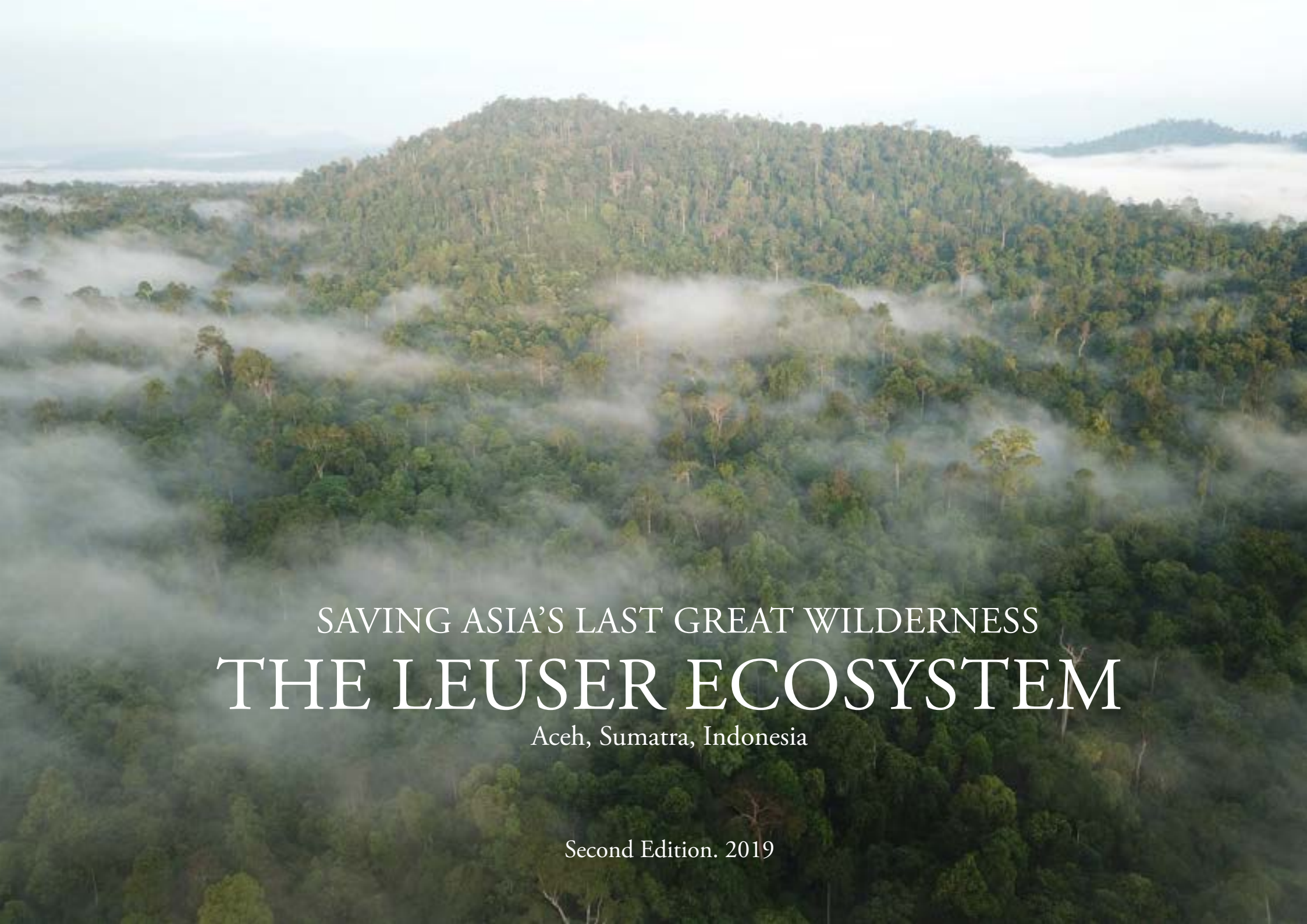


SAVING ASIA'S LAST GREAT WILDERNESS

THE LEUSER ECOSYSTEM

Aceh, Sumatra, Indonesia

Second Edition. 2019

SAVING ASIA'S LAST GREAT WILDERNESS

THE LEUSER ECOSYSTEM

Aceh, Sumatra, Indonesia

Text by
Mike Griffiths

Photographs by
Mike Griffiths
The Leuser Conservation Forum (FKL)

Cover Photography by
The Leuser Conservation Forum (FKL)

Design and Illustrations by
Coopers Hill Singapore
Allen Kerton, Bartosz Pawel Majchrzycki,
Dzaki Mustafi, Pocholo Colo Estremos, Vishesh Wanvari

Sponsored by
Jeff Morgan - Global Conservation

For further information regarding The Leuser Ecosystem, please contact
Global Conservation PO Box 29278 Presidio National Park
San Francisco, California 94129 USA
Phone: +1.650.814.2045
Email: jmorgan@globalconservation.org

GLOBAL CONSERVATION

COOPERS HILL

Foreword

In 2011 Jeff Morgan, of Global Conservation, commissioned a short book on the Leuser Ecosystem illustrating its natural beauty and biological richness. The book also identified the threats and covered efforts that were being done to conserve it.

Since this time much has happened. The Aceh Government agency entrusted with Leuser's conservation was dissolved, management was changed and subsequently several tracts of lowland forest were lost. However, on the positive side there has been a steady growth of civil society organizations, working closely with Government partners, and together much has been achieved in conserving and restoring Leuser.

There has been a significant reduction in the poaching of wildlife, illegal logging and forest clearance. Large areas previously under oil palm cultivation have been restored to their natural forest cover and the wildlife is returning. To deal with the potential loss of extremely important areas such as certain river valleys some land has been purchased and will be safeguarded in perpetuity under conservation.

This book is thus an update – a new edition - in which some of the sections dealing with the forests of Leuser are essentially the same but a lot of new information is provided on what is being done to deal with the threats and challenges facing Leuser's conservation. It also includes a section on how investments may help in stabilizing land use, minimize illegal logging, reduce poaching to very low levels, and create a sustainable income stream for conservation.

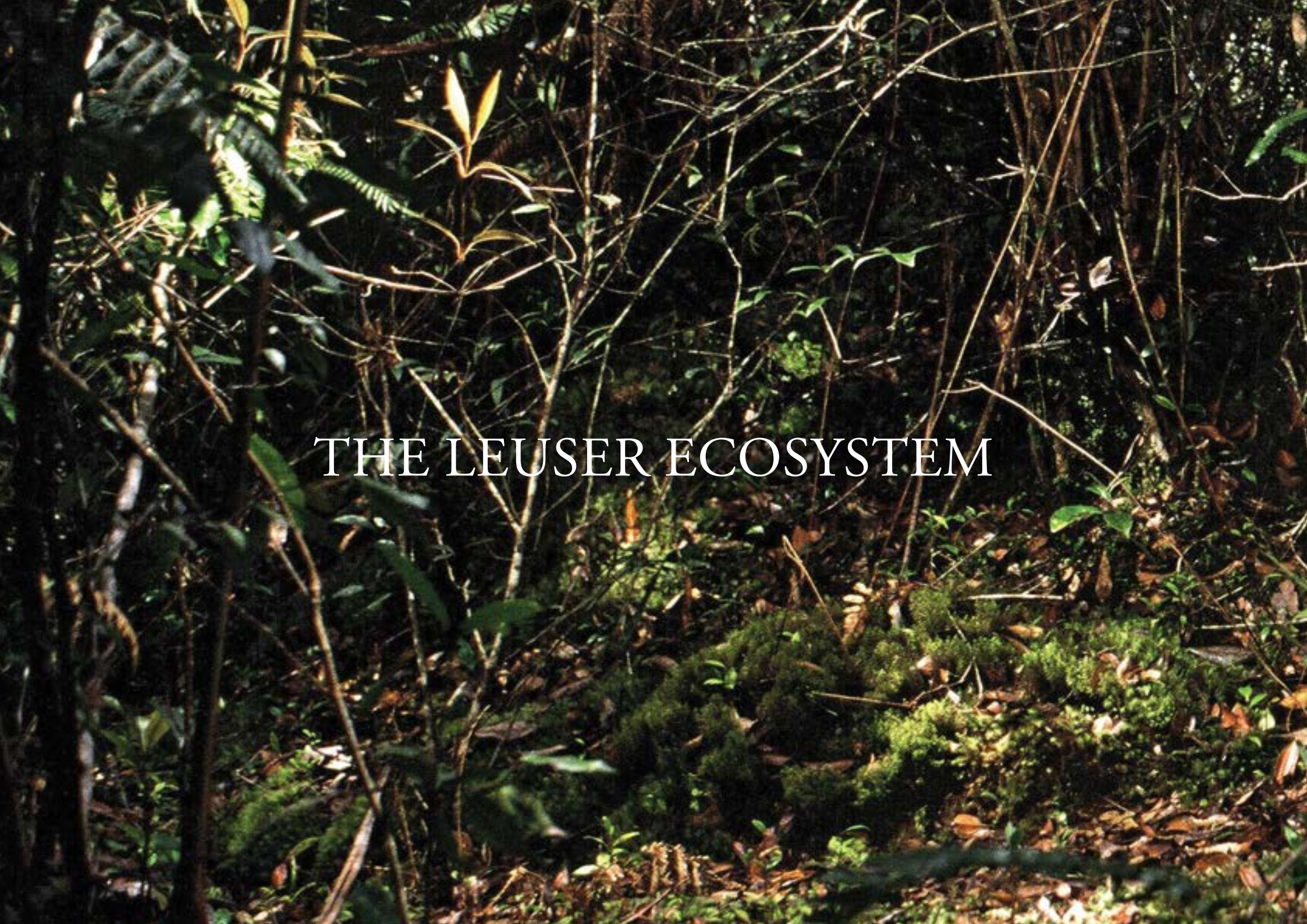
Jeff Morgan should be commended once again for commissioning this new edition. He has consistently supported the protection of Leuser and has persuaded many others to do the same. Gratitude should also be extended to a local NGO, the Leuser Conservation Forum (FKL), which provided many of the new photos for this edition. And the work done by Coopers Hill in Singapore also deserves great credit particularly for the layout and the graphic illustrations that depict difficult concepts and provide a vision for Leuser's future.

The growing commitment of many grass roots organizations in Aceh gives real hope that the future conservation of the Leuser Ecosystem is in good hands and that the efforts to protect it will carry on.

It is hoped that leafing through this booklet will give real hope to the many people who are already helping to support the conservation of Leuser, and inspire more people and organizations to join this great enterprise.

Mike Griffiths. November 2019

Contents


THE LEUSER ECOSYSTEM


Banda Aceh
Penang
Medan
Kuala Lumpur
Singapore

Location

Yellowstone National Park
899,117 hectares

The Leuser Ecosystem
2,600,000 hectares

The Leuser Ecosystem is located at the northern part of the island of Sumatra, in Indonesia. The majority of it (85%) lies within the province of Aceh and the remainder, is in the province of North Sumatra. The total area of the Leuser Ecosystem is approximately 2.7 million hectares. It is difficult to fully comprehend this size, so we have included a graphic comparing the Leuser Ecosystem with the most famous national park in the USA. The graphic shows these two areas drawn to the same scale and illustrates just how large Leuser is, but even at this scale the ecosystem is considered to be the minimum area needed to provide sufficient habitat for the continued viability of populations of large mammals - such as Tigers, Elephants, and Orangutans.

Alpine Meadows

The highest parts of the Leuser Ecosystem reach over 3000 meters in altitude; too high, exposed, and with soils too poor for trees to grow. Instead, the summits of Leuser's highest mountains are covered in alpine herb fields - called blangs in the local language. It is here that we find pitcher plants, which rely on trapping insects to augment their intake of minerals, and colourful ground orchids.

Unlike elsewhere in Leuser, where tall trees form a barrier to sunlight, Leuser alpine meadows are one of the few places were the sun reaches the ground. Here we can find flowers in abundance. Some typical alpine plants found in these regions are Lobelia, Gentiana, Potentilla, Prenanthes, and Oldenlandia.

Despite the limited plant life on these high mountains, large animals - notably the Sambar Deer and the Serow (a cross between a goat and an antelope) are found here. Where such large herbivores roam, the tiger will surely follow. Pug marks of all three of these animals have been found right to the very top of Gunung Leuser, the highest mountain in the Leuser Ecosystem.

Above, Left: This alpine member of the Liliaceae family is found mostly on the summits of the Leuser massif.

Above, Right: Compared with the spectacular flowers of the Lowlands, Leuser's Alpine flowers are mostly small.

Opposite: The alpine blangs of the Leuser Ecosystem have poor soils. Only species that can live in these challenging environments – such as these ground orchids – can thrive here.

