A burning issue

Large scale industrial tree plantations and climate change

Discussion Document

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The discussion document compiles information and concerns about the combined impact of climate change and large-scale tree plantations, which together are the cause of a severe increase in the occurrence of devastating wildfires. Industrial monoculture pulp and timber plantations are becoming a public threat on a global scale.

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Large scale industrial tree plantations and climate change

Over recent years, large scale industrial plantations have been associated with a number of impacts, from driving deforestation,[1] causing massive land-grabbing,[2] [3] emitting huge amounts of CO_2[4] and promoting illegality.[5] [6] They have also been associated with poor management practices, such as reducing soil carbon stock, reducing micronutrients and increasing soil compaction,[7] lowering of water tables,[8] release of invasive species, use of fertilizers and herbicides. All these practices can cause profound changes in the flora and fauna of local ecosystems.[9] There have been many discussions considering whether plantations can represent a solution to the problem of deforestation[10] or if they are one of the major drivers of biodiversity loss. There is, however, agreement among scientists and civil society organizations that further expansion of large, homogenous blocks of tree plantations characterized by a single dominant exotic species growing under intensive management cannot be considered a responsible development.

In recent years, however, a new issue has been associated with expansion of industrial tree plantations: the increasing occurrence of fires. Large scale plantations extending over entire landscapes provide fuel for fires. As temperatures are rising as a consequence of climate change, and fires are more likely to occur, these plantations represent a public threat on a large scale.

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[1] Anne Casson,Yohanes I Ketut Deddy Muliastra,Krystof Obidzinski Large-scale plantations, bioenergy developments and land use change in Indonesia, http://www.cifor.org/publications/pdf_files/WPapers/WP170Casson.pdf

[2] Wally Menne, Timber Plantations in Swaziland:
An investigation into the environmental and social impacts of large-scale timber plantations in Swaziland, Timberwatch, 2004, http://wrm.org.uy/oldsite/countries/Swaziland/Plantations.pdf

[3] Arnim Scheidel and Courtney Work, Large-scale forest plantations for climate change mitigation? New frontiers of deforestation and land grabbing in Cambodia, International Institute of Social Studies, https://www.tni.org/files/publication-downloads/11-icas_cp_scheidel_and_work.pdf

[4] EPN, Too much hot air, 20q7, http://www.environmentalpaper.eu/wp-content/uploads/2017/04/Too-much-hot-air-20170426.pdf

[5] Eric Wakker, Aidenvironment Asia, Indonesia: Illegalities in Forest Clearance for Large-Scale Commercial Plantations, Forest Trend, 2014, http://www.forest-trends.org/documents/files/doc_4528.pdf

[6] Lim Teck Wyn, Malaysia: Illegalities in Forest Clearance for Large-scale Commercial Plantations, Forest Trends, http://www.forest-trends.org/documents/files/doc_4195.pdf

[7] Shete, M., Rutten, M., Schoneveld, G.C. et al., Land-use changes by large-scale plantations and their effects on soil organic carbon, micronutrients and bulk density: empirical evidence from Ethiopia, Agric Hum Values (2016), https://link.springer.com/article/10.1007/s10460-015-9664-1

[8] Janine M. Albaugh, Peter J. Dye,2 and John S. King, Eucalyptus and Water Use in South Africa, February 2013, http://www.hindawi.com/journals/ijfr/2013/852540/

[9] Ricardo Carrere, Pulping The South, 1996, see: http://wrm.org.uy/wp-content/uploads/2013/04/Pulping_the_South.pdf

[10] WWF, Better Production for a Living Planet, 2012, https://c402277.ssl.cf1.rackcdn.com/publications/357/files/original/wwf___better_production_for_a_living_planet___2012_web.pdf

