Stora Karlsö Tourism Sustainability Studies - A case study to understand & investigate impacts of water shortage and power outage on tourism.

Master Thesis
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Acknowledgements

The motivation for the topic came from the fact that I visited Stora Karlsö as a tourist twice which left a lasting impression on me. The ecological importance of the island, its unsurpassed beauty and the structure of tourism operation intrigued me to investigate this nature based destination. In my visits, I was pleasantly surprised how the tourism on the island makes genuine attempts to bring people closer to nature, appreciate the biodiversity and conserve this biodiversity. Words cannot express my gratitude for the contribution of everyone who made this study possible and for me to write about the tourism sustainability in an academic research. The idea was welcomed, refined and assumed its current form, thanks to the unconditional support of my supervisor Dr. Shannon Bower. Shannon was actively engaged in guiding my research process and constantly supported me even when I experienced low moments in course of this study and she encouraged me to believe in myself and continue the pursuit in the face of adversaries. I would also like to thank Ms. Ulrika Persson-Fischier for approving and welcoming the idea right from the beginning and being flexible throughout the process.

My special thanks to all the interviewees participated in the study and offering deep insights which made it possible for this study to reach its aim and objectives. I would like to thank Mr. Dan Widegren, as he helped me establish contact with other stakeholders which was essential to complete this study.

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Sumit Nair
Abstract

Tourism is one of the main driving forces of economic growth for several regions of the world. Many countries have flourished economically due to tourism revenues but this exponential and unsustainable growth has brought negative consequences, including major impact on resources such as water (availability) and electricity (disruptions). These impacts can be more severe on islands which rely heavily on tourism revenues. Tourist experience, tourism operations, which are important strands that support tourism function, can also be negatively affected these two problems. Stora Karlsö, an island located 6.5 km southwest of Gotland, is very popular for its diverse bird life attracts bird watchers, nature lovers and other tourists. The focus of this study was to investigate the impact of water supply shortage and electricity power outages on sustainability of tourism on Stora Karlsö during its tourist season (May – September). The data for the study was collected using a broadly inductive process. Stakeholders from the Karlsö club and a DMO representative were interviewed, data from Trip Advisor were also examined for context. These findings were used for further testing the impact of these two problems on tourist numbers by examining trends and patterns in visitor numbers for the last ten years. The study shed light on the steps taken towards sustainable tourism by the stakeholders of Stora Karlsö, their awareness of the problems that can arise due to unsustainable increases in tourism, and their awareness that it would be difficult to maintain sustainable use of resources available to them.

Keywords: Stora Karlsö island, Sustainable tourism, water availability, electricity disruption, revenue, tourist experience.
LIST OF ABBREVIATIONS

DMO - Destination Management Organization
EU - European Union
GEAB - Gotlands Energi Aktie Bolag
GSTC – Global Sustainable Tourism Council
H₀ - Null hypothesis
H₁ - Alternate hypothesis
UNWTO – United Nation World Tourism Organization
US – United States
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1. **Introduction**

Tourism, an important pursuit has consistently produced economic gains despite the great economic crash of 2008, natural calamities, terrorism and continues to emerge as a resilient business. According to UNWTO 2017 Annual report, ‘Tourism has grown above average, at 4% per year for 8 straight years’ and reached 1323 million tourist arrivals in 2017, suggesting that tourism has been consistently rising. With the sector growing globally, the scale of issues is growing too. According to Saarinen (2006), increasing size and scale of the industry, has led to a range of existing and potential impacts on environment, society, culture and political systems. Saarinen also stresses the need for creating alternative environmental and host friendly practices in development, planning and policy. Over decades now, sustainability and scale of environmental problems due to anthropogenic activities are being extensively discussed and many stricter targets are being set to meet the environmental goals to prevent any further deterioration of the environment and limit resource consumption at the rate that will permanently deplete natural capital.

Sustainability is broader holistic concept of resource consumption and development activities of various types that factors in not only current needs but also working to meet future needs. According to the UNWTO Sustainable tourism is, "Tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities"

The elements of overall sustainability and tourism sustainability are not separate islands however sustainable tourism can be considered subsets and integral part of overall strong sustainability. (Fig. 1). Tourism relies on many other allied industries and stakeholders for its efficient functioning which includes transportation, infrastructure development, energy, human services, etc. Therefore, it does not operate in isolation and just as the stakeholders are important for the wellbeing of tourism the same way tourism has ways to contribute value and influence on stakeholders and other industries. Sustainable tourism development not only includes economic development but also to safeguard the future of humanity to solve and mitigate contemporary issues that jeopardizes the pursuit. These issues keep tourism often outside the sphere of overall strong sustainability (Fig. 1). The current state of matters and the ‘business as usual’ approach has lead us to witness many socio-political conflicts, human- wild life conflicts, economic exclusion of local communities, depletion of resources, etc. Therefore, the two spheres ‘Sustainability’ and
‘Tourism’ cannot be regarded as separate and development plans must factor in all the interdependent components for attempting to address these problems.

