiian citizens for the installion of solar panels has occurred as a long term investment in cheaper electricity (GetSolar, 2013).

Regarding environmental education, the model for evaluating environmental information perception of educational event participants can be modified to any setting, thus allowing appropriateness for the Hawaiian environment. The environmental education indicators we developed for TNP can be applied to monitor environmental education at other protected areas. Albeit, the set of indicators were developed for TNP thus it would need adjustments according to the new protected area's cultural heritage and ways of passing environmental education to its visitors, inhabitants and managers.

We may conclude that the recommendations we have draw on ecotourism development in Slovenia and the possible implementation of research outcomes from Slovenia case studies in Hawai'i indicated the possibility of knowledge transfer and "know how" at an international level.

6 CONCLUSIONS

This thesis took a wide approach in addressing the implementation of sustainable development in protected areas, by (a) investigating different decision problems from environmental, social and economic dimensions of sustainable development and (b) conducting case studies in two different geographical, social and cultural environments, Slovenia in Central Europe and Hawai'i in the USA Pacific Region.

The focus of this thesis was on environmental education and ecotourism, however peoples' relationship to nature conservation, pro-environmental behaviour in Slovenia and Hawai'i, and willingness to pay for natural attractions have also been investigated.

In this thesis qualitative and qualitative methods were used in order to assess decision problems in protected areas, which made a more credible interpretation of the results and meaningful confirmation of theoretical hypothesis by various case studies outcomes. Each theoretical hypothesis is supported by at least two case studies' research outcomes.

The outcomes from this thesis' eight case studies lead to the confirmation of six theoretical hypotheses from four research foci, as first indicated in Figure 1. As is evident in Figure 31, all hypotheses except H2 were confirmed and supported by at least two case studies. Some case studies partly supported or partly confirmed the hypothesis. The dashed arrows indicate the outcomes of the case studies' contributions to decision support for the implementation of sustainable development in protected areas regarding environmental education and ecotourism, which is also the title of this thesis. The red coloured text under the case study names indicates the relationship of the case study to the hypothesis written directly above in the research focus box. The results of these thesis case studies complement each other as shown in Figure 29.

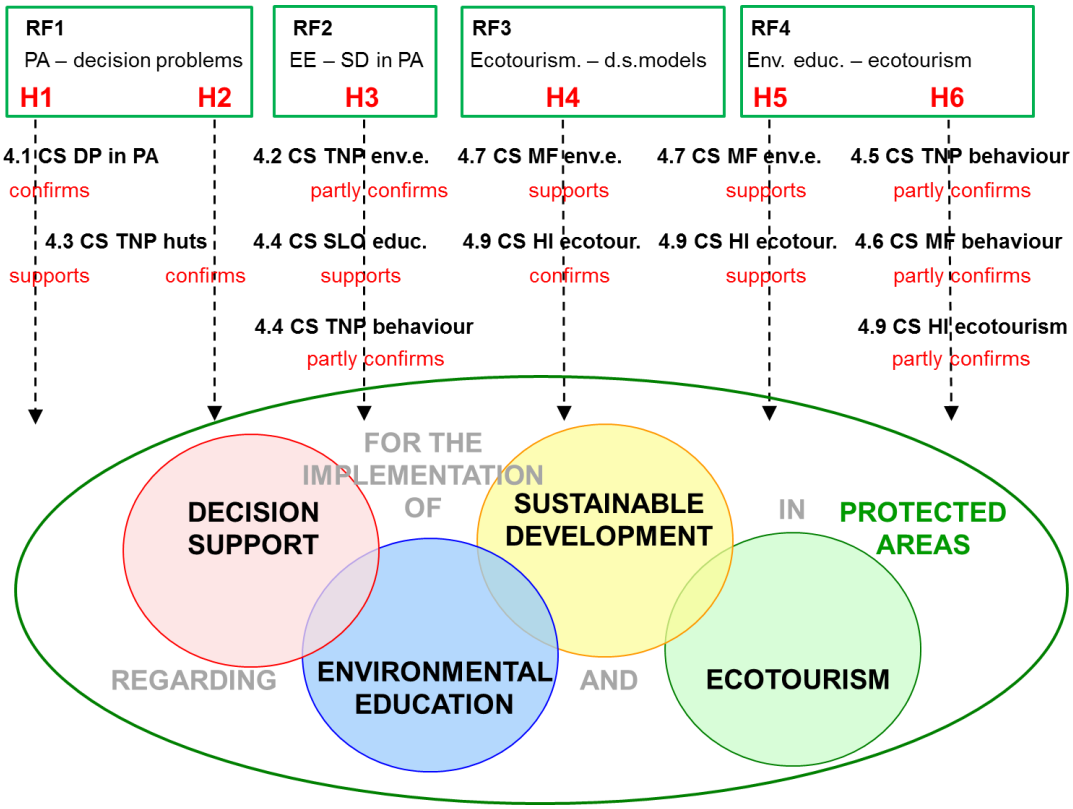

Figure 31: *The fulfillment of research goals and confirmation of the thesis theoretical hypotheses through the case studies outcomes.*

Each of the case studies ends with a section “Relation to the theoretical hypothesis (hypotheses)” in which we explained how the case study's outcomes, confirm, support or partly confirm the hypothesis or hypotheses they relate to:

- H1 is confirmed by CS DP in PA (section 4.1) and supported by CD TNP huts (4.3).
- H2 is confirmed by CD TNP huts (4.3).
- H3 is confirmed by CD TNP env. edu. (4.2), supported by CS SLO education (4.4) and partly confirmed by CS TNP behaviour (4.5).
- H4 is supported by CS MF env.edu. (4.7) and confirmed by CS HI ecotourism (4.9).
- H5 is supported by CS MF env.edu. (4.7) and supports as well by CS HI ecotourism (4.9)
- H6 is confirmed by CS MF behaviour and partly confirmed by CS TNP behaviour and CS HI ecotourism.

As already detailed above, the CS MF WTP does not relate directly to any of the theoretical hypotheses but contributes to the pool of knowledge on WTP for viewing natural attractions, particularly in the State of Hawai‘i and provides valuable data for Na Ala Hele further management decisions. By addressing WTP for hiking at the Mānoa Falls Trail we addressed an economic dimension for sustainable development and from that and other case studies we addressed decision problems in protected areas from all three pillars of sustainability. However, we did not include the CS MF WTP in Figure 31.

In this thesis we investigated both mountain and island ecosystems, and provided connections through addressing common decision problems and by providing decision tools and guidelines towards their sustainable management. Decision support tools can be built and applied to a wide range of decision problems. As far as protected areas are concerned, the extent of the applicability of the decision tools developed, used and derived in this thesis goes beyond education and ecoturism. There are other human activities that have a bearing on protected areas worldwide, forestry and agriculture being two most directly linked to survival and sustainability. The practice in these areas should benefit from the application of the proposed tools extended to the particular issues faced by these disciplines in the vital task of sustaining and enhancing human life.

6.1 Fulfillment of research goals

The case studies from this thesis confirmed all six theoretical hypotheses and fulfilled all research goals outlined in the thesis Introduction.

- We made an overview of decision problem and decision making in protected areas in the last decade, identified decision problems associated with protected areas and provided a classification for decision problems in protected areas.
- The collaboration with protected area managers was established in Slovenia and Hawai‘i. The research from this thesis has applicable value for their management decisions in Triglav National Park from Slovenia and Na Ala Hele from Hawai‘i.
- Two decision support models were developed using DEX methodology. These offer new insight into evaluation and comparison of alternatives and provide a new decision support tool for the end users.
- We assessed the environmental education workshop outcomes on the case of high school students from the Biotechnical Secondary School within the School Center Nova Gorica.
- The assessment of tourists’ pro-environmental behaviour was analyzed in two protected areas: Triglav National Park in Slovenia and Mānoa Falls Trail in the Ko‘olau Mountain Watershed, Conservation District on the island of O‘ahu, Hawai‘i.
- We assessed six ecotourism operators in O‘ahu, as examples of ecotourism best practice and provided recommendations for the ecotourism development in Slovenian protected areas with the emphasis on environmental education activities.

