ASIA / PACIFIC

JEJU VOLCANIC ISLAND AND LAVA TUBES

REPUBLIC OF KOREA

WORLD HERITAGE NOMINATION – IUCN TECHNICAL EVALUATION

JEJU VOLCANIC ISLAND AND LAVA TUBES (REPUBLIC OF KOREA) – ID No. 1264

1. DOCUMENTATION

i) **Date nomination received by IUCN**: April 2006

ii) **Additional information officially requested from and provided by the State Party**: IUCN requested supplementary information on 1 November 2006 after the IUCN Evaluation Mission. The State Party responses were submitted on 20 November 2006 and 6 December 2006, including a revised comparative analysis, revised management plan and responses to all the issues raised by IUCN.

iii) **UNEP-WCMC Data Sheet**: 1 reference (nomination)

iv) **Additional literature consulted**: Bloom, A.L. (1998). **Geomorphology: a Systematic Analysis of Late Cenozoic Landforms**. Prentice Hall, Upper Saddle River. Forti, P. (2005). **Genetic processes of cave minerals in volcanic environments: An overview**. Journal of Cave and Karst Studies, 67, 1, 3-13. Gray, M. (2003). **Geodiversity: Valuing and Conserving Abiotic Nature.** Wiley, Chichester. Gunn, J. (ed.) (2003). **Encyclopedia of Cave and Karst Science.** Fitzroy Dearborn, New York. IUCN (2005). **Geological World Heritage: A Global Framework**. IUCN. Jeju Provincial Government (2005). **Field Guide for the Jeju Island Biosphere Reserve**. Republic of Korea. Jeju Provincial Government (2005). **Jeju Biosphere Reserve Management Plan**. Republic of Korea. Research Institute of Cultural Assets of Jeju Cultural and Art Foundation (2003). **Report of Academic Project on the Natural Heritage of Jeju Island**. Republic of Korea. Report of the Samcheok International Cave Expo, Samcheok, Korea 2002. Reprints of **"Caves in Jeju Island, Korea"** from the 14th International Congress of Speleology, Athens, Greece 2005. Simkin, T. and Siebert, L. (1994). **Volcanoes of the World**. 2nd Edition, Geoscience Press, Tucson. Smithsonian National Museum of Natural History (2007). **Global Volcanism Program**. Accessed online: www.volcano.si.edu/index.cfm. Son, In-Seok (2005). **The Underground World of Jeju Volcanic Island in Korea**. (ISBN 89-957284-0-X). Woo, Kyung Sik (2005). **Caves: A Wonderful Underground**. Hollym, Seoul.

v) **Consultations**: 10 external reviewers. Extensive consultations were undertaken during the field visit with: representatives of the Korean National Assembly; Cultural Heritage Administration of Korea; Jeju Special Self-Governing Province; Jeju Culture, Tourism and Sports Bureau; Manjanggul District; Hallasan National Park, Research Institute for Mt Halla, Manjanggul Lava Tube Management and Seongsan Ilchulbong Tuff Cone Management; Cave Research Institute of Korea, Korean Institute of Biospeleology, Korean Institute of Geoscience and Mineral Resources, Kangwon National University and Catholic University of Korea; Korean National Commission for UNESCO; Korean UNESCO MAB National Committee; IUCN National Committee for Korea; and Korean conservation NGOs.

vi) **Field visit**: Paul Dingwall, October 2006

vii) **Date of IUCN approval of this report**: April 2007

2. SUMMARY OF NATURAL VALUES

Jeju Island (Jeju-do), located in the Yellow Sea at N 33° 21´, E 126º 32´, is the southernmost territory of the Republic of Korea. Volcanic in origin, the island is elliptical in shape, 183,160 ha in area and rises to an altitude of 1,950 m at the summit of Mt Hallasan, Korea's highest peak. The nominated Jeju Volcanic Island and Lava Tubes property covers a total area of 18,846 ha, or 10.3% of the island. It is a serial property comprising the core zones of three sites, each of which is surrounded by a buffer zone, as shown in Table 1.

