

## World Heritage Sites

Protected  
Areas and  
World  
Heritage



## HISTORIC SANCTUARY OF MACHU PICCHU PERU

*One of the most important and most visited PreColumbian sites in the Americas, an outstanding symbol of Peruvian national pride and Inca civilisation. The ruins are a uniquely sited royal winter retreat, religious sanctuary and mausoleum of the Inca rulers from Cuzco built around the middle 15th century, superbly constructed and integrated with a spectacularly beautiful landscape. Its sheltered and remote location has preserved a very rich endemic and relict flora and fauna, including the rare spectacled bear.*

*Threats to the site: Inadequate governance and institutional coordination, landslides, fire, heavy tourist pressures, and the unplanned, unsafe and unsanitary development of Machu Picchu village.*

### COUNTRY

Peru

### NAME

Historic Sanctuary of Machu Picchu  
(*Santuario Historico de Machu Picchu*)

### MIXED CULTURAL & NATURAL WORLD HERITAGE SITE

1983: Inscribed on the World Heritage List under Cultural Criteria i & iii and Natural Criteria vii & ix.

### IUCN MANAGEMENT CATEGORY

V Managed Resource Protected Area

### BIOGEOGRAPHICAL PROVINCE

Yungas (8.35.12)

### GEOGRAPHICAL LOCATION

The site is in south-central Peru, 75 km northwest of Cuzco in the highest part of the eastern Andes, sited on a narrow ridge 650m above the Rio Urubamba, an upper tributary of the Amazon, at 13°10'19" to 13°14'00"S by 72°30'05" to 72°34'33"W.

### DATES AND HISTORY OF ESTABLISHMENT

c.1440-60: The settlement built as a sanctuary by the Inca Pachacutec Yupanqui; deserted by c.1560;

1911: Re-discovered and studied by H. Bingham of Yale University;

1981: Created a National Historical Sanctuary by Law DS 001-81-AA;

1983: Designated a Mixed World Heritage site, part being the Archaeological Park of Machu Picchu;

1998: Draft masterplan prepared; 1999: Machupicchu Management Unit created by Decree 023-99AG;

2001: Management Advisory Committee established

## LAND TENURE

The Republic of Peru, Department of Cuzco (Peruvian Delegation to UNESCO, 2005). Administered by the National Institute for Culture (INC) and the National Institute for Natural Resources (INRENA) plus the national Vice Minister for Tourism and the President of the Cusco regional government.

## AREA

32,592 ha.

## ALTITUDE

Ranges from 1,850m to >4,600m. The ruins lie at 2,430 ha.

## PHYSICAL FEATURES

The site lies between the *selva alta* and yunga zones of the Andean plateau in the steep and highly dissected topography of the eastern high Andes, rising from a deep gorge to glacier-bearing mountains. The ruins rise just above cloud forest on the flattened top of a narrow steep-sided ridge which rises within but some 650m above a meander of the Rio Urubamba (Rio Vilcanoto) canyon. The spectacular site is on the northern end of the Cordillera de Vilcanoto facing the Cordillera de Vilcabamba across the valley which rise in the nearby tutelary mountain of Cerro Salccantay to 6,271 meters, and lies in the shelter of these peaks. The ridge forms a saddle at 2,430m between a humpbacked mountain (Machu Picchu, 2,795m) and a pinnacle, Huayna Picchu (2,667m) which overlook the ruins. The remaining buildings are single storey and built of a local white granite. They comprise the upper ceremonial buildings - palace, temples and tombs - separated by a long plaza from the peoples' housing and agricultural terraces below.

