

Tourism as a tool for communicating
complex environmental issues:

Applying the ecosystem services
framework to nature-based tourism
activities across Iceland

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ABSTRACT

Throughout the twenty-first century, the lowering cost and increased availability of travel options has resulted in virtually uninterrupted economic growth of the international tourism sector. While financially beneficial, the increased movement of people has also been shown to have a negative impact on the environment, leading to the growth of a more environmentally-friendly approach to travel called nature-based tourism. One country at the forefront of the nature-based tourism movement is Iceland, and while the sector has grown significantly in the country over the past decade, the way in which information concerning environmental issues is communicated to tourists has not been widely researched. Being the case, the aim of this study was to examine the extent to which environmental issues are communicated to the general public through the use of the ecosystem services framework. Four popular nature-based tourism activities were selected for analysis; a whale watching tour, a horse riding tour, a boat tour of a glacial lagoon and a spa experience in a geothermal hot spring. A literature review concerning how the ecosystem services framework related to each of these tours was carried out and findings were compared to observatory data gathered through participation in said tourism activities. Results showed that while scientific publications could be found for each tour/ecosystem service combination, information concerning environmental issues was not widely communicated to participants in the nature-based tourism activities using the ecosystem services framework.

Key words

Case study, Ecosystem services, Iceland, Literature review, Nature-based tourism

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CHAPTER 1 – INTRODUCTION

1.1 Background on the issue

In today's society, travel has become an increasingly common aspect of peoples' lives. As relatively inexpensive commercial travel has become a viable option for the rising middle and lower-classes (Theobald, 2005, p.5), the opportunity for people to visit new places has grown enormously. With both domestic and international travel becoming cheaper, less time-consuming and more readily available, the tourism industry has developed into one of the world's largest and fastest-growing sectors, boasting virtually uninterrupted economic growth since the 1950s (United Nations World Tourism Organization, 2016, p.2). While this constant growth has significant economic benefits, the increased movement of people has been shown to negatively impact the natural environment. Past non-sustainable growth has led to highly-visible environmental effects such as diminishing water supplies, but has also been linked to less-obvious effects such as global warming through increased carbon dioxide emissions and the loss of biodiversity (Murphy & Price, 2005, p.167). The recognition of the negative impacts of mass tourism demanded a new, environmentally-friendly approach to travel, and as such, sustainable tourism was born (ibid, p.174).

With travel becoming more commonplace throughout the twenty-first century, interest in sustainable tourism 'reflects a rising tide of social concern about the quality of the natural environment and the effects of tourism' (Eagles, McCool & Haynes, 2004, p.13). Sustainable tourism involves the development of travel programmes designed to preserve the resource base of a given location for future generations while avoiding irreversible changes being made to the environment (Edgell, 2005, p.18). When discussing the sustainable tourism practices, the concept of nature-based tourism must also be addressed. Nature-based tourism is an overarching form of tourism encompassing aspects of sustainable tourism, ecotourism and adventure tourism, specifically referring to travel designed for the purpose of enjoying undeveloped natural areas or wildlife (Fennell, 2003, p.21). One area of the world which has embraced the nature-based sustainable approach to tourism is in the Nordic region, where public, scientific and governmental interest in the sector has grown substantially over recent years (Gössling & Hultmann, 2006, p.4). Being the case, and due to nature-based tourism involving the 'the direct enjoyment of relatively undisturbed phenomenon of nature' (Mehmetoglu & Normann, 2013, p.3), the uniqueness of Iceland's natural environment sees it act as the ideal location for successful nature-based tourism practices to thrive going forward.

In recent decades, the tourism industry in Iceland has grown rapidly largely based on the truly unique natural sites and experiences that prove attractive to international visitors. The nation's rugged landscapes, hot springs, volcanic fields and glaciers have provided a strong foundation for nature-based tourist activities to be developed (Gössling & Alkimou, 2006, p.53; Karlsdóttir, 2013, p.142), leading to the tourism sector to be one of the country's most profitable. The importance of the tourism industry in Iceland is evident when understanding that in 2011, tourism contributed around 6% of the nation's overall gross domestic product (Promote Iceland, 2013, p.4). This significance is reflected by the industry's recent growth as the total number of foreign visitors increased by 29.2% from 2014 to 2015 (Óladóttir, 2016, p.6), and further increased by 29% from 2015 to 2016 (Bender, 2016, p.10). According to the Icelandic Parliamentary Committee on the Strengthening of the Green Economy (2011), one major driver for this growth centres on the fact that 'travellers are increasingly looking for an authentic and unique experience without compromising the destination visited' (p.19), subsequently promoting the nature-based tourism activities that exist in the country.

As it stands today, the Icelandic nature-based tourism industry finds itself in the unique position of acting as an intermediary between the general public and the country's natural environment. As the industry continues to grow, it becomes apparent that certain opportunities exist with regards to nature-based tourism companies communicating environmental issues to people who otherwise may not have been exposed to them. With this being the case, the question remains as to what extent environmental issues are communicated to visitors, an area which can be examined through the use of the ecosystem services framework.

1.2 Aim and research questions

Understanding the growth of the Icelandic nature-based tourism sector, the aim of this report is to examine how the ecosystem services framework can be used to analyse certain tourism activities in Iceland, as well as to determine the extent to which this information is communicated to the tourists themselves. With this in mind, the following research questions have been developed:

- How can the ecosystem services framework be applied to different nature-based tourism activities across Iceland?
- To what extent are nature-based tourists in Iceland informed about environmental issues in relation to the ecosystem services framework?

1.3 Topic motivation and knowledge gap

The motivation for selecting this topic for my dissertation centres on my interest in the notion that tourism can be used as a tool for communicating complex environmental issues to a wide audience, an idea especially relevant in relation to nature-based tourism. As it can be reasonable to assume that people participating in nature-based tourism activities have at least a passing interest in the natural environment, it stands to reason that the nature-based tourism sector can act as a channel for informing visitors as to important issues concerning environmental conservation and to assist in affecting long-lasting sustainability. Regarding this point, it has been argued that when properly managed, tourism ‘has the potential to participate in, change and improve the social, cultural, economic, political, and ecological dimensions of future lifestyles’ (Edgell, 2005, p.1).

While the potential of nature-based tourism to educate is evident, certain key environmental concepts have not been comprehensively addressed in previous studies, with one key example of this being the concept of “ecosystems”. Whitelaw and Partalis (2014) reinforce this point, stating that while “ecosystems” are fundamental to nature-based tourism [though] the word is seldom specifically used’ (p.104), possibly due to the somewhat complex nature of ecosystems themselves. With regards to the complex nature of communicating the function and importance of ecosystems, the ecosystem services framework was selected as the theoretical framework of the study as it provides a clear and relatively straightforward outline as to the outputs of an ecosystem that benefit people, ideally making it easier for nature-based tourists to understand multifaceted environmental issues.

With regards to the decision to designate Iceland as the focus of the case study, the unique nature of Iceland’s natural environment as well as the country’s reliance on the nature-based tourism industry seemed highly relevant to the research topic. During a recent visit to Iceland, I was able to participate in a range of nature-based tourism activities. While listening to the information provided by the tour guides it became apparent to me that the concepts being discussed were able to be placed into the ecosystem services framework, regardless of whether they were referred to explicitly or implicitly. As the ecosystem services framework personally allowed me to better understand the importance of ecosystem functioning, I began thinking about whether or not it could be applied to (or is already incorporated into) certain nature-tourism activities in order to help communicate environmental issues to visitors who may otherwise not have been exposed to them. Upon returning to Sweden, I began to look into the topic further in preparation for this dissertation, and found that ‘[n]o statistics specifically related to nature tourism are available for Nordic countries’ (Kettunen, et al., 2012, p.177), reinforcing the relevance of this research topic to being carried out in Iceland.

1.4 Disposition of study

Chapter 2 discusses the ecosystem services framework in greater detail, highlighting the different aspects of the framework and creating a foundation for the analysis of data gathered in the study. Chapter 3 of this paper is used to present earlier research relating to different aspects of the dissertation topic, namely the use of the ecosystem services framework throughout nature-based tourism activities in Iceland. This section will examine previous studies concerning ecosystem services in the Nordic context, the use of the ecosystem services framework in other contexts (such as valuation of ecosystem services and in relation to human health and well-being), and the notion of tourism being used as a means of communicating environmental issues. Chapter 4 concerns the methods and methodology implemented throughout the research process. This section specifically addresses the chosen philosophy of science, the research design of the study, data collection and analysis techniques, the overall credibility of the study (including reliability, validity and generalisability), important ethical considerations and the limitations of the study. Chapter 5 presents the results gathered throughout the course of the study and analyses said results in relation to the ecosystem services framework presented earlier in the report. Chapter 6 discusses the results gathered in relation to the overall aim and research questions of the study and addresses the use of the ecosystem services framework and the methodological approach utilised. Chapter 7 will be used to provide concluding remarks concerning the entire study, as well as to provide suggestions for further research within this topic based on the experiences gained during the research process.

CHAPTER 2 – THEORETICAL FRAMEWORK

2.1 The ecosystem services framework

As discussed previously, the chosen theoretical framework for this dissertation is the ecosystem services framework. The concept of ecosystem services concerns the benefits that people obtain from the ecosystems (Orians & Groom, 2006, p.60; Millennium Ecosystem Assessment, 2003, p.53) and is commonly divided into four main service categories, namely provisioning, regulating, supporting and cultural services (though these categories often overlap) (ibid, p.56). Each of ecosystem service categories will be discussed in greater detail in the following sections (including examples), subsequently providing an analytical foundation for the variety of ecosystem services that are presented throughout the selected nature-based tourism activities in Iceland.

2.1.1 Provisioning services

The first category of ecosystem services is that of provisioning services. According to Chapin (2009), '[p]rovisioning services are the goods produced by ecosystems that are consumed by society [representing] the most direct link between ecosystems and social systems' (p.41). With this being the case, provisioning services are often the category of ecosystem services which is most easily identifiable to the general public as it involves goods which are directly involved in peoples' lives on a day-to-day basis. Some examples of provisioning services which are easily identifiable in everyday life include food and fibre (i.e. food products derived from plants, animals and microbes, as well as other materials such as wood and hemp), fuel (i.e. wood, dung, and other biological materials which act as sources of energy), biochemical (i.e. biological materials used in many medicines and food additives), and fresh water (i.e. clean drinking water) (ibid, pp. 41-43; Millennium Ecosystem Assessment, 2003, pp.56-57). While these services are relatively straightforward with regards to their importance to human well-being, other (possibly less obvious) varieties of provisioning services are also of significance, namely genetic resources (i.e. genes and genetic information used for animal and plant breeding and biotechnology) and ornamental resources (i.e. animal and plant products used for decoration, such as skins, shells, and flowers) (ibid). In order for provisioning services benefit human well-being, other (much less visible) categories of ecosystem services must also exist, the first variety of which are regulating services.

2.1.2 Regulating services

The concept of regulating services concerns the ecosystem processes which ‘influence processes beyond [the] borders of ecosystems where they originate [...] constitut[ing] some of the key cross-scale linkages that connect ecosystems on a landscape and integrate processes across temporal scales’ (Chapin, 2009, p.43). Plainly stated, regulating ecosystem services are the important processes that happen throughout the natural environment that are not always easy to see, but if they did not occur, all ecosystems would be affected human well-being would be subsequently impacted. Examples of regulating services include climate regulation (affecting both temperature and precipitation levels), water regulation (concerning water run-off and flooding), and pollination (where ecosystem changes affect the distribution, abundance and effectiveness of pollinators) (Millennium Ecosystem Assessment, 2003, p.58). While each of these services are vital to effective ecosystem functioning, certain regulating services have a more direct connection to human well-being. Examples of these services include air quality maintenance (where ecosystems both contribute and extract chemicals from the atmosphere), regulation of human diseases (as changes in ecosystem functioning can direct impact the abundance of human pathogens and disease carrying vectors), and biological control (the prevalence of crop and livestock pests and diseases which effect primary production) (ibid, pp.57-58). As made evident through these examples, the role of regulating services within all ecosystems is fundamental yet essentially invisible, though they in turn are sustained by another invisible group of services, namely supporting services.

2.1.3 Supporting services

According to Chapin (2009), supporting services refer to ‘the fundamental ecological processes that control the structure and functioning of ecosystems’ (p.31). While supporting services are necessary for the production of all other ecosystem services, their “behind-the-scenes” nature result in ‘the public often overlook[ing] these services because they are not products directly valued by society’ (ibid). This unfamiliarity of supporting services can be understood as they effect the natural environment over a long period of time and are not readily on display (i.e. unlike the other ecosystem service categories, supporting services generally do not have an immediacy of impact). Examples emphasising the vital yet underappreciated impacts of supporting services in relation to human well-being can be seen with the maintenance of soil resources, as well as water, nutrient and carbon cycling processes. While none of these examples are directly used by people, if the processes were to be effected, certain types of provisioning services (such as food production) may be impacted

(Millennium Ecosystem Assessment, 2003, pp.59-60). A further example of a supporting service relating to this dissertation is the maintenance of biological diversity, where species that exist within an ecosystem can have a strong impact on the functioning of said ecosystem (Chapin, 2009, p.36). As a significant proportion of Icelandic nature-based tourism activities involve the interaction with or observation of wildlife, this is an important aspect of supporting services category to be aware of, as is the final category of the ecosystem services framework: cultural services.

2.1.4 Cultural services

The cultural services category of the ecosystem services framework concerns the ‘[n]on-material benefits that society receives from ecosystems (e.g. cultural identity, recreation, and aesthetic, spiritual and religious benefits)’ (Chapin, Kofinas & Folke, 2009, p.344), subsequently playing a significant role in human well-being (Milcu, et al., 2013, p.43). As many cultures attach spiritual and religious values to their environment, cultural services play an important role in the quality of life of certain groups of people. Another area of significance concerning cultural ecosystem services centres on their relationship to human health and well-being. According to Pröbstl-Haider (2015), ‘[f]or recovery from work as well as for recreation and relaxation, the presence and accessibility of a green environment such as forests, diverse landscapes, parks or gardens are now regarded as crucial’ (p.2), emphasising the connection between ecosystems and their beneficial effects on health and well-being. Furthermore, ecosystems have been shown to provide people with inspiration for art, folklore and national symbols, as well as provide a “sense of place” for people within a given ecosystem, subsequently impacting the way in which humans both view and interact with their immediate environment (Millennium Ecosystem Assessment, 2003, pp.58-59).

Due to the nature of this research topic, certain varieties of cultural services relating to the nature-based tourism sector should be specifically highlighted. Firstly, recreation and ecotourism is considered a cultural ecosystem service as it allows people to spend their leisure time experiencing new cultures and differentiated (and aesthetically-pleasing) environments, a factor which has been observed in the Icelandic case (Ólafsdóttir, 2013, p.133). Another cultural service type of interest for this study concerns the educational values that an ecosystem can provide. According to the Millennium Ecosystem Assessment (2009), ‘[e]cosystems and their components and processes provide the basis for both formal and informal education in many societies’ (p.59), reflecting the potential of the nature-based tourism sector with regards to communicating environmental issues to tourists in Iceland.

2.2 Discussion of the ecosystem services framework

After understanding the different categories of the ecosystem services framework, it is beneficial to acknowledge both the positive and negative aspects of the framework in relation to the research process. Due to the in-depth nature of the ecosystem services framework, only the most pertinent aspects of the framework in relation to this dissertation will be addressed.

2.2.1 Positive aspects of the framework

One of the greatest strengths of the ecosystem services framework can be seen when acknowledging its interdisciplinary nature. According to Bull, et al. (2016), '[t]he diversity of disciplines involved in ecosystem services research strengthens the framework [and allow it to be] methodologically flexible' (p.105), allowing the framework to be applied in a diverse variety of scientific studies. Another area of great strength concerning the methodological foundation of the ecosystem services framework is the holistic nature of the approach. As was previously mentioned, the flexibility of the framework allows different scientific disciplines and methods to be utilised, but on top of this, also encourages social, ecological and economic perspective of a problem to be included throughout the research process (ibid). In relation to the topic of this dissertation, the ecosystem services framework is able to reconnect people with nature, allowing a link to be established between the biophysical and human dimensions of ecosystems (as is seen through nature-based tourism), as well as 'provid[ing] a tool to advocate and communicate nature conservation' (ibid), justifying its use in determining the extent to which environmental issues are communicated to nature-based tourists across Iceland.

While the strengths of the ecosystem services framework can be discussed, so too should the potential opportunities be acknowledged. One of the most relevant opportunities of the ecosystem services framework to the nature-based tourism sector in Iceland is the ability of the framework to be implemented in order to increase awareness of environmental issues. This potential benefit is strengthened by the ability of the framework to also increase the interest of societal actors (i.e. the general public, researchers, the media and the business sector) in environmental issues, as well as enhance awareness surrounding the decision-making process (ibid, p.106). Finally, with regards to the relationship between science and policy, Gómez-Baggethun and Ruiz-Pérez (2011) state that 'a growing number of environmental scientists have advocated economic valuation of ecosystem services as a pragmatic short-term strategy to communicate the value of biodiversity' (p.613), emphasising the interdisciplinary nature of the approach as previously discussed.

2.2.2 Negative aspects of the framework

While the ecosystem services framework does possess numerous strengths and potential benefits, a variety of weaknesses and external threats also exist and must be addressed. One area of the ecosystem services framework which has been identified as a significant weakness is view that the scientific basis surrounding the framework is incomplete. This argument is reflected in the notion that ‘[o]ur current understanding of the links between biodiversity, ecosystem functioning and ecosystem services provision is poor’ (Bull, et al., 2016, p.105). As the complex nature of the ecosystem services framework has been widely addressed, studies centred on how to link already available knowledge in order to make better understand complex environmental issues have been carried out (Pascual, Pérez Miñana & Giacomello, 2016, p.112). While studies such as this act as a positive step in addressing the weaknesses in the ecosystem services framework, the fact that research of this nature are required seems to justify the general lack of understanding that exists concerning the framework, emphasising the need for better ecosystem service tools (Bull, et al., 2016, p.105). On top of this, the framework’s over-emphasis on the monetary value of ecosystem products and the view that the intrinsic value of nature being is often disregarded through its use are also relevant (linking back to the over-commodification of ecosystem products) (ibid). Finally, and in direct relation to the topic of this dissertation, it has been argued that the ecosystem services framework is inaccessible to non-specialists (due to its overall complexity when not actively involved in the research area) (ibid), an area of great interest concerning the use of the framework in the Icelandic nature-based tourism sector to communicate environmental issues.

Concerning the potential weaknesses (threats) of the ecosystem services framework, the lack of awareness across the general public is highlighted. According to Bull, et al. (2016), the ‘[o]verall low understanding of ecosystems among [the] general public including stakeholders and policy makers [may lead to] these groups [becoming] disengaged’ (p.107). Interestingly, while the interdisciplinary nature of the ecosystem services framework has been identified as a strength, the difficulty of working practically within an interdisciplinary team has also been noted as a potential negative due to the challenge of combining differing approaches to research (ibid). As can be seen with this final aspect of the ecosystem services framework being viewed both as a strength and possible weakness, the framework is, like the ecosystems it examines, a highly complex approach to research despite the benefits gained from its utilisation being numerous and varied.

CHAPTER 3 – EARLIER RESEARCH

One area of importance for any academic study is to examine earlier research that has been carried out in relation to the research topic in order to develop a greater understanding of the topic as a whole. In this case, it is vital to acknowledge the previous work that has been carried out in relation to the use of the ecosystem services framework (the theoretical framework of this dissertation), and specifically how it has been implemented in the Nordic context (as Iceland is the focus of this report). Continuing on from this, how the ecosystem services framework has been used in other contexts is also of use and will be discussed (i.e. valuation of ecosystem services and how ecosystem services relate to human health and well-being). Finally, as the research topic of this dissertation centres on the nature-based tourism industry being used as an educational tool for communicating environmental issues to tourists, previous research in this field was also examined.

3.1 Ecosystem services in the Nordic context

The first area of earlier research relevant to the research topic of this dissertation regards ecosystem services in the Nordic region. First and foremost, Kettunen, et al. (2012) have carried out a general identification and classification of Nordic ecosystem services, outlining examples of each of the varieties of ecosystem services observed throughout the study (pp.85-87). Of particular interest to the research area of this dissertation is that of recreational and tourism-based activities which fall under the “cultural” ecosystem services category. In keeping with the general consensus as to the significance of the nature-based tourism industry, the authors state that ‘[i]t is estimated that the market value for nature tourism [in the Nordic region] is increasing at six times the rate of tourism overall’ (ibid, p.177). While the importance of the tourism sector is acknowledged in relation to the ecosystem services framework, it was also stated that ‘there are significant gaps in the existing data on biophysical status of Nordic ecosystem services’ (ibid, p.99), somewhat encouraging further research into the topic to be carried out.

One area which was substantially covered relating to ecosystem services in the Nordic context centred on different forms of valuation. In discussing challenges surrounding “greening” the economy of the Nordic nations (i.e. working towards the private sector adopting more environmentally-friendly practices), one article presented the notion of adopting payment schemes

for ecosystem services with the goal to preserve and enhance the services themselves going forward (Skjelvik, Bruvoll & Ibenholt, 2011, p.48). With this in mind, one common theme throughout the collected earlier research publications centred on the valuation of ecosystem services in the Nordic region, with the Icelandic context often being directly referred to. According to Barton, et al. (2012), ‘Iceland does not have the same tradition for environmental valuation as some of the other Nordic countries, [though] has started a research project which aims specifically to investigate ecosystem service values related to the Heiðmörk Nature Reserve’ (p.50). While the Heiðmörk Nature Reserve case study is considered to be one of the most interesting ecosystem service based valuation studies in the Nordic region, it has also been argued that ‘Iceland has some way to go in terms of reaching the level of application of valuation methods [utilised] in the other Nordic countries’ (ibid), once again highlighting an area which could be significantly further researched.