Fig. 1 Model representing sustainable tourism as a subset of overall strong sustainability

There are number of deeply entrenched problems that exists in tourism operations that pose many obstacles in the development of sustainable tourism such as water shortage, power outages, terrorism, climate change, etc. These issues have become much more important because of many imminent global challenges that have a direct effect on the tourism industry by affecting tourist numbers, impact on receiving environment, dilution of local cultures, hampering tourist experience, etc. But it is not just these issues that impact tourism. Tourism, because of its magnitude and distribution, contributes its fair share to the global environmental dilemma with which we are now faced with.
Water Scarcity and Tourism

Having access to a clean supply of water constitutes one of the fundamental pillars for any civilization. Water is a vital necessity for everyday needs such as drinking, washing and cooking and is also, most importantly, required for growing the food we depend on for survival and for economic development. In most of the developed world, where we have become accustomed to readily available water through our taps, water is a resource that most us take for granted. However, with nearly 1.2 billion people around the world still lacking guaranteed access to water and more than 2.6 billion without adequate sanitation, many countries find themselves in the midst of a global water crisis, which seriously threatens the pursuit of goals such as development and poverty reduction (Jacobson and Tropp, 2010). Water scarcity is, however, not only the result of water shortage in the physical sense.

In many developing countries, lack of access to water is compounded by insufficient funds, inadequate infrastructure, poor governance, corruption and an inability to provide water of decent quality. Water scarcity is likely to become even worse in the future. Ongoing climatic change will, most certainly, have a severe impact on water supplies in many parts of the world. Climate change is expected to threaten the reliability of both the quantity and quality of water supplies by increasing the current variability in the climate, through an intensification of extremes such as droughts and floods (World Water Assessment Programme, 2009). Even though water use in the tourism sector may appear to be dwarfed by use in other sectors such as agriculture when looking at average figures, the spatial and temporal concentration of water use by tourism implies that unsustainable use can still lead to severe depletion of local resources and conflict between tourist facilities, other industrial sectors and local residents. Furthermore, with tourism’s anticipated continued expansion, some destinations are likely to experience increased water stress if measures are not taken to make tourism’s water consumption more sustainable.

Water use by tourism only amounts to 0.04 per cent of the total water withdrawals (Gössling, 2005). Tourism can be responsible for up to 16.9 per cent of domestic water use in island states like Cyprus (Gössling, 2006), which corresponds to 5 per cent of the total mean annual water use (Savvides, et al. 2001). Furthermore, what is important to consider in this overall consumption is that the use of water by the tourist sector may be very seasonal in nature, meaning that the annual figures mask the actual stress exerted from the tourist sector on local water resources. Conflict
over water resources during the peak tourism period is not uncommon, especially in drought years when local residents and farmers have restricted access to water while the supply to tourist establishments remains unaffected (Holden, 2000). As a high-value user of water where a single day of insufficient water supply could severely affect the public image and reputation of any tourist destination, tourism commonly takes priority over other uses.

In many developing countries, lack of access to water is compounded by insufficient funds, inadequate infrastructure, poor governance, corruption and an inability to provide water of decent quality. In most cases, water scarcity is a combination of first order (physical) scarcity and second order scarcity (implying poor water management). Furthermore, it is often extremely difficult to assess whether water scarcity is caused by insufficient supply or excess demand. Similar to the supply of water, which varies in space and time around the globe, human demand for water also varies in different places, as it is a factor of societal values and human behaviour. Although scarcity often arises due to a combination of different causes, most societies facing water scarcity have options available to them in order to address their problems (UN-Water 2006). What are often lacking, however, are the resources and appropriate incentives to implement these options. Especially in developing countries where the national per capita use is low, the difference between local and tourist consumption can be large. A study by Gössling (2001) showed that average per capita daily water use in hotels in Zanzibar corresponds to around 15 times the daily per capita demand from the local population. This understandably raises issues of inequity as tourism, being a higher-value user than the local population, is given priority over water resources. Added to this is the fact that most of the tourists come from developed temperate countries where water is abundant. They, therefore, often have little appreciation of how their water use compares with that of the local population. When in ‘holiday mode’ and in the absence of financial incentives to promote more prudent use, pro-environmental behaviour can be rare (Miller, et al. 2010).

Tourism, is undoubtedly one of main driving forces of economic growth in several regions of the world but the growth sometimes may come with a cost of negative environmental impacts, particularly on water availability (Tortella, et al. 2011). There are several studies which has highlighted these negative effects for e.g. Santa Cruz Island (Galápagos Archipelago), which is currently experiencing an exponential increase in tourism and local population growth, jeopardizing current and future water supply (Reyes, et al. 2017). Emmanuel, et al. 2017 also
expressed that water management issues are typical to small islands like Barbados and it makes them particularly vulnerable to water crisis especially in the wake of climate change.

**Power outage and tourism**

Tourists consume electricity of a destination either directly or indirectly (Lee, 2013). Like water, electricity is an indispensable resource for modern day tourist operations. Electricity powers boarding facilities, cooking facilities, heating and/or cooling, payments and communication systems, etc. The offshoots of modern technology are electricity powered; modern travelers heavily rely on these technological features. Lee (2013) also acknowledged that despite the recognition of potential effect of international tourism on electricity consumption, the relationship between the two is under studied.

Adverse effects of electricity disruptions on economic activities like tourism are not easy to quantify before such a disruption takes place (Zachariadis, et al. 2012). Lee (2013) suggested in their case study on electricity consumption in Singapore, that number of international inbound tourists, industrial production, and the variability of the electricity consumption have positive effects on electricity consumption and went on to elaborate that high electricity consumption was due to the fact that Singapore has many natural and man-made attractions which attracts many tourists. The man-made attractions in Singapore consume electricity (ibid).

A similar study examining relationships among hotel and restaurant electricity consumption and tourism in 11 European Union (EU) countries revealed that hotel and restaurant operation electricity consumption per capita, with respect to tourism per capita was positive. This means that as tourist overnight stays increase, the electricity consumption of these tourist operation increase (Pablo-Romero, et al. 2017). Their research also suggested that increased economic growth will also increase electricity consumption, reinforcing the need for energy efficiency measures and renewable energy development (ibid). Stern (2011) outlined that energy is an important cause of economic growth—and inversely, that lack of adequate energy supply is an obstacle to economic development.

