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**SCANDAL
IN THE JUNGLE**
Biofuels, palm oil and
the carbon catastrophe

ARTHUR C. CLARKE
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FOR THE STARS

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Editorial

Beyond fossil fuels

The Kyoto protocol's successor must address all sources of carbon emissions

CARE to hazard a guess which country is the third largest emitter of greenhouse gases after the US and China? Chances are you didn't think of Indonesia. It is in the big league of global polluters partly because it is destroying its rainforests, but more importantly because it is draining its peat bogs. Newly drained bogs on the island of Sumatra are releasing more carbon dioxide than western cities of a comparable size. Often the bogs are drained to grow palm oil for use as biofuel in Europe. Here's the tragedy: draining a hectare of bog emits 30 times as much carbon dioxide as is saved by burning the biofuel produced from it in place of fossil fuels (see page 50).

Clearly this is madness, but we should have seen it coming. It stems from the fact that the Kyoto protocol addresses some of our interventions in the planet's carbon cycle yet ignores others. For example, Europe is covered by emissions targets, whereas Indonesia and other developing nations are not. Likewise, the protocol is tough on emissions from burning fossil fuels but takes little account of those from natural ecosystems.

Many scientists argued that this made no sense a decade ago when the protocol was being negotiated. Every source of carbon and every sink should be accounted for, they said, precisely to avoid the kind of situation that has arisen in Indonesia. They were ignored because measuring the movement of greenhouse gases between the atmosphere and natural ecosystems is far harder than counting the tonnes of fossil fuels we burn. But since then the science has improved, and it's now clear that carbon sources such as bogs must be accounted for if we're to have any chance of keeping global emissions in check.

Next week there will be a chance to put things right, when signatories to the Kyoto protocol meet on another Indonesian island, Bali, to begin negotiations on the protocol's successor. The Indonesian government plans to use the 12-day meeting to promote the idea that tropical countries should benefit from protecting their natural carbon stores from deforestation and drainage. They could win carbon credits, just as rich nations do for cutting emissions below their Kyoto targets. The idea has received wide backing from both developed and developing nations.

There is something crucial missing, however. Rich nations face penalties if they don't make

their targets: they must buy carbon credits to make up any difference. Indonesia's proposal is all carrot and no stick: developing countries that carry on deforesting and draining, or fail to keep fossil fuel emissions in check, will face no penalties. One likely consequence is that the market in carbon credits will be swamped with an oversupply of credits and too few purchasers. Prices would crash and there

"A newly drained peat bog releases more carbon dioxide into the atmosphere than a western city of a comparable size"

would be few incentives to avoid emissions of any sort. There is a way out: make each country responsible for all its carbon emissions, so that targets would be based on a country's total carbon output, industrial as well as natural. Developing countries with large natural carbon sources will say this is unfair, and they have a point. When you account for Indonesia's peat bogs, its per capita carbon emissions are not much below those of European countries, yet most Indonesians are responsible for far less emissions than the average European. Some allowance must be made to ensure that any targets system does not discriminate against poorer countries' development.

Yet for most developing countries, a scheme of credits and penalties based on total per capita emissions would be an incentive, and would help redress a situation in which the world's half-billion richest individuals – just over 7 per cent of the global population – are responsible for half of all carbon dioxide emissions from burning fossil fuels, while the 3 billion poorest are responsible for just 7 per cent. It could tie in with the recent proposal from German chancellor Angela Merkel that national emissions quotas should eventually be based strictly on population size, with per capita emissions of rich nations falling until they meet the rising emissions of poor nations.

This is not all going to be resolved in Bali. But delegates should have the central message in mind: that to stabilise climate we need targets that are both fair and tough, and that account for all emissions, whether from a power station or a peat bog. The atmosphere does not discriminate: a tonne of carbon dioxide is bad news whatever its source. ●



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I AM standing in the heart of the world's second largest tropical peat swamp, the Kampar bog in central Sumatra, watching the swamp's water drain away along a small canal. Across the western side of the bog there are dozens more drains. The peat bog is bleeding to death before me.

