Conflict Plantations #4

Scorching the earth

The impacts of pulp and paper expansion in the Três Lagoas region – Brazil



December 2022

Environmental Paper Network

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Cerrado vegetation

(Cover: Fire in eucalyptus monoculture plantation, near Três Lagoas - Press photo [1]).

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[1] JP News, Incêndio consome área de vegetação às margens do Rio Sucuriú, Ocatober 2020, https://www.rcn67.com.br/jpnews/tres-lagoas/incendio-consome-area-de-vegetacao-as-margens-do-rio-sucuriu/142602/

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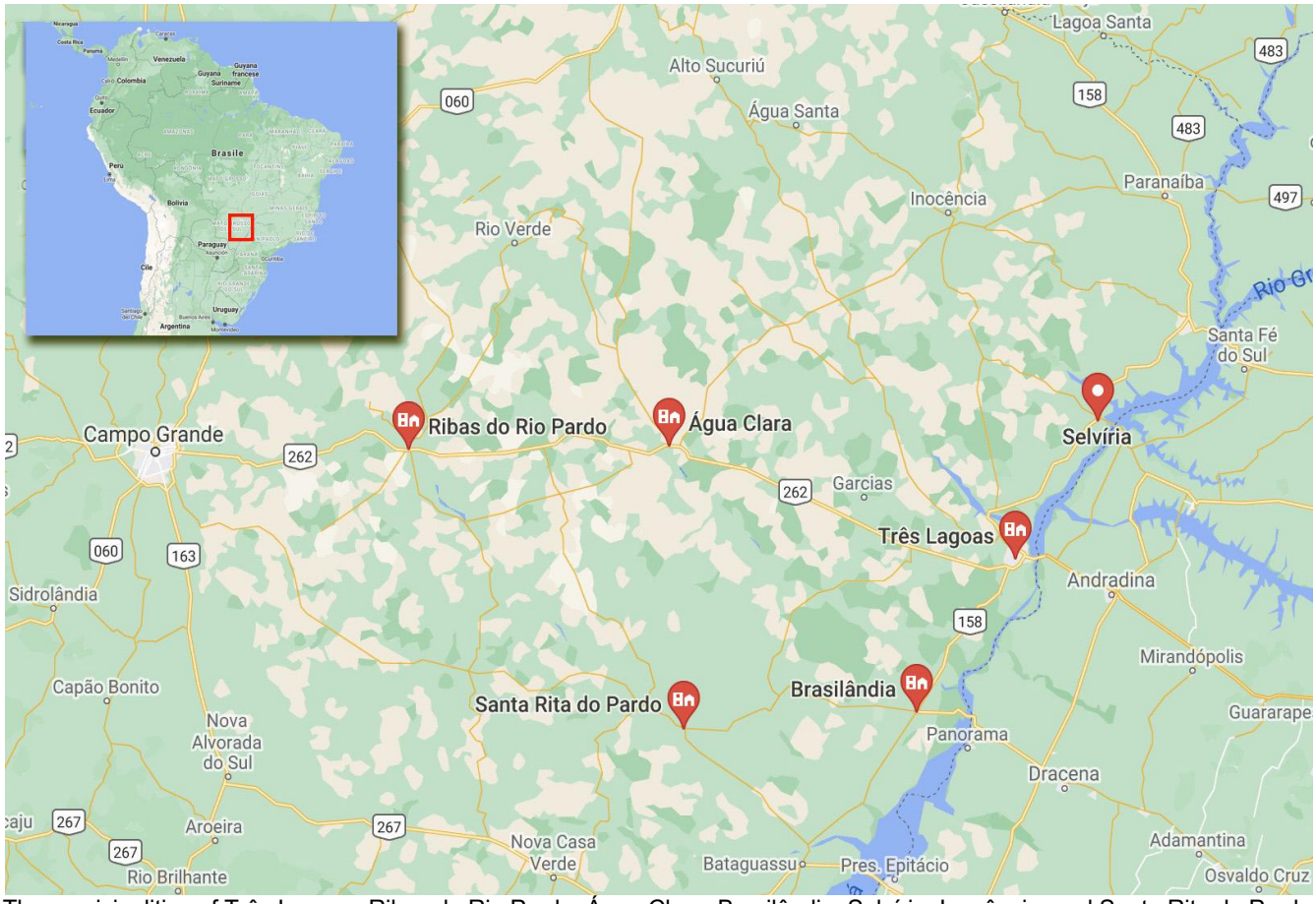
Executive summary

In the last two decades Brazil's pulp and paper industry has tripled its pulp production capacity, from 6.7 to 21.5 million tons per year.[2] The epicentre of pulp expansion is now shifting to the Três Lagoas region, on the eastern corner of Mato Grosso do Sul, where production exploded from 0 to more than 7 million tons per year within a decade, with nearly a million hectares of eucalyptus plantations. There are now plans in the area to double the capacity, with a further 6 to 7 million tonnes per year, in the coming years.
Such massive expansion will likely result in enormous impacts on biodiversity, soil quality, water availability and forest fires.



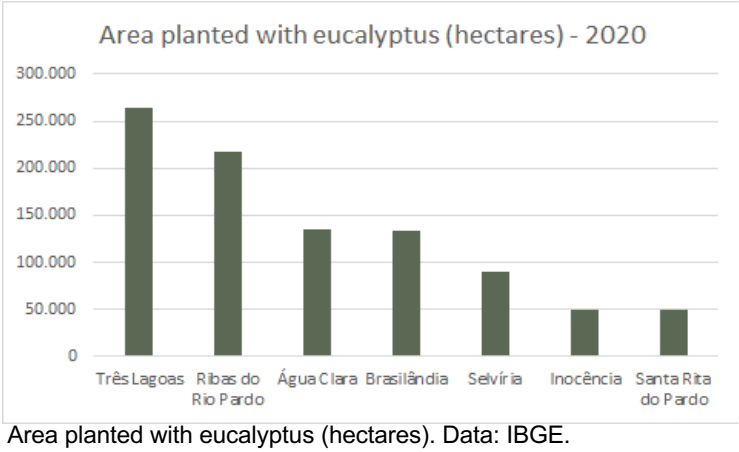
The municipalities of Três Lagoas, Ribas do Rio Pardo, Água Clara, Brasilândia, Selvíria, Inocência, and Santa Rita do Pardo.

The Três Lagoas region is located in the Cerrado biome, a vast tropical and subtropical biome, which occupies almost a quarter of the Brazilian territory and which is critical to eight of the twelve Brazilian river basins, and the Guarani aquifer. The biome is a mosaic of landscapes, from open fields and savannas to dense forests and riparian forests, and it is the habitat of 5% of all animal species on Earth. It also has a rich social diversity, with hundreds of traditional settlements, among them, Indigenous and *Quilombolas* (descendants of escaped enslaved Africans) communities.
Cattle ranching, soy plantations, but also forestry, charcoal production, mining, corn, cotton and sugarcane production, alongside urbanization, keep expanding into natural habitats.

The last to arrive on the scene was the paper industry.
By 2019, in Três Lagoas and the nearby municipalities of Ribas do Rio Pardo, Água Clara, Brasilândia, Selvíria, Inocência, and Santa Rita do Pardo, almost one million hectares of land (924.515 ha) had been converted into pulp plantations, mostly eucalyptus.[3]

[2]FAO, Forestry Production and Trade, https://www.fao.org/faostat/en/#data/FO
[3] IBGE Produção da Extração Vegetal e da Silvicultura, 2019, https://www.ibge.gov.br/estatisticas/economicas/agricultura-e-pecuaria/9105-producao-da-extracao-vegetal-e-da-silvicultura.html

However, this area is destined to grow further, as the installed pulping capacity has already reached 7 million tonnes per year meaning the mills require more wood.
With the newly announced development plans, these mills will probably require a much larger area of land, between 0.9 and 1.3 million additional hectares.
This development comes at a high cost for Indigenous peoples, wildlife, and water resources, also causing fires, poisoning the land, expelling rural people and finally, creating fewer dirty and poorly paid jobs:



Area planted with eucalyptus (hectares). Data: IBGE.

Indigenous people - large tracts of eucalyptus plantations cover Indigenous land. Expelled from their land by cattle ranching decades ago and scattered across the farms, Indigenous people have been expelled by the homogenous land management of pulp-wood plantations. The Indigenous land of Ofayé-Xavante, in the process of demarcation, was surrounded by plantations.
Cerrado - Despite claiming otherwise, the pulp & paper industry converted large tracts of remaining natural habitat in the Três Lagoas region: according to an academic study, around two thirds of pulpwood plantations have been developed between 2003 and 2013 by replacing the remaining Cerrado vegetation.[4]
Wildlife - from one of the most species-rich biomes, the Cerrado is now an extinction hotspot. First the forests were clumsily cleared by cattle ranching, but eucalyptus plantations, along with soy farming, are removing the last layers of natural vegetation remaining in the pastures.
Water - Eucalyptus is well known for absorbing water and draining the land. The massive expansions of these plantations at landscape level, in conjunction with climate change, is slowly turning the continental water reservoir into a dry land. Remaining natural vegetation is affected, and traditional and subsistence agriculture has become impossible.
Fire - the draining effect due to large scale eucalyptus plantations, in association with drier seasons linked with the El Niño climate pattern, are causing persistent fires, which in the long run may become endemic and uncontrollable.
Poison - the growing use of pesticides and other agrochemicals in connection with eucalyptus and soy farming, are polluting the already shrinking water table and threatening wildlife and the livelihoods of local communities.
Emptied land - Under eucalyptus management, the land loses its people. Small farmers, as well as employees of larger farms, are pushed away from the land, which is now managed by fewer, and mostly seasonal, workers.
Working conditions - The few jobs which replace the much larger number of people who previously lived on the land, are dirty, poorly paid and exhausting.

And yet, this massive industrial growth has not received the same amount of scrutiny as other land use sectors such as cattle ranching, possibly because the latter are more often directly linked to vicious practices, such as deforestation, fires, land grabbing and brutal violence. However these two industries are synergic in the elimination of the Cerrado biome.

In the area of Três Lagoas, most of the land was converted decades ago by the cattle ranching business, which also cast out traditional communities. Forested lands are not suitable for developing pulp and paper business, which is a highly technological industry that needs good infrastructure, such as roads and a stable electric grid, but they are good for cattle ranching, an industry with basic needs that can play the pioneering role.
With time, cattle farms bring people, trade and services to the newly converted lands, until finally infrastructure arrives. As these areas become consolidated, the price of land goes up and eventually the ranchers can cash in by selling their land to other actors, like the paper industry, which requires

[4] Lopes, Cassiomar. Expansão da silvicultura de eucalipto no bioma Cerrado: uma análise sob a perspectiva dos fatores físicos e socioeconômicos, July 2013 https://repositorio.bc.ufg.br/tede/handle/tede/3250

more infrastructure. With greater funds, cattle ranchers can now invest in larger tracts of cheaper 'marginal' woodland, beginning whole new cycles of deforestation.[5]
So even where the pulp and paper industry is not responsible for direct deforestation, it profits from the deforestation done by other actors.
When the pulp & paper industry enters, its footprint is heavy. Pulp mills are big plants, consuming large amounts of wood that should be sourced from within the area in order to minimize transportation costs. Paper companies acquire land where they can find it, be it pasture or natural vegetation, and it is not a surprise that most of the remaining Cerrado stands have been converted into eucalyptus plantations. In the newly acquired land, the paper industry completes the elimination of any residual trace of natural life, developing homogeneous plantations of exotic trees that, unlike pastures, leave no space for natural regrowth.

This report investigates the environmental and social impacts caused by industry expansion at such a large scale.



[5] The progressive retirement of cattle ranching from the regions doesn't mean this industry is declining, on the contrary, it is expanding, as confirmed by Petterson V. et Al.. So, if it loses ground in certain regions, it is only to gain more land in others. It is difficult to show evidence of the functional link between the paper industry and cattle ranching industries in the deforestation business, because when they move to a different location, cattle farms usually change name and ownership. However, given the magnitude of the phenomenon, 7 million tonnes pulp per year within a decade, it looks specious to require such evidence. See: Petterson V. et Al., Mapping the cattle industry in Brazil's most dynamic cattle-ranching state: Slaughterhouses in Mato Grosso, 1967-2016, April 2019, https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0215286

Methodology

The present research was carried out using a combination of field and desk research. Field research was carried out between October 2020 and May 2021. During this period, interviews were carried out with rural residents, agrarian reform settlers, teachers from local rural schools and workers in the plantations in the municipalities of Três Lagoas, Selvíria and Brasilândia.
Some interviews were carried out by phone, due to the pandemic.
The choice of interviewees was initially based on previous contacts made by one of the fellow researchers we consulted, who has been investigating the study area since 2015, guided by the Snowball methodology (interviewee indicates other people, according to the information gathered in dialogues and interviews.)
Some interviews were recorded for later consultation and other conversations took place informally.
The statements in the report are, for the most part, derived from this field research. There are also some excerpts of dialogues from previous studies, as well as information provided by other researchers at the Federal University of Mato Grosso do Sul. The names of the people interviewed have been changed to protect their identities. Their accounts have been authorized for publication in this report.
During the field trips, in the municipalities mentioned, but also in Água Clara, Ribas do Rio Pardo and Campo Grande, photos were taken to later integrate throughout the report
As for documentary research, a survey has been made of previous studies, and of news in local or sectorial newspapers, published in the period between 2009 and 2021.
Databases were consulted, such as the Brazilian Institute of Geography and Statistics (IBGE), and the Information System for Monitoring the Quality of Water for Human Consumption (Sisagua), and reports from institutes such as the Indigenous Missionary Council (CIMI), the Socio-environmental Institute (ISA), the Institute for Society, Population and Nature (ISPN), the Chico Mendes Institute for Biodiversity Conservation (ICMBio), as well as sustainability reports released by pulp and paper companies.

Três Lagoas, the world capital of pulp



In April 2013, the administrators of the sleepy provincial town of Três Lagoas (Mato Grosso do Sul, Brazil), caught up in the excitement of booming industrial development, declared the city, the "Capital Mundial da Celulose" (world capital of pulp).[6]

At that time, both Fibria and Eldorado were building pulp and paper mills near the city. Celulose Rio Pardense e Energia announced another mill in the nearby town, Ribas do Rio Pardo (a project later acquired by the Brazilian paper giant Suzano). As projects approached the completion phase, the paper companies announced more expansion projects. In the last decade, the area between Três Lagoas and Ribas do Rio Pardo has become an immense pulp factory.

Timeline of major developments:

• 2009 - Fibria and International Paper build the pulp and paper factory "Horizonte 1 in Três Lagoas. Production capacity: 1.3 million tons of pulp/year (mty).[7]

• 2012 – Start-up of Eldorado Brasil factory in Três Lagoas. Initial production capacity of 1.5 million tons of pulp/year, later increased to 1.8 mty[8], and a goal to reach 5 million tons with its expansion, reaffirmed recently after the total purchase of Eldorado's assets by the Indonesian conglomerate Asia Pulp & Paper (APP)[9].

• 2017 – Start-up of the 100% automated Fibria seedling nursery in Três Lagoas. Production capacity: 43 million seedlings annually[10].


Fibria Horizonte 1, Tres Lagoas, Brazil.

• 2017 – Fibria expands with a new production mill, Horizonte 2, also in Três Lagoas, with a production capacity of 1.95 mty. This brings Fibria's total production capacity to 3.25 mty[11].

• 2018 - Fibria announces its merger with Suzano Papel e Celulose. To finance the merger, Suzano obtained a loan of US$ 9.2 billion from BNDES (National Bank of Economic and Social Development).[12] A legal complaint against the merger (being Fibria partially-public owned a public bidding would have been required)[13] was rejected. The companies concluded their merger in January 2019, creating Suzano S/A.

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6 Diário Oficial do Estado de Mato Grosso do Sul, 12 April 2013, https://www.spdo.ms.gov.br/diariodoe/Index/Download/DO8411_12_04_2013

7 JPNews, VCP começa a produzir celulose em Três Lagoas, March 2009, https://www.jpnews.com.br/tres-lagoas/vcp-comeca-a-produzir-celulose-em-tres-lagoas/5400/

8 Eldorado Brasil, Instituciona, https://eldoradobrasil.com.br/Institucional

9 Celulosa Online, 2012: Fábrica da Eldorado é inaugurada em Três Lagoas (MS), April 2015, https://www.celuloseonline.com.br/2012-fabrica-da-eldorado-e-inaugurada-em-tres-lagoas-ms/

10 JPNews, Fibria inaugura o primeiro viveiro automatizado de mudas de eucalipto do mundo, October 2017, https://www.jpnews.com.br/tres-lagoas/fibria-inaugura-o-primeiro-viveiro-automatizado-de-mudas-de-eucalipto/102854

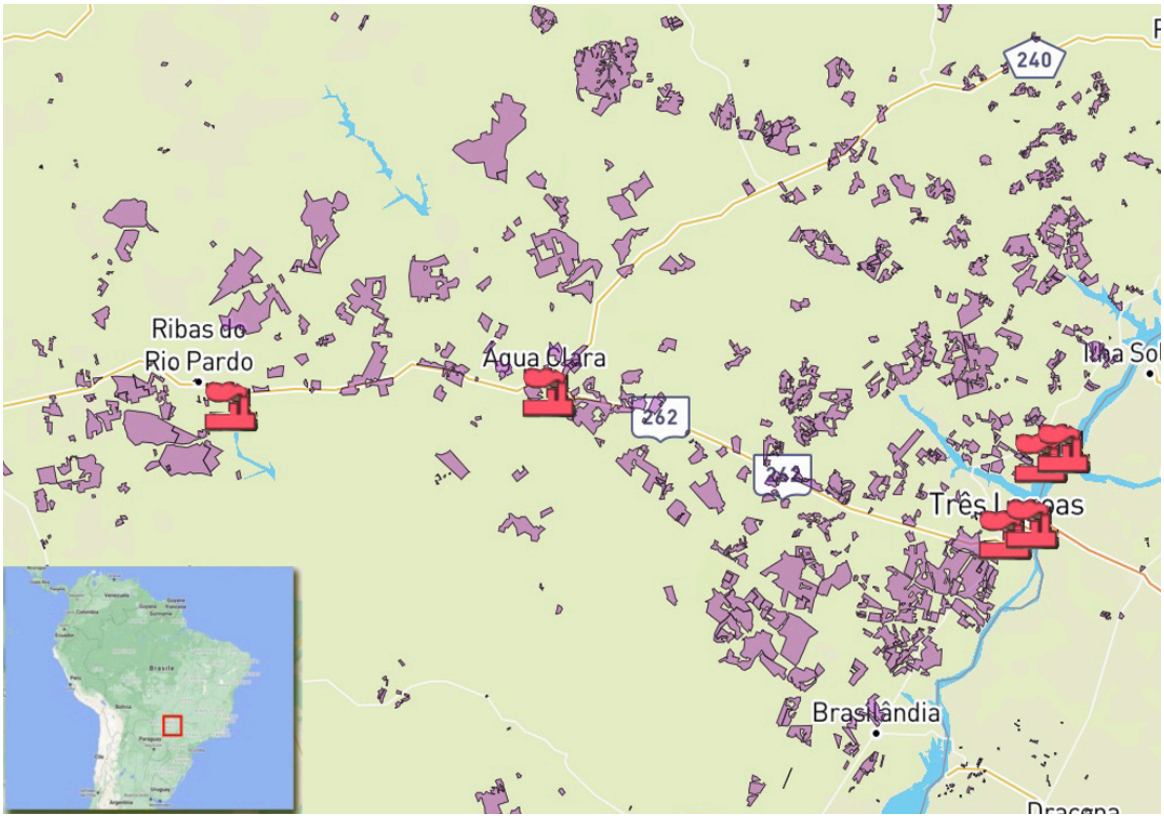
11 Tissue Online, Projeto Horizonte 2 da Fibria realiza primeiro processamento de madeira em Três Lagoas, July 2017, https://tissueonline.com.br/projeto-horizonte-2-da-fibria-realiza-primeiro-processamento-de-madeira-em-tres-lagoas/

12 PulpaperNews, Suzano and Fibria to merge, March 2018, https://www.pulpapernews.com/20190803/9342/suzano-and-fibria-merge

13 Caraipe, Escândalo mundial da celulose: Compra da Fibria pela Suzano continua sub judice e pode ser cancelada pela Justiça, November 2021, https://radiocaraipefm.com.br/2021/11/09/escandalo-mundial-da-celulose-compra-da-fibria-pela-suzano-continua-sub-judice-e-pode-ser-cancelada-pela-justica/

• 2019 – Suzano announces a new pulp mill project in Ribas do Rio Pardo.[14]
• 2020 – Eldorado announces plans for the construction of a second production line, Vanguarda 2, in Três Lagoas, with a capacity of 2.5 mty.
• 2020 – Mato Grosso do Sul reaches the record of 1,200,000 hectares of eucalyptus monoculture plantations, exceeding the expectations of the sector for 2030.[15]
• 2021 – Asia Pulp & Paper, via its controlled entity Paper Excellence, wins arbitration to complete its acquisition of Eldorado.[16]
• 2021 - Suzano start to build the plant in Ribas do Rio Pardo, to be completed by 2024 and announces a further increase in production capacity of up to 2.5 mty[17].
• 2021 - Eldorado starts-up the biomass power plant Onça Pintada in Três Lagoas.[18]
• In 2022 Arauco announces a plan to build a pulp mill with 2.5 mty capacity, between Inocência and Agua Clara.[19]

As a well-known business newspaper recently noted, "if all the planned or announced plants would become active now, there would be a deficit of at least half a million hectares of planted eucalyptus in Mato Grosso do Sul only."[20]



Pulp production lines (existing and planned) and existing eucalyptus industrial plantations in Três Lagoas.

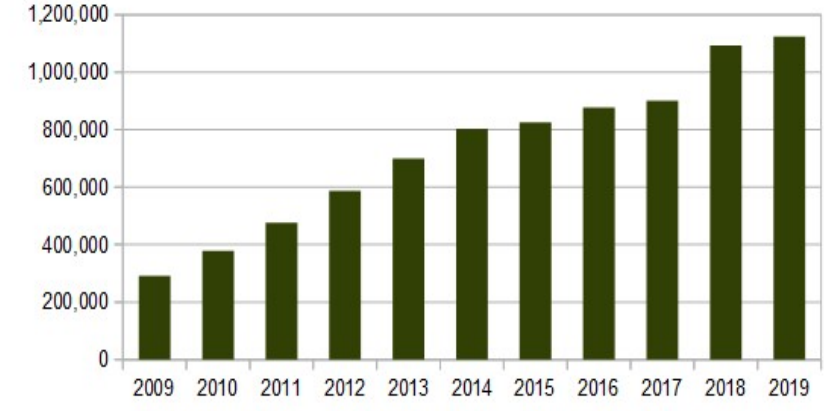
[14] Midiamax, Suzano compra 106 hectares em Ribas do Rio Pardo e anuncia nova fábrica de celulose, December 2019, https://www.midiamax.com.br/cotidiano/economia/2019/suzano-compra-106-hectares-em-ribas-do-rio-pardo-e-anuncia-nova-fabrica-de-celulose
[15] Canal Rural, Mato Grosso do Sul atinge a marca de 1,2 milhão de hectares de florestas plantadas, February 2020, https://blogs.canalrural.com.br/florestasa/2020/02/05/mato-grosso-do-sul-eucalipto/
[16] Reuters, Paper Excellence wins arbitration to complete acquisition of Brazil's Eldorado: sources, February 2021, https://www.reuters.com/article/us-eldorado-m-a-arbitration-idUSKBN2A32KI
[17] Globo Ruural, Suzano eleva previsão de capacidade para nova fábrica de celulose no MS, October 2021, https://revistagloborural.globo.com/Noticias/Empresas-e-Negocios/noticia/2021/10/suzano-eleva-previsao-de-capacidade-para-nova-fabrica-de-celulose-no-ms.html
[18] Campo Grande News, Primeira usina movida a tocos e raízes do País inicia operação em MS
Planta terá capacidade para gerar 432 mil MegaWatts de energia por ano, April, 2021, https://www.campograndenews.com.br/economia/primeira-usina-movida-a-tocos-e-raizes-do-pais-inicia-operacao-em-ms
[19] Tissue Online, Governador confirma instalação da maior fábrica de celulose do mundo em MSl,june 2022, https://tissueonline.com.br/governador-confirma-instalacao-da-maior-fabrica-de-celulose-do-mundo-em-ms/
[20] O Valor Econimico, Globo, Novas fábricas de celulose levam a corrida por terras e madeira no país, July 2022, https://valor.globo.com/empresas/noticia/2022/07/08/novas-fabricas-de-celulose-levam-a-corrida-por-terras-e-madeira-no-pais.ghtml

Money growing on trees

I'm going to plant eucalyptus
To see if I get rich
And you'll fall in love with me
(...)
When I'll harvest the eucalyptus
and I'll get rich
Everything will change
My ambition will rise
I'll only want hot women
- and I'll dump you.
(Jads e Jadson - Eucaliptos)

Who said that money doesn't grow on trees? Come to Mato Grosso do Sul, and you'll see. The local country music duo Jads e Jadson even rhymed it: eucalyptus is the new *Eldorado* of modern Brazil, the green gold rush: you plant it and you get rich - with all the disputable consequences.[21]

In Brazil, large scale tree monoculture began to expand with support from the ruling military dictatorship, as part of a plan to modernize the country (a plan that included converting the Amazon forests to agriculture land). A specific law provided generous incentives.[22] Plantations were developed in the 1960s, starting with the coastal regions of the Atlantic Forest biome (Espírito Santo, São Paulo, southern Bahia and Rio de Janeiro), then expanding in the mid-1970s into the Pampa biome (Rio Grande do Sul).[23] Since then, the area – planted mostly with Eucalyptus and Pinus genus – has expanded to reach 7.2 million hectares in 2021.[24]



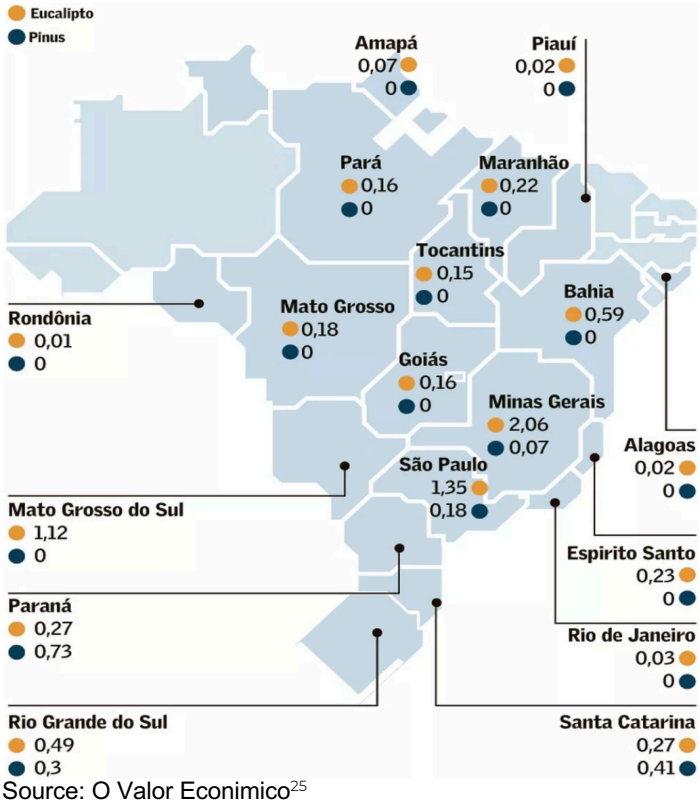
The unstoppable march of eucalyptus plantations. Source: Reflore MS/IBGE.

