

EUROPE / NORTH AMERICA

VATNAJÖKULL NATIONAL PARK - DYNAMIC NATURE OF FIRE AND ICE

ICELAND



Mt Snæfell, a 700,000-year-old glacier-capped stratovolcano © IUCN / Bastian Bertzky

WORLD HERITAGE NOMINATION – IUCN TECHNICAL EVALUATION

VATNAJÖKULL NATIONAL PARK: DYNAMIC NATURE OF FIRE AND ICE (ICELAND) – ID N° 1604

IUCN RECOMMENDATION TO WORLD HERITAGE COMMITTEE: To inscribe the nominated property under natural criterion (viii).

Key paragraphs of Operational Guidelines:

Paragraph 77: Nominated property meets World Heritage criteria.

Paragraph 78: Nominated property meets integrity, and protection and management requirements.

It is noted that one part of the nominated property is proposed for referral, as it does not yet fully meet protection and management requirements.

1. DOCUMENTATION

a) Date nomination received by IUCN: March 2018

b) Additional information officially requested from and provided by the State Party: Following the IUCN World Heritage Panel a progress report was sent to the State Party on 20 December 2018. This letter advised on the status of the evaluation process and sought responses/clarifications on a range of issues including in relation to legal protection of parts of the nominated property; the status of community consultation; and road building materials sourced in the nominated property. A formal response from the State Party to the issues raised in the progress report was received on 27 February 2019.

c) Additional literature consulted: Various sources, including: Dingwall, P.R., Weighell, T. & Badman, T. (2005). Geological World Heritage: A Global Framework. IUCN, Gland, Switzerland; Guttormsson, H. (2011), Vatnajökull National Park: A Guidebook. Vinir Vatnajökuls; Hannesdóttir, H. & Baldursson, S. (2016), Melting Glaciers: a Natural Laboratory to Study Climate Change. Vatnajökulspjodgardur, Iceland; Iceland Magazine (2018), Preparations for a new National Park in Central Highlands get underway. Iceland Magazine, 24 January 2018, URL: <https://icelandmag.is/article/preparations-a-new-national-park-central-highlands-get-underway>; Petursson, J.G., Thorvardardóttir, G. & Crofts, R. (2016), Developing Iceland's protected areas: Taking stock and looking ahead. Parks 22.1:13-24; Thordarson, T. & Höskuldsson, A. (2014) Iceland. 2nd Edition, Classic Geology in Europe (Book 3), Dunedin Academic Press; Wood, C. (2009) World Heritage Volcanoes. IUCN, Gland, Switzerland.

d) Consultations: 16 desk reviews received. The mission met with the Ministers of Education, Science and Culture, and of Environment and Natural Resources and their staff; scientific experts involved in the preparation of the nomination; representatives of the Icelandic Institute of Natural History, University of Iceland and Cultural Heritage Agency of Iceland; and also with members of the Governing Board for the management of Vatnajökull National Park (VNP); and

with each of the four Regional Committees responsible for regional park management, together with the Park Manager and staff. The mission also met members of the local government municipalities adjacent to the park, tourism and outdoor users and environmental stakeholder groups, commercial operators and individual guides in the park and one of the two private landowners with property within the boundary of Vatnajökull National Park.

e) Field Visit: Bastian Bertzky and Dan Tormey, 23 September to 1 October 2018.

f) Date of IUCN approval of this report: April 2019

2. SUMMARY OF NATURAL VALUES

The nomination of Vatnajökull National Park: dynamic nature of fire and ice (VNP), encompasses 1,448,200 ha, approximately 14% of the territory of Iceland, and includes no buffer zones. More than 85% of the nominated property is classified as wilderness according to national legislation, and most of the nominated property qualifies for IUCN Category II protected area status.