In terms of its legal status and management regime the nominated property is equivalent to a mix of IUCN Category I and II protected areas. Hallasan Natural Reserve also forms the core of the Jeju Island Biosphere Reserve, which was established in 2002, covering 83,094 ha of Udvardy's subtropical and temperate rainforest / woodland biome in East Asia.

Jeju Island is a shield volcano about 1.2 million years in age, characterized by a thick sequence of basalt lava flows forming a gently sloping plateau, or shield, surmounted by a trachyte dome. The island originated as underwater hydromagmatic eruptions on the continental shelf, which were then overlain by basalt lavas erupting from about 360

Table 1: Name and size of the nominated core zones and their surrounding buffer zones

Name of the site	Core zone (ha)	Buffer zone (ha)
Hallasan Natural Reserve	9,093.1	7,347.4
Geomunoreum Lava Tube System	330.3	1,906.4
Seongsan Ilchulbong Tuff Cone	51.8	117.0

subsidiary cones, mostly scoria cones with tuff cones on the coast. The basalt flows were tube fed, forming extensive lava tube caves of which 120 are known today.

The Hallasan Natural Reserve comprises a substantial part of the summit area of the primary volcano. The diverse volcanic landscape includes a 1.6 ha lake-filled crater, 550 m in diameter and 108 m deep, a younger (circa 25,000 years in age) intruded trachyte dome, and a series of columnar jointed basalts forming prominent cliffs. The vegetation cover ranges from sub-alpine evergreen coniferous forest, dominated by the endemic Korean fir, to temperate deciduous hardwood forest, in which Mongolian oak predominates. The flora includes some species endemic to Jeju Island and Korea, and species at their northern and southern distributional limits. Most of the island's 20 mammal species (four endemics) inhabit the reserve.

The Geomunoreum Lava Tube System contains five lava tubes in lavas that erupted from the Geomunoreum scoria cone 300,000 to 100,000 years ago. Formed by differential cooling within the lava field, the lava tubes are elongated tubular cave structures varying in length, configuration and composition, as shown in Table 2.

The Seongsan Ilchulbong Tuff Cone is a hydroclastic volcanic feature on the coastal flank of the Jeju volcano. Composed of a mix of breccia, lapilli tuff, stratified tuff and bedded tuff, it was formed by a Surtseyan-type (Icelandic) eruption from a shallow sea bed in the Late Pleistocene Epoch (120,000-40,000 years ago). It is a 179 m high castle-like feature with a bowl-shaped summit crater 570 m in diameter. Wave erosion has exposed the internal sedimentary structures and stratification.

Collectively, the three sites in the nominated serial property are representative of the key landforms that fully illustrate the origin and evolution of a mono-genetic basalt shield volcano at a continental tectonic plate hot spot.

3. COMPARISONS WITH OTHER AREAS

A comprehensive global comparative analysis is presented in the nomination considering both comparable World Heritage properties (inscribed both under criterion (viii) and other criteria), and other comparable sites not included on the World Heritage List.

Most of the world's 10,000 volcanoes are either shield volcanoes formed from lava flows, or stratovolcanoes com-

Table 2: Length, topography and distinctive features of the lava tubes in the Geomunoreum system

Lava tube	Length (m)	Topography and distinctive features
Manjang	7,416	Two-storied cave in single meandering passage up to 30 m high and 23 m wide; diverse series of lava speleothems - stalagtites, stalagmites, 7.6m-high column, flowstone, blisters, helictites, bridges, benches, rafts, striations and ropy lavas. Fauna includes Korea's largest known colony of long-winged bats.
Bengdwi	4,481	Complex labyrinth of irregularly braided caves on several levels: diverse microtopography of lava stalagmites, pillars, bridges, ledges and chambers. Relatively rich cave fauna including endemic Jeju millipede and spider.
Yongcheon	2,470	Single passage, 1.5-20 m high and 7-15 m wide with arched ceiling and vertical walls; diverse lava features - stalactites, shelves, terraces, rolls, falls, wall and ceiling pockets; diverse array of secondary carbonate speleothems, originating from solution of overlying carbonate sand dunes, including stalactites, stalagmites, pillars, cave corals, cave pearls, curtains, flowstone, and rimstone pools.
Gimnyeong	705	S-shaped passage in three parts with openings; wide variety of tube structures - lava stalactites, shelves and falls, cave corals and carbonate sediments.
Dangcheomul	110	Single tube, 0.3-2.7 m high and 5.5-18.4 m wide. Lava features include stalactites, helictites, grooved and ropy lava and gutters. Spectacular display of secondary carbonate speleothems, many of them formed as coatings around tree roots and irregularly shaped.