Geologically the area is a complex of intrusive lavas and metamorphic rocks. Ordovician schists, slates and quartzites lie under a layer of Cretaceous-Quaternary marine sedimentary rocks. The area is prone to earthquakes and a fault line crosses the site. There are hot springs nearby at Aguas Calientes. Most of the soils are acid, poorly developed and shallow. In the valleys below, colluvial and alluvial soils and rocky detritus predominate. The hillsides were carefully terraced by the Incas to conserve the thin soil, but under heavy rains the slopes are liable to landslides and erosion, especially on the steep backslope of the ridge. The Urubamba river, which is an upper tributary of the Amazon, flows below the site in a canyon, but its alluvial basin as far as Quillabamba to the north, the 'Sacred Valley of the Inca' is an almost continuous band of arable and pastoral farmland fed by many side valleys and flanked by innumerable irrigated terraces, forming one of the most productive areas in the Andes. From Machu Picchu the 'Sacred Road of the Incas' or Inca Trail across the mountains links the site with the old Inca capital of Cuzco 75 km up the valley which is also reached by road and rail in the valley.

## CLIMATE

The site is sheltered by the snow-capped mountain ranges of Salccantay to the south and the peak of La Verónica to the east. The climate on the mountain is humid but temperate. At 2,500m the average annual temperatures range between 12°C and 15°C with annual rainfall averaging 1,950 mm and frequent mist. On the high *paramo* the diurnal variation in temperature exceeds the fairly constant annual range. The agricultural valley below is warmer: the temperature there averages 16°C and the rainfall ranges between 1,850mm and 3,000mm. The wet season lasts from October to April. The winter, between May and September is dry and is the season for forest fires in the lower forest and the *paramo*, though the cloud forest between the two remains moist.

## VEGETATION

The site is on the margin between the Andean and Amazonian ecosystems, possessing elements of both. Because of the altitudinal range, irregular terrain and long alteration by man, it possesses a great diversity of habitats within a short distance: riverine vegetation, humid and very humid low montane subtropical forests, humid evergreen and quasi-cloud forests, cultivated fields, terraces which have reverted to grass and secondary scrub or woodland, with above the ruins, bamboo, *Polylepis* thickets and *paramo* grasslands. Its montane forests, though partially degraded, contain one of the richest and most threatened of all floras. Shoobridge *et al.* (2004), following Holdridge, give the following nine life zones:

Life Zone	Elevation	Average Precip.	Temp °C	% of Area	Terrain
Subtropical humid forest	1,850-3,000m	1,950 mm	15-18°C	0.51%	flat to hilly
Subtropical humid low montane forest	2,400-3,000m	1,100 mm	12-15 °C	3.67%	flat to hilly / steep
Subtropical very humid low montane forest	2,000-3,000m	1,950 mm	12-15 °C	14.12 %	flat to hilly / steep
Subtropical montane rainforest	3,000-3,800m	1,900 mm	6-12 °C	27.21 %	sloping to steep
Subtropical very humid montane rainforest	3,000-3,800m	1,500 mm	6-12 °C	7.65%	sloping to steep
Very humid subtropical subalpine paramo	3,800-4,400m	1,000 mm	3-6 °C	12.43 %	hilly to steep
Subtropical pluvial subalpine paramo	4,000-4,400m	1,500 mm	3-6 °C	13.73 %	hilly to steep
Subtropical pluvial alpine tundra	4,400-4,900m	1,000 mm	1.5-3 °C	13.71 %	hilly to steep
Subtropical snow-capped peaks	>4,600m	900 mm	<1.5 °C	7.5%	rugged

The site lies on the upper edge of the humid subtropical *selva alta* forest, in the *yunga*, a region of subtropical montane deciduous and evergreen forest. These forests form the transition zone along the eastern slopes of the Peruvian Andes between the high dry *puna* and wetter *páramo* grasslands and the lowland humid forest habitats. They are a part of an elaborate mosaic of habitat types in a steep rugged country of lush vegetation, high species diversity and high endemism. Over the whole ecoregion there are more than 3,000 plant species and within the site a tree density of nearly 90 species per hectare (WWF, 2001). Along a 200 km transect from the high grasslands to the Amazon lowlands, 1,000 bird species are found, several dependent on specific plant associations such as the *Polylepis* forest (Manu Wildlife Centre, n.d.). The impenetrable montane evergreen forest between 2,000m and 3,000m is laden with epiphytic bromeliads, ferns and mosses and over 30 genera with 200 species of orchids - which are overharvested (Shoobridge *et al.*, 2004; Mujica, 2000). Dominant tree species include *Weinmannia*, *Nectandra*, *Cedrela* such as *Cedrela lilloi* (VU) and *C. odorata* (VU), relatives of papaya *Carica* spp, and tree fern *Cyathea* spp; *Myrcianthes oreophylla* (VU) is also found. Higher up, *Puya raimondii*, the largest bromeliad, with a 9.5m-high inflorescence, survives.