3.2 Ecosystem services in other contexts

3.2.1 Valuation of ecosystem services

As was previously discussed, one of the most researched areas concerning ecosystem services is that of valuation. From an environmental perspective, ‘we implicitly put a value on nature by looking at the services that are provided by the natural environment [where the] economic valuation of ecosystem services allows us to quantify the benefits they provide’ (Mumby, et al., 2014, p.96). Examining earlier research on the valuation of ecosystem services, the economic perspective is a regularly implemented approach based on the market value of said services in a variety of contexts (Costanza, et al., 2006, pp.17-18; Salles, 2011, p.471). The reasoning behind utilising such an approach can be understood in the fact that it allows for the complex reality of ecosystem services to be presented in a straightforward and (relatively) easy to comprehend manner. While this approach is common, earlier research also suggests that there is ‘an on-going debate about what some see as the “commodification” of nature this approach supposedly implies’ (Costanza, et al., 2014, p.153). Furthering this argument, certain of studies centred on ecosystem service valuation present the perspective that adopting a purely economic focus is insufficient in truly valuing the benefits the natural environment provides to people. This standpoint is emphasised by Carrasco, et al. (2014), who state that ‘[t]he implications are that conservation policies focusing solely on the economic value of ecosystem services will fail to protect biodiversity in remote and less disturbed regions’ (p.163), reflecting the view that other methods should be adopted in certain scenarios.

While the economic valuation approach concerning ecosystem services has dominated the academic landscape, some studies have adopted alternative methods to estimating value. Examples of different approaches include based on the biophysical valuation of ecosystem services (Keeler, et al., 2012, p.18622); based on the environmental impact of ecosystem services (such as gas emission levels) (Bateman, et al., 2013, p.45); or even the ability for scientific findings concerning ecosystem services to be easily incorporated into the decision-making process (de Groot, et al., 2012, p.50). As researchers seem divided in relation to how ecosystem services “should” be valued, it comes as no surprise that ‘[d]espite broad recognition of the value of goods and services provided by nature, existing tools for assessing and valuing ecosystem services often fall short of the needs and expectations of decision makers’ (Keeler, et al., 2012, p. 18619), something which could prove problematic. Being the case, Costanza, et al. (2014) sum-up the ideal scenario regarding ecosystem service valuation going forward (albeit from an anthropogenic perspective), stating that ‘[s]ustaining and enhancing human well-being requires a balance of all of our assets – individual people, society, the built economy, and ecosystems [where] reframing of the way we look at “nature” is essential to solving the problem of how to build a sustainable and desirable future for humanity’ (p.153).

3.2.2 Human health and well-being

A further research area concerning ecosystem services centres of the impact that nature has on human health and well-being, particularly in relation to the tourism sector. It has been widely acknowledged that the natural environment can have a positive effect on human health and well-being, and as such, how nature-based tourism plays a role in this has been examined. According to Willis (2015), being exposed to nature allows people to be relieved of stress by promoting feelings of rejuvenation, and as such ‘[t]ourism and leisure experiences in natural areas provide a unique opportunity for people to engage with nature and to benefit from these engagements in such ways’ (p.38). This argument is reinforced in other studies, arguing that “green and blue areas” (i.e. green spaces and/or freshwater or coastal zones) ‘are able to provide adequate flows of ecosystem services that will provide a positive impact on health’ (Martinez-Juarez, et al., 2015, p.65). With this in mind, the potential of nature-based tourism positively impacting human health and well-being becomes clear as the sector can act as an important mechanism in providing people the opportunity to interact with nature (ibid, p.68). Being the case, properly managed nature-based tourism activities should ‘not only take in account human impacts on natural resources but also [acknowledge] how natural resources impact on human psychological well-being’ (Willis, 2015, p.38).

Another topic concerning the connection between ecosystem services and human health and well-being concerns the impact of the natural environment in relation to poverty alleviation. While not directly related to tourism, the socio-economic aspects of the ecosystem services framework is important to identify as it is often the global poor whose livelihoods are directly dependent on said services (Fisher, et al., 2014, p.34). The ecosystem services framework is a far-reaching scientific approach, acknowledging the linkages between subjects which may have otherwise been considered as separate (such as environmental processes and poverty alleviation). This interrelatedness is also illustrated in a study connecting ecosystem services, human well-being and natural biodiversity, as the authors argue that there is ‘strong evidence linking biodiversity with production of ecosystem services and between nature exposure and human health [as] robust studies indicate that exposure to microbial biodiversity can improve health, specifically in reducing certain allergic and respiratory diseases’ (Sandifer, Sutton-Grier & Ward, 2015, p.1). By examining earlier studies, is evident that research utilising the ecosystem services framework should not discount the human element in any context, an area which is especially relevant in relation to the nature-based tourism sector.

3.2.3 Impacts on the natural environment and biodiversity

As was briefly addressed previously, the connection between the ecosystem services framework and environmental issues such as biodiversity is obvious and highly relevant. With regards to the nature of this relationship, numerous studies have argued that biodiversity and the provision of ecosystem services are in fact overwhelmingly positively related (Harrison, et al., 2014, p.195), where ‘the implication [of this shows] that management to enhance one should [in turn] increase the other’ (Bullock, et al., 2011, p.542). Having established the connectedness of biodiversity and ecosystem services, a variety of environmental assessment measures such as the Millennium Ecosystem Assessment (MEA) have been discussed in order to sustainably manage the natural environment. The MEA provides a ‘consistent framework to address biodiversity, ecosystems services and their societal values’ (Partidario & Gomes, 2013, p.36) and through its implementation it was found that 60% of the assessed ecosystem services were deteriorating or being used unsustainably, inevitably leading to lopsided impacts (ibid; Mace, Norris & Fitter, 2012, p.19). Being the case, recent work within the MEA framework has focused on ‘regional and national ecosystem assessments, developing methods for economic valuation and tools to support decision making’ (ibid), reinforcing the interrelated nature of the ecosystem services framework as it addresses the areas of biodiversity, valuation and use during decision-making processes, each of which have been previously discussed.

While current environmental assessment measures have identified key issues concerning issues relating the ecosystem services, not all research on the topic is entirely positive. In relation to the restoration of biodiversity-based ecosystem services, Montoya, Rogers and Memmott (2012) argue that '[d]espite recent advances in ecological research, knowledge gaps remain regarding the recovery of the ecosystem services of biodiversity that merit further theoretical and empirical exploration' (p.671). This view is supported by Baker, et al. (2013) who argue that despite the ecosystem services framework acting as valuable tool within environmental assessment, 'it requires a pragmatic context-specific consideration of how ecosystem services can be used to help address some of the common problems with current environmental assessment practice' (p.3), emphasising that further work must be done before it can be wholeheartedly accepted.

3.3 Tourism as a communication tool

The final topic of earlier research collected centres on how the nature-based tourism industry can be used as a tool for communicating environmental issues. As nature-based tourism continues to grow, so too does the opportunity to educate people about environmental issues. According to Kimmel (1999), nature-based tourism 'brings many people into environments in which they can learn about the locale and learn environmental principles that can heighten their awareness of commitment to environmental protections in general, [presenting] an important opportunity to advance the cause of environmental education' (p.44). While being based on a theoretical concept, this principle of environmental learning has been practically applied with great success, notable in the United States of America. Studies based on forested areas in Florida suggest that well-managed nature-based tourism activities has resulted in tourists developing an 'interest in learning [and] environmental education and interpretation [leading to the practices] becoming important parts of many public land management plans in the US' (Stein, Denny & Pennisi, 2003, p.406). Through the growth of the nature-based tourism sector, more people are being exposed to environments which they may not have previously experienced. While this is so, it has been suggested that 'to the great majority [of travellers] the concepts of natural capital and ecosystem benefits are neither known nor referenced' (Simmons, 2013, p.347), suggesting that while the opportunity exists for environmental education, its implementation is still far from the norm. As such, further research into this topic should be carried out regarding the implementation of the environmental education, looking into the extent to which it already exists, as well as if it can be implemented in a widespread and effective manner, hence the topic of this dissertation.

CHAPTER 4 – METHODOLOGY

4.1 Philosophy of science

In order to address the aim and research questions of this dissertation, a case study approach was selected as the methodological foundation of the study. According to Creswell (2013), case study research is ‘a qualitative approach in which the investigator explores a real-life, contemporary bounded system (a case) or multiple bounded systems (cases) over time’ (p.97). When considering that the focus of this study centres on a variety of activities taking place within the Icelandic nature-based tourism sector (multiple cases within one larger, bounded system), this research approach seems an appropriate choice. While the implementation of a case study approach fits the intended outcomes of this study, it has been argued that the case study research should not be considered a methodology but rather a choice of what is to be studied (i.e. a way of deciding the focus of study) (Stake, 2005, p.433), where other researchers present it as a strategy of enquiry or a comprehensive research strategy (Creswell, 2013, p.97). One reason for these differing views towards the case study research approach relates to the uncertainty felt by researchers with regards to structure and method (Yin, 2009, p.xiii) as the design of case study research is often presented as ‘open-ended and untethered [leading to] researchers feel[ing] unguided about structure [where this] open-endedness is an unwarranted expectation of structural looseness’ (Thomas, 2011, p.519). While this may be the case, the inherent flexibility of the case study research approach allows researchers examine a case (or multiple cases) in great depth, and provided that it is implemented appropriately in relation to the study object(s), it can be considered a justified methodological choice (Creswell, 2013, p.97).

4.2 Research design and data collection strategy

In order to effectively implement a case study research design, a clear research design must be developed. First and foremost, this study will utilise a qualitative approach to researching ecosystem services throughout nature-based tourism in Iceland. This approach was selected for use with this research topic as it aims to gain a deeper understanding of the actions being studied (Alvesson & Sköldbberg, 2009, p.7) (in this case, the different tourism activities), specifically the extent to which the ecosystem services framework is present in the tourism sector in Iceland both in practice and throughout academic literature. According to Creswell (2013) a qualitative case study requires

‘detailed, in-depth data collection involving multiple sources of information... and reports a case description and case theme’ (p.97). With this in mind, a variety of data sources will be utilised throughout this study, centring mainly on a comprehensive review of academic literature review, the collection of information provided by the different nature-based tourism companies in the study, and observational data gathered by participating in the selected tours.

The first step of data collection for this dissertation was a literature review. In order to carry out the literature review, a variety of tours were selected in order to provide a basis for the search. Four tours (focussing on different aspects of nature-based tourism) were selected for analysis, and a summary of these tours can be seen in Table 1 at the end of Chapter 4.3.1. After the types of tours have been determined, a variety of peer-reviewed, academic publications related to the study topic will be gathered using online databases such as SöderScholar (the Södertörn University online library database), Google Scholar and DiVA Portal. A combination of different search terms were utilised in order to narrow down the selected articles, including the different categories of ecosystem services (i.e. provisioning, regulating, supporting, cultural) and the focus of the selected tours (i.e. whale watching, Icelandic horses, glacier, geothermal, etc.). Finally, search terms in relation to specified aspects of the tours and the ecosystem services framework categories were used (i.e. whaling (in relation to provisioning services), Icelandic horses’ role in agriculture (in relation to provisioning services), the effect of glacial meltwater on ecosystem functioning (in relation to regulating services) and the benefits of bathing in geothermal hot springs (in relation to cultural services)). The articles were selected based on their relevance to the research topic, a judgement made based on their Abstracts. The final results of the literature review were then sorted based on which tour and ecosystem services category they related to using an ecosystem service assessment guide (Maes, 2013, pp.30-35) and presented in a table (Appendix I).

In order to apply the findings from the literature review (secondary data) in relation to the aim and research questions of the study, a qualitative observational research approach was also utilised (primary data). According to Creswell (2013), ‘[o]bservation is one of the key tools for collecting data in qualitative research [involving] the act of noting a phenomenon in the field setting through the five senses of the observer... recording it for scientific purposes’ (p.166). In this study, a “participant as observer” role was adopted where ‘[t]he researcher is participating in the activity at the site [where] the participant role is more salient than the researcher role’ (ibid, pp.166-167). Being so, field notes and other relevant publications (e.g., brochures and pamphlets) were gathered on the respective tours, and said notes were compared to the results of the literature review during the results and analysis stage of the dissertation.

4.3 Sampling

In order to effectively carry out the research design in relation to the aim and research questions of this study, the area of sampling is highly important. Sampling concerns the selection of cases being scientifically researched, and as such, can be based upon a variety of different variables depending on the purpose of the study. In qualitative research, a purposeful sampling approach is common (where cases are selected for a specific reason). As such, purposeful sampling in qualitative inquiry ‘typically focuses in-depth on relatively small samples [focusing on] studying information-rich cases yields insights and in-depth understanding rather than empirical generalisations [which] illuminates the questions under the study’ (Patton, 2002, p.230). With this being the case, certain purposeful sampling techniques were used throughout the selection of the chosen nature-based tours and the literature collected for use in this study.

4.3.1 Sampling of tours

When selecting the nature-based tourism activities for analysis in this study, a criterion sampling technique was utilised. In criterion sampling, research cases are selected based on meeting a predetermined criterion of importance (ibid, p.238; Creswell, 2013, p.158), in this case, that the tours selected represented a cross-section of nature-based tourism activities on Iceland. It was decided that the tours selected should represent four varieties of nature-based tourism, namely an observational wildlife tour (whale watching), a participatory wildlife tour (riding Icelandic horses), an observational natural phenomena tour (boat tour of the Vatnajökull glacial lagoon), and a participatory natural phenomena tour, respectively (Blue Lagoon spa experience). Once the categories and specific tour-types were finalised, a general Google search was conducted to determine the tour operator that would be selected (information on the chosen tour operators is discussed in the following sections). In selecting the actual tourism activities, great care was taken in ensuring that the tourism activity itself represented a “common” tourism experience in Iceland, and as such, allowances were made for this (i.e. selecting Iceland’s most popular whale watching tour company’s most popular tour, selecting the horse riding and glacial boat tours which were suitable for the most amount of tourists (based on the broadest range of experience and age)). As has been previously mentioned, a summary of the chosen tours (including the category and focus of the tours, the tour companies and the location of the tours) can be seen in Table 1.

4.3.1.1 Elding Whale Watching

Elding Whale Watching is one of Iceland's largest and most popular tourism companies, hosting marine-life tours across the country specialising in whale watching tours within Faxaflói in southwestern Iceland (between the Snæfellnes and Reykjanes peninsulas), departing from Reykjavík harbour daily since 2000 (Elding Whale Watching, 2014a). As Reykjavík's original whale watching tour provider, Elding advertises itself as a family-owned business with personal interests in wildlife, boats and people, stating that the tours it offers are 'the perfect way to unite these interests while giving locals and tourists the chance to experience Iceland's marine life' (ibid), although they do highlight that whale sightings are not guaranteed due to the uniqueness of each tour and the availability of food for marine mammals close to the shore (Elding Whale Watching, 2014b; Elding Whale Watching; 2014c). From an environmental perspective, the Elding website states that '[m]aking optimal use of the natural resources that our tours are built around requires us to respect nature... [and we] strive to maintain an essential ecological balance and help [to] conserve natural heritage and biodiversity' (Elding Whale Watching, 2014d). As such, the company states that they operate on principles of sustainability in line with Blue Flag and EarthCheck standards and (organisations looking to ensure ecological standards and scientific benchmarking within the tourism sector), as well as practicing "responsible whale watching" according to IceWhale guidelines (ibid). On top of this, the company also advocates the research that is carried out on their boats, ranging from migratory patterns of dolphins to estimation of age of individuals and the size of different porpoise and dolphin populations (Elding Whale Watching, 2014e).

The tour selected for analysis in this study is named "Reykjavík Classic Whale Watching" and represents the most common whale watching tour provided by Elding Whale Watching (Elding Whale Watching, 2014c).

4.3.1.2 Eldhestar

Eldhestar is a horse-based tourism company that was established in 1986 and is located in on a farm in Hveragerði, around a 30 minute drive from Iceland's capital, Reykjavík. The location of the company enables horse riding tours (ranging from one or two hours in length to several days) to take place within scenic Icelandic landscapes, including features such as volcanoes, rivers, the ocean, meadows and glacial streams (Eldhestar, 2014a). As Eldhestar highlights the uniqueness of the environment as a major selling-point for tourists, the company also acknowledges the importance of

sustaining and protecting nature through all of the activities they offer, subsequently advertising their standing as a participant in VAKINN, the label of quality and safety throughout Icelandic tourism (ibid). As a VAKINN certified travel service, Eldhestar ensures that they will offer a high quality tourism experience, as well as ensuring potential customers that ‘[t]he business operates in an ethical, professional and environmentally sustainable way’ (Eldhestar, 2014b). Another area of significance addressed on the company’s website centres on the type of horses they use throughout their tourism activities, namely the uniquely special Icelandic horse. As well as providing a simplified history of the Icelandic horse in Iceland, Eldhestar acknowledge the distinctive gaits (forms of locomotion) of the horse, specifically the “tölt” which is unique to the species (Eldhestar, 2014c).

The tour selected for analysis in this study is named “The Heritage Tour” which, over two hours, showcases the local scenery while focusing on how Icelandic agriculture has developed throughout the last decades with regards to the role of the Icelandic horse (Eldhestar, 2014d).

4.3.1.3 Glacier Guides

Glacier Guides is a tourism company based in Skaftafell at the base of the Vatnajökull glacier in southern Iceland (Glacier Guides, 2015a). The company boasts a range of nature-based tours for all ages and activity levels ranging from multi-day glacier hikes and alpine trips through Vatnajökull National Park, to hour-long boat tours in the glacial lagoon (Glacier Guides, 2015b; Glacier Guides, 2015c). The Glacier Guides website presents the unique glacial landscape of Iceland, explaining that ‘[g]laciers cover approximately 11% of Iceland, and exploring these ancient rivers of ice is undeniably one of the most unique and memorable experiences Iceland has to offer [including the] natural wonder Vatnajökull, the largest ice cap in the world outside of the Polar Regions’ (Glacier Guides, 2015a). In advocating for the pristine natural environment in Iceland, Glacier Guides also acknowledges the importance of protecting said environment, stating that the ‘Vatnajökull National Park is a perfect example of an area that is extremely fragile and sensitive to human traffic [and as such] it is our sincere intention to always treat nature with the utmost respect’ (ibid), a concept which is reflected in the company’s environmental policy (Glacier Guides, 2015d). This view towards ecologically sustaining the area is also evident as Glacier Guides is a member of the Arctic Adventures tourism group who aim to work in harmony with nature and to protect local communities (Glacier Guides, 2015e), and the company is also aiming to achieve the VAKINN certificate of approval from the Icelandic tourism board (the same certification as previously discussed with Eldhestar) (Glacier Guides, 2015d).

The tour selected for analysis in this study is named “Fjallsárlón Glacier Lagoon - Zodiac Boat” and represents an activity suitable for people over 6 years of age with an “easy” difficulty rating, thus potentially reaching the largest group of customers for a tour offered by this company (Glacier Guides, 2015f).

4.3.1.4 Blue Lagoon Ltd.

The Blue Lagoon has been considered one of Iceland’s most popular tourist locations since its opening to the public in 1987 in collaboration with the nearby Svartsengi geothermal power plant (which began development in 1976). The hot spring is unique in Iceland (and the world) due to its distinctive water profile and naturally occurring silica which can be applied to the skin of customers in order to treat certain conditions such as psoriasis (Blue Lagoon Ltd., 2017a). As it stands today, the Blue Lagoon hot spring is recognised as one of the wonders of the world, and on top of this, the site is powered by 100% clean geothermal energy (ibid). Another area of great focus on the Blue Lagoon website centres on the company’s environmental focus, specifically in relation to a concept known as the “ecocycle”. The company states that ‘[w]e see the Blue Lagoon as a part of an ecocycle, where nature and science work in harmony, with as little environmental impact as possible... based on ecological balance, economic prosperity and social progress’ (Blue Lagoon Ltd., 2017b). The Blue Lagoon is also VAKINN and Blue Flag certified (ibid). In acknowledging the importance of environmental sustainability, the Blue Lagoon company also highlight their active role in scientific research and development. This is evident as the company actively presenting their work with regards assessing water quality, examining the area’s microbial ecosystem, and studying the healing effects of the hot spring itself, many studies of which have been published in academic journals and are available on the website for download (Blue Lagoon, Ltd., 2017c).

No tour of the Blue Lagoon was selected for analysis in this study, but rather simple entry tickets to the site were purchased as this is the most popular option for tourists. It should be noted that while a guided tour of the location is not being studied in this dissertation, a guided tour of the Blue Lagoon is available to the public (for an added fee), though this is only available to predetermined groups of 11 people or more (Blue Lagoon, Ltd., 2017d), and therefore not a viable option.