The nominated property is an iconic volcanic terrain and includes the entire range of currently active mid-ocean rift features, including large rift systems with historically important eruptions (such as the 1784 Laki fissure flow that led to several years of no summer and famine conditions worldwide). It includes the world's largest and best expressed subglacial volcanic landforms (tindar ridges and tuya peaks) and rootless vents of all known types. Since the rift also includes a major mantle plume, there is the development of large central-vent volcanoes that include the entire magma series from basalt to rhyolite - more than six such central volcanoes are included in the nomination, including the largest, Bárðarbunga, over the plume itself, and the most famous, Askja, which is free of snow much of the year. The nominated property also includes some of the best exposed subvolcanic features on earth; as one goes east from the current centres of volcanic activity, one proceeds deeper into the volcanic plumbing system. Feeder dykes, cone

sheets, sills, and mixing of basaltic magma with rhyolitic magma are all preserved in stunning clarity at numerous well-studied centres. The nominated property also includes the roots of volcanic systems: the reservoirs of magma that were transported through the feeder systems to the volcanoes. These shallow-level magma intrusions are very rare around the world, and the nominated property contains more than five such intrusions, many of them well studied and central to our understanding of the subvolcanic plumbing and storage system. From a volcanic perspective, the nominated property certainly contains the best exposed products of historic magmatism, all the way down to the subvolcanic magma chambers, that represents a divergent plate margin setting. There is little to no vegetation on these outstanding examples rendering the values immediately visible.

From the perspective of glaciers, Vatnajökull is the largest glacier in Europe and one of the largest in the world. Unlike many of the world's glaciers, Vatnajökull is not a remnant of the great Pleistocene ice sheets that began their retreat 10,000 years ago. Rather, it is a young glacier formed approximately 2,500 years ago, which is highly sensitive to climatic conditions and is an outstanding natural laboratory for studying the effects of the current global warming trends on glacial extent. Iceland prepared information documenting Vatnajökull glacier as a natural laboratory for the Paris Climate Summit in 2016, further elevating the importance of this glacier to our understanding of the interplay between climate and glacial extent.

The nomination is subtitled “dynamic nature of fire and ice” and this is represented in the relationship between the heat of the central volcanoes and fissures that underlie (or during some eruptions also overlie) the Vatnajökull ice cap. This interaction takes many forms, but the largest and most dramatic is the jökulhlaup: a sudden flood of water caused by breaching the edge of a glacier during an eruption. Jökulhlaups are a recurring phenomenon in Iceland and are rare in any other part of the world. Over several days, up to ten times the flow of the Amazon is released during such events, leading to distinctive sedimentary landforms including broad sand plains, braided river systems, seen in the south of the nominated property, and deeply incised canyons, seen in the north. The Gjalp eruption and associated massive jökulhlaup in 1996 was the best studied event of its type in the world.

The globally significant values of VNP relate to the coexistence and active interaction of a divergent tectonic plate boundary, a mantle plume and a large ice cap. The outstanding values represented are dynamic, currently active, and at times devastating processes. The attributes of the nominated property (be it a specific volcano, mountain peak, or even Vatnajökull itself) are not immune to change or even complete erasure. However, the dynamic nature of these processes are part of the value of the nominated property and the area will continue as a natural laboratory of the glaciovolcanic processes so evident today.

3. COMPARISONS WITH OTHER AREAS

Vatnajökull National Park has been nominated solely under criterion (viii), and the nominated property includes outstanding examples of several of the themes recognised as guiding the consideration of geoheritage nominations: volcanism, glaciers, fluvial systems, tectonics, and mountains.

The global comparative analysis presented in the nomination is of good quality, although ideally should have considered a broader range of rift environments, and should have included a greater use of quantitative comparison. For volcanism, the site was considered in the IUCN 2009 Volcano Thematic Report, and IUCN notes that it will also be recognised as of potential Outstanding Universal Value (OUV) in the revision of this report, which is in press. The former report's classification was based on volcanic landforms, and noted that the important subglacial eruption landforms of Iceland were unrepresented and constituted a significant gap on the World Heritage List. The revision will be based on plate tectonic setting, and in that respect mid-ocean ridges are also significant yet unrepresented. The nominated property is an iconic volcanic terrain: together with Hawaii, the Andes, and the island arcs of the southwest Pacific (Indonesia), Iceland is central to global scientific understanding of how earth processes work.

The nominated property contains the world's best exposed mid-ocean ridge volcanic system that is not under water, with some of history's most notable and well-studied eruptions. As noted above, the broader geological evidence is highly diverse and well exposed, including the full range of active volcanic features for this plate tectonic setting, preserved in a largely unvegetated state, contributing to spectacularly clear exposures.