Around the ruins grow scattered thickets of the high-altitude endemic *Polylepis*, open grassland and low shrubs (Parker *et al.*, 1982). The very humid mountain mist forest above 3,000m has thin water-retaining lightly acid soils subject to landslips which provide a mosaic of many microhabitats and increase diversity. Here the upper cloud forest becomes a stunted elfin forest with bamboo *Gaudua* and *Chusquea* spp. on ridge tops with woodlands of *Podocarpus*, and, above 3,700m, wet rocky thickets of *Polylepis* which include *Polylepis pepeii* (VU) and *P. subsericans* (VU), grading to the shrubby mountain grassland of the *paramo* and subalpine barrens. There, the plants and animals have to adapt to harsher conditions and sporadic fire, aggravated by overgrazing and tree-cutting. It includes many species of bunchgrass such as *Festuca* spp. and *Stipa ichu* plus the *Puya raimondii* (Ferreira, 1988; INRENA, 2000; WWF, 2001).

Below the 2,700m level, the forest is denser and richer in species. Below 2,000m lower montane evergreen forest grows, generally on colluvial or alluvial soils in deep stream valleys. *Phragmites* reeds, willow *Salix* spp. and alder *Alnus* spp. grow around rivers and streams. Trees include the locally endangered mahogany *Swietenia macrophylla* (VU), *Cecropia* species, among them the trumpetwood *Cecropia peltata*, quinine *Cinchona* spp. and the palm species *Geromoina*, *Guasca* and *Ripuala* (MAA, 1981). This dense forest provides a rich habitat for birds and the larger mammals but is very subject to clearance.

## FAUNA

The region's rich fauna of more than 200 vertebrate species is typical of the montane evergreen east Andean forests. The site's most notable threatened mammal is the spectacled bear *Tremarctos ornatus* (VU), South America's only species of bear, for which the area is good habitat and an important corridor between its eastern and central populations, though probably insufficient in itself to support a viable population (Jorgenson, 1983). Other characteristic mammals include long-tailed otter *Lontra longicaudis incarum*, long-tailed weasel *Mustela frenata*, ocelot *Leopardus pardalis*, Andean cat *L. jacobita* (EN), oncilla *L. tigrinus* (VU), pampas cat *L. colocolo*, Peruvian huemal *Hippocamelus antisensis* (VU), northern pudu *Pudu mephistofiles* and Peruvian dwarf brocket deer *Mazama chunyi* (VU).

The avifauna of Machu Picchu is very rich, especially in the lower montane evergreen forest, but extending to the elfin forest and the high level *Polylepis* thickets. There is a high incidence of endemism and near endemic species. According to Walker & Fjeldsa in their *Field Guide to the Birds of Machu Picchu*, (2001), 423 species of birds have been recorded in the Sanctuary itself, and some further 40 species may well be found as research continues. They attribute this degree of endemism to the unique topography of the area where the land forms a wide fan of projecting mountain ridges separated by deep valleys. The high flanking ridges of the cordillera provide good protection from cold winter winds from the south. Throughout the tropical Andes, the highest concentrations of endemic birds are found in areas of ecological stability, suggesting that the endemic species represent relict populations which survived periods of climatic instability in places protected against extreme variations of weather. Machu Picchu contains six threatened bird species that are not protected in any of the other local proposed protected areas: royal cinclodes *Cinclodes aricomae* (CR), white-browed tit-spinetail *Leptasthenura xenothorax* (EN:100 individuals), Junin canastero *Asthenes virgata*, Inca wren *Thryothorus eisenmanni*, Cusco brush-finch *Atlapetes caniceps* and Parodi's tanager *Hemispingus parodii*. The birds of the *Polylepis* woodlands such as ashbreasted tit-tyrant *Anairetes alpinus* (EN) and Takzanowski's tinamou *Nothoprocta takzanowskii* (VU) are some of the most threatened in the country, so their protection within the Sanctuary is very important (Manu Wildlife Centre, n.d.).