6.2 Contributions to the science

Contributions to the body of scientific knowledge from this thesis research are:

- List and classification of decision problems and decision making processes that occur in protected areas.
- Identification of environmental education indicators in the Triglav National Park, applicable to other protected areas as well.
- Characterisation of significant differences of pro-environmental behaviour between self-defined ecotourists and non ecotourists.
- Proposal of solutions for decision problems and dilemmas regarding ecotourism and environmental education in protected areas in the Alps.
- Guidelines for the future development of ecotourism in Slovenia derived from the assessment of examples of best practice by ecotourism operators from Hawai'i, with an emphasis on environmental education from Hawai'i.
- Development decision support models (sections 4.3 and 4.4) as applications of the theoretical knowledge on the real case studies.

The mountain hut infrastructure model (section 4.3) is applicable for the assessment and comparison of other huts in TNP or another mountain environment. The student evaluation model (section 4.4) can be adequately modified for the assessment and comparison of students' knowledge in various fields of education. The models will be shared with interested parties in the future.

6.3 Publications and presentations

At the time of the thesis defense, two scientific articles from this thesis content have been published in scientific journals:

STUBELJ ARS, Mojca, BOHANEC, Marko. Towards the ecotourism: a decision support model for the assessment of sustainability of mountain huts in the Alps. Journal of Environmental Management, 2010, vol. 91, no. 12, pp. 2554-2564. (Thesis section 4.3)

STUBELJ ARS, Mojca. Evaluation of hikers' pro-environmental behaviour in Triglav National Park, Slovenia. Eco.mont - Journal on Protected Mountain Areas Research and Management, 2013, vol. 5, no. 1, pp. 35-42. (Thesis section 4.5)

The results of this thesis have been presented at the following events:

ALPWEEK 2008 "Innovation in the Alps", L'Argentiere la Basse, France, June 2008, the poster "Environmental information perception of high school children: the case of Slovenian Alps", Mojca Arsenijević and Marko Bohanec. The contribution presented the research objective, basic concept applied, methodology, and preliminary results from section 5.3.

BEST Educational Network THINK TANK VIII: "Sustaining quality of life through tourism", Izmir, Turkey, June 2008, oral presentation and extended abstract "Environmental education and ecotourism: a case study of protected areas in the Alps" published in the conference proceedings, Mojca Arsenijević and Marko Bohanec. The contribution presented the environmental education as one of the key elements of ecotourism and specifically addressed the problem of infrastructure management in protected mountain regions. For this contribution the author of this thesis received the "Award for the contribution to sustainable development of society for the year 2008". The prize was awarded by the Slovene Human Resources Development and Scholarship Fund.

"Življenje v Alpah – novi izzivi 2008· Vivre dans les Alpes - les nouveaux défis · Vivere nelle Alpi - le nuove sfide · Leben in den Alpen – die neuen Herausforderungen" Triglav National Park, Bled,

Slovenia, October 2008, the poster “Comparison of National Parks in the Alps”, Mojca Arsenijević and Marko Bohanec. The poster presented the results of statistical comparison of demographic data for all National Parks in the Alps.

4th International Symposium on Research in Protected Areas in Kaprun, Nationalpark Hohe Tauern, Austria, September 2009, the poster “Decision Support Models for Protected Areas Management in Slovenian Alps”, Mojca Arsenijević and Marko Bohanec. The contribution presented the concept, methodology and results of decision support modeling on the case of Slovenian Alps.

20th Hawai‘i Conservation Conference in Honolulu, Hawai‘i, USA, August 2012, the poster and abstract “An environmental education management strategy for effective rainforest conservation of Mānoa Falls Trail, O‘ahu”, Mojca Stubelj Ars and John Cusick. The poster contained the summary of the research outcomes from the CS MF env.educ. (section 4.7) and MF WTP (section 4.8).

5th International Symposium on Research in Protected Areas in Millersill, Nationalpark Hohe Tauern, Austria, June 2013, the poster and extended abstract “Assessment of environmental education indicators in Triglav National Park, Slovenia”, Mojca Stubelj Ars. The contribution was a presentation of environmental education indicators development from section 4.2.

6.4 Further work

The work from this thesis laid out some pioneer research on ecotourism in Slovenia and Hawai‘i. We hope that other researchers and future post graduate students will build on some of the case study outcomes and thus continue with investigations into environmental education and ecotourism related research in managing protected areas of Slovenia, Hawai‘i or other geographical locations. Hopefully, more case studies will be published in the form of scientific articles, reaching the broader scientific readership. The thesis author’s postdoctoral research would ideally build on one or two of the case studies presented in this thesis.

More than half of Slovenia is covered with forests, its diversity of landscapes, biodiversity and geographical features make it literally “green”. The numerous efforts in the implementation of sustainable practices at various levels and dimensions justify the “green destination” label and marketing of Slovenia as a green destination. However, much remains to be achieved especially in the field of ecotourism products and services development. We propose further research in order to focus on an ecotourism certification program development similar to that established in Hawai‘i, with an emphasis on activities in protected areas. Ideally these processes would include stakeholders’ participation, government facilitation and funding support.

Further research on the environmental education indicators developed for the Triglav National Park is desired. Current findings present an excellent starting point for further work on the implementation of environmental education monitoring in TNP. The guidelines for the desired development of the indicators use were presented in the conclusions of section 4.2. In Slovenia environmental education is integrated into the syllabuses of various school subjects at the primary and secondary school levels. The efforts for more for education oriented on learning concerning nature conservation and finding solutions for environmental problems are being made at the national level, but mostly depend on the enthusiasm and innovative approach of the student’s tutors and teachers. Thus, father research on the implementation of environmental education within education for sustainability should be conducted with applicable approaches and outcomes.

In the conclusion of case study on hikers’ pro-environmental behaviour assessment in TNP (section 4.5.4) we indicated further work initiatives. At the moment the Swiss National Park has agreed to collect 100 questionnaires during the summer season of 2013, two other Alpine parks are evaluating a collaboration proposal. We plan to conduct comparative research as a part of the post doctoral research of the thesis author.

Finally, we hope that our MADM model will be used as a reference in the mountain hut research and real situations as well before making decisions on further investments for huts infrastructure improvements.

In 2011, there were 65.5 % of repeaters in Hawai‘i, tourists that had previously visited Hawai‘i in the past (DBEDT, 2011). The American foreign policy aims towards "the streamlining of applications for foreign tourist visas to the United States" (Spetalnick and Bohan, 2012), meaning that Hawai‘i will be more accessible to tourists coming from Asian countries in the future. Our questionnaires used in this thesis were available only in the English language, in spite of the multicultural aspect of tourist profiles at the the Mānoa Falls Trail and in Hawai‘i in general. Therefore, our results reflect the characteristics and perspectives of the English-speaking hikers (American, Canadian, and other nationalities that generally speak English or as a second/foreign language). This includes at least 66.8 % visitors whose mother tongue is American or English, without counting on visitors from Australia, New Zealand and the United Kingdom of Great Britain (DBEDT, 2013b). Taking that into account, in order to obtain data that reflect the international visitor’s share of characteristics and perspectives, we advise that the future questionnaire should be made available in Japanese, Chinese, Korean and Thai languages.

In 2013 Hawai‘i Ecotourism Association continues with a new round of the certification program. This indicates that steady progress is being made towards the greening of the tourism industry In Hawai‘i and enabling Hawai‘i to become an attractive ecotourism destination. The findings from this thesis from the Mānoa Falls Trail, especially research described in 4.6, presented valuable data for the HEA and their further decision making regarding the development of ecotourism services and HEA’s further work. To our knowledge, this thesis has been one of the first to publish the research on ecotourists’ characteristics and pro-environmental behaviours in Hawai‘i. We believe further work should build on this thesis outcomes, by assessing visitors pro-environmental behaviour at other tourism sites and aiding ecotour operators to attract more environmentally aware tourists and to silently transform their visitors to ecotourists by educating them and providing a memorable experience that builds permanent awareness on the importance of the preservation of the cultural and natural heritage of Hawai‘i and beyond.