Driven by incentives and growing global demand, eucalyptus plantations reached the Cerrado biome by the end of the 1970s, establishing themselves first in Minas Gerais. Although the government had planned the development of a "Forestry District of Mato Grosso do Sul" since 1974, plantations only started to play a key role from 2007 in the Brazilian state, but since then, their expansion has boomed, increasing by 386% in the following 10 years.

[21] Jads e Jadson - Eucaliptos, https://www.youtube.com/watch?v=WTOaJm2a_8Y
[22] According to the Law No. 5.106 of 1966, tax incentives were provided to the Sector Investment Fund – FISET FISET Reflorestamento to the projects approved by the Brazilian Institute of Forestry Development – IBDF.
[23] Viana Maurício. 2004. Eucalipto e os efeitos ambientais de seu plantio em escala, 2004, https://bd.camara.leg.br/bd/handle/bdcamara/1162
[24] IBGE, 2022. https://sidra.ibge.gov.br/tabela/5930

In Mato Grosso do Sul, the pulp and paper industry seems to have found a perfect environment. Regional physical characteristics, such as flat terrain, adequate soil, high rainfall and an abundance of water, make the region perfect for eucalyptus plantations. However, for decades, this region has been relatively inaccessible, as it was too remote to profitably use the wood in pulp mills located mostly around the coast. Roads were in poor condition too and the region's infrastructure was insufficient to develop a highly technological industry like pulp milling.

Planted trees in 2020, in million hectares



Source: O Valor Econimico[25]





Eucalyptus plantation in São Joaquim, Selvíria.

Cattle ranching literally paved the way for the paper industry, which, pushed by market demand, expanded at the cost of natural habitats. Cattle ranching did not need much infrastructure, but its growth and the intensification of business activities in the area slowly led to increased infrastructure, including services, roads and an electricity grid, making the region attractive to the pulp & paper

[25] O Valor Econimico, Globo, Novas fábricas de celulose levam a corrida por terras e madeira no país, July 2022, https://valor.globo.com/empresas/noticia/2022/07/08/novas-fabricas-de-celulose-levam-a-corrida-por-terras-e-madeira-no-pais.ghtml

industry. Land concentration, further exacerbated by the cattle farming, also made it easier for paper companies to acquire large extensions of land to convert into eucalyptus plantations.

Politics also played an important role. In 2009, the state government swiftly changed its environmental law, exempting companies from submitting an Environmental Impact Assessment (EIA) for developing eucalyptus plantations, among other legal and fiscal flexibilities.[26] The national development bank, BNDES, offered loans, and the government provided fiscal incentives.
So the money is not yet growing on eucalyptus trees, rather it is public money that has actually been hung on their branches.



Land use change in Mato Grosso do Sul - from cattle farming to eucalyptus monoculture (Fazendas in Água Clara, 2021).

[26] Resolution SEMAC/MS n. 17 of September 20, 2009, https://www.legisweb.com.br/legislacao/?id=254170

Not a place for Indigenous Peoples

For 13 thousand years the Cerrado biome has been inhabited by Indigenous communities, and more recently, in the centuries since colonization, also by communities descended from Afro-Brazilian slaves (*Quilombolas*).

The largest Indigenous community in Mato Grosso do Sul is the Guarani-Kaiowá people. In addition to Indigenous Peoples and Quilombolas, there are also other traditional communities who live off the land, without legal demarcation of their territories.

Since 1988, the Brazilian Constitution has recognized the right of Indigenous Peoples to usufruct their traditional land. However only a minority of these lands have been fully demarcated and recognized. Cattle ranchers and others who have grabbed land from Indigenous communities tend to fight back against land recognition and, supported by a powerful political lobby,[27] often manage to stall the process. Even the former governor of Mato Grosso do Sul, André Puccinelli publicly declared that "it is a crime to give a swath of productive land to the Indians".[28]
As a result, of the total area of Mato Grosso do Sul, only 2.5%, has been recognized as Indigenous territories, alongside a 0.02% of quilombola territories.

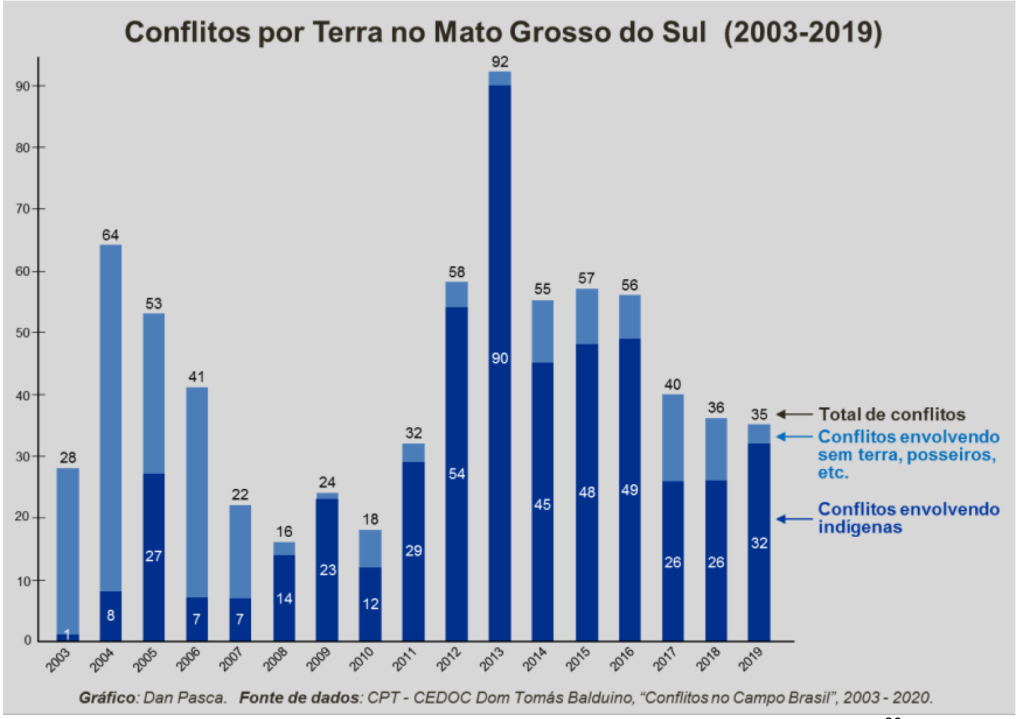
Of the 32 lands where the Guarani Kaiowá and Ñhandeva still live, and that has been regularly delimited, the communities obtained effective recognition of only 29% of the surface: 1.1 ha per person. The situation is not much different for the Quilombolas: of the 22 communities in the state, only 9 territories have had their official delimitation completed, and even in these territories, the traditional communities obtained less than a third (32.8%) of the claimed area.

Legal status	No	Area
Under study	15	n.a.
Delimited	4	129,123.0
Declared	10	145,392.8
Approved by presidential decree (homologation)	5	28,165.8
Regularized (formally registered as Indigenous land, Indigenous Reserve or Dominial Indigèna i.e. assigned to indigenous communities)	29	601,904.3
TOTAL	63	904,585.9

State of Indigenous Lands in Mato Grosso do Sul - 2020 Source: Instituto Socioambiental.[29]

As the Brazilian state failed to assure Indigenous People land according to their constitutional rights, conflicts increased all over the state about control over traditional lands. As a result, most of the land conflicts (77%) recorded between 2005 and 2019 in Mato Grosso do Sul are related to the recognition of Indigenous lands.

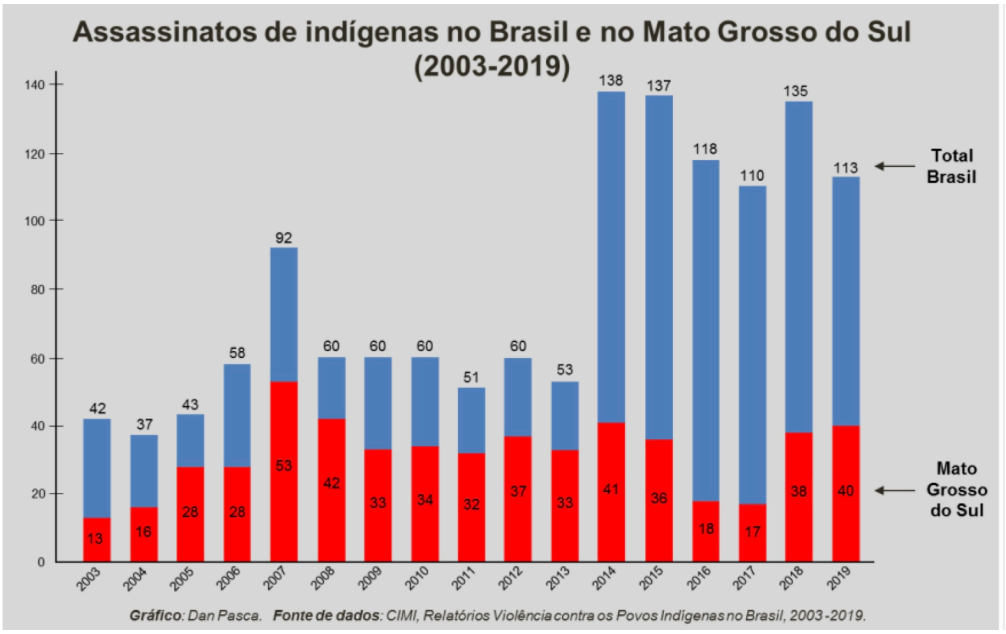
[27] For comparison, the policy makers of Mato Grosso do Sul own on average 1,351 hectares each. This helps to understand why the constitutional mandate assuring the right of traditional land to Indigenous peoples has not been implemented in this state. See https://deolhonosruralistas.com.br/deolhonoms/2018/11/08/ms-tem-1-351-hectares-para-cada-politico-e-apenas-1-hectare-para-cada-guarani-kaiowa/?fbclid=IwAR3JzX-yBC_AAgST44CD9q8YHKCQY343Q5HDYgBIapF9qqeL7CtZ0Pl5Deg
[28] Conselho Indigenista Missionário, Relatório - Violência contra os Povos Indígenas no Brasil, 2015, http://www.mpf.mp.br/atuacao-tematica/ccr6/documentos-e-publicacoes/mapa-da-violencia-contra-os-povos-indigenas/relatoriodados2015.pdf
[29] Souza Santos, A, et Al, "É muita terra pra pouco índio"? Ou muita terra na mão de poucos? Conflitos fundiários no Mato Grosso do Sul, 2020 https://acervo.socioambiental.org/sites/default/files/documents/prov0384.pdf



Land conflicts in Mato Grosso do Sul, 2003-2019. Source: Instituto Socioambiental.[30]

More and more often the ranchers resorted to open violence and terror. According to Conselho Indigenista Missionário (Missionary Council for Indigenous Peoples, an organization stemming from the Catholic Church), dozens of attacks against Indigenous communities were carried out every year by paramilitary militias led by farmers, and legitimized by public campaigns of defamation against Indigenous communities by federal parliamentarians and Rural Unions. As a result, 539 Indigenous People have been murdered in Mato Grosso do Sul between 2003 and 2019, almost 40% of the total killings of Brazilian Indigenous people.[31] Between 2001 and 2018, fourteen Indigenous leaders were murdered in reprisal for attempting to peacefully retake lands already recognized by the State. Most of these killings have been linked to land conflicts with farmers. The assassination of Indigenous people spiked to 182 under the government of Bolsonaro, who proactively delegitimized the rights of Indigenous Peoples to reclaim their traditional lands in order to promote business expansion.[32]

[30] Souza Santos, A, et Al, "É muita terra pra pouco índio"? Ou muita terra na mão de poucos? Conflitos fundiários no Mato Grosso do Sul, 2020 https://acervo.socioambiental.org/sites/default/files/documents/prov0384.pdf
[31] Conselho Indigenista Missionário, Relatório - Violência contra os Povos Indígenas no Brasil, 2020, https://cimi.org.br/wp-content/uploads/2020/10/relatorio-violencia-contra-os-povos-indigenas-brasil-2019-cimi.pdf or https://cimi.org.br/observatorio-da-violencia/edicoes-anteriores/
[32] Conselho Indigenista Missionário, Relatório - Violência contra os Povos Indígenas no Brasil - Dados de 2020, 2021 https://cimi.org.br/wp-content/uploads/2021/11/relatorio-violencia-povos-indigenas-2020-cimi.pdf



Murders of Indigenous People in Brazil and in Mato Grosso do Sul, 2003-2019.
Source: Instituto Socioambiental.[33]

Facing extreme marginalization and social exclusion, the Indigenous People of Mato Grosso do Sul struggle to survive. Their life is miserable: state statistics claim 63.7% of total suicides between 2000 and 2019 were committed by Indigenous People, mostly related to the most dramatic situation endured by the Guarani Kaiowá due to the confinement of the population in tiny territories, 1.1 ha per person. Young people are those who suffer most, as they are no longer able to become adults according to tradition. The initiation ritual for boys consists of clearing a piece of land to offer to the woman they are going to marry. When this is impossible due to a lack of land, young people have to find work on farms, giving up any hope of building a family and a future, and falling into depression, often associated with the use of alcohol, and many young people commit suicide by hanging or poisoning.[34] Almost half of the deaths (47.7%) registered in the Indigenous population between 2010 and 2017, are concentrated in the age group from 10 to 19 years old.[35]

This process of ethnocide of Brazilian Indigenous Peoples, inexorably follows the march of the bulldozers in the direction of the deforestation front. While the conflicts between cattle ranchers and Indigenous communities are still violently ravaging in the western part of Mato Grosso do Sul, in the eastern areas of the state, where eucalyptus plantations have been expanding during the last decade, most Indigenous communities were cast out of their lands long ago.
The Indigenous People that were still living in the area, scattered between the cattle farms, did not last long: the conversion into plantations definitively expelled them, silently, together with the residual rural population.

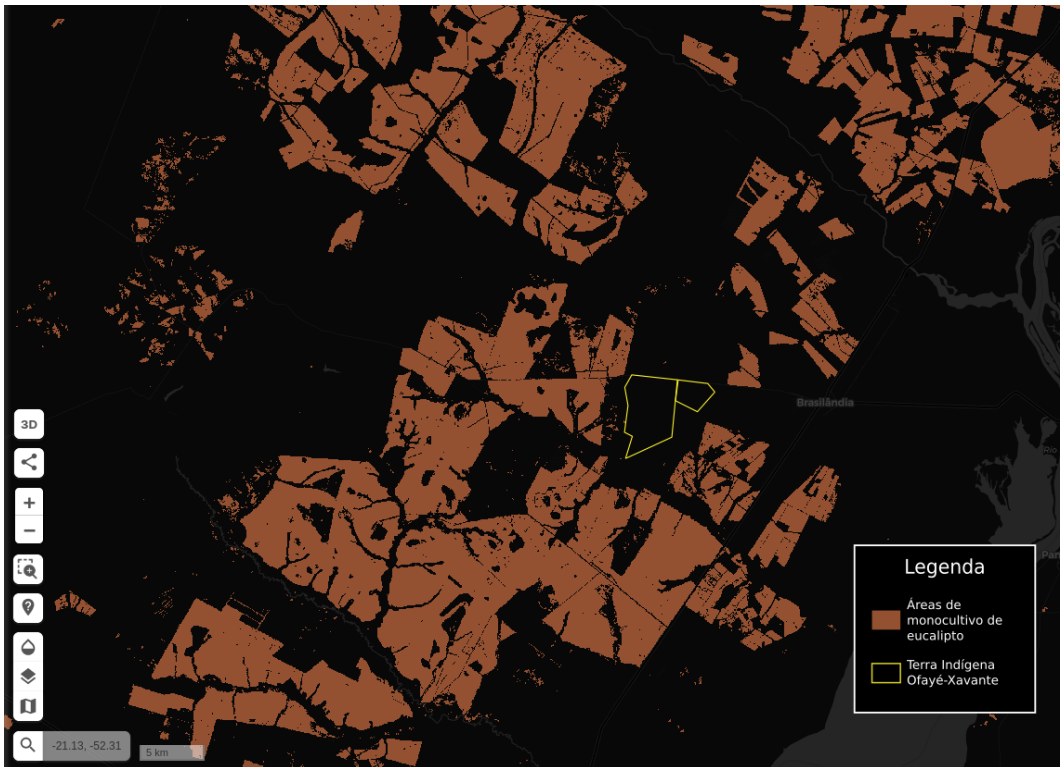
This area, once inhabited by Indigenous People, is now dominated by eucalyptus plantations, and only a single Indigenous community survives here, just seventeen families of the Ofayé-Xavante people, living in the municipality of Brasilândia[36] on an area of 484 ha.[37] Their land has been demarcated and is regularly registered, but after twenty years is still waiting for official recognition by presidential decree.

[33] Souza Santos, A, et Al, "É muita terra pra pouco índio"? Ou muita terra na mão de poucos? Conflitos fundiários no Mato Grosso do Sul, 2020 https://acervo.socioambiental.org/sites/default/files/documents/prov0384.pdf
[34] Rangel, L.H.,Violência autoinfligida: jovens indígenas e os enigmas do suicídio. Relatório - Violência contra os Povos Indígenas no Brasil, 2020 http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S2318-92822019000400003
[35] Albuquerque, F.P. , Análise descritiva dos óbitos por suicídio na população indígena assistida pelo Subsistema de Atenção à Saúde Indígena entre 2010 e 2017., 2018, https://portalarquivos2.saude.gov.br/images/pdf/2018/novembro/16/prevencao-do--suicidio---saude-indigena-em-debate.pdf
[36] Povos Indigens, Ofaié, https://pib.socioambiental.org/pt/Povo:Ofaié
[37] Terras Indígenas no Brasil, Terra Indígena Ofayé-Xavante, https://terrasindigenas.org.br/pt-br/terras-indigenas/3956



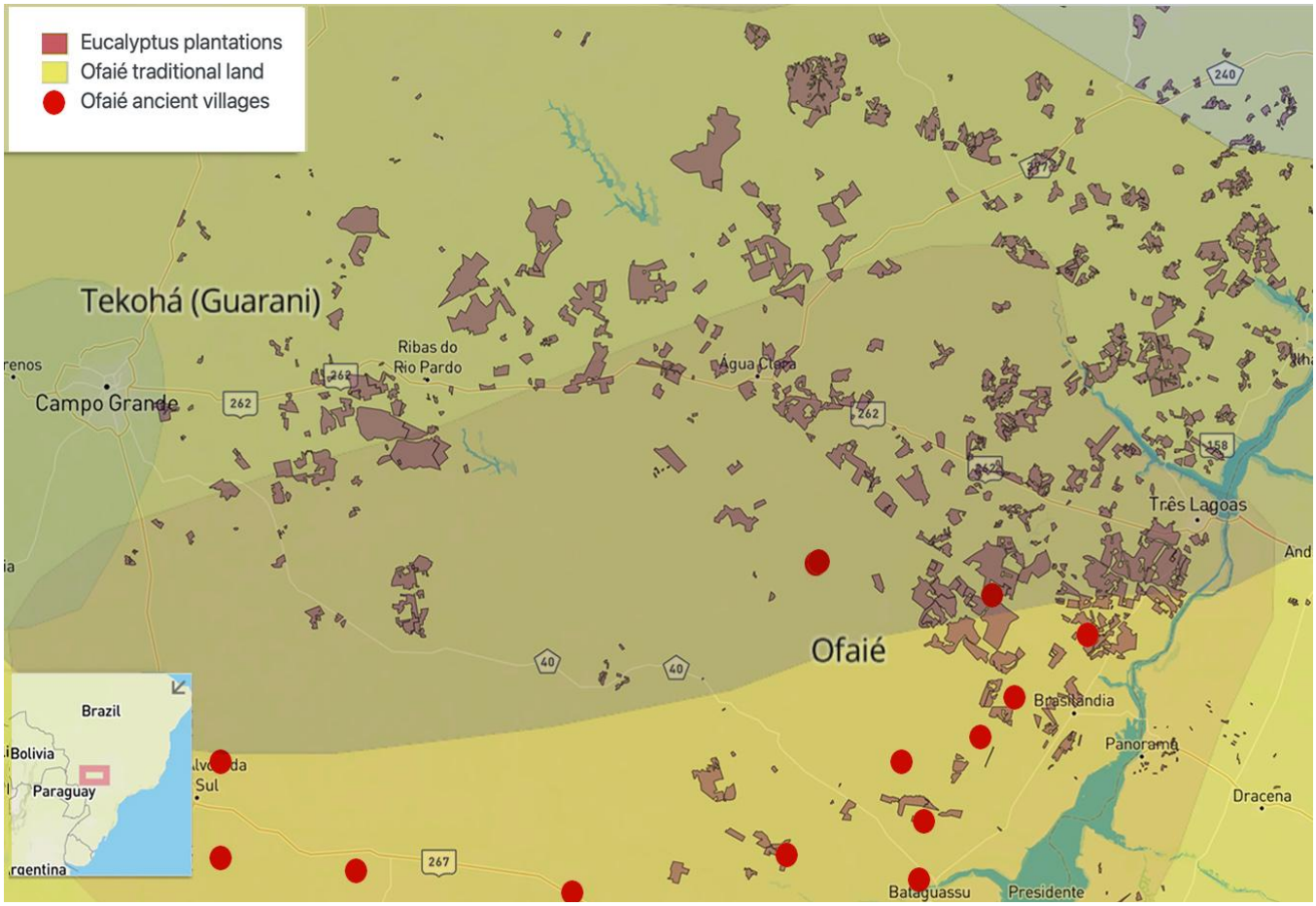
Ofayé people, living in the Cerrado, in Brasilândia. Photo: Nataly Guimarães Foscaches.[38]

Their residual presence caught the attention of Fibria / Suzano who proudly announced its support for a project aimed at "training handicraft production groups through guidance on entrepreneurship" and "contributing to reinforcing their ethnic identity".[39] It turns out that the project involves just 12 people, assuring them a *family income* of less than 13 USD a month (70.83 Reais - note that minimum wage in Brazil is 1,212 Reaais) and generating a total of 1,800 USD (10,200 Reais). It is easy to imagine that the company invested much more money in media expenditure to promote the project as an example of its social responsibility. The project was suspended in 2020 "due to the change in the community's leadership".[40]



The only demarcated Ofayé territory, surrounded by eucalyptus plantations. Source: biomap.org.

[38] UFMS, "O Território Ofaié – Pelos Caminhos da História" será relançado durante VI RAMS, April 2007, https://www.ufms.br/o-territorio-ofaie-pelos-caminhos-da-historia-sera-relancado-durante-vi-rams/
[39] Suzano, Indicators Center, May 2021, https://centraldeindicadores.suzano.com.br/wp-content/uploads/2021/05/Indicators-Center-Suzano-2020_eng.pdf
[40] Suzano, Indicators Center, May 2021



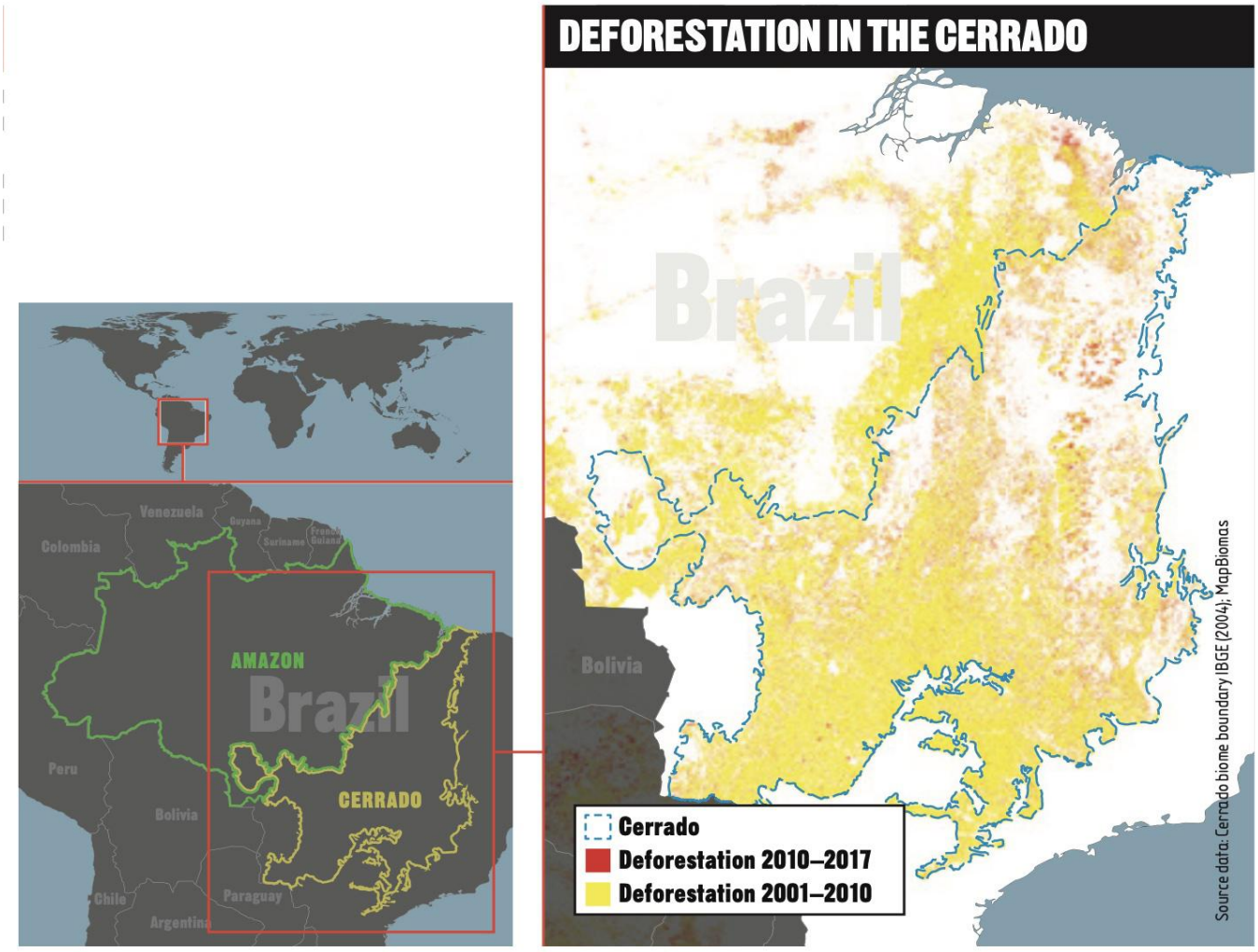
Map of Ofayé territory before the arrival of cattle ranching, superimposed on the current eucalyptus plantations. Red points are where Ofayé villages were located prior to their expulsion by ranchers. Realized from data in Carlos Alberto Dos Santos Dutra, Ofaié, morte e vida de um povo, from Native Land (https://native-land.ca/) and MapforEnvironment (shorturl.at/qyAD3) . Pls. Note that there is an overlap with the Tekohá (Guarani) territory.