Until five years ago, Kampar was a true bog with water at the surface, and it was covered by a rich rainforest in which Sumatran tigers roamed. A huge dome of peat, up to 15 metres deep, had built up over the past 6000 years as woody debris fell into the swamp. It contains several billion tonnes of carbon.

Now this part of the Kampar bog has been clear-felled, and the canals have been installed to turn it into plantations. As water levels fall beneath the blackened and treeless wasteland, the peat is drying and decomposing, releasing more carbon dioxide into the atmosphere per square kilometre than do many cities.

I watched as workers planted acacia trees for paper and palm oil trees destined to make

biofuels to help reduce Europe's CO₂ emissions. Yet draining the peat will release 30 times more CO₂ than will be saved by replacing fossil fuels with biofuels – an irony that is hard to stomach. The fact that European countries can meet their Kyoto protocol obligations by sponsoring activities that have helped turn Indonesia, of which the giant island of Sumatra is a part, into the world's third largest emitter of greenhouse gases is a savage indictment of the perverse incentives created by the protocol.

Next week, the world's governments will assemble on the Indonesian island of Bali to discuss what should follow Kyoto. The fate of peatlands like Kampar will be an important topic. The Indonesian government is expected to argue that the very companies destroying the bogs should be awarded carbon credits for stopping the haemorrhaging of even more carbon. But can the region's great despoilers really become its saviours?

The destruction of tropical peatland forests

The despoilers of Indonesia's swamp forests now want to be paid to staunch the flow of carbon from the exposed peat. **Fred Pearce** reports from Sumatra

The bog barons

As peatland forests are felled and drained, thousands of years' worth of accumulated carbon is being released in just a few years



is a disaster for many reasons, not least its global impact. Peat holds many times more carbon than the forest above it. Marcel Silvius, a tropical ecologist at Wetlands International, estimates that in south-east Asia, 130,000 square kilometres of peatland forests have already been cut down and partially drained. As a result, an average of 2 gigatonnes of CO₂ is being released each year through burning and decomposition. That's equal to 8 per cent of the total annual global CO₂ emissions from fossil fuels – and 90 per cent of it comes from Indonesia alone.

Here, forests are being cut and the peat drained to make way for two crops: palm oil trees for food and biofuels, and acacia to make pulp for paper. This is happening fastest on Sumatra, and most intensively of all in the central Sumatran province of Riau. Until the late 1980s, Riau was 80 per cent jungle. Today it's just 30 per cent.

Palm oil is used for cooking and as an ingredient in everything from shampoo to

biscuits. Global production has been soaring and Indonesia now produces a third of the global crop. In Riau, palm oil plantations already cover more than 15,000 square kilometres – a fifth of the province – with another 5000 square kilometres planned to meet the expected demand for biofuels. Local politicians see this as boosting both industrial and rural development.

That may be true, but in climate terms, razing rainforests to grow palm oil for biofuels is madness. Clearing a hectare of tropical forest releases between 500 and 900 tonnes of CO₂. Since turning a hectare's worth of palm oil into biodiesel saves approximately 6 tonnes of fossil CO₂ emissions a year, it will take 80 to 150 years of production to offset the one-off emissions from trashing the forest.

That is bad enough. If the forest is growing on a peat bog, however, the CO₂ losses are far greater and continue far longer.

During a drought in 1997, when fires set by farmers in Sumatra burned out of control, the

peat bogs produced most of the smoke that blanketed vast swathes of south-east Asia. Later studies suggest that the burning peat accounted for as much as 40 per cent of human CO₂ emissions that year.

What is only now becoming clear is that burning is not the only threat. With or without fires, the draining of peatlands is causing massive emissions of CO₂.

