Executive Summary

The pulp and paper industry in Indonesia has extensive tree plantations on drained peatlands. Drained and dried peat is a particularly high source of greenhouse gas (GHG) emissions through its oxidation and increased susceptibility to burning. As a result Indonesia is among the top GHG emitters globally, more than half of the emissions coming from degraded peatlands.

GHG emissions from the Indonesian pulp and paper sector are estimated at 88 million tonnes of CO2 per year from peat oxidation. An additional unknown but probably even larger amount is released in periodic peat fire events, such as the one in 2015, which also caused life-threatening smog and haze. Addressing these issues will require widespread re-wetting and restoration of peatlands and adoption of new production practices by the pulp industry.

Local communities in Indonesia are developing methods of managing peatlands in a responsible way, re-discovering old practices and experimenting with new methods of paludiculture, the practice of mixed crop production on undrained or re-wetted peat soils.

The pulp and paper industry has not yet developed a corresponding paludiculture system at a sufficient scale to substantially reduce its GHG emissions and prevent excessive risk of fire and flooding. Urgent action is required to prevent a climate catastrophe.

Content

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Introduction

Indonesian peatlands and forests are critically important for preventing further climate change. As much as 50 billion tonnes of carbon is locked up in Indonesia's peat bogs - the equivalent of eight years of global fossil-fuel emissions.[1] It is essential that it remains underground, however this document reveals that peatland users, including the pulp and paper industry, are causing catastrophic emissions of this carbon, while in the opposite, local communities are offering innovative and practical solutions.

The first part of this report gives some background to the pulp industry's responsibility for greenhouse gas (GHG) emissions, explaining the peat fires fuelled by plantations of fire and their impacts, detailing the resulting emissions and assessing the on-going risks from peatland damage and subsidence.

Swamp forests form a layer of peat over thousands of years from forest debris conserved by a permanent waterlogged condition. During the past 30 years, oil palm and acacia plantations (for pulp and paper production) have been developed by clearing precious peat swamp forests, a unique habitat hosting threatened species including the Sumatran elephant, Sumatran tiger and orang-utan. The development of these plantations is the main driver, causing these and many other species to dwindle.

To produce acacia pulpwood, palm oil or other non-native agricultural crops, water must be drained to a depth of around 70 cm using drainage canals. Depending on bulk density, topography and seasons, these canals can cause drainage-effects over 2 kilometres away into adjacent land and forest.[2]

After drainage, the peat oxidizes, releasing carbon in the form of CO2 into the atmosphere. Drained peatland contributes more than half of Indonesia's GHG emissions, which in addition to above-ground deforestation emissions, puts Indonesia among the world's highest GHG emitters. The emissions due to pulp plantations are detailed later in this document, particularly for the two largest pulp companies, Asia Pulp and Paper (APP) and Asia Pacific Resources International Limited (APRIL) and their subsidiaries, which together emit respectively more GHG than Norway and Slovenia.

Furthermore, dried peat is prone to fire, and pulp or palm oil plantations provided the fuel for the massive fire that raged on Sumatra and Borneo in 2015, with severe consequences for human health. In the wet season, plantations on dried peat are also leading to ecosystem-wide flooding, caused by progressive subsidence of the soil.

The second half of this report presents solutions to the problem of peatland emissions. Local communities have developed a wide range of experience in managing peatlands in a responsible way, re-discovering old practices and experimenting with new methods of paludiculture We present here some of these experiences, illustrated during a workshop on paludiculture held in Bogor in November 2016. These include:

- soil restoration after fires;
- soil preparation avoiding burning;
- repair of damage due to drainage and peatland re-wetting;
- cultivation of wetland species such as sago palm and fibre crops including purun and rattan.

The paper industry is slow to develop paludiculture practices: doing endless experiments without any large-scale implementation. The pulp plantation industry is therefore still practicing business as usual, while every year more than 80 million tonnes of GHG belch from their plantations into the atmosphere. This is too much hot air!

1. https://www.newscientist.com/article/dn3024-indonesian-wild-fires-spark-global-warming-fears/
2. https://www.wetlands.org/publications/kampar-peninsula-science-based-management-support-project/

1. The dire impacts of peatland drainage

Fire

In autumn 2015 more than 100,000 fires occurred in Indonesia, burning 2.6 million hectares of plantations, forests and peatlands throughout Sumatra, Kalimantan and Papua.