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9 APPENDICES

Appendix A (section 4.1)

Table 34: *The list of 119 articles identified in ScienceDirect database.*

No:	Author(s), year:	Country:	PA name:	PA type:	Decision problem:	DP no:
1	Xu et al., 2006	China	Wolong Biosphere Reserve	t	local people's perceptions, local people's attitudes, managing PA	3
2	Trousdale and Gregory, 2004	Canada	British Columbia Parks	m & t	zoning PA	1
3	Stubelj Ars and Bohanec, 2010	Slovenia	Triglav National Park	t	tourism and recreation, scenario evaluation, managing PA	3
4	Anderson et al., 2009	Canada	Nova Forest Alliance (NFA) of Nova Scotia	t	participatory approach, forest management	2
5	Teh et al., 2012	Malaysia	MPAs in Sabah	m	zoning MPA	1
6	Adams et al., 2011b	Fidji	Kubulau District, Fidji	m	FSM-MPA: fishermen's financial behaviour	1
7	Rudolphi and Haider, 2003	BC, Canada	West Coast Trail in Pacific Rim National Park Reserve	t	ranking management alternatives	1
8	Geneletti and van Duren, 2008	Italy	Paneveggio-Pale di S. Martino Natural Park	t	zoning PA	1
9	Santana-Medina et al., 2013	Mexico	Nevado de Toluca National Park	t	monitoring sustainability, indicators use, local knowledge	3
10	Scholz et al., 2004	California, USA		m	FSM-MPA: using local knowledge, managing MPA	2
11	Hjortsø et al., 2006	Nepal	Royal Chitwan National Park	t	buffer zone management, forest management, scenario evaluation	3
12	Rodríguez-Martínez, 2008	Mexico	Puerto Morelos reef marine protected area	m	participatory approach, managing MPA	2
13	Bown et al., 2013	Honduras, Latin America	Cayos Cochinos MPA	m	co-management	1
14	Cho, 2005	Belize	Belize Barrier Reef	m	managing MPA, biodiversity conservation	2
15	Davison et al., 2012	Southwestern U.S	protected area network	t	/	
16	del Pilar Moreno-Sánchez and Maldonado, 2010	Colombia, Latin America	Colombian Caribbean	m	FSM-MPA: management of common pool resources	1
17	Parrott et al., 2011	Canada	Saguenay-St. Lawrence Marine Park	m	wildlife conservation, scenario evaluation	2
18	Beech et al., 2008	Mexico, Belize, Guatemala, Honduras	Mesoamerican Barrier Reef System (in the Caribbean Sea	m	zoning MPA	1
19	Batista et al., 2011	Portugal	Arrábida MPA	m	FSM-MPA: indicators use	1
20	Mow et al.,2007	Caribbean	Archipelago of San Andres, Old Providence, and Santa Catalina	m	FSM-MPA: management of common pool resources	1
21	Gerhardinger et al., 2009	Brazil	Brazilian National System of MPAs	m	FSM-MPA: Local Ecological Knowledge (LEK), managing MPA	2
22	Di Ciommo and Schiavetti,	South of Bahia,	The Marine Extractive	m	FSM-MPA: using local	1

	2012	Brazil	Reserve Corumbau		knowledge	
23	Arias-González et al., 2004	Mexican Caribbean	Boca Paila, Tampalam (semi-protected areas)	m	coral reef management	1
24	Bryan, 2012	Ireland	Natura 2000	t	zoning PA	1
25	Phua and Minowa, 2005	Malaysia	Kinabalu area, Sabah	t	zoning PA, forest management, indicators use	3
26	Sayce et al., 2013	California, USA	MPAs & MLPA	m	public participation, redesigning MPA	2
27	Schofield et al., 2013	Greece	MPA Zakynthos	m	zoning PA, wildlife conservation	2
28	Zabeo et al., 2011	identification of contaminated sites				
29	Mitchell et al., 2004	/	/	/	climate change impacts, land use planning	2
30	Berman, 2008	USA	/ Gulf of Alaska, Aleutian Islands	m	funding research, wildlife conservation	2
31	Kirlin et al., 2013	California, USA	MPAs & MLPA	m	redesigning MPA	1
32	De Santo, 2013	worldwide	/	m		
33	Lopes et al., 2013	Brazil	Paraty town	m	FSM-MPA: co-management, using local knowledge	2
34	Glaser et al., 2010	Indonesia	MPAs	m	using local knowledge	1
35	Gleason et al., 2010	California, USA	MPAs & MLPA	m		
36	Apostolopoulou and Pantis, 2009	Greece	PA	m & t	managing new PA	1
37	Stevenson et al., 2012	California, USA	MPAs & MLPA	m	FSM-MPA: stakeholders' participation	1
38	Martínez-Harms and Gajardo, 2008	West. Patagonia, Latin America	Protected Areas National System	m & t	zoning PA	1
39	Jones et al., 2012	Greece	in two National Parks	wetland	choice of management strategy, local peoples' perceptions, local people's attitudes, trust in managing	4
40	Merrifield et al., 2013	California, USA	MPAs & MLPA	m	stakeholders' participation, scenario evaluation	2
41	Parravicini et al., 2012	Europe	Mediterranien Sea	m	ranking management alternatives	1
42	Lexer and Seidl, 2009	Austria	/	t	climate change impacts, biodiversity conservation, forest management	3
43	Grantham et al., 2013	Eastern Indonesia	Raja Ampat MPA network	m	FSM-MPA: zoning MPA	1
44	Caveen et al., 2013	worldwide	/	m	?	
45	Jones-Walters and Čivić, 2013	Europe	Natura 2000	all		
46	Bernard et al., 2011	Brazil	Maués State Forest, an SUR in Brazilian Amazonia	t	understanding socio-economic characteristics, forest management, PA management	3
47	Clifton, 2013	Indonesia	Wakatobi National Park	m	FSM-MPA: tourism conflict, stakeholders' participation	2
48	Teixeira et al., 2013	Southeastern Brazil	MPA	m	FSM-MPA: Traditional Ecological Knowledge (TEK), community participation	2
49	Ban et al., 2009	central Philippines	30 MPAs	m	zoning MPA, expanding existing PA, using local knowledge	3

50	Baral, 2012	Nepal	Annapurna Conservation Area	t	trust in managing, forest management	2
51	Thur, 2010	Bonaire, Netherlands Antilles	Bonaire National Marine Park	m	WTP, funding PA	2
52	Agrawal and Gupta, 2005	Nepal	PA in Terai	t	public participation, forest management	2
53	van Riper et al., 2012	Australia	Hinchinbrook Island National Park	m	understanding social values	1
54	Jones-Walters and Čivić, 2010	Europe	/	t	wilderness areas management	1
55	Ylhäisi, 2003	Tanzania	/	t	forest management	1
56	Gelcich et al., 2007	Chile	MPA	m	FSM-MPA: co-management, fishermen's financial behaviour	2
57	Lagabrielle et al, 2011	French island in Indian Ocean (Mauritius is closest)	PA	m & t & c	land-use planning	1
58	Bernués et al., 2005	Spain	“Sierra de Guara” Natural Park	t	land use change, livestock grazing management	2
59	Rees et al, 2013	United Kingdom	Lyme Bay	m	local peoples' perceptions	1
60	Cook et al., 2012	Australia	/	/	managing PA	1
61	Sacchelli et al., 2013	Italy	Tuscany region and Trento in North-Eastern Italian Alps	t	forest management, managing wood biomass	2
62	Türe and Böcük, 2010	Turkey	/	t	zoning PA, flora conservation	2
63	Segan et al., 2011	/	/	/	/	
64	Wanderseeet al., 2012	China	Fanjingshan National Nature Reserve	t	wildlife conservation, local peoples' perceptions	2
65	Rogério Mantelli et al., 2011	State of São Paulo, Brazil	/	t	forest management	1
66	Gerner et al., 2011	Germany	Bavarian Forest National Park	t	stakeholders' participation	1
67	Chen et al., 2011	sink source pollution model				
68	Chowdhury, 2006	Mexico	Calakmul Biosphere Reserve	t	forest management, deforstation	1
69	Piekielek and Hansen, 2012	USA	U.S. National Park Service on land	t	managing PA, land use change	2
70	Grafton et al., 2011	/	/	m	zoning MPA	1
71	Navarrete et al., 2011	Mexico	Monarch Butterfly Biosphere Reserve	t	forest management, wildlife conservation	2
72	Cunningham, 2013	Saudi Arabia	/	t	reintroduction - wildlife management, flora conservation	2
73	Marques et al., 2013	Portugal	Luiz Saldanha’s Marine Park	m	stakeholders' participation, monitoring MPA management, indicators use	3
74	LoBue and Udelhoven, 2013	USA	Great South Bay Marine Conservation Area, (South Bay, Long Island, New York)	wetland	/	
75	Fuller et al., 2010	Indonesia	East Kalimantan	t	forest conservation	1
76	Trisurat et al., 2012	Thailand	/	t	wildlife conservation, zoning PA, deforestation, developing new PA	4