The critical process here is oxidation. As long as peat stays wet, the acidity and lack of oxygen preserve organic matter, allowing the peat to build up. But when water levels fall and the peat begins to dry, the organic matter starts to break down. The loss of forest accelerates the process by exposing bare peat to the tropical sun. Emissions continue until any peat above the water table is gone.

Where water is drained to a depth of a metre, typical for many palm oil plantations, about 10 centimetres of peat disappears every year. This emits between 130 and 180 tonnes of CO₂ per hectare each year. So, including ▶



the one-off releases from deforestation, each hectare of peatland drained for palm oil will emit between 3750 and 5400 tonnes over the next 25 years, according to Jack Rieley, a tropical peatlands specialist at the University of Nottingham, UK. Even if the palm oil is used as biofuel, a hectare's output will save only 150 tonnes in vehicle emissions over the period, meaning 25 to 36 times as much carbon will be emitted as is saved.

Yet when I went to see Ang Boon Beng, head of a research station run by palm oil company Asian Agri, he suggested that the peatland plantations absorb carbon. This ignorance extends to the authorities. At the plantation department in the provincial capital of Pekanbaru, they told me that peat less than 3 metres thick does not emit CO₂ when drained.

During my travels, however, it became clear that palm oil is not the biggest problem. The main driver of deforestation and peat-bog draining here is the voracious appetite for timber, and the big players are two giant pulp

mill owners. One company is Asia Pacific Resources International (APRIL), part of RGM International, an empire owned by Singapore-based magnate Sukanto Tanoto. APRIL's rival is the Sinar Mas Group dynasty founded by Eka Tjipta Widjaja, which owns Asia Paper and Pulp (APP).

APRIL and APP have built two of the world's largest pulp mills in the jungle near Pangkalan Kerinci – now a town of 50,000. On the way to Kerinci, I passed 44-wheel "road trains" carrying acacia logs, which run on company roads because they are too heavy and dangerous for public roads. They supply APRIL's mill alone with 22,000 tonnes of timber a day, much of which is turned into the company's main paper brand, PaperOne.

Having logged thousands of square kilometres of easily accessible forests, the two companies have moved on to swamp forests. Some 60 per cent of APRIL's concessions are now on peat. The companies are installing huge networks of canals to gain

access, clear-felling the forests and replacing them with acacia trees. Acacia grows spectacularly well here – up to 25 metres in five years, at which point they are harvested. The companies can sell their products cheaply, outcompeting others around the world.

Acacia, however, can grow on peatland only if it is kept drained. Peatland scientist Jonathan Bathgate, who works for APRIL, is candid about the carnage his company has wreaked in recent years. He explained the loss of peat to me as we cruised canals in a newly exploited patch of western Kampar, passing barges carrying timber out of the bog.

This 100-square-kilometre patch is likely to be the first of many to be drained across the 4000-square-kilometre Kampar peatland in the next few years. Its surface has collapsed by more than a metre in the past five years, resulting in carbon losses of about 1800 tonnes per hectare. And if development continues as expected, the peat surface could go down by over 5 metres within 25 years, according to an unpublished report for APRIL by the UK-based consultancy ProForest.

Some say that the loss of forest and haemorrhaging of CO₂ from peat bogs is a reasonable price to pay for the development of the world's fourth most populous country. After all, western countries long ago razed their own forests and drained many of their swamps. Why shouldn't tropical countries do the same? Moreover, even taking into account deforestation and peat loss, Indonesia's CO₂ emissions per head remain below Europe's and are half those of the US.

From the number of mud-spattered Land Cruisers travelling the logging roads of Riau, it is clear that much wealth is being generated. But this is a "wild east" where there are many losers as well as winners.

I saw that on the banks of the Indragiri river on the edge of the Kerumutan peatlands. Here, Kuala Cenaku, a community of 7000 people, has for centuries harvested rattan and honey, cut a few trees and planted rubber trees on what they regard as their lands. Then last year loggers arrived, claimed the land had been given to them by the government, and cut down the forest for 5 kilometres south of the river.