Table 1: Summary of tourism activities and tour providers selected for analysis in this study

	Tour 1: Whale watching	Tour 2: Horse riding	Tour 3: Glacier boat tour	Tour 4: Blue Lagoon
Category of tour	Observational wildlife tour	Participatory wildlife tour	Observational natural phenomena tour	Participatory natural phenomena tour
Focus of tour	Observing whales, dolphins and birds in the wild	Learning how Icelandic agriculture has developed over the last century	Experiencing glacial lagoon and learning how it impacts local farmers	Spa experience in a natural geothermal hot spring
Tour company	Elding Whale Watching	Eldhestar	Glacier Guides	Blue Lagoon Ltd.
Company website	elding.is	eldhestar.is	glacierguides.is	bluelagoon.com
Location	Faxaflói (Reykjavík harbour)	Hveragerði	Fjallsárlón, Vatnajökull	Grindavík, Reykjanesbær
Was the tour guided?	Yes	Yes	Yes	No

4.3.2 Sampling of scientific articles

When considering selection of scientific articles for the literature review of this study, a slightly different approach was utilised in comparison to the sampling of tours. While the articles were selected in accordance with the different types of ecosystem services within the various tourism activities (i.e. meeting a standard criteria, or criterion sampling), the results of literature review can be considered to have been gathered through a “stratified purposeful sampling” strategy. According to Patton (2002), ‘[s]tratifed samples are samples within samples’ (p.240), a somewhat confusing concept for those unfamiliar with the different aspects of this study. Plainly stated, the literature collected for use in this study fell within a few different categories (i.e. the different types of ecosystem services, and the different tours being studied) and within the different tour types where even more categories exist (this concept was briefly discussed in Chapter 2.1). As the topic at hand is complex, a stratified purposeful sampling approach was appropriate to implement when considering that the purpose of the technique ‘is to capture major variations rather than to identify a common core’ (ibid), an ideal which is reflected in the results of the literature review.

The multi-layered nature of the literature review can be better understood using a practical example from the literature review itself, namely the regulating and supporting ecosystem services related to whales in Iceland. From the literature review, articles discussing the role of whale fall (whale skeletons and carcasses on the ocean floor) in supporting deep-sea biodiversity; articles arguing the role of whales in the ecosystem as consumers, prey and nutrient-cyclers; and articles examining the role of whales in relation to fish-catch levels were all collected (this can be seen in Appendix II). As can be seen, this area of ecosystem services relating to one type of tourism activity returned a wide variation of results, an outcome which is positive in relation to developing a deeper understanding of the different aspects of this particular case. While this variation was welcomed, other categories relating to different tourism activities did not return such diverse results, a point evident concerning cultural ecosystem services and naturally occurring geothermal hot springs (i.e. the Blue Lagoon). In this example, the overwhelming majority of academic literature on the topic concerned the recreational aspects of bathing in geothermal pools, focusing on the healing effects it can have on human skin (both as a result of the chemical composition of the water and the minerals which exists within it). As such, research on the topic seemingly neglected the other sub-categories related to cultural ecosystem services (i.e. aesthetic beauty, spiritual and religious values, etc.) (evident in Appendix VIII). While this limited focus was the outcome of the literature review in some cases, it reflects the reality of academic literature analysing tourism based on the ecosystem services framework, and as such, suitably addresses the aim and research questions of this study.

4.4 Data analysis

In order to systematically analyse the data collected from both the literature review and the observational field notes from the tourism activities in Iceland, a simple thematic pattern was utilised. First and foremost, the articles gathered from the literature review were sorted into a table based on the tours they corresponded to as well as the relevant category of ecosystem services (Appendix I). While this was the case, it must be acknowledged that often the classification articles based on the ecosystem services framework is complex, where scientific publications can be unclear as to what category they fall under (as they are often not explicitly referred to according to the framework). One example of this complexity is evident with the classification of regulating and supporting services (both are “invisible” service types often reflecting the same issues), and as such, the decision was made to combine the results and analysis of regulating and supporting services with regards to both findings from the literature review and the collection of first-hand observational data (a commonly used strategy when classifying ecosystem services (Maes, 2013, p.32)). Another difficult aspect of this study concerns the classification of articles according to the ecosystem services framework as articles may discuss more than one variety of service, complicating where it should be placed in the thematic table (i.e. the healing benefits of bathing in geothermal hot springs versus the recreational value of the same activity). In order to simplify the process, articles were classified within one category within the ecosystem services framework based on the concept they most readily address, and were subsequently analysed according to this classification.

When concerning the analysis of observational data, the results of the literature review provided a thematic and analytical foundation, essentially acting as a precursor to the tours by emphasising focus areas (i.e. guiding me as a researcher that could possibly be introduced). While this approach was utilised, any “new” information presented on the tours (either by the tour guide or other sources such as brochures) would also be included in the results and analysis section of the dissertation, however this would be acknowledged as having been gathered from the tours and not through the literature review in order to strengthen essay credibility. The observational data and the information collected through the literature review would then be combined and discussed in relation to the study themes and the aim and research questions of the study. A table summarising and comparing the results from the literature review and observational data for each tourism activity can also be found on page 53 of this dissertation (Table 2).

4.5 Essay credibility

4.5.1 Validation and reliability

In order to justify and support the research design, results and analysis, and conclusions of a scientific study, a certain degree of validation should be met on behalf of the researcher. While the concept of validation in qualitative research has been hotly discussed and defined in a variety of manners, simply stated validation concerns one simple question: “Am I measuring what I intend to measure?” (Frankfort-Nachmias & Nachmias, 2008, p.149). In relation to the aim and research questions of this dissertation (i.e. analysing the extent to which the Icelandic nature-based tourism sector communicates the concept of ecosystem services to tourists), it can be argued that one specific form of validation has been utilised, namely construct validation. In order to establish construct validity within a study, researchers ‘relate a measuring instrument to the general theoretical framework within which they conduct their studies in order to determine whether the instrument is logically and empirically tied to the concepts and theoretical assumptions they are employing’ (ibid, p.152). Applying this definition of concept validation to this study, the measuring instrument concerns the tools used to collect data (i.e. literature review and observations) and the theoretical framework concerns the ecosystem services framework, where the connection between the data and the framework are being tested.

With regards to ensuring the reliability of a given study, the concept of triangulation is highly relevant. In its simplest sense, triangulation concerns the ‘[u]se of more than one form of data collection method to test the same hypothesis within a unified research plan’ (ibid, p.528), otherwise known as methodological triangulation (Patton, 2002, p.247). Concerning this dissertation, method-based triangulation is evident in the use of both a literature review and the collection of observational data, subsequently comparing the result that other researchers have found in previous studies within relevant fields to the primary data I found throughout the selected tours. A further form of triangulation utilised in this study is that of data triangulation (i.e. using a variety of data sources) (ibid), a process evident given the amount of academic articles included in the literature review, as well as information gathered from tour guides and other tourism-company publications (e.g. websites, brochures). Finally, a simple way to enhance the reliability of a study is to describe in great detail the work that has undertaken at every stage throughout the research process (Kvale & Brinkmann, 2009, p.245), therefore making the process itself transparent, as well as allowing the future studies to assess, alter, and/or replicate the study going forward.

4.5.2 Generalisability

Another important research concept which should be addressed concerns generalisability, that is, ‘[t]he extent to which the research findings can be generalised to larger populations and applied to different settings’ (Frankfort-Nachmias & Nachmias, 2008, p.520). The idea of generalisability in qualitative research is interesting as qualitative studies generally taking the form of case studies and including relatively small sample sizes (each of which are reflected in this study), it can be difficult to justifiably suggest that any results found are applicable in other settings (Bryman, 2012, p.390). Concerning this study, this lack of generalisability is compounded further due to the fact that the observational data collected was based on one specific tour, from one specific company, with one specific set of tour guides, on one specific day. Being so, any information gathered throughout the study (however valid in this context) can not necessarily be applied to other cases, or even essentially provided a definitive result concerning the inclusion of the ecosystem services framework through the Icelandic nature-based tourism industry. While this is the case, the study approach can be replicated in other situations (or using the same research conditions), or be used as a foundational study for similar research in the future (this concept is discussed in greater detail in Chapter 7.2).

4.6 Ethical considerations

One of the major ethical considerations applicable to this study concerns the notion of “overt” versus “covert” research, that is, whether or not the people being studied are made aware of that fact that they are being studied before any observations are made. In qualitative research, arguments have been made both supporting and rejecting the ethical merits of conducting covert research (where subjects are unaware of the researcher’s intentions), citing that action without information is either deceptive or an acceptable method to uncover a deeper truth (Patton, 2002, pp.269-270). With regards to this dissertation, a covert approach to observation was implemented during the different tourism activities as the tour guides themselves were not made aware of reasons for participating in the tours. The decision to implement this data collection approach referred back to the purpose of this study, that is, to determine to what extent is information regarding ecosystem services communicated to nature-based tourists in Iceland. In designing the study it was determined that in order to gain the best results relating to the research aims, it would be better to experience a “true” tourism experience (as any other tourist), and as such, informing the tour guides as to my intentions may have adapted the information they provided on the tour (a common view of those opposed to

overt data collection) (ibid, p.270), possibly impacting the validity of the study. While the tour guides themselves were not informed of the study, great care was taken as to protect the anonymity of the tour guides through not including any names or the dates in which the tours were carried out, and no guides were directly quoted as to ensure that no information was reported out of context.

Contrary to the protecting the confidentiality of the individual tour guides, the tourism companies have been openly highlighted. The decision to include this information in the final report was made in order to provide an informational foundation concerning the companies' views towards environmental sustainability, and thus justify their inclusion in the study (based on the likelihood that tours designed by companies advocating environmental protection would provide a significant amount of information that could be analysed using the ecosystem services framework, as well as their overall popularity with tourists). It should be stated that the intention of this study is not to “judge” the tours/companies based on their inclusion of aspects of the ecosystem services framework, nor to determine whether or not the tours were of a high or low quality, but rather to determine whether the ecosystem services framework exists in the Icelandic nature-based tourism industry and to what extent this is the case. It should also be noted that all costs of the trip to Iceland (e.g. flights, accommodation, tours, etc.) were paid for by me and not by any other party.

4.7 Limitations of study

As with any scientific research, a variety of limitations with regards to the planning and application of a study exist, a reality which is no less apparent when analysing this dissertation. First and foremost (and most obviously), this study is limited by the time available to complete it. From the initial planning stages to carrying out the data collection strategy to analysing and discussing the results found to submitting a complete (and accepted) dissertation manuscript, around four months were made available. Being so, the scope of the dissertation had to be limited in order to be able to complete the study in a timely manner while still remaining wide enough in order to allow for deeper analysis of the subject matter. Another limitation of this study relating to time constraints concerns the amount of time spent in Iceland collecting primary data by participating in the tourism activities. A total of ten full days were spent in Iceland, subsequently limiting the realistic amount of time allotted to collect observational data (as it would not be feasible to return to Iceland for further data should it be required), and as such, the tours were booked accordingly. This was the case as the tours were booked with a minimum of one full day between them, allowing the primary data collected to

be immediately analysed and integrated into the dissertation manuscript for greater reliability, as well as providing adequate time to re-book a tour if required (due to weather-related cancellations or alike). On this note, the tours with the higher possibility of needing to be rescheduled (i.e. whale watching and horse riding) were booked earlier in the trip to Iceland in order to provide the greatest number of available days after-the-fact for the trip to be re-booked.

Another limitation of this study relating to time restrictions concerns the implementation of the ecosystem services framework as an analytical tool. As was discussed in Chapter 2, the ecosystem services framework is a highly detailed model consisting of four major categories of ecosystem services (i.e. provisioning, regulating, supporting and cultural services), and within these, a number of sub-categories exist (i.e. recreational values, spiritual and religious values, and aesthetic value within the cultural services category). As such, the results of this study (in relation to the literature review) had to be limited to reflect only a sample of the ecosystem services sub-categories, focusing on the most studies concerning the most researched aspects of the framework rather than discussing its wide breadth in its entirety. While this was the case for this particular study, it stands to reason that undertaking a more in-depth study which includes each of the sub-categories within the ecosystem services framework, or focussing on only one category or tour-type, should be feasible (this is discussed in greater detail in Chapter 7.2).

CHAPTER 5 – RESULTS AND ANALYSIS

5.1 Whale watching boat tour

A variety of scientific articles related to whale watching and the importance of whales in the marine ecosystem were gathered throughout a literature review. The articles were summarised in relation to the ecosystem services framework (presented in Appendix II) and subsequently compared to the observational information gathered while participating in the whale watching tour (Appendix IIIa). A general summary comparing the results of the literature review and observations made in relation to whales in Iceland (as well as the other tourism activities) can be found in Table 2 on page 53.

5.1.1 Provisioning services related to whales in Iceland

5.1.1.1 Findings from literature review

Throughout the collection of scientific articles during the literature review, one specific research area concerning the connection between whale watching and provisioning ecosystem services was highly prevalent, that being the debate between whaling and whale watching as a means of utilising the mammals for human benefit. The way in which this topic was examined differed greatly between publications, with some studies choosing to focus on the economic factors associated with whaling and whale watching (Cunningham, Huijbens & Wearing, 2012, p.143), while others examined the issue from the perspectives of people directly involved with either whaling (Einarsson, 2009, p.129) or whale watching (Bertulli, et al., 2016, p.969), respectively.

The article by Cunningham, Huijbens and Wearing (2012) outlines the history of whaling in Icelandic culture in comparison to the recent growth of the whale watching industry, specifically highlighting the financial benefits that exist in each case (p.143). Concerning provisioning services, the article outlines the history surrounding the capture of whales for sale as food, stating that after the country's 2006 whaling season, trading in the meat resumed (consumed domestically and exported, mostly to Japan), generating high profits (ibid, p.149). While this view towards whales as a commodity is somewhat widely held (ibid, pp.149-150), anti-whaling activists argue that the practice should not continue as '[r]esponsible whale watching is the most sustainable, environmentally-friendly and economically beneficial "use" of whales in the 21st century' (ibid, p.153). As with any

hotly-debated issue, this perspective has not been universally accepted. This is the case as pro-whaling advocates acknowledge that ‘a number of researchers have questioned the sustainability of whale watching in terms of its impacts on wildlife’ (ibid, p.146), seemingly using the sustainability argument of anti-whaling groups as an argument as to why whaling is a more environmentally-focused approach.

One important finding from the article by Cunningham, Huijbens and Wearing (2012) centres on the view towards the whaling industry in Iceland by the respective advocacy groups, as ‘[n]on-whaling nations tend to invoke a moral and ethical approach, while whaling nations base their arguments on culture and science’ (p.144), opening a new line of inquiry into the industry. In terms of the ethical view towards whaling and the effect that this can have on the tourism sector of a country, Bertulli, et al. (2016) found that some tourists would consider boycotting travel to a country in they participated in whaling, however tourists also stated that they would consider consuming whale meat while visiting Iceland (p.973). This confusion surrounding the harvest of whales is reflected by Cunningham, Huijbens and Wearing (2012) who conclude that ‘[a] nation’s decision to engage in whaling depends on revenues from whaling industry, ecological and market linkages, and the potential for boycott’ (p.152), ultimately providing no clear-cut conclusion but rather suggesting that the whaling and whale watching industries could co-exist (ibid, p.143).

Concerning the topic of the co-existence of whaling and whale watching, Einarsson (2009) presents an interesting perspective by implementing an anthropological research approach to assess how local inhabitants of a fishing village named Húsavík in north-eastern Iceland view the topic (p.129). While the paper itself does not delve deeply into different aspects of provisioning services (other than undertaking a case study in a community who previously relied heavily on subsistence fishing), it does emphasise the community’s willingness to adapt to whale watching as a means of business. In relation to the notion of nature-based tourism activities being used as a vessel for communicating environmental issues to tourists, the town provides an active example as to placing emphasis on educating both foreign and native tourists on whale watching in Húsavík (ibid, p.134). The town boasts a multilingual museum featuring exhibits on whale conservation, whaling history, whale use, whale biology and the marine ecosystem (ibid), reiterating the ability for tourism to be used as an educational tool, and emphasising the Húsavík’s transition from a traditional whaling village to a whale-based tourism community.

5.1.1.2 Data gathered through observations

While on the whale watching tour, the only information presented with regards to provisioning ecosystem services concerned the consumption of whale meat in Iceland. As was evident throughout the literature review, the topic of eating whale meat harvested through whaling was an area of controversy, however the tour company themselves argued strongly against the practice of whaling and using whale meat for food, rather advocating for whale watching as the most suitable and socially-responsible “use” for whales in Iceland. In arguing this point, the tour guides made clear that the notion of Iceland being a whaling nation historically (often held by tourists) was inaccurate, rather stating that the practice of commercial whaling began in 1948. According to the guides, before commercial whaling was legalised, any consumption of whale meat by native Icelanders was as a result of dead whales washing-up on shore and the meat was distributed among the local community, subsequently debunking the myth that it was always an important part of Icelandic culture, thus discouraging tourists to eat whale meat once returning to land, as was so often the trend.

While the notion of provisioning services relating to whales was only briefly addressed on the whale watching tour itself, after returning to port further information was made available to tourists by means of a gift shop and “Whale Watching Centre” located at the tour entrance/exit. Hanging outside of the Whale Watching Centre was a chart showing the growth of the whale watching sector in comparison to the whaling industry (Appendix IIIb), highlighting the fact that despite the tourism-based practice growing substantially over the previous few years, commercial whaling was still actively taking place. Two further charts discussed the current status of and debate over whaling and whale watching in Iceland (Appendix IIIc). Concerning whale meat, one of the charts stated that only around 1% of Icelanders eat whale meat, eluding that the majority of meat consumption is through tourists visiting Iceland or exporting of the product overseas. This area was discussed in greater detail during a film being shown on loop in the Whale Watching Centre (screenshots seen in Appendix IIIId) where the both the whaling and whale watching arguments were presented by representative from each side of the debate. In this, whaling advocates argued that money gained from tourists consuming whale meat was one of the main drivers for the industry, as up to 40% of visitors had consumed the meat (as well as approximately 2000 tonnes of whale meat being exported annually, mainly to Japan), and as such, economic factors drove much of the decision-making in the area, reflecting the findings from the literature review. Opposing this, anti-whaling (and pro-whale watching) advocates argued that whales were more valuable to Iceland alive, both by protecting the creatures acting as a drawcard for foreign tourists to visit the country and for the tours to also aid in educating guests about the issues currently surrounding whales in Iceland.

5.1.2 Regulating and supporting services related to whales in Iceland

5.1.2.1 Findings from literature review

In relation to the connection between whales and regulating and supporting ecosystem services, the marine ecosystem and the food web presented themselves as common themes, though in slightly different ways. First and foremost, Hacquebord (1999) discussed in great detail the impact that climate change in north Atlantic regions (i.e. Icelandic waters) has had on certain species of whales, namely the elimination of large amount of Greenland right whales from the marine ecosystem (p.375). In turn, this decrease in the amount of whales in the area led to millions of plankton (which would otherwise have been consumed by the whales) becoming an available food source for other varieties of marine mammals, polar cod and plankton-feeding birds (ibid), emphasising the importance of whales with regards to the balance of the marine ecosystem. While the reduction in the number of Greenland right whales can be viewed as a negative outcome of climate change, it has also been acknowledged that the abundance of plankton resulting from the extermination of the whales benefitted other species who fed on the same food source, most notably the polar cod and the capelin (ibid, p.379). Furthering this point, the increased number of polar cod and capelin resulting from an upwards spike in the availability of their food source benefitted other species which feed on fish, including common guillemots, Greenland seals, and interestingly minke whales (ibid).

Continuing with the theme of the food web, Morissette, Kaschner and Gerber (2010) studied the effect that a variety of whale species have on fish levels in the Caribbean area (p.388). Throughout the article the authors present a variety of views concerning whales and their subsequent impact of fishery yields, stating that some argue that ‘scientific research has shown that whales consume huge quantities of fish, making the issue a matter of food security for coastal nations’ (ibid, p.390). In actuality, the findings from the study argue quite the opposite, stating that ‘simulated reductions in large whale abundance do not produce any appreciable increase in biomass of the commercially important fish species [and] in some cases, the presence of some whales actually improves fishery yield as a result of indirect predation effects’ (ibid, p.388), emphasising the importance that whales play within the marine ecosystem. The importance of whales in the food webs was also addressed by Roman, et al. (2014) who found that the impact of the whale within the food web is evident in many areas including as consumers of fish and other invertebrates or as prey to other large marine mammals (p.377). This article also acknowledges the role that whales play in acting as reservoir vectors aiding nutrient cycling. According to the authors, ‘[a]s major predators in many marine ecosystems, whales can influence the ecological and evolutionary dynamics of prey populations,

with effects propagating through food webs and biogeochemical cycles, such as the transport of nitrogen and iron' (ibid, p.378). The importance of whales regarding nutrient cycling is also addressed by Roman & McCarthy (2010), especially concerning the delivery of recycled nitrogen to coastal surface and the effect this has on enhancing and sustaining primary productivity (p.2).

Another area in which whales are connected to regulating and supporting ecosystem services occurs once after their death, provided that this occurs in the ocean and not as a result of whaling or being beached. Baco and Smith (2003) discuss the role that whale fall (i.e. whale carcasses or skeletons on the ocean floor) plays with regards to supporting deep-sea biodiversity (p.109). This is the case as whale falls 'provide hard substrates, organic enrichment, and free sulphides at a typically sediment-covered, organic-poor deep-sea floor' (ibid), essentially providing a variety of microbes and whale-bone consumers, and suspension and deposit feeders and environment in which they can thrive (ibid). With this being the case, it becomes abundantly clear that in both life and death, and even in areas with reduced populations, 'marine mammals [such as whales] provide an important ecosystem service by sustaining productivity in regions where they occur in high densities' (Roman & McCarthy, 2010, p.1), emphasising their significance as a member of the marine ecosystem.

5.1.2.2 Data gathered through observations

Concerning regulating and supporting ecosystem services, the main focus of the information provided throughout the tour centred on how the company aims to not disturb whales and other sea creatures, thus affecting their natural behavioural patterns (i.e. feeding, resting, and migrating). This point was emphasised on one poster at the tour entrance, stating the ethical guidelines that the company follows with regards to responsible whale watching (Appendix IIIe). While this information (provided by both the guides and on the highlighted poster) addressed the impact that human interaction through observational tours could potentially have on areas such as the whale feeding behaviours, neither source of information expanded upon the role of the whale in the food web or the marine ecosystem as a whole. Related to this was the fact that the behavioural patterns and characteristics of the specific whales in the area were addressed (i.e. their diet and the time of year in which they are most likely to be observed due to availability of food), though there was no discussion of the supporting role of whales in the marine ecosystem (i.e. as predators, prey, nutrient reservoirs through whale). With this being the case, the majority of information gathered through the literature review concerning whales and regulating and supporting ecosystem services was not addressed in great detail in any form throughout the whale-watching tour experience.