In what the Guardian called "the year's worst environmental disaster" [3],an estimated 1.75 billion tonnes of carbon dioxide equivalent was released in just a few months, more than Germany's or Japan's total annual emissions. Daily emissions during the peak weeks of the fires exceeded the daily fossil fuel emissions of the entire USA economy.[4]

This was not just a global climate crime on a huge scale. The fires created a smoke and haze crisis affecting all of South East Asia, triggering national emergencies across Indonesia and into Singapore, Malaysia and other countries, resulting in diplomatic tensions between Indonesia and its neighbouring countries.[5]

The human cost was terrible: 19 people died and an estimated 500,000 cases of respiratory tract infections were reported at the time of the fires [6]. It is estimated that the fires led to more than 100,000 premature deaths in the region [7]. A public health study estimated that 91,600 people in Indonesia, 6,500 in Malaysia and 2,200 in Singapore may have died prematurely in 2015 because of exposure to fine particle pollution [8]. The study said those figures were nearly 2.7 times higher than the estimated deaths linked to the previous fire and haze crisis in 2006.Long term impacts are unpredictable, but a study of the effects of the 1998 haze crisis on foetal, infant and child mortality showed that the air pollution led to 15,600 fewer children in Indonesia.[9]

The crisis caused schools to close around the region and shut down air transport. Damage to the Indonesian economy was calculated at around US$ 16 billion (IDR 221 trillion), equivalent to 1.9 percent of Indonesia's gross domestic product.[10]

Fires have always been part of land-management in the tropics and beyond because fire is the cheapest way to prepare land for planting. Drained peatlands are susceptible to fire as dry peat is highly inflammable. The magnitude of industrial-scale plantations led to large areas of drained peatland. In combination with natural and climate change

induced droughts, these provide the fuel for catastrophic fires. As peatland burns with low oxygen levels and hence burns incompletely it leads to thick haze formation. Thus development of large plantations has become the major driver of fires and led to haze episodes of disastrous proportions.

This is exactly what happened in autumn 2015: the dry season, exacerbated by the El Niño effect, meant large areas of plantations on dry peat were the perfect cocktail for fuelling uncontrolled forest fire. Most of the fire hotspots were inside or around pulp or palm oil plantations [11]. A few months before the fires, the Rainforest Alliance, in its audit of APP's policy implementation, reported that "staff in these supplier concessions consistently told the Rainforest Alliance that they have not received guidance to implement any new or different management practices on peatlands since the introduction of the Forest Conservation Policy (FCP) in February 2013". This is despite APP's claim that field staff received information about the FCP and new guidance including no further canal development or forest clearance on peatland.

APP's current plantation operating procedures for peatland management primarily concern the growth of *Acacia crassicarpa*, a species that does not naturally occur in wet environments and that requires drainage.[12] The audit also added that "in some of concessions visited, fire towers were unmanned or in poor repair. The Rainforest Alliance's visits occurred during fire season and, based on these observations, management of the fire risk is weak."

Government investigations in Indonesia have led to the arrest of an APP affiliated concession manager (Bumi Mekar Hijau) and APP and APRIL supplier plantations have had licences suspended for their involvement with the fires.[13] Even the authorities in Singapore, the neighbouring country highly affected by the haze, called on the Transboundary Haze Pollution Act authority to open legal investigations into APP. [14]

3 https://www.theguardian.com/sustainable-business/2015/nov/11/indonesia-forest-fires-explained-haze-palm-oil-timber-burning
4 http://www.globalfiredata.org/updates.html#2015_indonesia
5 http://thediplomat.com/2015/10/the-trouble-with-indonesia-singapore-relations/
6 https://www.theguardian.com/world/2015/oct/28/indonesia-forest-fires-widodo-visit-stricken-regions-death-toll-mounts
7 https://www.theguardian.com/environment/2015/oct/07/indonesian-forest-fires-on-track-to-emit-more-co2-than-uk
8 https://www.nytimes.com/2016/09/20/world/asia/indonesia-haze-smog-health.html?_r=0
9 https://ideas.repec.org/p/nbr/nberwo/14011.html
10 http://pubdocs.worldbank.org/en/643781465442350600/Indonesia-forest-fire-notes.pdf
11 http://www.eyesontheforest.or.id/?page=news&action=view&id=812
12 http://www.rainforest-alliance.org/sites/default/files/uploads/4/150205-Rainforest-Alliance-APP-EvaluaBon-Report-en.pdf p. 36
13 https://www.theguardian.com/environment/2015/sep/18/indonesia-arrests-seven-company-executives-for-illegal-forest-fires
14 http://www.straitstimes.com/asia/se-asia/indonesias-biggest-paper-firm-back-in-the-spotlight

The climate crime

Protection of Indonesian peatlands and forests is critical to prevent further climate change. The 50 billion tonnes of carbon locked up in Indonesia's peat bogs must stay in the ground. Unfortunately, drained peat in Indonesia is releasing up to 80 tonnes of CO2 per hectare every year [15] into the atmosphere, a total of 500 Million tonnes of CO2 for the whole of Indonesia every year, [16] excluding emissions from fires. This adds up to more than half of Indonesia's GHG emissions, making it one of the world's highest emitters.

Pulp wood plantations on peatlands extend to around 1.1 million hectares [17] (an area roughly the size of Jamaica). Of this, approximately 600,000 hectares of plantation area is managed by APP's supplier companies [18] and more than 265,000 hectares is managed by APRIL's subsidiaries or long-term supplier companies.[19] A further 235,000 hectares is managed by other pulp companies, some of which are short-term suppliers of the big companies.

