

## Iceland as a geotourism learning destination

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### ABSTRACT

Iceland is a country where geotourists can find an amazing scale of volcanism shaped landscapes, beautiful geomorphological features and often also volcanic activity. Iceland is situated on the contact of the North American and European tectonic plate. As these two rift apart by 25mm each year, there are areas, where the surface subsides, creating long, picturesque faults. From tourism point of view – as the 103 000 m<sup>2</sup> of land is inhabited by only 319,500 inhabitants, the extent of land without human presence is considerable. The fauna is rich in birds, fish and domesticated mammals like sheep and horse. Thus the country is ideal for geotourists - trekkers, mountaineers, organic climbers, nature lovers, birdwatchers and tourists that enjoy the geothermal springs and hot pots that have also balneological importance. The paper gives an overview on the tourism of Iceland, with special reference to geotourism as well as a short illustrated review of the geotourist attractions.

**Keywords:** Iceland, geotourism

### INTRODUCTION

Iceland is a country that does not need an introduction to tourists. Its unique position at the contact of the North Atlantic and European tectonic plate, its wealth of volcanic features, picturesque geomorphological features, enchanting rivers, waterfalls, lakes, hot springs, pools and rivers combined with characteristic flora attracts about 500 000 visitors every year (cf Dowling 2010). Tab.1. gives the changes in tourist numbers from 1980. Thus the yearly numbers of visitors now outnumber the number of inhabitants. The number of tourists is peaking in May-August, but it is only November and December, when their number is significantly decreasing (<http://www.statice.is/>). The tourist season usually ends in the beginning of September. The majority of tourists enter Iceland by air (Keflavik or Akureyri airports) and there is a specialised low cost air transport company – the Iceland Express that offers direct

flights to Iceland from various European cities (including e.g. Kraków) and the USA.

**Tab. 1** Number of tourists arriving to Iceland between 1980 and 2010. The differences stem from differences in method of counting (e.g. inclusion of visitors in transit).

Year	No. of incoming tourists	No. of incoming tourists according to WTO data
1980	65 900	-
1990	141 700	-
1995	178 000	-
2000	302 900	634 000
2002	277 900	705 000
2004	348 500	836 000
2006	398 600	971 000
2007	458 800	1 058 000
2008	472 500	1 106 000
2009	566 000	1 280 000
2010	n.a.	1 213 000

**Source:** <http://www.statice.is/>, <http://www.travelvideo.tv/news/iceland/01-28-2010/record-number-of-foreign-tourists-in-iceland-2009> and <http://data.un.org/DocumentData.aspx?id=261>

Tourists in Iceland have a wide choice of tourist agencies offering one or more day trips that are fully or partly (because they are adventure oriented and highly experiential, not so much knowledge, aesthetics or solitude oriented) of geotourist character. One of the favourite trip type are "Adventure day trips" (see Arctic adventures 2010). Tab. 2 shows the range of guided tours offered by thins company. The tours marked by \* can be considered as geotourist ones. One can see, that the offer is concentrated around events that in the majority of cases involve enjoyment of nature and of geologic phenomena (cf Dowling 2008). For winter there is another set of trips (<http://www.adventures.is/WinterTours/>). Another company – IcelandRovers (<http://www.icelandrovers.is/>) is offering 4x4 Rover tours across geotourist sites. These are less ecologically favourable tours due to the impact of the large off road vehicles on the environment. Mountain guiding specialists have their own organization - see <http://www.mountainguides.is/>. This company provides "Glacier walks" that may include also ice climbing. The guides are well trained, but the tourist has to take personal health and safety as his/her responsibility. There are also long tours (typically 3-14 days), but the range of attractions is similar. Thus we will deal with the tour types given in Tab. 2.

From Tab. 2 we can see that the majority of tours centre around hiking, ice treks, diving and rafting/kayaking. The offered activities are predominantly in the southern part of Iceland (Lake Þingvallavatn, Hvítá river, Langjökull glacier, Mýrdalsjökull glacier, Skaftafell part of Vatnajökull). The Icelandic Mountain Guides offer ice bound programmes at Myrdarsjökull, Sólheimajökull, Skaftafell and Svínafells-jökull glacier). A number of activities occur in protected areas.