The fires that killed many people in Portugal in June 2017 happened in extremely hot conditions, with 40 degree Celsius temperatures and strong winds. In Chile, in 2018, fires spread in a very hot summer, with record temperatures recorded in the country: 37.4 degrees in Santiago, 44.9 degrees in Quillón, 43.9 degrees in Cauquenes and 41.5 degrees in Chillán. In Indonesia, in autumn 2015, fires raged in an extremely dry season exacerbated by the El Niño effect. The climate is changing, and very dry seasons will become a more and more usual occurrence, not only in Portugal but also in other subtropical regions[11], while in many regions the El Niño effect is already a recurrent phenomenon. Climate change is further exacerbated by huge amounts of greenhouse emissions released by fires, creating a dangerous vicious circle (Although the exact quantities are impossible to calculate, scientists estimate that wildfires emitted about 8 billion tons of CO2 per year for the past 20 years. [12] In 2017, total global CO2 emissions reached 32.5 billion tons, according to the International Energy Agency[13])

According to scientists, climate change is an important driver of increased fire occurrence, but it is not the only one, with socio-economic factors and changes in land use also of great importance.[14]

This discussion document aims to provoke debate about why governments and businesses provide fuel for these massive disasters by maintaining or even expanding large scale industrial monoculture tree plantations.

[11] https://www.uv.es/jgpausas/papers/Pausas2004CEAM.pdf
[12] Guido R. van der Werf et Al. Global fire emissions estimates during 1997–2016, December 2016, https://www.earth-syst-sci-data.net/9/697/2017/
[13] EIA, Global Energy & CO2 Status Report 2017, https://www.iea.org/publications/freepublications/publication/GECO2017.pdf
[14] https://mediterranee.revues.org/6863

Case studies

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",[15] an estimated 1.75 billion tonnes of carbon dioxide equivalent was released in just a few months, more than Germany or Japan's total annual emissions. Daily emissions during the peak of the fires exceeded the daily fossil fuel emissions of the entire USA economy.[16]

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.[17]

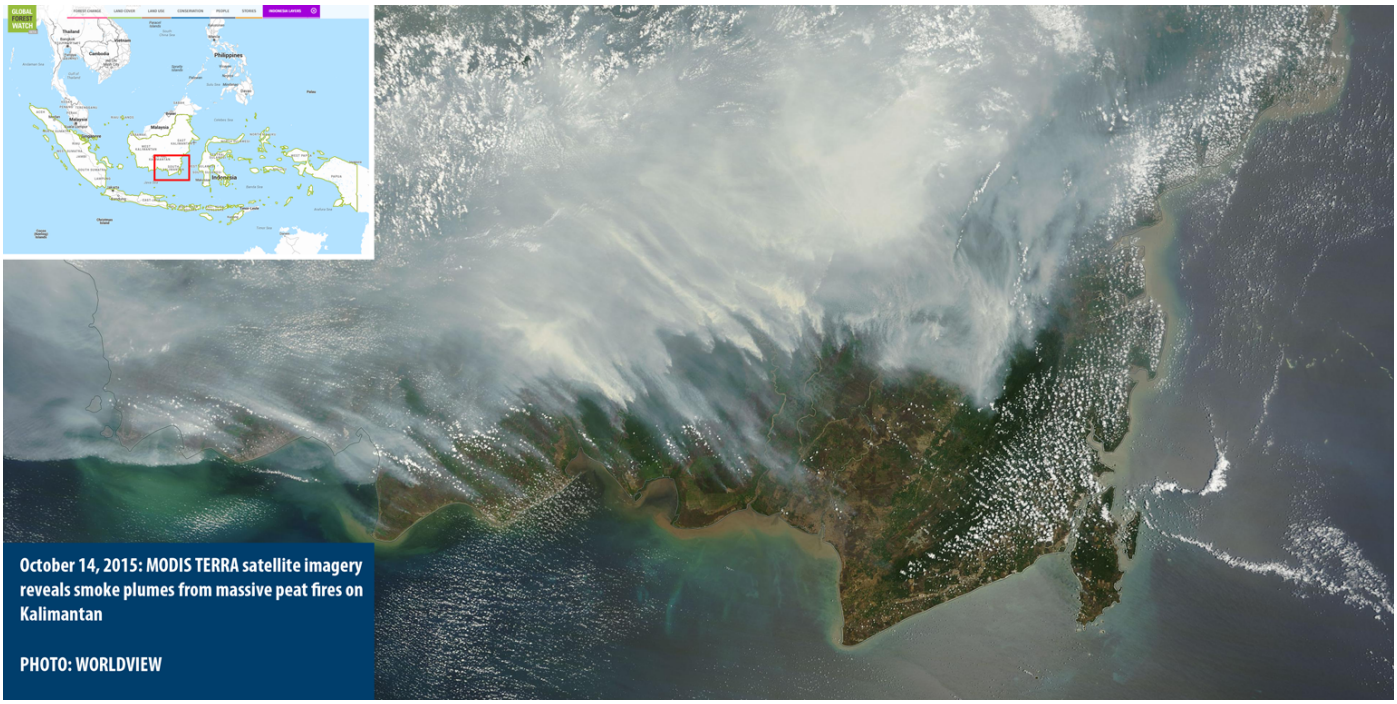
The human cost was terrible: 19 people died, and an estimated 500,000 cases of respiratory tract infections were reported at the time of the fires[18]. It is estimated that the fires led to more than 100,000 premature deaths in the region.[19] A public health study estimated that 91,600 people in Indonesia, 6,500 in Malaysia and 2,200 in Singapore may have died prematurely in 2015 because of exposure to fine particle pollution.[20] 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.[21]