77	Armenteras et al., 2009	Colombia, Latin America	Colombian Guyana shield	t	deforestation	1
78	Crossman et al., 2007	/	/	m & t	conservation planning	1
79	Mangubhai et al., 2012	Indonesia	The Bird's Head Seascape	m	co-management	1
80	Elliott and Udovč, 2005	Slovenia	/	t	public participation	1
81	Christensen et al., 2009	/	/	m	zoning MPA	1
82	Perez de Oliveira, 2013	NW Spain	/	m	FSM-MPA: developing new (M)PA, co-management	2
83	Corbera et al., 2007	Meso-America	/	t	forest management, stakeholders' participation	2
84	Höchtl et al., 2005	Italy, ALPS	Val Grande National Park and Strona Valley	t	land use change, wilderness areas management	2
85	Sharafi et al., 2012	Australia	protected areas in Victoria	t	conservation planning	1
86	Salau et al., 2012	/	/	t	landscape fragmentation, zooning PA, corridor management	3
87	Douvere, 2008	worldwide	/	m	zoning MPA, developing new (M)PA	2
88	Coskun et al., 2006	Turkey	Tercos (drinking water dam reservoir) catchment protected area	t	land use planning, management of PA	2
89	Cobb and Thompson, 2012	USA	National Park Service	t	scenario evaluation, climate uncertanties, managing PA	3
90	Levin et al., 2013	Israel	Mediterranien	t	conservation planning, flora conservation	2
91	Petheram et al., 2012	/	/	/	local peoples' perspectives, stakeholders' participation	2
92	Suffling et al., 2008	Ontario, Canad	Quetico Provincial Park	t	wildernes areas management, fire management	2
93	Sadeghi et al., 2013	Iran	Selkeh wildlife refuge	wetland	wetland conservation	1
94	Basterretxea et al., 2007	beach nourishment with sand				
95	Romero-Calcerrada and Luque, 2006	Finland	/	t	forest management, biodiversity conservation, scenario evaluation	3
96	Safont et al., 2012	Venezuela	Patepui	t	flora conservation, global warming uncertainties, preventing habitat loss	3
97	Saura and Pascual-Hortal, 2007	NE Spain	in Catalonia	t	zoning PA, wildlife conservation	2
98	Netherer and Nopp-Mayr, 2005	Slovakia and Polan	High Tatra Mountains	t	forest management	1
99	Crabtree et al., 2009	USA	Yellowstone National Park	t	monitoring PA ecosystems	1
100	Maina et al., 2008	Indian Ocean	/	m	climate change uncertainties	1
101	Schmied and Pillmann, 2003	tree protection in cities				
102	de Juan, 2012	Europe	Mediterranien Sea	m	FSM-MPA: managing MPA	1
103	Nahuelhual, 2013	Chile	/	t	ecotourism development	1
104	Cvitanovic, 2013	Australia	/	m	managing MPA	1

105	Rees, 2010	England	Lyme Bay	m	tourism and recreation in MPA, biodiversity conservation	2
106	Cinner, 2010	Kenya	/	m	FSM-MPA: Traditional ecological knowledge (TEK)	1
107	Pinto da Silva, 2004	Brazil	Arraial do Cabo, Rio de Janeiro	m	FSM-MPA: co-management	1
108	Beliaeff and Pelletier, 2011	Europe	/ , European Water Framework Directive	m	indicators use, managing MPA	2
109	Rastogi et al., 2013	India	/	t	wildlife conservation	1
110	Zacarias et al., 2011	Portugal	Recreation carrying capacity estimations to support beach management at Praia de Faro, Portugal	c	beach management, recreation carrying capacity	2
111	Torell et al., 2012	Tanzania	around Saadani National Park	t & c	coastal conservation, understanding community development	2
112	Buitrago et al., 2008	Venezuela	/	m	wildlife conservation, public participation	2
113	Schleyer and Celliers, 2005	South Africa	St Lucia and Maputaland Marine Reserves	m	managing MPA, coral reefs management, ecotourism management	3
114	Kerley et al., 2003	South Africa	Cape Floristic Region	t	wildlife conservation	1
115	Kendall et al., 2008	/	/	m	zoning MPA	1
116	Park et al., 2010	Utah, USA	Wasatch-Cache National Forest	t	WTP, funding PA	
117	Hagerman et al., 2010	/	/	t	biological conservation, climate change uncertainties	2
118	Figueroa et al., 2006	/	/	t	managing PA, biodiverity conservation, understanding socio-economic factors	3
119	Pierce et al., 2005	South Africa	Subtropical Thicket Biome	t	land use planning, stakeholders' participation, biodiversity conservation	3

Appendix B (section 4.2)

QUESTIONNAIRE

Questionnaire in workshop “Environmental education in Triglav National Park” part one.

The aim of this questionnaire is to gain information for discussion in third part of the workshop. Some questions have a possibility for multiple answers. Feel free to write your opinion, experience, suggestion or comment after any question.

1. How long have you been working in Triglav National Park (TNP)? _____.

2. Your job position is: _____.

3. Do you work in the professional or common service in TNP or on a project?
    - Professional Service
    - Professional Ranger Service
    - In the Information Centre
    - On the project
    - Professional Service and on Projects
    - Other _____.

4. Are you actively involved in planning environmental education activities and nature conservation educational activities?
    - Yes
    - No
    - Partly

    How many hours per month do you use for this activities? _____.

5. Are you actively involved in the implementation of environmental education activities?
    - Yes
    - No
    - Partly

    How many hours per month do you use for this activities? _____.

6. Are you working on the field as well? If yes, which portion of your time it takes? _____.

7. Please circle the groups you deal with within implementation of environmental education in the park. Please indicate the percentage of the groups you work with.

    By age group:
    - Preschool children
    - Primary school children
    - High school youth
    - Youth and students
    - Adults 25-40 years
    - Adults 40-60 years
    - Adults 60 years and more

By origin:

- Park inhabitants
- Tourists from Slovenia
- Foreign tourists

8. In which language(s) do you communicate with foreign tourists?
   _____

9. Have you attended organized educational activities for park managers while working in TNP?
   - Yes
   - Few times (How many? _____)
   - No

10. Within educational activities for park managers have you met with planning and implementation environmental education?
    - Yes
    - No

11. Have you visited “Visitor Centers” in other Alpine protected areas within your work?
    - Yes (Which? _____)
    - No

12. Have you attended training for protected areas managers?
    - Yes (Which? _____)
    - No

13. Please circle the activities in which you are actively involved?
    - organization and realization of events in Information Center “Triglavska Roža”
    - organization and realization of events in Information Center TNP in Trenta
    - guided tours of organized groups on park’s hiking trails in TNP
    - guided tours of organized groups in TNP
    - guided tours and education of pre-school groups in the
    - guided tours and education of school groups in the field
    - education for pre-school groups in Information Center “Triglavska Roža”
    - education for school groups in Information Center “Triglavska Roža”
    - field work with local inhabitants
    - field work with tourists (park visitors)
    - educational workshops for local inhabitants
    - educational workshops for tourists (park visitors)

In case this list does not contain all activities, which you work on in relation to environmental education activities in TNP, please state new ones:

_____
_____

14. Are you using indicators to measure the investment in environmental education activities?
    - Yes
    - No

Appendix C (section 4.2)

QUESTIONNAIRE

Questionnaire in workshop “Environmental education in Triglav National Park” part three.