5.1.3 Cultural services related to whales in Iceland

5.1.3.1 Findings from literature review

With regards to the role of whales connected to cultural ecosystem services, Cisneros-Montemayor, et al. (2010) discuss the role that whaling has played throughout history and the potential for whale watching to become a sustainable, ecological and economically viable alternative to this practice going forward (p.1273). As many nations move away from whaling-based industries, “uses” for whales including within the tourism sector have gained traction (as has been well-documented in many studies), and as such, it has been argued that ‘the continued protection of marine mammals can translate into benefits that are significant, sustainable, and relatively easy to attain’ (ibid, p.1277). Continuing the analysis regarding the usage of whales within tourism (i.e. recreational services), Parsons and Rawles (2003) address the notion that tourists boycott travel to a country that participates in whaling, negatively impacting the tourism sector (p.444). Using Iceland as an example, the researchers found that 79% of whale watching tourists stated that they would boycott visiting a country that hunts whales, with a further 12.4% of respondents stated that while they would visit a country that hunts whales, they would not participate in a whale watching tour in that country (ibid, p.446). This result suggests that activities carried out with the intention to utilise whales in for their meat (i.e. provisioning services) impact the benefits gained from recreational activities such as tourism (i.e. cultural services), emphasising their connection.

Examining a different aspect of cultural ecosystem services, Henderson (2005) examines the cultural and historical significance of whales in whaling countries (pp.673-678). The author begins by presenting the International Covenant on Economic, Social, and Cultural Rights, specifically the basic right for humans which endures the preservation of culture (ibid, p.673). In highlighting this legal foundation, the author includes the example the Makah Tribe from the Pacific coast of the United States, a group which has been exempted from whaling bans as they have historically hunted grey whales for nutritional and religious reasons (ibid, p.671). In noting this exception, the question is raised as to whether a broadened cultural subsistence exemption could be applied for whaling across all of Iceland due to its historical link to the nation’s seafaring past and the importance that whale meat plays in Icelandic culture (ibid, p.676). On this point of culture, a poll discussed in the article stated that 80% of the Icelandic population are in favour of re-establishing whaling practices based on the reasoning that ‘Icelanders claim that they have a right to hunt whales as part of their national identity’ (ibid, p.674), providing a contrarian view towards to usage of whales in comparison to the views expressed by tourists in other studies.

5.1.3.2 Data gathered through observations

As was covered to a great extent in the provisioning services section, one of the largest issues concerning the usage of whales in Iceland centres on whether whaling should or should not continue, and as such, the information provided at the Whale Watching Centre can also be addressed from a cultural services perspective. Throughout the film being shown at the exhibition, the issue of whaling in Iceland was somewhat presented in connection to the country's seafaring history, with arguments for the practice continuing being based partly on this cultural identity (as 60% of Icelanders support whaling). This connection was also addressed in throughout the literature review, though this point was not the most advocated point by pro-whaling people in the film, but rather that whaling should continue due to the demand of tourists visiting Iceland who wish to consume whale meat.

As was found in the literature review, the practice of whaling was generally condemned by tourists visiting whaling countries, and as such, the tourism sector in said countries was one area which could be most directly impacted by whaling. While this was the case in the articles, information provided through the documentary stated that tourists somewhat expected whale meat to be available for their consumption after participating in whale watching activities, and survey findings on the topic showed that around 40% of foreign visitors to Iceland had eaten whale meat. This seems to show that the possible impact to the tourism sector in Iceland of participating in whaling of tourists discussed in the articles of boycotting the country is in fact non-existent (a point which may be reflected in the recent major growth of tourism in the country), but rather if whaling were to be stopped, potential negative implications for the sector (e.g. lost revenue) could result. On this point, the Icelanders portrayed in the documentary stated that they never have and never will consume whale meat as it is not a part of their culture, and rather that it exists to appease tourist expectations. It must be noted that a documentary on Icelandic whaling practices being shown in by a whale watching company will examine the issue from a distinctly anti-whaling perspective, emphasising another point from the literature concerning whether whale watching and whaling can co-exist in a country, a view not held by this (and presumably other) whale watching companies.

Other issues related to cultural ecosystem services and whales in Iceland found through observations on this tour relate to education, that is, the use of whale bones, baleen, porpoise skeletons and a range of stuffed local birds used throughout the exhibition (Appendix IIIf). These samples were essentially used as artefacts for communicating the types of species present in the area in which the tour took place, showing to an extent the range of local biodiversity if they were not able to be viewed in-person by the tourists while on the tour.

5.2 Icelandic horse riding tour

A variety of scientific articles related to the role and impact of the Icelandic horse were gathered throughout a literature review. The articles were summarised in relation to the ecosystem services framework (presented in Appendix IV) and subsequently compared to the observational information gathered while participating in the horse riding tour (Appendix Va). A general summary comparing the results of the literature review and observations made in relation to Icelandic horses (as well as the other tourism activities) can be found in Table 2 on page 53.

5.2.1 Provisioning services related to Icelandic horses

5.2.1.1 Findings from literature review

One of the most commonly discussed aspects regarding Icelandic horses and ecosystem services is the role that the species has played throughout the agricultural history of Iceland. In an article authored by Hugason (1994), the farming industry on Iceland has been highly dependent on the Icelandic horse, whether for its use in herding, grazing, or even the unique gait it possesses (i.e. the “tölt”) (p.26). While the Icelandic horse has historically been a mainstay in agriculture in the country, the move away from a farming-based economy has seen the value and usage of the species shift. As it stands, specified breeding plans for Icelandic horses have been developed in order to develop riding horses (i.e. for use in tourism) as well as for meat production. Further, certain by-products from breeding Icelandic horses have been used to benefit people in other ways, including hides and horse hair, mares’ milk, and even blood from pregnant mares for pharmaceutical purposes (ibid). The idea that Icelandic horses can be used in relation to biomedical research is also discussed by Andersson (2016) who acknowledges the species’ unique ability to “tölt” can be studied from a genetic perspective (p.8). Continuing on, a report published by the Agricultural University of Iceland, Jóhannesson (2010) addresses the provisioning service potential of the Icelandic horse, highlighting the consumption of the species by stating that ‘[a] small part of the horse population in Iceland is kept entirely for meat production, but this is rather the exception as most horse breeders aim for the production of riding horses’ (p.21). The author outlines the breeding of Icelandic horses for other purposes including for horse rentals, horse shows and large scale exhibitions, often being coupled with the country’s tourism industry. A further area addressed was that of the financial gain that the Icelandic horses provide outside of Iceland, acknowledging the roughly 2000 horses exported for usage in other markets as either meat or for recreational activities (ibid).

5.2.1.2 Data gathered through observations

The horse riding tour took place on a farm in the town of Hveragerði, around 30 minutes' drive south of Reykjavík. As the tour was based in this location (Appendix Vb and Appendix Vc), it was easy to observe the type of setting where Icelandic horses have historically been utilised for agriculture, a point which was briefly addressed by the tour guides during the activity. The guides addressed the fact that horses played an integral role in the settlement of Iceland, providing transport for the local people as well as assisting in farming practices. Furthering this, the guides stated that breeding of Icelandic horses also provided a form of family tradition for farmers, a practice that would carry on through numerous familial generations; a point which was reinforced by the tour being taken through a nearby farm in which one family bred a particular species of Iceland horses which were utilised mostly for grazing. Contrasting this, the horses used for the tour were bred for riding (within the tourism sector), highlighting their differentiated usage. Information concerning the different breeds of Icelandic horses could be found on a poster hanging in the company cafeteria, providing more enlightenment regarding the different varieties of horses that could be found in the country (Appendix Vd). While general information regarding the use of Iceland horses within agriculture was discussed, no significant information about the specific roles they aided farmers with was addressed by the tour guides. On top of this, no information was provided concerning Icelandic horses being bred for meat or any other by-products that could be collected from the animals for human usage (i.e. hair, milk, or blood) as was discussed throughout the articles gathered during the literature review.

5.2.2 Regulating and supporting services related to Icelandic horses

5.2.2.1 Findings from literature review

Concerning the area of regulating and supporting ecosystem services, a variety of articles address the different roles that the Icelandic horse plays within the Icelandic ecosystem. In an article discussing the different types of land-based mammals in the Icelandic landscape, Hersteinsson (1992) notes the grazing patterns of Icelandic horses and the effect that this can have on a wider scale (p.396). Focusing on the Þingvallavatn area in south-western Iceland, the author notes that due to both horses and sheep grazing on actively eroding land, their ecological importance is paramount (ibid, p.404). One of the major reasons that the Icelandic horse effects its environment to such a great extent (second only to sheep) is due to the fact that ‘most horses graze in the open throughout the year and are only fed hay during the most severe parts of the winter’ (ibid, p.402), reiterating their position in the functioning of the Icelandic ecosystem. This importance becomes evident in a report provided by the Icelandic Ministry for the Environment (2001) who emphasise the effect that grazing horses and sheep have on their natural surroundings, stating that ‘[g]razing pressure of uncultivated land has effected the vegetative cover and changed the species composition in many areas, and it has in that way influenced the biological diversity of grazing lands’ (p.45). As evident in this statement, horses feeding on uncultivated land play a role in the maintenance of biodiversity among the Icelandic landscape, proving an important step regarding the maintenance of the country’s ecosystem.

As well as the impact of Icelandic horses grazing with regards to the maintenance of the ecosystem, another research area was discovered concerning regulating and supporting ecosystem services; horse-based tourism. Schmutte (2015) discussed the impact that feeding horses on riding tours can have, stating that ‘hay brought to feed the horses may bring seeds into unvegetated areas [although] these impacts were all described as not serious environmental problems’ (p.96). In a book assessing the environmental impacts of ecotourism, one chapter written by Newsome, Cole and Marion (2004) also assesses the environmental impact of recreational horse riding in natural areas depending on the type of equestrian activity is being undertaken (i.e. horse riding on multiple-use trails, designated horse riding trails, cross-country riding with no designated pathways, and horse party camping sites) (ibid, pp.61-64). It was found that issues such as disturbance to local wildlife, browsing of shrubs and grazing, and damage to vegetation and soil erosion were existent in all forms of horse riding activities (ibid, p.64). While these reflect negative impacts to the environment, one positive outcome of horse riding in natural areas present in each case related to the nutrient enrichment from faeces and urine scalds by the horses, subsequently supporting biodiversity in a given area (ibid).

Assessing the direct impact that horse riding tours in Iceland have on the landscape, Schmutde (2015) acknowledges that '[e]xperts claim that there are few environmental impacts through equestrian tourism in national parks and protected areas [noting] that trails [are] becoming deeper, wider and multiple parallel trails are forming' (p.96). The impact that horse-based tourism has on natural areas is also addressed by Cole and Spildie (1998) (in Montana, United States), where the purpose of the study was to 'assess the relative impact of hiker, horse, and llama traffic on vegetation and groundcover conditions' (p.61). Their findings revealed that horse traffic had more potential to cause disturbance to the environment (at a rate of six-times more damaging than human or llama passes), impacting vegetation areas (ibid, p.68). While so, in general the vegetation levels were able to recover over a period of one year (ibid), subsequently proving that no long-lasting damage occurred. Despite vegetation disturbances not having a strong negative impact on the environment, horse-based tourism through natural areas could be recognised as an area which should be managed effectively in the future. This area was also addressed by, In assessing both the potential positive and impacts to the environment associated with recreational horse riding Newsome, Cole and Marion (2004) state that in certain circumstances '[w]here significant conservation and biodiversity values are threatened, it might be necessary to prohibit horse riding entirely' (p.80), a suggestion which could prove damaging to equestrian tourism activities in countries such as Iceland.

5.2.2.2 Data gathered through observations

As was discussed in relation to provisioning services, certain breeds of Icelandic horses are kept purely for grazing, a point which was briefly presented by the tour guides during the ride. While this grazing has been shown to have significant effects on the Icelandic ecosystem according to the collected articles, no mention of this was included during the tour, most likely due to the grazing horses highlighted being bred for in order to graze the farmland rather than being wild animals. The other significant concept related to regulating and supporting ecosystem services found during the literature review centred on the impact that horse-based tourism can have on the natural environment, both positively and negatively (i.e. nutrient enrichment from faeces and urine scalds by the horses, disturbance to local wildlife, browsing of shrubs and grazing, and damage to vegetation and soil erosion). These areas were also not addressed during the tour, and while environmental impact could be seen on the walking trails as a result of trampling (e.g. bare Earth), the trails used were on private property and only utilised as tourism paths, suggesting that any damage was "permitted" by the owners.

5.2.3 Cultural services related to Icelandic horses

5.2.3.1 Findings from literature review

Undertaking the literature review returned a variety of articles concerning the cultural significance of horses in Iceland, both from a historical standpoint and in modern-day tourism activities. While this was the case, it is interesting to note that the majority of work examining these areas was undertaken by the same authors to a certain degree (either individually, working in a pair, or as a part of a larger collaborative process), namely Guðrún Helgadóttír and Ingibjörg Sigurðardóttír. While the main researchers in the area are also the most prolific, the highlighted studies suggest that a great deal of variability exists in what exactly can be discovered concerning the importance of horses in Icelandic culture. The first area studied by Helgadóttír (2006) concerns the horse-based cultural tradition in Iceland and how this tradition (otherwise known as “horsemanship”) has evolved into horse-based tourism (p.535). One of the reasons surrounding the growth of horse-based tourism in general centres on the fact that ‘[t]he relationship between horses and people is and has been strong and long-lasting... [and as such] [h]orse-based tourism as an experience can therefore refer to a rich cultural and historical heritage tinged with the nostalgia of the romantic past’ (ibid, p.536). When examining the growth of horse-based tourism from the Icelandic perspective, Helgadóttír (2006) states that ‘[t]he unique aspects of the culture of horsemanship in Iceland pertain both to the characteristics of the [Icelandic horse] and to cultural premises for the equestrian arts which are seen as important aspects of tourism’ (ibid, p.537), a point of importance with regards to rural tourism in the country.

Focussing specifically on modern-day Icelandic tourism, an article written by Helgadóttír and Sigurðardóttír (2008) examines the role that this history of horsemanship has on current practices, revealing that horse-based tour operators ‘belong to a culture of horsemanship rather than a culture of tourism as business operations in a service industry’ (p.105). This idea that tour providers possess a certain level of attachment to the horsemanship history of Iceland is also reflected in the way that they expect tourists to view the area, suggesting that guests should have a level of interest in and passion for horses (ibid). Possibly as a result of the tour providers’ perceived passion for horsemanship in Iceland, a study conducted by Sigurðardóttír and Helgadóttír (2015) found that visitors (both domestic and international) had a high level of satisfaction in the tours themselves. This was the case as tourists acknowledged the diversity of the trails used, the performance and service-mindedness of the tour guides and the facilities for the horses themselves as being of a high standard (p.105), emphasising the crucial link between a historical culture of horsemanship and the provision of high quality tourism activities.

5.2.3.2 Data gathered through observations

Throughout the literature review examining the relationship between Icelandic horses and cultural ecosystem services, one concept dominated the discussion, that of “horsemanship” or the horse-based cultural tradition in Iceland and how this has evolved into horse-based tourism. While the articles gathered tended to address Icelandic horsemanship as a genuine passion for horses (which was expected to be somewhat reflected by visitors) rather than an overriding interest in generating profits through the activities being offered, the company did have a strong business culture in the sense that they aimed to bring in many tourists to participate. This could be seen as free pick-up from and drop-off in Reykjavík city centre (around 30 minutes away) was offered to all tourists (therefore allowing for more people to participate as most tourist are based in the capital city), as well as there being a company-run hotel adjacent to the farm. While this was the case, it is not to say that the tourism activities took place over the horsemanship of the company itself. The staff were very aware of the fact that many tourists had little to no horse riding experience, subsequently adapting the horse chosen for each tourist based on their experience (both for the benefit of the person and horse). As was the case, while the concept of horsemanship and all that this involves was not explicitly stated during the tour, it was evident that this historical connection and the desire to offer the best possible tourism experience were paramount in the planning of the activity.

5.3 Boat tour of Vatnajökull glacial lagoon

A variety of scientific articles related to the impact and importance of glacial landscapes were gathered throughout a literature review. The articles were summarised in relation to the ecosystem services framework (presented in Appendix VI) and subsequently compared to the observational information gathered while participating in the glacial lagoon boat tour (Appendix VIIa). A general summary comparing the results of the literature review and observations made in relation to glaciers in Iceland (as well as the other tourism activities) can be found in Table 2 on page 53.

5.3.1 Provisioning services related to glaciers in Iceland

5.3.1.1 Findings from literature review

Throughout the literature review concerning provisioning services and Icelandic glaciers, one research area dominated; the generation of energy through hydropower as a result of glacier melt and how this area impacts (or is impacted by) other areas. Several articles addressed the effect that climate change is having on global glacial retreat, highlighting Iceland. The potential impact that fluctuations in glacier melt resulting from changing climatic conditions could have in the country is evident when considering that ‘[h]ydropower provides about 73% of the electrical power in Iceland’ (Sæþórsdóttír & Saarinen, 2016, p.85), and due to the physical isolation of Iceland, the importation of energy is not a practical solution (Jonsdóttír, Eliasson & Madsen, 2005, p.420). As such it can be argued that due to the importance energy production through glacial melt, ‘changes in glacier mass balance and associated changes in river hydrology are view among the most important consequences of future climate change in Iceland’ (Thorsteinsson, Jóhannesson & Snorrason, 2013, p.591), potentially leading to heavy social and political problems going forward if a power shortage would occur (Jonsdóttír, Eliasson & Madsen, 2005, p.420). One interesting aspect of this issue concerns the connection between power production in Iceland and the country’s growing tourism sector as debate has arisen concerning how the natural resources in the Icelandic highlands should be utilised. Those in favour of power development argue that the ‘abundance of natural resources has made it possible for Icelanders to live in this hostile environment, and thus the energy resources should continue to be utilised in order to maintain the wellbeing of the nation’ (Sæþórsdóttír & Saarinen, 2016, pp.87-88). Opponents to this argue that the recent financial growth of the Icelandic tourism sector is as a result of international tourists visiting the Icelandic highlands, making it one of the main natural resources of the sector (ibid, p.88), adding complexity to the discussion of the areas usage going forward.

5.3.1.2 Data gathered through observations

While a great deal of research gathered throughout the literature review addressed the importance of hydropower developed by means of glacial melt in Iceland, no mention of this area was included in the tour itself. While this is somewhat understandable as the tour location (Fjallsárlón glacial lagoon) is not itself utilised for energy production but rather as a tourism site, it was interesting that the concept in general was not mentioned by the tour guide in any form. While this was the case, the way in which the tour was operated reflected an area of discussion found through the literature review with regards to provisioning ecosystem services, that is, the debate as to whether Iceland should utilise glaciers for energy production (and therefore generating energy for the country) or for attracting tourists (and therefore generating money for the country). In this case it was apparent that the focus of the tour was that of tourism, where the main intention of the tour centred on providing visitors with the opportunity to experience the glaciers and the glacial lagoon close-up, leaving issues such as energy production in Iceland unaddressed.

5.3.2 Regulating and supporting services related to glaciers in Iceland

5.3.2.1 Findings from literature review

Similar to the articles examining Icelandic glaciers and their provisioning services output, the articles collected relating to regulating and supporting services examine the role and impact of climate change. The importance of glaciers in Iceland cannot be understated as the around 11% of the country is covered by the formations ensuring that they play an integral role in the Icelandic ecosystem and maintaining a standard of living for the locals (Björnsson & Pálsson, 2008, p.365). With this being the case, changes in climatic conditions in Iceland is a significant issue, a view emphasised by Björnsson and Pálsson (2008) who state that '[d]ynamic in nature, the glaciers are responsive to climate fluctuations and effect their environment profoundly' (p.365). Being the case, the authors have examined the effect that changing climatic conditions are having on the Vatnajökull glacier in southern Iceland, the country's largest glacier. The study revealed that the volume of the glacier has decreased by around 10% in volume since the end of the 19th century, and future modelling suggest that the ice caps will around 25% to 35% of their present volume with the next 50 years (p.365), suggesting that this transformation could have serious negative implications for the Icelandic ecosystem in the foreseeable future (pp.380-382).

The change in glacial conditions has also been observed in other studies which were research glacier patterns in other areas, namely in the Virkisjökull-Falljökull area in maritime south-east Iceland. The authors of the article relating to this study observed that since the glaciological threshold was breached around the year 2005, retreat rates of the glacier have increased considerably, and the period from 2007 until 2012 has been “exceptional,” displaying ‘the most ice-front retreat in any five-year period since measurements began (in 1932)’ (Bradwell, Sigurðsson & Everest, 2013, p.972). Concerning the retreat of Icelandic glaciers, Astthorsson & Vilhjálmsson (2002), provide a comprehensive overview of the relationship between glacial waters and a number of different aspects within the Icelandic marine ecosystem including water temperature and salinity (ibid, p.222-224), primary production (pp.224-227), zooplankton biomass (pp.227-229) and the yield of fish (pp.229-238), emphasising the far-reaching significance of glaciers and glacial melting with regards to regulating and supporting ecosystem services. In understanding the rapid decrease in glaciers across Iceland, other less-obvious processes have been observed, such as the supercooling of glacial meltwater. In a study by Tweed, Roberts and Russell (2005), the authors acknowledge that ‘if the total hydraulic potential of subglacial meltwater increases more rapidly than the resulting mechanical energy can be transformed into sensible heat, then supercooling and ice growth will result’ (p.2308). While it may seem counterintuitive that meltwater from glaciers can lead to a form of ice growth, the process can have significant effects in that sediments flowing in meltwater can become trapped in the glacier ice (ibid), yet another impact on the ecosystem functioning of glaciers in Iceland.

