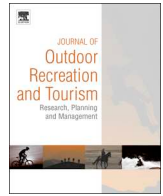




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## Accessibility of protected areas and visitor behaviour: A case study from Iceland



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## ABSTRACT

In countries facing rapid growth in nature-based tourism, increasing use of protected areas for recreational purposes creates a demand for improved infrastructure and accessibility. However, increased infrastructure, such as road improvements, is likely to alter the natural environment and visitors' experience, and may ultimately change the type of tourism which operates in given areas. This study aims to assess how the accessibility of protected areas affects visitor perceptions, satisfaction, preferences, and subsequently visitor behaviour. Furthermore, it aims to compare perceived environmental impacts of visitors at sites with different levels of accessibility. To this end, an on-site visitor survey was conducted at five sites within protected areas in Iceland, each with different level of accessibility. The Purism Scale model was applied to categorize visitors based on their preferences. The results show that the majority of visitors at all five study sites fall into one of two categories – neutralists and urbanists – implying that the type of tourism operated in Iceland is changing as a result of continuous tourism development, and that improved accessibility to previously remote nature destinations accelerates these changes. Improved accessibility thus facilitates the use of protected areas, which leads to a higher level of perceived crowding. Tourists tend to spend less time in easily accessible areas and rarely choose such areas as the venue for an overnight stay. Moreover, improved accessibility increases the demand for the development of further infrastructure needed to cope with the environmental pressure from tourism. The processes relating to improved accessibility observed in this study emphasize the importance of preserving particular nature destinations in an undeveloped state in order to provide a wide range of recreational opportunities for local people as well as for foreign visitors.

*Management implications:* Accessibility of a natural area is an important factor affecting tourism development and a critical management tool to control the area's future state. The following management implications are drawn from this study:

- Accessibility is one of the most critical variables in the planning of tourism development in nature destinations.
- Improved accessibility to protected areas will increase the demand for further infrastructure development to meet the needs of a higher number of tourists visiting the area and to cope with their environmental pressure.
- Improved accessibility leads to changes in visitor behaviour and subsequently the type of tourism operated in protected natural areas.
- It is fundamental for planners and decision makers to recognize these processes in order to ensure the most sustainable and environmentally sound tourism development.
- Accessibility improvements to protected natural areas should be planned in line with the goals of nature conservation and tourism development.

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## 1. Introduction

The growing interest in nature-based tourism is attracting an increasing number of visitors to many of the world's protected areas (PAs) (Buckley, 2003). While higher visitor numbers are likely to strengthen the economic sustainability of the communities adjacent to PAs, they also lead to increasing environmental pressure. Many researchers (e.g. Leung & Marion, 2000; Manning, Anderson, & Pettengill, 2017; Rankin, Ballantyne, & Pickering, 2015; Tolvanen & Kangas, 2016) consider tourism and recreational activities to be among the primary threats to the biodiversity of protected areas worldwide, given that they have the potential to negatively impact all elements of an ecosystem: soil, water, vegetation and wildlife. Juutinen et al. (2011) point out that the increase in visitor numbers is especially notable in national parks, where high visitation and the resultant environmental impacts make combining recreation with biodiversity conservation a challenging task. It has also been shown (i.e. Cságoly, Sæþórsdóttir, & Ólafsdóttir, 2017; Hall, 2006; Havlick, 2002) that increasing use of protected areas for recreational purposes creates a demand for improved accessibility to these areas. Road improvements not only have significant ecological effects on the neighbouring environment (e.g. Coffin, 2007; Trombulak & Frissell, 2000), they also accelerate further growth in visitor numbers in PAs given that, according to a range of studies (e.g. Balmford et al., 2015; Larsen & Guiver, 2013), the journey time required to reach the area in question is a more decisive factor for visitors when choosing a destination than actual physical distance.

By facilitating higher use of PAs, improved accessibility often leads to an increased demand for further infrastructure development, which in turn changes the appearance of natural areas to more anthropogenic landscapes (Ólafsdóttir & Haraldsson, 2015, 2018). These changes have the potential to alter the composition of visitors to PAs by displacing those visitors who are more sensitive to human modifications and attracting tourists who not only accept, but in fact prefer the presence of a higher amount of infrastructure in protected areas (Cole & Hall, 2008). Accordingly, in order to ensure sustainable development of PAs, road and other infrastructure development must be carefully planned and executed in accordance with these areas' management objectives.

