Version 1.0: Preliminary Working Notes only

The Sublime Karst of Papua New Guinea

Towards a Tentative Listing for World Heritage Nomination

Introduction

Geology and Geomorphology

Papua New Guinea lies at the junction of the Australian and Pacific crustal plates. The relatively low-lying Southern area is, in effect, an isolated fragment of Northern Australia. However, the mobile central belt has been subject to an indeed turbulent geological history with folding, faulting and deformation of the rocks and considerable volcanic activity. The resulting central mountains are rugged and rise to over 5000 metres.

In the Northern region, there are the mountains originating from the Pacific plate, with the Huon Peninsula and other mountains now forming part of the mainland, and others forming the island arcs, including New Ireland and New Britain. Again these areas have been subject to continuing volcanism and tectonic movement. For instance, the Huon Peninsula has been steadily rising at a rate of some 3mm. per thousand years. Occasional still stands have resulted in a spectacular series of coastal terraces which provide an invaluable testimony to the role of uplift in shaping the geo-climatic history of the region.

The Karst

Significant karst occurs in the mountains of the Mobile belt, and the Bismarck Archipelago of the Pacific plate. That on the Southern side of the central highlands provides one of the most extensive and spectacular areas of polygonal karst landscapes in the world. Extremely large and complex cave systems have developed in the central mountains, e,g, in the Telefomin and Hindenburg Range areas to the West and in the Atea area of the Muller Plateau. Large areas of karst occur in both New Ireland and New Britain, with the latter having massive limestone plateaus with river caves on a remarkable scale.

These karst areas are all on a grand scale and represent absolutely outstanding examples of Edmund Burke's concept of the Sublime. This can be summarized as being " . . .exhilarating to contemplate, of the most exalted kind, distinguished by size or nobility or grandeur such as to inspire awe and wonder raised far above the ordinary". This is discussed further below in relation to each site.

Smaller low-level islands have a large number of quite different caves in the young and relatively shallow coralline limestones, and many of these are of significant cultural value, but are not further discussed here..

Biodiversity

The geological and geomorphic history of the country, coupled with intervening periods of both land bridge linkages and isolation has resulted in a remarkable diversity and fragmentation of habitats. In turn, there has been strongly shaped and developed by a diversity of both Australian and Indo-Malaysian influences. Similarly, the human ecology has resulted in a total of over 1,000 languages and the inevitable linguistic communities.
Areas included in this descriptive summary are generally covered with either a lowland broadleaved hill forest or the montane forests. Valleys have generally been developed for a variety of farming purposes, while the forests are harvested for a wide range of non-timber products. However, any significant account of biodiversity must be dealt with at a regional level (below).

Nakanai

5^{o} S – 6^{o} S, 151^{o} E – 153^{o} E
We need a map that shows proposed boundaries clearly.

Criteria met

(i)	(ii)	(iii)	(iv)	(v) √	(vi)	(vii) √	(viii) √	(ix) √	(x) ?

Description

The Nakanai Mountains is an area of outstanding natural beauty on the Island of New Britain, Papua New Guinea. To the north the mountain range is dominated by a group of spectacular volcanoes. To the east the Kol Mountains and to the west the Kapiura – Ania Divide which divides the Nakanai Mountains from the Whiteman Range.

The coastal regions are of exceptional natural beauty and exhibit raised coral reefs and terraces up to 200 meters above sea level with numerous pure white coral sand beaches fringed with palms. There are a number of ecologically important Mangrove swamp forests. Estuarine Crocodiles and Leather Back Turtles inhabit the coastal waters along with a vast variety of marine species. The pristine and biologically important reefs lie close to shore with a huge diversity of coral forms and marine life.

The mountains range in altitude from sea level to 2185 meters and are predominantly covered by primary tropical rain forest of lowland and montane types. A vast range of both flora and fauna has been identified; many are endemic to New Britain and are found nowhere else on earth. This is only a small proportion of the estimated total and no doubt there will be thousands more species identified with further research. Many will be new to science with the distinct possibility of pharmaceutical or other value.