posed of a mix of explosive material and lavas. Shield volcanoes are mostly composed of basalt and are dome-shaped, such as those comprising the Hawaiian Islands. Stratovolcanoes are usually composed of andesite and tend to have a more classical steep cone shape, such as Mt Fuji in Japan. Of the two types, shield volcanoes are much less common, making up only 10% of the 1,500 volcanoes that have erupted in the past 10,000 years. The greatest majority of shield volcanoes are formed on the ocean floor, in island arcs or in other deep subduction zones of the earth's crust. Shield volcanoes located on continental tectonic plates are relatively rare.

Jeju Island is an example of a large shield volcano built on a continental plate, and can be distinguished as unusual in its formation over a mantle plume (hot spot) in a marine environment on a stable continental plate margin. Among the world's other major shield volcanoes: the Hawaiian Islands are oceanic hot spot volcanoes; Iceland and the Galapagos Islands are oceanic plate margin volcanoes; the Kamchatka Peninsula has island arc volcanoes; and those in continental Africa, America and the Red Sea region are non-marine volcanoes. In its tectonic and environmental setting the Jeju volcano is therefore globally rare. This technical level of distinction is clearly of significance to volcanology, but does not necessarily provide sufficient justification for a claim of outstanding universal value.

Tuff cones such as Seongsan Ilchulbong are relatively common features of basaltic volcanoes, and – taken alone – are not a sufficiently significant feature to provide sufficient justification for a claim of outstanding universal value. They are a type of volcano formed by violent explosive eruption where magma interacts with water. Jeju Island has many such (phreatomagmatic) volcanoes and has become internationally important for the study of them. Ilchulbong is distinctive because almost all of its outer structures have been eroded by wave action leaving cliffed sections that expose its internal structures and stratification. This enables the eruptive process be understood in ways not possible elsewhere. The type locality, Surtsey Island in Iceland, does not demonstrate these features because it is very young (40 years old) and not yet dissected to expose its core. Nor does the well-known Diamond Head tuff cone in Hawaii have cross-section exposures. Other world-important tuff cones in Japan, Kenya, Mexico and the Philippines are still active, while those in the USA, Saudi Arabia and Italy have suffered from substantial natural or human-induced degradation.

The most significant and distinctive feature of Jeju Island, as emphasized by the majority of reviewers, is the lava tube system. Such tubes form where, on cessation of vent activity, parts of the liquid lava continue to drain downslope leaving elongated voids or lava tube caves. Such caves are like those in limestone karst in scale, shape and internal decoration, but they are completely different in origin. Lava tube caves are known from basaltic terrain in most of the world's volcanic regions (they have also been observed on the Moon and planets such as Mars, Mercury and Venus). The lava tube caves of the Geomunoreum system are, however, regarded as internationally important due to their length, massive volume, intricate passage configuration, well preserved internal lava features, abundant and spectacular secondary carbonate formations, ease of access, and their scientific and educational values. There are other lava caves in the world that are longer and equally voluminous, but they are either unprotected, inaccessible, damaged or not as well formed or preserved as those of the Geomunoreum system. For example, the much celebrated Kazamura cave on Kilauea volcano in Hawaii is the world's longest at 65 km, but it is in private hands and undergoing real estate development, and parts of it are used for waste disposal. It is not included within the existing Hawaii Volcanoes National Park World Heritage property. The 7.4 km long Manjang cave in the nominated property is one of only 12 known lava tube caves in the world longer than 7 km (the longer caves are located in Hawaii, Spain (Tenerife and Lanzarote), Kenya (Chyulu)). Together with its related Gimnyeong and Yongcheon caves it forms a single cave passage more than 13 km long.

