

Road kill

The world is experiencing an unprecedented highway building boom – with untold consequences for the planet’s wildlife, says **Graham Lawton**

LAST November, a remarkable new species was added to life’s catalogue. The Tapanuli orangutan lives in a small patch of rainforest on the Indonesian island of Sumatra, a biodiversity hotspot known as the Batang Toru ecosystem. It is just the eighth living species of great ape to be described, besides two previously known orangutans, two gorillas, chimps, bonobos – and us.

But triumph is tinged with tragedy. The entire population of Tapanuli orangutans is thought to be fewer than 800. It instantly became the world’s most endangered great ape. Soon it won’t be endangered any more. It will be extinct.

Right now, bulldozers and chainsaws are tearing into its habitat. By 2022, if things go to plan, the Batang Toru hydroelectric dam will have destroyed 3.6 square kilometres of prime habitat in the middle of the orang’s home. A 13.5-kilometre tunnel will be dug to carry water from the dam. Access roads will be built, power lines laid and part of the valley flooded. “The associated infrastructure will destroy key habitat with the highest density of orangutans,” says Gabriella Fredriksson, founder of the Pro Natura Foundation, a local conservation charity. The dam will send the oranges “spinning towards extinction”, says her colleague Matt Nowak.

The orangutan’s demise is not unstoppable, but the forces that threaten it probably are. The dam is one small piece of a global infrastructure boom that promises to reshape our world over the next decade. This will bring much-needed roads, energy and jobs to some of the world’s poorest people. But it will come at a shocking expense to nature.

The question is: can we do things better?

When conservation biologists hear the word “infrastructure”, they shudder. “It’s the primary force that is peeling back nature and opening the last remaining wild areas like a flayed fish,” says Bill Laurance of James Cook University in Australia. “If you look at everything that is going on environmentally – dwindling wildlife populations, habitat fragmentation, shrinking wilderness areas, protected areas being isolated, poaching and encroaching of biodiversity hotspots – you find that infrastructure is the proximate cause, the first step, in those processes.”

Gouged strips

And its effects are profound. According to the International Union for Conservation of Nature, which maintains the Red List of Threatened Species, of 13,761 endangered or critically endangered species, 4383 are directly threatened by infrastructure projects of one kind or another. These include residential and commercial development, extractive industries, energy projects and road building.

A further 7500 or so species are at risk from farming, logging, hunting, gathering, trapping and fishing. These are not infrastructure projects per se, but they are enabled by them – especially road building. Cutting a road through a wilderness is like gouging a strip of paint off the surface of a piece of wood: rot gets in and diffuses outwards.

“Roads are the most damaging sort of infrastructure,” says Laurance. “They are the common denominator: you can’t put in a new

Continued on page 40 ➤

Scar on the landscape: This new road cuts through verdant valleys to service a Chinese-funded railway project in Laos



Continued from page 36

mine or a hydro project or fossil fuels without roads.” They also open frontiers for logging, land clearance, poaching, hunting and illicit drug production. In the Brazilian Amazon, 95 per cent of forest destruction occurs within 5.5 kilometres of a road. Similar levels have been seen in Cambodia, Sumatra, Thailand and Panama. Around 70 per cent of the world’s forests are now less than 1 kilometre from a forest edge.

That creates lots of “edge habitat”, which has different light levels and exposure to the elements from the forest interior, and often ends up with different plant and animal species. Roads also affect biodiversity directly. They restrict the movement of animals, fragment their habitats, expose them to new diseases and chemical and noise pollution, and convert them into road kill. To add insult to injury, they also facilitate the spread of invasive species and clamp the world ever tighter into the vice of fossil fuels.

A recent paper on the risk of road building, co-authored by Laurance, reported that “we are currently witnessing the most dramatic era of road expansion in human history”. The researchers calculated that since 2000, the world’s legal road network has lengthened by 12 million kilometres, enough to encircle the globe 300 times – not including wildcat road building for illegal logging, farming and hunting. Most new roads are in the tropics, where the bulk of the world’s wildlife resides.

For these reasons, conservation biologists

12 million km

The estimated length of road built worldwide since 2000

• • •

25 million km

The projected extra length of road to be built worldwide by 2050

SOURCE: CURRENT BIOLOGY, VOL 27, PAGE PR1130

regard infrastructure development as the principal agent of biodiversity decline. An analysis of 35 years of research on habitat fragmentation caused by such development concluded that it reduces biodiversity by anything from 13 to 75 per cent.

But still we build. The Batang Toru dam is part of probably the largest infrastructure programme the world has ever seen: the Chinese-led Belt and Road Initiative, which since it began in 2013 has grown to encompass around 7000 individual projects across 70 countries (see “Belts and roads”, page 38).