The release of CO2 from an acacia plantation on peat has been identified by a scientific field study as around 80 tonnes per year per hectare [20] (emissions are higher in the first 5 years of plantation development). However, we will use a more conservative figure: the Intergovernmental Panel on Climate Change (IPCC), after comparing different studies on emissions, suggests that emissions from acacia plantations on drained peatlands are approximately 70 tonnes of CO2 per year per hectare. [21]

Therefore pulp plantations on peat soil in Indonesia release more than 80 million tonnes of CO2 every year. APP is responsible for almost 44 million tonnes and APRIL for more than 19 million tonnes.

To put these figures in perspective, excluding fires and downstream emissions, the pulp and paper industry in Indonesia emits more GHG than Finland. According to the same calculation, APP's plantations emit nearly as much GHG as Norway and APRIL's plantations more than Slovenia.

Another way of looking at the same figures, is to compare these GHG emissions with coal, the dirtiest form of fossil fuel. A typical coal-fired power station emits 3.5 million tonnes of CO2 per year. [22]

Therefore, 1.1 million hectares of pulp plantations on peat, emitting 80 million tonnes of C02, is the equivalent of 23 coal-fired power plants.

We recognise that emissions locally depend on drainage depth, bulk density and peat humidity, along with other factors. However, we believe that these numbers do indicate the scale of the emissions of these companies, and highlight the need for urgent action.

The only way to protect peat that has already dried out is to re-wet it, by permanently blocking drainage canals and letting the water cover the peat again. But the pulp and paper industry is reluctant to take this step on large scale, as this would harm their capacity to produce the same amount of fibre per hectare using *Acacia crassicarpa* at current costs.

Pulp companies are currently discussing how to compensate for their deforestation heritage as part of their sustainability commitments. There is however, insufficient planning to address their ongoing damage of peatlands. The "best management practice" or "Eko-Hidro" approach is often promoted as a sustainable solution by companies but it insufficiently curbs drainage effects in the long term. [23]

15 https://helda.helsinki.fi/bitstream/handle/10138/34598/Jauhiainen_etal_2012_bg_9_617_2012.pdf?sequence=2
16 http://www.biogeosciences.net/7/1505/2010/bg-7-1505-2010.pdf
17 http://www.sciencedirect.com/science/article/pii/S2351989415300470
18 http://www.rainforest-alliance.org/sites/default/files/uploads/4/150205-Rainforest-Alliance-APP-EvaluaBon-Report-en.pdf p. 35
19 APRIL owned PT RAPP has 110,161 ha on peat (compared to an overall plantation area of 211,268 ha). APRIL's long term suppliers have 145,386 ha on peat (compared to an overall plantation area of 255,169 ha). Community fibre plantations programme extend on 10,326 ha of peatland (on a total surface of 12,501 ha). See: http://www.aprildialog.com/wp-content/uploads/2016/12/APRIL-SFMP-2-0-Full-Report_KPMG-PRI.pdf p. 35
20 https://helda.helsinki.fi/bitstream/handle/10138/34598/Jauhiainen_etal_2012_bg_9_617_2012.pdf
21 According to IPCC emissions from acacia plantations on peat soil are estimated to be 20 tonnes C ha/yr., in: http://www.ipcc-nggip.iges.or.jp/public/wetlands/pdf/Wetlands_separate_files/WS_Chp2_Drained_Inland_Organic_Soils.pdf. 20 tonnes CO2-C ha/y is equivalent to approximately 73 CO2 ha/yr.
22 http://www.ucsusa.org/clean-energy/coal-and-other-fossil-fuels/coal-air-pollution#.WOUEWGe1vIU
23 https://www.wetlands.org/news/a-new-paper-rejects-claims-that-drainage-of-peatlands-for-plantations-can-be-sustainable/

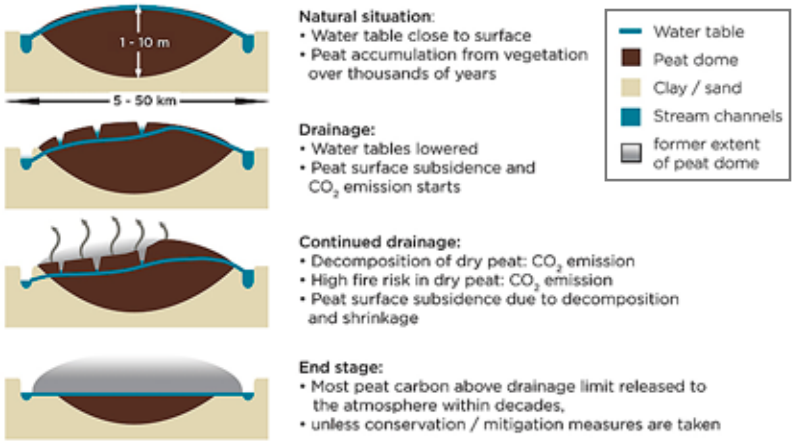
The creeping danger of draining peatland: subsidence and flooding

Oxidation due to peatland drainage leads to subsidence. Most of Indonesia's peatlands have their base below mid sea or river level, so in the mid to long term, they will flood and become unproductive.