Montane Forest

Between Leuser's alpine meadows and the tall forests of the lowlands, are forests with smaller trees, some straight and others gnarled by exposure to the wind. In the higher regions, the trunks and branches of these trees are covered in dense blankets of mosses, which thrive in the almost constantly moist, misty conditions. When walking through these forests, one gets the impression of being in a mythical forest. The mist silently wafts by and walking on the moss makes no noise. If the sun is not shining, few birds sing.

The soil here is also not very rich, but certain flowers thrive - in particular various kinds of Rhododendrons, that are adapted to living in acidic soils. Rhododendrons bring brilliant flashes of colour, to an otherwise soft green world.

While one encounters fewer animals, they are nonetheless here. Bears do well at these altitudes and Deer, Serow and Pigs are also found. Sufficient sunlight reaches the ground to support a dense ground cover of vegetation which in turn provides ideal forage for the very rare Sumatran Rhinoceros. Pheasants of various sorts, including the rare Hoogerwerf's Pheasant, reach their highest densities here and the animals that feed on them - martens, clouded leopard etc are found here as well.

Above: Rhododendrons do well in the acidic soils that prevail in many upland parts of Leuser. For a weary hiker who has seen nothing but green for many days, the explosion of colour on a rhododendron shrub is striking.

Opposite: This yellow Bromheadia orchid is mostly found in the higher altitudes of the Leuser Ecosystem.

Opposite & Above, Left: Leuser is remarkably rich in its diversity of pitcher plants which are found from sea level up to the top of the highest mountains. Because of their ability to trap and digest insects they thrive in areas where soil nutrients are poor.

Above, Right: Where Higlhand forests have been disturbed through landslides or fire, the native pine is the first tree to re-establish itself. And given time a whole ecosystem develops around these trees including the epiphytes clinging high up the pine in this photo.

Above: The Sunda Minivet (this is a male) is fairly common in the mountains of Leuser. Colourful birds are targets of poachers supplying the illegal market.

Opposite: The Serow prefers to live in very rugged terrain where it is reasonably safe from predators. This photo is unusual in that it shows a serow along a river in relatively benign topography.

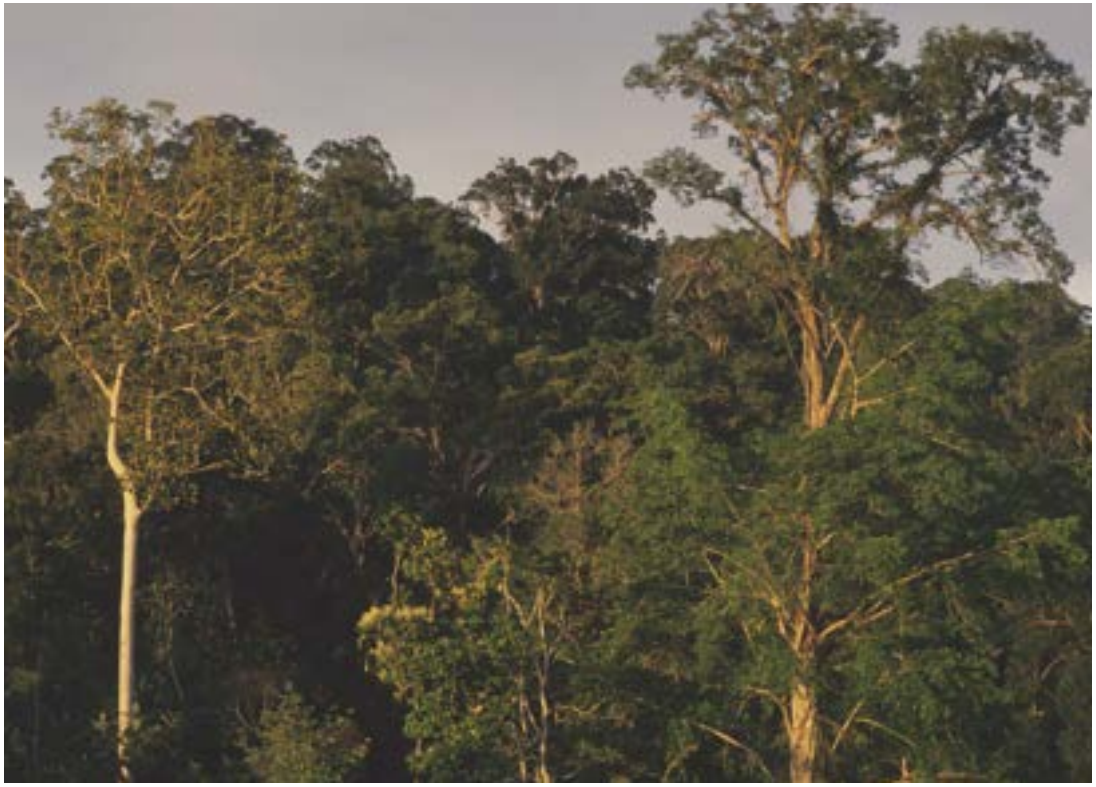
Lowland Forest

When one thinks of tropical forests, one probably imagines huge trees linked together with suspended vines and spectacular animals, both in the trees and on the ground. These are the defining features of lowland forests and it is these forests that are now very rare, on account of their valuable trees and because they often grow on land that is ideal for agriculture. In fact, Leuser has more lowland forest than the rest of Sumatra combined. As a result, Leuser is able to support viable breeding populations of Elephants, Tigers, Orangutans, Gibbons, Bears and Clouded Leopards and may well be the last place in Southeast Asia to do so for all these species.

The dominant trees of the lowland forest are, like the rest of Southeast Asia, Dipterocarps - literally meaning, two winged seeds. These seeds are like giant sycamore seeds and spin to the ground when they are ready for dispersal. In addition to the Dipterocarps, there are numerous species of oaks (all with their own shapes of acorns), hardwoods and many other species, too numerous to mention. The number of different trees in a hectare of lowland forest in Leuser can surpass two hundred. That is a graphic indicator of the rich diversity for which tropical forests are renowned. With so many great trees it is easy to overlook the vines or the lianas as they are more correctly known. These may produce, in total, a greater mass of foliage than the trees themselves and almost certainly provide a greater mass of fruit. They also provide critical walkways that apes, monkeys, squirrels and many other arboreal animals use to move through the forest.

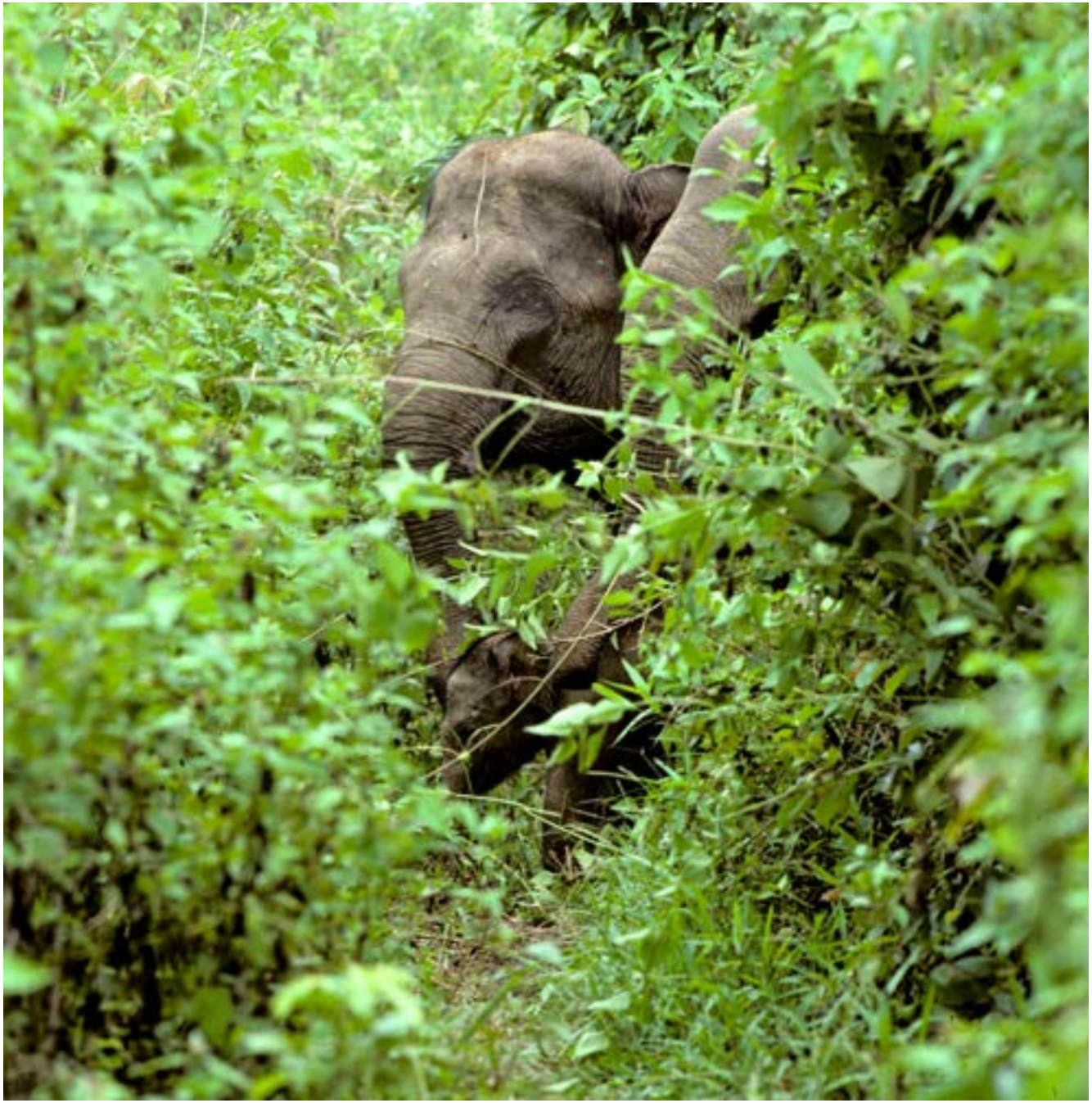
It is in the lowland forest that we find Elephants, Orangutans, and Gibbons, exclusively. Also present are the Tigers, which move throughout the Leuser Ecosystem and at least four other species of wild cat - Clouded Leopard, Golden Cat, Marbled Cat and Jungle Cat. In addition to the Sambar Deer, there are three other species of deer - the Barking Deer, the Greater Mouse Deer, and the Lesser Mouse Deer - the last being about the size of a rabbit. Leuser has seven species of hornbills, most restricted to the lowlands. The forest also has its own version of peacock - the Great Argus Pheasant - said to have the longest feathers of any bird.

If the wildlife is not spectacular enough, Leuser has two giant flowers - the meter high Amorphophallus, which can smell faintly like rotten carrion, and the Raffelesia, said to be the biggest flower in the world. The lowland forests of Leuser also have wild varieties of many important species of commercially grown fruit - mangoes, mangosteen, durian, rambutan, banana and citrus. The lowland forests of Leuser are thus very important and must be protected at all costs.



Above: The morning sun casts a golden hue on the lowland forests in SW Leuser.

Opposite: Dipterocarp trees dominate the lowlands of the Leuser Ecosystem. This picture was taken before the logging boom of the 1990s emptied many of the best stands for timber. However the forest is now regenerating and similar stands will soon grace Leuser's lowlands again.



Opposite: Two wild elephants, part of a herd of forty individuals, cautiously move to a nearby river in NE Leuser to take an evening bathe.

Above, Left: Sun Bears are still reasonably common in Leuser. In the highlands, the bears augment their diet with amber and beetles.

Above, Right: Barking Deer are one of the key prey species of the Tiger and as a result they are extremely wary.

Photo Sequence: At midday orangutans (Pongo abelii) take time out to rest. These three photos records a female orangutan laying down to rest in a tree near the Alas River that bifurcates Leuser.

Opposite: Of the predators of Leuser the tiger is the largest, and Leuser is one of the last expanses of forest that is able to support a potentially viable population.

Above, Left: The Dhole, or Asian wild dog, moves in small family groups and thus can prey on both small and relatively large animals.

Above, Right: Capable arborealists, Clouded Leopards have coat patterns that make excellent camouflage and this enables them to prey on primates.

Above, Left: The insects of Leuser are spectacular, diverse and largely understudied. This slate blue Phasmatidid is seen here on a peppermint tasting wild Sirih leaf.

Above, Center: Leuser has many kinds of Lizards. Even with their sometimes striking colours they are easy to miss, as they pose motionless on branches or in the undergrowth.

Above, Right: Even some of the spiders of Leuser have bizzare forms. This Gasteracantha spider is one of the most extreme examples, with its long brittle spines extending from it's carapace.

This Page: This Long-Nosed Whip Snake is fairly common in the Leuser Ecosystem. It preys on small animals including frogs and lizards, but is not dangerous to humans.

Opposite: The Sumatran Rhino is the most endangered of the world's rhinos and huge efforts are now being made to breed them in captivity in the hope that eventually their progeny may be released in to the wild.