Other notable birds are the iconic and near threatened Andean condor *Vultur gryphus*, and the national bird, the Andean cock-of-the-rock *Rupicola peruvianus*. At low altitudes in farmed fields the mountain caracara *Phalcobaeus megalopterus* and Andean lapwing *Vanellus resplendus* are found. Along narrow stream valleys in riverine trees are redbacked hawk *Buteo polysoma*, American kestrel *Falco sparverius*, speckled teal *Anas flavirostris*, Andean gull *Larus serranus*, torrent duck *Merganetta armata*, whitecapped dipper *Cinclus leucocephalus* and fasciated tiger-heron *Tigrosoma lineatum*. Around the ruins are seen blacktailed trainbearer *Lesbia victoriae*, whitewinged black tyrant *Knipolegus aterrimus*, cinereous conebill *Conirostrum cinereum*, bluecapped tanager *Thraupis cyanocephala* and rufus-collared sparrow *Zonotrichia capensis*. There are snakes such as *Boa* spp and fer-de-lance *Bothrops atrox*, and many species of lizards and frogs.

## CULTURAL HERITAGE

The sheltered environmental conditions and benign climate which protect relict bird species and ensure predictable crops probably facilitated the development of human civilisation in the Andes based on a well developed sustainable irrigated agriculture on the mountain terraces. Machu Picchu is at the junction of the humid lower Urubamba basin and the fertile Vilcanota valley that was the centre and breadbasket of the Inca culture (Walker & Fjeldsa, 2001). It was founded by the powerful reforming chief Pachacutec who established his rule in 1438 as the ninth Inca, Yupanqui, over the fertile valley and the great city of Cuzco where his successors ruled their vast empire of Tawantinsuyo until the Spanish invasion in 1534. Machu Picchu was built as a royal retreat, religious sanctuary and mausoleum for the mummified Inca, a natural fortress which was preserved by its mysterious sudden abandonment, inaccessibility and remoteness. It was reached from Cuzco by the Inca Trail (*Camino Real*) across the mountains above the terraced Urubamba valley with its lesser settlements of Pisac and Ollantaytambo.

The site, *La Ciudadela*, of about 500 square hectares, sits on a narrow saddle between the humpbacked lower Machu Picchu (old mountain in Quechua) and the pinnacle of Huayna Picchu (young mountain). It is divided between the buildings of the court and the houses of the artisans, site guardians and cultivators with food stores and agricultural terraces clinging to the mountain slope below. The ceremonial town site falls into two sections, the upper (*hanan*) lies to the west, with the palace, mausoleum, sun temple and the

Intihuatana solar calendar stone for making astronomical observations. The lower section to the east (*hurin*) had the quarters for the religious and workers. They were separated by a long open plaza and two smaller squares. At present 172 enclosures are connected by 109 stairways and stone channels for water and fountains (Mujica. 2001). The dry-stone masonry is massive yet refined and, for the nobles' buildings, even polished. Burial cave chambers were also made at the base of Huayna Picchu. The number of residents when the court was present is variously estimated at 750 to more than a 1,000 but few stayed on in the wet season. It was probably last used as a stronghold by Pachacutec's great grandson, Manco Inca during his defiance of the Spaniards. The site was never found by the Spanish, and, concealed by encroaching forest, known only to a few locals, was only rediscovered in 1911 by the American Hiram Bingham of Yale University, who revisited and published on the site for the next five years.