As already noted, Vatnajökull is the largest glacier in Europe, and as a relatively young glacier, it is exceptionally sensitive to climate change; it is truly a natural laboratory for the response of glaciers to changing climate, both historically and in the present day. The interaction of volcanic features and glacial features is very clear, dramatic, educational, and found nowhere else in this full range of expression.

Iceland's tentative list does include three additional properties that may be nominated under criterion (viii): Þingvellir National Park, already inscribed as a cultural property in 2004; Mývatn and Laxá near the Dettifoss area of VNP; and the Torfajökull Volcanic System near the Laki area of VNP. VNP compares favourably to these properties, which could in time be considered for nomination, or as serial extensions of the present nominated property.

Thus, given the documentation in the nomination and the recognition of VNP in published reports for the World Heritage Committee, and the scope of features included in the nomination, there is a clear case to support inscription under criterion (viii).

4. INTEGRITY, PROTECTION AND MANAGEMENT

4.1. Protection

Around 97% of the nominated property is protected by the Act on Vatnajökull National Park No. 60/2007 and Regulation No. 608/2008 (with subsequent amendments). In addition, there are two nature reserves included, Herðubreiðarlindir and Lónsöræfi, which are independent protected areas established respectively in 1974 and 1977 according to the Nature Conservation Act No. 47/1991 in force at the time. Other important legislation for the protection and management of the nominated property include the later Nature Conservation Act No. 60/2013, the Cultural Heritage Act No. 80/2012, the Planning Act No. 123/2010, the Public Land Act No. 58/1998 and Act No. 48/2011 on the Master Plan for Nature Protection and Energy Utilisation.

Overall, this legal framework is adequate to protect the values represented. However, there is one exception to the adequacy of the legal protection: the IUCN mission noted, and supplementary information confirms, that the Jökulsá á Fjöllum river corridor connecting the northern portion of the nominated property to the main Vatnajökull portion is only partly protected by law. Iceland has confirmed that the Minister for the Environment and Natural Resources will officially enact the protection of the whole river from hydropower development after a public consultation. Iceland has stated that this process is in progress and should be resolved by May 2019. IUCN therefore notes that, whilst this matter might be resolved by the time of the World Heritage Committee, on the operating date for the evaluation of 28 February 2019, this matter is not yet addressed in relation to the requirements of the Convention. Thus, that part of the nomination cannot be recommended for inscription in the present report.

IUCN considers that the protection status of the nominated property meets the requirements of the Operational Guidelines, with the exception of the Jökulsá á Fjöllum river corridor, which does not yet meet these requirements.

4.2 Boundaries

The nominated property covers a very large area as described above. The proposed boundaries are adequate to include all of the values that support OUV. However, there are specific concerns regarding the proposed boundaries of the northern part of the nominated property (north of the Herðubreiðarlindir Nature Reserve). The issues were raised by IUCN noting that the information provided by Iceland on 29 November 2018 stated that the private landowners along the Jökulsá á Fjöllum River had not been approached or consulted in relation to the nomination process, but that the Ministry for the Environment and Natural Resources intended to address this point and consult with the landowners. Iceland provided further supplementary information that addresses the question of protective ownership or control over the corridor connecting the northern and southern portions of the nominated property, and IUCN notes two issues:

a) Private landowner consultations along the corridor of Jökulsá á Fjöllum itself, including areas around Mt. Herðubreið adjacent to the Herðubreiðarlindir Nature Reserve: This corridor connects the northern and southern portions of the nominated property, but at present there is not continuous state ownership or control over this corridor (see section 4.1 above). However, there is an ongoing consultation process. The State Party states that the timeline for this process is uncertain, but of high priority. It is not entirely clear from Iceland's response whether or not there are privately owned lands included within the nominated area of the river corridor for which there has been no consultation, and/or there could be objections from the owners.

b) Inclusion of the Natural Monument of Selfoss, Dettifoss, and Hafragilsfoss into the nominated property: This was discussed during the field mission as an option to improve the boundaries of the nominated property in the Dettifoss area, and Iceland has confirmed that they commenced the consultation, landowners are interested, and it is hoped to complete consultation in early May 2019.