The economic cost of the fires was also huge. It forced 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.[22]

[15] https://www.theguardian.com/sustainable-business/2015/nov/11/indonesia-forest-fires-explained-haze-palm-oil-timber-burning
[16] http://www.globalfiredata.org/updates.html#2015_indonesia
[17] http://thediplomat.com/2015/10/the-trouble-with-indonesia-singapore-relations/
[18] https://www.theguardian.com/world/2015/oct/28/indonesia-forest-fires-widodo-visit-stricken-regions-death-toll-mounts
[19] https://www.theguardian.com/environment/2015/oct/07/indonesian-forest-fires-on-track-to-emit-more-co2-than-uk
[20] https://www.nytimes.com/2016/09/20/world/asia/indonesia-haze-smog-health.html?_r=0
[21] https://ideas.repec.org/p/nbr/nberwo/14011.html
[22] http://pubdocs.worldbank.org/en/643781465442350600/Indonesia-forest-fire-notes.pdf

Fires have always been part of land-management in the tropics and beyond as it is the cheapest way to prepare land for planting, but monoculture plantation development has transformed a long-lived, small-scale practice into a landscape-scale threat. Indonesian swamp forests form a layer of peat over thousands of years from forest debris conserved by their permanently waterlogged condition. Peat swamp forests are a unique habitat hosting threatened species including the Sumatran elephant, Sumatran tiger and Orang-utan, but during the past 30 years, oil palm and acacia plantations for pulp and paper production have been developed by clearing these precious ecosystems. 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. The magnitude of industrial-scale plantations has led to large areas of drained peatland but these are susceptible to fire as dry peat is highly flammable. In combination with natural and climate change induced droughts, they provide the fuel for catastrophic fires. [23] [24]

Peatland burns with low oxygen levels and hence burns incompletely, so it leads to thick haze formation. Development of large plantations has become the major driver of fires and has 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.[25]



October 14, 2015: MODIS TERRA satellite imagery reveals smoke plumes from massive peat fires on Kalimantan

PHOTO: WORLDVIEW

[23] A. Hooijer et Al., Current and future CO2 emissions from drained peatlands in Southeast Asia, May 2010, https://www.researchgate.net/publication/44130644_Current_and_future_CO2_emissions_from_drained_peatlands_in_Southeast_Asia

[24] Lee YitLeng et Al. ,Brief review on climate change and tropical peatlands , January 2017, https://www.sciencedirect.com/science/article/pii/S1674987118300343#bib36

[25] http://www.eyesontheforest.or.id/?page=news&action=view&id=812

In January 2017, a wave of fires devastated an entire region's pine plantations in Chile, with more than 600,000 hectares of scrubland, plantation forests, agricultural land, native forests and homes devastated in what is thought to be the worst episode of forest fires in Chile's recent history. It affected thousands of people.[26] Eleven people died in the blazes, and thousands of people were evacuated from their homes. Entire communities were razed to the ground. Chile's capital, Santiago, several hundred miles away, was shrouded in haze.