Cerrado, so precious, so fragile

The Cerrado is one of the world's largest hotspots, covering more than two million square kilometers, an area bigger than Great Britain, France and Germany combined.[41]
The region comprises a mosaic of landscapes, from open fields and savannas to dense forests and gallery (riparian) forests. It is characterized by two well-defined seasons in the year: dry and wet. Its plants are adapted to periods of drought. They are also adapted to fire, which occurs naturally, mainly in the rainy season, related to the presence of lightning in storms. Fire has a complex relationship with the biome.

Being a wooded savannah ecosystem with a long dry season, the Cerrado is extremely rich in life. It is actually one of the richest ecosystems in the world, containing about 5% of all species on Earth. It has 2,636 catalogued species of vertebrate animals (among them a thousand birds and three-hundred mammals), an estimated 90,000 species of insects and of 12,000 identified plant species. More than 4,000 are endemic of the region[42].
The Cerrado is also known as the 'cradle of waters', because it is critical to eight of the twelve Brazilian river basins; it contains the headwaters of nearly all of the southern tributaries of the Amazon River, as well as those of several rivers in the states of Maranhão and Piauí.

The Cerrado also has a rich cultural diversity: there are about 216 Indigenous lands (the vast majority still without finalized demarcation processes, e.g. with no status or protection), 44 quilombola territories, and several other traditional communities, who have extensive knowledge of the local plants and their medicinal uses and who conduct a traditional life fully integrated with the biome.



[41] IBGE, Cerrado, https:/brasil síntese.ibge.gov.br/território.html
[42] ISPN, Cerrado, O coração do Brasil, https://ispn.org.br/biomas/cerrado/

Despite being rich in biodiversity, having high hydrological importance and containing much social diversity, the Cerrado has not been spared from conversion. Cattle ranching, soy plantations, but also forestry, charcoal production, mining, corn, cotton and sugarcane production, alongside urbanization, continue to expand into natural habitats. Pumping water to support agricultural production and spraying the land with increasing amounts of pesticides, further impacts the biomes.[43]
Large amounts of pesticides and fertilizers are also used in eucalyptus plantations, including through aerial spraying, which harms the environment, local residents' health, and organic farmlands.

This development has come at a high cost and the clearing of land for pastures and monoculture cultivation is rapidly wiping away entire species. In the last five decades, the Cerrado has been the main area for agricultural expansion and consolidation of Brazilian agribusiness, and two million hectares of the Cerrado vanished every year to agriculture. As a result, the biome has lost half of its original vegetation cover.[44] Erosion has also been significant and less than 20% of the original biome remains intact, with just 3.2% of it under full protection[45].
The Cerrado has now become one of Brazil's most threatened ecosystems and a global biodiversity "hotspot" (combination of endemism and threat).[46]

It has been projected that continuing uncontrolled occupation of the Cerrado may lead to loss of 82% of its original area by 2050. The process now extends from Brazil into Paraguay as well. The fact is that a further reduction of the Cerrado due to conversion into plantations would likely lead, as scientists have warned, to an irreversible mass species extinction.[47]

Taxonomic Group	Species	Endemic Species	% Endemism
Plants	12,070	4,208	34.9
Vertebrates	2,373	433	18.2
Fish	*800*	*200*	*25.0*
Amphibians	*204*	*72*	*35.3*
Reptiles	*262*	*99*	*37.8*
Birds	*856*	*30*	*3.5*
Mammals	*251*	*32*	*12.7*
Total	**14,443**	**4,641**	**32.2**

Species Richness and Endemism Among Plant and Vertebrate Groups in the Cerrado
Source: CEPF.[48]

While deforestation in the Amazon has drawn national and international attention, the destruction in the Cerrado has escaped attention. This may be related to the impenetrability, mystery and mythology linked with the Amazon forests since the first colonizers, but also because monitoring deforestation in the Cerrado biome is actually much more challenging, as it is a mosaic of very different habitats, with different densities of forest cover, therefore, it is difficult to identify by analyzing satellite imagery: riparian forests often do not appear in satellite images, while shrubs and savannas can be confused with pasture.

Unchecked, deforestation has moved forward. With the progressive substitution of natural forests and grassland areas with monocultures, the natural environment for wildlife has decreased drastically. Within a few decades, half of the Cerrado has been totally cleared, while most of the rest has been degraded to various degrees. As a result, the Cerrado is leading in the number of species threatened with extinction: 903 species are included in the National Red Lists of Brazil (266 species of fauna and 637 species of flora); 976 species are included as threatened locally, nationally or globally.

[43] Bombardi, L., Geografia de Uso de Agrotóxicos no Brasil e Conexões com a União Europeia. 2017, https://www.academia.edu/43627393/Atlas_Agrot%C3%B3xico_Larissa_Bombardi
[44] https://news.mongabay.com/2018/03/cerrado-appreciation-grows-for-brazils-savannah-even-as-it-vanishes/
[45] Instituto Chico Mendes de Conservação da Biodiversidade, Categorias de UC, https://www.icmbio.gov.br/portal/images/stories/servicos/geoprocessamento/DCOL/dados_tabulares/UC_bioma_julho_2019.pdf
[46] Critical Ecosystem Partnership Fund, Cerrado Biodiversity Hotspot, February 2017, https://www.cepf.net/sites/default/files/cerrado-ecosystem-profile-summary-english-revised-2017.pdf
[47] Strassburg, Bernardo B. N. et Al., Urgent action on Cerrado extinctions, 2016, https://www.nature.com/articles/540199a
[48] Critical Ecosystem Partnership Fund, Cerrado Biodiversity Hotspot, February 2017, https://www.cepf.net/sites/default/files/cerrado-ecosystem-profile-summary-english-revised-2017.pdf

Nationally and Globally Threatened Species in the Cerrado Hotspot, by Taxonomic Group

Taxonomic group	Brazilian National Red List	IUCN Global Red List	Total Threatened Species**
Plants	637	41	**637**
Birds	34	41*	**54**
Amphibians	4	4	**7**
Reptiles	17	7	**22**
Mammals	41	20	**46**
Fishes	103	5	**108**
Invertebrates	67	41	**102**
Total	**903**	**159**	**976**

Notes: *= including globally threatened birds from Bolivia and Paraguay; ** = species evaluated as threatened nationally and/or globally.
Source: CEPF.

This wildlife tragedy has serious consequences for local communities, as animals expelled from their natural habitats, end up invading villagers' gardens and eating people's crops, making some cultivations unfeasible.

> *The animals are coming to the city. If you have some plantation here, and it's full of fruits, the animals come right in the morning and eat everything, because they don't have to eat, there's no forest for them anymore, it's a sea of eucalyptus.*
>
> *(João, Arapuá Villager)*

> *You could see the papaya trees dying, because the toukans are heavy, they would break all the leaves. The tree was full of fruits and you could see all over the ground, half eaten. The pequi trees and the macaws would take care of them. So I gave up, I got tired (of cultivating fruits).*
>
> *(Cristina, Pontal do Faia village*

> *We got some corn seeds, but not for us, for the parrots, as the parrots eat all the corn production, and we cannot harvest anything*
>
> *(Raquel, Arapuá villager)*

In the Três Lagoas region this process is well advanced. Most of the land clearing began as a result of cattle farm expansion decades ago, but the elimination of biodiversity is being completed by the pulp & paper industry. A study conducted in 2013, suggests that 61% of the eucalyptus plantations developed between 2002 and 2013 in the area analyzed by this study (municipalities of de Água Clara, Três Lagoas, Brasilândia and Santa Rita do Pardo) have replaced the remaining Cerrado vegetation, while just 25% has been converted into pasture.[49]

As for the land already converted by cattle ranching, on this land deforestation has been dramatic, but also relatively fragmented. Farmers normally clear the land with the fire. In some cases this is not the end of the natural vegetation, since Cerrado plants, due to their deep roots, have a remarkable capacity to resprout. Many pastures considered by farmers as degraded are, in fact, dominated by natural vegetation under natural regeneration.

This fragmentation came to an end with the shift from cattle ranching plantations to the rapidly expanding soybean plantation industry along the median belt, leading from the south-west to the north-east of the state, and the eucalyptus plantations booming in the eastern corner. Under these two industries, the different farms were unified under a single and uniformed management unit that cleared blocks of natural shrubs, plowed the land deeply, and left behind no deep roots, nor chance of regeneration.

[49] Lopes, Cassiomar. Expansão da silvicultura de eucalipto no bioma Cerrado: uma análise sob a perspectiva dos fatores físicos e socioeconômicos, July 2013 https://repositorio.bc.ufg.br/tede/handle/tede/3250

If cattle ranching logged the Cerrado, then the paper industry uprooted it for good.

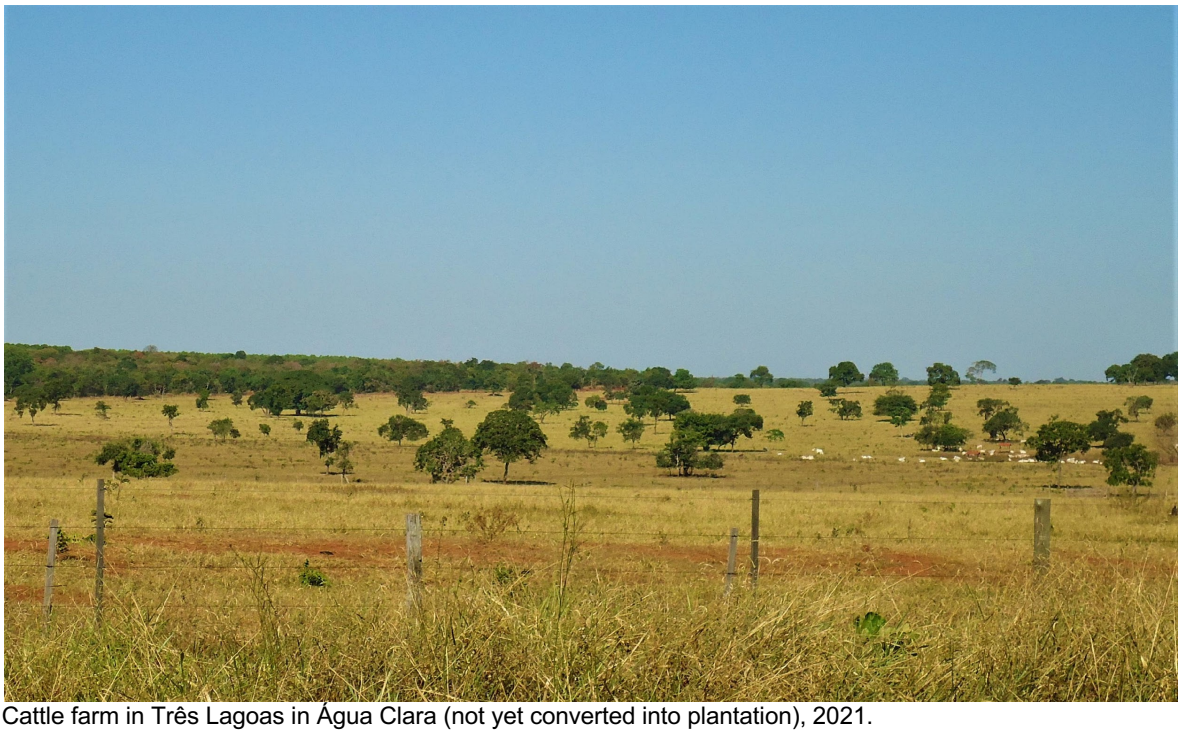
> *The animals that live inside the plantations, what do they eat? In the past our region was rich in fruits: wild guava, marolo, all the wild fruits, right, today there's none; unless in the preservation area. Even there, we have to fight a lot because in many cases it is getting degraded.*
>
> *(Lurdes, Garcias villager)*

Classification of expansion areas

Converted Area	Surface %
Cerrado remnant	61.66
Pasture	25.70
Existing timber plantations	11.46
Agriculture	1.18

Comparison of PROBIO 2002 land cover dataset and mapping data collected in 2010 by Lopes Cassiomar.

> *In a while we are going to lose our space here too, because the animals I see there in my grange, parrots and toucans, don't have anything to eat anymore. They come to eat in our grange. I'm planting a lot of pumpkin so we can feed them. Why? The eucalyptus, I was told they let 100 pequi trees in that "forestation" they made. A year later, 67 of them were already dead. So it is ending, we don't have it anymore, the animals are hungry, we have to fight.*
>
> *(Selma, villager of 20 de Março).*



Cattle farm in Três Lagoas in Água Clara (not yet converted into plantation), 2021.



Eucalyptus plantation in Água Clara 2021.



Endemic Cerrado tree that has been left removed in the middle of an eucalyptus monoculture and ended dying, like others in the background. A very common scene.

Brazilian law requires that certain protected trees are left standing when converting natural or semi-natural land into plantations. These trees, as reported by the villagers, usually die within a few years, because the environment on which it depends is not there anymore. When a tree is left alone on a soil desertified by clearing, it is simply unable to survive, as plants usually are co-dependent organisms.

Where has all life gone?

Many wild species are in decline in the Cerrado. The best known are the jaguar, the giant armadillo, the tapir, the giant anteater, and the maned wolf. They are all threatened with extinction and for all of them specific threats come from the pulp & paper industry.

The Jaguar *(Panthera onca)* The Jaguar is the largest cat species in the Americas and is at risk of extinction in Brazil. On the Brazilian Red List the Jaguar is classified as vulnerable and is considered to be facing a high risk of extinction. It is hunted, but the main threat is the dramatic reduction of habitat. This big feline was a natural inhabitant of the region, but its population has declined dramatically since the nineteenth century. However, according to interviews with local communities, since the ongoing conversion from cattle ranching to eucalyptus plantations, this animal is frequently spotted near to settlements, probably because it has been driven out of its habitat.

> *There were no jaguars in the region, now there are. Because the animals don't have food anymore. There's a woman in the settlement here, she said she went to water her garden, and saw two jaguars. A neighbor also said that jaguars are eating calves... and people say it is because of the eucalyptus.*
>
> *(Maria, Arapuá villager)*

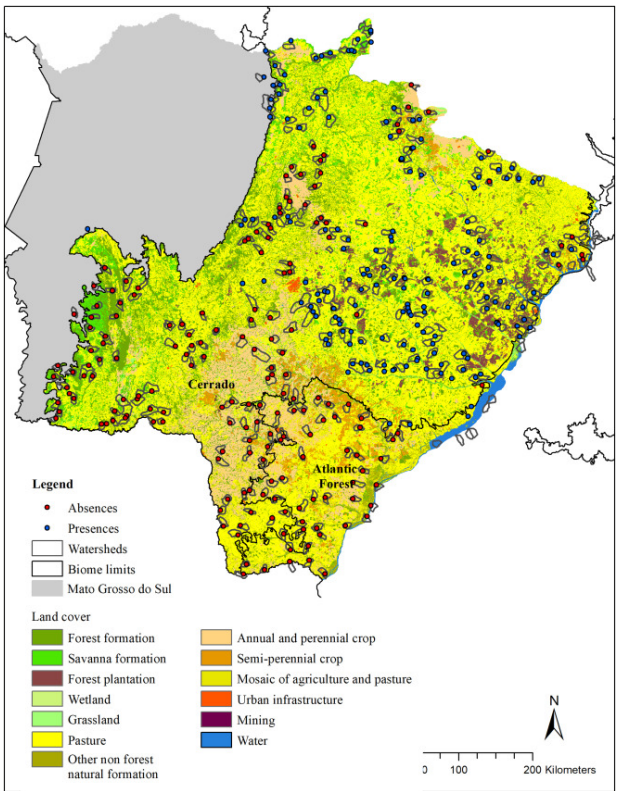
> *One of the most feared animals in nature is being seen more and more frequently in the Córrego do Moeda region, near to the Fibria factory, in the rural area of Três Lagoas. The jaguars, or suçuarana, as they are called, live in the Paraná River basin, where large eucalyptus plantations are now concentrated. With the intense work of planting and harvesting trees, plantation workers are already getting used to the scene, to see jaguars up close.*
>
> *(Radio Caçula, 2014)*[50]

Armadillo *(Dasypus)* The most iconic species of armadillo genus is the Giant Armadillo (Priodontes maximus), the largest and rarest in the world. It can be up to 1.5 m long and weigh up to 60 kg, and males are larger and heavier than females. Researchers consider it an "ecosystem engineer", because its burrowing behavior alters the physical environment and creates new habitats. The species is threatened with extinction and currently classified as Vulnerable (VU) on the IUCN Red List and Critically Endangered (CR) in various states. Loss of habitat and hunting have been the main reasons for the drop in population, but in the last few decades road accidents have also taken their toll.



The Giant armadillo is a totemic animal of great relevance in many traditional Indigenous cultures.

[50] Radio Caçula, Trabalhadores da área rural estão se acostumando com a presença de onças, August 2014, https://www.radiocacula.com.br/noticias/trabalhadores-que-da-area-rural-estao-se-acostumando-com-a-presenca-de-oncas



Giant armadillo presence points: land cover (Mapbiomas, v. 4.1) in the modeled area (g-space) of Cerrado and Atlantic forest of the state of Mato Grosso do Sul, Brazil. Watersheds surveyed for the presence of giant armadillos (Priodontes maximus) are represented by polygons. Points represent confirmed presences (blue) and absences (red).[51]



An Armadillo (Dasypus novemcinctus), crushed near Suzano factory (BR 158) photographed during the present research, 2020/2021.

The Tapir *(Tapirus terrestris)* The Tapir is the largest terrestrial mammal in South America. It reaches a height of 1 meter, is 1 meter long and can weigh up to 300 kg. It is known for its long snout similar to an elephant's trunk. It is a good swimmer, even in large rivers. The species is classified as Vulnerable (VU) on the IUCN Red List and Endangered (EN) in the Cerrado. The main threats to this species are habitat loss, hunting and declining and isolated populations.

> *Before, there were forests, there was food and water for the animals. Now they don't find them anymore. We see the animals getting here [in the settlement] to eat. The tapirs, armadillos, anteaters, monkeys... how are tapirs gonna live with no water? We like to keep our house like this, full of fruit trees, but it is not very common. So there's no food left for them. I think the company [Eldorado] should plant them, they should get a piece of plantation and plant only fruit tree areas for the animals, every now and then. They have to. Because the animals are dying and starving, and now they're running out of water.*
>
> *(Artur, Alecrim villager)*

The tapirs are increasingly affected by road accidents, due to the intense traffic of logging trucks. These incidents have been documented by the media and local researches[52].
According to a technical study carried out by IPE (Instituto de Pesquisas Ecològicas), 15 wild animals are killed every second on Brazilian roads.[53]

[51] Paschoaletto, K.M. Et Al., Species distribution model reveals only highly fragmented suitable patches remaining for giant armadillo in the Brazilian Cerrado, February 2021, https://www.sciencedirect.com/science/article/pii/S2530064421000018
[52] Arnaud Leonard Jean Desbiez e Emília Patrícia Medici, "Atenção! Bichos na pista!". Ciência Pantanal, vol 3, nov 2017. Available in: https://www.researchgate.net/publication/337001489_Ciencia_Pantanal_vol_03_2017
[53] IPE, Relatòrio Tècnico, 2019, https://www.ipe.org.br/images/Impacto-de-Atropelamentos.pdf



Tapir (Tapirus terrestris) run over on the side of the road.[54]

The Giant Anteater *(Myrmecophaga tridactyla)* This species is easily recognisable by its characteristic coat, with a broad diagonal black stripe flanked by white borders that runs from its chest over its shoulder, halfway down its back.
It can reach up to 2.2 m in length and has a long thick bushy tail and long elongated snout used to dig up anthills and termite nests. It lives in open grassland, cerrado and forests. It was once very common, but is now under threat of extinction in all regions of Brazil (Vulnerable). The main causes of population decline are the degradation and destruction of habitat, hunting, and road accidents.
The Giant Anteater is the animal most affected by road accidents in the Cerrado area. In Mato Grosso do Sul, according to data from the Federal Highway Police, between 2007 and 2019 there were 614 collisions with animals resulting in fatal deaths or injuries.[55]



Anteater, run over near Suzano mill in Ribas do Rio Pardo (BR 262), photographed during the present research, in 2020-2021.

The Maned Wolf *(Chrysocyon brachyurus)* The Maned Wolf is the largest canid in South America. It weighs between 20 and 30 kg and it is known for its red coat and long, thin legs. It feeds mainly on small rodents, birds and fruit. It prefers open vegetation, such as grasslands and wetlands. There are less than 25,000 Maned Wolves in the world, 20,000 of which are in Brazil. On Brazil's Red List, the Maned Wolf is considered threatened with extinction in the category Vulnerable (VU). The main threat to this species is habitat destruction, leading to isolated populations.

The maned wolf suffers a lot from the destruction of the environment, forcing them to look for other places to live and feed. In this quest, many are run over on roads. According to farmers, they attack the creation of chickens and pigs, so these animals, in addition to having their habitat destroyed, have to deal with hunting. In the face of so many problems, it is not surprising that it is classified as vulnerable to extinction by the IUCN (International Union for the Conservation of Nature and Natural Resources). (Arapuá MS, 2019)

[54] Capital do Pantanal, Cresce número de atropelamento de animais silvestres nas estradas de MS, April 2017, https://www.capitaldopantanal.com.br/geral/numero-de-atropelamento-de-animais-silvestres-nas-estradas-de-ms/522525/
[55] ICAS, Sobre Tamanduás e Rodovias, https://www.tamanduabandeira.org/sobre.html

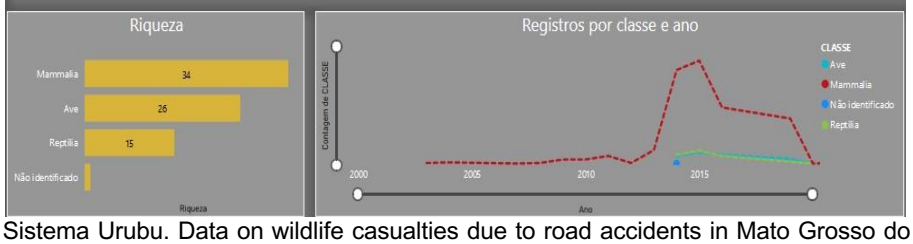


In Arapuá, a maned wolf was seen carrying a jackfruit to eat, which is not part of their regular diet, indicating a possible lack of food (Arapuá MS, 2019).

On the road to death

The sharp increase in road traffic in the form of heavy trucks carrying eucalyptus logs to pulp mills, has caused an increase in wildlife deaths in the municipalities where plantations have expanded the most. The Environmental Military Police have reported an increase in casualties related to fires and to the expansion of eucalyptus plantations, especially alongside the BR-158, which connects the municipalities of Brasilândia, Três Lagoas and Selvíria.[56] These are the same municipalities which have the largest areas of eucalyptus monocultures. The Police have warned that the increase in fires (see below) expels large mammals out of their habitats, forcing them to cross the highways, resulting in slaughter.

ESPÉCIE	2003	2004	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2019	2020	2021	Total
Não identificado							2			34	34	17	9	1		97
Myrmecophaga tridactyla					1	1				30	30	21	9		1	93
Cerdocyon thous				1	2	3				15	19	20	25			85
Hydrochoerus hydrochaeris						1	1			20	15	13	6			56
Tamandua tetradactyla					2	1	1			18	15	10	3			50
Tapirus terrestris						1				17	20	4	2			44
Euphractus sexcinctus					1	1				9	15	3	9	1		39
Leopardus pardalis		1					6	1	7	5	12	4				36
Chrysocyon brachyurus									11	1	6	1				19
Dasypus novemcinctus										7	1	7	4			19
Procyon cancrivorus										2	7	4	2			15
Puma yagouaroundi	1		1		1		4			3			1			11
Caiman yacare										4	2	3				9
Total	2	3	1	2	8	8	14	2	24	192	220	127	87	3	2	695



Sistema Urubu. Data on wildlife casualties due to road accidents in Mato Grosso do Sul.

