

DRAFT - EMBARGOED TO 3 MARCH 2021 7PM CET
EXECUTIVE SUMMARY

GREENPEACE

MAKING MINCEMEAT OF THE PANTANAL

THE MARKETS FOR (JBS) BEEF

() Marfrig & *Minerva Food*



Zandbergen
world's
finest meat

montesano



Carrefour



Egatesa
carnes de primeira

DANISH
CROWN



Nestlé

GRUPO
JUCARNE

FN
GLOBAL
MEAT

Casino

FM
FROSTMEAT
SINCE 1983

meat 2000

Walmart





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'The livestock industry is not a threat to the future of the planet despite Greenpeace and certain other NGO claims. Livestock can deliver biodiversity, socio-economic development, sustainable livelihoods and meet food security goals.'¹

Maccio Nappo, Director of Corporate Responsibility,
JBS Brazil, February 2021

'The need for rapid reduction in GHG emissions from fossil fuels to meet the 1.5° or 2°C targets is widely acknowledged. We show that the same is true for food systems: Even if fossil fuel emissions were rapidly reduced, emissions from the global food system are on a trajectory that would prevent achievement of the 1.5° and 2°C targets. ... [M]eeting the 1.5° and 2°C targets will likely require extensive and unprecedented changes to the global food system.'²

Michael A Clark et al, *Science*, November 2020



EXECUTIVE SUMMARY: MAKING MINCEMEAT OF THE PANTANAL

In 2020, thanks to two consecutive years of severe drought,³ some 30% of the Brazilian Pantanal – the world’s largest contiguous wetland⁴ – burned,⁵ with official sources saying that the vast majority of the fires were started by human activity.⁶ In many cases ranchers are suspected of starting fires deliberately,⁷ in defiance of official bans on the use of fire introduced in July by regional governments and presidential decree.⁸

Despite its value as a vital habitat for jaguars⁹ and other wildlife,¹⁰ about 90% of the Brazilian Pantanal is under self-declared land claims, where ownership is not verified by the state.¹¹ As a consequence, these land claims often overlap with Indigenous lands or public conservation units (including federal, state and municipal reserves). In the Pantanal, these land claims overlap with about 28% of Indigenous lands¹² and 58% of public conservation units.¹³ About 80% of the Pantanal is reportedly managed as cattle ranches.¹⁴

Greenpeace International¹⁵ has identified 15

ranchers who are either current or recent (2018–2019) suppliers of Brazil’s leading meat processors, JBS, Marfrig and Minerva, and that are linked to the devastating 2020 fires in the Pantanal, environmental violations and/or property registration irregularities.¹⁶ The fires within the boundaries of the case study properties alone burned more than 73,000 ha – an area the size of Singapore, or about half the size of Greater London¹⁷ – between 1 July and 27 October 2020, and in many cases appear to have contributed to extensive burning far beyond the property limits.

These 15 ranchers were linked directly or indirectly in 2018–2019 to at least 14 meat processing facilities owned by JBS, Marfrig and Minerva which trade globally. Direct trade links have been identified from one or more of these 14 facilities to customers including **Burger King** and **McDonald’s**, **Danish Crown Group**, **Nestlé**, Brazil’s **Pão de Açúcar** supermarket chain (a member of the French **Casino Group**), **Carrefour** and **Walmart-Chile**.¹⁸ According

to shipping data, between 1 January 2019 and 31 October 2020 these 14 facilities collectively exported over half a million tonnes of beef and beef products worth nearly US\$3 billion to markets including Hong Kong (22%), China (21%), the EU-27 and the UK (8%) and the USA (1%). Exports from JBS's Pantanal-linked facilities alone reportedly accounted for almost US\$2 billion over the period, with the EU-27 and the UK representing around 9% of the export volume and over 13% of the value.¹⁹

Exports are a primary source of revenue for the Brazilian operations of JBS, Marfrig and Minerva.²⁰ Despite the chaos and economic upheaval caused by the global Covid-19 pandemic, Brazil's beef exports set a new all-time high in 2020, with volumes reported to have reached 2 million tonnes and revenues some US\$8.4 billion – up 11% over 2019.²¹ The main global revenue source for JBS SA (as for Marfrig²²), however, lies in its North American business units, with the United States accounting for around half of the company's global revenue in the third quarter of 2020.²³ JBS has business interests in every continent except Antarctica;²⁴ customers of the company and its subsidiaries internationally include **Costco, KFC, Lidl, Mars, M&S, Nando's, Nestlé, Pizza Hut, Princes, Sainsbury's, Subway, Tesco, Walmart** and **YUM**.²⁵

As a result of numerous damning exposés, including the 2009 Greenpeace report *Slaughtering the Amazon*,²⁶ JBS, Marfrig and Minerva first promised to deliver 'zero deforestation in the supply chain' by 2011.²⁷ But as this investigation into their Pantanal supply base exposes, the processors still do not have the fundamental procedures in place to guarantee that cattle from rogue ranchers linked to environmental destruction or legal violations are excluded.

Proper product due diligence procedures would mean JBS, Marfrig and Minerva only slaughter cattle where they have established full traceability to origin. This would also mean they could guarantee that they exclude any cattle where there is a risk that they may originate from destruction or degradation of natural forests or other ecosystems, or lands that have been exploited in violation of Indigenous Peoples' rights or conservation laws. When applied to ensure corporate transparency and accountability, due diligence

procedures would mean JBS, Marfrig and Minerva proactively identify and prevent any other adverse human rights and environmental impacts resulting from their own activities, from the activities of the companies they control and from the activities of their subcontractors and suppliers with whom they have an established commercial relationship.

Against this background, the meat processors' current approach to supply chain screening in the Pantanal focuses primarily on the supply ranch, without sufficiently considering practices in the rancher's other operations. This blinkered view enables the most transparent form of cattle laundering – the potential for ranchers to supply cattle from operations that violate law or company policy by passing them through approved intermediary ranches they also own before sending them to slaughter.