## LOCAL HUMAN POPULATION

The original inhabitants were skilled irrigators who built terraces and drainage channels that extend long distances across irregular ground and still exist in many places. The population is of the Quechua-speaking descendants of the pre-Columbian inhabitants who live in seven small communities and number about 1,200 within the Sanctuary itself. The local population, including Aguas Calientes (Machupicchu village), was 3,500 in 2004 (Shoobridge *et al.*). At present over half the Sanctuary (20,000 ha) is settled by *campesino* communities and farmers, especially on the lower slopes which are routinely burned to stop encroachment by the forest and to provide pasture. Much burning occurs for no apparent reason in August and September, perhaps in the belief that the smoke causes cloud build up and the onset of much needed rains (Manu Wildlife Centre, n.d.). Agriculture, for maize, potatoes, yucca and fruit, and the cash crops of coca, coffee and tea, with grazing mainly for small animals but also for llamas, cattle and sheep (some 1,400 in 2004) form the traditional support of the people. But the local economy is increasingly augmented by tourism.

Aguas Calientes (Machu Picchu village) 8 km away in the valley below, sprang up as an unplanned shanty town after the railway arrived to service tourists but is now the district administrative capital with growing strongly pressed claims to the facilities and use of 40% of the Sanctuary's budget. The district is the fastest growing area in the country, rising from 1,303 inhabitants in 1993 to 3,436 in 2005; half remain very poor and half are migrants, coming in for the tourist season. But in this temporary population there is no traditional culture to instil respect for the sacred place (UNESCO-IUCN-ICOMOS, 2007). Fast unplanned growth without controls or improvements in infrastructure or services such as for disposal of wastes is aggravating the problems of landslides and threats to health. Cusco, 75 km southeast, is a city of over 100,000 inhabitants and the administrative and commercial centre for much of the Urubamba basin.

## VISITORS AND VISITOR FACILITIES

Machu Picchu is Peru's most popular tourist destination, growing from 180,000 visitors in the 1980s to over 400,000 in 2003, averaging 3-400 a day but some 1,500-2,000 a day in the high season and likely to increase (Shoobridge *et al.*, 2004). There were 691,623 visitors in 2006 (75% foreign) and the number is likely to rise (UNESCO-IUCN-ICOMOS, 2007). The Management Plan advised that to reduce environmental deterioration, the archaeological site should not support more than 917 visitors per day and no more than 385 visitors at any one time. The INC recommend a maximum carrying capacity of 2,000 visitors a day with an increased entry fee. The government favors the higher number of 3,400 (UNESCO, 2002). A suggested daily limit of 2,500 visitors paying a higher entrance fee may be enforced (Leffel, 2005). Recent listing as a new 'Wonder of the World' will increase tourist numbers.

Visitors generate some \$40 million a year. Recent past growth led to a proliferation of uncontrolled and exploitative tour operators and many overcrowding problems, but the site is now better regulated by the government. Cusco is three hours away by railway, an approach which facilitates control of visitors and roadside developments. Access is by bus from Puente Ruinas station up a zigzag track in groups led by approved operators, or on foot, by a 2 to 4-day journey along 38 km of the Inca Trail. This carries 70,000 visitors a year and is now limited by permit to 500 a day in groups of 30. The preservation of roadside *Polylepis* groves from being used for firewood also preserves some of the country's rarest birds. In 2007 a new bridge and road at Carrilluchayoc in the buffer zone, to the growing village of Santa Teresa, to the west, has provided an alternative access to the site and raised fears of destructive overcrowding. At the ruins there is one hotel, a museum, ticket office and overnight campsites, also a steep stepped path up to

the top of Huayna Picchu. Tourist facilities are being developed in Aguas Calientes instead of on the mountain itself, and there is a new visitor centre, hotels and restaurants there. 561 rooms were available in 2007 with 16 eating places, employing some 300 people (UNESCO-IUCN-ICOMOS, 2007). Helicopter access was restored in 2008.