IUCN is of the view that the northern portion should not yet be included in the nomination, and to avoid an inappropriate serial configuration of the nominated property, at the present time only the southern portion up to and including the Herðubreiðarlindir Nature Reserve could be recommended for inscription. The delay in considering these areas (which could be considered via either the referral process, or a minor boundary modification in due course) relates to the former Jökulsárgljúfur National Park and some smaller areas along the narrow river corridor. The precise delimitation of the nominated property resulting is clear, but the area will need to be reconfirmed by the World Heritage Centre with the State Party. IUCN estimates that the area removed from immediate inscription is less than 2% of the total area of the nominated property, whose area would remain at over 1,400,000 ha.

The State Party has indicated some plans that could lead to the eventual expansion of the boundaries of the national park and World Heritage site, including the planned acquisition and inclusion of the large sand plain to the south (Skeiðarársandur), which is currently in private landownership. Moreover, the Government of Iceland has recently launched a process to consider the establishment of a much larger "Central Highlands National Park", which would probably include VNP as a core area. Although Iceland may choose to seek to expand the boundaries of the World Heritage Site to include future acquisitions, this is not essential to adequately protect the full range of values that is already included in the current nomination.

There is no buffer zone proposed. Given the vast size of the nominated property, the particular resilient nature of the OUV, and the existing protection in the nominated property's surroundings through the Nature Conservation Act, the Public Land Act and the Master Plan for Nature Protection and Energy Utilisation, IUCN agrees that the designation of a buffer zone is

not essential for this property, provided these wider measures continue to be effective.

IUCN considers that the boundaries of the nominated property meet the requirements of the Operational Guidelines; however, in view that ongoing consultations are not completed in the Jökulsá á Fjöllum river corridor, this area of the nomination, and the area to its north, does not appear to be appropriate for inclusion in an inscription at the present time.

4.3 Management

The government agency Vatnajökull National Park (Vatnajökulsþjóðgarður) is the primary state agency responsible for implementing the park legislation, and operates under the aegis of the Ministry for the Environment and Natural Resources. The park has a governing board and a central park manager based in the Ministry in Reykjavik. In each of the four administrative park regions, there are also one or two regional park managers and a regional advisory committee, involving local authorities and stakeholder groups. The four chairs of the regional advisory committee are also members of the VNP Board.

VNP has been managed under a comprehensive Management Plan for ten years. The plan achieves a high level of local input and decision making, coupled with legal protections against over development. The field mission noted that areas incorporated into the park boundary since 2013 have not yet been fully integrated into the overall Management Plan.

The overall management organisation and capacity of the VNP agency is adequate and effective. VNP has 16 permanent staff, including one overall park manager based in Reykjavik, five regional managers (two in the north and one each in the west, south and east), assistant regional managers, and some permanent rangers. Each year, the park also hires 60-70 temporary staff to work as rangers, service staff at visitor centres, or as general workers. The nominated property depends upon this additional staffing to operate in an optimal way. This was also confirmed during the mission, as all regional park managers reported a need for some additional staff resources, including field staff for certain areas and times of the year, and especially some centralised administrative support to help with tasks such as human resources, accounting, outreach and education.

The nomination also includes a clear and adequate framework for monitoring the state of conservation of the nominated property, including a set of useful indicators covering the fields of geology, geological hazards, biota and tourism. This includes, for example, continuous monitoring of the risk of volcanic eruptions, earthquakes and jökulhlaups, as well as continuous monitoring of visitor numbers and distribution, trail erosion, 'wear and tear' on visitor facilities and the presence of waste.

According to the Ministry for the Environment and Natural Resources, specific management effectiveness evaluations have not yet been

implemented in VNP (or any other protected areas in Iceland), but this should be considered in the future.

Overall, the nominated property has an adequate budget to cover essential staff and operations, and this budget seems to be reasonably secure. VNP is funded through two main sources: approximately 70% of its annual budget comes from the central government and the other 30% is self-generated income from camping/parking fees and sales of food and merchandise in the park's visitor centres. The government funding is divided into resources for the day-to-day operation of the park and investments into infrastructure developments. Significant, but fluctuating, support has also come from the government controlled Tourist Site Protection Fund and the non-profit organisation Friends of Vatnajökull. The total budget of VNP has almost tripled since its establishment in 2008; however, since 2014, investments into infrastructure developments have stagnated while salaries continue to increase. In 2016, the total budget amounted to 559 million ISK, including 313 million ISK for salaries.