Thirteen of the 15 ranchers identified by Greenpeace were 'tier-one' suppliers: they directly supplied one or more of the meat processors from an approved ranch in 2018 or 2019.²⁸ In the majority of instances, the links between the case study properties themselves and the meat processors were indirect – cattle from those properties passed through one or more other ranches before the final sale. However, in most cases, the intermediary ranches were owned by the same individual.²⁹

The supply chain links established by Greenpeace between the ranchers and the big three meat processors predate the 2020 fires. As confirmed by the company responses to Greenpeace regarding the cases laid out in this report, the meat processors deem that all of the ranches that directly supplied them met their policy requirements at the time of purchase. Further, at least 11 of the 15 ranchers apparently remain tier-one suppliers – ie have at least one property approved to directly supply at least one of the meat processors.³⁰

Disturbingly, the processors provided no indication of having imposed meaningful requirements on their Pantanal suppliers in light of 2020's bans on deliberate use of fire, or of any intention to do so despite the evidence provided of supply to approved ranches from problematic ones. In the case of JBS, three of its current tier-one approvals as well as one of its historic (2018–2019)

trading relationships appear to violate its sourcing policy, and its assessment of the suppliers' compliance conflicts with that of Minerva in some instances.³¹ One of Marfrig's historic trading relationships similarly appears to violate its sourcing policy,³² despite the company's assertions about compliance. Marfrig has not indicated that it intends to review these trade relationships more closely.

As for JBS, presented with the summary findings of this report, the company confirmed to an industry journal that for the moment it has no intention to exclude suppliers – tier-one or third-party – that violate its policies. Instead, the emphasis is on getting Amazon suppliers onto a monitoring platform by 2025:

'Right now, we're not going to block them [noncompliant suppliers], we're going to try to help them solve the issue. Sometimes it's paperwork, sometimes they need to put together a conservation plan, sometimes they need to reforest part of their property. We are going to help them and we're hiring people to help these suppliers.

'We think excluding the property and the supplier is a negative approach. It won't solve the problem because they'll go to the next meat packer and try and sell it. We don't want that because it won't address the issue.³³

Such an accommodating approach sits uneasily with JBS's claimed 'zero tolerance' to deforestation and certainly fails to send a clear message to the sector that violations come with consequences – they seem to come with bonuses.

Beyond the Amazon, JBS reverts to a simple checklist of official legal findings³⁴ in a country where the government is systematically dismantling environment agencies and undermining law enforcement.³⁵

The profound deficiencies in the meat processors' policies and related enforcement procedures for their Pantanal supply base help explain the sector's failure to end its links to environmental destruction or to close the market to dirty suppliers. These include:

- **Failure to effectively and comprehensively ban and monitor for the deliberate use of fire**, legal or otherwise.
- **Failure to effectively and comprehensively ban and monitor for all new land clearance**, not just

illegal deforestation and not just within iconic regions such as the Amazon.³⁶

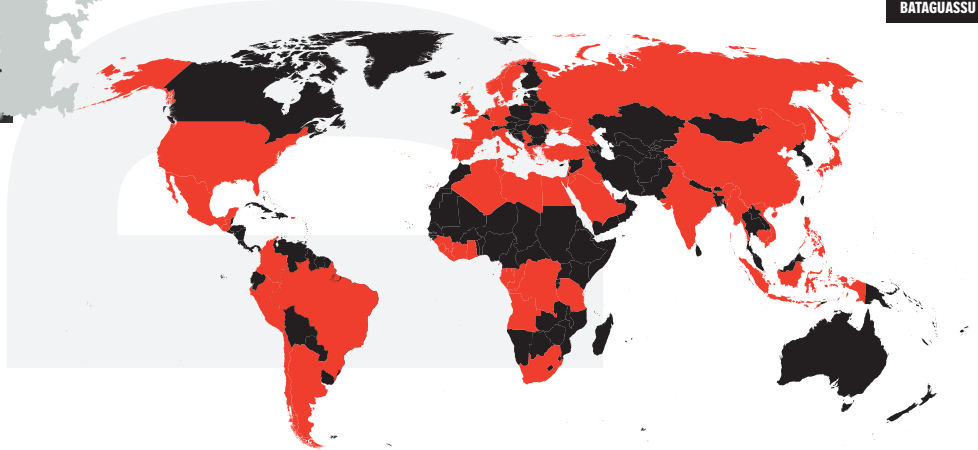
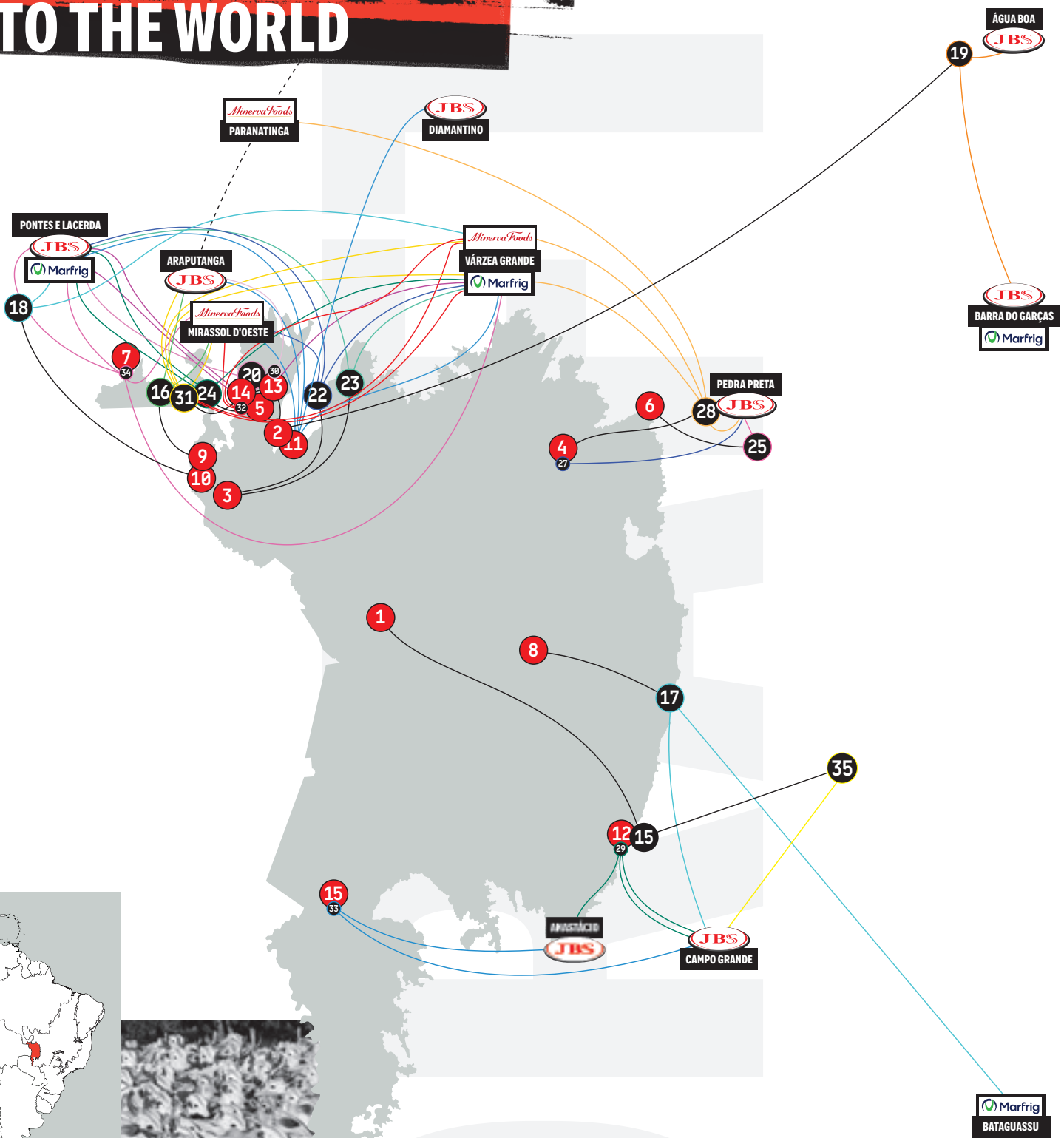
- **Failure to require, as a condition of trade, that ranchers comply with the law and zero deforestation policies across their operations.**³⁷
- **Continued failure to proactively identify and monitor their entire supply base** (including indirect supply and third-party suppliers), despite a 2009 agreement to achieve this in the Amazon by 2011.³⁸
- **Failure to make supply chain transparency a condition of trade** (ie requiring ranchers to disclose the suppliers and origins of their cattle) and a model for responsible business (ie ensuring the public availability of data on all ranchers in the company's supply chain, including the locations of their operations, in order to enable independent scrutiny of their impact).