These two issues, water shortage and power outage, have the potential to seriously impact tourism sustainability on islands which rely heavily on such revenues. Tourist experience, tourism
operations, which are important strands that support tourism function can be negatively affected by these two problems.

1.1. **Stora Karlsö**

The island of Stora Karlsö off the coast of Gotland is very popular for its diverse bird life and scenery, and is the largest bird nesting site in the Baltic Sea. Geographically, the island is part of the bigger island Region Gotland (Fig. 2). Stora Karlsö is located 6.5 km southwest of Gotland and one can travels there with the vessel M / F Stora Karlsö from Klintehamn. The boat trip from Klintehamn to Stora Karlsö takes about 30 minutes.

Stora Karlsö is home to famous red-yellow orchid meadows and is the second oldest nature reserve in the world after Yellowstone National park in the US. The island, a coral reef more than 400 million years old, also has a rich cultural history going back to the Stone Age and was the site of pioneering conservation measures in Sweden. Many fossils of plants and animals can be found on the island which visitors can view and study, however they are forbidden from taking these fossil remains. The island attracts bird watchers, nature lovers and other tourists who come to escape the hustle from the city life (Stora Karlsö, 2019).

The island was purchased by Karlsö club and protected as long ago as the 1880s, and has been a popular destination for visitors for nearly a hundred years. The Karlsö club company comprises of 1071 shares with approximately 900 shareholders. The association is a nature conservation management group for the nature reserve Stora Karlsö and keeps the area accessible to the public. The island is frequently visited by tourist from across Sweden and abroad. The island receives day and overnight tourists mainly between the months of May to August and early September in a calendar year (ibid).
Fig. 2. Map of Gotland showing Karlsö Islands
1.2. Water and Electricity Shortage - the wicked problems for Gotland

According to the data published by Region Gotland, ‘in 2016, over 2.2 million passengers travelled to and from Gotland by either ferry or air’ while the population that lives year around on Gotland is 58,000. These number seem encouraging however the island has been experiencing water shortage and power outages recently, that really raises the question whether there should be a limit placed on the tourist arrivals but on the other hand the tourism seasonality and employment availability challenges the idea of limits on tourism volumes as off season tourism contribution is insignificant to local economy.

The island of Gotland has experienced record low groundwater levels which may lead to severe drinking water shortage on the island during summer (Sverige Radio, 2016). Also, in the last few years, Gotland has experienced power outages in summer (Sverige Radio, 2015). In the wake of these two issues, I think it would be interesting to see if the problem of water shortage and power outage has any effect tourism on the small island of Stora Karlsö. Though most research in this area focuses on the developing world, water and electric supply are crucial for tourist operations on Gotland also, and its shortcomings may impact tourist numbers in some cases or may hamper tourist experiences. Based on personal empirical observations, as a resident of Gotland, during peak tourist season, there are notices issued by the Region to reduce consumption of water to be able to meet the overwhelming tourist demand (Fig. 3). Very little precipitation, long summer days and higher evaporation rates puts additional stress on ground water levels in Gotland.
The aims and objectives of this research are to understand the water and power supply structure on the island of Stora Karlsö and understand Stora Karlsö’s degree of dependence of water and electricity on the larger Gotland island. To accomplish this I studied the local water shortage and power outages incidences to determine whether they had any impacts on tourism operations in Stora Karlsö. I further attempted to assess the scale of impacts on tourism operation and determine if the two issues resulted in negative impact on tourist experience. In doing so, I answered the research question: **How do water supply shortages and electricity power outages on Gotland during its tourist season (May – September) impact tourism sustainability in Stora Karlsö?**
2. Methods

Due to the lack of any previous study on the subject for the chosen location, also given the fact that exploratory nature of this research, an inductive approach seemed more suitable for this project (Neumann 2014). Since a large part of the study was qualitative, one may argue that it might lack the rigor in generating data that cannot provide generalizable conclusion. However, the qualitative approach used here was more flexible and allowed for greater spontaneity and adaptation of interaction between researcher and the interviewees (Vakulchuk, 2018). “Case-study research intensively investigates one or a small set of cases, focusing on many details within each case and the context” (Neumann 2014). The research design here involves intensive analysis of a single case and used, conversational style interview to get a well-rounded perspective. This aided the process of answering the proposed research question making it more valid than research using more formal methods of data collection (Bryman 2012).

The study participants provided responses in their own words and in greater depth, thus this approach has the potential to provide insightful analysis and may provide deeper understanding of the issues under study.

After obtaining the relevant data using inductive process, the findings used to further test the given case to see if the two issues under study resulted in affecting tourist numbers in any form or shape on the small island.

2.1. Research Design:

A) Qualitative Case study –

I conducted five semi-structured qualitative interviews with tourism managers (Stakeholder(s), Operations Manager (VD), on site employees of Stora Karlsö (Appendix 2) with a mix of open ended, direct, indirect, structuring, follow-up and probing questions were asked to the interviewees (Appendix 1). Some of the survey question will be designed keeping the Global Sustainable Tourism Council (GSTC) criteria (Industry, Destination Criteria) relevant to water and energy management in mind. According to Bernard (2006), Semi-structured interviewing works very well in research projects where design involves dealing with high profile officials and senior management who are accustomed to efficient
The interviews were transcribed carefully and analyzed for context and reference to water shortage and power outage. Secondary data of tourist reviews were obtained from Trip Advisor on Stora Karlsö to analyze visitor comments regarding the two issues under study. There are currently 42 reviews posted on Trip Advisor all the reviews be carefully studied to find evidence of effect of water shortage and/or power outage reported by the tourists.
Other review sites like Google Reviews, Booking.com lacks reviews for the island of Stora Karlsö. According to Nikjoo, et al. (2019), due to large scale penetration of social media like Facebook, tourists can share their experiences therefore provides a great opportunity for investigating their response to their visit. Stora Karlsö Facebook page comments were also analyzed if any references are made by the visitors regarding the two issues under study.