There is a general expectation that the new Nature Conservation Agency that is proposed to be established in Iceland could potentially provide additional support to VNP – especially some centralised administrative support to help with tasks such as human resources, accounting, outreach and education.

IUCN considers that the management of the nominated property meets the requirements of the Operational Guidelines.

4.4 Community

There is strong general evidence of community engagement in, and support for VNP and its World Heritage nomination. The mission heard impressive and unanimous support in all quarters for the management plan, recognition that local input to decision making is critical to successful management of the park and support for the designation as World Heritage to preserve values for future generations.

As already discussed, there is a particular issue regarding ongoing landowner consultations in areas in the northern part of the nomination (see section 4.2). Two small areas in the south of VNP are privately owned grazing areas in the mountains. In both cases, the nominated property does not include the farmhouses and guesthouses, but only some summer grazing areas in the mountain hinterland of the farms. The mission was able to meet one of these owners and were informed that there is support from both of them for the park and the nomination.

The overall governance arrangements are effective and highly participatory. Through the VNP Board and the regional advisory committees there is a high degree of stakeholder involvement, including from local authorities and various stakeholder groups such as environmental conservation associations, and outdoor and travel associations. The locally based

regional park managers, assistant park managers and rangers work directly with the local communities and stakeholders in the day-to-day management of the park. Nonetheless, conflicts and disputes over certain management decisions occasionally arise evidenced by some complaints heard during the mission. Most of these concern the use and area restrictions that affect some of the traditional user groups (hunting, four-wheel drive clubs). More generally, the need to strengthen communication between the central park management and the four regions, eight municipalities and various stakeholder groups was noted. Some stakeholders also requested more clarity and transparency with regard to the decision-making, and these improvements should be a priority for site managers.

4.5 Threats

More than 95% of the nominated area has a very high level of integrity due to its remoteness. The nomination addresses expectations of increased levels of tourism. As Iceland has become more of a transatlantic transport hub and encouraged stay-overs, tourism has increased dramatically. Specifically, Vatnajökull National Park has had much increased tourism since its designation, but most of this has been concentrated in a relatively small number of easily accessible tourism hotspots on the southern and northern fringe of the park (notably Jökulsárlón, Skaftafell and Dettifoss). While inscription on the World Heritage List may increase visitor numbers, if managed correctly, it could lead to a change in the nature of that tourism. Visitor stays could increase, and visitors seeking ecotourism or a more immersive experience than simply a day trip from Reykjavik or Akureyri, or a bus trip around the island could be attracted. The measures needed to achieve this positive change (enhanced education /outreach /communication, more support at a national level, increased awareness of the ecotourism market among municipalities) are clear to the Icelandic authorities, and were in part the motivation for this nomination. The Minister for Education, Science and Culture, the Minister for Environment and Natural Resources, and the member of the Alþingi (Parliament), whose constituency includes the south and east of the park, made clear the intention that inscription would be seen as a milestone event to elevate the educational and communication efforts for VNP, and strengthen the quality of the tourism offer. Visitor management is and will remain one of the key challenges for the park, but mostly in and around the known tourism hotspots. It is therefore a matter of urgency to put in place, as planned, adequate visitor facilities and management in the Jökulsárlón and Dettifoss areas. The need to implement an anticipated certification scheme for commercial operators and guides operating in VNP is also noted.

There are two areas of gravel extraction for road maintenance within the nominated property: one near Jökulsárlón in the southern part of the park and one along the paved road (Dettifoss to Ásbyrgi) that is under construction through the northern part of the park from the Ring Road. Once the road upgrade is

completed, the affected areas should be restored. IUCN notes that such gravel extraction should remain limited to the minimum necessary, and be exclusively in relation to the maintenance of roads within the nominated property. No conversion of these areas into sources of commercial export of material would be acceptable. Furthermore, additional road construction should not be permitted, unless there is an exceptional justification and full prior impact assessment.