Abbreviations:
TNP – Triglav National Park
EE – environmental education
PA – protected areas

Indicators importance:
3 – essential
2 – desireble
1 – not significant

THE LIST OF INDICATORS	IMPORTANCE			MEASURABILITY
	1	2	3	indicate with X
ENVIRONMENTAL EDUCATION				
Number of environmental workshops for children	1	2	3	
Number of environmental workshops for youth	1	2	3	
Number of kindergartens that collaborate with TNP	1	2	3	
Number of primary schools that collaborate with TNP	1	2	3	
Number of secondary schools that collaborate with TNP	1	2	3	
Number of environmental workshops for adults	1	2	3	
Number of environmental workshops for local inhabitants	1	2	3	
Number of environmental workshops for target groups	1	2	3	
(e.g. highland farmers, cheese producers, hunters...)	1	2	3	
Number of training courses for Junior Rangers	1	2	3	
Number of Junior Rangers in TNP	1	2	3	
Number of thematic events (e.g. Wednesday's nights)	1	2	3	
Number of seminar tutors employed in TNP	1	2	3	
Number of diploma thesis tutors employed in TNP	1	2	3	
Number of children involved in EE	1	2	3	
Number of adults involved in EE	1	2	3	
EVENTS				
Number of photo exhibitions	1	2	3	
Number of action events (e.g. Clean Slovenia)	1	2	3	
PROJECTS				
Number of projects in TNP	1	2	3	
Number of international projects in TNP	1	2	3	
Number of projects on EE	1	2	3	
QUESTIONNAIRES				
Number of questionnaires done among park visitors	1	2	3	
Number of questionnaires done among local inhabitants	1	2	3	
GUIDED ACTIVITIES				
Number of organized recreational activities (e.g. trekking)	1	2	3	
Number of guided tours for target groups (e.g. on	1	2	3	

greenways)				
Number of thematic guided tours	1	2	3	
PUBLICATIONS				
Number of publications, published by TNP	1	2	3	
Number of publications on EE	1	2	3	
Number of leaflets on EE (e.g. waste separation)	1	2	3	
Number of leaflets on nature conservation / environmental projects in TNP	1	2	3	
Number of magazine publications (e.g. TNP magazine)	1	2	3	
Number of books in TNP library	1	2	3	
Number of magazines in TNP library	1	2	3	
Number of publications, written by TNP employees	1	2	3	
Number of conference publications (abstract, poster)	1	2	3	
Number of conference lectures by TNP employees	1	2	3	
Number of articles published in national scientific literature	1	2	3	
Number of articles published in international scientific literature	1	2	3	
WORK				
Number of employees in TNP	1	2	3	
Number of employees in Department for education and EE in TNP	1	2	3	
Number of employees hours, dedicated to EE in TNP	1	2	3	
Number of working students in the summer season	1	2	3	
Number of volunteers' working hours	1	2	3	
Number of calls for employees in TNP	1	2	3	
Number of calls for project work	1	2	3	
Number of calls for voluntary work	1	2	3	
Number of calls for student work in the summer season	1	2	3	
PROFESSIONAL EVENTS				
Number of conferences attended by TNP employees	1	2	3	
Number of national conferences attended by TNP employees	1	2	3	
Number of international conferences attended by TNP employees	1	2	3	
Number of consultation events attended by TNP employees	1	2	3	
Number of workshops attended by TNP employees	1	2	3	
Number of round tables attended by TNP employees	1	2	3	
PROMOTION				
Number of shops that sell TNP promotion products	1	2	3	
Number of sold TNP calendars	1	2	3	
Number of TNP's promotion products that are on the market	1	2	3	
Number of sold TNP's promotion products that are on the market	1	2	3	
Number of TNP promotion events on the fairs in Slovenia	1	2	3	
Number of TNP promotion events on the fairs abroad	1	2	3	
Number of TNP promotions in media (TV, radio, newspapers, internet...)	1	2	3	

Number of press conferences in TNP	1	2	3	
Number of organized international events in TNP	1	2	3	
(e.g. free climbing championship)	1	2	3	
Number of consultations/conferences/round tables in TNP organized for PA managers	1	2	3	
COLLABORATION IN THE ALPS				
Number of Alpine PA managers' meetings attended by TNP employees	1	2	3	
Number of NGO's collaborating with TNP (e.g. CIPRA)	1	2	3	
Number of other PA in Slovenia collaborating with TNP	1	2	3	
Number of other PA abroad collaborating with TNP	1	2	3	
Number of other National Parks abroad collaborating with TNP	1	2	3	
COURSES				
Number of courses conducted in TNP	1	2	3	
Number of courses for TNP managers	1	2	3	
VISITORS				
Number of TNP visitors	1	2	3	
Number of national visitors in TNP	1	2	3	
Number of international visitors in TNP	1	2	3	
Number of overnights in TNP	1	2	3	
Number of overnights in TNP in municipalities	1	2	3	
Number of TNP web page visitors	1	2	3	
Number of national TNP web page visitors	1	2	3	
Number of international TNP web page visitors	1	2	3	
Number of news published on TNP web page	1	2	3	
Number of contributions published on TNP web page	1	2	3	
FUNDING				
Annual finances available for operation of PI TNP	1	2	3	
Annual finances available for EE	1	2	3	
Annual finances available from EU sources	1	2	3	
Annual finances available from national sources	1	2	3	
Annual finances available from donations, sponsorships	1	2	3	
Number of EU calls on which TNP applied	1	2	3	
Number of EU projects in implementation	1	2	3	
ECO				
Number of "eco" activities in TNP (e.g. eco-farming)	1	2	3	
Number of "eco" events in TNP (e.g. eco-market)	1	2	3	

Feel free to suggest new indicators:

_____
_____
_____
_____
_____
_____

Thank you.

Appendix D (section 4.4)

QUESTIONNAIRE

This questionnaire is anonymus. Please fill out the questionnaire honestly. Your opinion is important to us.

QUESTIONNAIRE PART I **Your initials or code**: _____

Please circle the correct answer or add information on a provided line.

About you:
Year you were born: 19____
Gender: ● male ● female
Educational program:_____ Year of study:_____
I come from: ● the contryside ● the town
I live: ● at home, in my patents household ● in school dormitory
How many brothers or sisters do you have? ● 0 ● 1 ● 2 ● 3 ● more than 3
Does your family run agricultiral business? ● Yes ● No
Are you a member of Slovenian Alpine Club? ● Yes ● No
Are you a member of scouts? ● Yes ● No
Are you in a member of a sport club? ● Yes ● No

About your relation to nature:
How many hours a week of your free time you spend in the nature? _____
How many hours a week you have outdoor practical education? _____
What do you prefer? ● seaside ● mountains
Where whould you prefer to go for the outdoor school day? ● on Slovenian seaside ● in Slovenian mountains
Have you ever been to The Skocjan Caves? ● Yes ● No
Have you ever been to Postojna Cave? ● Yes ● No
Have you ever been to Triglav National Park? ● Yes ● No

What do you know about...?

Every question has only one correct answer. Please circle the correct answer.

What is the most efficient way of nature protection?

● legislation ● inspection services ● individuals' actions ● activities prohibition

What is the highest level of nature protection in Slovenia?

● world ● national ● European ● local

How many types of parks (protected areas) we have in Slovenia?

● three (National, Regional and Landscape park) ● two (National and Regional park) ● one (National Parki) ● two (National and Landscape park)

What is the Slovenian biodiversity in comparison with other EU countries?

● very high ● high ● equal ● low

How many climate types we have in Slovenia?

● Continental, Mediterranien and Alpine climate ● Continental and Alpine climate ● Mediterranien and Alpine climate ● Continental and Mediterranien climate

What proportion of Slovenia is covered by TNP?

● 10 % ● 6 % ● 3 % ● 1 %

Why do we have in Slovenia such large number of animal and plant species?

Slovenia has many ● habitat types ● climate types ● forests ● inhabitated land

How do we protect mountain flowers?

● by planting ● by not picking them up ● by cultivating ● by watering

Which are the indigenous ungulates in Slovenian Alps?

● gams, mouflon ● gams, Alpine ibex, red deer ● mouflon ● gams, Alpine ibex, red deer, roe dear

How many National Parks do we have in Slovenia?

● one ● two ● three ● four

How many mountain huts are there in the Triglav National Park?

● 16 ● 34 ● 23 ● 170

How many meters of hight has our highest mountain?

● 2684 m ● 2864 m ● 2468 m ● 2586 m

Which flower is the symbol of Triglav? (In original questionnaire the flowers' names were in Slovenian language.)