The geological history covers a period of 43 million years and the mountains exhibit rapid uplifting, some of the highest recorded. The majority of the mountain range is a karst landscape of limestone up to 1.5 kilometres in thickness, deposited over a period of 17 million years. The limestone regions contain numerous white water rivers

situated in spectacular one kilometre deep gorges. Large rivers can be seen issuing from caves as beautiful waterfalls from high above river level. There are many massive sinkholes with collapsed dolines up to 400 metres deep and 500 metres in diameter. At the base of the dolines some of the worlds largest underground rivers flow at over 20 tons of water a second in caves of outstanding natural beauty and of immense proportions.

The caves are of international importance and are unique as they are considered to be among the most active river caves in the world. They also represent some of the most technically difficult caves in the world to explore. Muruk Cave is 17 kilometres long and 1178 metres deep, the deepest cave in the southern hemisphere and one of the most beautiful 1000 metre deep caves in the world. The entrance pitch of Nare is one of the most impressive known being 250 metres deep with a massive river flowing along the base into one of the largest river passages in the world. Minye Cave possesses one of the biggest pitch entrances known at 410 metres in depth. At the bottom, a 15 cubic metre a second river roars into a large cave.

Kavakuna is also a giant doline with its 392 metre deep entrance pitch. One side is not vertical so this cave is suitable for adventure eco-tourism. Bikbik Vuvu, Liklik Vuvu, Gamvo, Ka 2, Arcturus and Kururu also possess amazing underground sceneries. The Nakanai underground wealth is not yet fully explored so the potential for further important discoveries is huge. The area is an asset for future generations.

The opportunities for cultural, adventure and nature tourism are unparalleled with trekking, caving, diving and many cultural activities. The cultural significance of the indigenous clans is a vital and integral part of the Nakanai Mountains. Their traditions and beliefs are as important as the biodiversity and caves of this unique part of the world.

Justification

Despite massive social change in Papua New Guinea, the indigenous communities of the Nakanai have managed to maintain most of their traditional beliefs (concurrently with having generally adopted the Catholic faith) and their social behaviour patterns remain largely intact.

The Nakanai certainly has many superlative natural phenomena, represented principally by the immense dolines, giant rivers, and spectacular caves as briefly described above. These are the epitome of what have become recognised as high-energy cave systems and so represent absolutely outstanding examples of the Sublime.

Biodiversity

As with so many of the isolated areas of Papua New Guinea, the Nakanai is unique in its geological evolution and its biodiversity. Although the vegetation has not yet been adequately studied, it is particularly rich in epiphytic species and is considered of high biological importance. There are at least eight species of endemic or near-endemic mammals, and at least four species are recognised as endangered. Similarly, there are 22 endemic or near-endemic species of birds, including eight that are recognised as

threatened. Over 20 new species of troblobitic or stygiobitic fauna have been collected from the caves, although few of these have yet been named and described.

Assurances of authenticity or integrity

The ranges and plateau have only a very sparse human population, with small villages generally on the lower lands. Various areas of flat or near-flat land are used for cultivation, but then once harvested are left to lie fallow until secondary forest is re-established. Some other disturbance results from natural causes such as earthquakes or landslides. This, one can say that the natural forest has remained very much in its original but dynamic and constantly changing state.

Comparison with other similar properties

Although as already emphasized, the Papua New Guinea environments must be recognised as distinctive, one can make superficial comparisons with a few World Heritage properties. Gunung Mulu (Malaysia), Thung Yai Hua Kha Kaeng (Thailand) and Phong Nha Ke Bang (Vietnam) each have large but morphologically distinct cave systems with a rich but structurally distinctive forest on the surface. Aerial reconnaissance suggests that the closest comparison lies in a totally unexplored region of Halmahera in Papua New Guinea.

Muller Plateau

5^{o} S – 6^{o} S, 142^{o} E – 143^{o} E

Criteria

(i) (ii) (iii) (iv) (v) (vi) (vii) √ (viii) √ (ix) √ (x) ?