After obtaining the relevant data using inductive process, interviewee responses were used to further test to see if the two issues under study resulted in affecting tourist numbers in any form or shape on the small island. This was accomplished by conducting an additional quantitative study.

B) Quantitative study –

Bernard (2006) stated that mixed methods are becoming a norm, therefore a sensible mix of qualitative and quantitative methods that matches the need of the research is acceptable. A quantitative study involving collecting total visitor numbers per tourist season for Stora Karlsö were obtained from visitor logs or other relevant source as shared by the VD (chief) of tourism operations in Stora Karlsö.

The data sets would be use for investigating trends between water shortage and visitor numbers also power outage and tourist numbers separately. I received month-wise data for total tourists visited from 2006-2018 and overnight tourist data for the last 10 years (2009-18). This data was plotted to look for patterns and trends that will be relevant for the study.
3. Results and Discussions

Due to the nature of the study and the use of mixed approaches - qualitative and quantitative, I decided to combine the results and discussion section to categorize the findings in terms of its relevance with the aims and objectives. By doing so, it also enabled me to present the outcomes in an easy and comprehensible manner in the relevant sections, and these sections facilitate disseminating the results and followed by the discussion which makes the interview data more coherent.

Case study data obtained from Interviews with three stakeholders who have administrative or maintenance responsibilities on Stora Karlsö along with one ground staff. An interview encapsulating perspectives from Gotland Destination Management Organization (DMO) was also obtained (Appendix 2).

The response from the stakeholder interviews were transcribed and the key findings are summarized as follows:

A. **Assessing Impact of Water shortage on Stora Karlsö tourism**

1. **Water supply to Stora Karlsö and it’s degree of dependence on the Region Gotland:**

   The interview with the Karlsö club stakeholders revealed that water supply and consumption on Stora Karlsö comes from three sources. Firstly, there are two well near the lighthouse which is located on the hilltop which supplies fresh water for the houses nearby which is used by overnight staying guests. Dan Widegren, confirmed the water from this well is tested and is fit for all type of use. Björn Cedergren, stated that 80% of the water used comes from a drilled well on the island itself. A third well also exist in the middle of the island, which is capable of water supply. Water is pumped on need basis so all the wells are not in use all the time. Secondly, the Karlsö restaurant receives fresh water from Region Gotland brought in tanks by boats which is used for cooking, drinking and other purposes. There are two trips by boat bringing the fresh water from the Region. Sometimes, the water is brought is only in one of the trips. Thirdly, there are also sea water toilets for communal
use in Norderhamn where the water for flushing is directly obtained from the sea. Adjacent to the communal toilets is a communal sauna, which is also equipped with one shower booth which has running water supplied using the sea water and it is a cold shower. Recently, a fourth well was dug near the restaurant area autumn 2018, the water available is currently being test pumped and will eventually be sent to test potability and fitness for consumption. The board members of the Karlsö club collectively agrees that when second well is fully functional, it will reduce the water dependence on Region Gotland and increase its self-sufficiency.

2. Measurement and monitoring water usage
The interview questions regarding the measurement of consumption and monitor use of water was inspired from the GSTC Hotel and Industry Criteria on water conservation D.1.4. This criteria states that water risks are assessed by the operation, consumption is measured by type, and steps are taken to reduce consumption and the supply of water is environmentally sustainable with no negative impacts and stewardship goals are identified and pursued. The conversation with board members revealed that, as most the water is supplied locally, by own means, there are not any external authority to regulate the water us says Björn Cedergren. Also, Anne Mehlin revealed that the consumption of well water is duly checked but not monitored. Dan Widegren, also stated that the water brought by the boats is measured and monitored using a water meter located in Klintehamn, Gotland. This meter measures the volume of water pumped and transported on to the boats which is direct indicator of the water usage. It is a fixed volume that arrives with each trip. This water is purchased directly from Region Gotland. All the board members affirmed the reiteration of sustainable water consumption for all visitors is done by the ground staff and also there are signs in strategic places urging careful use of freshwater. Anne Mehlin and Dan Widegren acknowledged the receipt and awareness of the notices from Region Gotland that urges all residents to be careful with water usage and assured that the nature based tourist attraction ensures that water sustainability is at the heart of its tourist operation.
3. **Impacts due to water shortage on Stora Karlsö**

The board of the Karlsö club acknowledged that there have been no serious incidents or impacts that were experienced in the past due to water shortage. However, Dan Widegren, mentioned there were very rare occasions when the water for the restaurant ran out, however the water was arranged by the shuttle boat also with the help of supply from the wells. “The water scarcity is of course an increasing problem on Gotland, but we (Stora Karlsö) had no larger difficulties with our consumption this past summer in 2018”, says Clara Kjällman. All the stakeholders involved in various capacities in tourism operation, think water shortage may not be a serious threat for Stora Karlsö as they have systems in place to tackle the water shortage issues however they think it is a bigger issue for the main island Gotland. Björn Cedergren added, during the peak tourist seasons, there are way too many people on the island then what it can sustain and he went to say that quality of visits is not the same when you have too many people. All stakeholders unanimously stated there is economic or business impact that have been experienced so far. They also confirmed there is no decline in tourist numbers which they thought could be linked to water shortage.