The other feature making the Geomunoreum system globally significant and distinctive is the presence of carbonate deposits and decorations. Very small deposits of calcite are common in lava tube caves, and are more significantly developed as speleothems in Duck Creek cave in Utah, USA. However, in abundance, density and diversity they are far less impressive than those of Jeju's Yoncheong and Dangcheomul caves, and the scale of these decorations within the lava caves of Jeju Island far exceeds any other comparable examples. The nomination is supported by the Commission on Volcanic Caves of the International Union of Speleology – the world's most authoritative scientific body on volcanic caves, which regards Jeju's lava caves as being of the highest international ranking. Further, a 1995 global review regarded Dangcheomul cave as the "best display of different calcite speleothems within a volcanic cave." Yongcheong cave has been discovered subsequently and is of equivalent value.

At least 26 of the 830 properties on the World Heritage List are located in volcanic terrain. Many of these were inscribed, either primarily of secondarily, for their biological or other values, including cultural values. Thirteen properties have been inscribed on the basis of their volcanic features and processes including Yellowstone National Park (USA), Volcanoes of Kamchatka (Russian Federation), Virunga National Park (Democratic Republic of the Congo), Tongariro National Park (New Zealand), Sangay National Park (Ecuador), Hawaii Volcanoes National Park (USA), Heard and McDonald Islands (Australia), Galapagos Islands (Ecuador) and Aeolian Islands (Italy). The volcanoes of Virunga National Park are the most comparable of existing World Heritage properties, being shield volcanoes located on a continental plate; however their origin is related to rifting of the African continent, not to mantle plume (hot spot) activity like Jeju Island. Lava tubes are present in Hawaii Volcanoes National Park, but none ranks in overall size, quality and ease of access with those in the nominated property. The smaller shield volcanoes of Kamchatka and the Galapagos Islands do not display the range of subsidiary landforms, including lava tube caves. The few known lava tube caves in the Galapagos Islands and Heard and MacDonald Islands are relatively short and less significant. Lava caves are also known from some cultural World Heritage properties in volcanic terrain such as Rapa Nui / Easter Island (Chile), where they have not been mapped or described, and from the lavas outside the World Heritage property of Pico Island in the Azores (Portugal).

4. INTEGRITY

4.1 Legal status

There is a strong statutory and regulatory basis providing for strict legal protection of all sites in the nominated property. The principal statute applying is the Cultural Properties Protection Act administered by the central government Cultural Properties Administration. Under this legislation the core zones within the property are designated as Natural Monument (except one cave which is a Jeju Monument), which provides for absolute protection. Buffer zones allow for some very restricted development provided there is no impact on the values of the core zones. Hallasan Natural Reserve was declared as a National Park in 1970, under the Natural Parks Act, and the Highlands Management Act, for sustainable forest conservation and use, also applies to this area. At the provincial level, the Jeju Provincial Cultural Heritage Protection Ordinance and the Jeju Province Regulation on Promotion for Inscription on the World Heritage List contain the necessary provisions for management planning and operations, and for establishment of a World Heritage Promotions Committee. If Jeju is inscribed on the World Heritage List then it is intended to pass, under the Cultural Properties Protection Act, a Conservation and Management of World Natural Heritage Ordinance allowing for protection, management and promotion of the World Heritage property. Management regulations include Guidelines for Conservation and Management of Natural Caves, Guidelines for Conservation and Management of Natural Reserves and Rules for Facilities Inside Parks.

Land tenure overall in the nominated property is 84% (15,785 ha) government owned and 16% (3,060 ha) privately owned, virtually all of the latter being in the Geomunoreum system. Private lands in the core zones will be progressively purchased in the period 2006 to 2013, with an investment of US$ 12.5 million, 70% of which will come from central government.