Above, Left: During the dry season in Leuser, the rivers decrease in depth and Thomas Leaf Monkeys come to the river's edge to feed on the green algae that clings to the boulders.

Above, Right: The Slow Loris is the only primate species in Leuser that is nocturnal. During the day it sleeps in holes in tree trunks, where it is sometimes discovered and eaten by Orangutans.

Above, Left: There are numerous varieties of “ginger” plants in the forests of Leuser (particularly the lowland forests). This species of the Zingiber family is just one example of the spectacular colours these flowers can have.

Above, Right: Not yet in full flower this Amorphophallus titanium, sometimes referred to as a ‘carrion flower’ on account of its smell, is the tallest flower in the world – reaching more than one meter in height.

Right: The Raffelesia flower is considered to be the biggest flower in the world. It is parasitic on a forest vine from which it draws its sustenance. The smell of this Raffelesia species R. arnoldi attracts flies, which may play a role in pollination.

Above: The coral fungi remind one of flames emanating from the ground.

Opposite: The fungi of Leuser come in a spectacular array of forms and colours. The bracket fungi on the left are found on rotting logs.

Swamp & Coastal Forests

Second only to the lowland forest in terms of diversity, the coastal fresh water swamps of the Leuser Ecosystem produce deep layers of peat, which accumulates from the steady fall of leaves, branches and trees into the acidic swamp waters. These rich deposits of organic material are a rich store of carbon and contribute to the reduction of the build-up of carbon dioxide in the atmosphere.

Despite the rather special conditions of the peat swamps, animals thrive here. Tigers and clouded leopards are frequently sighted, pigs and deer feed on nutritious roots and swamp plants, and the waters support high densities of fish, amphibians and reptiles including crocodiles and pythons. What is outstanding about the swamps from a visitor's point of view, is the relative ease of observing Orangutans and the two smaller apes, the black Siamang and the White Handed Gibbon. The reason for this is the trees do not tend to grow so high in the swamps and thus the large primates are closer to the ground. Orangutans reach their highest densities found anywhere in the world here and one of the reasons for this seems to be their ability to make tools. They use these to extract difficult-to-access food sources, such as termites, honey and the insides of spiny fruit. The older Orangutans teach the younger ones how to make the tools and as such it can be said that the orangutans of Leuser's peat swamps have a culture. Rare birds also find a home in these swamps - the White Wood Duck and the Masked Finfoot are both critically endangered and the conservation of the peat swamps in the Leuser Ecosystem is even more important for their continued survival.

The peat swamps of the Leuser Ecosystem border Aceh's west coast in three places. In fact, the total length of unspoiled coastline bordering these swamps is around 110 kilometers. These coastal fringes are the home of salt tolerant trees such as Casuarina Pines. A walk along these coastal stretches is however interrupted by numerous steams of clear brown water that emanate from the adjacent swamps. The effort also provides stunning glimpses of the bird life - Hornbills, Kingfishers and birds of prey are common. In the evening, dense clouds of rainbow coloured Pigeons can be seen flying home to roost.

Above & Opposite: The Leuser Ecosystem contains over 100 km of coastline, all bordering the Indian Ocean. Some beaches are important nesting areas for sea turtles.

Left: The gregarious pink-necked green-pigeon lives in the lowlands and formally, clouds of these birds would fly in to roost at dusk. Heavily hunted, they are slowly recovering with increased protection.

Above, Left: The salt water crocodile also uses the beaches inside the Leuser Ecosystem as basking areas. This individual was photographed near the coastal fringe of the Kluet swamp.

Above, Right: Thomas Leaf Monkeys as pictured here are creatures of the lowlands, but in the peat swamps of the Leuser Ecosystem, the Dusky Leaf Monkey significantly outnumber them.

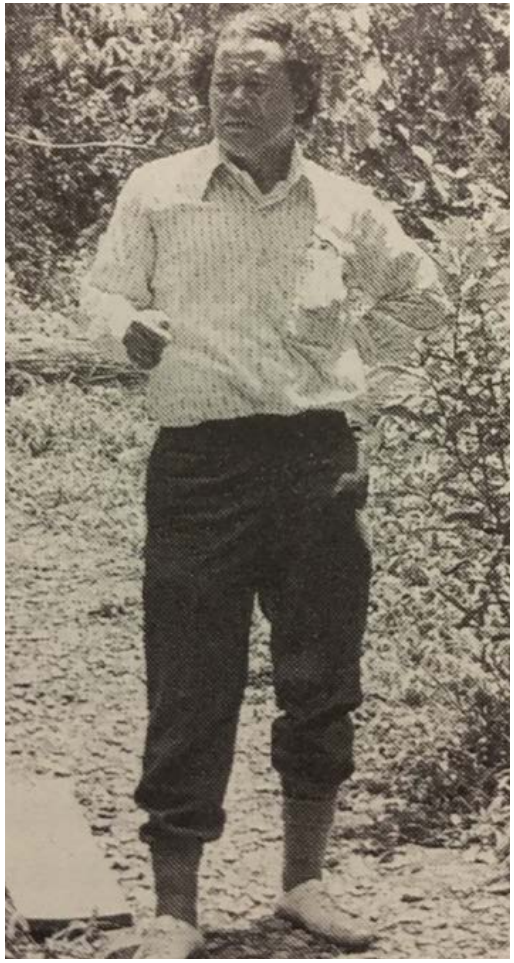
CONSERVATION HISTORY

The Early Years

The Beginning: Unlike most other conservation areas in Indonesia which were initiated by the colonial government or the national Government of Indonesia, the desire for the Leuser Ecosystem to be conserved came directly from the people of Aceh - in particular the Alas and Gayo tribal leaders. They were concerned that their sacred mountains and forests would be exploited for minerals and so they made constant efforts from 1927 to 1934 to have the area set aside for conservation.

Eventually, in 1934, with the help of a Dutch geologist, F.C. van Heurn, the colonial government gave formal protection status to the mountainous highlands in the Leuser region. However, the rich lowland forests that were part of the original request were left out. Again with the help of Van Heurn, in 1936 the Kluet peat swamp was added to the original conservation area.

After Independence: After independence, there was a lull in conservation efforts, until 1980 when the area originally given protection under the colonial government was proposed as the Gunung Leuser National Park. A national park body was set up to protect the area and to perform the necessary steps to give the area full national park status. Partly because of lack of funding and partially due to political changes, the procedures for full national park status were stalled for a long time. However, the work of Dr Herman Rijksen, Ir Poniran and others succeeded in adding important additional areas to the conservation complex. This was seen as a very positive development.



Above, Left: From 1927, F.C Van Heurn acted on behalf of the Acehenese leaders by lobbying the colonial government to conserve Leuser's forests.

Above, Right: Walman Sinaga was the first conservation director in charge of the proposed Gunung Leuser National Park.

New Commitments

The 1990s: The original vision for the conservation of the whole of the Leuser Ecosystem had to wait for the establishment of the Leuser International Foundation, a non-profit organisation formed by distinguished Acehnese leaders, who were committed to fulfilling the original vision of the Gayo and Alas leaders who initiated it over seventy years earlier. Eventually in 1998, the President of Indonesia declared the Leuser Ecosystem to be an indivisible conservation area that must be fully protected. The decree included an attached map, showing the extent of the Leuser Ecosystem that included the important lowland forests that were part of the original request made by the local leaders in Aceh from 1927.

Conservation areas in Indonesia are managed from the national level, under the Directorate General of Forest Protection and Nature Conservation. Because Aceh was so far from Jakarta, the Leuser Ecosystem was sometimes not well managed and was consistently underfunded. More seriously, the area did not benefit from the political and administrative attention that it deserved. The result was a net loss of forests that was only slowed down by some heroic work carried out by Minister Djamaluddin of the Department of Forestry, who cancelled several logging concessions and applications for oil palm plantations in the conservation area and produced a decree recognizing the Leuser Ecosystem as a clear entity.

Left, Top: In 1994 A.R Ramly (A retired Major General) established the Leuser International Foundation to promote the conservation of the Leuser Ecosystem, where he spent his childhood.

Left, Bottom: Bustanil Arifin (who along with A.R Ramly prevented the recolonization of Aceh after WWII) was a founding member of the Leuser International Foundation

Above, Right: The official opening of the European Union funded Leuser Development program, 1995.Standing to the left of the EU Ambassador are three senior Indonesian Ministers.

End of The Aceh Conflict

From 1999 to 2004 Aceh was engaged in a major conflict between the Indonesian military and a local separatist movement. This ended with the Asian Tsunami and the subsequent peace negotiations. Peace was formally concluded in 2005 in Helsinki, Finland, and subsequently incorporated in a national law (Act No 11, 2006), which spelled out Aceh's responsibilities and powers. One condition in this law was that the management of the Leuser Ecosystem in Aceh would be carried out by the Provincial Government of Aceh.

The Aceh Government, with the approval of the Aceh Parliament, in-turn created a dedicated body - the Leuser Management Authority (BPKEL) - to undertake this work. The Leuser Management Authority had the powers of a government agency, but was manned by professionals.

This Page, Above: Prior to assuming the chaimanship of the Leuser Management Authority (BPKEL), Fauzan Azima was a regional military commander in the Aceh independence movement.

Beyond 2012

A change in the political climate in Aceh and perhaps as a reaction to the effectiveness of BPKEL in conserving Leuser, coupled with a lack of clear understanding of the importance of the Leuser Ecosystem for the development of Aceh, BPKEL was dissolved in 2012.

In BPKELs place the Leuser Ecosystem is now managed by numerous agencies and bodies: the Aceh Forest Agency: a National Park Management Agency (BTNGL): the Wildlife Protection Agency (BKSDA), the Watershed Management Body, and five local Forest Management Units (KPH). With so many agencies having management responsibility, the conservation of the Leuser Ecosystem went into serious decline and the damage was only stemmed with the rise of several committed local NGOs who have since dedicated their efforts to the protection and restoration of the Leuser Ecosystem. Among these are the two Aceh based NGOs: the Leuser Conservation Forum (FKL) and the Aceh Forest, Nature and Environment Organisation (HAkA). Others also exist in North Sumatra such YEL and OIC, and at the national and provincial levels the NGO, WALHI, continues to advocate for conservation

This Page, Above: T.M Zoel has dedicated his adult life to conservation and to the people who depend on it. He is currently a leading activist promoting the conservation of the Leuser Ecosystem.

VALUES OF THE LEUSER ECOSYSTEM

Water Supply

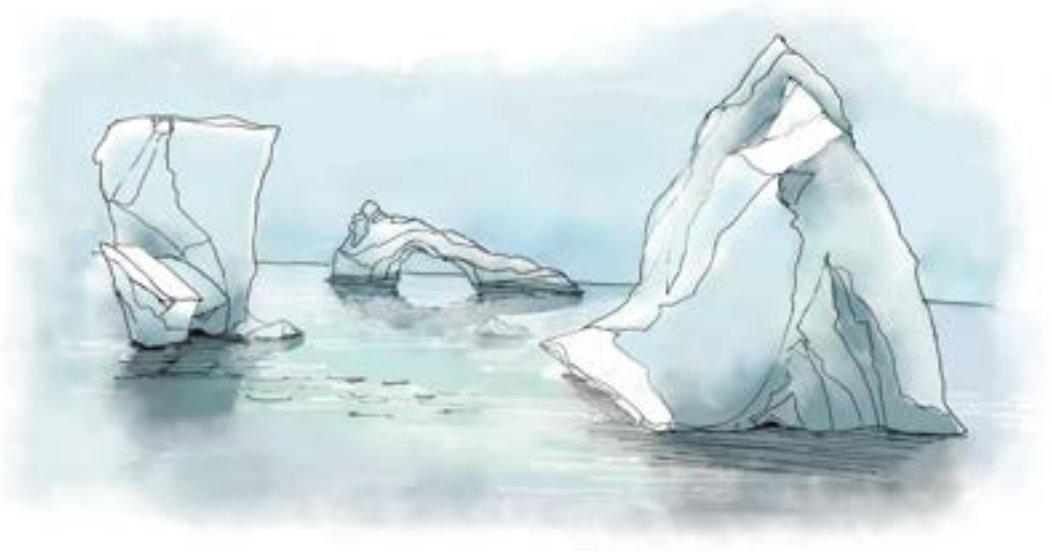
Probably the most important resource that flows from the Leuser Ecosystem is water which supplies the needs for four million people in the surrounding areas. The mountains catch the rising moist air, which condenses and falls as rain. The rain then falls gently through the layers of the forest and then either runs into streams and rivers, or else percolates into the soil, eventually emerging as springs to feed into the water systems at lower altitudes.