Subsidence and the related flood risk is a well-known and inevitable phenomenon in all places where lowland peatlands have been converted to drainage-dependent land-uses. Examples include the UK (Somerset), USA (Sacramento Delta, Everglades), Northern Germany, Denmark and the Netherlands where a large part of the highly populated west is situated below sea level as a result of soil subsidence. These areas only remain inhabited and productive by using expensive flood protection mechanisms.

Large scale plantations on drained peatlands in the tropics subside at the incredible speed of 5.2 centimetres per year. [24] In coastal regions, subsidence leads to salinisation from the infiltration of salt water which can lead to early productivity loss, accelerated by climate-change induced sea-level rise. In other peatlands, subsidence can reach the toxic acid sulphites preserved in the mineral soil under the peat. Productive land-use will be lost, with disastrous socio-economic consequences.

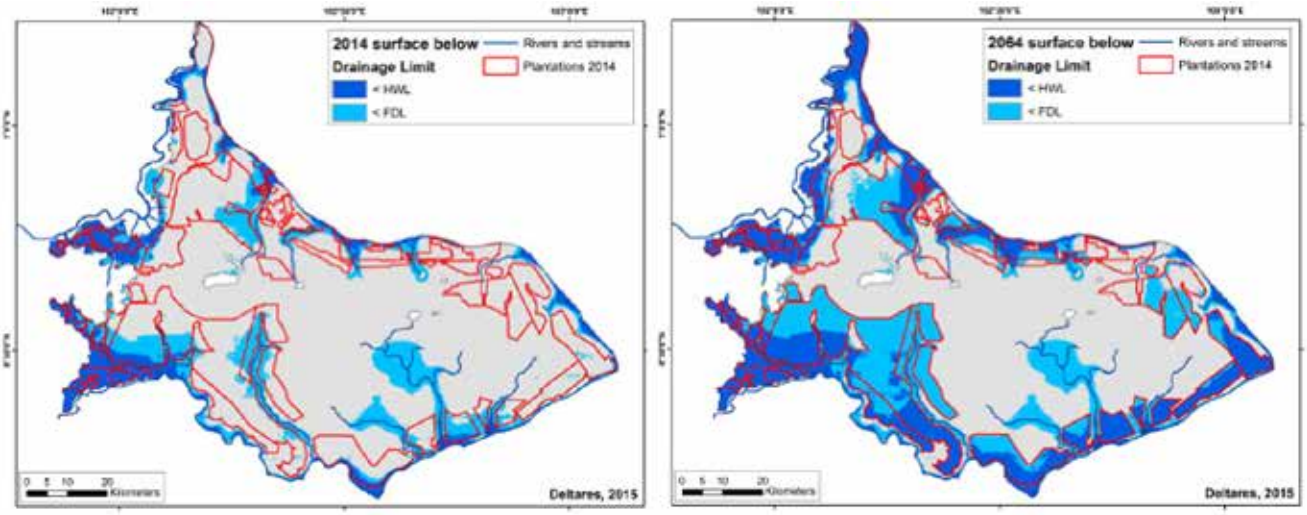
As an example, by 2014 31% of the existing plantation area (including 5% of the existing pulp plantations) on the Kampar Peninsula in Sumatra suffered from regular flooding and drainage problems. [25] It is projected that even with the best achievable hydrological management of acacia plantations, within 25, 50 and 100 years, the area under duress will increase to 71%, 83% and 98% respectively. This makes nearly all plantations (pulp and oil palm) on the Kampar Peninsula peatlands economically unfeasible in the middle to long term.



24 http://www.biogeosciences.net/9/1053/2012/bg-9-1053-2012.pdf
25 https://www.deltares.nl/app/uploads/2015/12/Plantation-Impacts-Kampar-Peatland-DELTARES-2015.pdf

Flooding and drainability issues on the Kampar Peninsula peatlands, currently (LEFT; in 2014) and as projected in 50 years (RIGHT; in 2064). Note that areas below HWL are below river/sea flood levels, whereas areas below FDL suffer from other drainage problems.

Deltares, see: https://www.deltares.nl/en/projects/impact-assessments-for-pulp-and-oil-palm-plantations-in-the-kampar-peninsula-peatlands-riau-indonesia/



2. A fresh approach from local communities

For centuries, local people have cultivated crops native to peatlands, such as sago, rattan, jelutung and purun. These crops still play a vital role in the livelihoods of communities, providing food security, building materials and products to sell (inter) nationally, while preserving peat swamp forests and natural values such as biodiversity, carbon storage, water regulation and flood- and fire-protection. Their 'paludiculture' is based on the naturally wet state of peatlands, does not require the use of fire or drainage and keeps the soil healthy.