These failures, underpinned by lack of transparency and traceability, both expose and contribute to the industrial meat sector's continued role as a leading global driver of land-use emissions, biodiversity loss and social injustice. Of particular concern is the potential for cattle linked to deliberate or illegal use of fire to find their way into the international market.

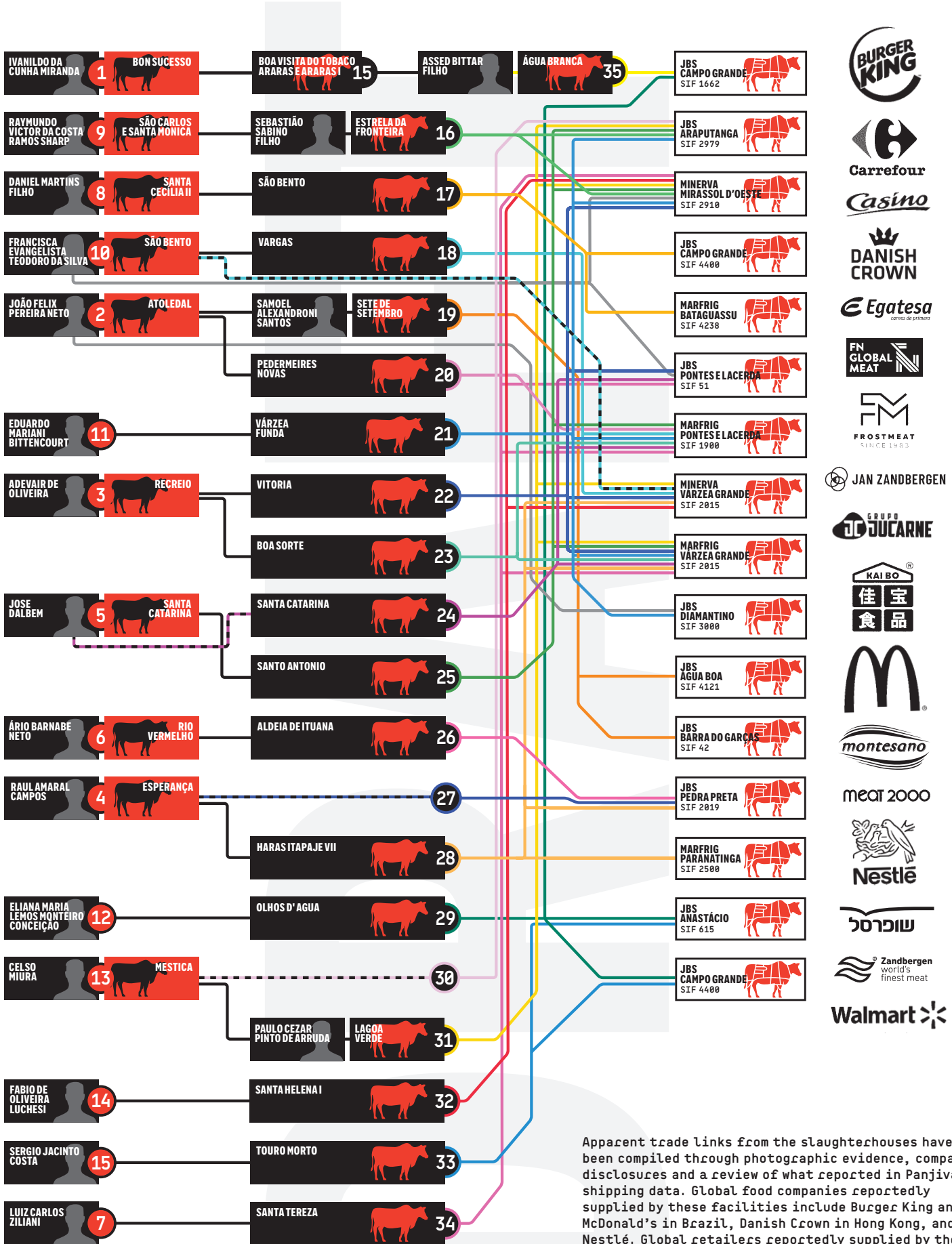
Given such structural failings, it is untenable for international consumer goods companies, supermarkets and fast food companies that claim to have zero deforestation policies to continue to trade with the meat processors named in this report. Further, if trade blocs such as the European Union³⁹ and the United Kingdom⁴⁰ are to end their consumption of products linked to environmental destruction then they must swiftly enact and enforce the necessary laws to ensure that products from these groups find no place in these markets.

The overproduction of meat and dairy is literally costing the earth. To halt and begin to reverse the current crisis, decisive action is needed from governments, finance and consumer companies to shift away from industrial meat and close markets to companies contributing to forest and ecosystem destruction. Without these vital steps our food system will continue to be a driving force of deforestation, climate change and future pandemic risk.

FROM THE PANTANAL TO THE WORLD



The map shows the point location of the Pantanal case study ranches (in red) linked to the 2020 fires, intermediary ranches (in black), and the JBS, Marfrig and Minerva slaughterhouses supplied by them. The connecting lines trace the historic (2018-2019) flow of cattle between operations. The numbers of the ranches correspond to those on the adjacent diagram.