## THE NATURE OF ICELAND AS GEOTOURIST ATTRACTION

In some regions of Iceland, geotourism is linked to sustainable forms of tourism (Hull, 2010) and the high proportion of landscape untouched by humans offers the geotourist a highly aesthetic experience (Pralong 2006, Dowling 2008). Within the range of possible choices, a qualified tourist may also undertake unguided tours, but he has to take the responsibility for his safety and health into his own hands. In Iceland there are unstaffed huts and emergency huts (Fig.1) to aid tourist in need. There are reliable maps, GPS and mobile phone signals are available at most of the island to feel on the safe side. Nevertheless, the experience given by solitary exploration of the solitary mountains, highland or glaciers is truly special.

The overall description of the volcano and geothermal related tourism possibilities is given by Dowling (2010). Iceland has four national parks: Þingvellir, Snæfellsjökull, Jökulsárgljúfur and Skaftafell. In the following, examples of various typical landscape features will be given. The southern shore is known as the "black sand" area (Fig. 2). The southern seashore is often covered with lava fields (see Fig. 25). The coastal area is sometimes composed of ignimbrites. Sea stacks are found in many places (Fig. 3). On the North, basalt dykes are frequent near the shore. Whale watching offers also an excellent possibility to view the beautiful shore morphology even if no whale shows up. In the SW area of Iceland is the world famous Blue Lagoon area (Fig. 4).

In most of the area of Iceland hot pots (small pools with geothermal water) are a genuine attraction. They may be natural or artificial (many times next to a hotel or swimming pool). In the snow-covered Askja area there is a caldera called Viti, which features a warm water lake (Fig. 5)

**Tab. 2** Some of the “Adventure day trips” offered between 1<sup>st</sup> May and 11<sup>th</sup> September by Arctic Adventures company (\* mark the geotourist type tours). **Source:** <http://www.adventures.is/>

Brand name	Contents	Price (ISK)	Note
Blue ice	Glacier hiking and ice climbing at Sólheimajökull	15990-19890	*
Black and blue	Snorking in Sifra fissure and lava caving in Þingvellir National Park (6h)	17990	*
Golden Grand Slam	Combined tour consisting of sightseeing and activity (rafting on the Hvítá river, sauna, hot-pot)	17990	*
Golden Glacier Ride	Combined tour consisting of trip to Geysir, the Gullfoss waterfall, Þingvellir National park and snow scooter adventure.	17990	*
River Fun	Rafting on river Hvítá	7990-10990	
Into the Blue	Snorking in Sifra fissure and lava caving in Þingvellir National Park (2h)	9900-12990	*
Fjord Serenity	Sea kayaking on Hvalfjörður fjord	1990-14990	*
Mountain Ride	ATV (Quad bike) tour on the Hellisheidi plateau	9900-14990	
Glacier Ride	Gulforr waterfall, snowmobile ride on Langjökull glacier	19900-27990	*
Super Jeep Self Drive A	Self drive through the “Golden Circle”. This includes Geysir, Gullfoss waterfall, Þingvellir National Park and white water rafting on Hvítá river.	39990	
Super Jeep Self Drive B	South shore black sand beaches and glacier hiking. This includes visit to Skógafoss, Seljafandsfoss, the South shore black sand beaches and glacier hiking on Sólheimajökull.	41990	*
Beast for the East	Rafting on the Austari-Jökulsá Glacier river	22990-49990	*
Full Throttle	ATV and river rafting on Hvítá river	19990-22490	
RiverRide	White water canoeing on the Hvítá river	9990-12990	
Vatnajökull Voyager	Hiking at the Virkisjökull Glacier and visit of the Jökulsárlón glacier lagoon on Breidamerkursandur.	29990	*
Rafting and riding	Horse riding and a horse ranch in Vellir. Rafting at river Hvítá.	17990	
Hot spring hunt	Visiting hot-pots in the valley of Reykyadalur	12990	*
Deep into the Blue	Scuba diving in the Sifra ravine at Þingvellir	29990	*

and where below the approximately 200m m of silt, the bottom is too hot even to touch. The lakes are of different types and shapes.

There is a number of proglacial lakes (Fig. 6) associated with every glacier. Except for some areas of the highlands, rivers and rivulets are almost ever-present. They may be calm or forceful, adorned with waterfalls (Fig. 7) or flowing within romantic gorges. They may be hot (Fig. 8) or cold. Iceland is the home of impressive waterfalls. Some are already tourist

attractions (Fig. 9) or hidden in deep canyons outside tourist locations (Fig. 10). Glaciers, although the climatic changes took toll on their size, are both awesome to look at and an area for intensive trekking. In the foreground the glacier is often mixed with mafic rock particles and thus it is dark. Wandering on glacier needs special skills and outfit, but is a remarkable geotourist activity. Fig. 11 shows the Vatnajökull glacier, Fig. 12 shows seracs (surging glaciers) on Vatnajökull.