4. **Action taken for water sustainability at Stora Karlsö**

Some steps that are currently in place to address the water shortage include, tour guides on arrival make announcement about the judicious use of water, says Anne Mehlin. She also mentioned that there are signs in various location to educate tourist about the water shortage (Fig 4.)
Fig. 4. A sign normally in the bathrooms and other locations which says ‘Fresh water is in short supply, Save Water, Thank you!’ Stora Karlsö

Clara Kjällman, the ground operations supervisor reaffirmed that staff and guests are informed fresh water is a scarcity on the island and ask them to respect this and not take long showers and use the sink plug while doing dishes. Dan Widegren also suggested the new well that is dug near the restaurant area, if the bacteriological and other tests come positive, will help in reducing Stora Karlsö’s dependency on the water supplied by the Region. Björn Cedergren highlighted concern about the challenges involved in digging wells in limestone also iterated that guests are encouraged to watch their consumption of fresh water. Dan Widegren also suggested that showering is not necessary for guests staying only one night, and the guests can take a dip in the sea, or use the communal shower booth by the sauna that uses sea water or take showers once they are back on the main island of Gotland. Since on average overnight stay are 1.4 nights, tourists profile usually comprises of interested and informed guests, impacts of water shortage are minimal and actions taken are positively received. Anne Mehlin, also stated in future the Well water that is currently used is not monitored but they are open to the idea for the future.
B) Assessing impacts of Power Outage on Stora Karlsö tourism

1. Power supply to Stora Karlsö and it’s degree of dependence on the Region Gotland

The interview with the Karlsö club stakeholders revealed that power supply and consumption on Stora Karlsö comes from the following source: The main power supply for Stora Karlsö is linked to the lighthouse by Sjöfartsverket. The electricity for tourist operations is brought from the same company, says Dan Widegren. For the electricity, there is a counter on the station where the cable is connected on the island, says Björn Cedergren. The cable originates from Klintehamn and runs through the sea. Dan Widegren and Anne Mehlin confirmed the source of this supply is from renewable energy. Stora Karlsö has a reserve generator which kicks in when there’s a power cut, says Clara Kjällman. This generator is diesel powered and the diesel required for the generator is also brought from Gotland. Generator starts automatically after 10 minutes approximately. The generator does not power the whole island, but mostly restaurant area and houses only for basic use and not in full capacity. Solar panels are installed in some houses on the island (Strandhuset) and the restaurant which provides the energy is used for solar water heating in some houses and to power the heating elements while in other houses it is electrically heated, said Clara Kjällman.

2. Measurement and Monitoring Power usage

The interview with the board members and the on-ground supervisor revealed that the power consumption is monitored using a meter. The electricity meter is separate for the lighthouse and the rest of the tourism operation.

3. Impacts due to Power Outage on Stora Karlsö

Dan Widegren suggested, if the electricity is out on Gotland, since the booking system and office is located in Klintehamn, the booking system will experience an impact of a long power outage. He also said that the Card Payment system on Stora Karlsö restaurant may get affected. He also said that power outage on Gotland may affect water pumping which is necessary to carry the fresh water for restaurant from Klintehamn. Anne Mehlin, added that last year (2018) there were many power cuts incidences (10-15 times) which created a disturbance several operations and she went
to say that sometimes powercut occurrence depends on the time of the day it happens and its impact varies accordingly. Similarly, Clara Kjällman, on-ground supervisor also said ‘‘for us, the power cuts has relatively little impact as we have our reserve generator. Of course, the restaurant struggled at times with i.e. payments’’ When asked about the impact in terms of tourist numbers, all the board members and ground staff echoed that tourist numbers are not affected, as visitors who come are aware of the fact that it is nature reserve and not a tourist trap.

4. Action taken for energy sustainability at Stora Karlsö
The nature based island destination is equipped with solar panels which are used for water heating and to power the heating element. Dan Widegren expressed that more panels can be installed however this may not be permissible by the county administrative board (länsstyrelsen). The back-up generators kicks-in as the power goes out. Clara Kjällman and other board members expressed these backs up lead to smooth operation.
C) DMO Perspective on Stora Karlsö:

Monica Frisk from Gotlands Besöksnäring, the local DMO opined about the dependence of Stora Karlsö on Gotland for water and electricity, stating that as long as the current system works, then it is hope it will continue to work, i.e., sustainable. She thinks that it would be interesting to understand if the state funds that Gotland receives, will be allocated towards sustainability of Stora Karlsö as a ‘destination within a destination’. Monica Frisk affirmed that since there is a degree of dependence of Stora Karlsö on Gotland for water and electricity, should the situation become worse for these two wicked problems on Gotland it may have trickle effect on Stora Karlsö. The new tourism strategy implementation is due to start in the Fall-2019, sustainability is the main goal. She thinks that the representatives from Stora Karlsö must bring the problems forward for discussion in order for solutions to be reached collectively.

She also stated that for cruise tourism, the fresh water supply to cruises is stopped as a consequences. She thinks that the lack of communication between tourism sector and the municipality is a central problem. There are tourism players which are not local entrepreneurs, with no they come here during the peak season, maximum 7 weeks they are present here actively and then they leave. This seems to be a big loophole in system here as many of these enterprise consume local resources like electricity and water and do not necessarily consider themselves as a part of the problem, says Monica Frisk.