Financial losses were steep,[27] but, more devastating than this was the extensive loss of Chile's biological and ecological heritage, which reached crisis proportions. For example, most of the last remaining stands of the endangered Ruil beech tree (*Nothofagus alessandrii*) and the ecosystem linked to it have virtually disappeared. These losses are particularly critical in Chile because of the high level of endemism.[28]

The local fire chief, Carlos Hernandez, said the consequences would be felt for a long time to come. "It's going to mark me for the rest of my life," he said. "We were working, trying to put out fires in houses in the zone right to the end. And then next day, returning to Santa Olga and seeing it completely destroyed. It was as if it had been bombed to smithereens. It was an extremely painful experience. We've got to take lessons from what's happening; keep the plantations further away from where people live – install more fire-breaks, so that what happened to Santa Olga isn't repeated."[29]

For more than forty years Chile has implemented economic development policies that have favoured an industrial forestry model based on the use of exotic species that are highly flammable, such as pines and eucalyptus. Government after government has ignored warnings about this from experts, organisations defending the environment, communities affected by the forest industry, and victims of drought. They have also turned a blind eye to biodiversity loss, forest destruction, and the ecological problems that forest plantations cause.[30] [31]

[26] http://www.conaf.cl/situacion-nacional-de-incendios-forestales/
[27] https://www.dw.com/en/chile-ends-state-of-emergency-as-forest-fires-draw-to-an-end/a-37417021
[28] http://www.mma.gob.cl/librobiodiversidad/1308/articles-45159_recurso_2.pdf
[29] https://www.theguardian.com/world/2017/jan/29/chiles-forest-fires-poor-planning-fire-chiefs-monoculture-fire-breaks
[30] F.E. Arnold, Native forest policy in Chile: understanding sectoral process dynamics in a country with an emerging economy, The International Forestry Review, December 2003, https://www.jstor.org/stable/43740137
[31] A. Lara and homas T Veblen, Forest plantations in Chile: a successful model? 1993, https://www.researchgate.net/publication/316283410_Forest_plantations_in_Chile_a_successful_model

In particular, the authorities failed to ensure that plantations were kept away from populated areas, roads and water courses. This enabled the establishment of large connected areas of dense tree monocultures — a perfect and effectively limitless fuel — dangerously close to housing and transport networks.[32]

More than 110 NGOs demanded the government abandon a forestry model based on large-scale monoculture industrial plantations and insist the companies take corporate responsibility for the catastrophe.[33] In a joint declaration,[34] environmental and social organisations denounced the existence of a corrupt network behind the fires, and demanded an end to funding for the business groups responsible for the fires. According to the NGOs declaration, large-scale industrial plantations have received multi-million dollar pay-outs of public money, in the form of subsidies or fiscal incentives. This has led to a massive and uncontrolled expansion of plantations by a handful of companies with strong ties with politicians.

[32] Xavier Úbeda, Pablo Sarricolea, Wildfires in Chile: A review, June 2016, http://repositorio.uchile.cl/bitstream/handle/2250/146524/Wildfires-in-Chile.pdf?sequence=1
[33] http://tiempo21araucania.cl/mas-de-110-organizaciones-sociales-exigen-el-fin-del-modelo-forestal/
[34] http://www.araucaniacuenta.cl/organizaciones-sociales-exigen-el-fin-del-modelo-forestal-y-denuncian-responsabilidad-empresarial-por-catastrofe/

In June 2017, plantations in the region of Pedrogao Grande, 160 km north of Lisbon, burned with at least 62 victims. Flames, driven by a strong dry wind, tore into eucalyptus and pine plantations unobstructed, indeed fuelled by the dry soil and the abundance of dead wood residues.[35]

Portugal's prime minister, António Costa, described the blazes as "the greatest tragedy we have seen in recent years in terms of forest fires," and warned the death toll could rise.[36] Three days of national mourning were declared. The judicial police decided that the fires had no criminal origin, and the initial spark was probably caused by a lightning strike. The exceptionally hot drought and climate are perhaps not attributable to the human hand, but years of clearing of natural forests to develop large scale industrial plantations created the conditions for the tragedy. Plantations stretch across the landscape, with fast-growing trees sucking away groundwater, exacerbating drought, leaving dry residues on the ground and which can ignite and fuel quickly-spreading fires.