Geologically, basalts are perhaps the most



**Fig. 1 – 8:** 1 - Emergency huts on the highlands (Photo: J.Urbančík), 2 - Black sand typical for the southern coast, 3 - Sea stacks near Vík (Photo: R. Klik), 4 - Silica mud on Blue Lagoon bathers (Photo J. Urbančík), 5 - Viti – a warm water lake surrounded by snow in the Askja area, 6 - A proglacial lake at the Vatnajökull glacier, 7 - Glacial river fed by the Hagavatn lake, 8 - Barnafoss. The waterfalls are formed by surfacing underground water

frequently seen rocks (cf Dowling 2010), even though rhyolitic and andesitic lavas are also present. Basalt columns form wonderful designs, like the ones shown in Fig. 13. Basalts are used also for artefacts – like tombstones (Fig. 14). Stone boulders were historically used for carving petroglyphs.

The rift zone became one of the marketing tools of Iceland tourism as the contact of the North American and Eurasian plate that surfaces in Iceland as is very picturesque (Fig. 15). The in-depth details of Iceland geodynamics is given in (Sigmundsson 2006). In the Pingvellir area, is the Almannagjá rift valley that separates the two continental plates. The impressive cracks can be followed both on the land and under the water. The rift zone is volcanically active and produces lava fields that are both nice and interesting from volcanological point of view. The lava in a recent lava field in the Krafla area may have a low viscosity (Fig. 16) or higher viscosity (Fig. 17). Rope-lava (Fig. 18) is frequently observable. Interesting tafoni formations could be seen at the rift zone situated in the Reykjanes area. The activity level of the now famous Eyjafjallajökull volcano in June 2010 is indicated in Fig. 19. In 2011 The Katla volcano under Mýrdalsjökull glacier became also active and further, strong volcanic activity is predicted for 2011/2012. Fig. 20 shows how the movement of volatile constituents in the cooling lava formed “wormholes”.

On a number of places all over Iceland there are areas with geothermic fields, fumarolas and solfataras. Fig. 21 shows a high temperature mud pot in the Krafla area, Fig. 22 shows fumarolas in the Mývatn area and Fig. 23 shows the Strokkur geyser, near the world famous Geysir (at present inactive).

Volcanic sediments are very attractive from the point of view of aesthetic appeal, and were also used as dwelling caves. The last inhabitant of Laugarvatnshellar cave shown on Fig. 24 was the Þorvaldsson family. Their home became disinhabited in

1922. Local legends say that this area is inhabited by Trolls.

## GEOTOURIST TOUR DESIGN

Geotourism in Iceland is not fully developed yet, but in cooperation with the University College in Holar, the Institute of Geotourism (BERG Faculty, Technical University, Kosice, Slovakia) is working on a joint 1 semester course devoted to this subject. Here students of tourism intending to be involved in geotourist activity management could acquire the necessary knowledge.

When designing an exploratory tour in Iceland, it is useful to become acquainted with geology. The geological map of Iceland (Náttúrufræðistofnun 2009) may be a starting point. For a geotourist, basic information could be obtained from Dowling (2008 and 2010). The book of Einarson (2006) and Gudmundsson (2007) gives more than enough information and inspiration for detailed trip design. If we look at Fig. 25, we can see the main features of bedrock geology of Iceland (Gudmundsson 2007) that help to make choices of locations, around which we can design our trip – depending on the number of days, we would like to spend on geotourism.