When asked if Stora Karlsö is part of the natural heritage conservation plan so they could receive federal funds or conservation funds if any provided by the state, she said Stora Karlsö is not. However, she added that Gotland tourism products includes Stora Karlsö as one of the iconic places to visit along with Lilla Karlsö and places like Fårö and Gotska Sandön.
D) Tourist Reviews on TripAdvisor

Due to advancement in information and communication technology (ICT) and social media boom a significant amount of information can be found regarding travel behaviour, tourist experience which creates possibilities to improve tourism product and services with the aid of these data driven decisions (Van der Zee, et al. 2018). Therefore, the current study attempted to extend the qualitative findings by looking at the user generated data on TripAdvisor to get a well-rounded perspective on the lenses chosen for this study.

TripAdvisor contained 42 reviews of the destination that is Stora Karlsö itself the website also contained another 20 reviews for Stora Karlsö Restaurant.

**Table 1: TripAdvisor reviews and ratings for Stora Karlsö and its restaurant**

<table>
<thead>
<tr>
<th>Location/Establishment</th>
<th>Total reviews</th>
<th>TripAdvisor rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stora Karlso</td>
<td>42</td>
<td>Excellent - 35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Very Good- 7</td>
</tr>
<tr>
<td>Stora Karlsö Restaurant</td>
<td>20</td>
<td>Excellent - 8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Very good - 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Average - 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Poor - 1</td>
</tr>
</tbody>
</table>

Both reviews were studied to look for comments that conveyed any experience about water and electricity outages. The negative reviews for the restaurants were largely for the food served on the island which is not the chosen lens for this study. None of the comments had any mention of the water and/or electricity problems. Majority of the response from the guests seemed positive, it may be safe to assume that the actions taken by the tour operations prevents any negative experiences to occur due to the problems which are under study. Björn Cedergren also mentioned some tourist ask how the electricity and water is made available to the ground staff and no other comment he has read or heard regarding the water shortage and power outages on the island. Anne Mehlin, when asked about the guestbook entries and she affirmed no record of any guest entry pointed at the water or electricity problem.
Personal empirical observation as an overnight visitor on two occasions in June 2015 and May-2017 also revealed, no serious impact of water shortage or power outage felt as a tourist.

E) Stora Karlsö in numbers

According to the interviews conducted with the Board members of the Karlsö club and the ground supervisor it revealed the following:

Anne Mehlin, the CEO of Karlsö Club shared the following number, 300 visitors per day and around 4000 overnight visitors per month. July has the highest occupancy around 90%. Upon further conversation with her, a surprising fact emerged which resulted in a deviation from the original plan of to check for statistical correlation. She informed that when there are extreme windy days, the vessel M/F Stora Karlsö that brings tourist to the island and that has more serious impact on tourist numbers. She said in such situations, the tourists who are on the island are forced to stay on the island and the incoming tourists cannot make it to the island. Weather is unpredictable and such situations have bigger impacts, upon asking further, she also confirmed that visitors stuck on the island are not charged for the stay and the booked customers are given the option to rebook. The extraneous variable which was not considered in the scope of this study.

Dan Widegren, Secretary of the Board member of the Karlsö Club mentioned the island welcomes around 10,000 visitors per year and thinks there is possibility of scale up to 12,000 visitors per year with the current abilities and 5000 overnight visitors. Stora Karlsö can house 65-75 visitors overnight and on average overnight stays are 1.3 - 1.4 guest nights, says Björn Cedergren Vice-chairman of the board. He also added they would like keep the numbers around 11,000 visitors per tourist season (May- September) in a calendar year. He added, “We do not work to maximize the number or visitors or increase the comforts in terms of electricity and water from the current levels. Rather, we aim to work with what we have and put sustainability and minimal output in focus to create a genuine experience and live as we preach. First and foremost, we are representing a nature reserve, where nature should come first”
Table 2: Yearly comparison total visitors (Source: This data was provided by Anne Mehlin, CEO Karlsö Club after the interview)

<table>
<thead>
<tr>
<th>Year</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>2006</td>
<td>1485</td>
<td>2404</td>
<td>3762</td>
<td>1991</td>
<td>172</td>
<td>9814</td>
</tr>
<tr>
<td>2007</td>
<td>1952</td>
<td>2416</td>
<td>3044</td>
<td>2153</td>
<td>170</td>
<td>9735</td>
</tr>
<tr>
<td>2008</td>
<td>1789</td>
<td>2355</td>
<td>4557</td>
<td>1585</td>
<td>132</td>
<td>10418</td>
</tr>
<tr>
<td>2009</td>
<td>1735</td>
<td>2408</td>
<td>3655</td>
<td>2160</td>
<td>93</td>
<td>10051</td>
</tr>
<tr>
<td>2010</td>
<td>1320</td>
<td>2353</td>
<td>3621</td>
<td>2077</td>
<td>159</td>
<td>9530</td>
</tr>
<tr>
<td>2011</td>
<td>1151</td>
<td>2793</td>
<td>3665</td>
<td>1945</td>
<td>127</td>
<td>9681</td>
</tr>
<tr>
<td>2012</td>
<td>1276</td>
<td>2473</td>
<td>3699</td>
<td>2288</td>
<td>142</td>
<td>9878</td>
</tr>
<tr>
<td>2013</td>
<td>1209</td>
<td>2707</td>
<td>3685</td>
<td>2302</td>
<td>36</td>
<td>9939</td>
</tr>
<tr>
<td>2014</td>
<td>1302</td>
<td>2330</td>
<td>4116</td>
<td>2188</td>
<td>112</td>
<td>10048</td>
</tr>
<tr>
<td>2015</td>
<td>1226</td>
<td>2630</td>
<td>3641</td>
<td>2592</td>
<td>83</td>
<td>10172</td>
</tr>
<tr>
<td>Mean for 10 years</td>
<td>1444.5</td>
<td>2486.9</td>
<td>3744.5</td>
<td>2128.1</td>
<td>122.6</td>
<td>9926.6</td>
</tr>
<tr>
<td>2016</td>
<td>1862</td>
<td>2610</td>
<td>4108</td>
<td>2267</td>
<td>252</td>
<td>11099</td>
</tr>
<tr>
<td>2017</td>
<td>1457</td>
<td>2574</td>
<td>4255</td>
<td>2304</td>
<td>169</td>
<td>10759</td>
</tr>
<tr>
<td>2018</td>
<td>1325</td>
<td>2343</td>
<td>3851</td>
<td>2387</td>
<td>170</td>
<td>10076</td>
</tr>
</tbody>
</table>
Fig. 5. Graph representing yearly comparison of total visitors (Day + Overnight) per tourist season (2006-18)
Table 3: Yearly Comparison of overnight visitors on Stora Karlsö for the last 10 years (2009-18)
(Source: This data was provided by Anne Mehlin, CEO Karlsö Club after the interview)