What makes forested water catchments so important is that they regulate water flow. Without forest and a soft soil covered in leaves, all water would flow directly over the ground and into streams. Too much rain and there will be flooding downstream. Too little and the streams will run dry. On the other hand, with a forested catchment, the water flow is slowed down as the water gently flows through the leafy forest floor, or percolates underground to charge the ground water. This is the reason that if the forests are intact, water flows regularly all year round, even at the height of the dry season and this is important to ensure that there is sufficient water for irrigation, during the peak growing season for rice - the staple crop in most of Indonesia.

This Page, Above: Almost all rice cultivation in Aceh uses irrigation. The best way to assure a continuous supply of water throughout the year is the maintenance of well forested water catchments.

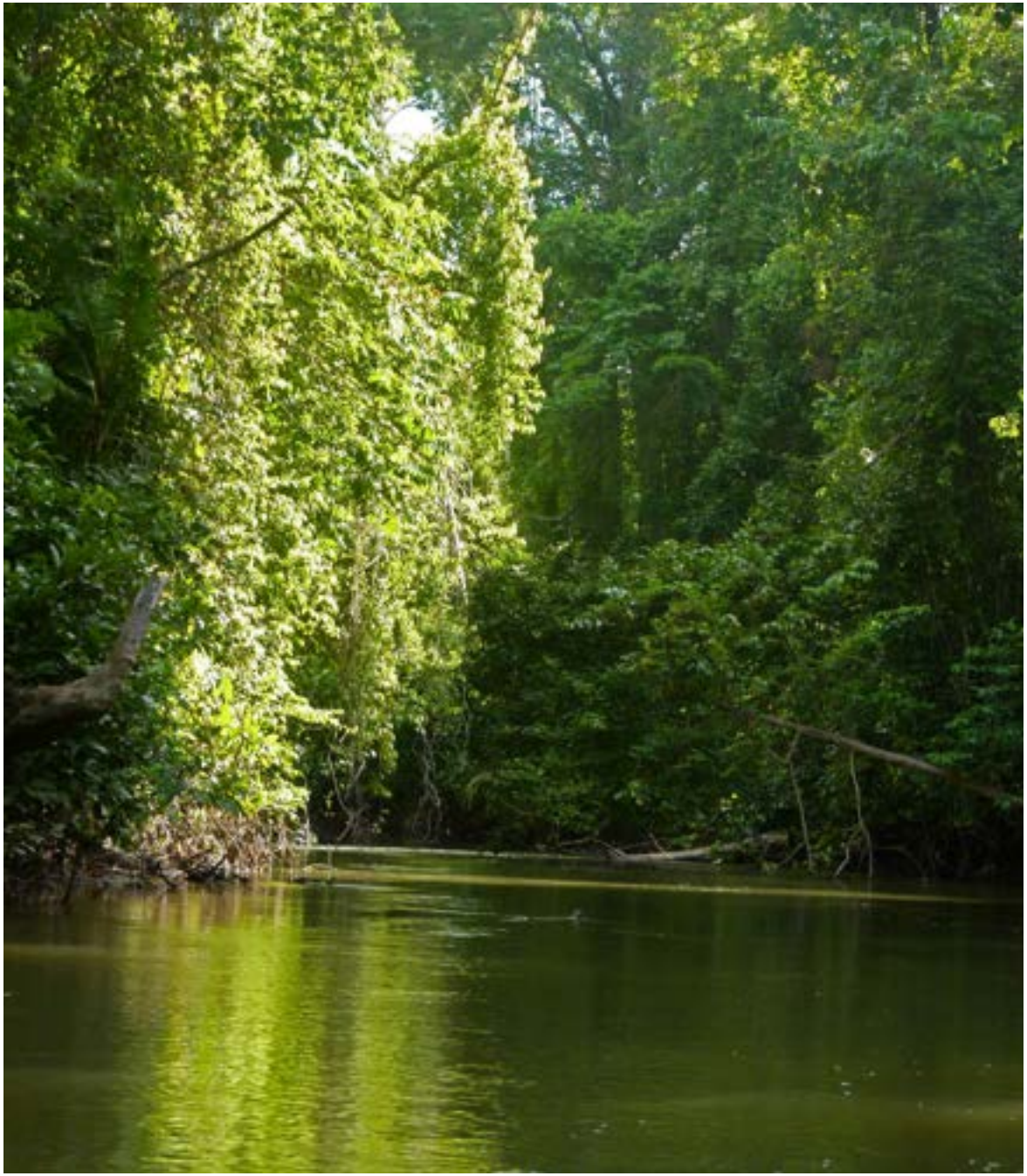
Opposite: As well as being important habitats for fish (a significant protein source for local people), rivers provide water for domestic, industrial and commercial consumption.

Global Climate Change Mitigation



The three peat swamps in the Leuser Ecosystem cover some 160,000 hectares and hold billions of tons of peat and its high concentration of carbon. Every year as trees die and fall, leaves fall and branches crash to the wet ground, the carbon steadily builds up and is never released - for here in the water logged ground, no wood-digesting termites and fungi can live. The peat swamps thus serve to extract carbon from the atmosphere. On the other hand, if the peat swamps are converted to agriculture and the peat is drained, there is massive oxidation and the carbon moves in to the atmosphere, contributing to the build up of carbon dioxide - a major greenhouse gas.

It is the build up of greenhouse gases that are said to be contributing to global warming. So in a sense, the conservation of Leuser's peat swamps mitigates to some extent global climate change.

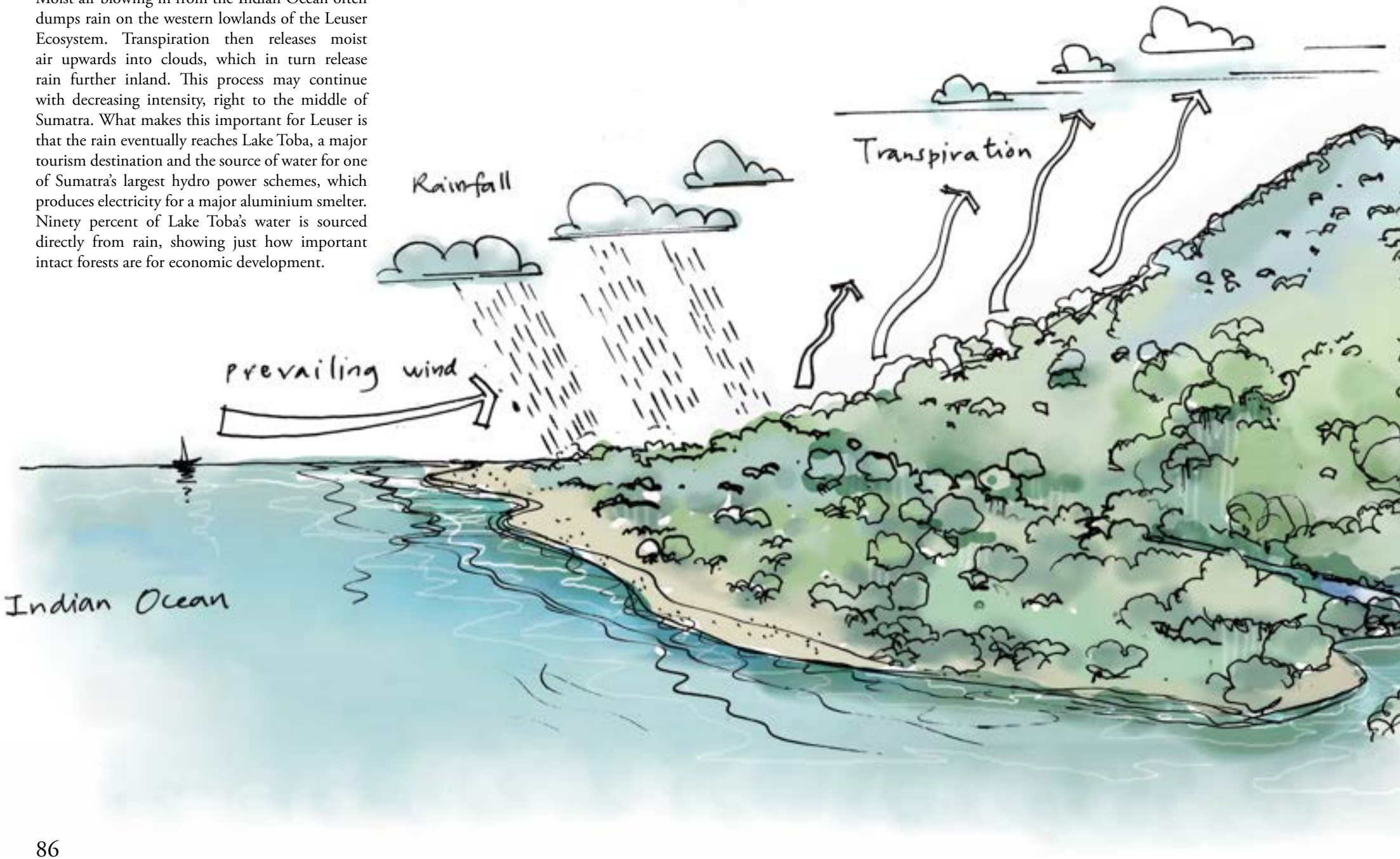


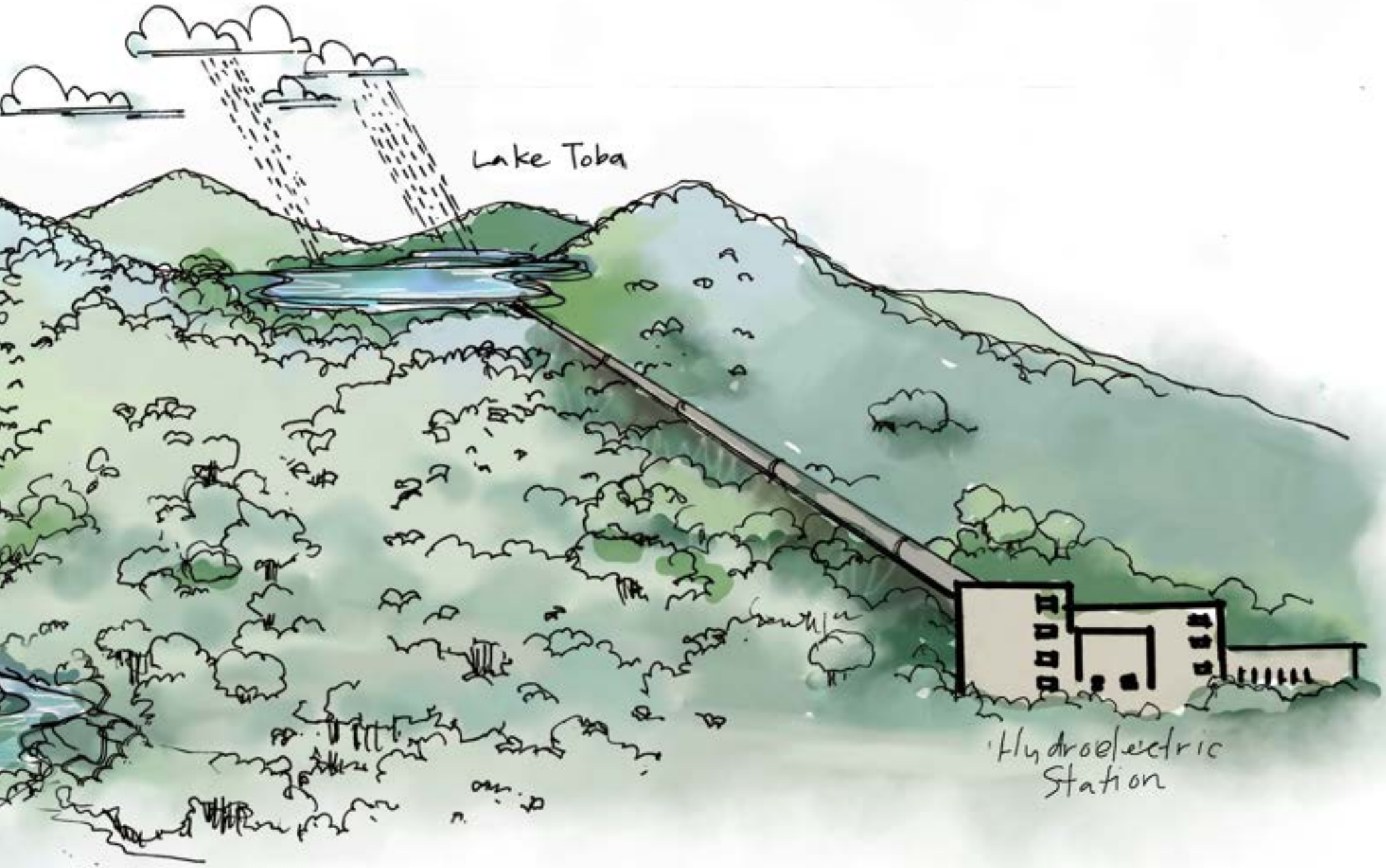
This Page & Opposite: The forests of Leuser absorb huge amounts of carbon from the atmosphere. But the most important stores of this carbon are the peat swamps where the carbon rich forest debris of leaves, branches and tree trunks are not decomposed, or consumed by termites.