Examining the issue retreating glaciers from another perspective, Eiriksdóttir, et al. (2017) studied the role that anthropogenic glacial water manage strategies have concerning mineral cycling using the Kárahnjúkar Dam in the eastern regions of Iceland (p.124). Through damming the river, ‘[t]he annual flux of the most dissolved elements increased substantially due to damming [where] the fluxes of dissolved Zn [zinc], Al [aluminium], Co [cobalt], Ti [titanium] and Fe [iron] increased most... by 46-391%’ (ibid). While this effect is significant, it can be better understood by comparing the results of damming a glacial river to those found when damming a non-glacial river. In this scenario, the authors suggest that ‘[d]amming a glacial river catchment cause accumulation of large amounts of particulate matter, which would otherwise have been carried to the ocean, affecting the particulate flux of non-soluble elements to the coastal waters, of which many are essential nutrients’ (ibid, p.136). Aside from the effect that damming glacial rivers can have on nutrient cycling, Gunnarsson, et al. (2006) briefly addressed the impact damming can have on a variety of bird species in the Icelandic lowlands (p.265). Relating back to Iceland’s energy production preferences, the authors note that the main source of power production centres on hydroelectric power plants, an

approach ‘which requires damming of large rivers and manipulation of water levels [and] such regulation is likely to affect the seasonal flood regime and the morphological diversity of the catchments... potentially interfer[ing] with the process of vegetation succession within river plains and alter[ing] their attractiveness to birds’ (ibid, p.274). While this effect is anthropogenic in origin, the impact it can have on the natural functioning of the Icelandic environment is significant, and as such should be considered in future planning efforts in Iceland.

5.3.2.2 Data gathered through observations

As was discussed in the observations section concerning the provisioning service of Icelandic glaciers, the main focus of the tour centred on providing tourists with an experience among the glacial lagoon rather than informing them about it on a more scientific level. While this was the case, the guide did briefly discuss some areas addressed by the literature regarding the regulating and supporting services of glaciers, namely the rapid retreat of the glacier in Fjallsárlón. According to the guide, approximately 150 years ago the glacial lagoon where the boat trip took place was one solid glacier, a notion more startling when experiencing the size of the lagoon (I would estimate around 100 metres of glacial ice had retreated based on the information provided by the guide), and within the last 30 years, the glacier had retreated around 25 metres (by my approximation). This area was discussed in a number of different research papers gathered through the literature review, where the extent and speed of the glacial retreat had been described as “exceptional” in recent times, a view reflected in reality when examining the glacial lagoon. The movement of the glaciers in the lagoon was also briefly discussed by the guide during the tour, mainly focusing on how the glaciers made their way from a nearby volcano to the lagoon area (a process which takes around 500 years); a process which explained the cracked and often “dirty” appearance of the ice.

While the issue of glacial retreat can be viewed from a climate change perspective (another area addressed in the literature review), the area was not discussed explicitly by the guide at any point in time. Other areas found connecting Icelandic glaciers and regulating and supporting ecosystem services included the supercooling of glacial ice, the impact that damming glacial rivers can have on the flux of elements, sediments, nutrients and minerals in glacial rivers, and the effect of damming on local wildlife were not discussed during the tour.

5.3.3 Cultural services related to glaciers in Iceland

5.3.3.1 Findings from literature review

Studies relating to the cultural services connected to glaciers in Iceland fall into two distinct groups: the cultural importance of the natural landscape on the Icelandic people, and the recreational value of glaciers with regards to glacier-based tourism. First of all, Lindhjem, Reinvang and Zandersen (2015) discuss the cultural importance of the landscape in Iceland, suggesting that ‘the appreciation of landscapes is interwoven with the national Icelandic identity and the Icelander’s sense of themselves’ (p.159). This point is reinforced by the fact that a great deal of traditional Icelandic poetry and art are infused with praise for the country’s unique formations, showing this to be an important part of the country’s culture (ibid).

In consideration of the recreational value of glaciers in Iceland, Welling, Árnason & Ólafsdóttír (2015) wrote a scoping review of glacier-based tourism practices addressing on a range of issues including the perception of value, social and ecological outcomes from the tourism activities, and the effect that climate change has on the industry (p.635). At the local level, the growth of nature-based tourism in general and glacier-based tourism specifically has had significant impacts for small communities, both positive and negative. From a beneficial perspective, ‘glacier tourism constitutes an important source of income and employment for local communities adjacent to glacier tourist sites [as well as] indirect economic gains in the form of amenities necessary for the construction of glacier tourism related infrastructure’ (ibid, p.649). While this is the case, the authors also acknowledge that the quality of life of local people can also be negatively influenced by growing tourism development in their communities, but they fail to elaborate why this may be the case (ibid).

Throughout the literature review, articles were also collected concerning the effect of glacier-based tourism on the tourists themselves. In a study taking place in New Zealand, Stewart, et al. (2016) discussed the short and long-term effects that climate change will have on the glacier-based tourism sector, presenting the concept of “last chance tourism” (p.377). The thought behind “last chance tourism” concerns the ‘desire to observe, photograph and interact with threatened or rare species or physical features... before they change forever’ (ibid, p.380), a concept that can be applied to glaciers due to the effects of climate change. With this in mind, other studies highlight the ability for glacial areas to be utilised for ecological education purposes, stating that ‘[k]inds of ecology education activities [can] raise tourists’ awareness of ecotourism and environment[al] protection’ (Xuling, Zhaoping & Ting, 2006, p.369), a concept which addresses one of the key areas of this dissertation.

5.3.3.2 Data gathered through observations

While each of the main areas found through the literature review concerning glaciers in Iceland and their connection to cultural ecosystem services were not directly addressed in any way by the tour guide during the tour, each area could be somewhat observed. First and foremost, the cultural importance and appreciation of the glacial landscape of Icelanders (and the resulting art and poetry based on the environment) were not directly addressed, however the unique nature of the glacial lagoon where the tour took place (Appendix VIIb and Appendix VIIc), as well as the presence of certain informational signs in the area (Appendix VIId) suggest a desire for the tour company (and by extension, the Icelandic community) to maintain and protect the environment as best as possible going forward. On this point, the concept of “last chance tourism” (e.g. the idea that tourists have an innate desire to view and interact with certain experiences before they are no longer able to) as discussed during the finding from the literature review, while not directly addressed, may in fact be an important factor in the growing Icelandic glacier-based tourism sector when considering the rapid retreat of glaciers such as in the Fjallsárlón glacial lagoon. This perspective may also have been a reason behind the tour guide remaining quiet for the majority of the activity, simply allowing tourists to observe the environment and take photographs. Examining the issue away from the glacial lagoon itself, my observations on glacier-based tourism in Iceland (and nature-based tourism in general within the country) has provided significant growth and revenue streams for local businesses and communities, and in the case of the Fjallsárlón glacial lagoon, the remote location of the site has established it as one of the main drawcards for tourism within the area.

5.4 Blue Lagoon spa experience

A variety of scientific articles related to the functioning of natural geothermal hot springs were gathered throughout a literature review. The articles were summarised in relation to the ecosystem services framework (presented in Appendix VIII) and subsequently compared to the observational information gathered while participating in the visit to the Blue Lagoon (Appendix IXa). A general summary comparing the results of the literature review and observations made in relation to the geothermal hot springs (as well as the other tourism activities) can be found in Table 2 on page 53.

5.4.1 Provisioning services related to geothermal hot springs

5.4.1.1 Findings from literature review

The provisioning ecosystem services most related to geothermal hot springs such as the Blue Lagoon relate to their usage in generating power, something which is evident when conducting a literature review on the topic. In a study analysing the development of geothermal energy around the world, Bertani (2012) highlights studies carried out examining the Icelandic case, noting the major geothermal power plants around the country and specifically highlighting the Svartsengi power plant operated by HS Orka located next to the Blue Lagoon (p.8). In this example, the Blue Lagoon itself fed with the discarded geothermal water from the plant which is rich in surplus minerals, while the energy output from this plant provides heating for the district in which it is located (ibid). While being a major source of energy development in Iceland, the environmental way in which the Svartsengi power plant works has been referred to as ‘the world’s first CO₂ to renewable methanol plant’ (Halper, 2011, p.58). With this in mind, a point worth addressing concerning geothermal energy development in Iceland is that the country ‘generates 100% of its electricity from renewable hydro and geothermal [sources]’ (ibid), subsequently earning it a reputation as one of the dominant players in Europe with regards to energy development using geothermal resources (Renewable Energy Focus, 2011, p.56). Other issues addressed in articles concerning the relationship between provisioning services and geothermal hot springs relates to the creation of a variety of consumer products for visitors to the Blue Lagoon using the natural products provided by the area. According to Ragnarsson (2010), ‘[t]he Blue Lagoon company offers a line of skin care products that contain unique natural ingredients, silica, minerals and algae’ (p.5), an output which ensures that the area produces more than only geothermal energy as well as addressing the link between provisioning and cultural ecosystem services in this particular case.

5.4.1.2 Data gathered through observations

While the majority of research gathered through the literature review concerning the provisioning ecosystem services present at the Blue Lagoon centred on geothermal energy production (both in general and in relation to the nearby Svartsengi power plant), observations made at the site revealed a greater emphasis being placed on the naturally occurring skin care products that the Blue Lagoon provides. It should be noted at this point that while the Blue Lagoon does offer guided tours of the facility, this option was not selected for use in this study. The reason for this was based on the fact that tours are only offered to groups over 11 people (which I was not a part of), as well as the fact that the overwhelming majority of tourists who visit the Blue Lagoon do not participate in the guided tour, but rather simply bath in the water and (potentially) observe the different varieties of information regarding the Blue Lagoon itself scattered around on their own as I did.

First and foremost, when first arriving at the Blue Lagoon (before even purchasing or redeeming tickets) visitors are able to see the range of skin care products available in the company store located directly next to the facility entrance (Appendix IXb). In this store, a variety of skin care products are made available for purchase, with information about the products being clearly displayed in a variety of languages (therefore reaching a greater number of visitors). The items available for purchase at the store (as well as the information about these items) greatly emphasise the naturally occurring products provided by the Blue Lagoon (i.e. silica, algae and other minerals) and how these are beneficial to human skin. While silica and algae based skin-care products are made available for purchase in the store, they are also offered for free one-time usage once visitors are bathing in the Blue Lagoon itself. Visitors were able to try the different skin care products while in the water at the floating “Silica Mud Bar” as both silica and algae treatments were made available. At this location, both varieties of treatment are available to guests, with the restorative effects of each being very briefly on informational signs on the counter (Appendix IXc).

With regards to the other area found in the literature review concerning provisioning services at the Blue Lagoon, that is, the nearby Svartsengi power plant and geothermal energy production in Iceland, very little information was provided to tourists. While the power plant itself could be seen from the water and other areas on the site (Appendix IXd), the only mention of the plant itself concerned how it feeds water into the Blue Lagoon (on both signs and through an audio recording), but not how the energy produced by the plant provides power or the local area or the by-products it creates, reflecting that this area, while an important topic in academic literature, was not a priority at the site itself.

5.4.2 Regulating and supporting services related to geothermal hot springs

5.4.2.1 Findings from literature review

In relation to regulating and supporting services associated with Icelandic geothermal hot springs (such as the Blue Lagoon), Menzel, et al. (2015) examined the role that conditions within a hot springs can have regarding biodiversity, highlighting examples from Iceland (p.411). The results of the study showed that ‘the biodiversity and community composition generally showed a decrease in biodiversity with increasing temperature and decreasing pH’ (ibid), where samples taken from the Icelandic location showing to have one of the lowest levels of biodiversity overall (ibid, p.417), but with a much higher bacterial diversity when compared to the other sites (p.421). This high ratio of bacteria in Icelandic hot springs was also noted specifically in the Blue Lagoon by Pétursdóttir, et al. (2009) in their analysis of the unique geothermal microbial ecosystem of the area, stating that ‘[t]he majority (83%) of analysed taxa were closely related to bacteria of marine and geothermal origin reflecting a marine character of the ecosystem and the origin of the Blue Lagoon hydrothermal fluid’ (p.425). Examining the make-up of the bacteria in the lake, the authors noted that ecosystem of the Blue Lagoon is dynamic between seasons (based on the amount of available light), made-up of two dominant forms of bacteria depending on the time of year and thus providing stability to the ecosystem (ibid, p.430). In the summer, one form of bacteria (*Cyanobacterium*) is most present, acting as a primary producer and utilising sunlight as an energy source, subsequently creating organic mass for consumer within the ecosystem (ibid, p.429). During the autumn and winter months where less light is available for primary production, a heterotrophic form of bacteria (*S. lacuscaerulensis*) is dominant in the ecosystem (ibid).

With regards to the unique nature of the Blue Lagoon, another commonly studied area in relation to regulating and supporting ecosystem service was that of the presence of silica, algae and other minerals in the water, and how this ecosystem is related to the nearby Svartsengi power plant. Examining this issue, Svavarsson, Einarsson and Brynjólsdóttir (2014) found that the silica discharged by the Svartsengi power plant (after being processed) ‘[has] been considered an undesirable by-product of geothermal power production and large quantities of it can be extricated from geothermal fluid’ (p.34), however, this discharge has in turn lead to development of the Blue Lagoon’s unique microbial ecosystem (ibid, p.31). The relationship between the conditions of the Blue Lagoon and the microbial diversity occurring within it is presented in an article by Pétursdóttir & Kristjánsson (1996), specifically addressing the temperature, salinity and pH level of the hot spring (p.39). According to the authors, the nearby geothermal power plant saturates the Blue

Lagoon with silica, ensuring that the hot spring ‘has been colonised by a few types of specialised microorganisms which seem to proliferate in this unique ecosystem’ (ibid). While the unique conditions of the Blue Lagoon has been shown to provide a variety of microbial organisms with a favourable and habitable environment in high numbers, the low biodiversity among these organisms show that the environment is considered extreme for most forms of life (ibid, p.44). The authors acknowledge that one reason behind the low level of observed biodiversity could be due to the high silica precipitation from the Svartsengi power plant, so much so that the expected level of environmental contaminant resulting from visitors bathing in the hot spring were also not observed (ibid), reflecting the effect that this silica discharge has its ecosystem.

5.4.2.2 Data gathered through observations

As found through carrying out the literature review, the most addressed area concerning geothermal hot springs such as the Blue Lagoon and their relationship to both regulating and supporting ecosystem services was that of their unique characteristics which produce a range of by-products such as silica and algae. Spread around the bathing pool at the Blue Lagoon were a variety of informative signs which briefly outlined the unique characteristics of the Blue Lagoon in relation to its geothermal activity and its standing as one of the “25 Wonders of the World” because of this (Appendix IXe). Furthering this, information was also provided as to how these distinctive environmental characteristics directly resulted in the naturally occurring products of silica, algae, and other minerals that are applied to the face of visitors in order to rejuvenate their skin (Appendix IXf), an area which was discussed in greater detail with regards to provisioning services. Furthermore, a general overview of the history of the Blue Lagoon, how it “works” from a geothermal perspective, and the benefits that its naturally occurring products provide to people can be heard in a short informational audio clip which can be heard in one bathing area on the site.

The other area found through the literature review which was researched in depth concerned the unique microbial ecosystem which existed in the Blue Lagoon due to the temperature, salinity and pH levels of the water. This area was also addressed in the audio recording made available to visitors, specifically highlighting one (unnamed) variety of algae present in the water which had a beneficial effect on human skin (an area which has been previously discussed in great detail), but also how it can impact the appearance of the water (turning the colour from a bright light blue to a more green hue). The effect that naturally occurring by-products of the site can have of the appearance of the water was also addressed concerning silica in the audio recording and through

signs at the sites entrance (Appendix IXg), where its natural reflective characteristics reflects sunlight, making the water appear bright blue. While these facts were provided to visitors, the specific nature of the Blue Lagoon's ecosystem regarding different forms of bacteria present and the lack of microbial biodiversity in the water were not addressed in any form.

5.4.3 Cultural services related to geothermal hot springs

5.4.3.1 Findings from literature review

Of any of the combinations of ecosystem service type and tourism activity selected in this study, the pairing of cultural services and geothermal hot springs produced the least amount of variation in terms of areas researched. This was the case as the majority of articles examining cultural services in areas such as the Blue Lagoon focused greatly on the recreational side of the tourism attraction as a spa experience for tourists; however these articles also somewhat addressed the provisioning services that the hot spring provides people as a result of said spa experience. In a PhD thesis, Erfurt (2011) discusses the growth in popularity of the Blue Lagoon as a tourist destination, noting that the destination offers visitors 'a large geothermal pool for recreational purposes [and] specialised treatments in the Blue Lagoon dermatologic clinic for people suffering from skin diseases such as psoriasis' (p.62). These beneficial results were also addressed in other studies, as both Ólafsson (1996, pp.649-650) and Eysteinsdóttir, et al. (2014, p.25) found that bathing in geothermal sea water (in combination with other treatments) induced an improvement in skin condition for people suffering from psoriasis, subsequently improving their quality of life (ibid).

Examining the unique nature of the Blue Lagoon, Grether-Beck, et al. (2008) acknowledged the positive effects regarding skin ageing when bathing in the pool, an outcome made possible due to the microalgae extracts present in the water (p.771). Finally, Kazandjieva, et al. (2008) examined the effect of climatotherapy (nature-based treatment), once again highlighting the unique nature of the Blue Lagoon (p.477). According to the authors, '[t]he unique healing properties of the Blue Lagoon are based on silica brine, the specific materials, and the blue-green algae' (ibid, p.481), noting many different aspects of the Lagoon itself which have been addressed in the results of the literature review for each category. Continuing from this, the authors state that '[i]t was demonstrated that extracts based silica mud and two different microalgae species derived from the Blue Lagoon improved the epidermal barrier properties and influenced the synthesis of a number of molecules related to epidermal differentiation' (ibid), emphasising the healing capabilities of the geothermal water.

5.4.3.2 Data gathered through observations

As has been discussed in great detail to this point, the unique characteristics of the Blue Lagoon allow the water to provide beneficial effects to people, mainly through naturally occurring algae, silica and other minerals which aid in skin rejuvenation. Furthering this area, the water of the Blue Lagoon has also been shown to have beneficial effect with regards to reducing the effect of the skin condition psoriasis, a point found both in the articles gathered through the literature review and an area of great focus at the Blue Lagoon itself. The positive effect that the hot spring water and the different products that exist in the water (i.e. silica, algae, minerals) are advertised in the form of informational signs (both in the Blue Lagoon store and visible in the water) and throughout the previously discussed audio recording playing in one area of the pool. With this being the case, the individual benefits resulting from bathing in the water at the Blue Lagoon have led to the site becoming an extremely popular tourism destination in Iceland, encouraging both people who would like to experience the natural spa-like qualities of the water and its surrounding facilities. This aspect of the Blue Lagoon falls clearly within the tourism and recreation categories of cultural ecosystem services, an area which the company aims to promote both externally and internally.