● Leontopodium alpinum ● Potentilla nitida ● Lilium carniolicum ● Linaria alpina

Which animal is the main character in the Triglav legend?

● brown bear ● gams ● Zlatorog ● Alpine ibex

QUESTIONNAIRE PART II

Your initials or code: _____

What do you know after the workshop...?

Every question has only one correct answer. Please circle the correct answer.

What is the most efficient way of nature protection?

● legislation ● inspection services ● individuals' actions ● activities prohibition

What is the highest level of nature protection in Slovenia?

● world ● national ● European ● local

How many types of parks (protected areas) we have in Slovenia?

● three (National, Regional and Landscape park) ● two (National and Regional park) ● one (National Parki) ● two (National and Landscape park)

What is the Slovenian biodiversity in comparison with other EU countries?

● very high ● high ● equal ● low

How many climate types we have in Slovenia?

● Continental, Mediterranien and Alpine climate ● Continental and Alpine climate ● Mediterranien and Alpine climate ● Continental and Mediterranien climate

What proportion of Slovenia is covered by TNP?

● 10 % ● 6 % ● 3 % ● 1 %

Why do we have in Slovenia such large number of animal and plant species?

Slovenia has many ● habitat types ● climate types ● forests ● inhabitated land

How do we protect mountain flowers?

● by planting ● by not picking them up ● by cultivating ● by watering

Which are the indigenous ungulates in Slovenian Alps?

● gams, mouflon ● gams, Alpine ibex, red deer ● mouflon ● gams, Alpine ibex, red deer, roe dear

How many National Parks do we have in Slovenia?

● one ● two ● three ● four

How many mountain huts are there in the Triglav National Park?

● 16 ● 34 ● 23 ● 170

How many meters of hight has our highest mountain?

● 2684 m ● 2864 m ● 2468 m ● 2586 m

Which flower is the symbol of Triglav? (In original questionnaire the flowers' names were in Slovenian language.)

● Leontopodium alpinum ● Potentilla nitida ● Lilium carniolicum ● Linaria alpina

Which animal is the main character in the Triglav legend?

● brown bear ● gams ● Zlatorog ● Alpine ibex

What do you think now...

Would you like to visit Triglav National Park with your school? ● Yes ● No

Would you like to know more about Alps? ● Yes ● No ● Not sure

Would you like to enroll in TNP activities for youth? ● Yes ● No ● Not sure

Did this workshop encourage you towards discovering nature? ● Yes ● No

Thank you.

Appendix E (section 4.5)

QUESTIONNAIRE

Instructions: This questionnaire is a part of the research that focuses on the evaluation of environmental education on the greenways in the park. Please choose the grade that describes the best your experience of the greenway. The questionnaire is anonymous, please be honest.

Greenway _____, **Date**_____. **TNP staff** _____.

What is the country you come from? _____.
How many days are you staying in the park? _____.

Are you: • Visitor • Inhabitant **Gender:** • Male • Female	**I am visiting the park for:** • Vacation • Weekend trip • A day in nature • Organized activity (please specify) _____.
Age: • 15 – 17 • 18 – 24 • 25 – 30 • 31 – 40 • 41 – 50 • 51 – 60 • 61 – 70 • 71 – more	**I came to the greenway:** • With an organized group (please specify) _____. • Alone • In a couple • With parent(s) • With family with children • With grandchildren • Other (please specify) _____.
Educational level: • Primary school • High school • College • BSc. • MSc. • PhD. or doctor of medicine	**The reason I visited the greenway is:** • Educational opportunity • Recreation • Enjoying nature • School trip or excursion • Leisure and pleasure • Curiosity

PRO-ENVIRONMENTAL BEHAVIOUR QUESTIONS	**PLEASE CIRCLE**
Do you segregate waste at home?	NO PARTLY YES
Do you use energy saving lightning bulbs at home?	NO PARTLY YES
Do you use alternative energy sources (e.g. solar cells) at your home?	NO PARTLY YES
Do you buy environmentally friendly products (e.g. with ecolabels)?	NO PARTLY YES
Are you prepared to pay more for services/products from environmentally responsible suppliers?	NO YES
Have you ever been enrolled in environmental education program, training, workshop or activity?	NO YES
Have you participated in nature conservation project(s)?	NO YES
Have you ever made a donation for nature conservation project?	NO YES
Do you choose location of your vacation based on nature preservation characteristics in the area?	NO PARTLY YES
Do you find greenways as interactive tools for environmental education?	NO PARTLY YES

Thank you.

Appendix F (sections 4.6)

QUESTIONNAIRE

Aloha, thank you for helping us better understand how hikers feel about Mānoa Falls Trail. Please answer all questions honestly and as an individual. This questionnaire is anonymous.

DEMOGRAPHIC QUESTIONS	
Are you: • Visitor • Hawai'i Resident • Military What is your gender? • Male • Female	I am visiting Hawaiian Islands for (circle all that apply): • Vacation • Professional reasons • Outdoor recreation experiences • Organized activity (please specify) _____-_____
What is your age range? • under 18 • 18 – 24 • 25 – 30 • 31 – 40 • 41 – 50 • 51 – 60 • 61 – 70 • 71 – more	What is the highest level of education you completed? • High school • College • Undergraduate degree • Graduate school • Graduate or professional degree • Doctorate
What is your: country of residence?_____ zip code if from USA? _____	

SUSTAINABILITY QUESTIONS	
Are you familiar with the term ecotourism? • Yes • No • Not sure If yes, what keywords describe ecotourism? _____ _____	Do you consider the Hawaiian Islands an ecotourism destination? • Yes • No • Not sure Why?_____ _____
Do you consider yourself an ecotourist? • Yes • No	Do you consider sustainability issues (water/energy conservation, use of local sources, recycling) when making travel decisions. • Yes • No • Not sure If yes, which of the following do you consider: • Transportation • Accommodations • Food choices • Recreational activities • Scenic beauty and biodiversity • Climate • Other (please specify)_____
Are you willing to volunteer time to further the wellbeing of this place? • Yes • No • Not sure Are you willing to donate money to further the wellbeing of this place? • Yes • No • Not sure	

PRO-ENVIRONMENTAL BEHAVIOUR QUESTIONS	PLEASE CIRCLE
Do you separate waste at home?	NO PARTLY YES
Do you use energy saving lightning bulbs at home?	NO PARTLY YES
Do you use alternative energy sources (e.g. solar cells) at your home?	NO PARTLY YES
Do you buy environmentally friendly products (e.g. with ecolabels)?	NO PARTLY YES
Are you prepared to pay more for services/products from environmentally responsible suppliers?	NO YES
Have you ever been enrolled in environmental education program, training, workshop or activity?	NO YES
Have you participated in nature conservation project(s)?	NO YES
Have you ever made a donation for nature conservation project?	NO YES

Appendix G (sections 4.6)

SIGNIFICANT CORRELATIONS BETWEEN 8 PRO-ENVIRONMENTAL QUESTIONS AND 5 SUSTAINABILITY QUESTIONS REGARDING VISITORS' PROFILE (ECOTOURISTS OR NOT), EDUCATIONAL LEVEL, GENDER, AGE AND ORIGIN.