4.2 Boundaries

The lower boundary of the Mt Hallasan site, at 800-1,300 m above sea level, follows the legal protected area boundary. Its core and buffer zones encompass a large area of state-owned land (8% of Jeju Island), including the summit and upper slopes of the volcano and substantial representation of the local biota. The boundary of the core zone at Ilchulbong essentially covers the terrestrial part of the tuff cone, while the buffer zone extends as much as 200 m landward and 500 m seaward from the core zone. For the Geomunoreum system, the core zone boundary is 50 m each side of the lava tubes, and the buffer zone extends 500 m beyond the core zone, sufficient to isolate the lava tubes from any damaging external influences. Determined by a mix of tenure and natural resource considerations, the boundaries of the nominated property overall include all key natural values and present no problems for site management or integrity.

A number of reviewers noted the potential for further areas to be included within the nominated property, including a greater range of tuff cones and a wider range of the lava caves. IUCN understands that during preparation of the nomination the boundaries went through several stages – at one stage the entire Jeju Island was included, then this was reduced to a large wedge of the island, and eventually the proposal was limited to the three sites in the final serial nomination. The reasons for the restricted number of sites were primarily considerations of management integrity, including land tenure, attitude of owners and condition of the site. All the potential additions present some management problems at present. For example, Bilemot Cave, which is the longest cave on the island with a magnificent three-dimensional structure, is protected by law but is substantially under private ownership and has suffered from damage in the past. Three other caves at Hyeopjae – Ssangnyong, Hwanggeum and Socheongul – are in Hallim Park whose private owners are not currently sympathetic to World Heritage inscription. They are also lime-decorated lava tubes, but the consensus of expert opinion is that they are not as spectacular as the caves in the nominated Geomunoreum system. Other volcanic sites and features mentioned as having potential for future addition to the nominated property are the scoria cones – Sangumburi, Saraoreum and Eoseungsaengak; the tuff cones – Songaksan and Dangsanbong; and the volcanic dome of Mt Sanbangsan.

In summary, the three areas provide sufficient recognition of the key features of the Jeju volcanic system that is the basis of the present nomination. It can, however, be regarded as a minimum solution and capable of extension. IUCN recommends that the State Party undertakes an active investigation of the potential for future addition of further sites in an extended serial property.

Other reviewers noted that the nominated property may have significant biodiversity values. IUCN considers these to be of local and regional significance, and they are not rated as being of outstanding universal value. Most of the important flora are in the Hallasan Natural Reserve, and include species endemic to Jeju Island and Korea, and species at their northern and southern distributional limits. Four of the 20 species of mammals and 24 of the 1,600 species of insects in the park are Jeju endemics. Some rare and unusual animals such as cave spiders are restricted to the lava tube habitats. These values are recognised within the Jeju Island Biosphere Reserve, and their protection would be further enhanced if managed within the context of a World Heritage property. In terms of its biogeographical representation, the Hallasan Natural Reserve is however less significant than protected areas on the continent and in Japan.

4.3 Management

Management policies and provisions for the nominated property have been assessed as exemplary and equivalent to international standards of practice for protected areas. The Jeju World Natural Heritage Management Plan provides for consolidated and integrated conservation management of the property's three sites – Hallasan Natural Reserve, Geomunoreum Lava Tube System and Seongsan Ilchulbong Tuff Cone. This government-approved plan has its statutory basis in the Jeju Provincial Ordinance and is legally binding on the Korean national and provincial governments and all administering authorities. During its 3-year preparation, the plan was comprehensively consulted and it reflects the consensus view of national and local institutions and communities. It spans the 5-year period until 2010 and is renewable following revision at that time. There is also a management plan for

the Jeju Biosphere Reserve, focused on the Hallasan Natural Reserve, which is operated under the direction of the Jeju Provincial Government.

The administrative framework for the property is comprehensive at both national and local levels. There are five major management and advisory agencies:

- Cultural Heritage Administration of Korea – the country's lead agency for conservation management of heritage properties has the primary role for legal, policy and regulatory functions associated with the property.
- Jeju Provincial Government – oversees and controls conservation of the property in accordance with the relevant laws.
- Jeju World Natural Heritage Management Committee – a representative body that has a co-ordinating function for developing and promoting management strategies and plans, monitoring and research, and training and education.
- Scientific Advisory Committee – with members drawn from the Korean and Jeju Cultural Properties Committee and from research institutions.
- Jeju World Natural Heritage Local Committee – a body representative of local government, NGOs, museums, universities, local community groups etc. for developing management priorities, processes and recommendations in the execution of site management and development plans.