There are limited areas where off-road driving occurs and can locally degrade the visitor experience. Off-road driving of this type is not legal anywhere in Iceland, but can occur either due to ignorance or visitors acting illegally. Park management typically cites off-road driving as the most persistent threat to the park, and has several active management means to address this; however, some additional measures (e.g. clearer road/track demarcation, additional signage, information materials and campaigns) could be taken to discourage off-road driving.

Just northeast of the main park area lies the Hálslón Reservoir. Following the construction of three dams between 2003 and 2006, the reservoir began to fill in late 2006, and has since stored water for the Kárahnjúkar Hydropower Plant that produces energy for the Fjarðaál aluminium smelter 75 km to the east in Reyðarfjörður. The dams, power plant and aluminium smelter are all well outside the nominated property; however, the uppermost parts of the Hálslón Reservoir water body extend slightly into the nominated property.

The nominated property and its surroundings face potential threats from further hydropower development. There appears to be continued interest in further development, as Iceland has outstanding hydroelectric power siting attributes. However, legal protections are in place to prevent such development (e.g. through the Master Plan for Nature Protection and Energy Utilisation and other legislation), and at present both the state and local communities are sensitive to the topic and appear to be primarily against further hydroelectric development.

Ongoing traditional use (such as sheep grazing, hunting, fishing, egg collecting, mushroom and berry picking) does not pose any significant threat to the values for which the property is being nominated, and is being addressed in the management plan and regulated by VNP in consultation with stakeholders, rights holders and property owners in the area. Similarly, neither the local presence of non-native tree species nor the spread of some invasive species (mainly Nootka lupine (*Lupinus nootkatensis*)) threatens the core values of the nomination, although such introductions do warrant management attention.

Climate change will clearly play a key role in the future of the nominated property, and is already evident in the ongoing and rapid retreat of Vatnajökull's many outlet glaciers, potentially leading to the complete loss of the Vatnajökull ice cap and hence the interaction of fire and ice. However, as noted in the nomination, this process may take centuries and provides an important natural laboratory for studying the glacial,

glaciovolcanic and ecological dynamics in response to climate change. This is reflected in the nomination's focus on processes. Furthermore, given the iconic means by which World Heritage Sites provide examples of the impacts of climate change, and the need for ambitious action to tackle it, the nominated property will also add significantly to the role of the Convention in underpinning global action on climate change.

In conclusion, IUCN considers that the integrity, protection and management of the nominated property meet the requirements of the Operational Guidelines, noting the reservations in relation to the northern part of the nomination referred to above, which do not meet fully the protection requirements at the present time.

5. ADDITIONAL COMMENTS

5.1 Associated cultural and other nature conservation values

Although nominated for criterion (viii) alone, the nomination document also notes a strong cultural element (both historic sites of significance to Icelandic people, and the overall importance of living in a dynamic island, with persistent and frequent volcanism and glacial floods, to the development of the Icelandic psyche). It also recognises regionally important biological attributes (illustrating arctic ecosystems and species), and aesthetic beauty (many areas with stunning views). IUCN notes this as an example of good practice in any nomination, in recognising the other significant values. These other significant values should be recognised and remain a focus for the conservation of the nominated property, as they support the exceptional nature of VNP.

6. APPLICATION OF CRITERIA

Vatnajökull National Park has been nominated under natural criterion (viii).

Criterion (viii): Earth history and the record of life

The coexistence and ongoing interaction of an active oceanic rift on land, a mantle plume, the atmosphere and an ice cap, which has varied in size and extent over the past 2.8 million years, make the nominated property unique in a global context. Earth system interactions are constantly building and reshaping the property, creating remarkably diverse landscapes and a wide variety of tectonic, volcanic and glaciovolcanic features. Especially interesting and unique in this regard are the basaltic lava shields (Iceland shields), volcanic fissures and cone rows, vast flood lavas, and features of ice dominant glaciovolcanism, such as tuyas and tindar. Interestingly, the well exposed volcanic features of the nominated property have been used as analogues for similar features on the planet Mars. Geothermal heat and subglacial eruptions produce meltwater and jökulhlaups that maintain globally unique sandur plains, to the north and south of the Vatnajökull ice cap, as well as rapidly evolving canyons. In addition, the nominated property contains

a dynamic array of glacial- and geomorphological features, created by expanding or retreating glaciers responding to changes in climate. These features can be easily accessed and explored at the snouts of Vatnajökull's many outlet glaciers and their forelands, especially in the southern lowlands, making the nominated property a flagship glacial research location.