## **SCIENTIFIC RESEARCH AND FACILITIES**

Studies of the site and its approach by the Inca Trail have been continuous ever since 1911. Bingham made several visits, writing books and papers and sending some 5,000 items to Yale. In the 1930s-40s the ruins were cleared, and between 1950 and 1980 much was excavated, examined and restored. But due to its ruggedness only about a third of the whole protected area has been investigated. Vegetation transects have been taken, over 4,500 herbarium specimens collected and numerous bird studies made. The ecology of the spectacled bear has been researched with the cooperation of the New York Zoological Society. Key species are monitored. Many recent researches of potential use to management have been made but few have been used. In 2000 a Japanese earthquake research team made a detailed investigation of soils and landslide potential which is the major unpredictable natural hazard in the area, especially at slope foots, and the ruins are monitored daily. There is a small museum on site and the Wiñay Huayna Research Station, founded in 1985, 3.5 km directly south, has a hostel for scientists.

## **CONSERVATION VALUE**

Machu Picchu is one of the most important, beautiful and most visited PreColumbian sites in the Americas, an outstanding symbol of Peruvian national pride and Inca civilisation. A royal winter retreat, religious sanctuary and mausoleum of the Inca rulers from Cuzco built around the middle 15<sup>th</sup> century, superbly constructed and integrated with a spectacular site. Its sheltered and remote location has preserved a very rich endemic and relict flora and fauna, including the rare spectacled bear. The Park lies within a Conservation International-designated Conservation Hotspot, a WWF Global 200 Freshwater Eco-region, a WWF- IUCN Centre of Plant Diversity and in one of the world's Endemic Bird Areas.

## **CONSERVATION MANAGEMENT**

The site was established to protect the natural heritage and landscape of the ruins and their surroundings, which had been deforested commercially and for firewood for decades. But protection also promoted the area for its value to the tourist industry, conflicting aims which make for difficulty in controlling the site. The Sanctuary is managed according to a five-year Management Plan drawn up in 1998 which was finally adopted in 2005. This divided the Park into seven zones: Strict Protection (no uses except research), Wildlife (light use), Tourism and Recreation (intensive use), Special Use (services and existing settled areas), Restoration (of vegetation), Historic-Cultural (conservation with public use) and Buffer. It was to be implemented by a Management Advisory Committee established by the National Institute for Culture (INC) and the National Institute for Natural Resources (INRENA) in 2001 to propose policies and facilitate their realisation. This consists of eight organisations: INC, INRENA, the Cusco Regional Government, the Regional Director of Industry and Tourism, the Rector of S. Antonio Abad National University in Cusco, the Governor of the Province of Urubamba, the Mayor of the Machu Picchu District and the Representative of the National Chamber of Tourism.

With the division of authority over the site between INC and INRENA a certain degree of confusion has been institutionalised, further complicated by the creation in 1999 of the Machupicchu Management Unit which combines the Cusco Regional Government, INC, INRENA, and the vice-minister for Tourism, to coordinate rehabilitation of the Sanctuary. However, by 2002 less than half of the Advisory Committee's mission, mostly short-term projects mandated in the draft management plan, had been realised due to the difficulty the Committee found in agreeing on long-term issues and policies. A UNESCO report in 2002 noted that many of the 38 recommendations made by ICOMOS and IUCN missions to the Sanctuary remained unrealised because of the continued inadequacy of the site's planning and management and the determined individualism of the area's stakeholders. There is also a 12-member Technical Group which now specialises in environmental concerns (UNESCO, 2002).