Day-to-day management is conducted through the Management Service established at the three sites within the property, each of which has in-house management units devoted respectively to planning, public relations and education; resource conservation and management; and visitor facilities management. These units are replicated in the Heritage Division of the Jeju Provincial Government. Current numbers of permanently employed staff and projected numbers in 2010 at the sites are: Hallasan Natural Reserve 23 current (50 projected); Geomunoreum system 13 (30); and Ilchulbong 8 (12). Each office also hires numerous heritage guides, interpreters and supporters, and encourages local residents to volunteer for roles in heritage management and the education of visitors and residents. Substantial increases in numbers of volunteers and supporters are planned over the next five years.

The overall budget for management of the property in 2006 is approximately US$ 10 million. A substantial increase in funding is projected over the next five years, providing for an estimated total investment budget of US$ 76.5 million, which allocates US$ 16.7 million to Hallasan Natural Reserve, US$ 17.5 million to Geomunoreum system, US$ 11.2 million to Ilchulbong and US$ 31.1 million to a common fund.

Visitors to Hallasan Natural Reserve exceeded 700,000 in 2005 and are projected to reach 1 million in 2007. Manjang cave received 400,000 visitors in 2005. That year a total of 1.2 million visited Ilchulbong, which is the most popular visitor attraction on Jeju Island, but most come here for scenic viewing and are readily controlled on a single trail system that is under camera surveillance. Although visitor numbers to the nominated property are already substantial and increasing rapidly, with planned improvements in facilities and increased staffing and funding, the considerable investment in visitor management appears adequate to maintain visitation within the carrying capacity of the nominated areas. IUCN notes that this is the most significant challenge for the State Party in managing the property, and it will be essential that capacity and funding is retained in the long term.

A new visitor centre has been built at Mt Hallasan, which on completion in 2008 will provide 1,500 m² of floor space for exhibitions, conferences and management offices. Construction of new visitor centres at Manjang cave and Ilchulbong will begin in 2008. There are also plans to construct a special Jeju World Natural Heritage Centre. IUCN suggests the State Party might wish to review whether it is necessary to build this exhibition centre, as the basis for it already exists in the Jeju Stone Park on the outskirts of Jeju City, devoted to displaying and explaining the geology of Jeju Island. The park, which is already operating to the highest world class standard, is not yet completed and it could readily accommodate exhibitions to highlight the World Heritage property.

Each site has scientific services provided by advisory boards and the quasi-autonomous Research Institute for Mt Halla. Considerable research has already been undertaken, and a comprehensive 5-year research plan exists for each site, with an overall budget of approximately US$ 1.2 million. Site monitoring, which is particularly sophisticated for the lava tubes, is based on a wide range of atmospheric, hydrologic, marine, geologic, biological and visitor impact indicators, and is supported by an estimated budget of US$ 350,000 per year.

4.4 Threats and human use

There are no significant external threats to the nominated property at present or in the foreseeable future. Within the property some extensive rehabilitation and restoration has been undertaken to remove or ameliorate detrimental elements and avoid potential impacts on the property's values. Many roads have been removed from core zones, or closed and/or converted into trails. Some roads have been upgraded and new improved roading is planned and budgeted, especially to minimize any vibration from traffic that might affect the lava tubes. All telegraph poles and transmission towers are being removed. Old and out-dated facilities have been removed, including a large hotel which was intruding on the natural scenery at Ilchulbong. At Mt Hallasan, US$ 5.4 million has been invested to date in repairing 42 km of trails, and by 2006 US$ 1.0 million had been spent on trail improvement at Ilchulbong. Steel pathways have been constructed over sensitive cave floor surfaces in Manjang cave and a special lighting system installed to prevent growth of lampenflora (green pollution). To avoid damage and vandalism, access to all lava tube caves, except part of Manjang cave, is prohibited without special permission for research and monitoring, and cave entrances are guarded by steel gates or covers, some with fitted alarm systems. There are no people living in the core zones of the property and in 2004 there were only 433 permanent residents in the buffer zones, primarily on small farm-holdings in the Geomunoreum system.