Local Climate Regulation

A visitor to the well forested fringes of the Leuser Ecosystem is sometimes surprised to find that even at altitudes near sea level, the temperature can be fresh and comparatively cool. This effect is partly due to the evaporation of moisture from the leaves of all the trees. Such evaporation is a very efficient cooling mechanism and a single tree can have the same effect as several domestic air-conditioning units.

Another important impact the Leuser Ecosystem has on local climate is its function as a "rain pump". Moist air blowing in from the Indian Ocean often dumps rain on the western lowlands of the Leuser Ecosystem. Transpiration then releases moist air upwards into clouds, which in turn release rain further inland. This process may continue with decreasing intensity, right to the middle of Sumatra. What makes this important for Leuser is that the rain eventually reaches Lake Toba, a major tourism destination and the source of water for one of Sumatra's largest hydro power schemes, which produces electricity for a major aluminium smelter. Ninety percent of Lake Toba's water is sourced directly from rain, showing just how important intact forests are for economic development.




Lake Toba
Hydroelectric
Station

Germplasm

Many commercial fruits have been bred for long periods and the genetic diversity between the cultivars is actually quite limited. A prime example is the Cavendish Banana, which constitutes about 98% of the world market in this fruit. All the bananas are essentially clones and have been bred to be seedless, large, and reasonably sweet. Unfortunately a disease called Blood Disease, which hit Sumatra in 1992 is decimating the commercial banana crops throughout the island, but in the Leuser Ecosystem, there is an immune wild variety that could be fairly quickly interbred with the Cavendish bananas, to produce a disease resistant stock and in doing so to improve the lives of hundreds of thousands of farmers.

What is true for bananas is also true for durians, mangoes, citrus fruit, rambutans and many other commercially important fruit in South East Asia. This store of rich native genetic diversity is sometimes referred to as Germplasm.

Left: There are six types of wild Durian fruit in the Leuser Ecosystem. Most are similar to commercially grown species, but some have much longer spikes, while others are coloured red.

Above, Left: This wild nutmeg is one of two varieties found in Leuser. Domestic nutmegs might benefit from being hybridized with wild types to prevent disease.

Above, Right: Mangoes of many kinds are found in the lowlands of Leuser. Here again these important wild varieties might strengthen the domesticated varieties.

Natural Beauty

Natural beauty requires no explanation and Leuser has it in abundance. Long coastlines with not a house in sight, clear-water rivers flowing through forested hills, high volcanoes, a high-altitude plateaus, 3000 meter high mountains, alpine herb fields and spectacular forests.

Because so much of Sumatra was once covered in forests, people have until recently taken it for granted and even pushed for forest clearance, to bring order to a “savage” scenery. Today, this attitude is changing and the young - especially those in the cities - are demonstrating a craving to visit wild areas and some natural landscapes, during holidays or spare time. Some want to scale mountains, to walk in the forest and observe wildlife while others come to sit beside a river and maybe take a swim.

This craving for natural beauty in a country that is already undergoing a major demographic shift, from the country to the cities, will certainly increase and it is the responsibility of Indonesia’s leaders to ensure that something remains of its spectacular natural heritage.

Above, Left: There are many species of wild bees in Leuser. The lobate hives visible hanging from the branches of this Tualang tree are rich in honey and much sought after by honey collectors and bears alike.

Above, Right: Some anthropologists believe that the common ancestor of hominins and chimpanzees was something like the orangutan in that this tree-living species displays basic elements of bipedalism.

Opposite: Two bull elephants square off against each other. This sparring is a key skill will become important in selecting which males become dominant and have access to the females.

Opposite: Tourism in a rain forest must be handled differently than the savannahs of Africa for instance. Elephant safaris may offer better opportunities to see wildlife in the confines of the forest.

Above, Left: The rivers provide ample opportunities for rafting, and wildlife viewing. To encourage this business, the surrounding wild landscape should be maintained intact.

Above, Right: Bird watching is another activity which is drawing increasing numbers of people to the forests of Leuser. The bird pictured here is a Rhinoceros Hornbill.

THREATS & RESPONSES

General Overview

Despite the considerable threats to the Leuser Ecosystem, there is also a lot of hope. Since its official recognition as a conservation area in 1998 all legal logging has stopped, large plantation development has been limited, and there has been a growing level of support by locally-based NGOs for its future conservation. However there is still great pressure to construct roads through Leuser's last great lowland forests, and large hydroelectric dams are currently planned. Encroachment continues to be a problem. Against this, the Aceh based NGOs are pushing the private sector to take a more active role in transforming logging concessions into restoration areas, and to purchase small but important pockets of land that are vitally important for conservation. The private sector may also become more involved in establishing appropriate tourism facilities in the Leuser Ecosystem, and some parties are interested in implementing carbon programs as a way of demonstrating that forests standing are worth more than those that are felled. In the pages ahead, some of the major issues are discussed along with solutions to deal with them.

Roads

Rainforests are difficult to penetrate, but roads change this situation by providing easy access for poaching, opportunities for illegal settlement, and accelerated forest clearance. They are thus devastating to many species of wildlife. Once roads have been built, they are very difficult to deconstruct and the impact on forests tends to continually expand. This is the case not only in Indonesia but in all rainforests over the world.

A secondary impact is that roads themselves are barriers to some 70% of rainforest wildlife. Elephants and tigers will readily cross roads, but the amphibians, many insects and most arboreal mammals, just cannot or will not cross such large open spaces. If Leuser is divided up by roads, it will eventually become a complex of semi-isolated forested tracts, with roads forming the boundaries. The Law of Island Biogeography development by E.O Wilson, allows us to calculate the percentage of animals that will become extinct in each of these separate forest divisions - the smaller the piece of forest, the more extinctions.

Alternative Infrastructure

NGOs have only very limited influence in development planning, and even the government agencies charged with forest protection are hostage to the decision of government leaders. Nevertheless, several local NGOs (including WALHI Aceh and HAkA) have spent a great deal of energy and resources in seeking revisions to the spatial plans in Aceh and have actively resisted the construction of some roads. So far, the results have been limited but the efforts continue and some politicians in the Aceh seem to be developing a more enlightened approach to development in which they recognise the importance of conserving living natural resources.

Where there is absolutely no option to a certain road cutting through the Leuser Ecosystem, the local NGOs are proposing alternative road designs that mitigate the impact of roads, and are beginning to promote infrastructure design that will be less harmful to the environment. By building tunnels or viaducts, for instance, traffic can flow through the Leuser Ecosystem, but will not impact that natural wildlife corridors. Solutions such as these which facilitate the natural migrations of wildlife are called Ecoducts. In another case a roll on/roll off railway system has been proposed. The terminals will lie outside the Leuser Ecosystem, so the trains will have no need to stop en-route and thus will reduce the possibility of wildcat encroachment. Railways tend to be slightly narrower than roads and because trains travel at predictable times, carrying a distinctive sound, wildlife can quickly adapt and only cross the lines when trains are not moving. These ideas and others are being promoted for inclusion in regional spatial plans.

In certain cases, especially through rugged hilly terrain, the appropriate structure might be a tunnel. In this case the road would create no impact on the forest or its wildlife, the latter being able to move freely along traditional routes.

Left: In this schematic the old winding road has been replaced by a more direct route through the construction of a tunnel. This not only makes travel quicker and more comfortable but allows free movement of wildlife over a previously impassable barrier. Elevated road ways over valleys achieves the same result.


Roll on – Roll off system
for vehicles

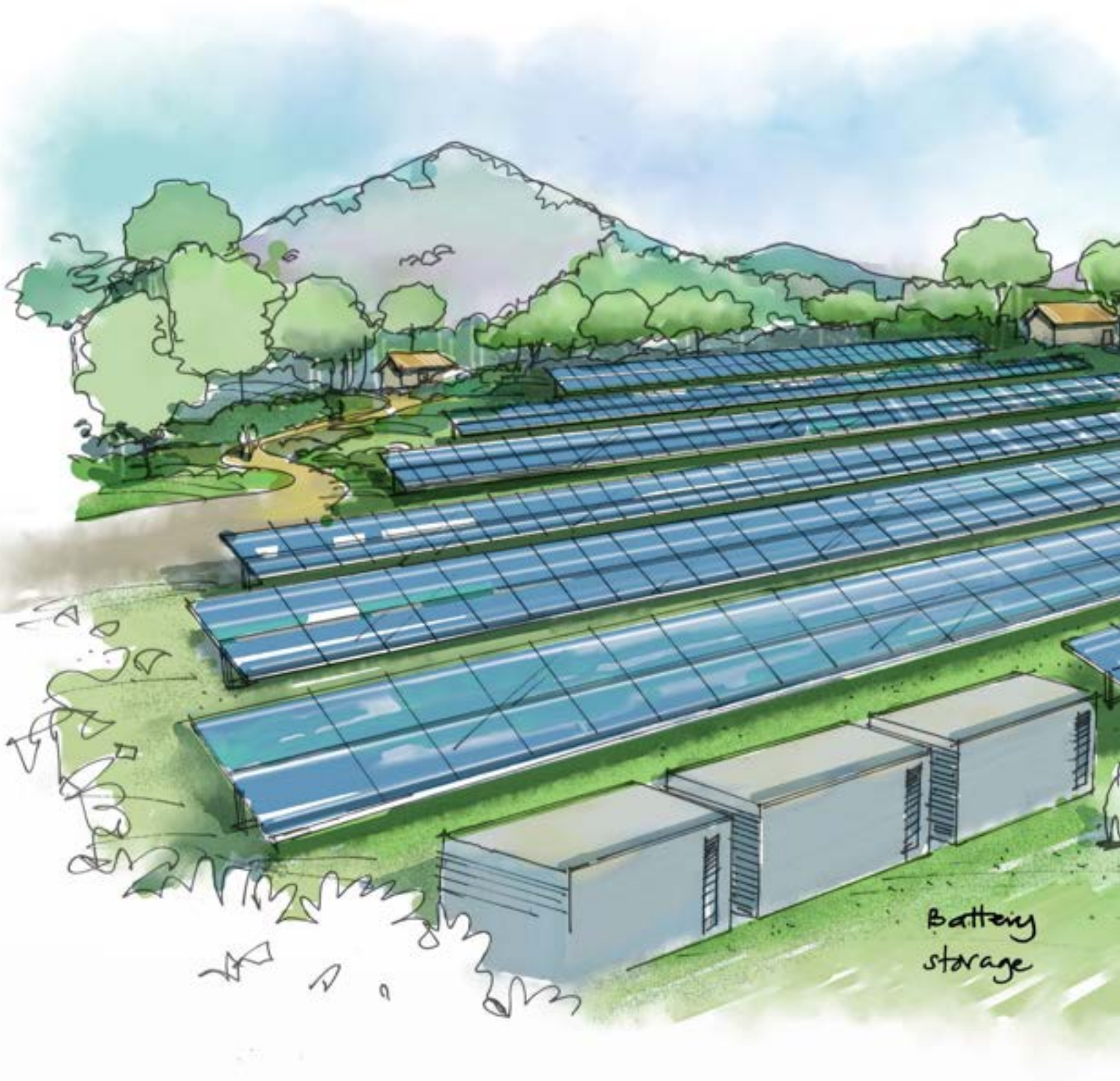
Left: Trains and their tracks have minimal impact on wildlife which quickly gets accustomed to the noise and timing of trains. Some roads in Leuser could easily be replaced by trains that could carry both passengers and vehicles. Such an approach has been taken in Queensland Australia, where a train journey through the Tropical Forest World Heritage Site has become a major tourist attraction. A similar initiative would be a big step in restoring the integrity of the Leuser.