Given the scale of drained peatlands and the vested interest of plantation companies, it is extremely challenging to restore all these peatlands back to peat swamp forest. Paludiculture is an economically-attractive and environmentally friendly alternative and is the only option to keep peatlands productive in the long term.

Designing paludiculture systems together with communities and including multiple crop and use systems is vital to ensure social acceptance. Awareness about the need to change practices with communities is growing because they feel the direct impact of unsustainable peatland management.

However, many migrants do not have traditional knowledge and in drained landscapes communities do not necessarily have the means or knowledge to rewet peatlands nor the investment power to implement a strict non-draining regime. Increasingly, communities are experimenting with re-establishment of traditional crops, while sharing and disseminating paludiculture practices. Together, communities form a huge networked laboratory that researches, experiments and puts into practice a different and sustainable way of managing peatland for agriculture. Companies need to invest seriously in research and up-scale paludiculture in practice.

In November 2016, Wetlands International and Jikalahari, a network of environmental organizations in Sumatra, with the support of the Environmental Paper Network, organised a workshop to compare and share local communities' experience in paludiculture, sustainable management of peat soils and solutions to the peatland degradation caused by the paper industry. Here are some of the case studies presented during the workshop. All of them do not use peat drainage.

Purun

(Eleocharis dulcis)

Purun, a grass used for weaving and carpet-making, grows wild on the banks of the rivers and in lowland peat swamps. Communities traditionally grew purun in areas destroyed by fires. "When there is a fire, people come together bringing purun seeds. We have done it for centuries", said Syaripudin from Padamaran, South Sumatra.

Purun cleans the soil and purifies the water by absorbing heavy metals, acting as a bio filter for pollution. Growing it was a perfect side-line alongside fish-farming and growing rice. But now the village's peat-fields for purun are gone under palm oil plantations. The peat is degrading, and the drainage canals are full of fertilizers and pesticides.

The last field of purun is a little spot, seven hours away from the village. Only 300 ha is still intact, surrounded by palm oil concessions. Nine villages in the area of Padamaran, with around 900 people, still rely on this one area. They bring the purun home, and clean and dry it to weave carpets and mats. A carpet takes three days of an artisan's work. Some of them also produce bags, sandals and huts. It is a specialized traditional craft that requires much skill, work and investment but brings a high added value. This is a key part of the identity of Padamaran people, threatened by the expansion of plantations. People are forbidden to stay overnight in the purun areas by companies because of the surrounding plantations.

"We demanded the government set a policy of protection for purun and for this ancient artisanal production linked to community peat management," said Syaripudin Gusar. "The government knows that even the souvenirs for official meetings are made from purun. This is our identity, and our source of livelihood. But plantations are eating all the peat. We need legal protection, training and market access so our people can produce more added value traditional products". The skills needed to craft products such as purses, bags, hats, sandals and souvenirs are already there. Peat degradation needs to be reversed for the peoples' welfare.

We have done it for centuries

Rattan

(Calamus rotang)

Rattan is a climbing palm, mostly living as a colony, which grows fast. It is easy to harvest, requiring simple tools, and is easy to transport. It is used for making furniture, baskets and souvenirs.

Arwin Mangaraja Harahap, from Katingan village (Yayasan Puter), said, "We started to cultivate it from the 1970s, planting rattan close to rubber trees (jelutung), to get two crops. Rattan is always there, you can harvest it every day, and you don't have to clean the soil".

It is always there, you can harvest it every day

Around two thirds of the village land is cultivated for rattan. Planting rattan is very easy. "You have to select the ripe fruit, dry them, remove the peel, and wash them in freshwater. Then you plant them out in the final spot in the forest three months after germination, on a rainy day, each plant between two rubber trees or jelutung.

"Rattan is now the second major source of income for the village. Most people in the village work cleaning and drying it. We used to export our rattan mostly to China. But since the raw material ban was applied by government, more is used domestically."

Arwin said, "We carried out participatory mapping and asked the government to help us to adopt a management plan, to help in capacity building for peat management in combination with agro-forestry, to develop artisanal rattan-processing industry and to develop programmes for managing post-fire peat". Peat-forest fires are a major threat. A fire in 1997 destroyed the whole village, causing incredible damage for the villagers.

Sago

(Metroxylon spp.)

Abdul Manan is from Sungai Tohor, in the Meranti Islands, located in the Straits of Malacca in the border area between Indonesia, Malaysia and Singapore. "We planted sago before independence," he said. 'Before independence' means before people's living memory: it is the crop of the elders.

Sago is a palm of the Arecaceae family with a spongy edible centre. It flowers and fruits only once in a lifetime. Once the fruits are ripe, they are collected for the nursery, and the tree is harvested as it will soon die anyway. A tree produces from 150 to 400 kg of wet sago, with which people produce noodles, porridge, chips and even a sugar that is recommended for diabetics. They even export sago noodles to Malaysia.