Table 2: Summary of results comparing data collected from the literature review to data collected through observations for each tourism activity/ecosystem service combination

	Tour 1: Whale watching		Tour 2: Horse riding		Tour 3: Glacier boat tour		Tour 4: Blue Lagoon	
	Literature review	Observations	Literature review	Observations	Literature review	Observations	Literature review	Observations
Provisioning services	<p>The debate between the whaling and whale watching industries, and whether they can co-exist in Iceland</p> <p>The consumption of whale meat by tourists gathered through whaling</p>	<p>Major focus on the debate between whaling and whale watching</p> <p>Stated that whale meat is consumed mainly by tourists (around 40% of visitors), not by Icelanders (only around 1%)</p>	<p>The historical use of Icelandic horses within agriculture, herding and grazing</p> <p>The production and consumption of Icelandic horse meat, milk and pharmaceutical products</p>	<p>Guides stated that horses provided transport and assisted in farming throughout Icelandic settlement</p> <p>Horses were bred for riding (tourism) and grazing, but no mention of meat or milk production</p>	<p>The importance of glacial melt with regards to energy produced through hydropower</p>	<p>No mention of the role of glacial meltwater and hydropower in Icelandic energy production</p>	<p>Geothermal energy production in Iceland and how it relates directly to the Blue Lagoon</p> <p>The natural skin care products which are created using the algae, silica, and minerals from the Blue Lagoon</p>	<p>Geothermal energy was addressed through signs and an audio recording, and the power plant is visible from the water</p> <p>Skin care products using minerals from the water were available to visitors</p>
Regulating & Supporting services	<p>The role of whales in the North Atlantic marine ecosystem and food web (both alive and dead)</p> <p>Whales as consumers of fish and invertebrates, as prey to large predators, and as nutrient vectors</p>	<p>Mainly related to the tour aiming to not disturb the feeding, mating and migrating habits of whales</p> <p>No specific mention was made of the role of whales in the marine ecosystem or food web</p>	<p>The effect that grazing horses has on the biological diversity of Iceland</p> <p>The disturbance to wildlife, damaged soil and vegetation, and nutrient enrichment throughout horse-based tourism</p>	<p>The role of grazing horses in relation to the Icelandic ecosystem was not addressed</p> <p>No explicit mention of the either the positive or negative effects of horse-based tourism on the environment</p>	<p>The increased retreat rate of glaciers in Iceland as a result of climate change</p> <p>The effect that damming glacial rivers has on downstream minerals and birds</p>	<p>The retreat of the glacier was noted by the tour guide, highlighting the changes in the area over the past century</p> <p>Associated effects of glacial melt were not addressed</p>	<p>The unique characteristics of the Blue Lagoon in terms of pH level, salinity and temperature</p> <p>The microbial biodiversity of the Blue Lagoon, and the minerals, algae and silica present</p>	<p>The unique make-up of the Blue Lagoon was addressed in relation to the beneficial effects it provides to people</p> <p>Only the role of silica in relation to the appearance of the Blue Lagoon was addressed</p>
Cultural services	<p>The potential for sustainable whale watching as an ecological and economically viable alternative to whaling</p> <p>The impact that continued Icelandic whaling could have on tourist numbers</p>	<p>While few Icelanders eat whale meat, most are in support of whaling (as it reflects a cultural identity)</p> <p>Film stated that tourists would boycott visiting Iceland if whaling continued</p>	<p>The Icelandic tradition of horsemanship and its effect on modern horse-based tourism practices</p>	<p>While not addressed by name, the concept of horsemanship was evident throughout the tour</p>	<p>The significance of the natural landscape in Icelandic art</p> <p>The growth of glacier-based tourism and how this is impacted by climate change (“last chance tourism”)</p>	<p>The usage of the Icelandic landscape throughout art was not mentioned</p> <p>No explicit mention of glacier-based tourism or “last chance tourism” were addressed</p>	<p>The beneficial effects of bathing in the Blue Lagoon were strongly emphasised through informational signs, the audio recording and throughout the company store</p>	<p>The beneficial effects on human skin and psoriasis from bathing in the Blue Lagoon</p>

CHAPTER 6 – DISCUSSION

6.1 Summary of results in relation to study aim and research questions

The aim of this study was to examine how the ecosystem services framework can be used to analyse certain tourism activities in Iceland and to determine the extent to which the information is communicated to the tourists themselves. In order to address this aim, two research questions were developed; the first focusing on how the ecosystem service framework can be applied to different nature-based tourism activities across Iceland, the second examining the extent to which this information is communicated to tourists. The results gathered through this study can be discussed in relation to these research questions individually, and then discussed in general relating to the overall aim of the study.

Research question #1: “How can the ecosystem services framework be applied to different nature-based tourism activities across Iceland?”

In order to address this research question, a wide-ranging literature review was carried out with the intention of collecting articles concerning each of the four ecosystem services categories (provisioning, regulating, supporting and cultural) in relation to four different nature-based tour activities taking place in Iceland (whale watching, horse riding, glacier lagoon boat tour and the Blue Lagoon). As was discovered through the literature review, scientific articles can be found in relation to ecosystem services and each of the selected types of tours, often reflecting a wide-range of research within each of the respective categories from a variety of scientific disciplines ranging from social sciences (most often within cultural and provisioning services) to medical sciences (most often within provisioning services) and natural sciences (most often within regulating and supporting services). The literature review provided a wealth of information concerning ecosystem services (though in most cases the term “ecosystem service” was not explicitly stated), providing a strong foundation for the collection of primary data through observations which took place afterwards. With this being the case, it can be argued that the ecosystem services framework can be applied to a great extent in relation to nature-based tourism activities in Iceland.

Research question #2: “To what extent are nature-based tourists in Iceland informed about environmental issues in relation to the ecosystem services framework?”

While information concerning each variety of ecosystem service can be readily found throughout scientific literature relating to the Icelandic nature-based tourism activities selected for analysis in this study, the extent to which this information was communicated to tourists (or other ecosystem service-based information not found through the literature review) was not as evident. This result was determined through observations made during the tours themselves, where very little information was communicated to tourists concerning ecosystem services (in comparison to the amount of information found in the literature review which was relevant to each tour), with the information which was discussed relating mostly to provisioning and cultural services. This may be the case as in general, regulating and supporting ecosystem services are often highly complex, concerning “invisible” processes which are not necessarily easily understood by people unfamiliar with the concepts as their impacts (both positive and negative) are often indirect concerning the general public. As such, it is understandable that these more complex issues were not discussed on the 1-3 hour tours which were more focused on recreation than education. While information concerning provisioning and cultural ecosystem services was evident to a certain extent in most cases, this information was also limited in comparison to that gathered through the literature review. This was the case as often concepts found in scientific literature were not discussed in great detail (or not included in the tours at all), once again possibly as a result of the tours being focused more on “fun” for tourists rather than as an educational tool concerning environmental issues.

Overall, the results of the study reflect the fact that while the ecosystem services framework can be applied to each of the different nature-based tourism activities selected for analysis from a scientific standpoint (i.e. scientific articles can be found concerning each ecosystem service/tourism activity combination), this information is not communicated to tourists in its entirety on the tours themselves (e.g. some tours focus more heavily on certain ecosystem services than others). While the tour guides in general seem highly knowledgeable of the important environmental issues related to their respective tour-type, communicating this information effectively to tourists (both in an entertaining and educational manner) is fundamental. While information regarding provisioning and cultural services related to the respective tours were discussed in greater detail than regulating and supporting services by the tour guides (or through other avenues connected to the tour, such as the “Whale Watching Centre” at the entrance to the whale watching tour, or on informational signs at the Blue Lagoon), not all of the areas found throughout the literature review were addressed. While this was the reality of the situation, I believe that the study aim and research questions were addressed well.

6.2 Comparison to earlier research

When examining the results of this study in relation to earlier research gathered on the topic, certain connections can be made. Throughout the process of collecting earlier research for this paper, a variety of distinct categories of research were found concerning different aspects of the study area. Firstly, a variety of papers examining the ecosystem services framework within the Nordic context were found, focusing mainly on the valuation of said services within Iceland. Looking at the findings from this study, the tour which most addressed this issue was the whale watching tour, highlighted within the whaling versus whale watching debate which permeated the industry. While the idea of valuing ecosystems is most associated with financial value, other forms of value such as the importance of something to people is also of relevance, an area also addressed during the whale watching tour through societal opinions on the ways in which whales should be “utilised” in Iceland. This notion of valuation outside of the economic perspective was also addressed to a certain extent through the horse riding tour, as while not explicitly discussed, the role of horses in the agricultural settlement of Iceland was highlighted, both in articles and on the tour itself.

Another area which was discovered through the collection of earlier research was that of human health and well-being associated with ecosystem services in relation to tourism activities. This area was also clearly observed (both in literature and in person) at the Blue Lagoon, so much so that this sub-category of cultural ecosystem services seemed to dominate the messaging of the facility. This was the case as the restorative and beneficial nature of the naturally-occurring silica, algae and minerals with the hot spring water was highlighted on the company website, on informational signs both in and out of the water at the Blue Lagoon itself, and through other information provided at the site. A further area discussed in the collected earlier research which was evident in the findings from this study concerned impacts to biodiversity and the natural environment. Throughout the literature review, the importance of biodiversity in relation each of the tour focuses (i.e. whales, horses, glaciers and geothermal hot springs) was made evident, highlighting the varying ways in which each impact their natural environment, both positively and negatively. This area is most obvious in relation to whales, as articles discussing their role in the marine ecosystem (e.g. as consumers, prey, nutrient cyclers and reservoir hosts for other organisms, etc.) were abundant, though this was not communicated to any great extent throughout the whale watching tour; a pattern seen in each of the tourism activities studied.

The final area of interest relevant which was discussed in the earlier research of this section centred tourism being utilised as an educational tool; in relation to this study, educating nature-based tourists in Iceland with regards to a variety of environmental issues. As was discussed in relation to the aim and research questions of this study, areas of environmental interest (as identified using the ecosystem services framework) were sparingly communicated to tourists, subsequently limiting the effectiveness of these tours as an educational tool. While the information provided to tourists by the tour guides on the chosen tour occasions was somewhat sparse, previous research on the topic has shown that education through tourism can be effective if implemented well. This view suggests that if the tours analysed in this study were to embrace this approach, they could be successful in achieving similar positive outcomes with regards to further informing nature-based tourists in Iceland, especially given the amount of information which could be drawn from as discovered through the literature review carried out in this study.

6.3 Discussion of theoretical framework

The reason behind selecting the ecosystem service framework as the theoretical framework for this dissertation centred on the fact that it allows for a wide array of important issues to be discussed in relation to the environment which may otherwise be ignored (i.e. social, financial, political, etc.). Being the case, the ecosystem services framework was well suited to address the aim and research questions posed at the beginning of the study, especially given the fact that the tours selected for analysis were multi-faceted in their nature. By allowing for areas outside of the “pure” natural sciences aspects of a tourism activity to be addressed, the ecosystem services framework enabled this dissertation to properly address important aspects of the selected tourism activities to be brought forward, most notably provisioning and cultural services which otherwise may have been neglected. Looking at the observational data gathered from the tours studied, that the ecosystem services framework acknowledges the provisioning and cultural benefits that ecosystems provide people is highly important given the fact that these areas were the some of the most discussed and addressed environmental concepts addressed throughout the respective tours.

While the ecosystem services framework is a relatively straightforward model to work with as it provides a systematic approach to studying the multi-faceted nature of environmental science, it did provide certain difficulties in its implementation, most notable in relation to the classifying the services themselves. This difficulty was most apparent when sorting and analysing the articles

gathered throughout the literature review which focused on the regulating and supporting services associated with certain nature-based tourism activities. Initially, the articles collected were classified as within either the supporting or regulating service categories, though as the study developed further, distinguishing between the categories was difficult, and as such, they were eventually combined to reflect both types of service. The decision to combine these two categories was based on my relative inexperience with the ecosystem services framework and in understanding the nuances of the model, a decision made in order to achieve the best possible outcome from this study with regard to my limited experience. While this was a challenge, I believe that the selection of the ecosystem services framework was well-founded, allowing me to address the aim and research questions of the study systematically while allowing for complex issues to be discussed thoroughly.

6.4 Discussion of methodological approach and research process

While in general I believe that the methodological approach implemented in this dissertation was well-suited, there are certain issues relating to its implementation which can be discussed. First and foremost, while the selection of the ecosystem services framework was well-suited to the study, the extent to which it was applied could be reviewed. As the intention of the study was to examine different varieties of nature-based tourism activities in Iceland, one tour from four designated tour categories was selected (observational wildlife tour: whale watching; participatory wildlife tour: horse riding; observational natural phenomena tour: boat tour of glacial lagoon; participatory natural phenomena tour: Blue Lagoon geothermal hot spring), providing what I believe to be a good balance of tourism activities to be analysed. Being the case, it may have been beneficial to limit the varieties of ecosystem services being examined (i.e. focus on one or two ecosystem service categories for each tour and compare results rather than examining each category for each tour). While the one of the major benefits of the ecosystem services framework centres on its interdisciplinary nature by encouraging varying aspects of a subject to be examined, this widespread nature may have “spread-thin” the analysis of the selected tours, meaning that they would each be studied briefly rather than only a few examples being examined in greater depth. Ultimately, I believe an appropriate balance was achieved in analysing the tours based on the ecosystem services framework where each tour was addressed to a suitable level (i.e. not too much, not too little), though this is an area which should irrespectively be acknowledged.

Another area which could be discussed in relation to the methodological approach implemented in this study concerns the choice to combine a literature review with observational primary data. As previously mentioned, utilising a midrange literature review (while time consuming) enabled me to develop a strong foundation with regards to understanding the main ecosystem services areas which were applicable to the selected tours. From this point, it may have been possible to carry out interviews with relevant people in Iceland in relation to their respective tours (i.e. the marine biologists associated with the whale watching tour, the farm operators associated with the horse riding tour, the boat operators at the glacial lagoon, and the facility managers at the Blue Lagoon), however as the intention of the study centred on tourism as a tool for educating tourists about environmental issues, this approach would have somewhat missed the point. This is the case as if professionals in their respective fields were interviewed, a great deal of information would potentially be gathered relating to the ecosystem services framework, however this may not be representative of what tourists actually hear or experience during the activities. As such, the decision was made to participate in a “true” tourist experience, thus leading to an observational approach being implemented, a decision which upon reflection I believe was the correct choice with regards to the intended purpose of the study (it was also a great experience on a personal level).

6.5 Suggestions for further research

As is the case with most scientific research, towards the end of the study it is beneficial to present suggestions for continuing research in the study topic based on the experiences of the researchers. After undertaking this study examining the extent to which the ecosystem services framework is present throughout nature-based tourism in Iceland, it could be suggested to examine the issue using different case studies, both in terms of examining other varieties of tourism activities in Iceland, or even by applying a similar research approach to other case study locations. On this point of examining the issue in different cases, the findings could then be compared and contrasted to those found in this study (such as how the issue of nature-based tourism is addressed in different counties), or used as the foundation for other tourism/ecosystem services studies going forward. Continuing the discussion of how other studies could be based on this study in some way, the methodology could be altered to examine different aspects of the wider issue. An example of this could be to adjust the observational approach to primary data collection with another type of qualitative method such as by utilising interviews or focus groups to gather data, or even adjusted to implement a quantitative research approach in order to address the issue from an entirely different perspective.

On the prospect of examining the communication of information concerning ecosystem services related to nature-based tourism using a quantitative approach to research, one possible idea which I believe would be suitable to examine would surround the extent to which the environmental information is understood by tourists. If this research area were to be studied, the level of understanding of certain tourists could be studied prior to participating in a given activity, and upon completion of the tour, measured again in order to determine the extent to which the information was transferred. If implemented properly, this type of study may be able to determine the effectiveness of how their messages are transferred to consumers, and from this, be able to inform how tourism companies operate with regards to how they communicate environmental information effectively going forward. This type of study could be important for nature-based tourism companies aiming to educate tourists of important environmental issues as the overriding purpose of education concerns how information is understood and applied in both the short and long-term, and if it was found that the information provided was not being absorbed by tourists, then it should be adjusted in order to meet the purpose of providing the information in the first place.

Finally, the topic and approach implemented in this dissertation (as well as the study results) support the idea that other aspects of the research area can and should be examined further. As this study utilised the ecosystem services and subsequently allowed issues outside of the natural sciences to be examined to an extent, a host of issues outside of, yet related to, environmental science presented themselves (one example being the political and cultural debate that exists in Iceland between whaling and whale watching). As such, other relevant sectors (i.e. political, economic, etc.) are highly relevant to nature-based tourism, and being the case, would allow for the issue to be examined using a much wider perspective, subsequently adding a greater weight and substance to environmentally-focused studies carried out in the future. Furthering the discussion of the implementation of different research approaches in this area, the results found through this study (that the ecosystem services framework (and aspects relating to said framework) is not being strongly communicated to nature-based tourists) suggest that further studies could focus more on the communication taking place within the research cases. Applying a communication-based theoretical framework to this type of study would allow for researchers to better understand the mechanisms of how ecosystem-based information is being transferred from tour guides to tourists, and as such, provide insight into how the tourism sector can act as a prominent actor in environmental education in the move towards a more sustainable future.

CHAPTER 7 – CONCLUSION

Looking back at my time working with this study, one area played a hugely influential role on the research design and the implementation of the methodological choices, that being the role that tourism can play in the education of the general public with regards to important environmental issues. The intention of this paper was to examine how and to what extent pre-existing nature-based tourism activities address these environmental issues, and in order to do so, the ecosystem services framework was selected as the theoretical foundation for the study. While it can be argued that the ecosystem services framework is an adequate tool in assessing a variety of environmental areas by not limiting itself to working only within the boundaries of the natural sciences, one of the main reasons that this framework was chosen was the fact that it reflects a general attitude of people towards the environment, that being, “how can this benefit me?”. While this view could be seen as an over-generalisation, I personally believe that it is easier for people (including myself) to understand complex and often confusing environmental issues from the perspective of how it directly effects them personally. On this point, a short trip to Iceland a few months before beginning this dissertation and experiencing the country’s picturesque surroundings and fascinating wildlife first-hand led me to develop this research topic; and considering the growing nature-based tourism sector in the country, I thought that there was an extremely interesting and important topic to be studied.

With this being the case and after undertaking this research, one question presents itself: Can tourism be effectively used as a means to educate people about important environmental issues? Well, maybe. While I personally believe that if properly implemented, tourism in general (and nature-based tourism specifically) can be an amazing opportunity to reach a huge number of people and teach them about important environmental issues on a host of different subjects while allowing them to experience those issues first-hand, the perception of tourism itself may first have to shift. The growing popularity of travelling inevitably leads to the growth of profits generated through tourism activities, and if ill-managed, this could potentially prove harmful to the environment as demand rises. Specifically examining tourism in Iceland both from afar and in-person, and despite the recent high-level financial growth within the sector, I am of the opinion that the well-being of the environment comes first and the profits gained through foreign visitors comes second in this case. Maybe this is merely the optimistic perspective of an environmental science student, but I believe that the way in which the tours were run, and the information provided by the tour companies and the

individual guides (while minimal) spoke to a genuine care and respect for the unique landscape and wildlife of Iceland. This attitude was also reflected (for the most part) by the international visitors themselves, as most seemed to have travelled to Iceland for the unique natural setting it provides, a point which shows great promise going forward with regards to education becoming a more fundamental aspect of nature-based tourism in the country.

This leads us to one final question: Should education about the environment be included in nature-based tourism? In my opinion, absolutely. I personally believe that the growth in tourism can be viewed as an amazing opportunity with regards to conservation, enabling environmentalists (or simply environmentally-focused companies) to reach an audience which they otherwise may not have had the means to directly communicate with. This opinion is clearly an optimistic one from an environmental standpoint which would require a distinct shift in the way that certain tourism activities are carried out, ideally to the point where a balance can be achieved between money earned and education provided that benefits all parties. With this in mind, I believe that the nature-based tourism sector in Iceland has established a foundation of environmentally-responsible business practices, though this environmental focus could be further extended in order to promote a forward-thinking approach to the way that people view nature as something worth protecting.

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APPENDICES

Appendix I: Table of collected articles from literature review

	Tour 1: Whale watching	Tour 2: Horse riding	Tour 3: Glacier boat tour	Tour 4: Blue Lagoon
Provisioning	(Bertulli, et al., 2016) (Cunningham, Huijbens & Wearing, 2012) (Einarsson, 2009)	(Andersson, 2016) (Hugason, 1994) (Jóhannesson, 2010)	(Jonsdóttir, Eliasson & Madsen, 2005) (Sæþórsdóttir & Saarinen, 2016) (Thorsteinsson, Jóhannesson & Snorrason, 2013)	(Bertani, 2012) (Halper, 2011) (Ragnarsson, 2010) (Renewable Energy Focus, 2011)
Regulating & Supporting	(Baco & Smith, 2003) (Hacquebord, 1999) (Morissette, Kaschner & Gerber, 2010) (Roman, et al., 2014) (Roman & McCarthy, 2010)	(Cole & Spildie, 1998) (Hersteinsson, 1992) (Ministry for the Environment, 2001) (Newsome, Cole & Marion, 2004) (Schmudde, 2015)	(Astthorsson & Vilhjálmsson, 2002) (Björnsson & Pálsson, 2008) (Bradwell, Sigurðsson & Everest, 2013) (Eiríksdóttir, et al., 2017) (Gunnarsson, et al., 2006) (Tweed, Roberts & Russell, 2005)	(Menzel, et al., 2015) (Pétursdóttir, et al., 2009) (Pétursdóttir & Kristjánsson, 1996) (Svavarsson, Einarsson & Brynjólsdóttir, 2014)
Cultural	(Cisneros-Montemayor, et al., 2010) (Henderson, 2005) (Parsons & Rawles, 2003)	(Helgadóttir, 2006) (Helgadóttir & Sigurðardóttir, 2008) (Sigurðardóttir & Helgadóttir, 2015)	(Lindhjem, Reinvang & Zandersen, 2015) (Stewart, et al., 2016) (Xueling, Zhaoping & Ting, 2006) (Welling, Árnason & Ólafsdóttir, 2015)	(Erfurt, 2011) (Eysteinsdóttir, et al., 2014) (Grether-Beck, et al., 2008) (Kazandjieva, et al., 2008) (Ólafsson, 1996)