That is not the only gigantic infrastructure project in the pipeline, just the biggest of a bad bunch. More than 30 development corridors are planned or being built across Africa, requiring 53,000 kilometres of new road,

much of it in protected areas. South America has its Initiative for the Integration of Regional Infrastructure, which will build roads, pipelines and dams across the Amazon and beyond. Reforms to the US Endangered Species Act will make it easier to build roads in wilderness areas there.

Over the next 30 years, it is estimated that a further 25 million kilometres of road will be built across the world, mostly in the tropics. If these highways all go ahead, the prospects for biodiversity are poor. The tropics will end up looking a bit like Western Europe, with heavily fragmented ecosystems stripped of wildlife.

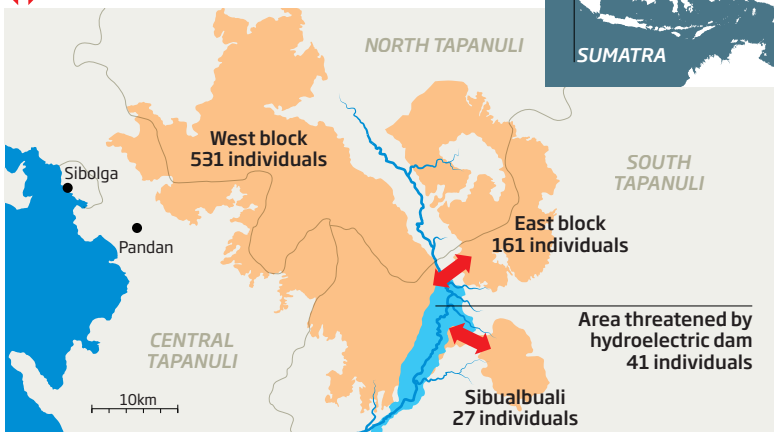
The story of the Tapanuli orangutan is a case study of development flying in the face of conservation. An environmental impact assessment carried out on the Batang Toru dam project in 2014, before the orangutan was recognised as a unique species, flagged up some major hazards, including habitat destruction. The following year, a biodiversity survey led by Fredriksson for the dam’s lead construction company, North Sumatra Hydro Energy, recorded numerous critically endangered and legally protected species on the site, including Sumatran tigers, Malayan pangolins and the orangutans. It warned that the area earmarked for the dam was “an integral part of the Batang Toru Ecosystem” and that “the construction of any infrastructure in this fragile ecosystem will have significant impacts on the highly biodiverse and unique Batang Toru forests”.

The oranges in particular will be hit hard. The area that will be cleared and flooded contains the highest density of the apes, with 41 individuals, 5 per cent of the entire global population. But worse, the dam and associated infrastructure will destroy already fragile corridors between the orang’s strongholds, creating three isolated populations that have no hope of interbreeding (see map, left). Two of these are too small to be considered viable. The largest one contains 531 oranges, which is just about viable.

Dammed to extinction

The entire population of Tapanuli orangutans lives in three patches of forest in northern Sumatra. A planned hydroelectric dam will cut off connections between them and probably doom the species

- Habitats of Tapanuli orangutans
- ◄► Wildlife corridors



Sound of chainsaws

“It’s crazy,” says Laurance. “It’s the world’s most critically endangered great ape, for God’s sake.” Further losses caused by encroachment on the forest will probably condemn the species to the grave. Fredriksson’s biodiversity survey found that the site is already being assaulted by illegal land clearance, catalysed by the prospect of development and facilitated by temporary river crossings installed to get equipment to the site. The survey was



Hydroelectric projects threaten Indonesia's Batang Toru ecosystem, sole home of the Tapanuli orangutan (below)



This is the second in Graham Lawton's series of articles about biodiversity. The third will be on rewilding. Send your suggestions for topics to cover to biodiversity@newscientist.com

carried out to the sound of chainsaws.

According to a coalition of local NGOs, the project is not even necessary. North Sumatra does not have an energy shortage and even if it did, there are other sites that could be developed without destroying a globally important habitat.

And yet the project ploughs on. “[The hydro company] has gone full steam ahead, especially after the orangutan was declared a separate species,” says Fredriksson. In May, the company announced that the dam would open in 2022. A spokesperson told the *Jakarta Globe*: “We understand that the forest ecosystem plays an important role... We are not going to sacrifice it. This has been our commitment from the very beginning.”

Ultimately, according to an investigation by the NGOs, the project is controlled by Chinese companies and money. *New Scientist* asked Sinohydro, the Chinese state hydropower company that is a major stakeholder in the project, for comment. It did not respond, but its website says that one of its priorities is “preserving biodiversity”.