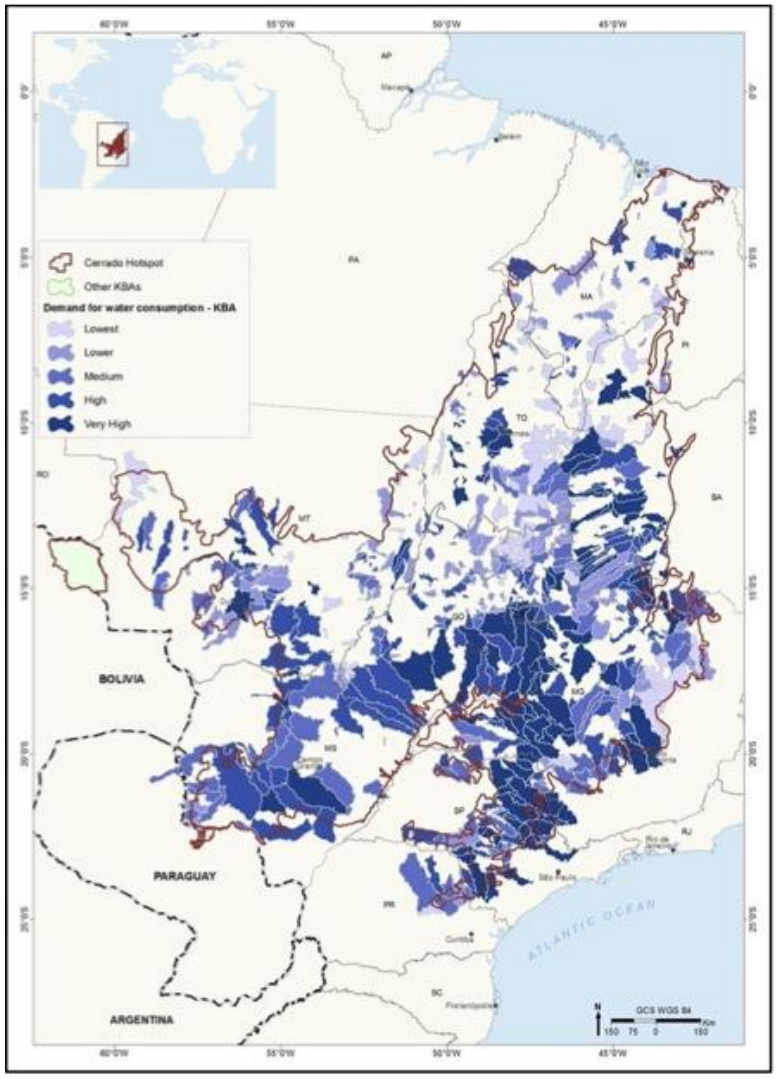
The monitoring system created by the Brazilian Center for Studies in Road Ecology (CBEE) and geolocalized photos posted by users, suggest that in Mato Grosso do Sul, 695 wild animals were run over by cars, most of them mammals, between 2003 and 2021. The database shows a substantial increase in casualties in parallel with the eucalyptus boom and, noticeably, a sharp increase in 2014

[56] JP News, Para escapar de queimadas, animais invadem rodovias e são atropelados, August 2017, https://www.jpnews.com.br/tres-lagoas/para-escapar-de-queimadas-animais-invadem-rodovias-e-sao-atropelados/100308/

and 2015 (reported casualties declined dramatically during the Covid-19 pandemic). Since this data is based on individual observations, it probably underestimates the reality.

According to the CBEE study, Ribas do Rio Pardo has the second highest number of accidents (41 casualties) in the state of Mato Grosso do Sul, and Três Lagoas has the third highest (with 37 casualties). The municipality of Miranda has a record number of casualties (216) as the railroad BR-262, better known as *Rodovia da Morte*, crosses the Pantanal biome. Considering the intense road traffic of paper company's logging trucks, these industrial groups should be responsible for financing damage mitigation measures, such as fencing highways, and building walkways or cross-tunnels for people and for wildlife.

Troubled waters



The Cerrado is called "the cradle of waters" because it is Brazil's water reservoir- something which seems unexpected for such a dry landscape.
The reason is due to its peculiar formation. The Cerrado is also known as the "inverted forest", due to the exceptionally long roots of its vegetation. The deep root system of Cerrado vegetation retains water from rainfall and stores it in aquifers. In this way, it maintains the water balance in the region and throughout Brazil[57]: of the twelve main hydrographic regions in the country, eight have springs in the region.[58] Rivers born there supply a large part of Brazilian hydrography. The three largest hydrographic basins in Latin America are in the Cerrado. There are also important aquifers under its soil, including the Guarani Aquifer, the second largest in the world[59].
The water that flows from the Cerrado is also essential for the ecology of the Pantanal, the world largest wetland, stretching from Mato Grosso do Sul, Mato Grosso, Bolivia and Paraguay. Other ecosystems along the São Francisco, Parnaíba, Paranaíba, Paraguay and Paraná rivers also depend on water coming from sources in the region.[60]
Almost all of the southern tributaries of the Amazon, except the Juruá and Purus, have their sources in the Cerrado. The river basins that have their origin in the Cerrado are home to approximately 40% of Brazil's population and parts of the populations of Bolivia, Paraguay, Argentina and Uruguay.

Furthermore, the Guarani Aquifer, which covers 1.2 million km2 in densely populated areas of southwestern Brazil and extends into Paraguay, Argentina and Uruguay, is fed by water from the Cerrado. This water, which infiltrates down to levels between 150 and 1,800 meters and is tapped by artesian wells, is an essential supply for large parts of southeastern Brazil.

Native Cerrado vegetation is crucial for water cycles.
The loss of intact Cerrado vegetation has decreased the amount of stored water, reduced the levels of aquifers and water tables, and led to the reduction and disappearance of rivers. According to Agência

[57] Nóbrega R.L.B. et Al. Effects of conversion of native cerrado vegetation to pasture on soil hydro-physical properties, evapotranspiration and streamflow on the Amazonian agricultural frontier, June 2017, https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0179414
[58] Lima, J.E.F.W., et Al."Estimativa da contribuição hídrica superficial do Cerrado para as grandes regiões hidrográficas brasileiras, 2007, www.abrhidro.org.br/SGCv3/publicacao.php?PUB=3&ID=19&SUMARIO=4580
[59] https://files.cercomp.ufg.br/weby/up/284/o/Cerrado_Parte1.pdf
[60] Ministério do Meio Ambiente, CERRADO: Ecologia, Biodiversidade e Conservação. Aldicir Scariot, José Carlos Sousa-Silva, Jeanine M. Felfili (Organizadores), 2005, www.mma.gov.br/publicacoes/biomas/category/62-Cerrado.html?download=302:Cerrado-ecologia-biodiversidade-e-conservacao

Brasil, the conversion of the Cerrado could result in a critical shortage of water for the entire country.[61]

The northeastern part of the Cerrado is already experiencing severe dry seasons and even desertification in some parts. Analyzing data from 125 pluviometric stations, a team from the University of Brasilia found that rainfall in the cerrado dropped by 8.4% in the three decades between 1977 and 2010, likely due to land use change.[62]

The removal of the root system of the native Cerrado vegetation has negatively affected water retention, evapotranspiration and the generation of rainfall in dry years. As a result, the capacity of the Cerrado to provide water to the subcontinent may collapse in less than 30 years, according to a research article published by 12 Brazilian scientists in Global Change Biology. The researchers observed increases of 2.24°C in average maximum temperatures between 1961 and 2019.[63]

If the Cerrado keeps drying out, its hydropower energy supply may collapse, as well as agricultural production.[64] On May 27, 2021, the National Meteorology System (SNM) published a note issuing its first *Water Emergency Alert*" associated with the scarcity of precipitation in the hydrographic region of the Paraná Basin that covers the states of Minas Gerais, Goiás, Mato Grosso do Sul, São Paulo and Paraná for the period from June to September 2021."[65] The water reservoirs in the Paraná Basin, which feed the largest hydroelectric dam in the country, were extremely low. In Itumbiara, Goiás, the useful water volume index was at 10%;¡[66] and the National Electric System Operator (ONS) warned about the risk of total collapse of the eight largest national hydroelectric plants, representing 53% of the country's water storage capacity.[67] This is not a small thing, as hydropower represents 63% of the country's electricity.

Modeling South America future precipitation trends derived from IPCC scenarios, extensive salinization and degradation of croplands are expected, as well as dropping livestock productivity, reflecting the fact that water availability and food security are closely related.[68]

It is not a surprise that most of the local people interviewed for this report stressed the disappearance of, or reduction in, streams, springs and lakes, both inside and outside plantation areas. In a once very water-rich region, local people have reported water shortages, which is causing further social and environmental impacts. The irony is that the paper industry chose this region to build its mills, precisely because it is rich in water.

What's worse, pulp plantations substitute long-rooted vegetation, which absorbs and maintains water, with trees that do exactly the opposite, and are in fact specialized in draining swamps. Eucalyptus plantations are not the sole factor for this drying up, but in the areas where they are present, they are a powerful agent. Scientific studies around the world focus on the impacts eucalyptus plantations have

[61] Agência Brasil, Occupation in Cerrado threatens Brazil's water supply, March 2015, https://agenciabrasil.ebc.com.br/en/geral/noticia/2015-03/occupation-cerrado-threatens-brazils-water-supply
[62] University of Brasilia, Chuvas no Cerrado diminuíram 8,4% em três décadas, April 2018, https://www.unbciencia.unb.br/biologicas/34-engenharia-florestal/569-chuvas-no-cerrado-reduziram-8-4-em-tres-decadas
[63] Hofmann, G.S. et Al., The Brazilian Cerrado is becoming hotter and drier, April 2021, https://drive.google.com/file/d/17kRfS3FyxpvSPtNhoj17tMvKCF3Vnxg7/view
[64] Critical Ecosystem Partnership Fund, Cerrado Biodiversity Hotspot, February 2017, https://www.cepf.net/sites/default/files/cerrado-ecosystem-profile-summary-english-revised-2017.pdf
[65] INPE, Nota Conjunta INMET / INPE / CENSIPAM, May 2021, http://www.inpe.br/noticias/arquivos/pdf/NOTA_Emergencia_Hidrica_v05.pdf
[66] Metropòles, olo seco e poeira no lugar de água: em Goiás, o retrato da crise hídrica nacional, July 2017, https://www.metropoles.com/brasil/pasto-e-poeira-onde-deveria-ter-agua-em-go-o-retrato-da-crise-hidrica-nacional
[67] Metropòles, ONS prevê colapso de 8 reservatórios de hidrelétricas até novembro, June 2021, https://www.metropoles.com/brasil/ons-preve-colapso-de-8-reservatorios-de-hidreletricas-ate-novembro
[68] Critical Ecosystem Partnership Fund, Cerrado Biodiversity Hotspot, February 2017, https://www.cepf.net/sites/default/files/cerrado-ecosystem-profile-summary-english-revised-2017.pdf

on the water table and in general on the water cycle. From Brazil[69] to Chile,[70,71] Uruguay,[72] Argentina,[73] India,[74] South Africa.[75,76,77]



Stream near the eucalyptus plantation. Água Clara, 2020.

This impact of eucalyptus plantations on the water table is also very evident to local villagers. In the settlement of Alecrim, surrounded by plantations, it is known that many reservoirs on the surrounding farms are dry, including the biggest ones. "*It was a sea of water, you wouldn't believe, it is all dry now*", said a villager, who also complained about the company's lack of responsibility for caring about the wild animals.

> *The reservoirs here have all dried up, people used to fish, it's all dry, the fishes are all dead. We see the streams, it's just that little vein now.*
> *(Maria, Arapuá villager)*

[69] BRITO, Isabel Cristina Barbosa. Comunidade, território e complexo florestal industrial: o caso de Vereda Funda, norte de Minas Gerais. Dissertação de Mestrado, UNIMONTES, 2006.

[70] "Annual recharge estimates were lower in the Eucalyptus plantation period than in the pasture period, even with the increase in the annual rainfall amount." Tiago Souza Mattos, Et Al., Groundwater Recharge Decrease Replacing Pasture by Eucalyptus Plantation, May 2019, https://www.mdpi.com/2073-4441/11/6/1213/htm#

[71] Antonio Huber et Al., Eucalyptus globulus sobre el recurso agua en la Cordillera de la Costa de la región del Biobío, Chile, 2010, https://scielo.conicyt.cl/scielo.php?pid=S0717-92002010000300006&script=sci_arttext

[72] Céspedes-Payret, C., Piñeiro, G., Achkar, M., Gutiérrez, O., & Panario, D., The irruption of new agro-industrial technologies in Uruguay and their environmental impacts on soil, water supply and biodiversity: a review. 2009,. International Journal of Environment and Health, 3(2), 175-197. https://doi.org/10.1504/IJENVH.2009.024877

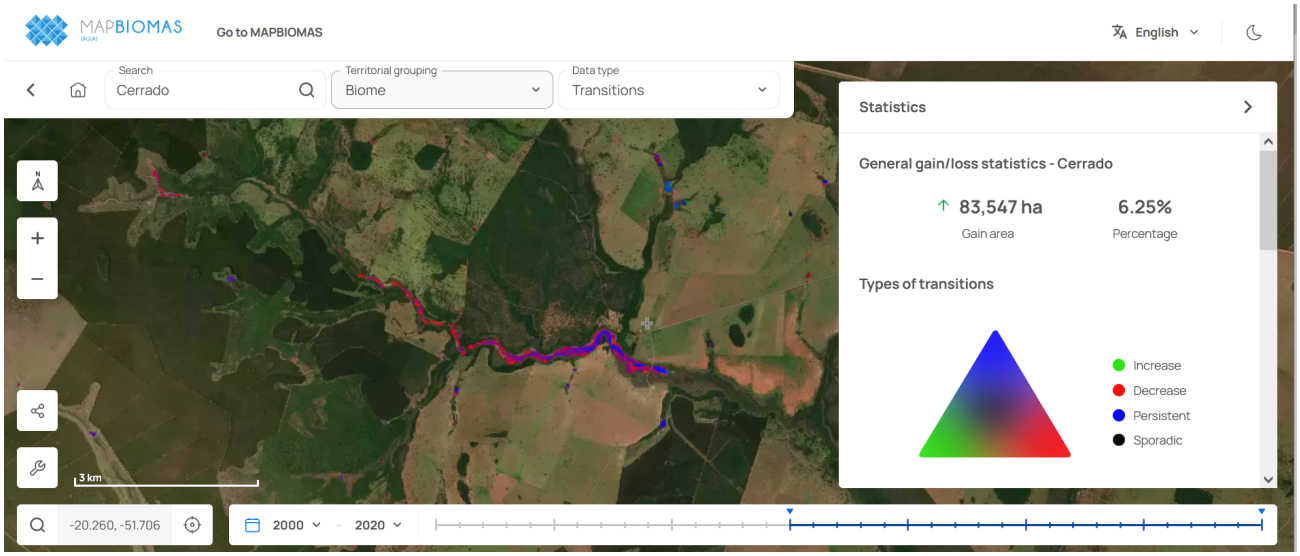
[73] Engel, V., Jobbágy, E. G., Stieglitz, M., Williams, M., & Jackson, R. B.. Hydrological consequences of Eucalyptus afforestation in the Argentine Pampas, Water Resources Research, 41(10) 2005, W10409. https://doi.org/10.1029/2004WR003761

[74] JOSHI, Mukund; PALANISAMI, K. Impact of eucalyptus plantations on ground water availability in south Karnataka. ICID 21st International Congress on Irrigation and Drainage, 15-23 October 2011, Tehran, Iran. P. 255-262. Available at: https://www.researchgate.net/profile/Arvind_Singh56/post/Eucalyptus_plantations-how_good_or_bad/attachment/5b0ceb42b53d2f63c3ceab5a/AS%3A392086940602380%401470492219932/download/1.pdf

[75] KARUMBIDZA, John Blessing. A Study of the Social and Economic Impacts of Industrial Tree Plantations in the KwaZulu-Natal Province of South Africa. 2005. Available at: https://wrm.org.uy/wp-content/uploads/2013/02/book.pdf

[76] Chapman, R.A. 2008. Long-term hydrological monitoring at Jonkershoek aids climate change studies. CSIR http://www.saeon.ac.za/enewsletter/archives/2008/september-2008/long-term-hydrological-monitoring-at-jonkershoek-aids-climate-change-studies/

[77] 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/

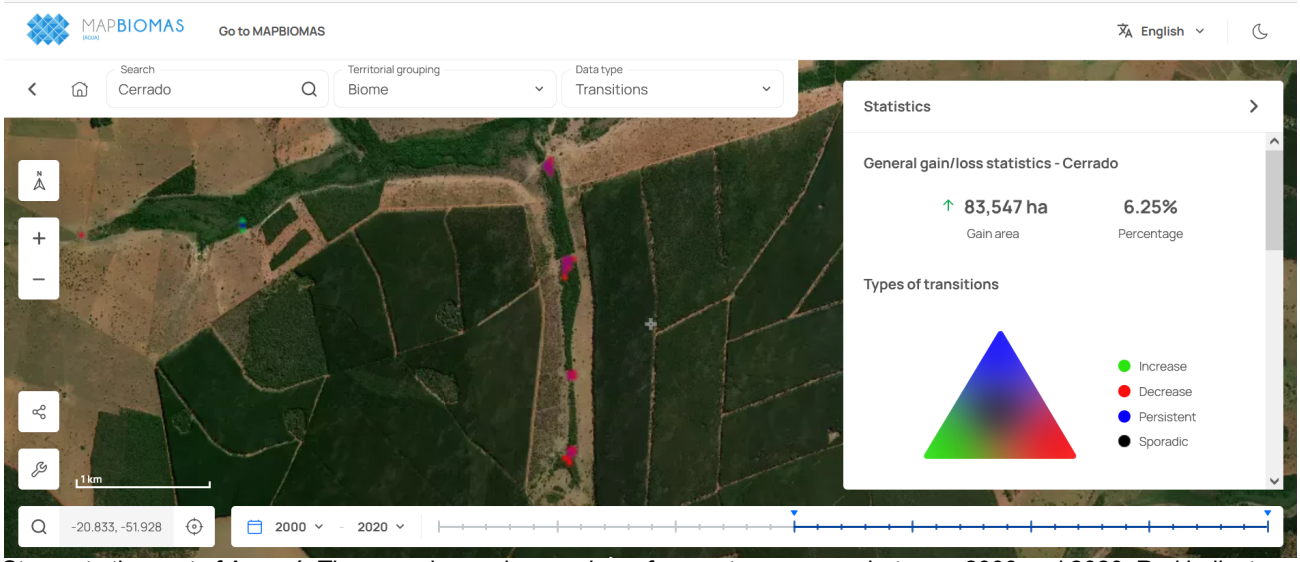


Ribeirão Dois Córregos. The map shows changes in surface water presence between 2000 and 2020. Blue indicates places where surface water has remained present during this period, while red indicates places where surface water presence has decreased over this period. Note that water presence cannot be detected when it is under tree cover, which is the case for parts of this river. Source: MapBiomas Agua.

Era um mar de água, você não acredita, tá tudo seco agora.)
(Débora, moradora de Arapuá)

"The Arapuá stream was full of water, today it's over, the stream dried up. (...) There were farms I knew, they had 10-15 reservoirs with a lot of fish, they all dried up. It's the eucalyptus that dries them up.
(Débora, Arapuá villager)

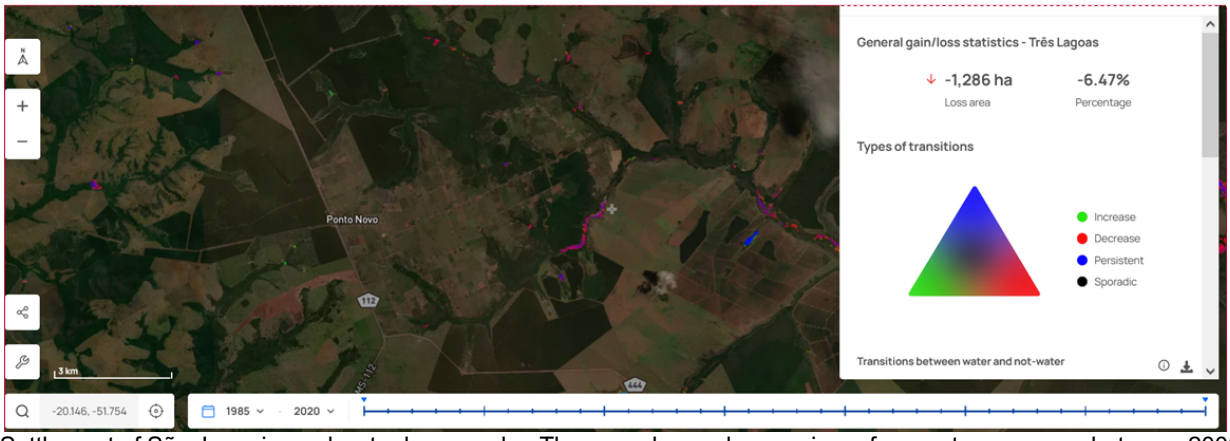
The rivers are dry. The waterfall is gone. Near the bridge there was a lake, now it's dry.
(Rosana, Garcias villager)



Stream to the east of Arapuá. The map shows changes in surface water presence between 2000 and 2020. Red indicates places where water presence has decreased over this period. Note that water presence cannot be detected when it is under tree cover, which is the case for large tracts of this stream.Source: MapBiomas Agua.

A schoolteacher living in the São Joaquim settlement also reported a sharp decrease in groundwater, signalling the risk of community wells running dry in the near future.

> *It is visible when we pass by the streams that there's been a big decrease. When we used to come here, when the road was still a dirt road, we could see it better. (...) And the water on the rivers, it was something big! Afterwards, the asphalt came, and the eucalyptus, it is visible that it brought a decrease in the water level. And with the wells, the same thing happens. Even the water box takes much longer than before to fill up, because we are really surrounded by eucalyptus. It's expanding, and expanding, and it is remarkable here in the settlement, they say there's no water before 50 meters deep so... something happened to this groundwater. Where has this water gone? Who is sucking it up?*
>
> *(Teacher Heloísa, nov 2020)*



Settlement of São Joaquim and water loss nearby. The map shows changes in surface water presence between 2000 and 2020. Red indicates places where water presence has decreased over this period. Note that water presence can not be detected when it is under tree cover, which is the case for large tracts of this stream. Source: MapBiomas Agua.

What local communities have noted is a process that has been well studied in the Brazilian region of Minas Gerais, where eucalyptus plantations which were developed in the 60'ss to produce charcoal or pulp, were causing a decrease in water recharge in the areas of reforested plateaus of the order of 164 mm/year. As a result, people, mostly women and children, had to walk more than a kilometer to find water for everyday use.[78] There is a similar situation in the north of Espirito Santo, where parts of the Atlantic forest were converted into pulp-plantations by the end of the 60's and, according to local water agencies, desertification is now "very critical", especially in the basins of the Itaúnas and São Mateus rivers.[79]

The impact of eucalyptus plantations on the water table has been confirmed by paper company employees who have been present in the field since the start of the operation. They noted a progressive disappearance of springs, streams and water reservoirs.

> *... And of course, it's something that we follow, with the naked eye you can see it, the streams that we use in a short time dry up, dams, reservoirs, they dry up, where there was a lot of water today there is no more, today it's over, so it happens a lot. Although we don't have much knowledge, and they don't offer us much information about this, about these impacts. But with your own naked eye, you can see that the dam that used to have a lot of water today is dry, it*

[78] "Local native vegetation is adapted to regional water and climate patterns, unlike eucalyptus and pine, which have higher yields, but cannot equate their evapotranspirative demand with that of native native vegetation, causing a decrease in recharge in the areas of reforested plateaus of the order of 164 mm/year. Thus, they contribute to further highlight the water scarcity in the region, which in turn is one of the pillars of the fragile regional social framework." in: BRITO, Isabel Cristina Barbosa Op.cit.

[79] CBH Itaúnas, CBH São Mateu, Planejamento da restauração nas bacias dos rio Itaúnas e São Mateu, 2020, https://agerh.es.gov.br/Media/agerh/Documenta%C3%A7%C3%A3o%20CBHs/S%C3%A3o%20Mateus/LO5_WRI_BaciasES_diagramacao.pdf

doesn't have any more water, a stream that had a large flow of water today only has a little one, right? This is what we see.

(Adailton, Suzano worker, 2021)

It's not just the eucalyptus trees that drain too much water from the soil. In the Três Lagoas area, paper companies proactively pump water to irrigate their plantations.

That day I saw it, I was astonished. There were nine trucks, each one would take 10 to 15 minutes to load 30.000 litres of water. Tell me, what spring can support this?? And what did they do? They closed the duct that connected to the other reservoirs, to other springs, one by one connected until the water went to the Permanent Preservation Area of the settlement. And it all dried up. Everything. But they went there, they [Eldorado] started measuring [the water level], she [the environmental coordinator] was sending me the measurements, it was already less than 1,40m deep. This lake had a spring in the middle of it. But it was already very low. They closed the duct to keep the water level high. They even made a landfill over the lake, so the trucks could pass, and they put a pump that was like 4 m² wide. But anyway, they took it away. But the water isn't back. It's not back.

(Bruna, Alecrim villager)

When a villager told Eldorado officers that she would denounce them to the competent authorities, they removed the equipment. However, she suspected that they kept exploiting the water table from inside the plantation: "*I saw, but we have no freedom to go inside private property and check what's going on in there. We cannot*". According to a worker she knows, this is a common practice:

Every two years they do a mapping. (...) They know where the water is, the springs. They got it. But since they are not on the official maps, they really won't respect it, so they grab the opportunity. They do it mercilessly, as they want to get promoted in the company. In this area we are, he said there are many, it's plenty. There's one near here, on fazenda São Jorge, I used to live there, back in 2003. It was a place with reservoirs, with springs that used to feed those reservoirs, and it overflowed to come back to feed the stream. This stream ends up in córrego São Mateus. I was there seven months ago. It's so sad!! To see something you knew before, it's very sad. The river is like one foot wide. Where we used to fish so much!

(Bruna, Alecrim villager)

It is the same story with the Córrego Queixada (Selvíria). According to local people it used to be a deep river, more than 2 meters deep, so clear and sweet smelling that they used to wash blankets in it. Many families lived by this river. Now it is reduced to swampy mud.

Near Córrego Queixada, deep erosion marks the soil, between plantation areas, as clearly visible in the satellite map below.



Córrego Queixada (coordinates: -20º11'25" -51º45'19").