Appendix II: Summary of selected articles related to whale watching tours

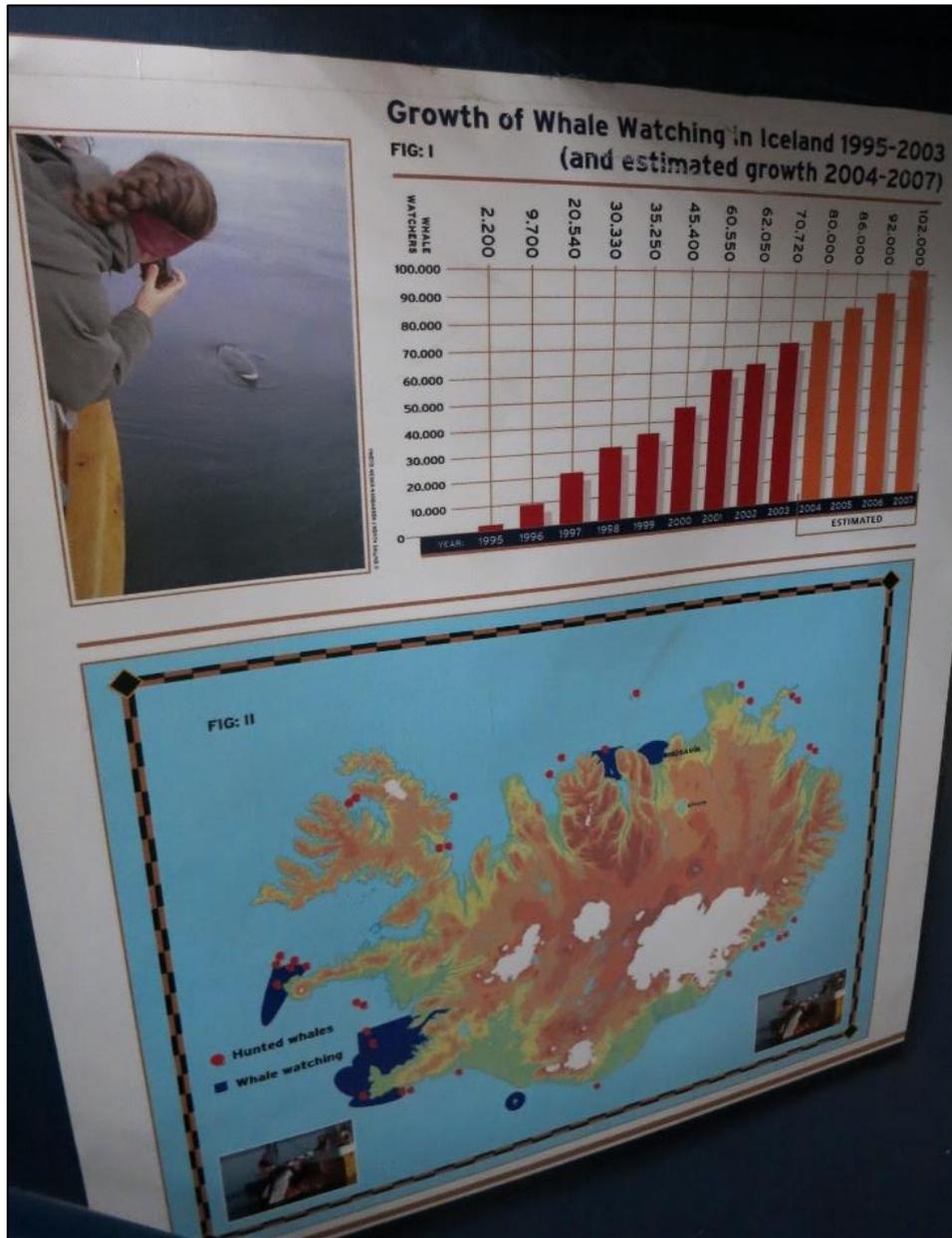
Tour 1: Whale watching			
Provisioning	Regulating & Supporting	Cultural	Cultural
<p>(Bertulli, et al., 2016) Addresses the perspective of tourists in Iceland concerning the role of whaling and whale watching in the country, whether the industries can co-exist, and the consumption of whale meat by tourists.</p> <p>(Cunningham, Huijbens & Wearing, 2012) Addresses the debate between whaling and whale watching in Iceland from an economic perspective and in relation to the cultural rhetoric; and whether or not the two industries can co-exist.</p> <p>(Einarsson, 2009) Presents the attitudes of community members from a north-east Icelandic fishing village in relation to the move from a fishing (whaling) based economy to a whale watching based economy.</p>	<p>(Baco & Smith, 2003) Discusses the role of whale fall (whale carcasses/skeletons on the ocean floor) with regards to supporting deep-sea biodiversity.</p> <p>(Hacquebord, 1999) Analyses the role the climate change and whaling has had on certain whale species in the North Atlantic, and the subsequent effect that the reduced whale numbers have had on the Arctic marine ecosystem and food web.</p> <p>(Morissette, Kaschner & Gerber, 2010) Discusses the concept of large species of whale acting as competitors to fisheries regarding available marine resources, where results show whales are generally not a threat to the level of fish, often increasing fishing yields.</p>	<p>(Roman, et al., 2014) Argues that larger species of whales have a strong influence on marine ecosystems, whether as consumers of fish and invertebrates, prey to other large-bodied predators, or as reservoir vectors for nutrients.</p> <p>(Roman & McCarthy, 2010) Examines the role that whales play with regards to enhancing and sustaining primary productivity in coastal areas, specifically focusing on the cycling of nitrogen.</p>	<p>(Cisneros-Montemayor, et al., 2010) Discusses the potential for the whale watching industry as a sustainable, ecological and economically viable use of whales in comparison to historically dominant whaling practices.</p> <p>(Henderson, 2005) Examines the cultural importance of whales in Iceland (in relation to the Whaling Moratorium), highlighting subsistence fishing and other areas of cultural significance in relation to the move toward whale watching as the dominant use for the mammals.</p> <p>(Parsons & Rawles, 2003) Addresses the issue of the whaling vs. whale watching debate in Iceland from the perspective of tourists, where an overwhelming majority stated that they would boycott travel to a country which participates in whaling.</p>

Appendix III: Photographs from whale watching tour

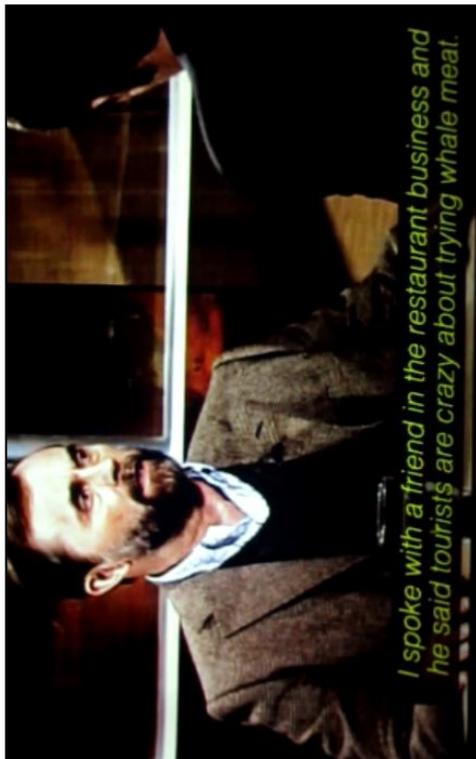
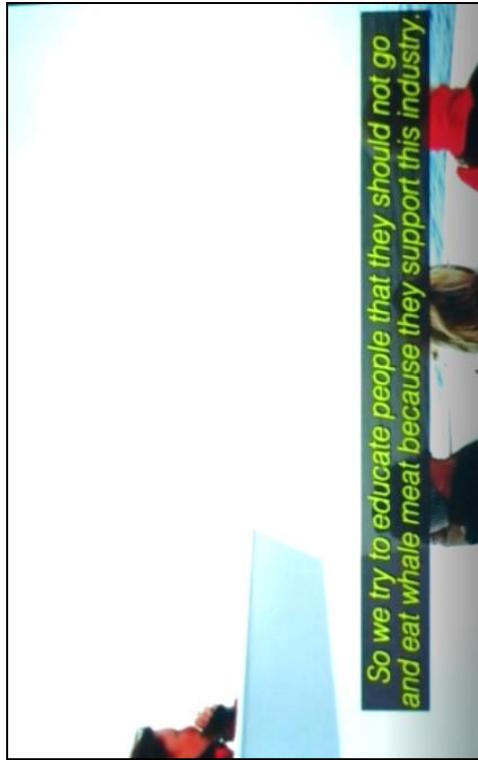
Appendix IIIa: Photograph of myself participating in the whale watching tour



Appendix IIIb: Poster outside of the “Whale Watching Centre” displaying information concerning the growth of whale watching in Iceland in comparison to current whaling practices



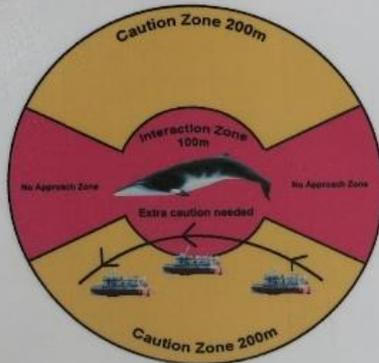
Appendix IIIId: Screenshots from informational movie shown regarding whaling and whale watching in Iceland at the “Whale Watching Centre”



Appendix IIIe: Company guideline concerning responsible whale watching practices

Elding Guidelines for Responsible Whale Watching

These are the guidelines we aim to abide by, however, there are many variables to consider when out at sea, such as the weather, number of whales, prey availability, if there are calves present, animal behavior and so on and so forth. We have to remember that these are wild animals and to enjoy them for the future we need to show them patience and respect. We will try to get you close but how close we get is always on the animals terms as we aim to minimise disturbance.



- No more than 3 vessels in the caution zone.
- Once in the caution zone we maintain a slow cautious speed and any changes in speed should be made gradually.
- Repeated attempts to interact with cetaceans that are showing signs of distress should be avoided.
- Avoid making sudden or excessive noises from both the vessel and the guide on the microphone.
- DO NOT sail through pods of concentrated cetaceans, i.e. do not encourage dolphins to bow-ride.

Potential problems caused by vessel disturbance

- Disruption of behavior (e.g. feeding, migrating).
- Avoidance of important habitats (e.g. feeding areas, resting areas).
- Stress.
- Injury.
- Increased mortality (more deaths).
- Reduced breeding success.

Signs of distress

Distress signals are sometimes very difficult to interpret and differs between species, it is more a feeling you have that the animal is stressed and wants to be left alone. Below are example behaviours that may be linked to vessel disturbance.

- Continuous attempts to move away from the vessel either it be quickly or slowly.
- Regular changes in direction or speed of swimming.
- Hasty dives.
- Changes in breathing pattern.
- Increased times spent diving compared to time spent at the surface.
- Aggressive behaviors such as tail slapping or loud trumpet blows.



Appendix IIIf: Porpoise and whale bones, and stuffed local birds used as educational tools for tourists in the “Whale Watching Centre”



Appendix IV: Summary of selected articles related to horse riding tours

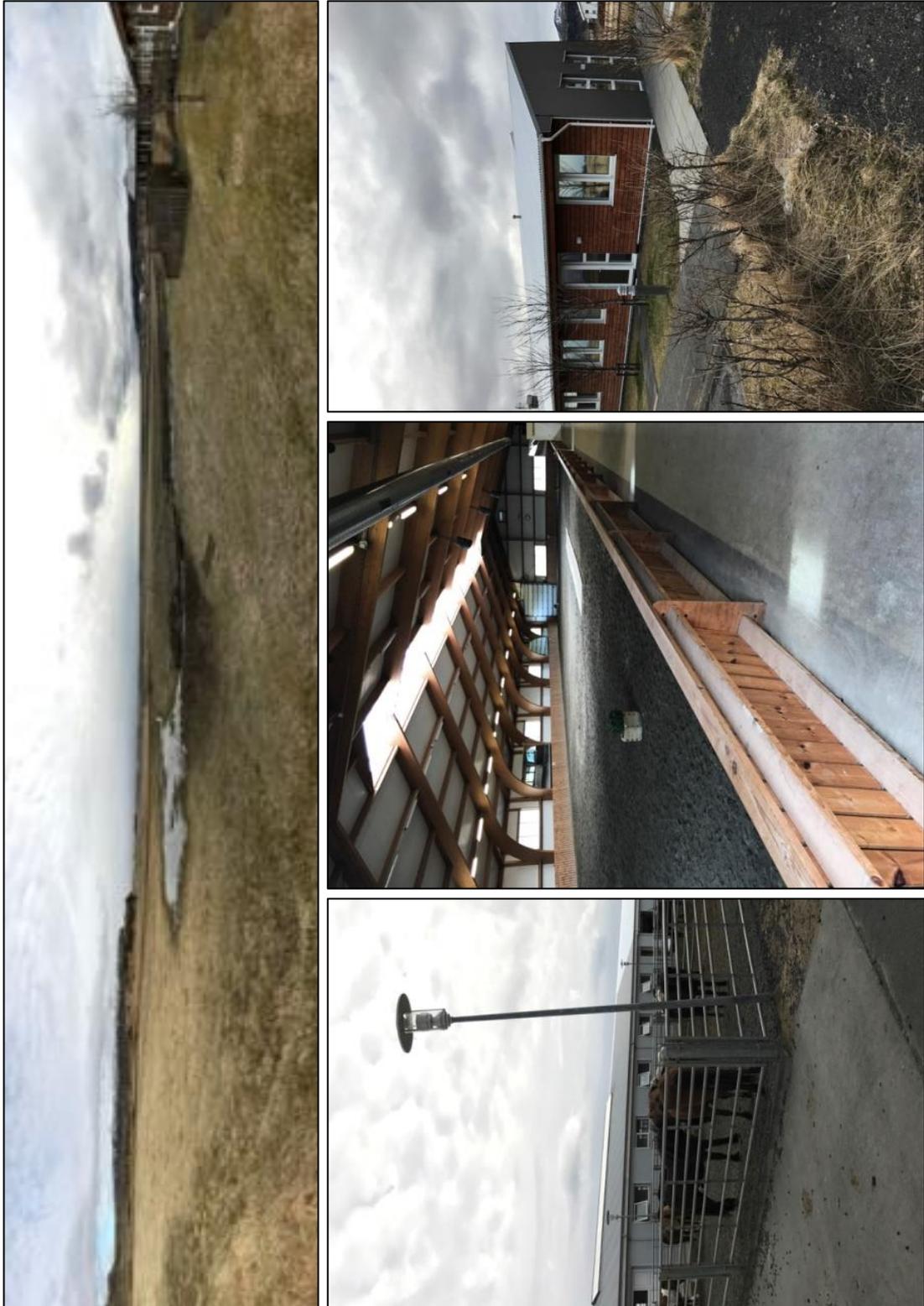
Tour 2: Horse riding			
Provisioning	Regulating & Supporting	Cultural	
<p>(Andersson, 2016) Addresses the use of domestic animals in biomedical research, analysing the different patterns of locomotion while specifically discussing the Icelandic horses' ability to "tölt" and how this is relevant to genetic research.</p> <p>(Hugason, 1994) Discusses breeding of the Icelandic horse in relation to how the species has been used in herding and others aspects of agriculture, as well as other by-products that can be gained from the species (e.g. meat, milk, pharmaceuticals).</p> <p>(Jóhannesson, 2010) Highlights meat production for consumption from Icelandic horses, as well as noting other benefits that the species provides to people relating to financial gain as a result of tourism and animal export.</p>	<p>(Cole & Spildie, 1998) Examines the effect that horse-based tourism can have on nature (in Montana, USA), where trampling of vegetation caused significant environmental disturbances.</p> <p>(Hersteinsson, 1992) Addresses the role and impact of the Icelandic horse concerning the natural environment, particularly its ecological importance due to the species grazing on actively eroding land (where its ecological impact is second only to sheep).</p> <p>(Ministry for the Environment, 2001) Addresses the impact that grazing Icelandic horses has on the environment, where said grazing on uncultivated land effects vegetative cover, impacting species composition and biological diversity.</p>	<p>(Helgadóttir, 2006) Addresses the Icelandic tradition of horsemanship and how this relates to modern horse-based tourism in the country and the Icelandic tourism industry as a whole.</p> <p>(Helgadóttir & Sigurðardóttir, 2008) Examines the position held by horse-based tourism in Iceland (due to the nation's historical connection to horses) from a "horsemanship" perspective rather than the business it creates and money it generates.</p> <p>(Sigurðardóttir & Helgadóttir, 2015) Addresses the customer satisfaction of tourists participating in horse-based nature tourism in Iceland, particularly highlighting approval surrounding the staff which led the tours.</p>	
	<p>(Newsome, Cole & Marion, 2004) Discusses both the positive and negative environmental impacts of horse riding in natural areas, including disturbance to wildlife, nutrient enrichment from defecation, and damage to soil and vegetation.</p> <p>(Schmudde, 2015) Examines the social and environmental impact that horse-based tourism has in different areas of Iceland, identifying damage to vegetation and disappearance of moss due to trampling (though these impacts were not long-term issues).</p>		

Appendix V: Photographs from horse riding tour

Appendix Va: Photograph of myself participating in the horse riding tour



Appendix Vb: Overview of the farm where the tour took place and the facilities made available to visitors, staff and horses (top: overview of farm; bottom-left: area where horses are kept directly before and after tour; bottom-centre: inside riding area used for training and shows; bottom-right: hotel located on the property)



Appendix Vc: Photograph showing the area where the horses on the farm are kept when not being used for riding tours



Appendix Vd: Informational poster located in the main building of the tour company highlighting the different breeds of Icelandic horses



Appendix VI: Summary of selected articles related to glacier boat tours

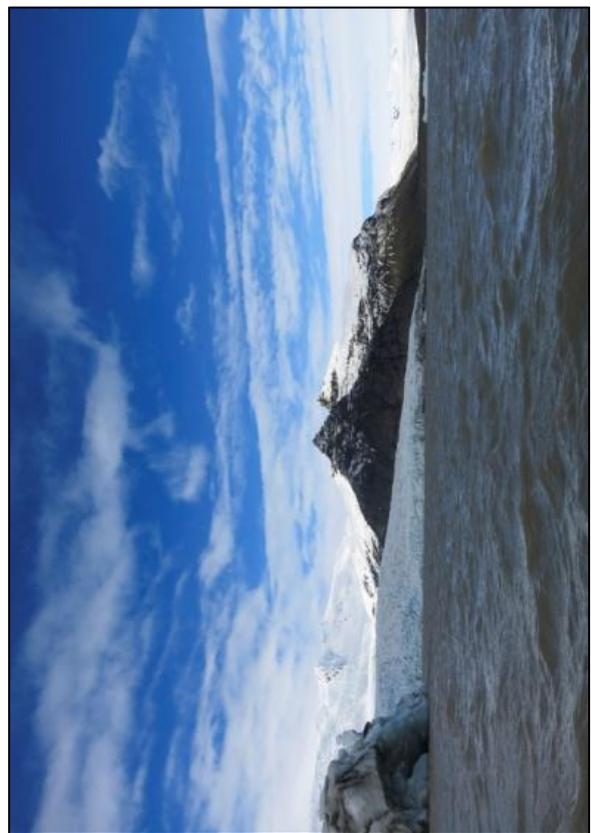
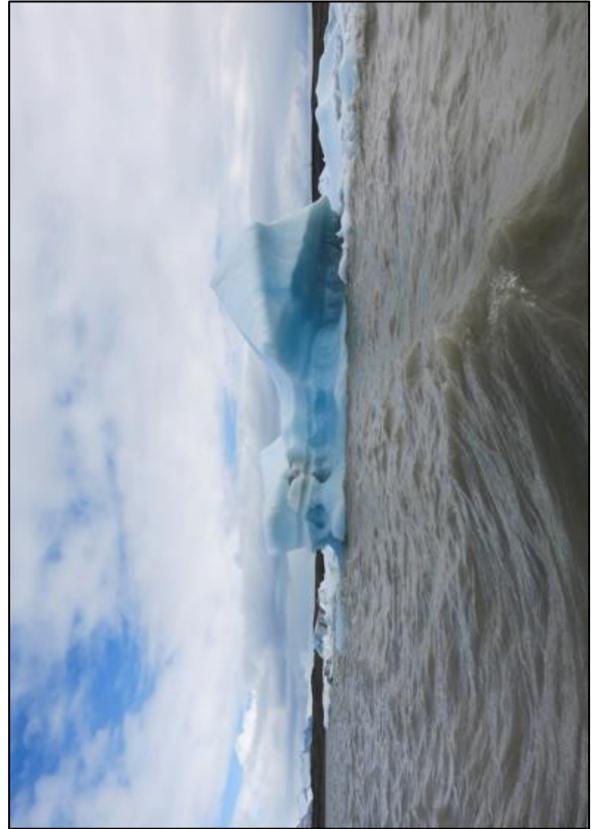
Tour 3: Glacier boat tour			
Provisioning	Regulating & Supporting	Cultural	
<p>(Jonsdóttir, Eliasson & Madsen, 2005) Examines the water resource system in Iceland and the reliance of the country on hydropower developed from melting glaciers (and how climate change is affecting this).</p> <p>(Sæþórsdóttir & Saarinen, 2016) Addresses the development of hydro-electric and geothermal energy production sites in natural areas and how this impacts the tourism industry.</p> <p>(Thorsteinsson, Jóhannesson & Snorrason, 2013) Discusses the glacier mass balance in Iceland in relation to energy production through hydropower, as the majority of energy produced in the country is as a result of glacial meltwater.</p>	<p>(Astthorsson & Vilhjálmsson, 2002) Examines the impact that Icelandic waters have on natural areas in relation to temperature and salinity, primary production, zooplankton biomass and yields of fish.</p> <p>(Björnsson & Pálsson, 2008) Concerns the impact that climate fluctuations have on glaciers, and how this subsequently affects meltwater, rising sea levels, and how it plays an important role in outlet dynamics and hydrology.</p> <p>(Bradwell, Sigurðsson & Everest, 2013) Discusses the effect that climate change has on glacial conditions in Iceland, where glaciers have been on a steady path of retreat since the 1990s, eventually settling into a pattern of non-uniform down wasting, decay and collapse.</p>	<p>(Eiriksdóttir, et al., 2017) Addresses the impact that damming glacial rivers has on a variety of naturally occurring minerals downstream.</p> <p>(Gunnarsson, et al., 2006) Addresses the impact that developments in relation to glacial rivers can have on a variety of species of birds in lowland areas (where the origin of the water source is most often from glaciers).</p> <p>(Tweed, Roberts & Russell, 2005) Addresses the need to monitor glacial movement and the products of glacial sediment deposition in relation to meltwater.</p>	<p>(Lindhjem, Reinvang & Zandersen, 2015) Presents the cultural importance of Iceland's unique landscape how the landscape itself is important in areas such as Icelandic painting and poetry.</p> <p>(Stewart, et al., 2016) Discusses in general the effect that climate change can have on glacier-based tourism (short and long-term).</p> <p>(Welling, Árnason & Ólafsdóttir, 2015) Provides a scoping literature review of the glacier-based tourism industry focusing on the perceptions and value of glaciers, social and ecological outcomes, and climate change.</p> <p>(Xuling, Zhaoping & Ting, 2006) Examines glacier tourism in terms of combining tourism with scientific research and education, and in relation to environmental protection.</p>