Table 35: *Chi-squared test for ecotourists.*

Behaviour	ECOTOURISTS	No	Partly	Yes	Total
Separate waste	Sample	72	166	508	746
	Fraction	9.7 %	22.3 %	68.1 %	100.0 %
	No	64	120	341	525
		12.2 %	22.9 %	65.0 %	100.0 %
	Yes	8	46	167	221
		3.6 %	20.8 %	75.6 %	100.0 %
	χ^2	14.701	df		2
	p-value	0.001			
Saving bulbs	Sample	68	106	573	747
	Fraction	9.1 %	14.2 %	76.7 %	100.0 %
	No	58	78	392	528
		11.0 %	14.8 %	74.2 %	100.0 %
	Yes	10	28	181	219
		4.6 %	12.8 %	82.6 %	100.0 %
	χ2	8.863	df		2
	p-value	0.012			
Alternative E	Sample	498	70	175	743
	Fraction	67.0 %	9.4 %	23.6 %	100.0 %
	No	373	46	107	526
		70.9 %	8.7 %	20.3 %	100.0 %
	Yes	125	24	68	217
		57.6 %	11.1 %	31.3 %	100.0 %
	χ^2	12.817	df		2
	p-value	0.01			
Buy EF products	Sample	110	284	332	726
	Fraction	15.2 %	39.1 %	45.7 %	100.0 %
	No	93	215	207	515
		18.1 %	41.7 %	40.2 %	100.0 %
	Yes	17	69	125	211
		8.1 %	32.7 %	59.2 %	100.0 %
	χ^2	24.887	df		2
	p-value	> 0.001			
WTP more EF	Sample	231		496	727
	Fraction	31.8 %		68.2 %	100.0 %
	No	189		326	515
		36.7 %		63.3 %	100.0 %
	Yes	42		170	212
		19.8 %		80.2 %	100.0 %
	χ^2	19.757	df		1
	p-value	> 0.001			
Enrolled EE	Sample	473		268	741
	Fraction	63.8 %		36.2 %	100.0 %
	No	360		165	525
		68.6 %		31.4 %	100.0 %
	Yes	113		103	216
		52.3 %		47.7 %	100.0 %
	χ^2	17.518	df		1
	p-value	> 0.001			
Participated in NC	Sample	440		301	741
	Fraction	59.4 %		40.6 %	100.0 %
	No	347		178	525
		66.1 %		33.9 %	100.0 %
	Yes	93		123	216
		43.1 %		56.9 %	100.0 %
	χ^2	33.679	df		1
	p-value	> 0.001			

Continues…

Continuation of Table 33: *Chi-squared test for ecotourists.*

Donated for NC	Sample	355		387	742
	Fraction	47.8 %		52.2 %	100.0 %
* Partly = Not Sure	No	285		240	525
		54.3 %		45.7 %	100.0 %
	Yes	70		147	217
		32.3 %		67.7 %	100.0 %
	χ^2	29.855	df		1
	p-value	> 0.001			
Know ecotourism	Sample	183	96	471	750
	Fraction	24.4 %	12.8 %	62.8 %	100.0 %
	No	183	96	249	528
		34.7 %	18.2 %	47.2 %	100.0 %
	Yes			222	222
				100.0 %	100.0 %
	χ^2	186.794	df		2
	p-value	> 0.001			
Self ecotourists	Sample	409		280	689
	Fraction	59.4 %		40.6 %	100.0 %
	No	409		58	467
		87.6 %		12.4 %	100.0 %
	Yes			222	222
				100.0 %	100.0 %
	χ^2	478.432	df		1
	p-value	> 0.001			
Hawai'i ecotourism destination	Sample	81	233	426	740
	Fraction	10.9 %	31.5 %	57.6 %	100.0 %
	No	71	209	240	520
		13.7 %	40.2 %	46.2 %	100.0 %
	Yes	10	24	186	220
		4.5 %	10.8 %	83.8 %	99.1 %
	χ^2	93.401	df		2
	p-value	> 0.001			
Volunteer at MF	Sample	371	205	153	729
	Fraction	50.9 %	28.1 %	21.0 %	100.0 %
	No	278	146	91	515
		54.0 %	28.3 %	17.7 %	100.0 %
	Yes	93	59	62	214
		43.5 %	27.6 %	29.0 %	100.0 %
	χ^2	12.523	df		2
	p-value	0.02			
Donate $ for MF	Sample	315	233	172	720
	Fraction	43.8 %	32.4 %	23.9 %	100.0 %
	No	236	158	114	508
		46.5 %	31.1 %	22.4 %	100.0 %
	Yes	79	75	58	212
		37.3 %	35.4 %	27.4 %	100.0 %
	χ^2	5.248	df		2
	p-value	0.073[3]			
Sustainable travel	Sample	267	91	371	729
	Fraction	36.6 %	12.5 %	50.9 %	100.0 %
	No	227	65	220	512
		44.3 %	12.7 %	43.0 %	100.0 %
	Yes	40	26	151	217
		18.4 %	12.0 %	69.6 %	100.0 %
	χ^2	49.198	df		2
	p-value	> 0.001			

[3] The p-values is above the significance level 0.05.

Table 36: *Chi-squared test for educational level.*

Behaviour	EDUCATION	No	Partly	Yes	Total
Separate waste	Sample	71	158	490	719
	Fraction	9.9 %	22.0 %	68.2 %	100.0 %
	Low	57	114	327	498
		11.4 %	22.9 %	65.7 %	100.0 %
	High	14	44	163	221
		6.3 %	19.9 %	73.8 %	100.0 %
	χ^2	6.14	df	2	
	p-value	0.046			
Donated for NC	Sample	344		372	716
	Fraction	48.0 %		52.0 %	100.0 %
	Low	255		243	498
		51.2 %		48.8 %	100.0 %
	High	89		129	218
		40.8 %		59.2 %	100.0 %
	χ^2	6.544	df	1	
	p-value	0.011			
Know ecotourism*	Sample	176	92	456	724
	Fraction	24.3 %	12.7 %	63.0 %	100.0 %
* Partly = Not Sure	Low	140	62	298	500
		28.0 %	12.4 %	59.6 %	100.0 %
	High	36	30	158	224
		16.1 %	13.4 %	70.5 %	100.0 %
	χ^2	12.112	df	2	
	p-value	0.002			
Donate $ for MF	Sample	299	225	170	694
	Fraction	43.1 %	32.4 %	24.5 %	100.0 %
* Partly = Not Sure	Low	208	164	102	474
		43.9 %	34.6 %	21.5 %	100.0 %
	High	91	61	68	220
		41.4 %	27.7 %	30.9 %	100.0 %
	χ^2	7.818	df	2	
	p-value	0.02			

Table 37: *Chi-suared tests for gender.*

Behaviour	GENDER	No	Yes	Total
WTP more EF	Sample	208	432	640
	Fraction	32.5 %	67.5 %	100.0 %
	Male	113	195	308
		36.7 %	63.3 %	100.0 %
	Female	95	237	332
		28.6 %	71.4 %	100.0 %
	χ^2	4.748	df	2
	p-value	0.035		
Donated for NC	Sample	325	329	654
	Fraction	49.7 %	50.3 %	100.0 %
	Male	142	171	313
		45.4 %	54.6 %	100.0 %
	Female	183	158	341
		53.7 %	46.3 %	100.0 %
	χ^2	4.495	df	2
	p-value	0.035		

Table 38: *Chi-squared test for age.*

Behaviour	AGE	No	Partly	Yes	Total
Separate waste	Sample	71	161	499	731
	Fraction	9.7 %	22.0 %	68.3 %	100.0 %
	18-29	24	77	168	269
		8.9 %	28.6 %	62.5 %	100.0 %
	30-50	29	58	192	279
		10.4 %	20.8 %	68.8 %	100.0 %
	51-more	18	26	139	183
		9.8 %	14.2 %	76.0 %	100.0 %
	χ^2	13.83	df	2	
	p-value	0.008			
Enrolled EE	Sample	464		263	727
	Fraction	63.8 %		36.2 %	100.0 %
	18-29	153		116	269
		56.9 %		43.1 %	100.0 %
	30-50	192		85	277
		69.3 %		30.7 %	100.0 %
	51-more	119		62	181
		65.7 %		34.3 %	100.0 %
	χ^2	9.528	df	1	
	p-value	0.009			
Donated for NC	Sample	350		377	727
	Fraction	48.1 %		51.9 %	100.0 %
	18-29	158		112	270
		58.5 %		41.5 %	100.0 %
	30-50	125		152	277
		45.1 %		54.9 %	100.0 %
	51-more	67		113	180
		37.2 %		62.8 %	100.0 %
	χ^2	21.251	df	1	
	p-value	0.002			
Know ecotourism*	Sample	180	93	463	736
	Fraction	24.5 %	12.6 %	62.9 %	100.0 %
*No. Yes. Not sure	18-29	81	38	153	272
		29.8 %	14.0 %	56.3 %	100.0 %
	30-50	73	39	167	279
		26.2 %	14.0 %	59.9 %	100.0 %
	51-more	26	16	143	185
		14.1 %	8.6 %	77.3 %	100.0 %
	χ^2	23.197	df	2	
	p-value	> 0.001			
Volunteer at MF	Sample	363	202	150	715
	Fraction	50.8 %	28.3 %	21.0 %	100.0 %
* Partly = Not Sure	18-29	101	92	75	268
		37.7 %	34.3 %	28.0 %	100.0 %
	30-50	143	71	54	268
		53.4 %	26.5 %	20.1 %	100.0 %
	51-more	119	39	21	179
		66.5 %	21.8 %	11.7 %	100.0 %
	χ^2	38.19	df	2	
	p-value	> 0.001			