The spider diagram shows how trade from the 15 ranches named in the investigation entered the cattle supply of 14 JBS, Marfrig and Minerva slaughterhouses, often via ranches controlled by the same individual. These slaughterhouses export to markets around the world (shown in red on the world map).

Apparent trade links from the slaughterhouses have been compiled through photographic evidence, company disclosures and a review of what reported in Panjiva shipping data. Global food companies reportedly supplied by these facilities include Burger King and McDonald's in Brazil, Danish Crown in Hong Kong, and Nestlé. Global retailers reportedly supplied by these facilities include the French groups Carrefour and Casino (Pão de Açúcar) in Brazil and Walmart in Chile. Importers of beef from these facilities reportedly include Germany - Frost Meat and Meat 2000 Fleisch Handels; Hong Kong - Kai Bo Frozen Meat Supermarket; Israel - Neto Malinda Trading Ltd and Shufersal; The Netherlands - FN Global Meat and Zandbergen Brothers Bv; Spain - Egatesa, Jucarne Sa, and Montesano.

WHAT'S THE BEEF WITH JBS?

We live in a boom time for the meat industry. Worldwide meat consumption is predicted to rise 76% by 2050,⁴¹ with meat-heavy diets being energetically promoted, including in emerging economies and by fast food companies.⁴² Driven by its insatiable hunger for new markets and for land on which to rear livestock and grow soya for animal feed, the industrial meat sector poses a threat to the global climate, to the wildlife of some of the world's most biodiverse regions, to the human rights of Indigenous peoples and other communities and to the long-term health of populations in the West and elsewhere.⁴³

Global meat giant JBS exemplifies and is a main contributor to this threat. Based in São Paulo,⁴⁴ JBS claims to be the world's largest animal protein company⁴⁵ and the second-largest food company in the world by annual sales (after Nestlé).⁴⁶ It has grown internationally through a series of acquisitions largely funded by the state-owned Brazilian National Bank for Economic and Social Development (BNDES),⁴⁷ which owns more than a fifth of the company.⁴⁸

JBS's impacts on the climate and on the ecosystems of South America are profound: its operations have been estimated to produce around half the annual carbon emissions of fossil fuel giants such as ExxonMobil, Shell or BP,⁴⁹ largely as a result of forest clearance linked to its cattle supply chains and the production of soya for animal feed.⁵⁰

The scale of JBS's environmental and social destruction became a global scandal in 2009, when Greenpeace published a report, *Slaughtering the Amazon*,⁵¹ exposing how JBS and other major players in the Brazilian beef industry were linked to hundreds of ranches in the Amazon, including some associated with illegal deforestation and other destructive practices, as well as modern-day slavery. In the wake

of that report JBS and three of Brazil's other big meat processors signed a voluntary commitment – the so-called 'G4 Agreement' – to end the purchase of cattle whose production is linked to Amazon deforestation, slave labour or the illegal occupation of Indigenous lands and protected areas. The agreement included a commitment to ensure fully transparent monitoring, verification and reporting of the companies' entire supply chains (including third-party suppliers) within two years.⁵²

This pledge has not been honoured. For over a decade, investigations by Greenpeace and numerous others have repeatedly exposed JBS's links to corruption, deforestation and human rights violations.⁵³ But despite its failure to implement the terms of its 2009 commitment, as the company plans to seek listing of its international operations on the New York Stock Exchange (NYSE) in 2021⁵⁴ it appears to be attempting to bolster its environmental image and distance itself from its destructive legacy. In response to increasing pressure from its customers and shareholders,⁵⁵ in late September 2020 JBS launched its new 'Together for the Amazon' initiative. As well as setting up a fund to support sustainable development and conservation projects in the region, the company has given itself until 2025 to implement a system for monitoring the supply of livestock to the ranches that directly supply it in the Amazon.⁵⁶ This new supply chain commitment – which in real terms represents a step backward from the 2009 commitments – has numerous failings, chief among them:

- **Failure to explicitly extend the whole of the supply chain policy, including 'zero tolerance for deforestation', beyond the Amazon**
- **Failure to explicitly exclude as suppliers ranchers that use fire deliberately**



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- **Apparent abandoning of the transparency component of the 2009 agreement, notably to ensure fully transparent monitoring, verification and reporting of the company's entire supply chain by 2011**
- **Failure to explicitly require legal and zero deforestation policy compliance across the operations of ranchers who supply the company as a condition of trade**

JBS's 2020 zero deforestation commitment applies solely to the Amazon, ignoring neighbouring regions such as the Cerrado, said to be the world's most biodiverse savannah⁵⁷ (from which, according to the Trase supply chain transparency platform, JBS sources the majority of the cattle it exports⁵⁸), and the Pantanal – both regions where the cattle industry is also driving ecosystem conversion.⁵⁹ While in climate terms the preservation of the Amazon rainforests is a key objective in South America, as the Intergovernmental Panel on Climate Change's 2019 land use report pointed out, the prevention of widespread land use change across all ecosystems is vital.⁶⁰

The incidence of fires in the Brazilian Amazon in the first nine months of 2020 was the highest in a decade, and more fires than ever before were recorded in the Pantanal over the same period.⁶¹ Still, the new JBS initiative makes no mention at all of excluding from the company's supply chain ranchers who use fire deliberately for land management or clearance, despite the announcement of local and federal bans.⁶²

The 2020 commitment delays supply chain mapping in the Amazon beyond the ranches that directly supply it until 2025, 14 years after the original deadline.⁶³ The proposed monitoring platform⁶⁴ itself will be confidential – ie not publicly available for stakeholder review and scrutiny – which abandons the original commitment to a transparent monitoring system.

While the 2020 Amazon commitment reasserts the company's 'zero tolerance for deforestation', which was at the heart of the original G4 Agreement, the company also asserts that the proposed monitoring platform will 'ensure any cattle from producers involved in illegal deforestation cannot enter the JBS supply chain' (emphasis added).⁶⁵

What is clear is that JBS has not immediately extended its 'zero tolerance' to include clearance of natural ecosystems beyond the Amazon. Brazil's current Forest Code allows the clearance of up to 80% of any

land claim in the Brazilian Pantanal and other biomes outside the Amazon.⁶⁶ Across the country, that means some 88 million ha of native vegetation – more than 3.5 times the size of the UK⁶⁷ – could be cleared legally within existing land claims,⁶⁸ despite the huge climate and biodiversity costs.