<table>
<thead>
<tr>
<th>Year</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>Sept</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>544</td>
<td>817</td>
<td>1200</td>
<td>693</td>
<td>58</td>
<td>3,312</td>
</tr>
<tr>
<td>2010</td>
<td>586</td>
<td>807</td>
<td>1209</td>
<td>634</td>
<td>113</td>
<td>3,349</td>
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<tr>
<td>2011</td>
<td>477</td>
<td>991</td>
<td>1582</td>
<td>629</td>
<td>198</td>
<td>3,877</td>
</tr>
<tr>
<td>2012</td>
<td>496</td>
<td>931</td>
<td>1316</td>
<td>849</td>
<td>23</td>
<td>3,615</td>
</tr>
<tr>
<td>2013</td>
<td>539</td>
<td>955</td>
<td>1419</td>
<td>949</td>
<td>36</td>
<td>3,898</td>
</tr>
<tr>
<td>2014</td>
<td>497</td>
<td>921</td>
<td>1352</td>
<td>787</td>
<td>147</td>
<td>3,704</td>
</tr>
<tr>
<td>2015</td>
<td>639</td>
<td>968</td>
<td>1371</td>
<td>890</td>
<td>189</td>
<td>4,057</td>
</tr>
<tr>
<td>2016</td>
<td>635</td>
<td>1073</td>
<td>1643</td>
<td>881</td>
<td>269</td>
<td>4,501</td>
</tr>
<tr>
<td>2017</td>
<td>692</td>
<td>1072</td>
<td>1539</td>
<td>886</td>
<td>292</td>
<td>4,481</td>
</tr>
<tr>
<td>2018</td>
<td>571</td>
<td>881</td>
<td>1257</td>
<td>815</td>
<td>171</td>
<td>3,695</td>
</tr>
</tbody>
</table>
3.1. Data Analysis

During analysis, I became aware of a major extraneous variable that was likely to impact my analysis of visitor data. The interview with the CEO, revealed that winds play a higher role in influencing the visitor numbers, as she mentioned during extremely windy weather conditions the boat transporting tourists to and fro is not functional. She added that this disruption affects tourist number for that season. This fact influenced me to take a detour from the proposed methodology to study correlation between the variables under study.

Upon having a closer look at the data revealed that the average visitor numbers (overnight + day) was approximately 9926 visitors for the decade (2006-2015) and since 2016-2018 the tourist numbers have been consistently more than 10000 visitors. The notices for water shortage that were found online dated back to 2015 also the Sverige radio reported the Power outage issue dating back to 2015, the tourist numbers still showed an increasing trend. The interview data also revealed that there were 10-15 instances of power cuts in 2018 tourist season and the interviewees did express that it resulted in temporary disruption however it would be unfair to pin the decline on to the two problems under study. There could be other extraneous variables which could influence the tourist numbers. As highlighted in the original research a spurious relationship may occur, therefore a further investigation of the problems identified for study is needed.
4. Evaluation and Further Research:

There were several missed opportunities which could have added value and strong sense of direction. Since, a contact with Municipality and County Government (Länsstyrelsen) was not established an important perspective was missing from this study. The involvement and interest of the governing body in supporting an important nature reserve would have shed more light on the issue. The interview revealed the electricity vendor for Stora Karlsö is Sjöfartsverket contrary to my belief it would be GEAB. An interview with Sjöfartsverket would have provided more clarity on the Power supply structure and they would have verified the information that was received from interviews that electricity consumed in Stora Karlsö originates from a renewable source. The quantitative data for the number of water shortage and power cut incidence over the last 10 years proved difficult to obtain. Contact with the water supply department of Region Gotland and Sjöfartsverket could have provided the respective data which would have added value and necessary depth to the study.

5. Conclusion

After carefully examining the multiple stakeholder perspectives, evidence from TripAdvisor and reviewing the tourist numbers since 2006-2018, currently the two problem under study cannot be conclusively linked to pose impact on tourism sustainability. In an advance country like Sweden, the water pumping is powered by electricity and therefore the two variables under study can also be considered mutually related. Therefore, the two issues cannot be taken lightly.

All the stakeholder interviews provided insightful information about the steps they are taking to ensure that they stay within sustainable limits of consumption and Board members like Dan Widegren expressed that water is over-consumed on Gotland, the likelihood of such shortage to increase is higher with climate change. All the board members collectively expressed that tourism operations at Stora Karlsö is not run with the intention for profit making and Björn Cedgren also suggested that they keep in the numbers in check to provide a quality experience and let people enjoy the nature. They have technocentric solutions to the problem of energy and water sustainability in place. The board members also expressed concern that the cable that provides electricity for the lighthouse and tourist infrastructure is quite old and any damage to that cable
can pose a strong risk as Karlsö Club alone do not have the financial capacity for repairs unless Sjöfartsverket sees the interest of keeping the lighthouse going. Björn Cedergren, the vice chairman is optimistic that in such scenarios he believes the tourism product they offer can be adapted on the basis of existing systems in place to keep it running.