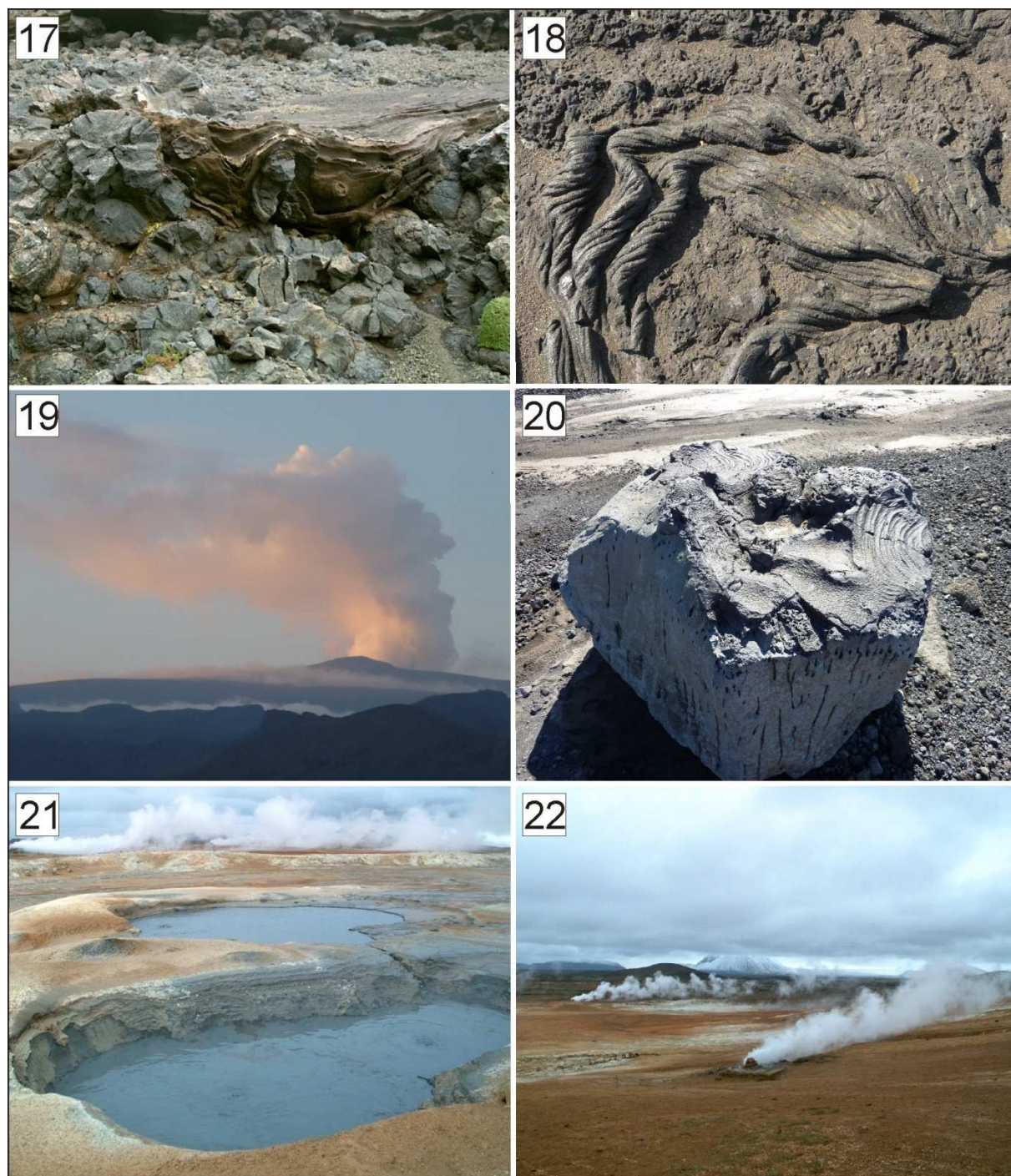
Moving around in Iceland is possible by *air* (there are local flights connecting cities, but there are also small landing sites for small pilot driven aeroplanes that one can hire), *road* (there is regular bus connection around Iceland and there are tourist buses, that can cope with very rough road conditions – see Fig. 26) or *water* (many ports are connected by regular ship cruises). For a geotourist, however, a hired car is a best solution. Depending on the type terrain one would like to drive through, one can use a smaller or bigger 4X4 car. For longer, comfortable snow tours, it is possible to hire snow scooters. Some of the roads are closed in winter and spring and reopen in mid June – depending on both the state of





**Fig. 9 – 16:** 9 - The Godafoss waterfall, 10 - The Skessufoss waterfall – the highest of the 3 waterfalls in the area, 11 - A view of the SE part of the Vatnajökull glacier. The bus shuttles tourists for glacier walking., 12 - Surging glaciers (seraks) at the Vatnajökull glacier, 13 - A basalt face showing two stages of deposition in the Seljavellir area, 14 - A basalt column used for tombstone, 15 - The rift as seen near Pingvellir, 16 - Recent lava field in the Krafla area





**Fig. 17 – 22:** 17 - Weathered lava near the Laugarvatnshella, 18 - Rope lava at the SW shore of Iceland, 19 - View of the Eyjafjallajökul volcano in June 2010 (Photo: R. Klik), 20 - A lava boulder showing “wormholes” formed by the rising volatile components during solidification, 21 - A high temperature mud pot in the Krafla area, 22 - Fumarolas in the Mývatn area

gravel roads, and the progress of vegetation and animal breeding. The real geotourist experience is, however tied to trekking on foot or by cross country skiing, even though the weather is very unstable and often presents a special challenge.