Visitor numbers in PAs seem to be rising especially rapidly in countries experiencing growing numbers of international arrivals (Balmford et al., 2009), such as Iceland. During the past decade two events, more than any other, placed a spotlight on Iceland: the Icelandic financial crisis of 2008 and the Eyjafjallajökull volcanic eruption in 2010, which were followed by an intensive and successful marketing campaign (Gil-Alana & Huijbens, 2018; Promote Iceland, n.d.). Since 2010 the average annual growth in international arrivals to Iceland has risen to approximately 24% (Icelandic Tourist Board, 2018). Iceland's chief attraction is its unique nature (Icelandic Tourist Board, 2017; Ólafsdóttir & Runnström, 2011), and as such the majority of tourists coming to Iceland come to visit protected natural areas and other nature destinations. In response to the rapid growth in nature-based tourism in Iceland, a large number of roads to remote nature destinations are currently being improved (Cságoly et al., 2017). This necessitates an investigation of how the accessibility of PAs affects visitor composition and the impacts visitors have on the areas' natural environment. Such information is of crucial importance for effective planning of tourism development in PAs because it helps predict and manage the changes that result from accessibility improvements and facilitates decision-making with respect to further road development to protected areas.

This study aims to investigate the effects of accessibility on visitor composition in protected natural areas in terms of visitor preferences, perceptions and behaviour by conducting an on-site visitor survey at five nature destinations located within protected areas in Iceland. Furthermore, it aims to conduct a comparative analysis of perceived environmental impacts of visitors at sites with varying levels of accessibility. In the context of this study, 'accessibility' encompasses road

design and quality, distance from the main tourist routes, and time needed to reach the area.

## 2. Roads and natural areas

Construction of roads to previously remote natural areas starts a chain of complex processes that often are impossible to reverse. Roads have various direct and indirect ecological effects on the surrounding environment, with a spatial extent of up to several kilometres (Ibsch et al., 2016; Seiler, 2001). The range of these effects and the size of the affected habitat vary depending on specific factors such as road category and traffic volume, together with other factors including topography, hydrology, slope, vegetation, and the sensitivity of individual species to the disturbances (Seiler, 2001). Roads affect the physical environment of neighbouring areas by altering soil density, surface temperature, amount of light, moisture content, water routing, stream sedimentation, and by spreading dust, which covers the surfaces of plants and negatively affects their growth processes (Trombulak & Frissell, 2000). Moreover, by covering the surfaces of plants, dust facilitates the absorption of chemical pollutants into the tissues of these plants. The range of chemical pollutants introduced into the environment via roads is broad and includes road salt, heavy metals, trace metals, dioxins, and polycyclic aromatic hydrocarbons, all of which have the potential to permeate organisms and affect their growth, reproduction and survival (Coffin, 2007; Seiler, 2001).

While roads can increase the abundance of more generalist species by providing habitat and food resources, and by facilitating the migration of exotic and even invasive species (Andrews, 1990; Coffin, 2007; Newsome, Moore, & Dowling, 2012; Von der Lippe & Kowarik, 2007), Fahrig and Rytwinski (2009) stress that the majority of species experience negative effects. As such, road mortality is a major threat to endangered species, since it can significantly reduce population size (Forman & Alexander, 1998; Jackson & Fahrig, 2011). Many researchers (Barber, Crooks, & Fristrup, 2010; Jaeger et al., 2005; Leblond, Dussault, & Ouellet, 2013) furthermore point out that the altered microclimate and noise, light, and air pollution result in species avoiding the vicinity of roads. Due to avoidance, road mortality, and physical hindrances, roads act as barriers limiting the movement and dispersal of organisms (Newsome et al., 2012; Seiler, 2001). Isolation of species populations due to this barrier effect leads to reduction of gene flow and loss of genetic diversity, which, according to some researchers (Holderegger & Di Giulio, 2010; Jackson & Fahrig, 2011), might negatively affect the population fitness.

Numerous researchers (e.g. Coffin, 2007; Seiler, 2001; Trombulak & Frissell, 2000) emphasize that road networks increase habitat fragmentation not only by limiting species' movement, but also by facilitating human access to previously undisturbed areas, enabling human use of local resources and frequently leading to further infrastructure development. This is supported by Manning (1999), who stresses that increasing use of nature destinations for recreation leads to higher demands for tourism infrastructure within natural areas in order to keep visitor satisfaction high by providing services and by lowering perceived crowding. Moreover, appropriate infrastructure plays a crucial role in minimizing negative environmental impacts of tourism (Mason, 2008). By manipulating tourism infrastructure, managers of natural areas can effectively manage visitor flows and thereby reduce the pressure on more sensitive environments. Well-designed and managed roads prevent off-road driving. Likewise, clearly marked trails, barriers and signs help keep visitors on trails and minimize negative impacts of trampling on the surrounding environment; trail outcropping and bridges help reduce soil erosion and ensure visitor safety; raised walkways help protect sensitive vegetation and water-saturated soil; toilets allow appropriate treatment of human waste; and visitor centres provide education and raise visitors' environmental awareness, thereby influencing their environmental behaviour (Hammit, Cole, & Monz, 2015; Kim, Airey, & Szivas, 2011; Marion & Leung, 2004). However, it is important

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