Description

The Muller Plateau has, even in comparison with other Papua New Guinea sites, a very complex geological history and structure. The karst occurs in the Cretaceous Ieru formation, the Oligocene-Miocene Darai Limestone and a series of younger marine sedimentary rocks with some volcanic and alluvial deposits of Pleistocene or even Holocene age. Each of these has a diversity of interbedded limestones, siltstones and mudstones.

The whole area has been subject to faulting and folding as a result of continuing tectonic movements. At the same time, joints have often been enlarged by the heavy rainfall of the region and so added to the complex structural arrangements. In turn, the underground hydrology reflects this complexity with a network of branching distributaries many of which may later coalesce into major drainage channels.

The overall result is a very complex surface landscape with many caves, of which the two major systems are long and deep complex networks. Atea Kanada has been surveyed to 35 km. and Mamo Kanada to 55 km, but with many unexplored areas

remaining. While parts of these have the large high-energy rivers that characterize other areas, there are also high-level tunnels that no longer carry streams and so provide lower energy areas. This has in turn created an environment that has fostered the genesis and evolution of a rich invertebrate fauna.

It also provides areas which have yielded palaentological and clastic deposits which again will both further our understanding of the karst history. .

Biodiversity

The Plateau is extremely difficult of access, and generally uninhabited. There have not been any systematic surveys of the biota. We only know that the montane forests of the Central Cordillera (within which the plateau is located) have some of the most diverse biotic communities of the country.

Justification

The major caves of the Plateau are again particularly spectacular and challenging and very adequate demonstrate the sublimity phenomenon upon which this nomination is based. The caves are also quite distinctive in their complexity and multiple level systems and contain a great deal of evidence that will enable elucidation of their own genesis and evolution.

The invertebrate fauna of these caves is the richest discovered to date in Papua New Guinea. Many species remain undescribed and un-named, but it is clear that the fauna as a whole will provide an excellent opportunity for evolutionary and ecological research.

Assurances of authenticity or integrity

The Plateau remains uninhabited and is undergoing little change other than that which is natural and endemic to the geological instability of the country.

Comparison with other similar properties

It is difficult to identify a World Heritage property that is genuinely comparable with this (nor with the neighbouring Telefomin/Hindenberg area which is discussed below). Probably that which most closely approximates is Gunung Mulu (Malaysia), but the geological structure and hence morphology of the karst is totally different, and hence, so is the biodiversity.

Telefomin and the Hindenburg Wall

5^{o} S – 6^{o} S, 141^{o} E – 143^{o} E

Criteria met

(i)	(ii)	(iii) √	(iv)	(v)	(vi)	(vii) √	(viii) √	(ix) √	(x) √

Description

This area has a spectacular surface landscape, largely because of the dominating Hindenburg Wall – the northern scarp of the range, rising to a maximum level of some 1500 m. It is rich in both major surface karren and caves, some of an immense size.

Two distinctive characteristics make this an especially significant area. One is that the caves have long been used as shelters by the regional inhabitants, and contain both rock art and many of the artifacts of everyday life. The second is that some of the troglobitic species discovered have evolved since the last incursion of the sea from a marine ancestry. It again symbolizes the complexity of the country's history in that these species occur only in a site so far distant from the current shorelines.

However, the description and analysis of the area as a whole is fragmented. The geological literature is focused primarily on economic geology; geomorphology is variously described and discussed, but this demands synthesis and summary; descriptions of the karst are generally narratives of exploration, and again a synthesis is necessary.

Biodiversity is particularly rich with a mixture of high altitude grasslands and wet montane forest with high levels of endemism. However, more detailed analysis is required to distinguish records from the Star Mountains area of Telefomin, the Muller Plateau and the Central / Eastern Highlands.

Justification

The grandeur of the area and the challenge presented by the caves are both clearly outstanding. But one must particularly recognise the archaeological and biodiversity values as distinctive, even in Papua New Guinea.

Assurances of authenticity or integrity

Much of the area is uninhabited; most of the caves have only been entered by a single expedition. It is in a less disturbed state than virtually any other part of the country.

Comparison with other similar properties

See above under the Muller Plateau.