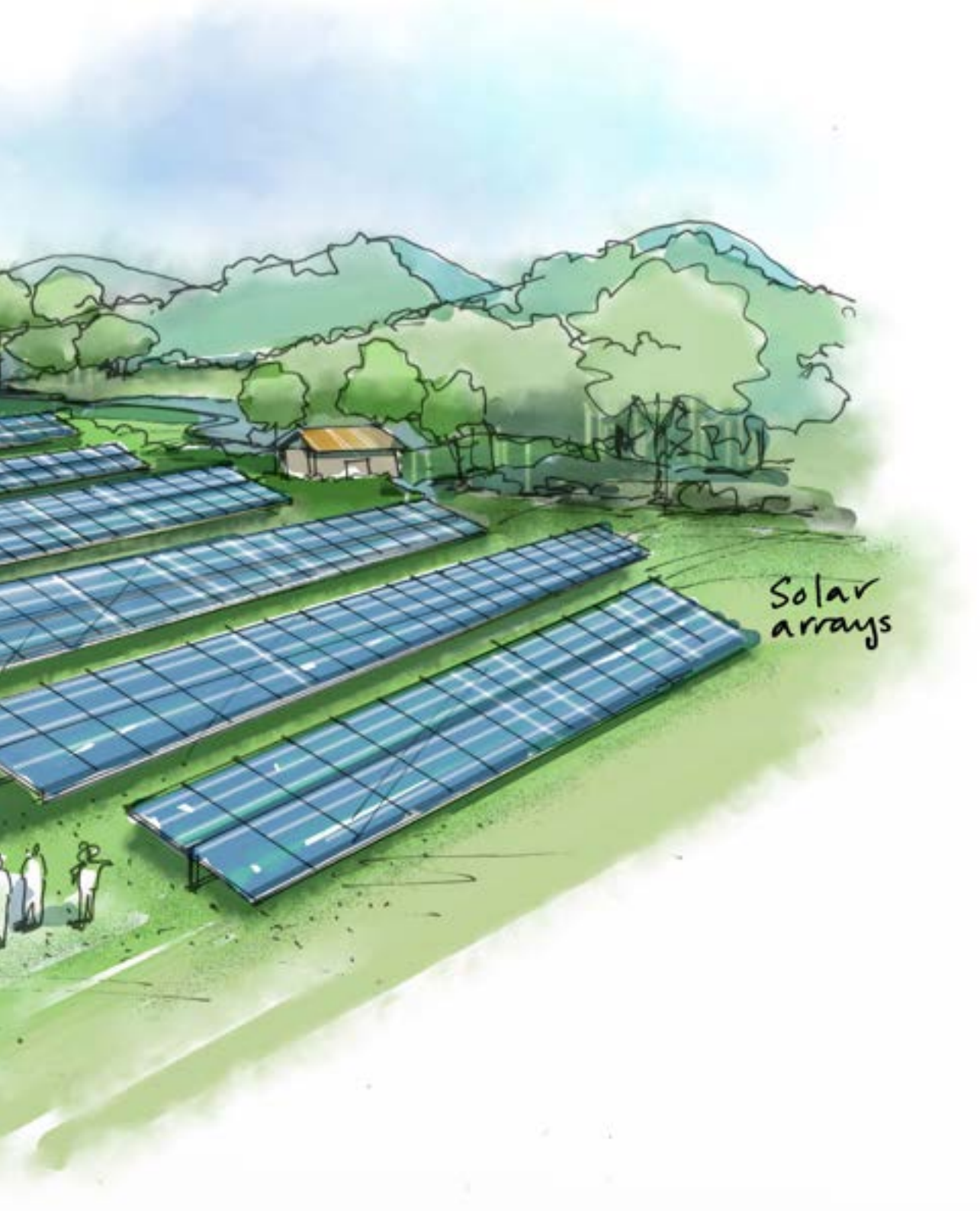
Left: In many countries (including neighbouring Singapore) elevated road ways have been built to facilitate the free movement of wildlife – which would otherwise be unwilling to cross a normal road. A promising candidate for this approach would be an elevated roadway over the Trumon/Bengkung wildlife corridor.

Large Hydro Electricity Schemes

Several large hydroelectric power schemes are currently being planned inside the Leuser Ecosystem. These dams will flood ecologically rich valley bottoms and, more seriously, will cut through the last remaining elephant migration corridors which link areas of prime habitat. In addition to the direct impacts on wildlife, the dams will negatively impact local fisheries and may pose dangers to communities downstream through erratic water flows.

Left: The Lesten river is the last river in the Leuser ecosystem with the full diversity of fish species. The valley through which it runs is also the last link in a chain of elephant corridors that unites the elephant populations of NW Leuser. It is irreplaceable and there are now plans to flood the entire valley to support a massive hydropower scheme.


Battery
storage



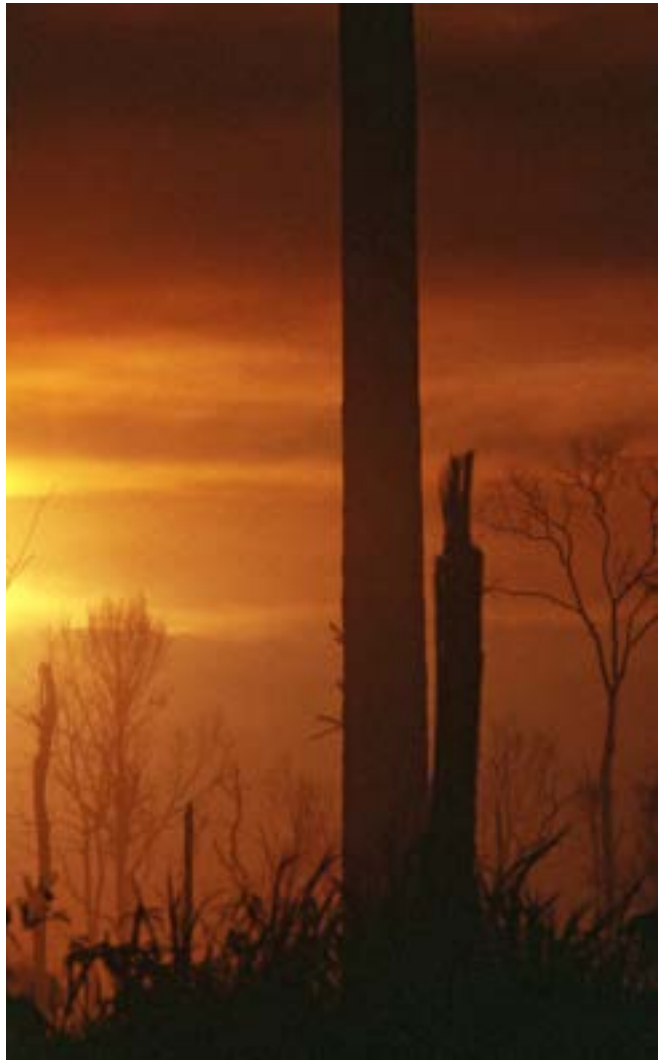
Solar Power

It is clear that some politicians are still somewhat behind the times in the development of electricity generation. Today in the tropics solar power is the cheapest form of electricity generation (even including the cost of battery storage to ensure electricity during night time). There are virtually no environmental impacts from solar farms, maintenance is the lowest for any power source, and solar farms can be installed in one quarter of the time it would take to build a major hydropower scheme. HAkA, YEL, and other local NGOs are trying hard to promote solar power generation as an alternative to large hydro schemes and their associated environmental impacts.

Agricultural Expansion

The hunger for more land for agriculture continues. Local people with diminishing opportunities in the fertile lowlands that surround the Leuser Ecosytem quickly take advantage of lax enforcement to clear forest inside Leuser and to plant crops. Mostly this results in subsistence agriculture and provides little in the way of wealth creation. Worse still, where this kind of agriculture has been undertaken on steeper hills sides there has been increased erosion and alarming rates of soil loss – eventually rendering some areas totally infertile.

A much more spectacular change in land use results from wholesale land clearance for large plantations – oil palm, rubber and cocoa. By far the most extensive are oil palm plantations, which now dominate the fertile lowlands in Aceh and North Sumatra, outside the protected forests. With current high prices for oil palm and easy bank loans for this industry, there are continuing efforts to open up new plantations even inside the Leuser Ecosystem. Plantations are biological deserts, and while they form useful buffer zones outside Leuser, they have no value or future within the Ecosystem. In addition, they are much less effective at controlling rain water runoff, and this results in increased flooding severity and the depletion of subsurface water.



Left: These smoldering tree trunks are the last vestiges of the grand forests that once extended over much of the North Aceh regency.

Opposite: Whether it is forest clearance for commercial plantations or small scale subsistence agriculture, the net result is the loss of forest, the fragmentation of habitat and the beginning of local extinctions of wildlife. This in turn means a reduction in essential environmental services for the millions of people who live around the Leuser Ecosystem.

Following Page: This entire photo is of oil palm and gives an idea of the scale of commercial agriculture in the eastern lowlands of Aceh.

Responses

Dealing with plantation development requires a number of different approaches. Those plantations that were licenced before the establishment of the Leuser Ecosystem may maintain those rights for the duration of their concession periods. Several of these plantation concessionaires have also taken a responsible attitude to conservation and have left areas of high conservation value, including elephant corridors, in their original state – off limits for development. A good example of this is Mopoli Raya which has extensive holdings in Aceh. It voluntarily set aside almost a quarter of its concession inside Leuser for wildlife habit and for a critical elephant corridor.

Where some plantations have sought to extend their areas illegally, the government has taken the concessionaires to court. One example was PT Kalista Alam, which cleared prime forest inside the Tripa swamp – one of three peat swamps in the Leuser Ecosystem. Supported by information supplied by HAkA, the Ministry of Environment successfully sued Kalista Alam which must now pay a penalty of 30 million dollars.

There are many smaller plantations in Leuser, normally 50 - 500 hectares in size, and most of these have insufficient legal permits to operate. FKL has worked closely with the police, local government, and society leaders to challenge these illegal plantations and, to date, some 40 plantations have been closed down and the areas returned to natural forest.

The Aceh government also passed an important law in 2018 in which any plantation in Aceh seeking renewal of its licence must set aside 30% of its area for the use of local people. This will free up considerable land for those people who were pushed into Leuser by insufficient land outside, and will thus give them a better chance for a future.

To deal with these threats to the regional hydrology, a consortium of NGOs in Aceh and North Sumatra are working to have the respective land use plans modified to ensure a cessation of forest clearance and the restoration of previously deforested areas.

Above: A great deal of conservation work is not done in the forest, but in the offices and residences of the reach decision makers – local government officials, informal leaders, industry leaders, etc. This patient work that builds trust, and develops solutions and compromises, is an essential part of the conservation of Leuser.

Above: Where illegal plantations or land clearings are identified, a process of consensus building takes place in which the local officials, police, local leaders are eventually involved in dealing with offenders. In the photos above, illegally planted oil palms are felled under the supervision of local government and enforcement officials.

Opposite: Some illegal plantations cover as much as 500 hectares.

Photo Sequence: In 2009 an illegal plantation was discovered deep inside Leuser. The picture to the left shows the area under cultivation. The second shows the same area after the oil palms had been felled. And the photo on the opposite pages shows the area as it is in 2019. Natural forest regeneration occurs rapidly, and now elephants, orangutans and even tigers have been seen here.

Poaching of Wildlife

The extraction of wildlife is formally not permitted in the Leuser Ecosystem, but where there is a demand, people will try and supply it - this drives poaching. Although the poaching of Tigers, Rhinos, Elephants and Orangutans captures the headlines, many other species are also poached - colourful birds and song birds are much sought after, while snakes, turtles and tortoises are taken alive for the international pet trade. Some birds have now been pushed to the edge of extinction.

Most of the animals that area poached, such as Deer, Bears, Tigers, Orangutans and Elephants, live in the lowlands and come in much closer proximity to people. Locals sometimes use the threat of conflict with these animals as a reason to intensify snaring, poisoning, and the laying of traps. Frequently they succeed in capturing and killing very rare and endangered wildlife.

Poaching can greatly upset the balance of the forest ecology. The poisoning of rivers with pesticides to catch fish, kills of the whole food chain, making it very difficult for the rivers to fully recover - if ever. The loss of tiger prey (deer and pigs are also heavily poached) has further reduced tiger numbers. Tigers are considered to be important for the conservation of plant diversity, as they keep down herbivore numbers that would otherwise eat out certain edible plants to extinction. Rhinos have a major role in seed dispersal, as do elephants.

Above: Almost all bird species in the Leuser Ecosystem larger than a few centimetres seem to have a commercial value and are thus at risk of poaching. Hunters supplying the bird market set up temporary aviaries in the forest to “store” captured birds during poaching operations.

Opposite: Tigers are much sought after and almost all body parts, as well as the bones and, of course, the skin have a ready market. Some tigers are also caught because they are considered a threat to local people.

Opposite: If trapped tigers are in good health they can be released back into the wild. Helicopters are essential in moving individuals to remote locations deep inside the Leuser Ecosystem.

Above: Released tigers are sometimes equipped with radio collars that allow the activities of the animal to be monitored in real time by satellite. This has provided important information as to how the tigers adjust after their release.

Responses

The best way to deal with poaching is to prevent it. By maintaining a constant presence in the field FKL, working with relevant government agencies and the forest police, regularly conduct joint anti-poaching patrols and have managed to reduce poaching in some areas to very low numbers.

The Wildlife Conservation Society(WCS) has initiated an awareness campaign, to discourage trapping on the periphery of Leuser, the effects of this work will take time to measure.