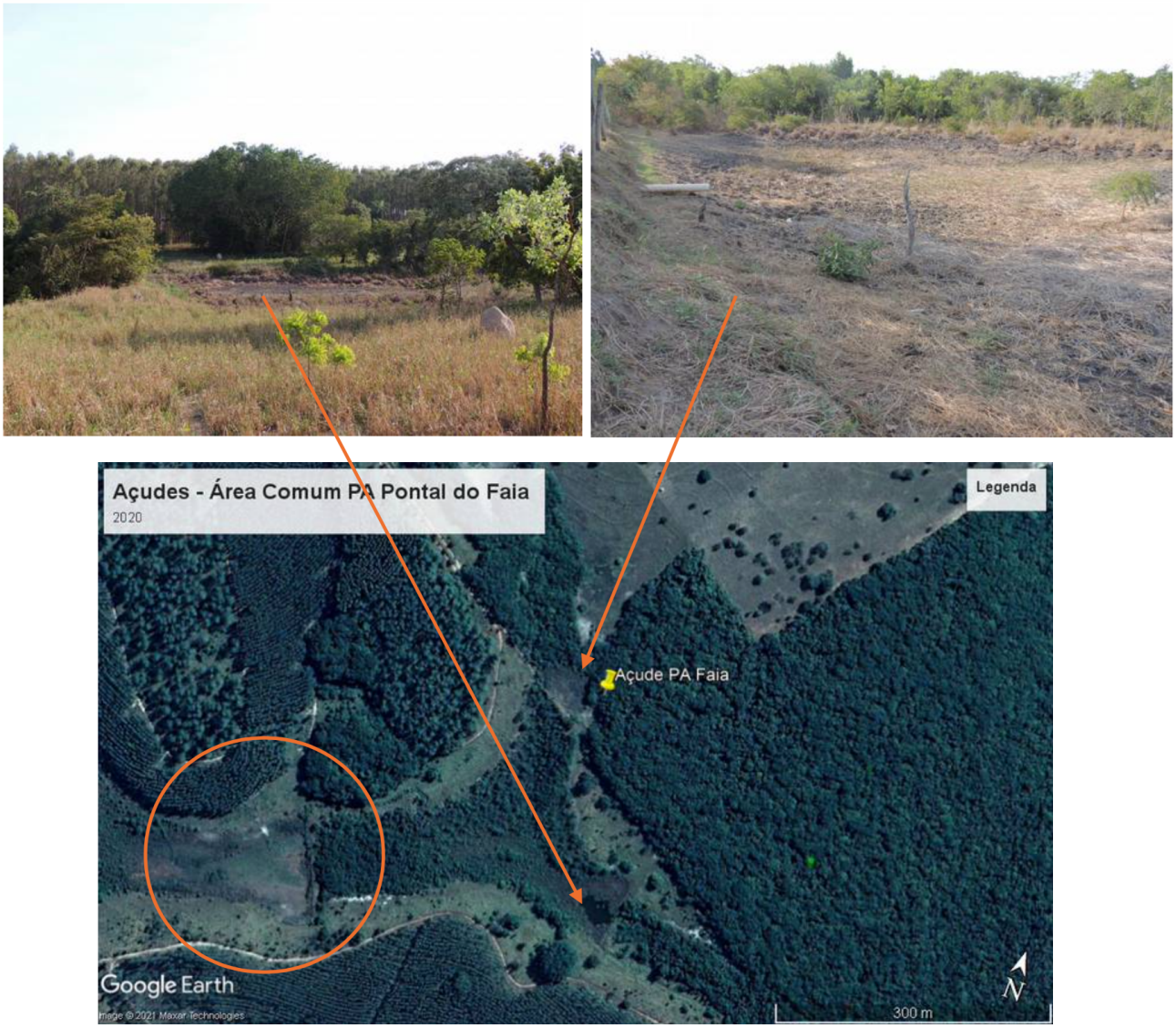
Satelite map of the area on MS 444 road where there are big cracks in the ground. Coordinates -20º10'52, -51º47'22.



Photo of the area on MS 444 road where there are big cracks in the ground. Coordinates -20º10'52, -51º47'22.

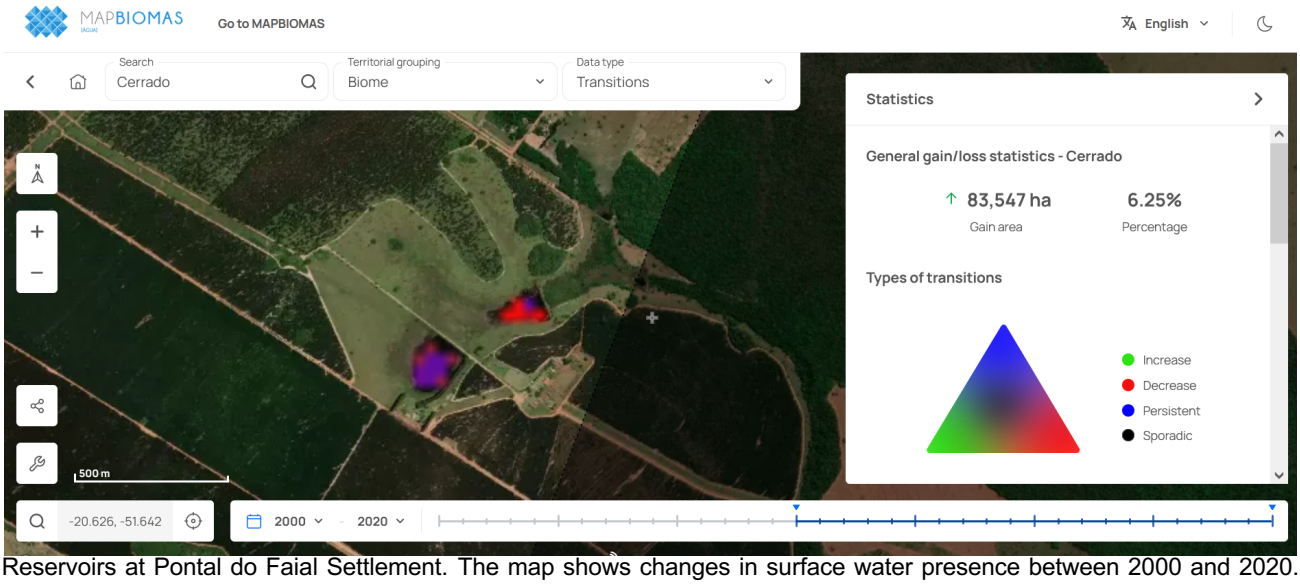


Córrego Queixada. The map shows changes in surface water presence between 2000 and 2020. Red indicates places where water presence has decreased over this period. Note that water presence can not be detected when it is under tree cover, which is the case for large tracts of this stream. Source: MapBiomas Agua.



Photos (above) and corresponding satellite image (below) from 2020, in an area where water reservoirs dried up, near the Pontal do Faia settlement. Coordinates: - 20° 37'20.97", -51° 38'36.35".

In the settlement, Pontal do Faia, the reservoir (common preservation area) is also dry. This area is surrounded by plantations and is near to the Eldorado mill. It is possible to see on satellite images the changes over the years. The same area, in 2012, still had water.



Reservoirs at Pontal do Faial Settlement. The map shows changes in surface water presence between 2000 and 2020. Blue indicates places where surface water has remained present during this period, while red indicates places where surface water presence has decreased over this period. Note that water presence can not be detected when it is under tree cover, which is the case for parts of this river.

> *They say they brought benefits but I don't believe so. Because our region was rich in water, we had a waterfall here, a stream that would come down, another stream over there, we had places to bathe. Today they are all gone. Did the eucalyptus help in anything? Of course not. The dams on the farms are dry where they planted eucalyptus. So how can that be something good? If it was good, the water should have remained there.*
>
> *(Lurdes, Garcias villager)*

Playing with fire

Eucalyptus plantations not only increase fire occurrence by draining the soil, but the manner in which they are planted also fuels forest fires because these large homogenous blocks are densely planted with young trees with a dry undergrowth. On top of it, Eucalyptus is a plant that in its natural environment, in Australia, is associated with the fire and it promotes fires. Its bark has particular morphological characteristics which allows it, in the presence of wind, to send burning embers over great distances, over kilometres,[80] far beyond any fire-break trench. In short, it is not the question *if* large scale fires will happen, but *when*.
It is exactly what is happening in the Cerrado:

2. Natural vegetation, which used to capture water, is removed;
3. It is replaced with plantation trees with the opposite characteristics (draining the soil);
4. Eucalyptus plantations provide large extensions of fuel ready to burn;
5. Its bark, in the presence of wind, can send embers over great distances.

Eucalyptus plantations not only increase fire occurrence by draining the soil, but the manner in which they are planted also fuels forest fires because these large homogenous blocks are densely planted with young trees with a dry undergrowth. On top of that, the bark of the eucalyptus has particular morphological characteristics (very flammable and aerodynamic) which allow, in the presence of strong wind, to send burning embers over great distances, up to three kilometres, well beyond any fire-break trench. In short, it is not the question *if* large scale fires will happen, but *when*.


Burned plantation alongside the road BR 158, EPN photo. October 1th 2020.

This would already be a good recipe to assure large wildfires. But there is more: climate change is already changing the water cycle, and making dry seasons longer and more extreme. One of the results of the combined effect of climate change and land use change are drought-induced fires. Which in turn, causes the release of huge amounts of greenhouse gases that impact the local and global climate, triggering a vicious circle.

[80] Paulo M. Fernandes et 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/



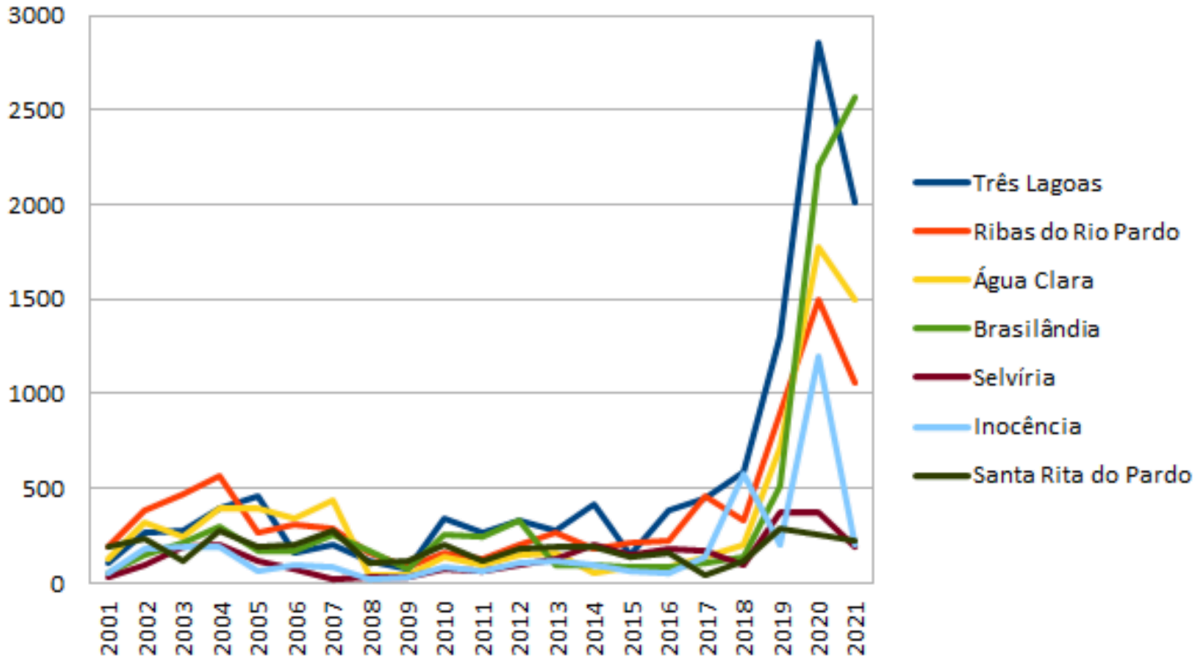
Remnants of fire in a monoculture of eucalyptus (right) and Cerrado (left), in a region close to Três Lagoas. Own photo. Nov. 2020.

It's not by chance that in recent years, Brazil has experienced growing meteorological disturbances: scant rains,[81] extreme drought,[82] even desertification.[83] This is of course not the sole responsibility of the paper industry. It is however, highly irresponsible to deliberately develop activities that will inevitably exacerbate the current trend.

Cerrado species and ecosystems are adapted to fire. The vegetation is able to resist fire and to quickly regrow after fire, thanks to thick bark and a higher amount of underground biomass, in the form of deep roots, rhizomes and bulbs. Fires naturally occur in cycles of around 16 years, giving natural vegetation a chance to regenerate. Now however, even in the remaining stretches of intact vegetation, human induced fires happen every one or two years, which is much faster than the capacity of the natural vegetation to recover and is changing the dynamics in plant communities, especially affecting rare species, and dramatically reducing the capacity of natural habitats to recover. Frequent fires encourage a profusion of exotic grasses, which in turn causes hotter fires, killing young trees and preventing recovery.[84]

In the region of recent intense conversion to eucalyptus plantation, in the area analyzed by this report, the sudden and sharp rise of wildfires is blatantly evident. Based on data from the National Institute for Space Research - INPE, **the year 2020 had 10,167 fires in the studied municipalities. In terms of comparison, in 2010 there were 1,268, a number 8 times smaller.** The graph shows the detected increase in fire outbreaks, mainly from 2018 onwards, when most of the eucalyptus plantations in the area were reaching maturity.

[81] Reuters, Scant rain poised to stress Brazil sugarcane as well as soy, January 2019, https://www.reuters.com/article/brazil-sugarcane-idUSL1N1Z30ZZ
[82] Phys.Org, Extreme drought in Brazil triggers fatal sand storms, October 2021, https://phys.org/news/2021-10-extreme-drought-brazil-triggers-fatal.html
[83] The New York Times, A Slow-Motion Climate Disaster: The Spread of Barren Land, December 2021, https://www.nytimes.com/2021/12/03/world/americas/brazil-climate-change-barren-land.html
[84] Gomes, L. et Al., Responses of Plant Biomass in the Brazilian Savanna to Frequent Fires, November 2020, https://www.researchgate.net/publication/346926795_Responses_of_Plant_Biomass_in_the_Brazilian_Savanna_to_Frequent_Fires



Number of fire accidents in the studied municipalities. Source: INPE.[85]

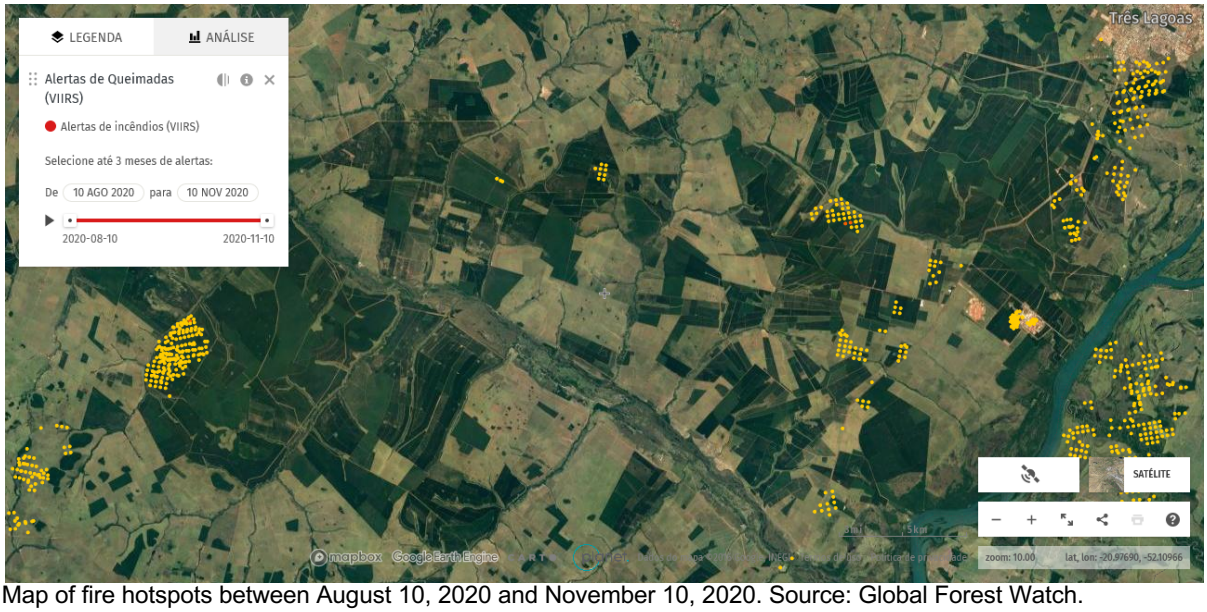
In the studied zone, drought has been particularly severe. Many fires ravaged the eucalyptus plantations and their surroundings, peaking between September and October 2021, the driest months. In the same year, fires affected the whole state of Mato Grosso do Sul, as a consequence of intense drought, an extremely low water table, and erratic rains related to climate change.

Poor policy and governance may have exacerbated the impacts of drought and fires all over the country, but the fact is that in the presence of eucalyptus plantations, fires have become more common and intense, as noted by local media.[86]


Fire in Três Lagoas. RCN67 Oct. 1st 2020.

[85] INPE Queimadas, https://queimadas.dgi.inpe.br/queimadas/bdqueimadas#
[86] RCN67, Incêndio de grandes proporções em Três Lagoas, October 2020, https://www.rcn67.com.br/jpnews/tres-lagoas/incendio-de-grandes-proporcoes-em-tres-lagoas/142615/

Forest fires now represent a serious financial threat to the paper industry, and companies such as Eldorado and Suzano have organized campaigns against fire. However, it looks like they are trying to empty the sea with a spoon: as long as their plantations provide huge amounts of dry fuel, wildfires will continue to ravage.
When observing the Fire Alert from Global Forest Watch,[87] it is easy to identify the fire spots and see that they mostly coincide with plantation areas.



Map of fire hotspots between August 10, 2020 and November 10, 2020. Source: Global Forest Watch.

In comparison with previous years, fire warnings can be observed in the same period (between August and November) from 2012 to 2020, in the eucalyptus plantation region (data available on the Global Forest Watch platform).



Fir hotspot recorded between 2012 and 2020. Source: Global Forest Watch.

[87] Maps at http://www.globalforestwatch.org



Suzano's truck on fire, on the road (BR 262), on September 13, 2020. The same incident happened twice in that year.

In some cases timber transportation is the cause of the fires. Between September 12th and 14th 2020, there were three recorded accidents involving trucks from outsourced companies providing services to Suzano, all loaded with eucalyptus logs. Fortunately, they did not result in worker fatalities. According to witnesses, one of the trucks had burst a tire and while braking, a fire started (perhaps due to friction with the asphalt) which spread to the wood. Suzano issued a brief press release saying it would investigate the causes of the accidents, but it failed to share if and when the research took place, or the results of such investigations. There are dozens of reports of fires involving eucalyptus trucks throughout Brazil and, in the news published by the press, the fires are linked to the high combustion of logs.[88]

One of the most serious fires in 2020 happened in Canoas settlement, a rural village surrounded by eucalyptus plantations controlled by Eldorado. According to a local villager, Eldorado was very late to help put out the fire. The settlement burned for 4 days (from September 30). The whole common area of the settlement turned to ashes, as well as some houses, and many farm animals died. According to the same source, at first the prefecture dealt with the fire, with inadequate tools, and despite the help of the villagers, the firefighters were unable to extinguish the flames. Eldorado refused to help, despite its plantations being all around the village.

> *Only "after a lot of yelling (from the peasants), they got in with a huge team, really really huge, with airplane, helicopter, ground, they came with a massive brigade, and helped us a lot to fight this fire"*
>
> *(Luana, Canoas resident. Oct. 2020).*



Horse with severe burns in the Canoas settlement, after a fire (photo shared by local residents).

[88] Perfil News, Final da semana registra três acidentes com carretase de eucaliptu na BR-262, September 2020, https://www.perfilnews.com.br/final-de-semana-registra-tres-acidentes-com-carretas-de-eucalipto-na-br-262/



Fire in Canoas settlement, October 1th 2020, (photo shared by local residents).



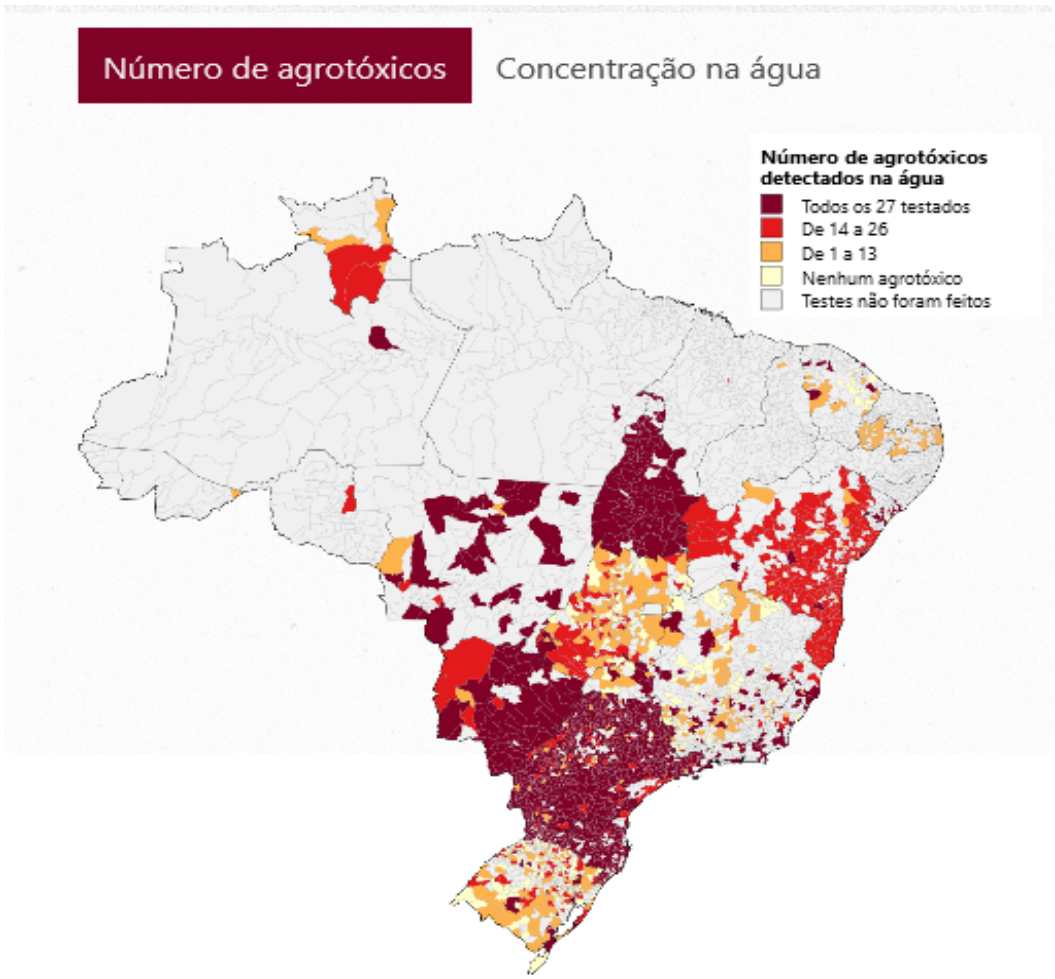
Fire in Canoas settlement, October 1th 2020, (photo shared by local residents).

Into a poisoned land

The pulp & paper industry is well known as a notorious polluter: their effluents have poisoned rivers, and their chimney smoke infected entire regions. With time, technology improved, and newer pulp mills are relatively less polluting - this is however counterbalanced by the progressive consolidation of the paper industry into huge pulp mills, concentrating the pollution in a specific region, as in the case of Três Lagoas.

Don't drink that water

What has not improved at all is the impact of using large amounts of agrochemicals, deployed to encourage quick growth and high yields in eucalyptus plantations. Local communities and forestry workers know better than anyone about the intense use of pesticides in eucalyptus monocultures. Many of the pesticides are used to eliminate ants and termites from the soils where the trees are cultivated, or larvae that may damage the trees. On top of this, herbicides are also sprayed to kill weeds growing between the trees.

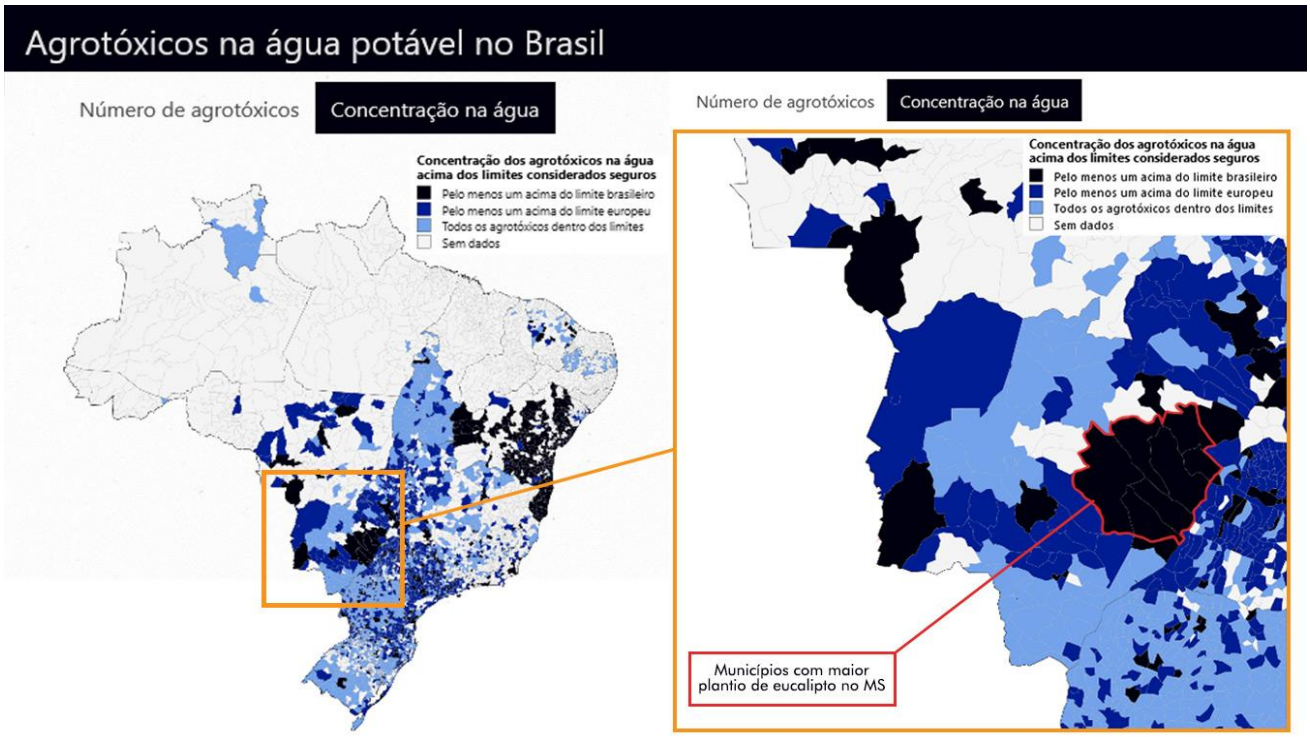


Map of water contamination of drinking water in Brazil, by municipalities, Source: Sisagua.