A few years ago *The Monthly* published an article entitled, 'The Eucalypt Invasion of Portugal'[37]. For years the Portuguese environmentalist group Quercus has warned against the indiscriminate expansion of eucalyptus and *Pinus radiata* plantations, promoted by the paper industry. It is precisely those plantations that have massively fuelled the recent fires.[38]

The eucalyptus bark is very flammable and aerodynamic, and with strong winds it can be transported, according some studies, up to three kilometres.[39]

The number and extent of large forest fires in Portugal is increasing. Before the 1980s no fire in mainland Portugal had ever exceeded 10,000 ha in extent, according to available data on forest fires, but in the past three decades, large forest fires doubled their impact from 500,000 ha to more than one million ha.[40] According to scientists, a new era of forest fires began in Portugal somewhere around 1987, with changes in

[35] Trovoada seca e eucalipto entre os possíveis "culpados" da tragédia de Pedrógão Grande. Jornal de Leiria. 18 Juni 2017, seehttps://www.jornaldeleiria.pt/noticia/trovoada-seca-e-eucalipto-entre-os-possiveis-culpados-da-tra-6639
[36] https://www.theguardian.com/world/2017/jun/18/portugal-more-than-20-people-killed-in-forest-fires
[37] https://www.themonthly.com.au/issue/2013/june/1370181600/michaela-mcguire/eucalypt-invasion-portugal
[38] http://www.quercus.pt/comunicados/2017/abril/5240-quercus-contesta-posicao-da-celpa-sobre-a-expansao-dos-eucaliptais?highlight=WyJldWNhbGlwdG8iXQ==
[39] Paulo M. Fernandes er Al, Fuels and fire hazard in blue gum (Eucalyptus globulus) stands in Portugal, January 2011, https://www.researchgate.net/publication/235876682_Fuels_and_fire_hazard_in_blue_gum_Eucalyptus_globulus_stands_in_Portugal
[40] Ferreira-Leite et al. Tendências de evolução regional dos grandes incêndios florestais (100 Ha) em Portugal Continental, nas últimas três décadas, 2018, https://digitalis-dsp.uc.pt/bitstream/10316.2/34928/1/128.pdf

land use including agricultural abandonment, expansion of highly flammable tree species, and renewed growth of woody vegetation in cleared landscapes.[41]

Portuguese law expert Vital Moreira commented, "It is not enough to mourn the dead and mourn atypical climatic conditions, we need to convince ourselves that we have created a killer forest".[42]

[41] https://mediterranee.revues.org/6863
[42] http://www.quercus.pt/comunicados/2017/abril/5240-quercus-contesta-posicao-da-celpa-sobre-a-expansao-dos-eucaliptais?highlight=WyJldWNhbGlwdG8iXQ==

Questions for Discussion

- Which forestry models and management practices should be promoted to reduce the risks of fire?
- If landscape-scale plantations had not been planted in areas experiencing severe fires, would fire risk or intensity have been lower?
- Where is international climate change policy failing to account for these issues and failing to address them? What is an alternative approach?
- By what means can NGOs and scientists bring these issues to the attention of decision-makers and increase understanding of the link between plantations and severe forest fires?
- Where do financial incentives and subsidies exist that drive the expansion of industrial, monoculture tree plantations. Which countries, and in which international financing institutions? What can civil society do to re-direct these incentives and subsidies?
- Are the fires raging in Europe in summer 2018 exacerbated by monoculture tree plantations?
- Which governments still give financial incentives for new monoculture plantation establishment?
- Why does the pulp industry continue to support this land-use model and what can be done to move the industry to more sustainable methods?
- If global demand for pulp is continuing to rise and there is strong agreement that intact forests should not be cut for pulp production, where will this pulp come from?
- Are there conditions under which pulp tree plantations can be environmentally acceptable given the urgency of protecting and restoring natural forests?