The management is geared to deal with heavy tourist use of the core of the site and INC has improved the congested flow of tourists round the ruins themselves but not dealt with many other problems. Environmental work is undertaken by the Cusco branch of the Ministry of Agriculture. Much of the day-to-

day landscape management is done by the local farmers, which includes burning, still a legal practice within the Sanctuary. Forest fires have showed the necessity of monitoring campesino use of the land within the site, of encouraging safer agricultural practices, and of enacting stronger laws to prevent damage. Progress has been made on fire prevention procedures, regulation of land ownership in the Sanctuary, assessment of natural resources, management of solid wastes, the analysis and mitigation of natural disasters and the development of Agua Calientes village. By 2002 the Inca Trail was cleared of trash and the numbers of tourists using it were reduced. The Management Plan mandates or recommends high performance standards, but the practice often falls short of the advice. Four IUCN-ICOMOS missions in 1998, 1999, 2002 and 2007 reiterated the need for inter-institutional management of the natural resources and for coordinated planning of tourism, perhaps reducing tourist pressure by regulating access as if to a sacred site (UNESCO, 2002).

## **MANAGEMENT CONSTRAINTS**

There are many threats to the Sanctuary: excessive tourism considering the relative visual fragility of the site, the widespread generation of solid wastes, unsustainable agricultural practices, overgrazing and forest fires, all aggravating erosion and the constantly threatening geological instability; also mineral extraction, the introduction of exotic plants, the hydroelectric plant and transmission lines, a lack of alternative access road studies to the overused Inca Trail, the absence of environmental impact assessments, incomplete physical and legal tenure of lands, the multitude of stakeholders and the complicated management system (Shoobridge *et al.*,2004). At Machu Picchu, the lack of an effectively implemented plan for the management of the site, difficulties in departmental coordination, the use by farmers of 57% of the Sanctuary's land for slash & burn with chemical cultivation, plus continual set fires, have all created serious problems.

There have been delays in reviewing the master plan, which is ineffective, and in developing detailed yearly operational plans as the funding for these is inadequate. The management had not provided a work plan or Environmental Adjustment Program as required by the government. The Peruvian authorities do not discuss the Sanctuary's management with UNESCO, and INC and INRENA submit separate reports on their work. Although there is a Management Plan, the Sanctuary's Management Unit was inactive from 2005 to 2007 and in 2007 the UNESCO mission, though approving of much good work, remained very concerned by the lack of support received by the Unit from government Ministries, and its lack of overall planning and control over the site. The mission voiced grave concern over urgent problems with illegal access to the sanctuary, deforestation, the risk of landslides triggered by traffic, and uncontrolled urban development (UNESCO-IUCN-ICOMOS,2007). There are continuing disputes over land caused by incomplete legal records of land tenure which also make the recommended expansion of the buffer zone difficult. As early as 2000, UNESCO considered declaring the Sanctuary in danger. In 2008 the many problems arising from poor governance, the lack of integrated management and institutional coordination, from the lack of technical capacity and insufficient political commitment by the State caused UNESCO again to consider listing the site in danger to secure its better protection by the State (IUCN, 2008).

As reported by Dourojeanni in 1985, the increase in tourist pressure by a proliferation of unregulated tour operators early impacted both the site and the Inca Trail. These have continued to cause overcrowding, excessive littering and solid wastes, erosion, and the exploitation of porters, though the government has now limited the number of tour operators and has improved conditions. In 2002 the Intihuatana sundial stone was damaged by an American company shooting a beer commercial and in 2004 a mudslide revealed the site's lack of any risk preparedness plan. The danger from landslides is the most serious natural threat to the Sanctuary and its slopes are covered with landslide debris. They occur quite often on the lower footslopes after rain. Japanese investigators in 2000 concluded that the whole Sanctuary hillside remains active, especially on the north side, where soil movement may be as great as a centimetre a month (BBC,,2001; Sassa *et.al.* 2002), a view not then shared by the Director of the INC. The contract was cancelled and the report was not submitted (IUCN,2008).