We planted sago before independence

"We don't buy sugar anymore since we learned to make it ourselves from sago", said Abdul. "We have 10 villages. Our sago palm plantation is managed by the community. We do not need fertilizers. The ponds are full of fishes. We don't have to dry or burn the peat because it's not a monoculture." In between the sago, the community plants timber species indigenous to peat swamp forest.

When a company called Sago Prima arrived, grabbed 21,000 ha of land and drained the peat using canals to plant sago, the community resisted. "We don't want them to destroy our peat," said Abdul. One of the consequences of the new management was a massive peat fire. 5,000 ha of land inside the plantation area burned, costing the company a record fine of 1.07 trillion rupiah (US$ 110 million).

In the absence of the authorities, the communities have also opposed illegal logging by timber companies. Abdul said, "We don't want companies to come on our land cutting wood and selling it away. That way only one person gets rich and our forest and our people keep suffering. We won't permit this".

The failure of the sago plantations, however, was not a lesson learnt after a pulp and paper company, PT RAPP, a subsidiary of APRIL, arrived, cutting down the forest, digging canals, drying and burning peatland. The villagers resisted repeatedly, to protect their gardens, their forest and their traditional way of life. They are blocking the canals, and still produce sago, but their conflict with the company is still unresolved.

Before the peat is completely eroded, sago can help to restore peatlands that were converted to pulp plantations. According to Abdul Manan, sago is the best crop to plant in degraded peat swamps, after re-wetting by blocking canals, as it grows well in shallow peat swamps up to 50 cm deep.

In the workshop, other successful experiences were exchanged of living on peat without destroying it, villagers from different provinces shared knowledge about many issues including the cost of enriching peat with mineral soil to avoid fire, whether it is possible to plant rattan between Rambutan fruit trees instead of between rubber trees, and how to commercialize sago. There are many such pieces of local wisdom, which together can become a systemic solution, preserving forest, limiting climate

Learning from local communities

Industrial development has followed a very different path. Just like the palm oil industry, the pulp and paper industry has imported alien species from another continent (Acacia crassicarpa), and developed a highly destructive model based on large scale monocultures, established by clear-cutting forests and building canals to drain the peat. The soil is adjusted to the plants, instead of fitting the plant to the environment. Acacia cannot be sustainable on peatlands, as it cannot survive on wet peat. Land that local communities managed according to traditional wisdom has been robbed, cleared and drained. Drainage has released huge amounts of CO2 and made the peat prone to forest fires and floods.

The incomes from palm oil and pulp expansion do not account for the hidden economic costs such as the decline of fish stocks, fire costs, biodiversity loss, illegality and large scale corruption. [26]

These industries should learn from the local communities and change their silvicultural model, or leave the ground to local people who can manage it better for the future of Indonesia. After the peat fire crisis last year and the looming future of floods and unproductivity, the pulp and paper industry cannot delay any longer.

Peat soil must be protected by keeping the water level high or by rewetting if drained. Peatlands have to be restored to peat swamp forest or planted with peatland-adapted species. Among these are species that can produce paper fibre. The monoculture model must be turned into a new landscape-based mosaic approach, which includes restoration of natural forest, community based paludiculture and agroforestry, and paludiculture-based fibre plantations for papermaking.

26 https://www.theguardian.com/sustainable-business/2015/jun/11/palm-oil-industry-indonesia-corruption-communities-forests

Gelam

(Malaleuca cajuputi)

Malaleuca is a fast growing pioneer species naturally found on peat that can produce fibre for pulp and paper production. Malaleuca can grow in acid sulphate peat soil where not many other species can grow.

Malaleuca cajuputi, commonly known as cajuput, gelam or white samet, is a tree in the myrtle family, Myrtaceae, and is widespread in Southeast Asia, Australia, New Guinea and the Torres Strait islands. It often grows to 35 metres, with papery bark, silvery new growth and white or greenish flower spikes. Its woody, cup-shaped fruit has important uses as a source of cajuput oil (a key component of Tiger Balm). [27] This medicinal oil is used as an insect repellent, a sedative and relaxant, to flavour foods and to add to the fragrance of soaps and cosmetics.

Paludiculture for papermaking

The chemical and physical properties of Malaleuca (cellulose and lignin content and fibre length) are suitable for pulp production. Malaleuca chips for pulp have been produced in Vietnam. [28] Malaleuca is just one plant that could compare to the species currently used by the wood-based paper industry system.[29] One study identified over 30 species suitable for pulpwood production. [30] For centuries, China produced paper using fibres from agriculture waste (straw, bagasse etc.), grass, reeds, barks and bamboos. There are many peatland species that could serve well for producing paper, if only the industry would consider them.

Of course paludiculture cannot produce timber at the same low costs as business as usual on drained peat (though in the long term it will be rewarding, by preventing soil subsidence and flooding). But the Indonesian paper industry has profited abundantly from environmental destruction and now it is time to change. This will require the industry to shift away from its large-scale monoculture plantation model. A more appropriate agroforestry land-use model must include a mix of commercial and natural vegetation, and include zones for restored forest and local communities' livelihood crops and trees.