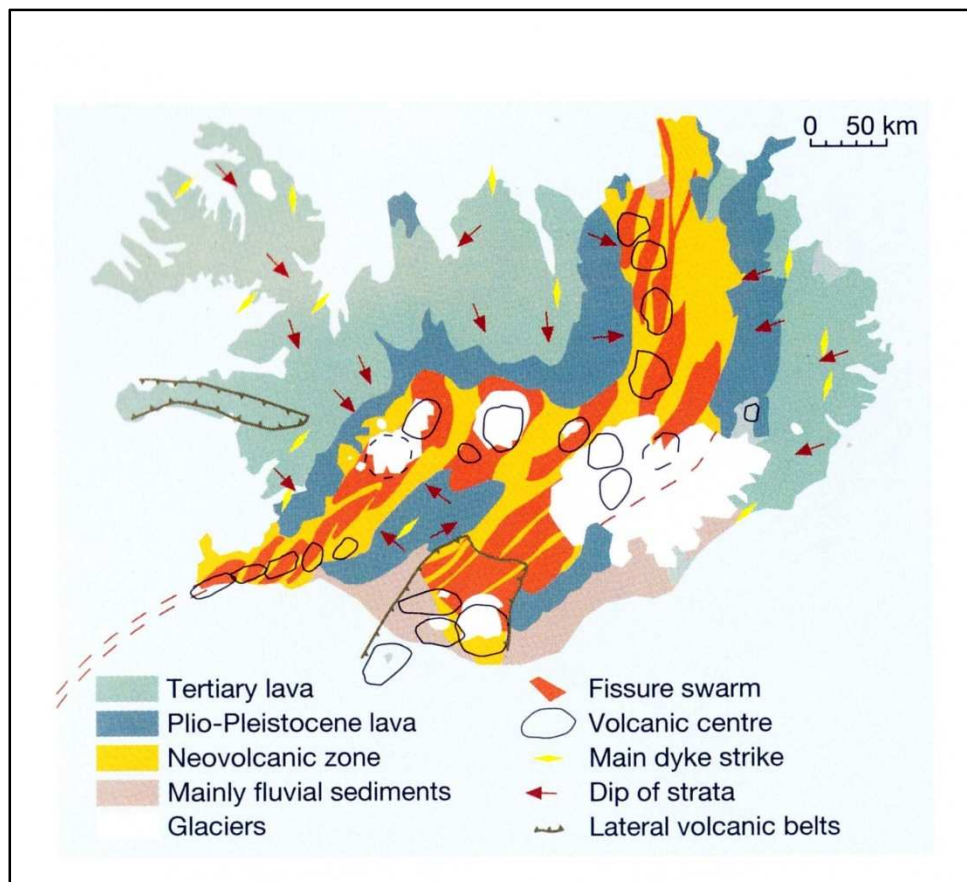
## CONCLUSIONS

Geotourism has a growing following among tourists visiting Iceland. Tourists visiting Iceland usually have as a goal adventure, soft tourism, education or seeker





**Fig. 23, 24, 26:** 23 - Geyser in the Icelandic Geysir area, 24 - The Laugarvatnshella cave that was inhabited up to 1922, 26 - Icelandic highlands. One can see what roads can be mastered by local tourist buses.



**Fig. 25** The main features of bedrock geology of Iceland (Gudmundsson 2007)



tourism (cf. Timcak 2011). The geological setup, the aesthetic values of the landscape and the special features of fauna and flora give an unending inspiration for discovery as well as reflexion. Past and present volcanic activity watching and geothermae related tourism could be the two dominant reasons for visiting Iceland. With a gently increasing number of active volcanoes, volcano watching may be increasingly popular. The conscious choice of the Icelandic policy makers to restrict road constructions and to keep the roads narrow and often covered only with gravel, limits the carrying capacity of roads. On the ecological risk side is the indiscriminate use of all terrain vehicles that can damage the landscape, vegetation and soil structure in areas of high ecological value and with long recovery time. In spite of the present economical pressure to increase the number of tourists – the limits of acceptable changes are to be assessed in order to avoid deterioration of the environment. Some move towards industrialization has already taxed the Icelandic image of country with pristine nature (e.g. Alcoa aluminium plant in Reyðarfjörður, Nordural aluminium plant in Helguvík, etc. - cf [www.savingiceland.org](http://www.savingiceland.org), [www.nordregio.se](http://www.nordregio.se)). These large industrial projects continue to evoke bitter discussions both at home and abroad and may influence some aspects of geotourism development.

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