Kuala Cenaku's forest is now a wasteland of charred wood on drying peat. In places the Duta Palma group has planted palm oil trees. Yet community head Mursyid Muhammad Ali said his people had scared off the planters and are determined to take the land back. At the jetty, I saw a boatful of new rubber seedlings for restoring the forest.

Days later Greenpeace sent in volunteers to block up the drainage canal dug by Duta Palma (left), but it was likely to be a token effort – the intact forest beyond the charred lands is set to become an APRIL concession.

"The main driver of deforestation and peat-bog draining is the voracious appetite for timber"



Activists block drainage canals (top). Locals say the continual fires are harming children

DANA PALANGRETER / OMA BUNINGRENTAPEX

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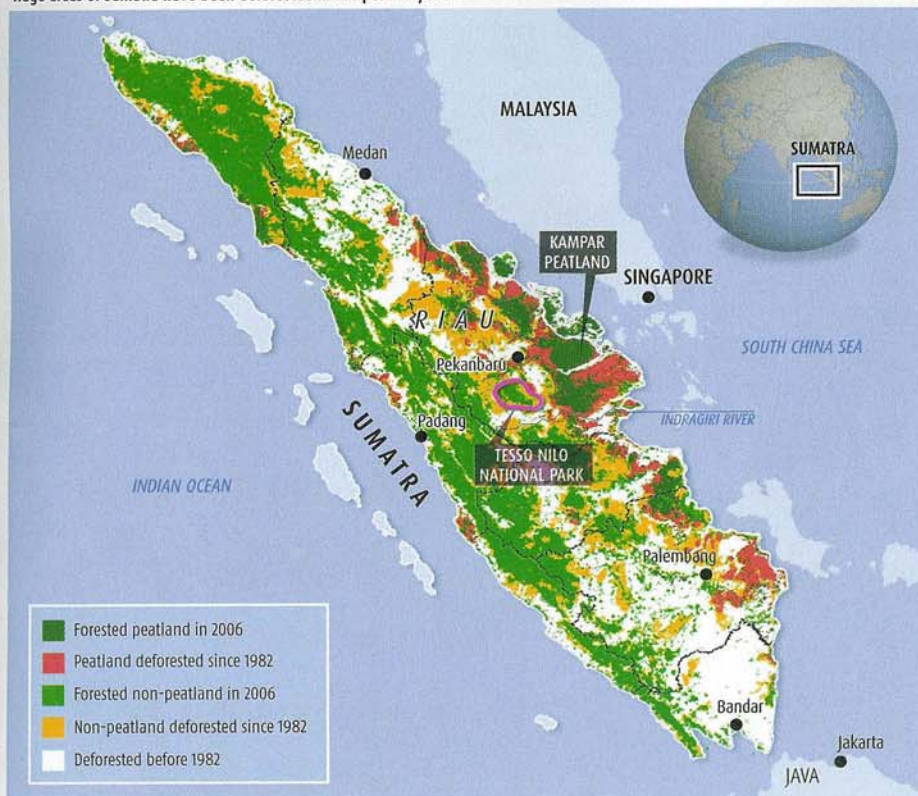


Activists block drainage canals (top). Locals say the continual fires are harming children

DANA PALANGRETERS / OMA BUNINGRENTAPEX

GOING, GOING...

Huge areas of Sumatra have been deforested in the past 25 years



Something remarkable is happening at the pulp giant, however. Wary of the future of its timber supplies and its worsening reputation, the company – unlike rival APP – has begun talking to environment groups.

For several years, APRIL and the environment group WWF have been engaged in an experiment to combine exploitation of forests round the Tesso Nilo national park in central Riau with conservation of the park itself. According to WWF's Michael Stuewe, Tesso Nilo has greater biodiversity than almost any other lowland rainforest worldwide. But it is besieged by migrants looking for land to grow palm oil. The idea is to create a "ring" of acacia plantations round the park that could be policed to protect it.