Appendix VII: Photographs from glacier boat tour

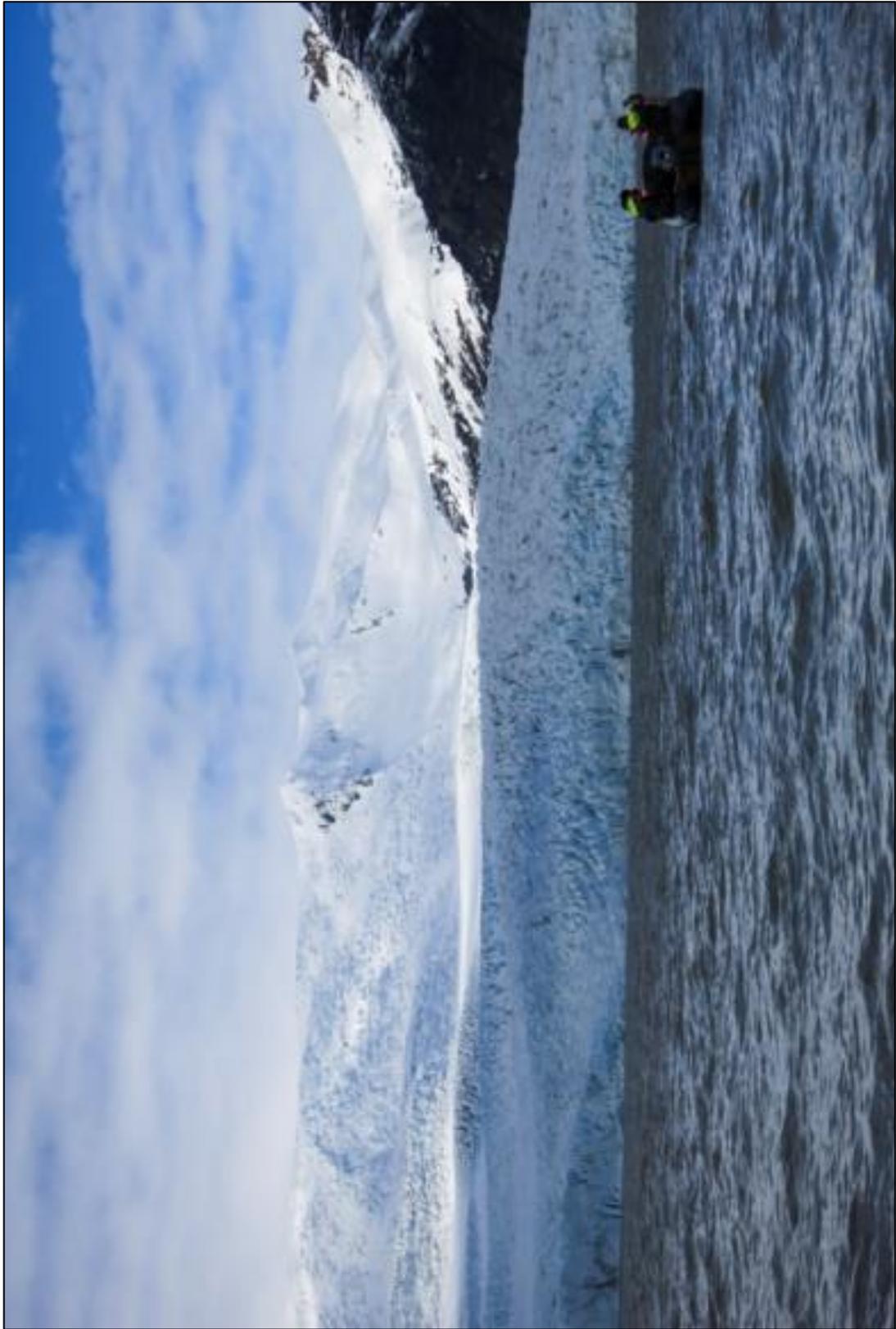
Appendix VIIa: Photograph of myself participating in the glacier boat tour



Appendix VIIb: Overview photographs of the Fjallsárlón glacial lagoon, where the tour took place



Appendix VIIc: Photograph showing a second boat taking the same tour as the one I participated in and showing the major glacier within the Fjallsárlón glacial lagoon



Appendix VIIId: General information sign concerning the glacial lagoon area

Breiðármörk gönguleið Fjallsárón – Jökulsárlón

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The Breiðármörk trail Fjallsárón – Jökulsárlón

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Map of Breiðármörk trail area showing the route between Fjallsárón and Jökulsárlón.

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Photograph of the Breiðármörk trail area showing the lagoon and surrounding landscape.

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Appendix VIII: Summary of selected articles related to the Blue Lagoon

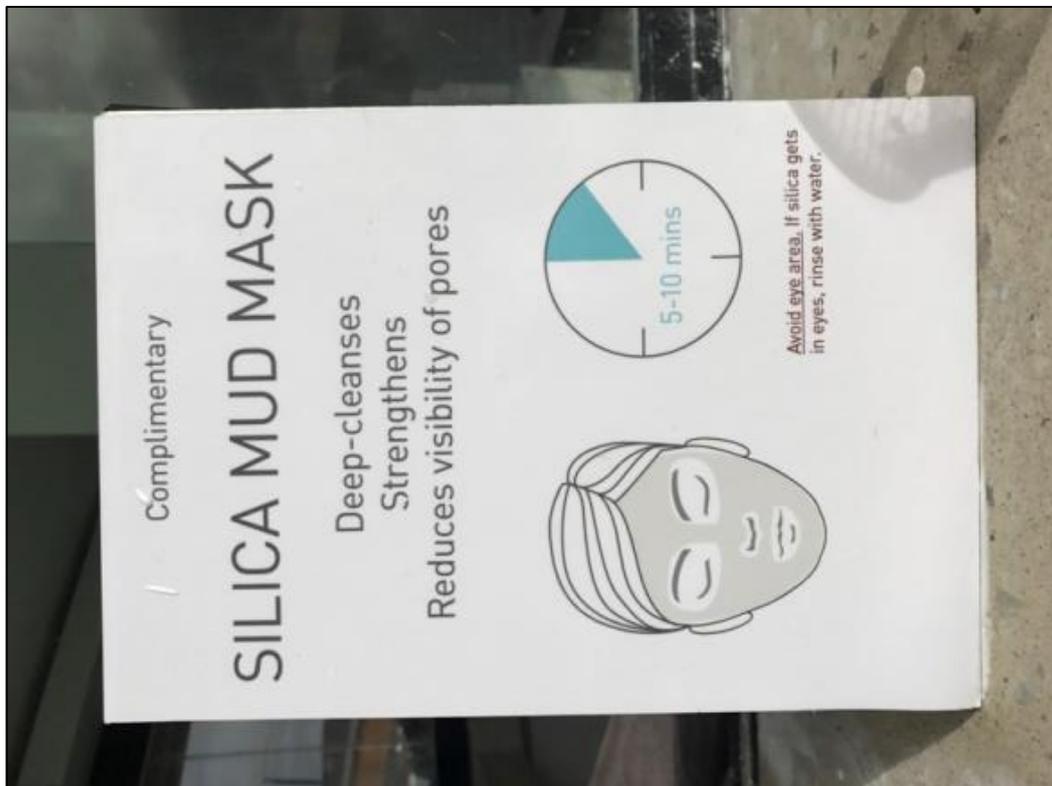
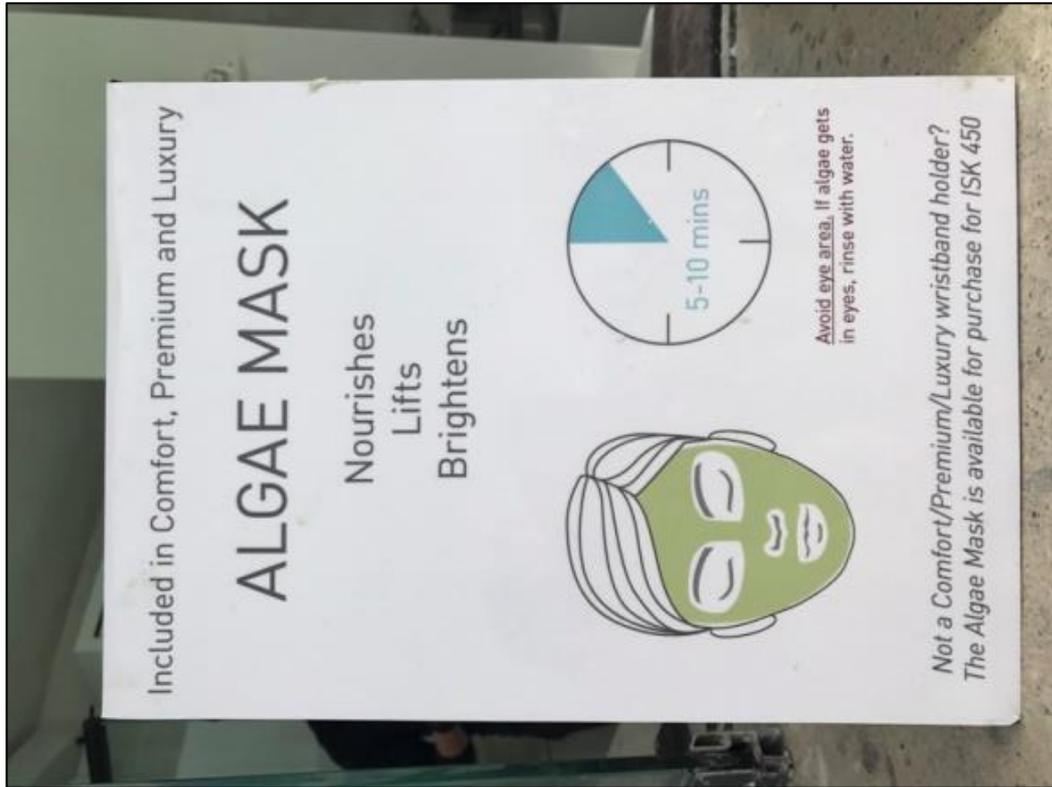
Tour 4: Blue Lagoon		
Provisioning	Regulating & Supporting	Cultural
<p>(Bertani, 2012) Provides an overview of the development of geothermal energy, highlighting the importance it plays across Iceland.</p> <p>(Halper, 2011) Addresses the electricity generated by the Svartsengi geothermal power plant and how it feeds water into the adjacent Blue Lagoon.</p> <p>(Ragnarsson, 2010) Discusses the development of geothermal energy in Iceland as well as the Blue Lagoon specifically (in relation to energy development and natural skin care products).</p> <p>(Renewable Energy Focus, 2011) Discusses the growth of geothermal energy production worldwide, specifically mentioning the case of the Blue Lagoon.</p>	<p>(Menzel, et al., 2015) A comparative study of eight geographically remote terrestrial hot springs (including Iceland) which examines the biodiversity and community composition which exist within them.</p> <p>(Pétursdóttir, et al., 2009) Presents an analysis of the unique geothermal microbial ecosystem that exists within the Blue Lagoon, recording the types and levels of microorganisms present at the site.</p> <p>(Pétursdóttir & Kristjánsson, 1996) Highlights the relationship between the conditions of the Blue Lagoon (temperature, salinity, pH level) and the microbial biodiversity which occurs within it (bacteria, microorganisms and mineral development).</p>	<p>(Erfurt, 2011) Discusses the growth in popularity of the Blue Lagoon among tourists and the potential benefits it can provide people with regards to skin care.</p> <p>(Eysteinsdóttir, et al., 2014); (Ólafsson, 1996) Highlights the beneficial nature of bathing in geothermal locations such as the Blue Lagoon with regards to skin conditions such as psoriasis (highlighting the high concentration of silica and moderate salinity at the site).</p> <p>(Grether-Beck, et al., 2008) Highlights the positive effects of silica and microalgae extracts from the Blue Lagoon regarding skin ageing.</p> <p>(Kazandjieva, et al., 2008) An analysis of climatotherapy (nature-based treatment) in order to treat skin conditions such as psoriasis.</p>
	<p>(Svavarsson, Einarsson & Brynjólfsson, 2014) Highlights the presence of silica in the Blue Lagoon as a result of discharges from the nearby geothermal power plant, an undesirable by-product of geothermal power production.</p>	

Appendix IX: Photographs from Blue Lagoon

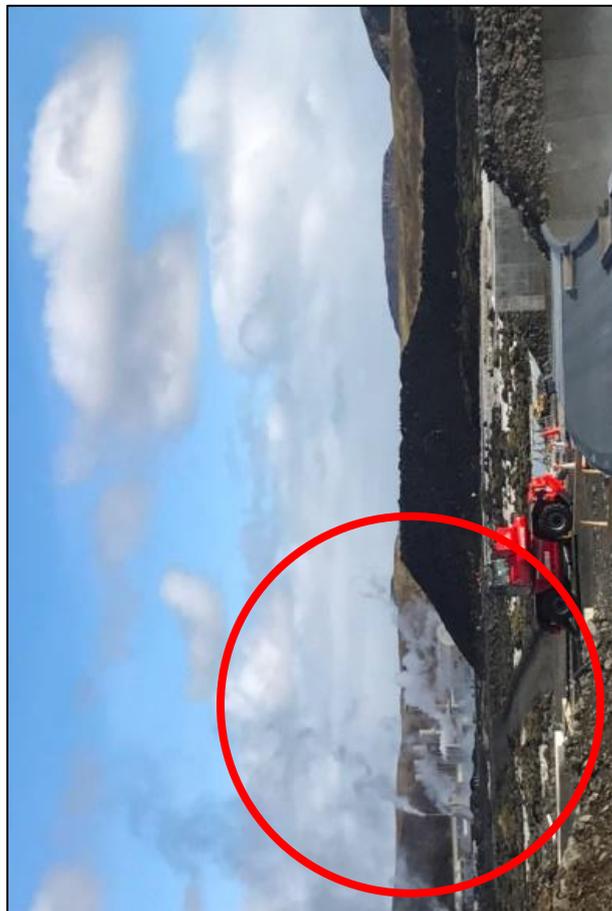
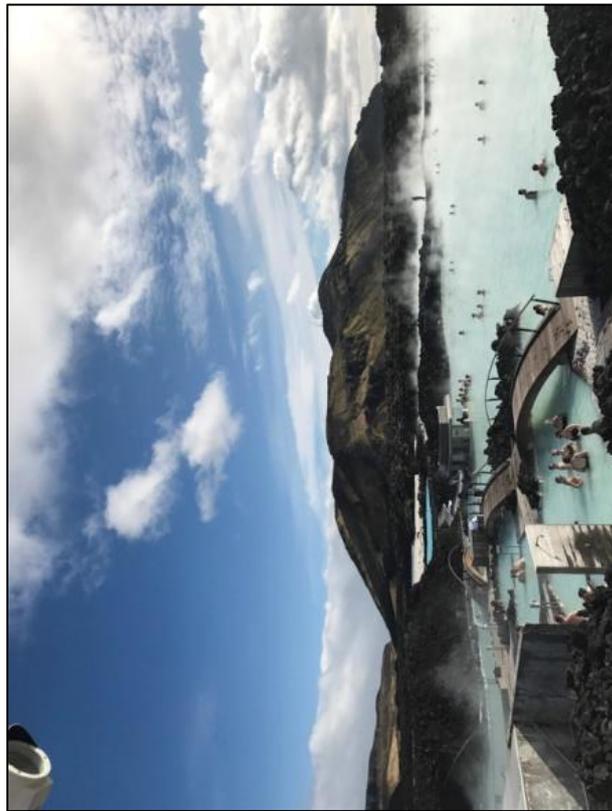
Appendix IXa: Photograph of myself at the Blue Lagoon



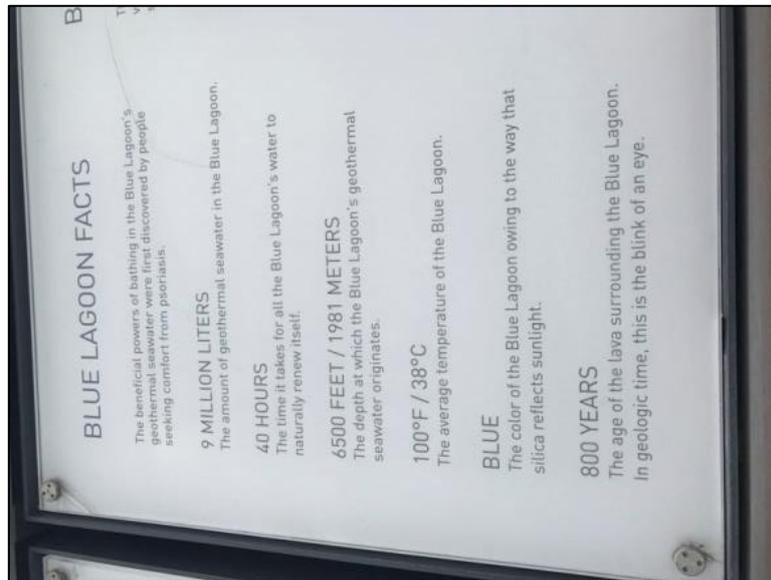
Appendix IXc: Signs located at the in-water “Silica Mud Bar” briefly explaining the beneficial effects of both silica and algae-based face treatments made available to visitors



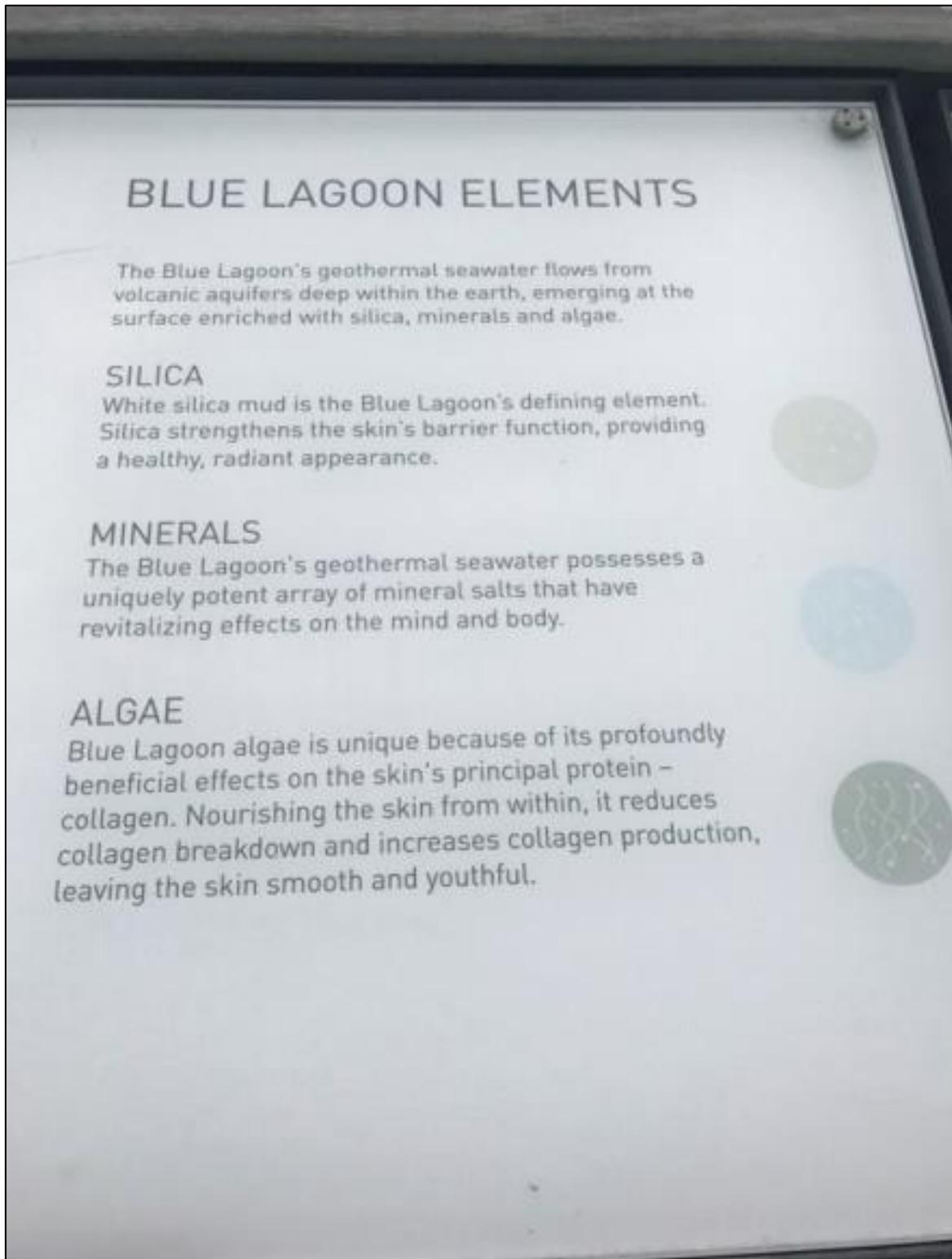
Appendix IXd: View of the nearby Svartsengi geothermal power plant visible from within the Blue Lagoon facilities (power plant highlighted in red circle)



Appendix IXe: Informational signs providing a general overview of the unique characteristics of the Blue Lagoon, visible from within the water



Appendix IXf: Informational sign explaining the beneficial nature to human skin of naturally-occurring silica, minerals and algae from the Blue Lagoon, visible from within the water



Appendix IXg: Sign explaining the role of silica with regards to the bright light blue appearance of the water in the Blue Lagoon, located at the entrance to the facility