According to *Sisagua* (an observatory on drinking water quality), the tap water in one out of four Brazilian municipalities contained a 'cocktail' of 27 agrochemicals.[89] Between 2014 and 2017, *Sisagua* tested for the presence of 27 agrochemicals, finding them in 1,396 municipalities out of the 2,639 that

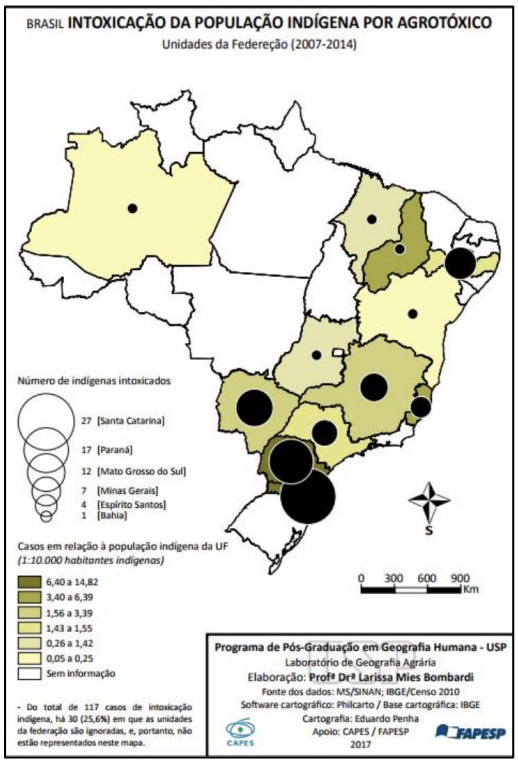
[89] Sistema de Informação de Vigilância da Qualidade da Água para Consumo Humano (Sisagua), a partnership between Repórter Brasil, the news agency Pública and the Swiss NGO Public Eye, https://portrasdoalimento.info/agrotoxico-na-agua/

took part in the project. In 92% of these municipalities, at least one agrochemical has been found in the tap water. This is worrying considering that Brazilian legislation is quite tolerant when it comes to matters of chemical contamination. As an example, the maximum limit allowed for *glyphosate* is 5,000 higher than in the European Union.



Map of municipalities classified by agrochemical contamination found in drinking water. In detail, on the right, the municipalities of Mato Grosso do Sul that are covered in this report. Source: Behind the food (Data from Sisagua).

Even more alarming is the presence of different agrochemicals, as Brazilian legislation sets a maximum limit for each single chemical, and does not consider the cumulative effect of more than one in the same water sample. Furthermore, the impact due to the interaction of different agrochemicals when mixed in the same water, is still unknown.



It is noteworthy that the municipalities with the highest concentration of water contamination, include the municipalities of Água Clara, Três Lagoas, Brasilândia and Santa Rita do Pardo, as well as others where the pulp & paper industry is currently expanding, such as Ortigueira, Paraná, Peixes and Araguaína, Tocantins, Eunápolis in Bahia, Aracruz in Espírito Santo, Lençóis Paulista, in São Paulo, Triângulo Mineiro, in Minas Gerais.[90]

Among the pesticides found in more than 80% of the tests, five are classified as "probable carcinogens" by the United States Environmental Protection Agency and six are identified by the European Union as causing endocrine dysfunction, which generates several health problems, such as early puberty. Of a total of 27 pesticides

[90] Environmental Paper Network, Mapping the Expansion of the Paper Industry, https://environmentalpaper.org/mapping-the-expansion-of-the-paper-industry/

found in Brazilian water, 21 are banned in the European Union due to the risks they pose to health and the environment.[91]

The Indigenous communities of Mato Grosso do Sul are among the most vulnerable. They are the third most contaminated in the country by pesticides (after those in Paraná and Santa Catarina), with six officially recorded cases of pesticide poisoning for every 10,000 Indigenous People, (between 2007 and 2014). However, considering that most cases go unreported, experts predict that up to 3% of the Indigenous population in the state is directly affected by poisoning.[92]

Concentration of agrochemical in the drinking water, by municipality

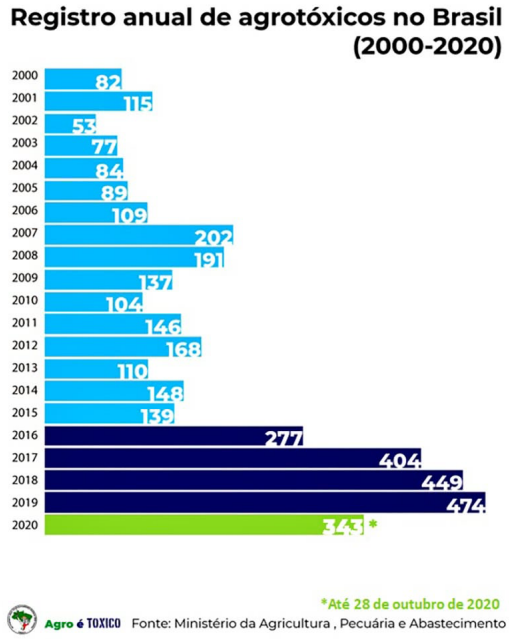
	Água Clara		Brasilândia		Inocência		Ribas do Rio Pardo		Santa Rita do Pardo		Selvíria		Três Lagoas	
Agrochemicals	Above by law limits in Brazil	Above by law limits in the EU	Above by law limits in Brazil	Above by law limits in the EU	Above by law limits in Brazil	Above by law limits in the EU	Above by law limits in Brazil	Above by law limits in the EU	Above by law limits in Brazil	Above by law limits in the EU	Above by law limits in Brazil	Above by law limits in the EU	Above by law limits in Brazil	Above by law limits in the EU
2,4 D + 2,4,5 T (Agent Orange)	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Alachlor	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Aldicarb + Aldicarb sulfone + Aldicarb sulfoxide	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Aldrin + Dieldrin	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Atrazine	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Carbendazim + benomyl	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Carbofuran	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Chlordane	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Chlorpyriphos + chlorpyriphos-oxon	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
DDT + DDD + DDE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes
Diuron	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Endossulfan (a, ß e sais)	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Endrin	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Glyphosate + AMPA	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes
Lindane (gamma HCH)	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Mancozeb	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Methamidophos	No	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Metolachlor	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Molinate	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Methyl Parathion	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Pendimentalin	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Permethrin	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Profenophos	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Simazine	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Profenophos	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Terbuphos	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Trifluralin	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Pesticides found in the region, by municipality. Source: Sisagua, organized by the author.

[91] Ana Aranha, Luana Rocha - Public Agency/Repórter Brasil, April 2019, https://reporterbrasil.org.br/2020/02/cocktail-of-27-pesticides-found-in-water-of-1-out-of-4-brazilian-cities/

[92] Bombardi L.M., Geografia do Uso de Agrotóxicos no Brasil e Conexões com a União Europeia, 2017, https://conexaoagua.mpf.mp.br/arquivos/agrotoxicos/05-larissa-bombardi-atlas-agrotoxico-2017.pdf

There is a lack of specific studies assessing the amount of pesticides used in pulpwood plantations, and paper companies are not keen to share detailed data. In the area of Água Clara, Três Lagoas, Brasilândia and Santa Rita do Pardo, all 27 agrochemicals scanned have been found in the drinking water. As the other industry in the area is cattle ranching, which doesn't use large amounts of agrochemicals, we can assume that it is the eucalyptus plantations that are playing a crucial role in poisoning the water table.All pesticides are above the limits allowed in the European Union. The pesticides found above the Brazilian limits are: Aldicarb, Aldicarbesulfone + Aldicarbesulfoxide, Aldrin + Dieldrin, DDT + DDD + DDE, Endrin, Glyphosate + AMPA, and Profenophos.[94]



Annual registration of pesticides in Brazil 2000-2020. (source: Ministry of Agriculture, Livestock and Supply, 2020, elaborated by MST[93]).

According to certification records, we know that glyphosate is widely used in pulpwood plantations. In 2015, an investigation carried out by the Universidade Federal Fluminense, collected data on the amount of glyphosate used by Eldorado and Fibria.[95] The research concluded that "***4.183 million tons of glyphosate*** *have been applied until this moment, excluding applications made in regrowth areas; these are, of course, impressive and frightening numbers." (2015, p. 162).* The companies also use "ant-killers" that are considered highly dangerous by the FSC. In 2019, Suzano used more than 2 mln kg of them, in the Três Lagoas region.[96]

[93] https://www.ecodebate.com.br/2020/11/16/veneno-a-nossa-mesa-o-brasil-e-o-pais-que-mais-consome-agrotoxicos/

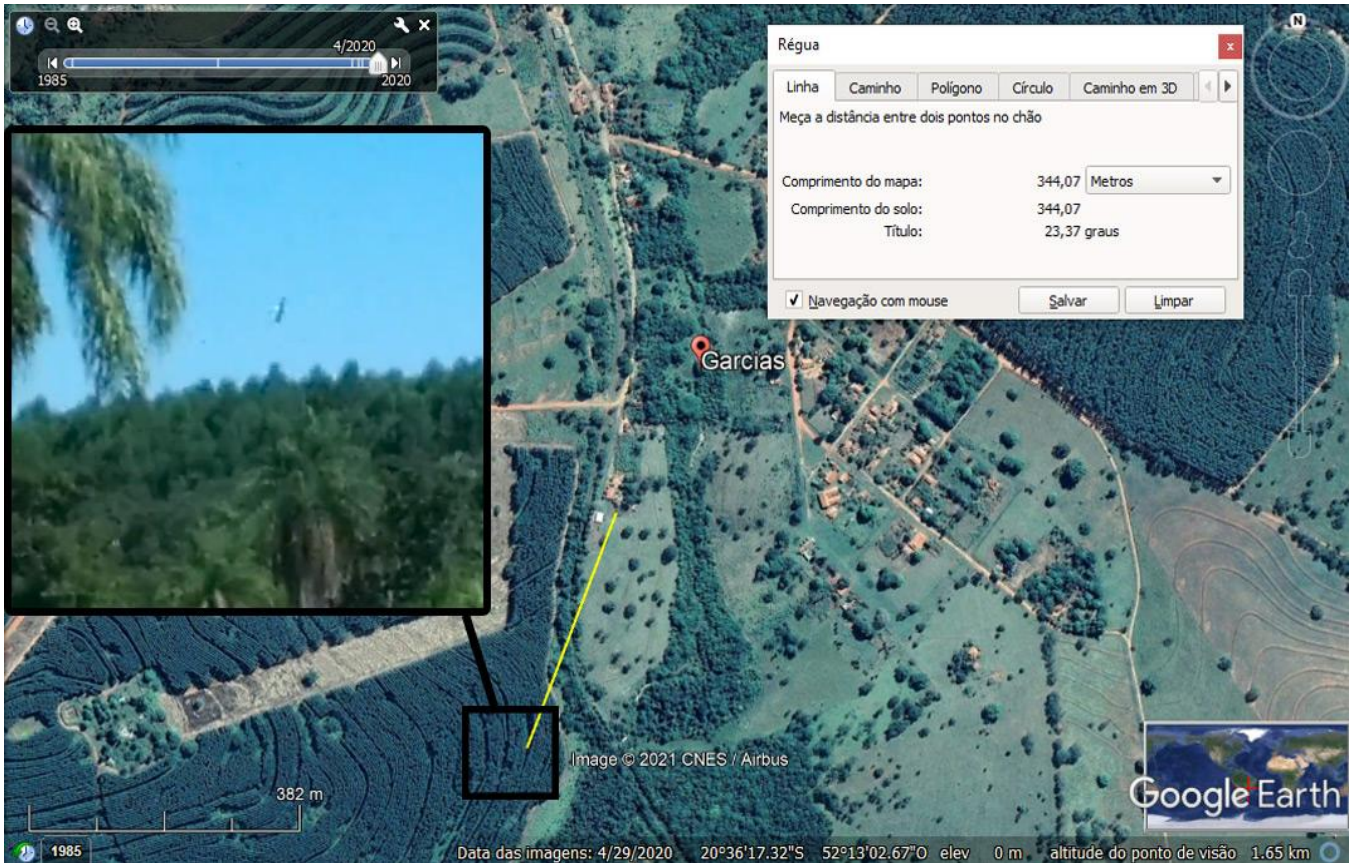
[94] Sisagua, Conheça os 27 agrotóxicos encontrados na água que abastece as cidades do Brasil, April 2019, https://portrasdoalimento.info/2019/04/12/conheca-os-27-agrotoxicos-encontrados-na-agua-que-abastasse-as-cidades-do-brasil/#

[95] Cláudio Ribeiro Lopes, "Cativeiros de Papel: Desertos Verdes, Papeleiras E Conflitos Socioambientais Na Região De Três Lagoas/MS (2009 – 2015)" Phd Thesis, Universidade Federal Fluminense. 2016, p. 162.

[96] Imaflora, Resumo Público Suzano S.A. - Unidade Três Lagoas EM Três Lagoas - MS, September 2029, http://fsc.force.com/servlet/servlet.FileDownload?file=00Pf300000zVvVTEA0

Purple rain

Of particular concern is that, in large pulpwood plantations, pesticides are often applied via air spraying with a plane. Aerial applications are dangerous, especially in the presence of settlements or sensitive habitats bordering the plantation, because it is very difficult to prevent the pesticides from reaching outside areas. For this reason, in 2009 the European Union prohibited aerial spraying of pesticides, with very few exceptions.[97] The Brazilian law, on the contrary, allows aerial applications, under the condition that a distance of 500 m. is maintained from settlements and water resources.[98] A condition that is not often met.



Aerial application of pesticides on the eucalyptus plantations controlled by Eldorado, near to the Garcias settlement on May 17 2021. The map shows the distance (344 m.) well below the limits lied down by the law.

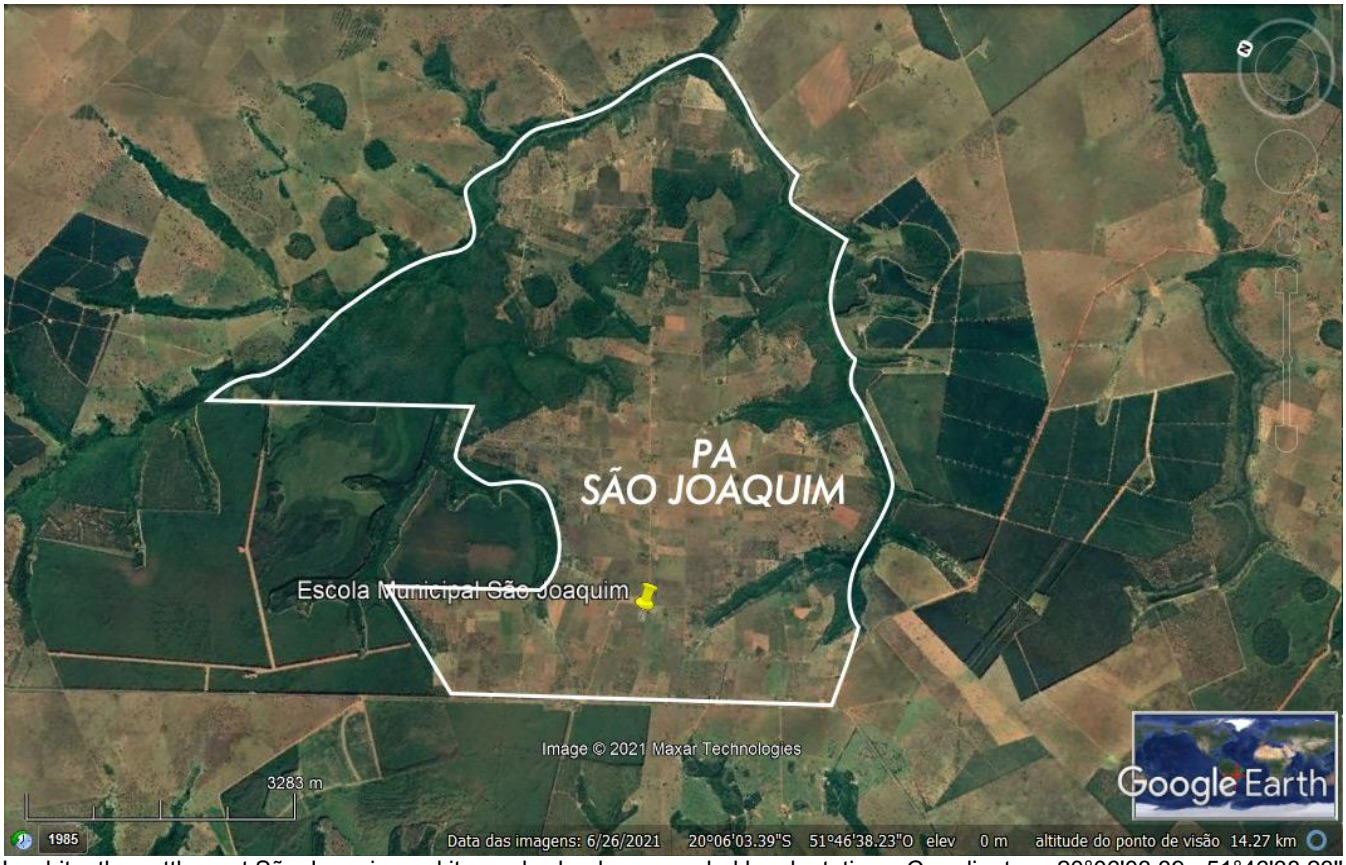
[97] European Union, Directive 2009/128/EC, October 2009, https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32009L0128&from=EN

[98] Ministério da Agricultura, Pecuária e Abastecimento, Instrução Normativa n°2, January 2008, http://www.indea.mt.gov.br/documents/363967/8546767/Agrotoxicos+Inst+Normativa%C2%BA+02+2008+MAPA+Avia%C3%A7%C3%A3o.pdf/f3bfac2c-0adf-2f03-8d69-f6a7f49ed63c

As a result, intoxication from pesticides became part of everyday life for local communities..

> *In 2016 to 2017, at the school, we had a huge number of kids with diarrhea and headaches. And it was in the time when they were spraying a lot of poison with the plane. So we complained a lot. (...) So they came to give some assistance. But it was very frequent, it was a rare day without having to run to the hospital with two or three kids. (Eliane, november 2020)*

The school mentioned is located in the settlement of São Joaquim, which is also surrounded by eucalyptus plantations.



In white, the settlement São Joaquim and its rural school, surrounded by plantations. Coordinates: -20°06'03.39, -51°46'38.23".

Elisa, a teacher at the school who lives in the settlement of Alecrim, reported that her garden is sprayed with pesticides or herbicides every time the company applies it to the plantations. As a result, her vegetables die. Eldorado also applies limestone to the crops and her house and car get covered by white dust. *"If the car gets like that, can you imagine our lungs?"* she commented. She also reported psychological disorders, as she can't sleep well because of her fear of the fires or other accidents caused by the plantation trees in front of her house falling on the electric grid.

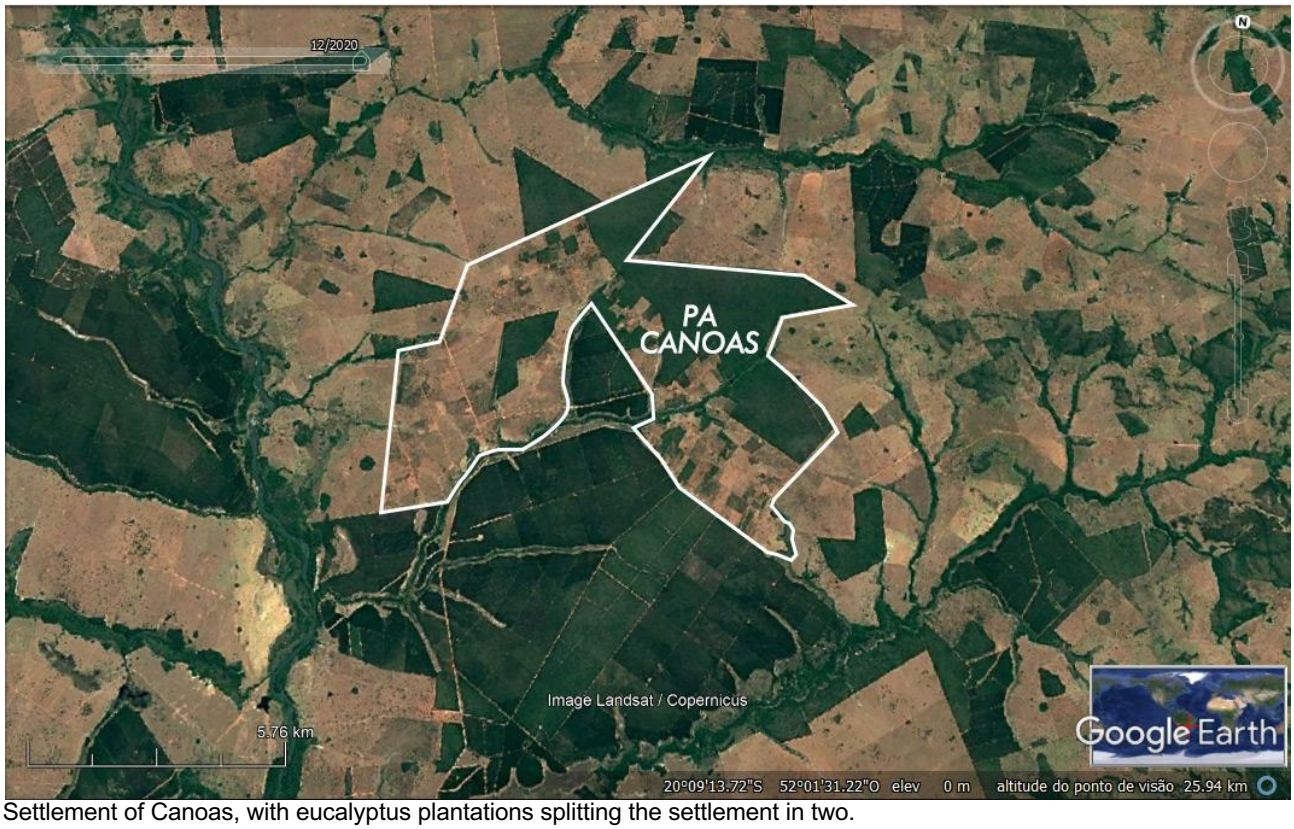


The settlement of Alecrim. Plantations border directly with the houses.

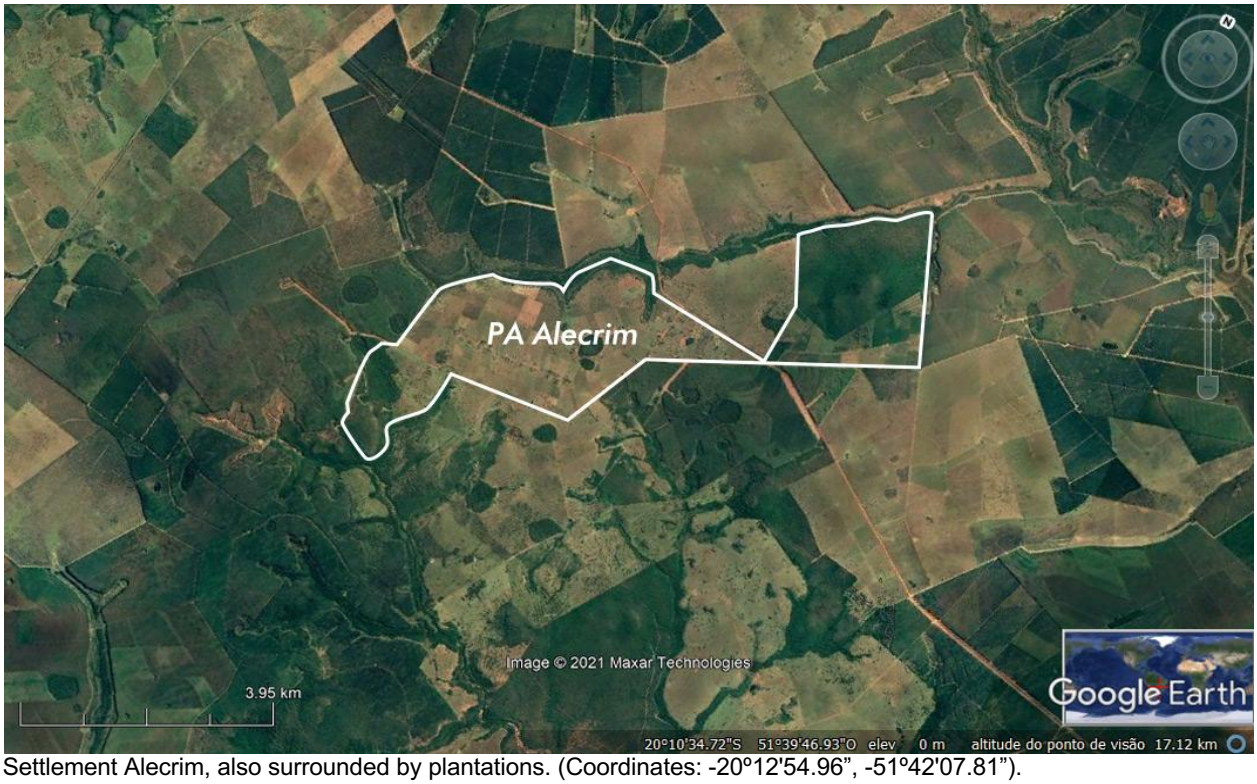


Garcias - Satellite images. Comparison between 2002 and 2021, showing the change in land use, with the village being progressively surrounded by eucalyptus plantations. (Coordinates: 20º36'16.22"S, 52º13'0267"W).

The enclosure of the village took place in such a way that the plantations are very close to the remaining houses. Much of the population has left, but there are still some residents. When there is spraying of poison in the plantations, this village is in a risky area, given the drift phenomenon that occurs in aerial spraying.



Settlement of Canoas, with eucalyptus plantations splitting the settlement in two.



Settlement Alecrim, also surrounded by plantations. (Coordinates: -20º12'54.96", -51º42'07.81").

Ms. Tamires, a villager from the Settlement of Pontal do Faia (near Eldorado factory and plantations), reported the death of fruit trees on her land, due to aerial spraying of pesticides .