JBS also fails to require comprehensive monitoring of the ranchers who supply it across their operations and across biomes. While this was not a requirement of the G4 Agreement either, in the years since that agreement was reached understanding of the adequacy of its approach to due diligence within the commodity trade has evolved. In the palm oil sector, for example, it is widely recognised today that if the sector is to be cleaned up, actors at all stages of the downstream supply chain must exclude any suppliers whose operations – including those of subsidiaries or associates – are illegal or environmentally destructive. This puts the appropriate emphasis on the exclusion of rogue suppliers, not just of tainted supplies.

In the case of Brazil's agricultural commodity sectors, including beef and soya, this should mean monitoring the activities of traders, ranchers and farmers across all their operations (that is, beyond the purchaser's immediate supply chain), not just in the Amazon and not just for deforestation but for other forms of ecosystem destruction, deliberate or illegal use of fire, unresolved land disputes and embargoes, outstanding fines and human rights abuses including the use of slave labour.

Considering the urgency of the global climate and nature emergency, initiatives such as JBS's new Amazon supply chain pledge that are based on self-regulation of voluntary commitments are a decade out of date in delivery and scope. They do not represent a decisive contribution to the radical shake-up of the global food system that science demands and that companies, financial institutions and governments need to deliver.

Food industry corporations that continue to source from JBS and financial institutions that continue to resource it are exposing themselves to financial and reputational risk. Worse, they are contributing indirectly to the existential risks faced by South America's iconic biomes and their inhabitants – and by all the inhabitants of an overheating planet – due in large part to the activities of the industrial meat sector. Governments are also stakeholders with exposure to JBS, and to the impacts of the industrial meat sector more broadly, through sovereign investments, trade and trade deals, and the choices they make regarding market and financial regulation.



WHO NEEDS TO DO WHAT

The steps that food industry, financial institutions and governments take in the immediate future in relation to JBS – and the global meat industry as a whole – will be a decisive test of their priorities. Governments and companies must align the economy with biodiversity and climate protection, along with social justice. They must ensure that private and public finance, trade policy and overseas cooperation do not drive further deforestation, but do support nature restoration and a transition to a green, just and resilient economy. This includes:

CLOSING THE MARKET TO ECOSYSTEM DESTRUCTION:

DROPPING FOREST AND ECOSYSTEM DESTROYERS:

End finance for or trade with groups such as JBS whose direct or indirect suppliers are linked to deforestation and alleged human rights violations – this includes ending trade with subsidiaries such as JBS-owned Pilgrim's Pride, which owns Moy Park and Tulip (recently renamed Pilgrim's Pride Ltd).⁶⁹

DROPPING COMMODITIES LINKED TO FOREST AND ECOSYSTEM DESTRUCTION:

Including through the adoption of a law on forest and ecosystem risk commodities (FERCs) and derived products, to ensure that commodities and products linked to deforestation, ecosystem destruction and abuses of human rights are not placed on the market. The legislation should include measures to cover the financial sector, ensure full supply chain traceability and transparency and rules on due diligence.

ENSURING TRADE POLICY ALIGNS WITH CLIMATE, BIODIVERSITY AND SOCIAL JUSTICE GOALS:

This includes refusing to ratify trade deals such as the EU–Mercosur agreement. Trade agreements of this kind are based on an extractive model that commodifies people and nature and is inherently incompatible with forest protection – governments should instead protect forests and other natural ecosystems by adopting policies to decrease meat production and consumption, and addressing their external forest and ecosystems footprint by means of product and supply chain regulations.

TRANSFORMING THE FOOD SYSTEM:

PHASING OUT INDUSTRIAL MEAT:

Immediately begin the phase-out of all finance for or trade in industrial meat, with the aim of reducing overall meat and dairy production and sales by at least 50% by 2025 and 70% by 2030 in countries with high levels of meat consumption.⁷⁰

MAKING FULL TRANSPARENCY A CONDITION OF TRADE:

Make full transparency of group operations and the supply chain a condition of finance or trade, requiring open and comprehensive monitoring and reporting systems to be in place.

PRIORITISING HUMAN AND ENVIRONMENTAL HEALTH:

Introduce targets, legislation and fiscal measures to decrease production and consumption of meat and dairy products in countries with high levels of consumption and support a fundamental shift towards ecological farming and healthy plant-rich diets in order to reduce pressure on natural ecosystems.

LAND COVER AND PROTECTED AREAS IN THE PANTANAL

CUIABÁ

BRAZIL

State of Guira Park Pantanal Matogrossense National Park

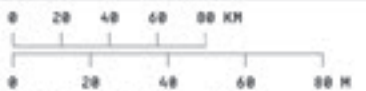
Encontro das Águas State Park Baía dos Guató (Indigenous land)

Kadiwéu (Indigenous land)