27 https://www.researchgate.net/profile/Hesti_Tata2/publication/305567035_Prospek_Paludikultur_Ekosistem_Gambut_Indonesia/links/5793a13308aed51475bfd712/Prospek-Paludikultur-Ekosistem-Gambut-Indonesia.pdf
28 http://kiengiangbiosphererereserve.com.vn/project/uploads/contents/report/4.Melaleuca_Potential_and_its_current_use_in_KG_-_Trung_E2008.pdf
29 https://www.wetlands.org/download/7933/
30 http://www.extranet.ecbmb.nl/iddnet/download.asp/file=Docs/Useful/InnovationBriefs/InnovationBrief16-Paludiculture.pdf

3. Too little, too late

The Indonesian pulp and paper industry's challenge

While local communities are showing the way towards responsible management of peat, the major pulp and paper industry groups in Indonesia are not making substantial progress.

After decades of environmental and social conflicts, and after draining more than one million hectare of peatland, APP and APRIL have committed to a moratorium on conversion of forested peatland, but have not stopped draining and degrading peat on already cleared land. This failure poses a serious threat to the health of large areas of peatland, inside and outside concessions, releasing huge amounts of GHG, providing fuel for huge fires and leading to progressive flooding.

APRIL (Asia Pacific Resources Limited)

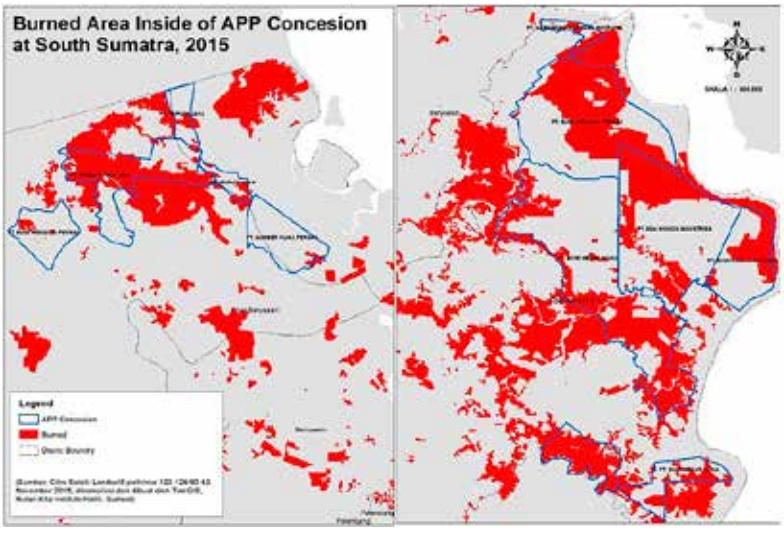
APRIL established a Peat Expert Working Group (PEWG) to provide inputs and recommendations on best management practices to be implemented in existing plantations on peatland and actions required to ensure conservation of forested peatland and critical peatland landscape. However the company is still promoting its business-as-usual model based on zoning (the so-called "eco-hydro") as an environmental friendly management of plantations on peat. Even with this management, peat is still degrading and remains prone to fire. A recent report by Wetlands International and Tropenbos[31] indicates that water management techniques including 'eco-hydro' only reduce the rate of subsidence by 20%, and result in impaired drainability, flooding and loss of productivity.

In order to protect peatland, the company should re-wet and plant species that can grow on wet peat using paludiculture, but it has not started to work in this direction. Worse, APRIL has failed to stop the expansion of canals and the development of plantations on peat domes, in violation of government regulations, and even tried to prevent an inspection by the government agency. [32]

APP (Asia Pulp & Paper)

APP hired high level experts (Peat Expert Management Team) to map and analyse their concessions on peat using LiDAR data, and to provide recommendations.

As a result, APP announced it will unilaterally retire and re-wet 7,000 ha of plantations on peat. This has been presented as an unprecedented move, which may be true, but it is not much (just 2%) compared to the area still managed according to business as usual. APP has indicated that the use of alternative species suitable for un-drained peatlands is a priority in its Peatland Best Practice Management Programme, but it "will require a longer time period to implement in order to ensure the right species are selected and trialled prior to implementing on a wider scale" [33] APP is experimentally planting



Entirely burned areas inside of APP concessions are 78% (293,065 ha) of the burned concession areas in South Sumatra (375,823 ha).

This is 37% of APP's entire concession area in South Sumatra.

paludiculture crops, especially Malaleuca cajuputi but it could require decades before paludiculture is implemented on the scale needed.