> *The poison gets here, when they spread it with the plane. After this thing (the factory) came here (2012), all this happened. The citric are over. It's a pity because we had some pretty lemons, it was all dead, suddenly.*
>
> *(Mr. Tamires, Pontal do Faia)*



Settlement Pontal do Faia, in white. On top right, Eldorado Factory. Coordinates -20°38'36.16", -51°37'28.13".

The aerial application of pesticides directly threatens local activities such as organic agriculture and apiculture. In 2016 Mr Tobias, a beekeeper of Brasilândia reported the case of a sudden mortality in bees, in relation to the aerial applications by Fibria over the conservation area where he used to keep his hives. He claimed he lost more than 100 of his 121 bee hives, which were his main source of income, two days after the application. He reported the case to the competent authorities[99] and an inspection by the State Agency for Animal and Plant Health Protection (IAGRO) confirmed the presence of 80 affected hives.[100]

[99] Occurrence No. 665/2016, registered on August 8, 2016, at the Brasilândia Police Station. Received by the Delegate Rodrigo Alencar Machado Camapum

[100] IAGRO, , Ris Lagoas Health Surveillance Report - Report No. 221457. Under the responsibility of Carlos Eduardo Fernandes Pires.



Dead bees at Mr. Tobias' hives.

Mr. Tobias stood firm and built new hives, but the next year the aerial application happened again. This time he lost 42 new bee hives. Mr. Tobias reported the case[101] once again and the IAGRO decided to analyse some of his bees in their lab. It resulted that the animals had died of Gloss palsy, due to "an excess of organophosphate insecticide." Specifically, the lab identified two compounds exceeding the legal limits in the bees: Thiamethoxam and Glyphosate.[102] Despite this indisputable documentation, Mr. Tobias did not get justice, as the prosecutor closed the case for lack of evidence. The beekeeper received no compensation.

> *I am suffering, even now I am still indebted, because I tried to make up for my loss by buying new material to replace the apiary, the next year I lost everything again, then I got stuck in debts, and I still am. I'm not able to move forward anymore.*
>
> *(Tobias, March 2021)*

[101] Ocorrência n° 661/2017, registered on 20 July 2017, in the Police Office if Brasilândia

[102] The concentration of the two compounds were:
- Thiamethoxam: 20µg/L)
- Glyphosate + AMPA: 628µg/L detected.

Thiamethoxam is a systemic insecticide, from the neonicotinoid chemical group, produced by Syngenta, which has been shown to be harmful to bees and other pollinating insects in several studies, leading to loss of motor skills, food restriction, and death. As a result, its use has been restricted in the European Union since 2013, and since 2018 its use outdoors has been permanently banned (in Brazil, its use is allowed).
Glyphosate is also lethal to Apis mellifera, and even its exposure in non-lethal concentrations causes loss of memory and learning retention, changes in feeding, reduction of cognitive abilities and the location of bees, hindering their flights and ability to return to the hive, reduction in larvae survival, mitochondrial alterations, alterations in the intestinal microbiota, reduced life span, among others.
There are 31 studies on the effects of Thiamethoxam and Glyphosate on bees listed in Martìn Rossi, E. er Al.,Bees and Agrotoxics, May 2020, p. 22 , available at: https://navdanyainternational.org/wp-content/uploads/2020/11/Bees2020.pdf

In June 2021, aerial applications again affected bees in the area of Selvíria near to the Alecrim settlement. Local media named the eucalyptus plantations as responsible, but no measure have been taken. [103]

Agrochemicals are not the only cause of pollution of the land. Field operations, especially the harvest, are also polluting. Oil, diesel and lubricant is spilled abundantly on the ground. This represents a threat to workers' health, but also to the environment, as plantation workers well know.

> *The damage is to the ground, contamination of the ground with diesel oil, with hydraulic oil, with grease, right? When washing the machines, even though you don't wash it there on the edge of the road, you know, but you wash in the plots, and it contaminates a lot, because the machines accumulate a lot of grease, a lot of diesel oil, so this contaminates the soil a lot. So the soil after the operation is compromised with contamination.*
>
> *(Adailton, Suzano worker, 2021)*



Sitiantes de Selvíria atribuem mortes de abelhas a veneno da Eldorado no Eucalipto

Terça, 29 Junho 2021 15:43

Impeti

News about the death of bees in Selvíria, attributed to pesticides aerially applied by Eldorado.





Broken machinery causing pollution. Oil spilled in large amounts on the land is one of the major causes of pollution.

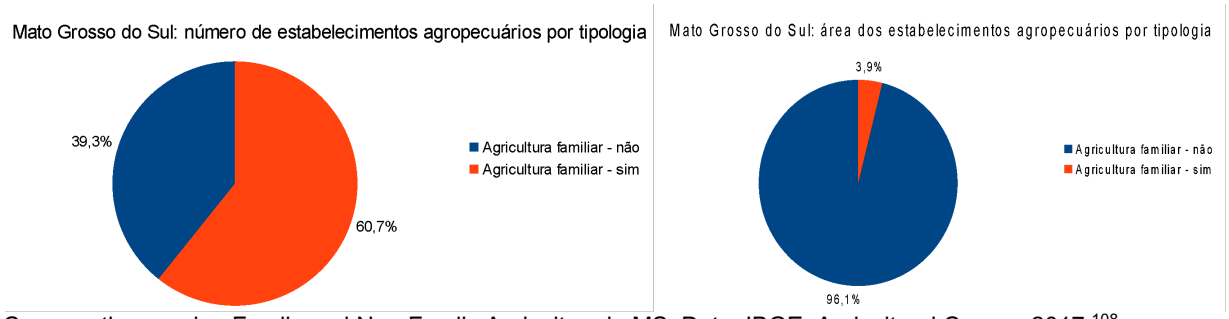
[103] Noroeste Rural, Sitiantes Atribuem Mortes De Abelhas A Veneno Da Eldorado No Eucalípto, June 2021, http://jornalnoroesterural.com.br/sitiantes-atribuem-mortes-de-abelhas-a-veneno-da-eldorado-no-eucalipto/a

The lords of the land

The first visible impact of the pulp & paper industry in the region is a further erosion of traditional culture. Rural land in Brazil is unequally distributed and highly concentrated, with a handful of big owners controlling large extensions of land, dating to the time of colonization in the 15th century. The colonial economy was based on large estates, with vast cultivated areas of export crops, and on slaves (Indigenous People and enslaved Africans). Their products aimed to supply the European demand for commodities such as coffee and sugar[104]. The end of slavery did not change the concentration of land into the hands of a few. Even today, Brazil's six richest men have the same wealth as the poorest 50 % of the population; and the country's richest 5 percent have the same income as the remaining 95 %, according to a report released by OXFAM.[105]

In Mato Grosso do Sul, occupation by settlers and ranchers began in the 18th century, and the resulting concentration of land became more intense. It is the state with the second largest Indigenous population (about 85,000) and the second highest land concentration. Its Gini index is 0.84. Large estates, larger than one thousand hectares, occupy 83% of the land, while small properties, below 50 hectares, occupy just 4% of the land.[106]

In Mato Grosso do Sul, farmers with less than 100 hectares control (69.2% of the rural owners) just 3.2% of the land, the rest is controlled by large landowners. In the same way, family farms, which are the vast majority, control just 3.9% of the land, despite the fact that they are essential for the country's food security[107] - while large estates mostly produce export driven commodities.



Comparative graphs: Family and Non-Family Agriculture in MS. Data: IBGE, Agricultural Census 2017.[108]

High land concentration in Mato Grosso do Sul has been a key factor in the expansion of the pulp & paper industry.

[104] Caio Prado Júnior. Formação do Brasil Contemporâneo.
[105] Oxfan, Brazil: extreme inequality in numbers, 2019, https://www.oxfam.org/en/brazil-extreme-inequality-numbers
[106] Souza Santos, A, et Al, "É muita terra pra pouco índio"? Ou muita terra na mão de poucos? Conflitos fundiários no Mato Grosso do Sul, 2020 https://acervo.socioambiental.org/sites/default/files/documents/prov0384.pdf
[107] 70% of the food consumed in Brazil is produced by family farms. Mitidiero Júnior, Barbosa e Sá. *Quem produz comida para os brasileiros? 10 anos do Censo Agropecuário 2006.* Revista Pegada, 2017. https://revista.fct.unesp.br/index.php/pegada/article/view/5540
[108] Sidra, Censo Agropecuário, https://sidra.ibge.gov.br/tabela/6880

Apocalyptus: the emptied land

The transition from cattle ranching to the paper industry has been swift and silent, while radically and carefully modelling the landscape according to a highly unnatural scheme. The new industry acquired the land in negotiations dealt with a few powerful people, in which the local population had little say. Most of the landowners in the area (81%) lived outside the municipality, in big cities, and had little relationship and little care for the life in the land they were selling out.[109]
The first result of this change in land use has been the dramatic reduction of the rural population, leading to the disappearance of entire villages. Cattle farming still needed workers, and there were entire rural villages inside the larger farms, including rural schools and churches. Pulpwood plantations, on the other hand, need mostly seasonal workers, just at planting and harvesting time. As entire cattle farms have been sold *en masse* to the paper industry, the villages they included were razed to the ground.

> *There were farms as big as Arapuá itself, with jobs, school, church, it was all destroyed. Most of these farms, in the beginning of eucalyptus, used to make a really big hole in the ground with heavy machinery, and bury the entire houses. Back then, many houses were buried.*
>
> *(Cipriano, Arapuá villager[110])*



Example of a cattle ranching farm in Mato Grosso do Sul, with main house, employees' houses and other buildings.

People had to leave. Their homes and their little gardens had been cleared. There was no place for them anymore. In entire areas the new industry got rid of human beings.

> *Then the eucalyptus came, for us at the time everybody thought it was gonna be very good, it was gonna bring development for the district, and it was totally the opposite, because our farms here were very populous, we had farms with 20-30 families. (...) Each party, each event here, was crowded with people, because everybody from the farms would come. Today, the buses that bring students soon won't bring anyone anymore, because there's no student left. The farms are over.*

[109] Nardoque, Melo e Kudlavicz. *Questão agrária em Mato Grosso do Sul e seus desdobramentos pós-golpe de 2016*. 2018, Revista Okara, v. 12, n. 2, p. 624-648, https://periodicos.ufpb.br/index.php/okara/article/view/41333
[110] Dubos-Raoul, Marine. A chegada do eucalipto no município de Três Lagoas (MS) na percepção dos moradores das comunidades rurais de Arapuá e Garcias: entre a sujeição e a resistência territorial. Revista NERA, 2022, no prelo.

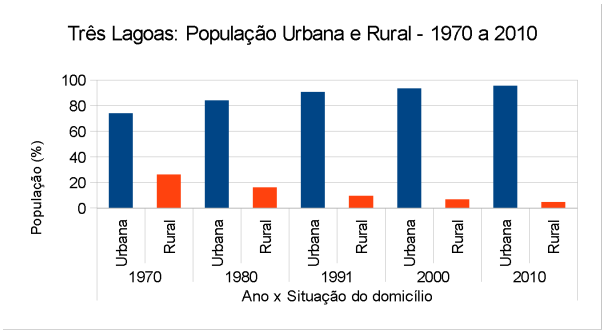
(Silvana, Arapuá villager)

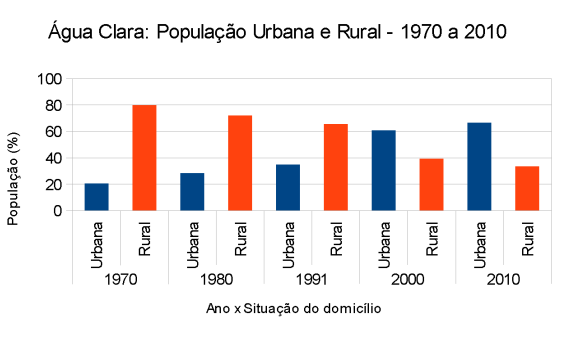
The Arapuá district is an emblematic case in Três Lagoas. Arapuá is a rural village that was constituted in the early twentieth century, passing through periods of diverse crop cultivation (corn, rice, beans, coffee, cotton), and a period of silk farming. Cattle ranching began in the early 1990s, and finally the eucalyptus plantations arrived from 2008. Hundreds of families that used to live in these farms, ended up with no jobs, so they can no longer remain in their territories.[111]
The people still living in Arapuá say that the arrival of eucalyptus ended their lively community life, which used to bring together hundreds of people in sports tournaments and traditional festivities, and have caused a cultural erosion, in addition to impacting on rivers and wildlife.

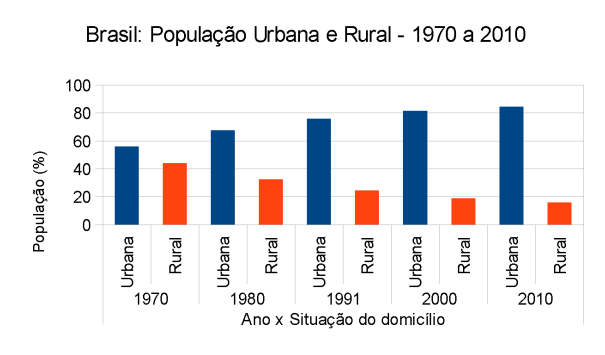
> *At the time, there was a very large population, because of the farms, not inside the village here, there were always a few people, but in the farms around Arapuá there was a large population, they employed many families, there was a lot of movement.*
>
> *(Ludmila, living in Arapuá since 1979)*

> *The eucalyptus, I'll let it be clear to you, is the black villain of our region.*
>
> *(Joaquim, Arapuá villager)*

Urbanization is a global fact, but what's happened in Três Lagoas and the nearby municipalities, as a result of the arrival of eucalyptus plantations, seems to exceed the national trend.







Graphs showing the urban and rural population of Três Lagoas, Água Clara and Brazil. Source: IBGE, Demographic Census, 2010, table 200.[112]

National data about population in these municipalities show that less than a twentieth of the population living in Três Lagoas (4.64%) still remain in the area.[113]
The decline of the rural population also annihilated important cultural traits, which were embedded in the existence of these communities and disappeared with them.

[111] Raoul, M; Almeida, R. Os impactos da expansão do eucalipto para a comunidade rural de Arapuá, distrito do município de Três Lagoas-MS: o papel dos elementos culturais no processo de expulsão e resistência territorial. XIII Enanpege, 2019, http://www.enanpege.ggf.br/2019/resources/anais/8/1562638972_ARQUIVO_ArtigoCompletoMDR.pdf
[112] IBGE - SIDRA, Censo Demográfico, População residente, por sexo, situação e grupos de idade, https://sidra.ibge.gov.br/tabela/200
[113] The 2010 is the most recent census carried out in Brazil; a new census was scheduled to be carried out in 2020, was postponed to 2021 due to the pandemic, and then to 2022 due to budget cuts by the Federal Government of 96% of the funds allocated to its realization, making it infeasible.

It used to be so crowded here, it was full of life. This school today, there are 300 students, we should have a thousand. There were colonies and colonies there in the farms. And how did people manage to survive? If you have today a farm, like this one that became a settlement, how many farms could have been turned into settlements, instead of eucalyptus plantation? And why did the farmer choose the plantation? There's nobody there now. It's all desert. There has been an exodus because of these plantations. Today, there's barely one ant killer, a man who lives here sporadically. Or a forest keeper, as they say. So it's all gone... And what disappears with all this? All the culture, all the peasant diversity vanishes. So it is not just about the water, right? It's about life itself.
(Heloísa, teacher in the São Joaquim school)



Eucalyptus plantation in São Joaquim, Selvíria.

In the words of the villagers, there is sadness, hopelessness and nostalgia.

> *Our sadness today is knowing that these families are leaving, it's full of empty houses, full of houses for rent, closed houses that can't be sold, and that's bad.*
>
> *(Silvana, Arapuá villager)*

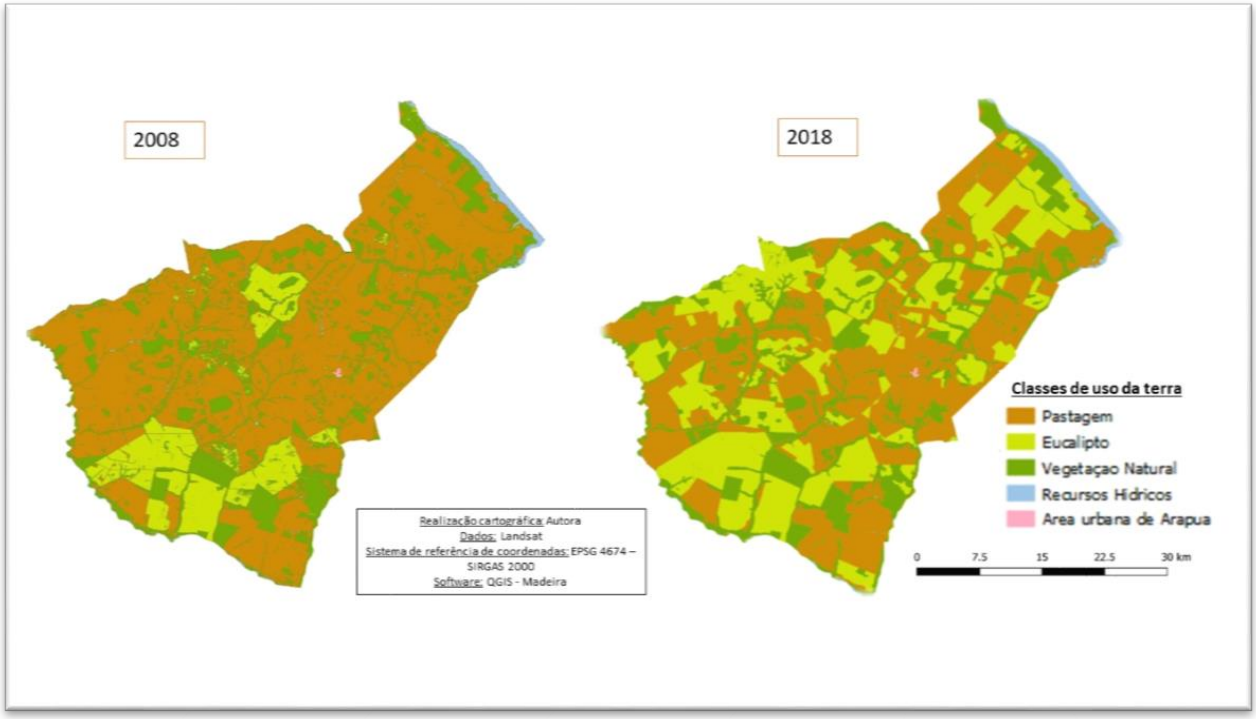
> *I wish the eucalyptus could disappear to bring back all the pasture, so people could live, could plant and harvest; I don't mean all become pasture back, but cultivated farms, so people could go to the crops and our abundance could come back.*
>
> *(Maria, Arapuá villager)*

The fact is that cattle ranching has been an authentic calamity in the region. The ranchers, often using fake property papers, cleared forests, savannas and bushlands, threatened and killed small peasants

to grab their land, terrorized and dispersed the remaining Indigenous communities[114] and even used slave labour[115]. But even this industry did not eradicate so completely the people from their own land, such that local people even talk about cattle ranching with some nostalgia, so totally have their lives been annihilated.

> *"Now we are an island, surrounded by eucalyptus (...) The school was at the center, here it was very busy, Saturday and Sunday there was always a party. The eucalyptus took the youngs out of here".*
>
> *(Amanda, Arapuá villager[116])*

In the area of Arapuá village, in the municipality of Três Lagoas, eucalyptus plantations took over. Only a little dot remains, right around the village, where a little group of subsitence farmers still resists. Maybe not for long. In the meantime, the reduction of the village caused the collapse of basic social services, such as health care and public transportation. The school in Arapuá is still open, but with half the students.



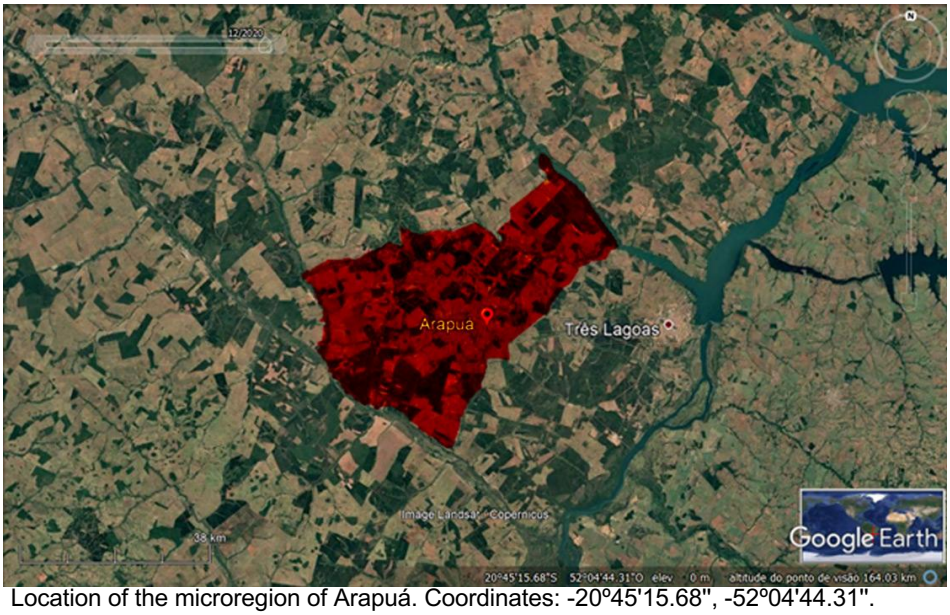
Land use in Arapuá: 2008 and 2018. (Raoul and Almeida, 2019[117])

[114] See the wide documentation provided in the annual reports by the Commissão Pastoral da Terra, "Conflictos no campo", in https://www.cptnacional.org.br/downlods/category/41-conflitos-no-campo-brasil-publicacao

[115] Repòrter Brasil, Slave labor in Brazil's meat industry, 2021, https://reporterbrasil.org.br/wp-content/uploads/2021/01/Monitor-8-Slave-labor-in-Brazils-meat-industry.pdf

[116] Dubos-Raoul, Marine. A chegada do eucalipto no município de Três Lagoas (MS) na percepção dos moradores das comunidades rurais de Arapuá e Garcias: entre a sujeição e a resistência territorial. Revista NERA, 2022, no prelo.

[117] Raoul, M; Almeida, R. Os impactos da expansão do eucalipto para a comunidade rural de Arapuá, distrito do município de Três Lagoas-MS: o papel dos elementos culturais no processo de expulsão e resistência territorial. XIII Enanpege, 2019, http://www.enanpege.ggf.br/2019/resources/anais/8/1562638972_ARQUIVO_ArtigoCompletoMDR.pdf



Location of the microregion of Arapuá. Coordinates: -20º45'15.68", -52º04'44.31".

On the Amoedo side, in Rio Verde, Zuza's farm had 6 families. Now these 6 families each had 3 children. In Barra Bonito there were 8 families, each family had 2-3 children. Today... there are no more farms, it's all over, it's all eucalyptus
(Raquel, Arapuá Villager)

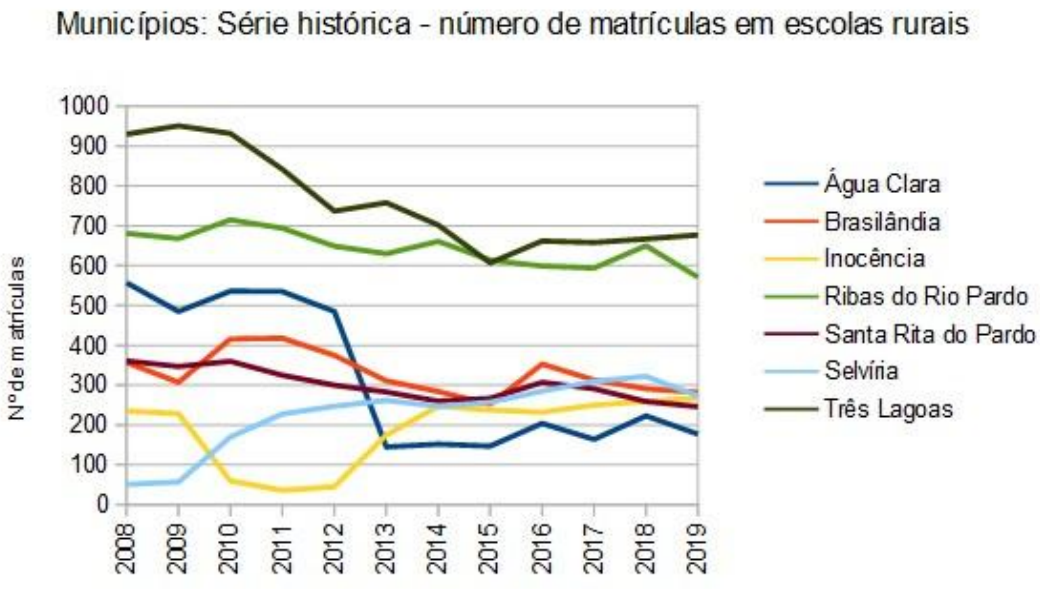
> *We said that to a Fibria manager but he didn't believe me, but after the eucalyptus came, they shrunk Arapuá. Because there are no jobs, the jobs that remain there are from public service, at the school, and if it keeps with this number of students, the jobs will end soon.*
>
> *(Silvana, Arapuá villager)*

> *Fibria applied here R$ 1,2 million to the honey house, it was great but it generated just one direct job.*
>
> *(Silvana, Arapuá villager)*

The local people insist that the eucalyptus brought them unemployment and caused rural depletion. A clear indicator is the wave of closures of rural schools. [118]

> *Back then, there were like 38 rural schools in the region, almost every farm had its own school and teachers.*
>
> *(Cipriano, Arapuá Villager)*

[118] MST, 80 mil escolas fechadas no campo brasileiro em 21 anos, November 2019 https://mst.org.br/2019/11/28/80-mil-escolas-fechadas-no-campo-brasileiro-em-21-anos/



Number of enrolments in rural schools. Data: Instituto Nacional de Estudos e Pesquisas Educacionais – INEP.[119]

Data from the National Institute for Studies and Education Research (INEP), shows a sharp decline in the number of students in rural schools since 2008 in Três Lagoas and nearby municipalities affected by the expansion of eucalyptus plantations. Três Lagoas presents a significant drop. Água Clara presents an abrupt decline from 2012-2013. The municipality of Selvíria, on the contrary, increased the number of its students, thanks to land allotments as part of the agrarian reform.