It is possible to build infrastructure without destroying vital habitats and the biodiversity that depends on them. Conservation biologists and even pressure groups like WWF accept that development can coexist with environmental protection, bringing enormous benefits to people without trashing nature. “We’re not anti-development, we’re anti-stupid development,” says Laurance.

In Russia’s wild east, for example, a precious habitat for endangered Siberian tigers and

even more endangered Amur leopards was recently saved from being sliced in two by a four-lane highway, part of the Belt and Road Initiative linking Russia to China and North Korea.

“During improvement and widening of this road, we have two or three places where leopards were killed in car accidents,” says Evgeny Shvarts of WWF Russia. Losing that many leopards was a huge blow. At one point, the entire population was down to 29.



He and other conservationists persuaded the Far Eastern Leopards Federal Conservation Program, which is overseen by Sergei Ivanov, Vladimir Putin’s special representative for the environment, to create a wildlife corridor by funding a 530-metre tunnel for the road. “It was a really important case,” says Shvarts. “We really believe it is possible to save habitat if we convince very high-level persons to make the right decisions.” The Narvinskiy Pass tunnel opened in 2016. Tigers and leopards are using the overpass and populations of both are increasing, says Shvarts.

There are other examples. In Nigeria, the government of Cross River state recently agreed to reroute a planned major highway to avoid slicing through a national park that hosts a population of gorillas. In Bangladesh, the state-owned rail company is building overpasses to allow wild elephants to cross a high-speed line now under construction.

And planned infrastructure projects sometimes don’t happen at all. In June, the new Malaysian government abruptly and unexpectedly cancelled four major Belt and Road projects. At the same time, millions of square kilometres of farmland, mostly in developed countries, are being abandoned. This is creating what conservation biologists see as a potential bonanza of ecological restoration, known as “rewilding”, which could be the saviour of biodiversity. But that is another story. ■

Graham Lawton is a staff feature writer for *New Scientist*

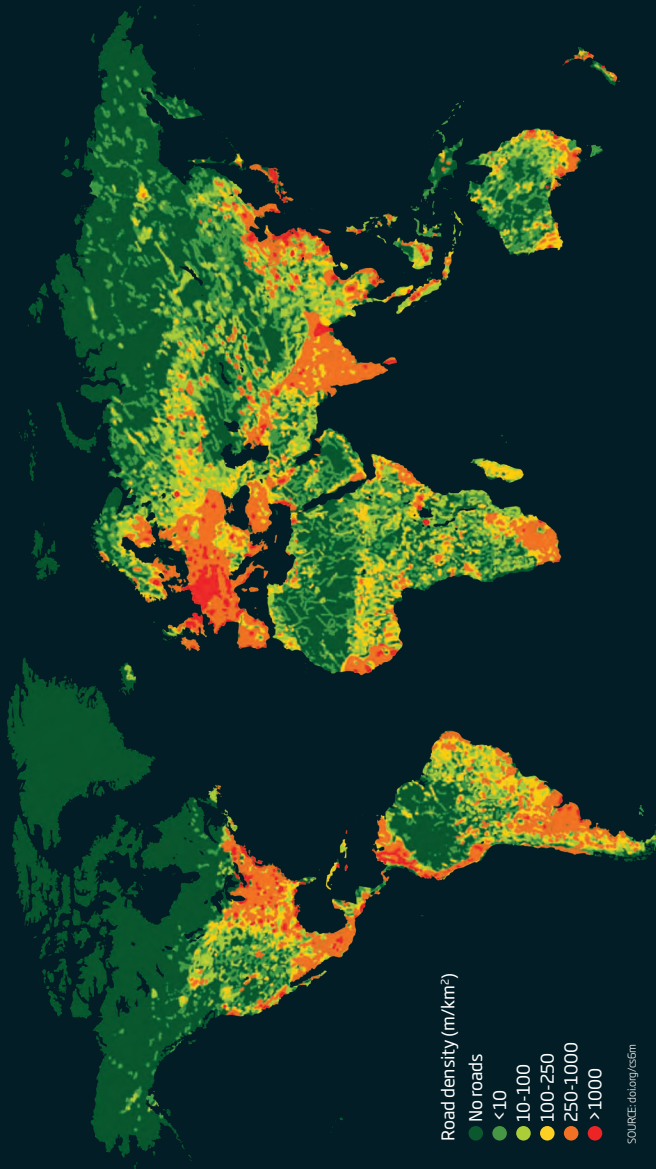
PORTRAIT: KRISTIN KIDD

ANDREW WALMSLEY / SOS / ALAMY STOCK PHOTO

ANDREW WALMSLEY / SOS / ALAMY STOCK PHOTO

PAVED PLANET

Large infrastructure programmes threaten biodiversity across the globe – with China's Belt and Road Initiative a new threat