IUCN considers that the nominated property meets this criterion.

7. RECOMMENDATIONS

IUCN recommends that the World Heritage Committee adopts the following draft decision:

1. Having examined Documents WHC/19/43.COM/8B and WHC/19/43.COM/INF.8B2;

2. Inscribes **Vatnajökull National Park - dynamic nature of fire and ice (Iceland)** under natural criterion (viii), including the area of the nominated property **up to and including Herðubreiðarlindir Nature Reserve** (thus not including at this stage the Jökulsá á Fjöllum river corridor and the northern Dettifoss - Ásbyrgi part of Vatnajökull National Park);

3. Refers back to the State Party the elements of the nominated property situated to the north of the Herðubreiðarlindir Nature Reserve, in the Jökulsá á Fjöllum river corridor and the northern Dettifoss - Ásbyrgi part of Vatnajökull National Park, in order to allow the State Party to complete consultations with landowners in these areas, and ensure appropriate protection measures are put in place, and recommends that these areas be added to the inscribed property, once the protection and consultation issues have been resolved.

4. Adopts the following Statement of Outstanding Universal Value:

Brief synthesis

The property, totalling over 1,400,000 ha, comprises the whole of Vatnajökull National Park, plus two contiguous protected areas. At its heart lies the c.780,000 ha Vatnajökull ice cap in southeast Iceland.

Iceland includes the only part of the actively spreading Mid-Atlantic Ridge exposed above sea level, with the tectonic plates on either side moving apart by some 19 mm each year. This movement is accommodated in rift zones, two of which, the Eastern and Northern Volcanic Zones, pass through the property. Underneath their intersection is a mantle plume, providing a generous source of magma. The property contains ten central volcanoes, eight of which are subglacial. Two of the latter are among the four most active in Iceland. Most of the property's bedrock is basaltic, the oldest being erupted some 10 million years ago and the most recent in 2015. Outside of the ice cap, the terrain varies from extensive, flat lava flows to mountains, including tuyas and tindar (ridges) of brown hyaloclastites, erupted in fissure eruptions

beneath ice age glaciers. The latter occur nowhere else in the world in such numbers.

The property comprises an entire system where magma and the lithosphere are incessantly interacting with the cryosphere, hydrosphere and atmosphere to create extremely dynamic and diverse geological processes and landforms that are currently underrepresented or not found on the World Heritage List. It was here that the phrase “Fire and Ice” was coined. The Vatnajökull ice cap reached its greatest extent by the end of the 18th century and has on average been retreating since then. Recently, its retreat has accelerated in response to global warming, making the property a prime locality for exploring the impacts of climate change on glaciers and the landforms left behind when they retreat. The volcanic zones of the property hold endemic groundwater fauna that has survived the ice age and single-celled organisms prosper in the inhospitable environment of subglacial lakes that may replicate conditions on early Earth and the icy satellites of Jupiter and Saturn.

Criteria

Criterion (viii)

The coexistence and ongoing interaction of an active oceanic rift on land, a mantle plume, the atmosphere and an ice cap, which has varied in size and extent over the past 2.8 million years, make the property unique in a global context. Earth system interactions are constantly building and reshaping the property, creating remarkably diverse landscapes and a wide variety of tectonic, volcanic and glaciovolcanic features. Especially interesting and unique in this regard are the basaltic lava shields (Iceland shields), volcanic fissures and cone rows, vast flood lavas, and features of ice dominant glaciovolcanism, such as tuyas and tindar. Interestingly, the well exposed volcanic features of the property have been used as analogues for similar features on the planet Mars. Geothermal heat and subglacial eruptions produce meltwater and jökulhlaups that maintain globally unique sandur plains, to the north and south of the Vatnajökull ice cap, as well as rapidly evolving canyons. In addition, the property contains a dynamic array of glacial- and geomorphological features, created by expanding or retreating glaciers responding to changes in climate. These features can be easily accessed and explored at the snouts of Vatnajökull's many outlet glaciers and their forelands, especially in the southern lowlands, making the property a flagship glacial research location.