Continues…

Continuation of Table 38: *Chi-squared test for age.*

Donate $ for MF	Sample	306	229	170	705
	Fraction				
* Partly = Not Sure	18-29	103	100	59	262
		39.3 %	38.2 %	22.5 %	100.0 %
	30-50	106	85	77	268
		39.6 %	31.7 %	28.7 %	100.0 %
	51-more	97	44	34	175
		55.4 %	25.1 %	19.4 %	100.0 %
	χ^2	17.553	df	2	
	p-value	> 0.001			

Table 39: *Chi-squared test for origin.*

Behaviour	**TYPE**	**No**	**Partly***	**Yes**	**Total**
Alternative E	Sample	465	65	156	686
	Fraction	67.8 %	9.5 %	22.7 %	100.0 %
	Visitor	360	48	97	505
		71.3 %	9.5 %	19.2 %	100.0 %
	Resident	105	17	59	181
		58.0 %	9.4 %	32.6 %	100.0 %
	χ^2	13.97	df	2	
	p-value	0.001			
Enrolled EE	Sample	433		252	685
	Fraction	63.2 %		36.8 %	100.0 %
	Visitor	337		168	505
		66.7 %		33.3 %	100.0 %
	Resident	96		84	180
		53.3 %		46.7 %	100.0 %
	χ^2	10.245	df	1	
	p-value	0.001			
Participated in NC	Sample	405		279	684
	Fraction	59.2 %		40.8 %	100.0 %
	Visitor	319		185	504
		63.3 %		36.7 %	100.0 %
	Resident	86		94	180
		47.8 %		52.2 %	100.0 %
	χ^2	13.221	df	1	
	p-value	> 0.001			
Volunteer at MF	Sample	348	187	139	674
	Fraction	51.6 %	27.7 %	20.6 %	100.0 %
* Partly = Not Sure	Visitor	290	124	80	494
		58.7 %	25.1 %	16.2 %	100.0 %
	Resident	58	63	59	180
		32.2 %	35.0 %	32.8 %	100.0 %
	χ^2	40.172	df	2	
	p-value	> 0.001			
Sustainable travel	Sample	244	84	346	674
	Fraction	36.2 %	12.5 %	51.3 %	100.0 %
	Visitor	193	65	238	496
		38.9 %	13.1 %	48.0 %	100.0 %
	Resident	51	19	108	178
		28.7 %	10.7 %	60.7 %	100.0 %
	χ^2	8.539	df	2	
	p-value	0.014			

Appendix H (sections 4.7 and 4.8)

QUESTIONNAIRE

Aloha, thank you for helping us better understand how hikers feel about Mānoa Falls Trail. Please answer all questions honestly and as an individual. This questionnaire is anonymous.

<table>
<tr><td colspan="2">HOW DO YOU FEEL AFTER HIKING MĀNOA FALLS DATE:</td></tr>
<tr><td>What was your primary reason for going hiking today?
• Physical exercise
• Outdoor activity
• Experience nature
• Traditional/cultural
• Spend time with a friend
• See the waterfall
• Other _____

Is this your first time on this trail?
• Yes
• No

Have you hiked other trails in Hawai‘i?
• Yes
• No</td><td>What did you bring with you today?
• Backpack
• Water
• Food
• First Aid Kit
• Cell phone
• Map
• Rain gear
• Flashlight
• Whistle
• Walking stick
• Bug repellent
• Sunscreen
• Other _____</td></tr>
<tr><td>How did you learn about the Mānoa Falls?
• Word of mouth
• Trail guidebook
• Internet
• Hotel/visitor activity desk
• Tour operator (please specify)_____
• Government office
• Other _____

Was the information accurate?
• Yes
• No
• Not sure</td><td>Would you like to see more information along the trail?
• Yes
• No
• Not sure

Which of the following would you like to learn about while hiking the trail? (Circle all that applies)
• Plants along the trail
• Water lifecycle and stream ecology
• Cultural importance of the valley
• Hawaiian history
• Geology of Hawai‘i
• Native flora and fauna of Hawai‘i
• Invasive species issues
• Erosion and trail maintenance affecting the trail</td></tr>
<tr><td rowspan="2">How did you access the trail?
• Car
• Bus
• Bike
• Walked
• Taxi
• Tour operator van
• Other _____</td><td>How would you rate the general condition of the trail?
• Very good
• Good
• Fair
• Poor</td></tr>
<tr><td>Did you notice the signs on the trail?
• Yes
• No</td></tr>
</table>

<table>
<tr><th colspan="2">DEMOGRAPHIC QUESTIONS</th></tr>
<tr><td>Are you:
• Visitor
• Hawai‘i Resident
• Military
What is your gender?
• Male
• Female</td><td>What is your:

country of residence?_____

zip code if from USA or Canada? _____</td></tr>
<tr><td>What is your age range?
• under 18
• 18 – 24
• 25 – 30
• 31 – 40
• 41 – 50
• 51 – 60
• 61 – 70
• 71 – more</td><td>What is the highest level of education you completed?
• High school
• College
• Undergraduate degree
• Graduate school
• Graduate or professional degree
• Doctorate</td></tr>
<tr><td>I am visiting Hawaiian Islands for (circle all that apply):
• Vacation
• Professional reasons
• Outdoor recreation experiences
• Organized activity (please specify) _____</td><td>I came to Mānoa Falls hiking trail:
• With an organized group (please specify) _____
• Alone
• As a couple
• With friend(s)
• With parent(s)
• As family with children (please indicate children's age) _____
• With grandchildren (please indicate children's age) _____
• Dog
• Other (please specify) _____</td></tr>
<tr><td colspan="2">What is your willingness to pay for hiking and enjoying Mānoa Falls?
• 1$
• 3$
• 5$
• 7$
• 10$

• I would not hike if I had to pay.</td></tr>
</table>

Thank you.

Appendix I (section 4.9)

INTERVIEW:
Understanding your ecotourism business

Introducing question: When did your ecotourism company started and how was the interest for the ecotourism business developed?

PRE ECOTOURISM ACTIVITIES
Do you believe mass tourism negatively affect your business?
Do you feel Hawai'i is a competitive ecotourism destination?
How much time is required to establish profitable ecotourism business?
Did you collaborate with any other ecotourism operator when establishing your business?
What is the proportion of Hawaiian residents employed by your business?
How do you involve local community in your business?

ENVIRONMENTAL EDUCATION ON TOURS
Is environmental education a critical component of your business?
Do you specifically state to your visitors what should not be done while on the tour (e.g. touching wildlife)?
Your tours are interactive. How curious are your visitors on tours?
At which point of the tour they have most questions (before entering the water or after)?
What is the level of visitors' interest in scientific information?
Do you educate your visitors about the importance of biological conservation?
Did you consider offering them adoption program?

VISITORS' RELATION AND SATISFACTION
How do visitors come in contact with you?
Are you building on the individual relationship with your visitors?
What is the average size of the group on your tours?
What is the average age of people who choose your ecotourism services?

POST ECOTOURISM ACTIVITIES
Do you measure by some means visitors satisfaction? If yes, how?
Do you keep contact with your visitors? If yes, how?
Do you have electronic newsletter you send to people who have taken your tours?
In which way do you contribute to biological conservation of HI natural heritage?
Do you give part of your business income / tax to biological conservation projects in HI?

SUSTAINABILITY PRACTICE
Are you Hawai'i Ecotourism Association (HEA) member?
Do you have or you consider HEA certification program?
Do you consider your tour activities have low impact on the natural environment?
Do you consider lowering your environmental impacts (even more)? How?
Does your business works toward environmental, social and economic sustainability? If yes, how?

OPEN DISCUSSION ON DECISION MAKING
What kind of decision making dilemmas you encounter by:
- dealing with visitors?
- investing money?
- running your business?