Some animals, particularly Bears, Tigers and Orangutans are captured and surrendered to the authorities. Healthy Orangutans are moved elsewhere to start new populations. The local NGO Yayasan Ekosistem Lestari (YEL) has done a very important job in establishing two new populations of orangutans in conservation areas in Jambi Province and Northern Aceh. These populations will form a critical insurance policy for the future of the species. If healthy, tigers and bears may be released back into remote parts of Leuser in the hope that they may establish new territories. Animals already released in this way have been equipped with satellite transmitters to allow 24 hour monitoring of the individuals, thus helping to learn more of these charismatic species.

Above: All conservation areas need to be protected by having people on the ground. Here a team of rangers travels upstream to a remote location from where they will walk into the interior and spend up to three weeks monitoring the forest and dealing with any illegal activities.

Right: Camera trapping is increasingly used to monitor both wildlife and human traffic inside the forest. It has the ability to do this around the clock, every day. Some cameras in the Leuser Ecosystem are linked into the local cell phone networks and can thus immediately alert monitoring staff that are based outside the area to any noteworthy events recorded by the cameras.

Above, Left: Forest patrol staff discuss activity plans for the day.

Above, Right: Monitoring and patrol staff that endure the first year of employment seem to develop a great love for their work in the forest. As a result they become ever more determined to save this natural asset from destruction.

Above: Life on patrol is not without risk, but the people that undertake this work develop a certain nonchalance to the rigors of the forest.

Above: This photo shows the total number of snares recovered from anti-poaching patrols over the course of one year (2016). Each subsequent year has shown a decrease in the number of snares recovered despite an increase in anti-poaching activity. This is encouraging news.

Opposite: The remains of an elephant trapped in SW Leuser during the early years of anti-poaching work. This photo serves as a graphic reminder of the gruesome business of poaching and the reality of the threat these magnificent animals are facing.

Left: As humans try to move into the Leuser Ecosystem they frequently come into conflict with elephants. Some conflicts may be mitigated if it is known that elephants are approaching settlements. To do this, wild elephants are fixed with radio transmitters secured in collars around their necks. This allows 24-hour monitoring of the herd.

Above: A team of rangers monitors wild elephants in the field.

Logging, Forest Clearance & Sponsored Settlement

Not only does clear cutting of forest eliminate all habitat for flora and fauna but it drastically changes the hydrology of the region, a serious impact of logging and deforestation is flooding. The loss of the humus layer on the ground and the subsequent hardening of the forest floor means that rain water rushes off the surface and directly into streams and rivers. This sudden influx of water causes rapid increases in river levels, which can cause loss of human life. More commonly, the flood waters rise steadily, giving people the chance to escape, but destroying property - houses, infrastructure, and agricultural crops. These losses can devastate families and communities for several years or for even longer. One of the greatest challenges that conservation faces is convincing local governments that while opening up forests may give temporary benefits to a few people, the impacts of these activities will eventually impoverish many more people downstream. Government cycles are often too short to take account of these longer-term impacts.

The most dangerous form of flooding is the flash flood. These massive torrents of water, mud, tree trunks and debris sweep down a river without warning and will kill anything in their path. Unlike pure water, this lethal mix of boulders, wood, debris and mud in a flash-flood, gives enormous destructive power. If a flash flood overflows the banks of the river (which is normal for these events) it will destroy any infrastructure and buildings in its path - houses, larger buildings, bridges, canals, even whole villages. The cause of these flash floods is now better understood and occur when temporary dams - created by landslides falling into a river valley - are breached by the rising water that has built up since their formation. When the water behind these dams is extensive, the huge amount of water suddenly released when the dam is breached, has enormous power and flows very fast. The water's speed gives little warning of its approach and causes many deaths.

Opposite: Although most industrial scale has now ceased in Leuser, even smaller operations can have an negative impact on the livelihoods of people living downstream.

Above: Forested water catchments play a very important role in mitigating floods. After logging began in the 1990's floods such as pictured above became more frequent.

Following Page: The most devastating kind of floods occur when a natural dam mode of landslide debris bursts. A resulting mix of water, mud, tree trunks, and boulders devastates anything in its path. This photo shows the remains of a small flash flood caused this way.

Responses

To deal with deal with the threats imposed by logging throughout the province of Aceh, the Governor of Aceh, in 1997, declared a moratorium on all logging of forests in Aceh. While this immediately stopped all large scale legal logging, some illegal logging still carries on to meet the demand for high grade timber. The locally based NGOs in Aceh have been active in motivating the police and various government agencies to deal with this threat and have been remarkably successful in most of Leuser thanks to increased resources from Government and donors. And many areas that were previously devastated by logging are now recovering under natural forest cover.

FKL, HAkA and several other locally based NGOs are working with local government leaders and politicians to understand the risks of deforestation and its impacts on downstream populations. In a few cases this work has resulted in the private sector and donors working together to purchase small pockets of critical land with an aim to having these areas conserved and thus mitigating downstream flooding. In other cases, the NGOs are working to promote policy changes in land use status so that unstable lands inside the Leuser Ecosystem will be restored under natural forest cover. Both approaches are working though on a limited scale at present.

Above: Some of the local NGOs have developed excellent working relationships with the police and other key agencies. This has led to coordinated interventions against illegal logging. Scenes such above are becoming increasingly rare as enforcement improves in Leuser.

Opposite: Although small scale illegal logging may not appear dramatic, collectively, many hundreds of these operations throughout the Leuser Ecosystem can have a major impact. On going enforcement is increasing and the number of incidents are being reduced.

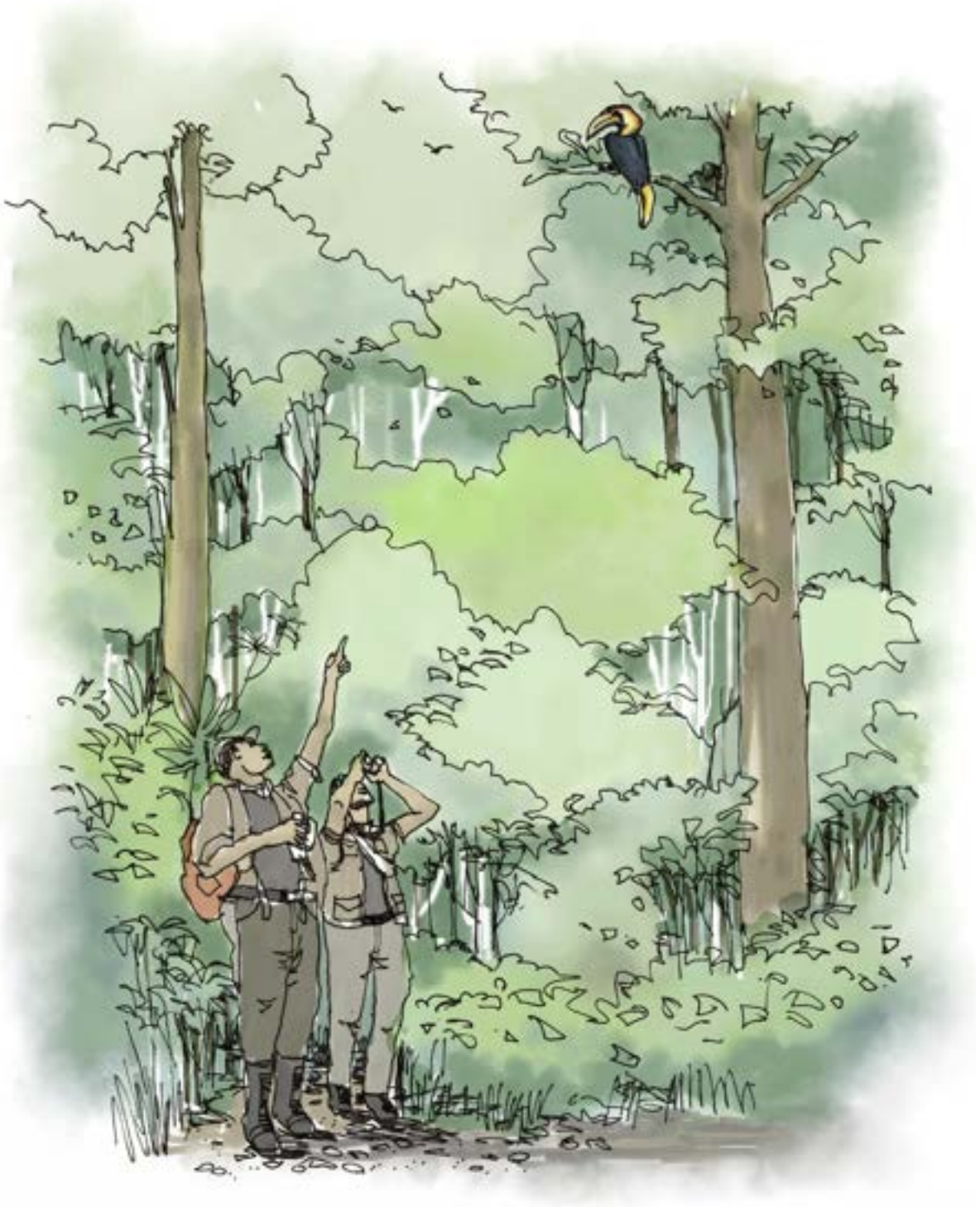
INVESTMENT OPPORTUNITIES

Nature Tourism

As with all the other potential business opportunities based in the Leuser Ecosystem, nature tourism shall be non-extractive and non-destructive. In fact this is the essence of 'Eco-tourism' and that is why it will be promoted.

In developing nature tourism in and around the Leuser Ecosystem it is important not to repeat the mistakes that are sometimes made elsewhere. The Government should limit areas for visitor and tourism activities and these will operate on the basis of clear ecological guidelines and robust permitting procedures.

Leuser has considerable potential for tourism development, but such developments will be controlled, so as to minimize harm done to the surrounding environment and to ensure that developers are given secure tenure as well as exclusivity over their areas of responsibility. Each type of landscape or forest type will need specific approaches to development and these will be coordinated through the appropriate government authorities in the two provinces in which Leuser is located. Some ideas for potential nature tourism development are outlined on the following pages.




'Luxury Tropical.
Eco-Lodge'

Pine Forests

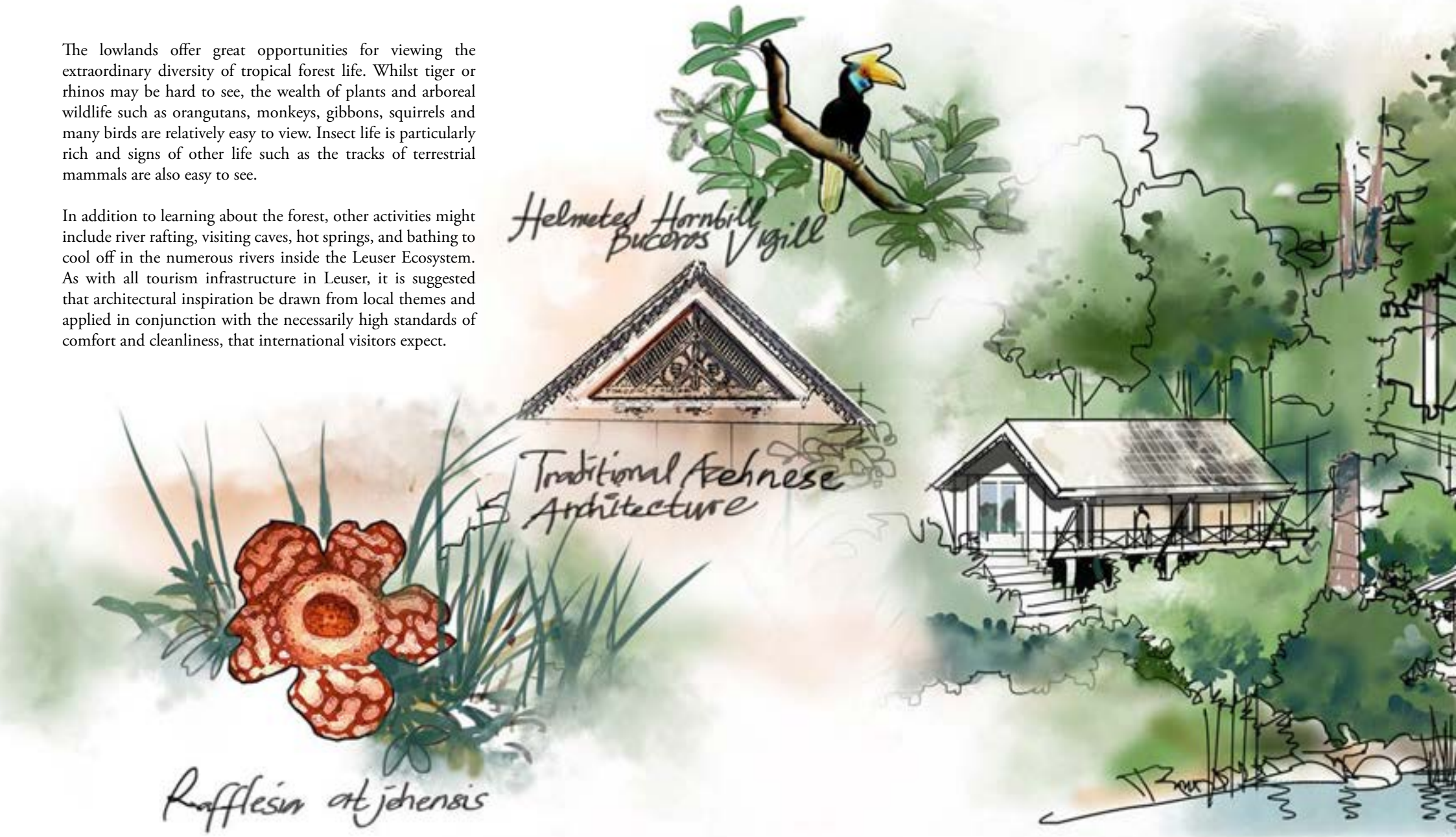
On the fringes of the Leuser Ecosystem, in the highlands of Aceh, pine forests dominate. For a weary traveller who has experienced the luxurious dampness and warmth of the great forests of the lowlands, a one-hour flight allows one to enjoy cool dry air, bright sunshine and long views over the surrounding hills. Here, one could go horse riding, trekking, bird watching or simply relaxing. While staying in a pine forest lodge might not be as exotic as visiting a tropical forest, it might well be part of a combined experience that includes several destinations in different types of forest.