CAMPO GRANDE

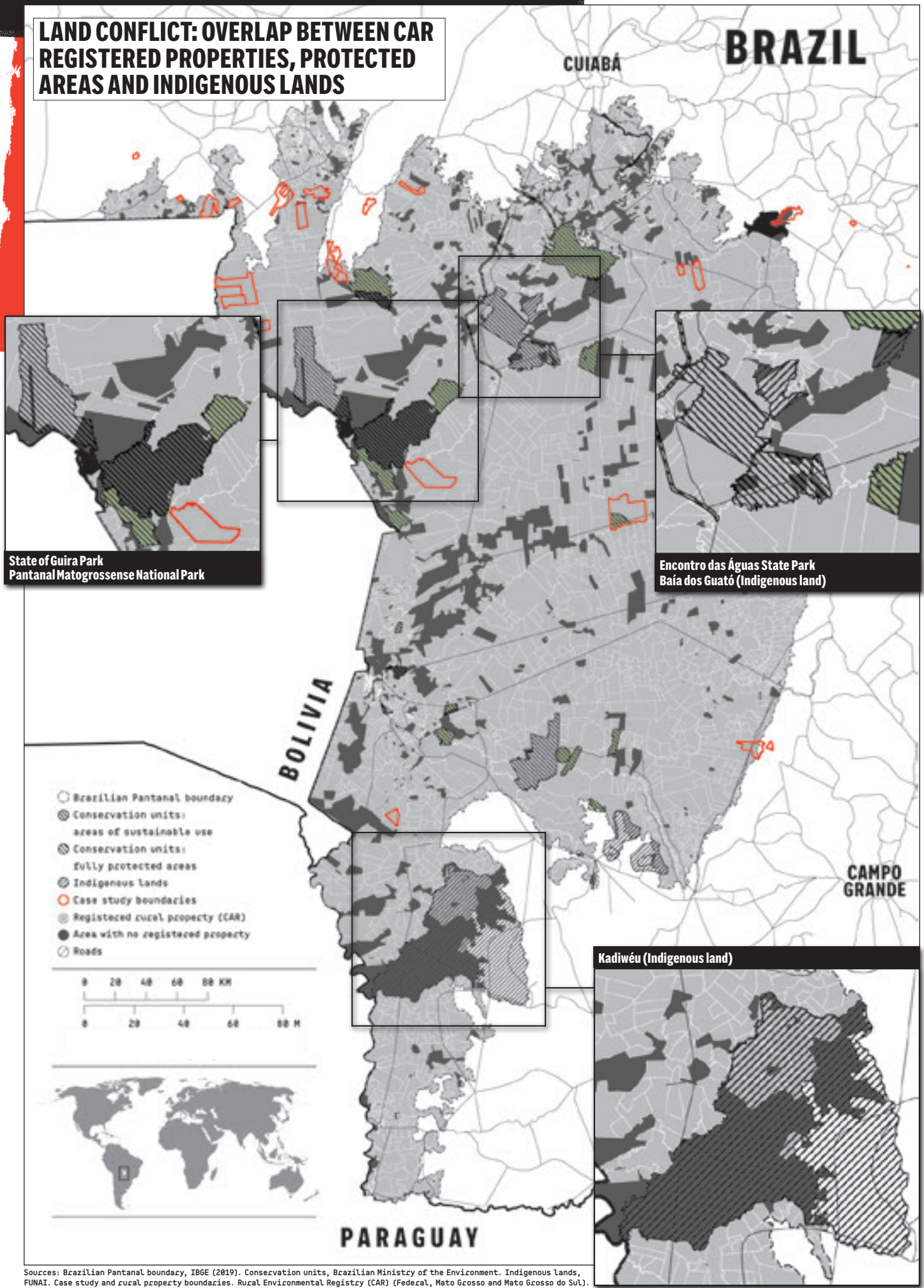
PARAGUAY

- Brazilian Pantanal boundary
- Conservation units: areas of sustainable use
- Conservation units: fully protected areas
- Indigenous lands
- Case study boundaries
- Meat processing facilities
- Grain silos and soya crushing facilities
- Forest
- Grassland
- Wetland
- Pasture
- Water
- Roads



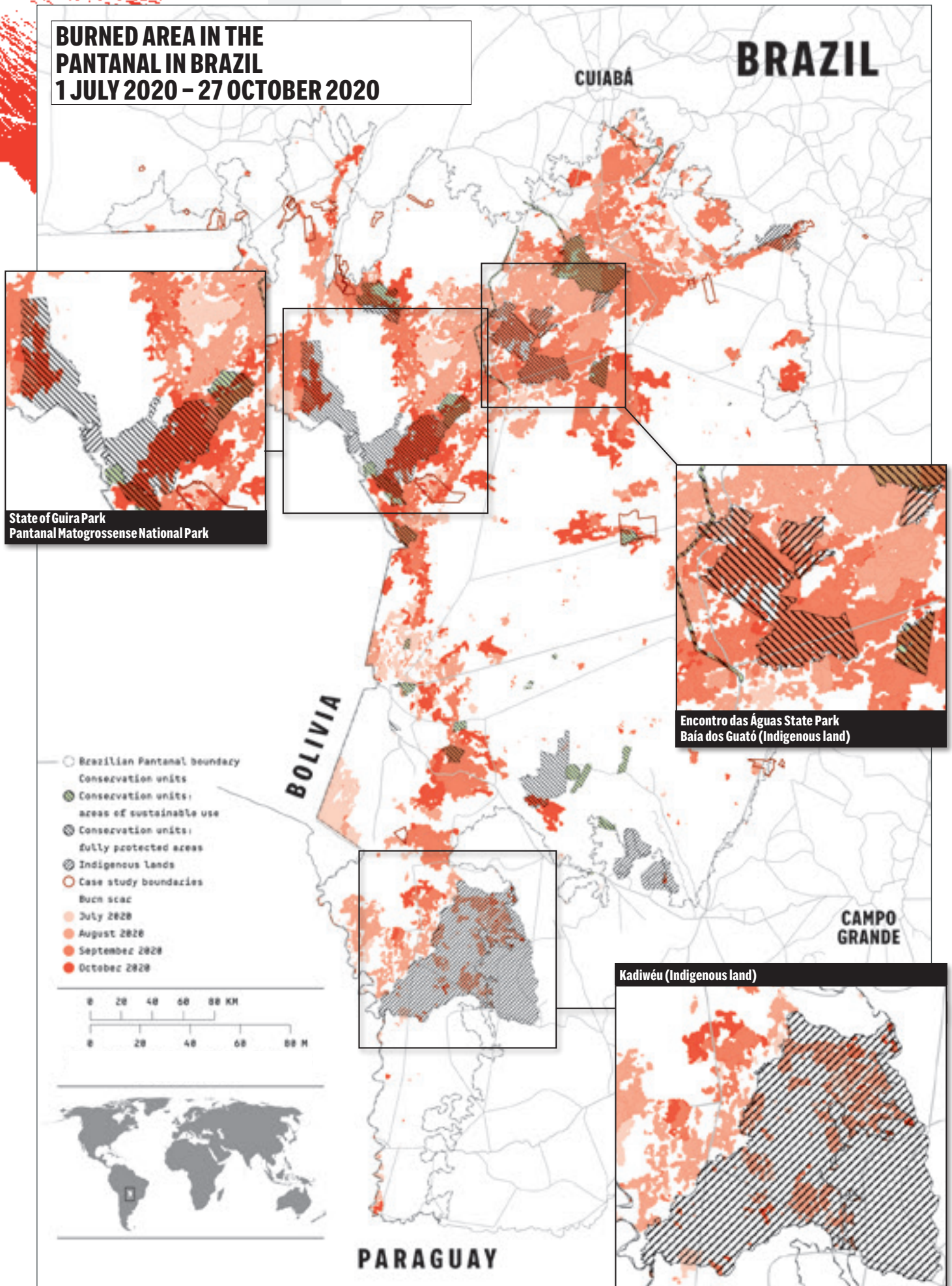
Source: Brazilian Pantanal boundary, IBGE (2019). Land cover, MapBiomas. Conservation units, Brazilian Ministry of the Environment. Indigenous lands, FUNAI. Case study boundaries, Rural Environmental Registry (CAR) (Fedezcal, Mato Grosso and Mato Grosso do Sul). Meat and grain processing infrastructure, The Ministry of Agriculture.

LAND CONFLICT: OVERLAP BETWEEN CAR REGISTERED PROPERTIES, PROTECTED AREAS AND INDIGENOUS LANDS



Sources: Brazilian Pantanal boundary, IBGE (2019). Conservation units, Brazilian Ministry of the Environment. Indigenous Lands, FUNAI. Case study and rural property boundaries. Rural Environmental Registry (CAR) (Federal, Mato Grosso and Mato Grosso do Sul).