And as per Monica Fisk, the region has ambitions to scale up tourism by 30% in the coming years to increase economic gains from the tourist season, therefore the two problems become incredibly relevant for study for the future of tourism sustainability for the whole Region including Stora Karlsö. Technocentric solutions like desalination plants where fresh water is obtained from seawater through the removal of salt and other minerals using technical processes to make it suitable for human and industrial use are considered. In combination with a search for further groundwater sources it is expected to contribute to the economic feasibility of providing the citizens with water. On Gotland three plants are planned, and one has already been built (Region Gotland, 2017).

To cope up with these problems in the future, the numbers of tourists must be carefully considered for the whole Gotland island to provide them with quality experience suggested Karlsö club board members. Also, a sustainable perspective need to be adopted else problem related to water availability and electricity disruption will prevail on the island thus hampering the tourism and overall revenue to the island by tourism.

The current research also revealed that the two problems studied brought deeper understanding on the degree of dependence of tourism on water and electricity. Contemporary tourism products which includes operation boarding, lodging, and dining operations rely heavily on use of technology which brings comforts for tourists. The nature based destination of Stora Karlsö promises to be different from these conventional tourist destinations. The carrying capacity of the destination and eco-centric operating principle are carefully considered by Karlsö Club. The solutions and measures taken by the tourism managers on Stora Karlsö are in the positive direction to genuinely be self-sufficient and the board members seemed enthusiastic about the tourism product they offer currently. However, as pointed out in the introduction that tourism does not operate as a closed system, it has inputs and outputs for which it relies on other industries and players. Even though Stora Karlsö is a small nature based island destination with a small-scale
operation, collaboration and involvement with other tourist operation on Gotland can help bring more sustainable solutions to many ‘wicked problems’ that the island faces as whole.
Bibliography


Harvard University Sociology


Appendix

1. Sample Interview Questions

The list below is indicative and not exhaustive list of questions that was asked to the participants. The questions were appropriately modified or asked differently to different stakeholders to gain meaningful information relevant for this study. For e.g. the problem of water shortage will not be asked to GEAB representative and vice versa. The question attempts to seek detailed responses from the interviewees. Appropriate nudges will be applied when response is inadequate like – Could you please elaborate? Or Could tell us more? whenever necessary.

1. Could you please explain how water and electricity is supplied on Stora Karlsö? (Direct question to understand the supply structure of the resources under study)
2. Could you describe ways in which you monitor and measure water and electricity consumption on Stora Karlsö? (Direct Question from GSTC criteria)
3. Have you received notices about shortage of water supply and to save water here in Stora Karlsö? (Relevant question to leading into the topic to be asked to Tourism manager and employees of Stora Karlsö. The same question will be modified when interviewing the Region – Are notices regarding water shortage on Gotland sent to Stora Karlsö during summer months when they receive tourists?)
4. How are these notices (if received) actioned or brought to work for ensuring water sustainability on the island (Stora Karlsö)? (Question inspired from GSTC criteria and general water conservation measures)
5. How serious do you think the problem of water scarcity and electricity power outage is for Gotland especially during summer tourist peak season? (Gives us some idea of perception and knowledge of the issue of the interviewee)
6. Does water scarcity and power outage in Region Gotland affects the functioning of tourism in Stora Karlsö? (Interviewees awareness of the problem)
7. Can you list some impacts (if any) of water shortage and electricity outage on Stora Karlsö? (Follow-up and direct question leading into implication of the issue under study)
8. Are there any economic or business impacts due to the two problems in Stora Karlsö? (Follow-up question to understand economic sustenance)

9. Have you experienced a decline in tourist numbers due to the two problems that the region is facing since last few years? (Follow-up on the previous lead)

10. How do you prepare for such impacts to avoid affecting tourism experiences? If so, how? (follow-up question to elaborate the lead on the previous question)

11. Have you had any tourist(s) that brought up the issue(s) to your notice? What were their comments? (follow up question to understand tourist accounts)

12. Do you think in the long run, in the wake of climate change, dry summer spell and overwhelming tourist numbers will the problem of water scarcity and electricity outages increase? (follow-up question to elaborate the lead on the previous question).

13. Any final thoughts, suggestion or message that you would like to give by the means of this interview to the larger audience who might benefit from your perspective. (Closure question to make the interviewee feel valued, empowered and appreciated for the inputs provided for the course of this qualitative study)

2. Participants interviewed for the study

<table>
<thead>
<tr>
<th>Name of the Interviewees</th>
<th>Position/Connection with study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr. Dan Widegren</td>
<td>Board Member of Karlsö Club, Secretary of the board.</td>
</tr>
<tr>
<td>Ms. Anne Mehlin</td>
<td>CEO and Managing Director Karlsö Club</td>
</tr>
<tr>
<td>Mr. Björn Cedergren</td>
<td>Vice Chairman of Karlsö Club</td>
</tr>
<tr>
<td>Ms. Clara Kjällman</td>
<td>On Ground Operation Supervisor at Stora Karlsö</td>
</tr>
<tr>
<td>Ms. Monica Frisk</td>
<td>Destination Management Organization (DMO)- Gotlands Besöksnäring</td>
</tr>
</tbody>
</table>