The potential for impacts of fertilizer seepage into the lava tube caves was raised during the field visit. There are no

known impacts at present and only about 15% of the land above the caves is in private ownership and not all this is being used for gardening and farming purposes. The private lands will all be progressively purchased up to 2013, retired from such uses and restored to natural vegetation cover – so the problem is likely to be a short-term one only. Meanwhile, fertiliser runoff impacts will be included in the intensive monitoring programme within the caves. There is a need to implement a programme to restore natural vegetation cover on formerly farmed or otherwise cleared areas.

IUCN considers that the nominated property meets the conditions of integrity as required under the Operational Guidelines.

5. ADDITIONAL COMMENTS

There is a high degree of public awareness of the World Heritage programme and support for the Jeju nomination within Jeju Province. A survey of Jeju school pupils and parents and of visitors to heritage parks, in September 2005, revealed that 50% of people were aware of the World Heritage Convention and the intention to nominate a World Heritage property. Some 85% supported the nomination and 27% offered voluntary support to management, while only 12% expressed some concerns over the possibility of stricter regulations. This result reflects in part the efforts of a national World Heritage awareness-raising and promotional campaign in recent years. The campaign was run by a 25-member promotions committee, chaired by a former Prime Minister and including government officials, ambassadors, media presidents, and business people including tourism operators. It provides an excellent example of the involvement of civil society in the World Heritage Convention.

5.1 Justification for serial approach

When IUCN evaluates a serial nomination it asks the following questions:

a) What is the justification for the serial approach?

The serial approach to the nomination is justified in that it identifies distinctive features that correspond to the different stages of the evolution of Mt Halla and the Jeju volcanic system. A serial approach can be justified as a practical solution to the selection of different features on separate parts of Jeju Island to achieve the objective of demonstrating the key features of the system. As noted above there is some debate regarding the possibility of including further areas in the series; however, IUCN concludes that the series selected is a sufficient initial selection to demonstrate the key features of the Jeju volcanic system.

b) Are the separate components of the property functionally linked?

The nomination focuses on three key inter-related elements of volcanism on Jeju Island: the central vent of the primary volcano, at the summit area of Mt Halla; the best example of a tuff cone, Seongsan Ilchulbong, illustrative of emergent volcanic activity in a marine setting; and the most outstanding representative of the hundreds of secondary volcanic vents with its associated lava flows and lava tube caves formed in the massive lava fields during shield formation, the Geomunoreum scoria cone and lava tube system. In combination, these sites fully reveal the origin and evolutionary history of the Jeju volcano, and form a single coherent and functionally linked series.

c) Is there an overall management framework for all the components?

A single management plan and administrative framework has been developed for the nominated serial property, covering all of its elements on a consistent and integrated basis.

5.2 Nominations of volcanic properties

IUCN notes that volcanic systems are relatively well represented on the World Heritage List, including several properties whose inscription was justified on the basis of arguments that are considered by a number of experts to be rather narrow. There are a large number of volcanoes worldwide and at a detailed level every one of these can assert that it is in some way unique.

In 1996 IUCN noted that the World Heritage Committee had already asked “how many volcanoes should there be on the World Heritage List?” In the interests of maintaining the credibility of the World Heritage List, IUCN considers that there is increasingly limited scope to recommend further volcanic nominations for inclusion on the World Heritage List. In particular, IUCN recommends that the World Heritage Committee should consider indicating clearly to States Parties that further volcanic nominations should only be promoted where:

- There is a very clear basis for identifying major and distinctive features of outstanding universal value that has been verified by a thorough global comparative analysis;
- The basis for claiming outstanding universal value is a significant and distinctive feature of demonstrable and widespread significance, and not one of many narrow and specialized features that are exhibited within volcanic terrains.

IUCN recommends that States Parties considering volcanic nominations carry out an initial global comparative analysis ***prior*** to proceeding with the development of a full nomination, in order to minimize the possibilities of promoting a nomination that will not meet the requirements of the World Heritage Convention, including those concerning the conditions of integrity.