**BURNED AREA IN THE PANTANAL IN BRAZIL
1 JULY 2020 – 27 OCTOBER 2020**



Sources: Brazilian Pantanal boundary, IBGE (2019). Conservation units, Brazilian Ministry of the Environment. Indigenous lands, FUNAI. Case study boundaries, Rural Environmental Registry (CAR) (Fedecat, Mato Grosso and Mato Grosso do Sul). Fire hotspot and burn scar, INPE (MODIS Aqua), LASA.

REFERENCES



- ABIEC (2020) 'Beef exports should conclude 2020 with new records in volume and turnover' 22 December 2020 <http://abiec.com.br/en/beef-exports-should-conclude-2020-with-new-records-in-volume-and-turnover/>
- Alexandratos N & Bruinsma J (2012) 'World agriculture towards 2030/2050: The 2012 revision' ESA Working Paper No 12-03, Food and Agriculture Organization of the United Nations <http://www.fao.org/3/a-ap106e.pdf>
- Alho CJR, Camargo G & Fischer E (2011) 'Terrestrial and aquatic mammals of the Pantanal' Brazilian Journal of Biology 71(1): 297-310 <https://doi.org/10.1590/S1519-69842011000200009>
- Alves G (2020) 'Selos de inspeção no Brasil' 24 June 2020 S26 <https://s2gestao.com.br/selos-de-inspecao-no-brasil/>
- Amigo I (2020) 'When will the Amazon hit a tipping point?' 25 February 2020 Nature <https://www.nature.com/articles/d41586-020-00508-4>
- Amnesty International (2020) 'From forest to farmland: Cattle illegally grazed in Brazil's Amazon found in JBS's supply chain' <https://www.amnesty.org/en/documents/AMR19/2657/2020/en/>
- Angeles M (2020) 'Brazil's updated climate plan seen lacking credibility as forests shrink' 10 December 2020 Reuters <https://www.reuters.com/article/brazil-climate-change/brazils-updated-climate-plan-seen-lacking-credibility-as-forests-shrink-idUSL8N2IQ33M>
- ASCEMA Nacional (2020) 'Chronology of an announced disaster: Actions of the Bolsonaro Government to dismantle environmental policies in Brazil' http://www.ascemanacional.org.br/wp-content/uploads/2020/09/Dossie_Meio-Ambiente_Governo-Bolsonaro_Ingle%CC%82s_04-set-2020-1.pdf
- Askew K (2020) 'Is Nestlé and McDonald's climate ambition "undetermined" by "plodding" meat and dairy suppliers?' 12 November 2020 Food Navigator <https://www.foodnavigator.com/Article/2020/11/12/Is-Nestle-and-McDonald-s-climate-ambition-undetermined-by-plodding-meat-and-dairy-suppliers>
- Banks V (1991) The Pantanal: Brazil's forgotten wilderness (San Francisco: Sierra Club Books)
- Bao F et al (2017) 'Plant species diversity in a Neotropical wetland: patterns of similarity, effects of distance, and altitude' Anais da Academia Brasileira de Ciências 90(1): 85-97 <https://doi.org/10.1590/0001-3765201720150370>
- Basso G (2020) 'Em um ano, governo Bolsonaro corta verba para brigadistas em 58%' 12 September 2020 Deutsch Welle <https://www.dw.com/pt-br/em-um-ano-governo-bolsonaro-corta-verba-para-brigadistas-em-58/a-54895957>
- Batista F & Gilbert J (2020) 'Not just the Amazon rain forest, other one-of-a-kind ecosystems are burning down too' 29 August 2020 ThePrint <https://theprint.in/world/not-just-the-amazon-rain-forest-other-one-of-a-kind-ecosystems-are-burning-down-too/491571/>
- Bautzer T, Alves A & Mandl C (2020) 'Brazil meatpacker JBS plans U.S. listing as BNDES sells stake - sources' 5 March 2020 Reuters <https://fr.reuters.com/article/us-jbs-newsissues-bndes-idUKKBN20S2A8>
- BBC (2013) 'Pantanal: Liquid heart of South America' <https://www.bbc.com/future/article/20130312-liquid-heart-of-south-america>
- BDO RCS Auditores Independentes (2020) 'MINERVA S.A.: Third-party audit report to meet "undertaking to adopt minimum criteria for industrial-scale operations with cattle and beef products in the Amazon Biome"' https://minervafoods.com/files/relatorio_publico_greenpeace_minerva_vf_ingles.pdf
- Belfast Telegraph (2018) 'Poultry giant reaches milestone of producing six million birds a week' 1 June 2018 <https://www.belfasttelegraph.co.uk/business/agri/poultry-giant-reaches-milestone-of-producing-six-million-birds-a-week-36966310.html>
- Bergier I et al (2018) 'Amazon rainforest modulation of water security in the Pantanal wetland' Science of the Total Environment 619-620: 1116-1125 <https://doi.org/10.1016/j.scitotenv.2017.11.163>
- Boadle A (2020) 'Brazil's Bolsonaro blames indigenous people for Amazon fires in U.N. speech' 23 September 2020 Reuters <https://in.reuters.com/article/un-assembly-brazil/brazils-bolsonaro-blames-indigenous-people-for-amazon-fires-in-u-n-speech-idINKCN26E0AM>
- Braun D & Machado R (2020) 'Apesar de incêndios, governo corta orçamento do Ibama e ICMBio em 2021' 13 September 2020 Folha de S.Paulo <https://www1.folha.uol.com.br/ambiente/2020/09/apesar-de-incendios-governo-corta-orcamento-do-ibama-e-icmbio-em-2021.shtml>
- BRF S.A. (2020) 'Form F-20 - 2019' https://www.sec.gov/Archives/edgar/data/1122491/000129281420001419/brffform20f_2019.htm
- Business Companion (2020) 'Requirements for cattle identification' <https://www.businesscompanion.info/en/quick-guides/animals-and-agriculture/requirements-for-cattle-identification>
- Business Insider India (2020) 'McDonald's eyes to capture KFC's market with the launch of fried chicken in India' 27 August