The forest fire of 1988 which destroyed over 4,000 ha of mountain forest and much wildlife, was declared the worst ecological disaster in Peruvian history. A second fire in 1997 which burned 800 ha of forest over five days was probably caused by farmers burning weeds or clearing forest for farmland, demonstrating the inadequate control over the use of the Sanctuary by the local population. In 1998 a major landslide in the nearby Aobamba valley destroyed Santa Teresa, the railway, and affected the power station. The

Machupicchu Hydroelectric Center in the Aobamba valley just downstream which provides much of the energy for southern Peru is also a threat, importing into the site powerlines, pollution, bridges, roads, migratory farmers, colonists, the risk of fire, deer hunting and increased visitors. A fire in 2007 affecting 161 ha prompted installation of a local fire monitoring system along the high-tension cable network.

The Sanctuary was created to be reached on foot but vehicle access is a growing pressure, and virtually uncontrolled, especially from the west. In 1999 and 2000 proposed helicopter overflights and installation of a cable car to increase visitor numbers were ruled out to lessen stress on the geologically fragile site, but helicopter access was restored in 2008. The bus traffic causes oil pollution and creates vibrations on the hillside road. The planning of rail access is done without coordination with the Sanctuary Management Unit and in 2007 the Carrilluchayoc bridge was built and Machu Picchu village (Aguas Calientes) was expanded in defiance of INC, INRENA and Urban District recommendations. The district is the fastest growing in Peru and in high season houses and caters for some 3,000 tourists a day.

The village's rapid expansion with neither planning controls nor improvements in infrastructure or services, on a small riverside bank site subject to landslides and flooding already produces 3 tons of solid waste every day and has aggravated the likelihood of landslides, building failures and threats to health from increasingly unsanitary conditions. In 2008 there were 43 unauthorised constructions on the property. The Urubamba is now one of Peru's ten most contaminated rivers. Severe damage from flooding and landslides in early 2009 dramatised the dangers of the unregulated growth of the village. In that year an Emergency Action Plan for Risk Reduction and Disaster Recovery for Machu Picchu village incorporating a warning system and evacuation procedures was completed. The disaster also prompted the intent to create a national authority for the Sanctuary as a Special Protection Area and the passing of a national decree approved in 2010 for environmental planning and management in areas of high potential risk from natural hazards (UNESCO,2010).

In 2007 the World Heritage Committee had voiced grave concern over governance of the property and noted urgent problems with deforestation, the risk of landslides, uncontrolled urban development and illegal access to the sanctuary (UNESCO-IUCN-ICOMOS, 2007). This concern was repeated in 2010 following the severe flood damage in 2009 and the IUCN mission later that year. This concluded that the lack of response plans and of adequate regulation of public access and development had exacerbated the disaster. The major natural and structural threats to the property emphasised the urgent need for better governance, planning and funding, stakeholder involvement and international technical advice if inscription of the property on the list of World Heritage sites in danger was to be avoided (UNESCO,2010).

## **STAFF**

INRENA: The Director with administrative assistants, 10 professional scientists and tourism managers with 32 guards in 6 guard stations and occasional university interns.

INC: There are 40 control agents for the many cultural sites in the area, including Machu Picchu which has a resident archaeological office (Shoobridge *et al.*,2004).

## **BUDGET**

In 1988 this was 1,300,000 Intis (-US\$1,000) and there were no funds for patrols (Ferreyros, 1988).

Between 1996 and 2000, \$6,000,000 was released by the Finnish government for conservation programs and to improve management. By 2001 \$98,825 had been granted by the United Nations Fund for training, emergency measures and technical assistance, plus \$5,000 in 2001 to repair the Intihuatana stone (UNESCO, 2002). In 2004 the World Bank loaned \$5,000,000 to help resettle 60 landslide-threatened families from the Sanctuary and mitigate the effects of tourism. INC charges entry fees of \$50 per person which generates some US\$40 million a year of which 12% goes to Machu Picchu, some of which is now also released to the local authorities to deal with the impacts of tourism (Shoobridge *et al.*,2004). In 2008 it was noted that US\$103,825 had been provided from international sources for fire suppression equipment; masterplan development; and consultancies, and UNESCO had provided US\$15,000 for a social participation workshop (IUCN,2008).



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