IUCN considers that the present nomination is a good example that conforms to these principles, but also is at the limit of acceptability in terms of the narrow and specialized nature of some of the features identified.

6. APPLICATION OF CRITERIA / STATEMENT OF OUTSTANDING UNIVERSAL VALUE

The property has been nominated under criteria (vii) and (viii). IUCN considers that the nominated property meets these criteria and proposes the following Statement of Outstanding Universal Value:

Jeju Volcanic Island and Lava Tubes is a coherent serial property comprising three components. The unequalled quality of the Geomunoreum lava tube system and the exhibition of diverse and accessible volcanic features in the other two components demonstrate a distinctive and important contribution to the understanding of global volcanism.

Criterion (vii): Superlative natural phenomena or natural beauty and aesthetic importance

The Geomunoreum lava tube system, which is regarded as the finest such cave system in the world, has an outstanding visual impact even for those experienced with such phenomena. It displays the unique spectacle of multi-coloured carbonate decorations adorning the roofs and floors, and dark-coloured lava walls, partially covered by a mural of carbonate deposits. The fortress-like Seongsan Ilchulbong tuff cone, with its walls rising out of the ocean, is a dramatic landscape feature, and Mount Hallasan, with its array of textures and colours through the changing seasons, waterfalls, display of multi-shaped rock formations and columnar-jointed cliffs, and the towering summit with its lake-filled crater, further adds to the scenic and aesthetic appeal.

Criterion (viii): Earth's history, geological and geomorphic features and processes

Jeju has a distinctive value as one of the few large shield volcanoes in the world built over a hot spot on a stationary continental crust plate. It is distinguished by the Geomunoreum lava tube system, which is the most impressive and significant series of protected lava tube caves in the world and includes a spectacular array of secondary carbonate speleothems (stalactites and other decorations), with an abundance and diversity unknown elsewhere within a lava cave. The Seongsan Ilchulbong tuff cone has exceptional exposures of its structural and sedimentological characteristics, making it a world-class location for understanding Surtseyan-type volcanic eruptions.

Conditions of Integrity, Protection and Management

The property is well managed and resourced, with a management plan in place for the period 2006-2010 and resources for its implementation. Key management issues include avoiding potential agricultural impact on the underground environment and managing the high number of visitors to the property. There is potential for further extension of the property to include other significant lava tube systems and volcanic features of Jeju.

7. RECOMMENDATIONS

IUCN recommends that the World Heritage Committee **inscribes** the Jeju Volcanic Island and Lava Tubes, Republic of Korea, on the World Heritage List on the basis of criteria (vii) and (viii).

IUCN recommends that the World Heritage Committee commends the State Party for the quality of the comparative studies carried out in support of the nomination and for obtaining widespread support and commitment for the nomination from all key stakeholders including international expert organisations.

The World Heritage Committee may further commend the State Party for establishing the Jeju Biosphere Reserve under the UNESCO MAB Programme; and urge the State Party to manage the World Heritage property in close collaboration with this Biosphere Reserve.

IUCN also recommends that the State Party be requested to:

a) Complete at the earliest opportunity the purchase of private land within the nominated property;

b) Ensure effective management of the high number of visitors to the nominated property and any commercial activities associated with it;

c) Implement strict measures in the buffer zone of the Geomunoreum Lava Tube System to prevent agricultural practices on the surface impacting the underground environment;

d) Give further consideration and attention to the management of the significant volcanic features in the wider area of Jeju, and to the management of the biodiversity values of Jeju; and

e) Consider the potential for extension of the nominated property to include other significant lava tube systems and volcanic features on Jeju.

Finally, and in the interests of maintaining the credibility of the World Heritage List, IUCN recommends that the World Heritage Committee notes that volcanic systems are relatively well represented on the World Heritage List and that there is increasingly limited potential for further inscriptions of volcanic sites on the World Heritage List. The Committee may therefore recommend States Parties considering further nominations of volcanic sites to consider the principles suggested in section 5.2 of this IUCN evaluation.

Map 1: Location and boundaries of nominated property