Infrastructure development, especially of roads, has already disturbed pristine ecosystems across the globe (see map, above). What China's Belt and Road Initiative (BRI) consists of is unclear: the project has no official map and communications about it lack detail. The "belt" originally referred to new overland links traversing the historic Silk Road across central Asia. The "road", confusingly, is a shipping route from ports in southern China to Western Europe via South-East Asia, the Indian Ocean and the Suez Canal. The original Silk Road was a network of overland trade routes passing through ancient, romantic-sounding cities such as Samarkand, Bukhara and Constantinople. It

outlasted the Greek, Roman, Byzantine, Umayyad and Mongol empires, but fell into decline in the 18th century. The vision behind its reboot, launched in 2013, is to hyper-accelerate trade and development across Eurasia and beyond. Western critics often see BRI as part of an attempt by China to build a new, Sino-centric world order. Its ambition is certainly unprecedented: some 7000 projects in 70 countries with a projected cost of \$8 trillion by 2050. The belt has now expanded to six development corridors radiating out from China. South America and Africa have their own programmes (see map, below). The potential cost to nature of BRI is incalculable. As a group of

conservation biologists wrote in *Nature Ecology and Evolution* earlier this year, "BRI could have disastrous consequences for biodiversity". Last year, conservation group WWF published the results of an initial analysis of the possible impact of the initiative's land-based development corridors and warned of a litany of threats. The corridors collide with numerous protected areas, wildernesses and biodiversity hotspots. They slice through the ranges of 265 threatened species, including 81 endangered and 39 critically endangered ones. Among these are tigers, snow leopards, saiga antelopes, Amur leopards and giant pandas. As yet, nobody has assessed the impact of the maritime silk road.

China has repeatedly pledged to make the Belt and Road a green and sustainable project. Xi makes frequent reference to his vision of turning China into an "ecological civilisation", with sustainable development a priority. He has extended this sentiment to the Belt and Road, in 2016 calling on participants to "deepen cooperation in environmental protection, intensify ecological preservation and build a green Silk Road". Conservation biologist Bill Laurance of James Cook University, Australia, accepts that China is making genuine efforts domestically. But its warm words about the Belt and Road Initiative are "a gigantic bunch of greenwash", he says.

Evgeny Shvarts, director of conservation policy at WWF Russia and co-author of a recent research paper on the risks of BRI to Russia's environment, warns that the initiative is in part a sleight of hand to export environmentally damaging activities from China to other countries. The view from inside China is more nuanced. A conservation biologist who works for the Chinese government, and who asked not to be named, says Chinese biologists are very aware of the project's environmental risks and are being given large amounts of funding to investigate and mitigate them. But they are also expected to toe the party line that the initiative is China's "gift to the world".

South America

- Port
- ✈ Airport
- Tunnel
- Road
- Power line
- Gas pipeline
- River navigation

SOURCE: IIRSA PRIORITY PROJECTS

Africa

- Active corridor
- Upgrade under way
- Planned

SOURCE: ddi.org/afkg

Belt and Road

- * Port
- Rail
- Gas pipeline
- Oil pipeline
- Land routes (belt)
- Sea route (road)

SOURCE: MERCATOR INSTITUTE FOR CHINA STUDIES

Areas of undisturbed forest, measured by distance from its edge

- 0-500m
- 500-1000
- >1000

SOURCE: doi.org/gcpmh

The Maritime Silk Road, part of the Belt and Road Initiative, stretches into the heart of Europe. The Italian ports of Ravenna, Venice and Trieste, along with Koper in Slovenia and Rijeka in Croatia, have formed the North Adriatic Port Association to take advantage. The Association has begun work on a giant platform off Venice to load and unload huge cargo ships from the Suez Canal

Russia's far east contains vast tracts of undisturbed forest and wetland home to Siberian tigers and Amur leopards - a biodiversity success story threatened by the Belt and Road Initiative

Expansion of coal industry infrastructure on Australia's east coast, partly in response to Chinese demand, threatens ecosystems both inland and offshore on the Great Barrier Reef

The new Malaysian government cancelled a planned high-speed rail link from Kuala Lumpur to Singapore earlier this year - the first major setback for this strategically crucial arm of the Belt and Road Initiative

The Belt and Road Initiative will make inroads into Africa, but the continent also has at least 33 other development corridors planned, which would add 53,000 kilometres of road and fragment vital wilderness areas such as the Congo basin

South America was recently invited to join the Belt and Road Initiative, but already has its own equivalent. The Initiative for the Integration of Regional Infrastructure is a \$38 billion plan to forge closer ties between the continent's economies. Improvements to the road from Caracas in Venezuela to Manaus in the Amazon basin in Brazil is a major conservation worry