Eucalyptus plantations advancing toward the village Church in Garcia, Três Lagoas, 2021.

Another village that is vanishing is Garcias, also in Três Lagoas county. In Garcias, the school has been closed. The remaining students have been transferred to Arapuá and some children spend up to three hours on the bus to get there. Some of the villagers stories and impressions are below:

[119] Inep, Dashboard, https://inepdata.inep.gov.br/analytics/saw.dll?Dashboard

When I came to Garcias there were more than 250 families, only in the village, not counting those on the farms. Today, there are, at the most, 50 families. Today I feel isolated already, this place doesn't exist anymore. The population is over. There used to be markets, a notary's office, a drugstore, a police station, a flour factory, today there is nothing left.

(Pedro, Garcias villager[120])

The village here was lively due to the farms. There were a lot of people. The weekend here it was full of people, playing ball, there were a lot of children. This farm, which was leased, at that time had 53 employees. The weekend everyone came here to the village. I worked there for 11 years, almost 12. And today... It is ending. So I say, the impact was very large, eucalyptus caused a lot of unemployment. The farms employed a lot, eucalyptus doesn't, if you don't have the required training.
(Lurdes, Garcias Villager)

Because it took the jobs of the people, and it just hired people from the outside, not from here. It hires outsiders and the money goes outside too!

(Mariana, Garcias villager)

According to local villagers, with the expansion of the eucalyptus plantations the quality of life declined sharply. It is not just the loss of jobs, but also the quick deterioration of infrastructure. In rural areas roads are everything: they allow you to reach schools, to go to the hospital in case of emergency, to once in a while buy products that are not offered by the limited choice of the local store. The roads have been the next victim of the paper industry: the intense traffic from trucks running at high speed, loaded with logs has quickly deteriorated the still unpaved roads.
For entire months ambulances were not able to reach Garcias, given the precarious state of the roads, excluding the local population from emergency health care. Road network maintenance is a state duty, so the paper companies don't feel responsible for them, but their intense use is affecting the very life of the region

The road is very important for us here. And we know Eldorado doesn't fix it, it just ruins it. It has strength to ride over it, but not to fix it. They never ever fixed anything here in Garcias.

(Rosana, Garcias villager)

Now we heard that Suzano doesn't work with the roads. In Fibria times, when we asked to fix the road, from the pavement to here they would pass the machine every 5 minutes during their harvesting period. It was a carpet. When it rained, the machines would come to fix, there was no mud, you could arrive and leave Garcias anytime. Today?? You don't go anywhere. If there's someone sick here, depending on this road, the person can die here, trapped. We are isolated by everyone, the mayor, the councillors

(Rosana, Garcias villager)

[120] Dubos-Raoul, Marine. A chegada do eucalipto no município de Três Lagoas (MS) na percepção dos moradores das comunidades rurais de Arapuá e Garcias: entre a sujeição e a resistência territorial. Revista NERA, 2022, no prelo.



Abandoned and decaying, surrounded by eucalyptus plantations. Garcias, 2021.

Increasing land prices and concentration

The change of land use, from cattle ranching to eucalyptus plantations, also caused a spike in land prices and intense real estate speculation in urban areas.[121] According to the association of tree plantation companies IBÀ, the land rush has accelerated recently with 58.8 billion R$ planned until 2028: “Land for Eucalyptus, which takes seven years until the harvest for pulp production, is still available in the state, but prices are increasing.”[122]
An academic study analysed the land prices in Três Lagoas and found that in 10 years they increased about 400%,[123] according to a number of factors, such as proximity to the factories, water availability, soil quality, and road proximity. According to a local newspaper, “In September 2021, it already cost R$ 600. Now, in May of this year, the rent for the kitchenette varies from R$ 1,200 to R$ 1,500.”[124]
High land prices are a direct obstacle to land reform and affect small farmers, paving the way for further land concentration, which is among the highest in Brazil.[125]

[121] Vittorino, Paula. Valorização de terras agrícolas triplica no Mato Grosso do Sul. 2013. Disponivel em: https://www.scotconsultoria.com.br/terras/noticias-da-terra/139/valorizacao-de-terras-agricolas-triplica-no-mato-grosso-do-sul.htm
[122] O Valor Econimico, Globo, Novas fábricas de celulose levam a corrida por terras e madeira no país, July 2022, https://valor.globo.com/empresas/noticia/2022/07/08/novas-fabricas-de-celulose-levam-a-corrida-por-terras-e-madeira-no-pais.ghtml
[123] Amanda Baratelli, "A dinâmica do processo de expansão do eucalipto e a majoração do preço da terra no município de Três Lagoas" Master's degree, Universidade Federal do Mato Grosso do Sul, 2019.
[124] Campo Grande News, Com aluguel custando até R$ 3 mil, empresa constrói para acomodar funcionários , May 2022, https://www.campograndenews.com.br/economia/com-aluguel-custando-ate-r-3-mil-empresa-constroi-para-acomodar-funcionarios
[125] De Olho nos ruralistas, Com 92% do território privado, MS tem maior concentração de terras particulares do país, April 2017, https://deolhonosruralistas.com.br/2017/04/11/com-92-territorio-privado-ms-tem-maior-concentracao-de-terras-particulares-pais/



Sign from Eldorado: “WE BUY LANDS: payment in cash; swift; no bureaucracy”.

In urban areas, the real estate market benefited a great deal with the arrival of pulp and paper companies. The terrains appreciated more than 1,000% in 10 years in many neighbourhoods, leading to serious social consequences, like the increase of peripheral areas (as the population couldn't afford rents near the centre anymore), denying a big proportion of citizens access to the city, pushing the population out to areas without public services and infrastructure.


Expansion of urban network, approaching to the plantations. Baratelli, 2019.

Dirty jobs

One of the main claims of the pulp & paper industry is that they create a large number of job opportunities. In reality, being a highly technological industry that needs large areas of plantation land, the balance is negative compared with subsistence agriculture,[126] and even to cattle ranching in Mato Grosso do Sul. The quality of the direct jobs created by this industry also seems to be low. Workers have complained about poor working conditions.

In 2015, Fibria (now absorbed by Suzano) fired 18 workers in retaliation to organizing an independent workers union.[127] Workers who contracted diseases due to poor quality machinery were also fired. Plantation workers complain of poor and unhealthy working conditions. Poorly maintained machines can be dangerous and their use can cause musculoskeletal injuries. There is often no adequate time nor shelter for eating, there is a lack of restrooms in the workplace, so bodily needs must be met in the fields, with the constant risk of coming into contact with venomous animals such as spiders or snakes.

Over the last few years, a number of irregularities have been reported, including violation of the labor legislation.[128] According to the Public Ministry of Labor (MPT), in Mato Grosso do Sul there are 205 cases against pulp and paper companies, distributed as follows: Eldorado Brasil (111 cases), Suzano S/A (65 cases), Fibria-MS (22 cases) and International Paper (7 cases).[129] These numbers are exceptionally high in comparison to other businesses. The main agribusiness company in the region, Cargill, has 15 registered cases and the three largest metallurgic industries have 29 combined.[130]

In 2018, the company Eldorado Brazil was ordered to pay R$ 2 million in damages to the municipality, after failing to comply with labor regulations.[131]

> *The public case was filed in 2014 and pointed to a series of frauds related to the working environment and the conditions in which employees were reported. According to the MPT-MS (Ed.), irregularities were found in the recruitment and transport of workers, shelters against unfavorable weather conditions, effective working hours control, unhealthy conditions, and uninterrupted shifts, among others. (...)*
>
> *(Campo Grande News)*

Two years later, the same company was ordered to pay R$ 5,000 for any violation and any affected worker.[132]

> *The excessive working hours and the lack of rest breaks are undoubtedly risk factors for diseases and accidents. It represents a degradation of rights so serious that it is considered the* ***submission of driver workers to slave-like conditions*** *through exhaustive working hours.. (...)*
>
> *(Vivian Letícia de Oliveira, judge)*

In its turn, Suzano received sentences on labor issues in other regions.[133] However, the court verdicts did not result in substantial improvements for the company workers. On September 15 2020, workers from Suzano in Três Lagoas went on strike, alleging the noncompliance of the company with the

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126 Almeida, Rosemeire. Territorialização complexo eucalipto-celulose-papel em Mato Grosso do Sul. XXI Encontro Nacional de Geografia Agrária. 2012. p. 8, http://www.lagea.ig.ufu.br/xx1enga/anais_enga_2012/eixos/1291_1.pdf

127 WRM, Demissões na FIBRIA Celulose, https://wrm.org.uy/pt/outras-informacoes-relevantes/demissoes-na-fibria-celulose/

128 Brasil de Fato, Reforma trabalhista reduziu renda, não gerou emprego e precarizou trabalho, November 2018, https://www.brasildefato.com.br/2018/11/11/reforma-trabalhista-reduziu-renda-nao-gerou-emprego-e-precarizou-trabalho

129 These numbers refer to Active, Under Follow-up, Archived and Rejected cases.. See MPT, https://www.prt24.mpt.mp.br

130 Ministério Público do Trabalho em Mato Grosso do Sul, Consulta Investigados, https://www.prt24.mpt.mp.br/servicos/investigados

131 Neris, Gabriel, Campo Grande News, Eldorado é condenada a pagar R$ 2 milhões por infrações trabalhistas,, August 2018, https://www.campograndenews.com.br/economia/eldorado-e-condenada-a-pagar-rs-2-milhoes-por-infracoes-trabalhistas

132 JD1 Noticias, Justiça reconhece jornada exaustiva de motoristas da Eldorado, October 2020,, https://www.jd1noticias.com/justica/justica-do-trabalho-reconhece-jornada-de-motoristas-da-eldorado/80837/

133 See: http://www.noticiadafoto.com.br/2015/06/suzano-e-condenada-pagar-r-821-mil-por.html , https://www.smetal.org.br/noticias/suzano-e-condenada-a-pagar-r-2-milhoes-por-terceirizacao-irregular/20130719-113814-u702 , https://www.amodireito.com.br/2015/03/suzano-e-condenada-pagar-indenizacao.html

previously signed *Collective Agreement*.[134] According to Mr. Adailton, a workers representative in Três Lagoas, working conditions are insanitary, and they lack an adequate environment to have meals or take care of their personal hygiene. Female workers are the most impacted by the lack of lavatories.



Workers conditions on the field: dirty food, no adequate place to eat and no restrooms.

The food is not only cold, but often contaminated with diesel and other chemicals as the boxes are opened during transportation. Lunch is consumed standing up with no shelter and no place to sit. In order to waste less time, workers often keep the engine running and take turns eating quickly (forget about a break) as there are targets to meet. At night, workers eat standing up to avoid dangerous animals.

> *At the harvest, what happens? Sometimes people eat lunch at the machines, because of the production premium. Why? Because you have your salary, but you have your production premium, which is in the collective agreement. We can't work on the production target. It is completely in the hands of the company. So there are goals that the operator has to meet, everyone has to meet that goal, so in theory the worker can go to lunch, but sometimes there is no car to take you, or sometimes there is, but anyway you would take a while, so they prefer to have their lunch quickly, in the machine, 10 minutes, 15 minutes, or even during refueling, when the mechanic is doing some service, so as not to waste time. (...) Suzano does it like that, it's called the "hot swap", or the "hot seat": (when the operators switch) the first operator doesn't even turn off the machine. The second operator arrives, they change the shift with the machine on and he goes to work, not to waste time because he needs to reach his production targets. And that's a crime, because it makes the boys work too hard! (...) In 2019, what did they do? They set an absurd goal! In 2019 we were earning 2 hours in itinerary per day [then scrapped by the recent Labour Reform]. That was BRL 1,200, 1,300 or 1,400 fixed rate. What happened? After this agreement, the worker that was unable to meet the target, he didn't earn anything. He worked like a camel, a donkey, but since he couldn't meet the target, his production premium was zeroed. We don't want this award that way, in this model. But it is entirely in the hands of the company, and they cheat. If the operator is on a machine that will reach 100% of the production premium, they stop the machine. If you have to change a part they leave the machine stopped, they do all these manoeuvres so that the worker does not meet the production premium. They rob the worker. If you are aware of everything that happens, you get very angry, you can't help but get angry. Because it really is robbery. And in a while, 4 or 5 years, by the way they are working today, everyone will be broken, and the company getting rich and stealing from workers, employees, and it will leave them broken, disabled by this model that is being applied today at Suzano.*

[134] More on: https://arapuanews.com.br/trabalhadores-rurais-da-suzano-entram-em-greve-no-15-de-setembro/; and https://www.youtube.com/watch?v=h7dBsOmT2iI.

(Adailton, Suzano worker, 2021)

The workers have complained about wage reductions that the company says are justified due to losses that are beyond the workers' responsibility, such as oil leaks or broken engines. According to Mr. Adailton, after four or five years a worker's body is so exhausted that he is unable to work efficiently anymore, and so they are replaced by new workers, without any kind of indemnity.

> *There are many colleagues of mine who have had an operation on their shoulder. They no longer have the physical condition to carry on with this work. They have to look for another activity, because they can't work again in the same area. This is the big trouble (with health), because of the repetitive movements, and because the machine that rocks too much, it breaks the spine, it breaks the lumbar, it breaks the shoulders, it breaks everything.*
>
> *(Adailton, Suzano worker, 2021)*

Recentlyat the Suzano factory in Maranhão, workers went on strike, pointing out similar problems to those reported in Três Lagoas, such as unachievable goals, poor food quality, and unhealthy working conditions, among others.[135]



Strike at Suzano factory in Maranhão on March 31, 2021 (In the sign: #no to abusive cuts and unreachable targets").

Fibria (now Suzano) has also been accused of providing dirty accommodation for the construction workers that were building its mill in Três Lagoas: "in order to reduce the cost of accommodation expenses for workers on the aforementioned project, the contractors overcrowded homes and hotels with 'beds that never got cold', leaving workers in poor hygiene conditions, among other situations of precariousness and violence".[136] The case was investigated by a task force of the Ministry of Labor, which found that there were more than 120 accommodations in the city linked to approximately 250 companies contracted by Fibria. As many irregularities were found during the inspections, a number of contractors' accommodations were banned.

[135] Wilson Leite, Trabalhadores Diretos da Suzano Fazem Protesto na Fábrica fe Imperatriz-MA, março 2021, https://blogwilsonleite.com.br/trabalhadores-diretos-da-suzano-fazem-protesto-na-fabrica-de-imperatriz-ma/

[136] Almeida, Rosemeire. Territorialização complexo eucalipto-celulose-papel em Mato Grosso do Sul. XXI Encontro Nacional de Geografia Agrária. 2012, http://www.lagea.ig.ufu.br/xx1enga/anais_enga_2012/eixos/1291_1.pdf

In Três Lagoas, there are also specific complaints from the workers driving the *hexatrem*. These are 6-trailers trucks, measuring 52 meters, and carrying 200 tons of wood.[137] They are presented by Suzano as the ultimate wood transport innovation. Despite this, they are only meant to transport wood within the company's areas and via “internal roads”.[138] However, as reported by the workers, these vehicles have made irregular trips on intercity roads. A Youtube video shows an overturned hexa train on the MS 459 highway, in the district of Garcias.[139]



Hexatrem carrying eucalyptus.



Youtube video showing hexatrem carrying eucalyptus toppling on state highway.

Hexatrain workers are hired in a category that guarantees them fewer rights, and are not considered ‘drivers’. This also puts pressure on the drivers, impacting on their capacity to assure good driving, especially when these h*exatrem* run on public ways, making them a real danger for local people.

> *All this hexatrem operation is weird, they are hired as ‘conductors’ but they are actually ‘drivers’. Why? They are not registered as drivers, because otherwise they would get some benefits that drivers have. And they don't. For example, they don’t have the right to follow workshops, because they are not registered as drivers, they are ‘conductors’. The hexatrain is almost 60 meters long, and carries over 200,000 kilos. The production it carries is very large. The production of these guys is very large, the company likes it... it's a ‘business from China’ [a very profitable business], do you understand? It's very profitable, and they pay very little. They pay well below the bottom, they say they are forest conductors*

[137] Volvo, Suzano investe em mais hexatrens Volvo para transporte de madeira, September 2021, https://www.volvogroup.com/br/news-and-media/news/2021/dec/suzano-investe-em-mais-hexatrens-volvo-para-transporte-de-madeira.html

[138] Suzano, Hexatrem - Suzano Unidade Três Lagoas, 2021 , https://vimeo.com/422915480#

[139] Youtube, Hexa Trem tombada na Rod. 459 Três Lagoas Ms, https://www.youtube.com/watch?v=eCef-3Raja8

because they work indoors, inside the company's private property. That's a lie, because they take the state highways, they are not yet paved but still they are highways. Wherever there is a traffic flow of people from the countryside, people from farms, local communities, they pass through all these places. It is not inside the company. Because when it's a private area of the company, the only traffic flow is the company's personnel, right? That's not what actually happens. They use intercity roads and highways. They are not yet paved but they are still highways.

(Adailton, Suzano worker, 2021)

Long hours, no proper place to eat, a lack of toilets, no pay for commuting time, exposure to physical ailments due to defunct machinery and a lack of training and recognition of workers' real jobs and skills, are among the things plantation and construction workers face. The jobs created by the pulp and paper industry are fewer, per hectare, than those of other land uses, such as cattle ranching, and on top of that, they are often dirty jobs that are exhausting and can leave workers permanently injured.



Cerrado landscape at Dois irmãos - Aquidauana

Conclusions

The paper industry is expanding at a rapid pace into the region

The Três Lagoas microregion (including the municipalities of Ribas do Rio Pardo, Água Clara, Brasilândia, Selvíria, Inocência, and Santa Rita do Pardo) is facing a huge expansion of the paper industry (and related pulpwood plantations) leading to a massive change in land use and social life. Despite the claims of this industry that it brings development, is environmentally friendly, and even that it reforests areas degraded by cattle ranching, these are often unsubstantiated and negative impacts on the ground prevail.

1. While acquiring land previously converted by cattle ranching and developing eucalyptus plantations, the paper industry does not repair damage by restoring forests, as it commonly claims to do. On the contrary, it destroys the surviving fragments of Cerrado which, thanks to its deep roots, tends to survive land conversion and to naturally regenerate. Plantation forest management on the other, eliminates any possibility for natural regeneration.
2. It also pushes the cattle ranching industry into other areas, including deforestation fronts. It provides the ranchers with financial means to buy larger areas of land in regions where land is cheaper.
3. The expansion of eucalyptus plantations expels rural populations from their fields. This includes Indigenous People who were historically chased off their land by cattle ranchers and survived in scattered rural settlements that have now mostly vanished from maps.
4. The rich and precious Cerrado wildlife that still survived in the margins between the remaining fragments of Cerrado and pasture (with low or high regrowth rate of natural vegetation) is excluded by the inhospitable conditions of the monocultures, and find death on the roads or in conflicts with local people when they end up invading settlements to look for food.
5. Eucalyptus plantations have a deep impact on the water table, draining springs, streams and water reservoirs. This directly affects the remaining subsistence agriculture, as well as the whole landscape. The Cerrado, once a source of water for a large part of the subcontinent, is now drying out, leading to major alterations in local meteorological patterns. Climate change and other industries play their part too, but eucalyptus monoculture is definitely not the solution in such an emergency. Furthermore, drier vegetation, as well as the extensive amount of fuel generated by eucalyptus plantations, is a major factor in the increasing frequency of fires.
6. As a result, and in combination with longer dry seasons linked with the El Niño climate pattern, fires are becoming more and more frequent and uncontrollable. This is a trend destined to increase and intensify together with the progressive depletion of the water table.
7. Eucalyptus plantations also involve the application of large amounts of agrochemicals, affecting surrounding agriculture, killing natural biodiversity, contaminating the water table and, ultimately, the drinking water.
8. The expansion of the paper industry brings some work opportunities, but far fewer than the rural work life it replaces. Furthermore, these jobs are dirty and exhausting. Workers are exposed to contamination and inhumane working conditions.

Demands to the Pulp & Paper industry

The massive expansion of pulping capacity and of the related pulpwood plantations, are leading to extensive environmental and social impacts.
No further expansion can be carried out if it is not clear what will be the consequences on the environment and on local communities.

This is why we demand an immediate moratorium on pulpwood industrial plantations expansion or intensification until future impacts are carefully assessed and past harm has been fully and fairly remediated.

Here we outline some demands that companies should incorporate in their own policy as a public commitment. Commitments must include time-bound targets, as trust building measures to pave the way for more comprehensive remedy plans that must to be openly discussed and agreed upon by the impacted communities and other relevant stakeholders.

FPIC, land rights

- Respect Free, Prior and Informed Consent (FPIC) of local communities and especially of Indigenous communities and publicly commit to remedy past harm due to failure to respect FPIC;
- Publicly commit to investigate past land-grabbing across the whole plantation's area, with the aim to carry on restitution or compensation, according to the preference of the affected communities;
- This investigation should not be restricted to land-grabbing committed by controlled companies or independent suppliers, but it should also take responsibility for previous owners' wrongdoings, if there has not been due diligence before the acquisition over prior unfair acquisition;[140]
- This investigation should include land acquisitions unfairly obtained (falsified land titles, owners forced to sell, unfair transition conditions, unfair price etc.)
- Widely inform local communities about the company's commitment to review past land acquisitions;
- Inform local communities about their rights according to the terms of the new policy;
- Have open and constructive dialogue with representatives of local communities and Indigenous Peoples and commit to avoid resorting to the police as a means to address conflicts;
- Publicly condemn violent gatherings by third parties aimed to intimidate or repress Indigenous land reclamation activities;
- Make a commitment not to buy any land that has been previously acquired in violation of the present policy, and not to acquire wood-fibre from operators whose land has been acquired or cleared in violation of the present policy;
- Develop and agree with key stakeholders, a methodology for identifying, classifying and mapping land and social conflict, in their supply chains. Results of the conflict mapping must be made public and include an open process for additional stakeholder input; This mapping should include conflicts about land, about water table depletion, about contamination from agrochemicals or include any other complaint from affected communities;
- All members of affected communities will be informed of the conflict mapping and about the opportunity to present a grievance and how to do this, including the possibility to refer to independent NGO advisors and access independent mediation;
- Publish Standard Operating Procedures (SOPs) aimed at urgently resolving all pending cases fairly, ensuring adequate compensation for damage, and eventually giving back land if requested. This will include developing SOPs and Conflict Resolution Units: SOPs shall be developed and agreed with key stakeholders and made public. Priority SOPs include: Free, Prior, and Informed Consent harm; Participatory Mapping; Security; and a robust, transparent and

[140] AFI Core Principles (Section 9.4) states that "Companies purchasing or acquiring interests in commodity-producing properties assume responsibility to remediate past harms, unless this responsibility is explicitly and legally transferred to or retained by another party". https://accountability-framework.org/wp-content/uploads/2019/06/Accountability_Framework_Core_Principles.pdf

accessible Grievance Mechanism;
- Establish conflict resolution units, with the necessary authority and training required to mobilize resources and resolve conflicts, and equipped with action plans and timeframes which have been agreed with communities and their chosen advisors. All communications with, and commitments to, communities must be documented and shared publicly;
- No infrastructure development, clearing, and new planting will be carried out in areas affected by social and land conflict, until an agreement is found with the affected communities on conflict resolution processes, conduct joint participatory mapping, and resolve conflicts in areas with social and land conflict (this must apply to the company's own operations as well as those of subcontractors).

Environmental impacts

- Complete a detailed baseline study on the current ecological and hydrological conditions of the area, including water table and groundwater quality, to serve as a basis for future analysis. This will include credible strategies, guidelines and Standard Operating Procedures (SOPs) to protect the current water table and water quality, to be shared and agreed with stakeholders;
- A plan has to be developed on-site and off-site to prevent chemical, pesticide and genetic pollution of aquatic ecosystems and the atmosphere. This must prohibit use of Genetically Modified Organisms (GMOs) and toxic, bio-accumulative and persistent pesticides, including those on the FSC 'Highly Hazardous' list and SAN prohibited pesticide list. Measures must be taken to avoid worker and community exposure to any potentially harmful chemicals, including - but not exclusively - the commitment to stop aerial spraying;
- Immediately terminate any legal activities challenging local legislation aimed to limit or contain industrial plantation expansion and publicly commit to refrain from such initiatives.
- Redirect truck and 'hexatrain' traffic to avoid settlements and inhabited areas, and where it is not possible, to build structures to prevent accidents (bridges, tunnels, fences) in consultation with local communities and the authorities;
- Conduct a comprehensive study about the threats to wildlife by the company trucks and 'hexatrains' and adopt a plan for remediation infrastructure, including re-directing the trucks routes, building barriers, bridges and tunnels to protect wildlife and make possible its migration, in consultation with local authorities and civil society;
- Do not incentivize lorry drivers to maximize speed in their delivery;
- All subcontractors will accept this policy and incorporate it into their SOP and any serious policy violation by subcontractors, or their operatives, will automatically lead to contract termination.

Working conditions

- Guarantee workers' right to join a union of their choice (regardless the state of the union's formal recognition);
- Provide workers with their labour rights, including holiday payments and social security and recognize the transfer time;
- Guarantee adequate working conditions, including lodging, toilets and decent places to have lunch or other breaks;
- Ensure workers are not exposed to working conditions leading to illnesses, including from operating machines or dealing with toxic substances.

Transparency

Publication of full versions of the following documents:
- Environmental impact assessments, including of plantations and infrastructures;
- Hydrology studies;
- A list of all past land acquisition agreements, including maps;
- Local consultation minutes and land allocation plans;
- Full environment assessment plans (EIAs) including on impacts from mills, infrastructures and supply plantations.
- HCV and HCS studies;

- Plantation management plans, biodiversity offset management plans, prescriptions and SOPs;
- Results of conflict mapping.

Demands to business partners

Buyers, investors and financiers may have concerns about being associated with companies involved in large scale environmental and social impacts. If they continue to do business with these companies (Suzano, Eldorado, Arauco etc ...), this could result in reputational and financial risks.

Buyers, investors and financiers who are profiting from the depletion of an entire region, should use their leverage to demand these companies address the ongoing impacts. They should require from their business relationship that it is agreeing to and successfully implementing (as per independent third-party audit) the demands made in this report. If a business relationship fails to act responsibly, we demand that buyers, investors and financiers end their relationships by closing supply contracts, divesting, and suspending financial and services agreements.