Why are pulp and paper companies so slow to shift from business as usual to new practices that preserve peat, the environment, the health of local communities and their own capacity to produce paper in the future? They lack neither experience nor the capacity to deploy substantial resources in the necessary research. For example, APP is not new to papermaking from paludiculture, as one of its subsidiaries in China, Mongolia Saiwaixing Huazhang Paper, runs a mill producing 150,000 tonnes of paper per year from reeds, one of the biggest reed plants in China and probably in the world. Inner Mongolia is not Indonesia, and the different climate would present some challenges: in China the reed harvest occurs in winter once the wetland has frozen and the reeds can be reached over the ice, so in the tropics, the harvest will have to use different methods. On the other hand, in the tropical climate, re-growth is far quicker and the yield greater. Clearly, APP has the experience and technology to run paludiculture-based papermaking, so it is surprising (and disappointing) to see so little progress in Indonesia.

31 https://www.wetlands.org/publications/peatland-brief-an-assessment-of-the-eko-hidro-water-management-approach/
32 see: "Peatviolations, 2016" herebelow
33 https://www.asiapulppaper.com/system/files/150813_peat_retirement_factsheet_0.pdf

Peat violations 2016

After the 2015 fire crisis, the Indonesian government started taking steps to protect peatlands, but pulp and paper companies failed to cooperate. Both APP and APRIL have been repeatedly sanctioned by the government for violations of regulations regarding peat management, in relation to the recent fires.

The Ministry of the Environment and Forestry issued two official letters ordering five APP suppliers (PT RHM, PT TPJ, PT SH, PT BPP and PT SPM [34]) to remove all the acacia they have recently replanted in burned peat. According to the Ministry, an APP subsidiary submitted false data about the burned peat. [35] Previously, the Ministry had sent letters demanding removal of unlawfully planted acacia to three APP pulpwood companies (PT BMH, PT SBAWI and PT BAP) operating in South Sumatra's Ogan Komering Ilir (OKI) regency. [36] The company is still under investigation by the authorities in Singapore.[37] Meanwhile, APRIL suppliers PT SRL and PT RAPP's permits have been suspended for illegal operations in concessions whose permits were frozen by the government because of involvement with the fires. [38] Also PT Rimba Lazuardi had its permit frozen for involvement with the forest fires. [39] In March 2017, a ministry field inspection discovered that APP supplier PT Sekato Pratama Makmur (PT SPM) was opening a new canal in peat soil in the Giam Siak Kecil-Bukit Batu landscape in Sumatra's Riau province, a critical area declared UNESCO Man and the Biosphere Reserve. [40]

Meanwhile, a supplier of APRIL in Riau was fined by the Supreme Court in August 2016, and must pay compensation of 16.2 trillion (US$ 1.19 billion) for illegal logging. [41] The Ministry of the Environment and Forestry has cancelled cooperation plans with both APP and APRIL. [42]

APRIL's subsidiary PT RAPP has been found converting peatlands and digging canals on Padang Island (Sumatra) in violation with the law. When the Peat Restoration Agency organised a field inspection the company sent their security guards to prevent it. [43]

34 http://www.foresthints.news/govt-cracks-down-on-five-more-app-peat-violators-bringing-total-to-eight
35 http://www.foresthints.news/caught-red-handed-app-company-orders-an-end-to-burned-peat-replanting
36 PT BAP: http://www.foresthints.news/app-under-the-spotlight-as-another-company-found-replanting-burned-peatlands.html; PT BMH:http://www.foresthints.news/govt-takes-tough-line-against-app-continual-exploitation-of-burned-peatlands
37 http://www.straitstimes.com/singapore/environment/haze-linked-firm-opaque-with-information
38 PT RAPP: http://aprilwatch.blogspot.de/2016/09/april-concession-permit-suspended.html; PT SRL: http://www.foresthints.news/ministry-begins-law-enforcement-phase-against-major-april-supplier
39 http://www.foresthints.news/operations-of-another-april-supplier-suspended-over-forest-fires
40 http://www.foresthints.news/first-violator-of-new-peat-regulations-caught-red-handed-gsk-landscape
41 http://www.eyesontheforest.or.id/?page=news&action=view&id=976
42 APP: http://www.foresthints.news/indonesian-authorities-reject-app-landscape-conservation; APRIL: http://www.foresthints.news/pulp-giant-company-work-plan-annulled-due-to-plantation-expansion-in-kampar-peninsula-landscape
43 http://www.thejakartapost.com/news/2016/09/07/rapp-accused-of-peatland-conversion.html

Concluding questions for discussion

APP and APRIL progress too slowly, while CO2 is erupting from their plantations on a scale of millions of tonnes every year. What can be done to highlight the fact that their products are the result of a gigantic climate crime?

The costs to Indonesian society are immense, in terms of human health, flooding and fire risk. What system of reparation of these damages needs to be put in place to hold the industry fully accountable?

Clearly local communities are innovating to practice sustainable use of peatlands. What incentives and rewards are needed to encourage this?

What can the financiers of the pulp companies, including APP and APRIL, do to force them to adopt sustainable paludiculture practices on the necessary scale and in an urgent-enough timeframe?

When unlawful activities were found, a subsidiary of APRIL send security to prevent official inspection.