Besieged

As I travelled along this ring, though, it was clear that things were not going well. A new road built by APRIL seemed to be attracting migrants. I met three young men squatting at the roadside. They said they had come 18 months before from northern Sumatra. The head of a village along the road, Kusuma, had sold them 6 hectares for about \$2600. Now they were planting palm oil.

A bit further on, three more men were living in a small hut, with a similar tale. Such

unofficial, often illegal development extends deep into the national park, where an entire village has been built.

As we drove around, my WWF guides were reluctant to stop and talk to locals. Five months before, one of them had been beaten up by a gang. Earlier, two of APRIL's staff were murdered during protests against new rules banning trucks carrying illegal logs from boarding a ferry owned by the company.

With the Tesso Nilo park now almost divided in two by the illegals, some regard it as a lost cause. The new front line in Sumatra is the coastal peatland. Here, too, APRIL has concessions and wants to surround the Kampar bog with a ring of plantations.

Some accuse APRIL of putting up a green smokescreen while it trashes another rainforest. The company insists it is sincere. Only it can save Kampar, with its carbon, its tigers and the few dozen indigenous Akit hunter-gatherers that live there, APRIL claims.

"If nothing is done, the parks will all be gone in 10 years," says Jouko Virta of APRIL, who is credited with the "greening" of the company. "The government should use us to protect conservation areas in return for being allowed to make productive use of the rest."

It's not just about keeping migrant farmers and illegal loggers out. The company also claims its engineering expertise can reduce emissions. It wants to close as many of the

canals draining the bog as possible, and then maintain water levels as high as is possible while still allowing acacia to grow. "We believe that we can cut CO₂ emissions by 80 to 90 per cent by minimising the dry zone," says Virta.

At WWF they remain unconvinced. "I don't believe them," says Stuewe. "They have failed in Tesso Nilo and they would fail again in Kampar. Both APRIL and APP have built roads into the Kampar dome, into the heart of the biggest carbon store in southeast Asia. They are stakes into the heart of the bog."

Some think the only solution is to conserve all of Kampar by shutting the roads and closing the canals. What about the government? Indonesia is a democracy, but one mired in corruption and with confused and contradictory laws.

Arguably, neither APRIL nor APP should be allowed to work on most of the peatlands at all. According to Indonesian law, nobody is allowed to exploit land where the peat is more than 3 metres deep. Yet the government has awarded logging and plantation concessions on such land. Bathgate admits that many APRIL concessions are on peat 6 to 8 metres deep. Are those concessions invalid? Or does a concession trump the law? Nobody knows.

The next steps to resolving Kampar's future could come during the upcoming negotiations in Bali. At the conference, Indonesia is planning to make the case that any successor to the Kyoto protocol should reward countries in the developing world with carbon credits for avoiding carbon losses from deforestation and drained peatlands.

Just as rich countries and companies can get tradeable credits for cutting emissions, the idea is that developing countries should get credits for avoiding future increases. It has strong support from many countries.

"The world has to provide incentives for Indonesia to preserve its peatlands," says the country's head of forestry research, Wahjudi Wardojo. For him, the nearly 2 billion tonnes of CO₂ a year being released from the country's peatlands are a massive bargaining chip. And companies like APRIL argue that the prospect of revenues from carbon credits would justify reducing their own emissions and managing land already leaking carbon into the air.

In all, an estimated 155 gigatonnes of CO₂ remains locked away in the waterlogged peatlands of south-east Asia. That's as much as the entire world's fossil fuel emissions for the past five years. There's no doubt that the continued destruction of peatland forests will greatly accelerate climate change. The question is: does the world trust the barons of the bogs to protect them in future as well as they have wrecked them in the past? And if not, what's the alternative? ●