Integrity

The property covers over 25% of the central highlands of Iceland and extends onto lowland areas to the south to cover a total of approximately 12% of the country. Most of the property corresponds to an IUCN Category II protected area. Its integrity is reflected in the inclusion of entire and intact landscape and geophysical units, minimal human use and intervention, and scientific interest in the property. The site contains the entire Vatnajökull ice cap, with all its subsidiary glaciers as they stood in 1998. It spans some 200 km of divergent plate boundary and

encompasses ten central volcanoes and large parts of the accompanying fissure swarms and subsidiary landforms. The area is largely intact and remote from habituated areas with some 85% of the property classified as wilderness. An intense international scientific interest in the property is evidenced by at least 281 scientific peer reviewed papers, published over the last decade, on various aspects of plate tectonics, volcanism, glaciovolcanism, glaciology, glacial geomorphology and ecology. There has been no destructive human development within the property's boundaries. A few historic farms exist, but today only a few park employees live there on a year-round basis.

Requirements for protection and management

The large majority of the property is protected by the Act on Vatnajökull National Park No. 60/2007 and Regulation No. 608/2008 (with subsequent amendments), whilst Herðubreiðarlindir and Lónsöræfi Nature Reserves are protected according to the Nature Conservation Act No. 47/1991. A range of other important national legislation is in place to ensure protection. Most of the land adjacent to the property is subject to the law on public land, where any invasive use requires approval by the Prime Minister's Office.

The government agency Vatnajökull National Park (Vatnajökulsþjóðgarður) is the primary state agency responsible for implementing the park legislation, and is an effective organization, supported at all levels by the Icelandic government, local municipalities and businesses. There is mature governance in place together with experienced staff responsible for management employed on a long-term basis, including a strong complement of permanent and temporary staff.

There is a comprehensive Management Strategy and action plan in place, that have achieved a notably high level of local input to decision making, and which are subject to regular review and updating. Areas added to the national park since 2013 are progressively integrated into management arrangements. An effective long-term monitoring system is in place, using space- and ground-based observations, for improved evaluation of seismo-tectonic movements and volcanic hazards as well as for glacial flow and fluctuations and key aspects of the property's biota.

The property has an adequate and secure budget to cover essential staff and operations, with the principal financial support from the central government and up to 30%, which is generated from its own income. Significant other support has also come from the government controlled Tourist Site Protection Fund and the non-profit organisation Friends of Vatnajökull. There is a need to sustain and further increase resourcing to ensure the management needs of the property are fully met.

Risk management is a major issue in this highly dynamic setting where natural hazards are common. Other essential management issues include preventing wear and tear of nature at popular visitor destinations within the property, resolving visitor use conflicts, and

addressing occasional illegal activities in the property when they arise. There is a need to develop and maintain adequate facilities for educating, managing and guiding the ever-increasing numbers of visitors, which were approaching one million in 2017, ensuring that any such provision is designed, assessed and implemented in a manner that ensures the protection of the property's conservation significance. There is also a need to continue to work with local communities, organizations and businesses around the park to maintain their involvement and help them benefit from the park.

5. Recommends the State Party address the following needs to maintain and strengthen the protection and management of the property:

- a) Complete, in a timely manner, the current revision of the management plan for Vatnajökull National Park, ensuring it integrates fully all areas included in the property;
- b) Seek to complete integration of the Herðubreiðarlindir and Lónsöræfi Nature Reserves into Vatnajökull National Park in order to facilitate cohesive management of the whole property;

- c) Make available additional staff resources, including both field staff and administrative support, to ensure the effective protection and management of the property, in view of the recent areas that were added to Vatnajökull National Park, and the recorded rapid recent increase in visitation to the property;
- d) Put in place adequate visitor facilities in the heavily visited areas around the Jökulsárlón Lagoon in the south of the property, and also at the Dettifoss Waterfall to the north of the property;
- e) Adopt and implement effective certification for commercial operators and guides operating in the property; and
- f) Take additional measures to discourage illegal off-road driving by visitors, and to rehabilitate any areas affected adversely by these and other visitor uses.

Map 1: Location of the nominated property (note, this includes elements of the nominated property recommended for referral, namely the Jökulsá á Fjöllum river corridor and the northern most part, Dettifoss – Ásbyrgi)