Pinus Mertusii Seed
Outdoor fire pit
Alpine flora

Lowlands

The lowlands offer great opportunities for viewing the extraordinary diversity of tropical forest life. Whilst tiger or rhinos may be hard to see, the wealth of plants and arboreal wildlife such as orangutans, monkeys, gibbons, squirrels and many birds are relatively easy to view. Insect life is particularly rich and signs of other life such as the tracks of terrestrial mammals are also easy to see.

In addition to learning about the forest, other activities might include river rafting, visiting caves, hot springs, and bathing to cool off in the numerous rivers inside the Leuser Ecosystem. As with all tourism infrastructure in Leuser, it is suggested that architectural inspiration be drawn from local themes and applied in conjunction with the necessarily high standards of comfort and cleanliness, that international visitors expect.




Suspended Bridge & Canopy Walk
Forest Walk & Trekking

Swamps

Development of visitor facilities in the swamps of the Leuser Ecosystem will require dealing with the challenges of water-logged soils and numerous small streams. Boardwalks, for instance will facilitate comfortable and safe access, whilst protecting the delicate ground from damage created by numerous visitors. Canoes and pedestrian bridges might also facilitate access, while minimizing impact.

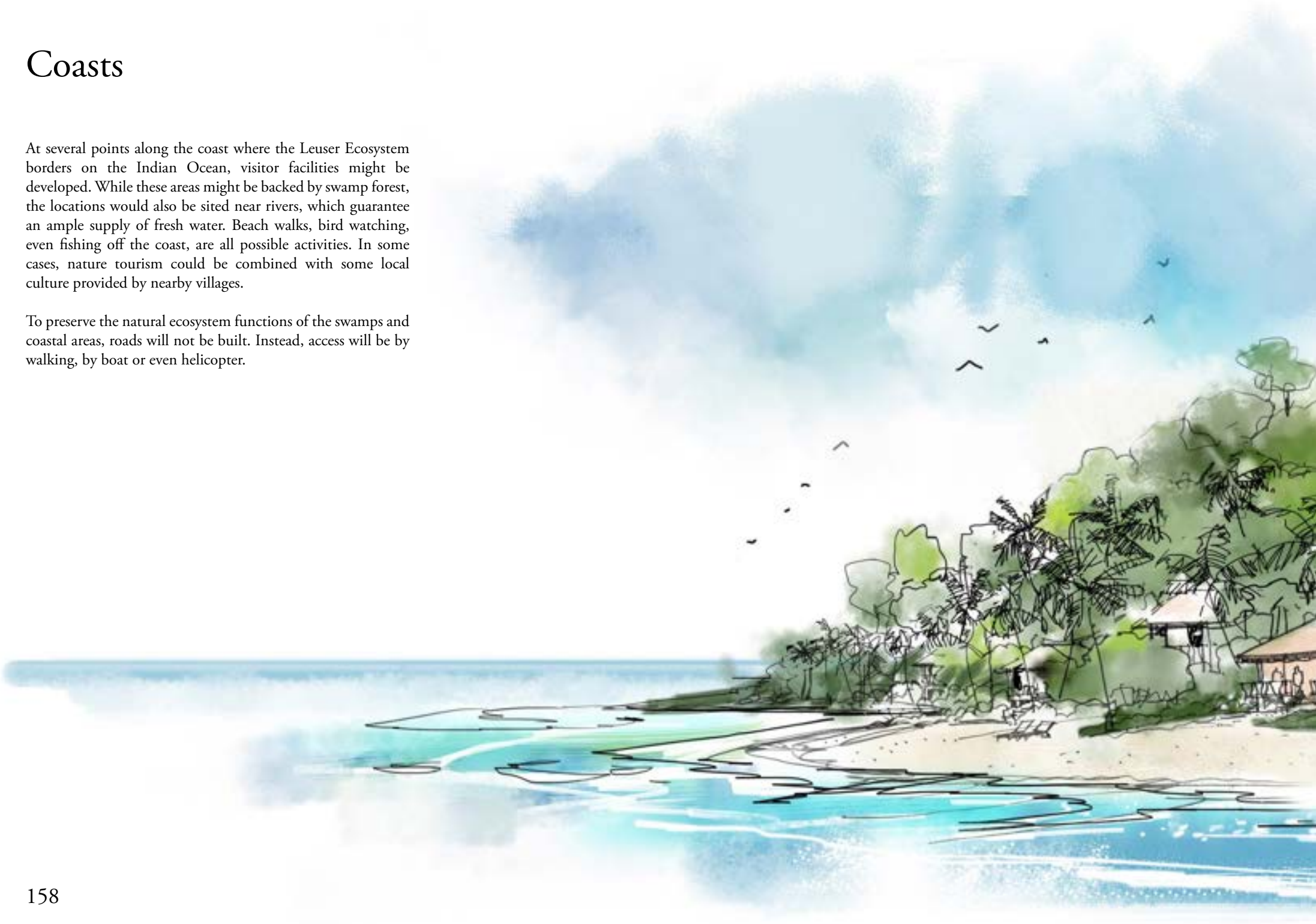
While swamps are challenging environments, they are certainly worth a visit, as they provide the best viewing of Orangutans and other primates and appear to have some of the richest assemblages of bird life of any forest type in Leuser.


Lookout Tower
frog 'Limnonectes blythii'
Monitor Lizard
'Varanus Salvator'

Coasts

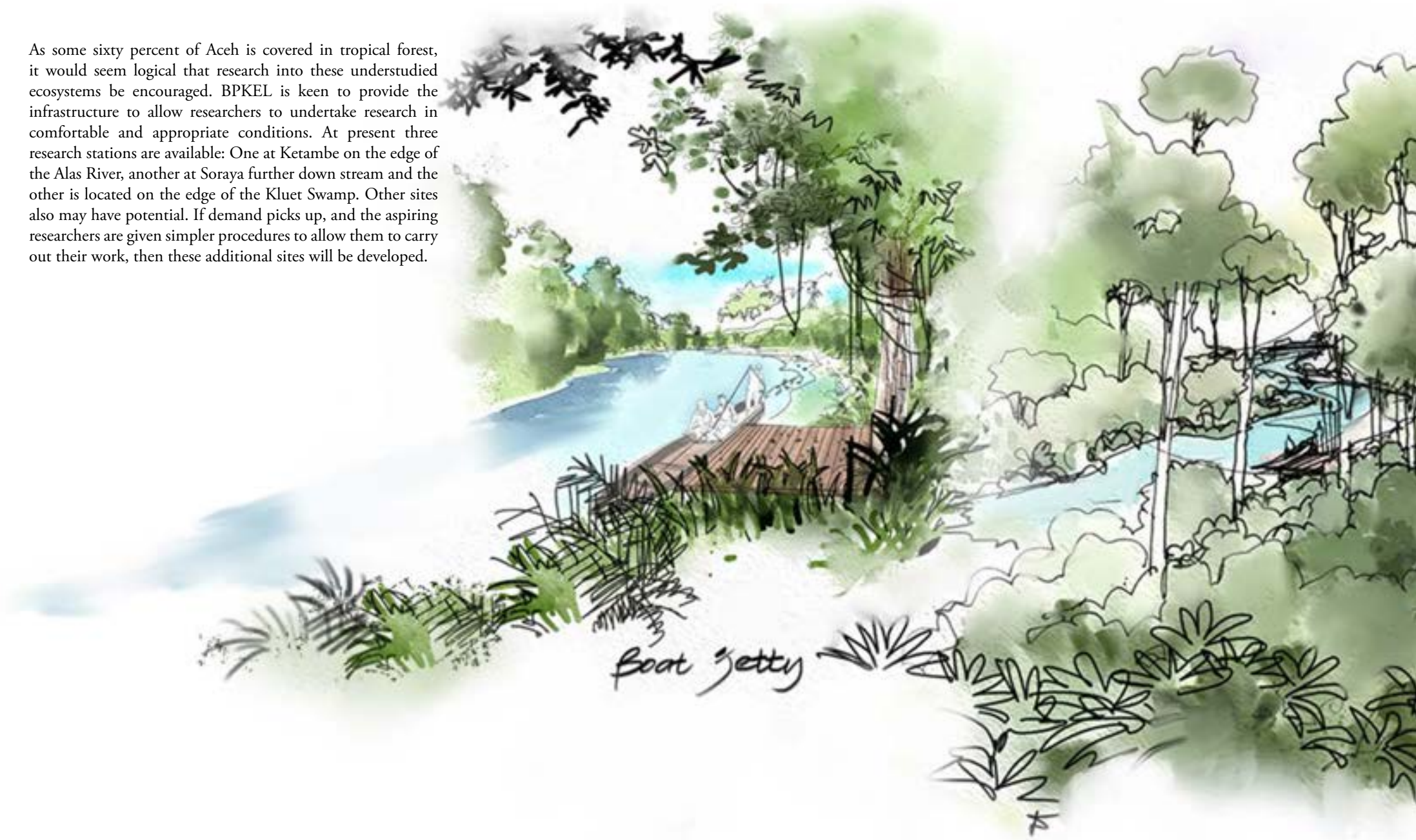
At several points along the coast where the Leuser Ecosystem borders on the Indian Ocean, visitor facilities might be developed. While these areas might be backed by swamp forest, the locations would also be sited near rivers, which guarantee an ample supply of fresh water. Beach walks, bird watching, even fishing off the coast, are all possible activities. In some cases, nature tourism could be combined with some local culture provided by nearby villages.

To preserve the natural ecosystem functions of the swamps and coastal areas, roads will not be built. Instead, access will be by walking, by boat or even helicopter.



Research Facilities

As some sixty percent of Aceh is covered in tropical forest, it would seem logical that research into these understudied ecosystems be encouraged. BPKEL is keen to provide the infrastructure to allow researchers to undertake research in comfortable and appropriate conditions. At present three research stations are available: One at Ketambe on the edge of the Alas River, another at Soraya further down stream and the other is located on the edge of the Kluet Swamp. Other sites also may have potential. If demand picks up, and the aspiring researchers are given simpler procedures to allow them to carry out their work, then these additional sites will be developed.




Verandah
. Raised deck & Path way
→ Rain Harvesting

Carbon Offset Projects

With growing international concern regarding global climate change several protocols have been established to mitigate carbon emissions and to encourage carbon sequestration. Of particular interest in Leuser is the REDD+ protocol which would allow for the creation of carbon credits through efforts to protect and restore forests under threat of destruction. For instance, there are several logging concessions in Leuser that at least on paper are legal entities. Though not active because of the logging moratorium these concessions are under the threat of illegal logging, and also their very existence means that with policy changes these concessions could be reactivated, and the forests – all in the precious lowlands – would be open for exploitation again. Taking over these concessions for conservation and implementing REDD+ would generate profits for the investors in carbon projects while also ensuring long term funding for conservation in the selected areas and beyond.

The peat swamps of Leuser cover some 185,000 hectares and store huge amounts of carbon in the thick peat - up to depths of 12 meters in some places. It is primarily the draining, deforestation, burning, and conversion of peatlands that has resulted in Indonesia releasing the second highest emissions from tropical forests in the World. Accordingly these areas should be considered critical for mitigating climate change. Although challenging, carbon projects could also be developed around the protection and restoration of these areas, which are also second only to the dry lowland forests in terms of biological diversity.

Investors agree to protect threatened forest

Carbon credit created through Redd+ Protocol

Credit sold to emitter

Money from sale of carbon credit invested in protection.


GLOBAL
CONSERVATION
COOPERS HILL