- 2020 <https://www.businessinsider.in/advertising/brands/news/mcdonalds-eyes-to-capture-kfc-s-market-with-the-launch-of-fried-chicken-in-india/articleshow/77780671.cms>
- CaIma J (2019) 'Everything you need to know about the fires in the Amazon' 28 August 2019 The Verge <https://www.theverge.com/2019/8/28/20836891/amazon-fires-brazil-bolsonaro-rainforest-deforestation-analysis-effects>
- Camargo S (2020) 'Prosecutors target Brazil's environment minister over dismantling of protections' 8 July 2020 Mongabay <https://news.mongabay.com/2020/07/prosecutors-target-brazils-environment-minister-over-dismantling-of-protections/>
- Camargos D & Campos A (2020) 'Fogo no Pantanal mato-grossense começou em fazendas de pecuaristas que fornecem para gigantes do agronegócio' 22 September 2020 Repórter Brasil <https://reporterbrasil.org.br/2020/09/fogo-no-pantanal-mato-grossense-comecou-em-fazendas-de-pecuaristas-que-fornecem-para-gigantes-do-agronegociio/>
- Campos A & Baccos CJ (2020) 'Desmatamento no Cerrado: Controle feito por frigoríficos é pior do que na Amazônia' 10 June 2020 Repórter Brasil <https://reporterbrasil.org.br/2020/06/desmatamento-no-cerrado-controle-feito-por-frigorificos-e-pior-do-que-na-amazonia/>
- CAR website 'Consultar demonstrativo do CAR' <https://www.car.gov.br/#/consultar>
- Carbon Majors Database (2017) 'CDP carbon majors report 2017' <https://www.cdp.net/en/reports/downloads/2327>
- Carvalho D (2020) 'Brazilian government bans fires in the Amazon and Pantanal for 120 days' 17 July 2020 Folha de S.Paulo <https://www1.folha.uol.com.br/internacional/en/scienceandhealth/2020/07/brazilian-government-bans-fires-in-the-amazon-and-pantanal-for-120-days.shtml>
- Casey S & Freitas T (2017) 'JBS sells U.K. food unit to its Pilgrim's Pride subsidiary' 11 September 2017 Bloomberg <https://www.bloomberg.com/news/articles/2017-09-11/pilgrims-pride-is-said-to-near-deal-for-u-k-producer-moy-pack>
- Castro A (2020) 'Fazendeiros são investigados pela PF por destruição de 25 mil hectares do Pantanal de MS' 17 September 2020 Gazeta <https://www.gazetanews.com/fazendeiros-sao-investigados-pela-pf-por-destruicao-de-25-mil-hectares-do-pantanal-de-ms/index.html>
- Chain Reaction Research (2020a) 'JBS, Marfrig, and Minerva: Material financial risk from deforestation in beef supply chains' <https://chainreactionresearch.com/wp-content/uploads/2020/12/JBS-Marfrig-and-Minerva-Material-financial-risk-from-deforestation-in-beef-supply-chains-2.pdf>
- Chain Reaction Research (2020b) 'The chain: Brazilian agribusiness faces mounting risks as fires in the Amazon and Pantanal biomes surge past 2019 levels' 7 October 2020 <https://chainreactionresearch.com/the-chain-brazilian-agribusiness-faces-mounting-risks-as-fires-in-the-amazon-and-pantanal-biomes-surge-past-2019-levels/>
- Chain Reaction Research (2020c) 'The chain: Soy traders in the Brazilian Cerrado under pressure as fires continue to burn in the vicinity of silos' 15 October 2020 <https://chainreactionresearch.com/the-chain-soy-traders-in-the-brazilian-cerrado-under-pressure-as-fires-continue-to-burn-in-the-vicinity-of-silos/>
- CIA World Factbook website 'Country comparisons - area' <https://www.cia.gov/the-world-factbook/field/area/country-comparison>
- Clark MA et al (2020) 'Global food system emissions could preclude achieving the 1.5° and 2°C climate change targets' Science 370(6517): 705-708 <https://science.sciencemag.org/content/370/6517/705>
- Companhia de Investimentos do Centro Oeste (2020) 'Requerimento para a construção, exploração e ampliação de instala portuária' 28 July 2020 http://portal.antaq.gov.br/wp-content/uploads/2020/08/Anexo_A_Requerimento_TUP_Terminal_Portuario_Paratuada.pdf
- Couto EG & de Oliveira VA (2010) 'The soil diversity of the Pantanal' in Junk W et al (eds) The Pantanal: Ecology, biodiversity and sustainable management of a large neotropical seasonal wetland, 71-102 (Soňa, Bulgaria: Pensoft) https://www.researchgate.net/publication/236596350_The_Soil_Diversity_of_the_Pantanal
- Critical Ecosystem Partnership Fund (2017) 'Ecosystem profile: Cerrado biodiversity hotspot' revised February 2017 <https://www.cepf.net/sites/default/files/cerrado-ecosystem-profile-en-revised-2017.pdf>
- da Silva JSV & Abdon MM (1998) 'Delimitação do Pantanal Brasileiro e suas sub-regiões' Pesquisa Agropecuária Brasileira 33: 1703-1711 https://www.researchgate.net/publication/47445898_Delimitacao_do_Pantanal_Brasileiro_e_suas_sub-regioes
- de Campos MM et al (2020) 'Predicted impacts of proposed hydroelectric facilities on fish migration routes upstream from the Pantanal wetland (Brazil)' River Research and Applications 36(3): 452-464 <https://doi.org/10.1002/rra.3588>
- Department for Environment, Food & Rural Affairs (2020) 'Due diligence on forest risk commodities' <https://consult.defra.gov.uk/eu/due-diligence-on-forest-risk-commodities/>
- DNV GL (2019) 'Evaluation of the fulfillment to the "Public Livestock Commitment": JBS SA' https://jbs.com.br/wp-content/uploads/2019/11/JBS_Relato%C3%B3rioAuditoriaCompromissoPublico_DNVGL-2019_EN.pdf
- Earthdata website 'FIRMS FAQ' <https://earthdata.nasa.gov/faq/firms-faq>
- EarthSight (2019) 'Bad beef: UK retailers feed illegal deforestation fears as corned beef imports from corruption-hit Brazilian firm peccis' 5 May 2019 <https://www.earthsight.org.uk/news/ldm/brazil-corned-beef-jbs-uk-supermarkets-deforestation-amazon>
- EcoHealth Alliance (2019) 'Infectious disease emergence and economics of altered landscapes - IDEEAL' https://www.ecohealthalliance.org/wp-content/uploads/2019/09/IDEEAL_report_final.pdf
- Ecosystem Alliance (2014) 'The whole Pantanal, not just the half: Soy, waterway and other threats to the integrity of the Pantanal' https://www.bothends.org/Uploaded_files/document/4The_whole_Pantanal_not_just_the_half_Ecosystem_Alli.pdf
- Einhorn C et al (2020) 'The world's largest tropical wetland has become an inferno' 13 October 2020 The New York Times <https://www.nytimes.com/interactive/2020/10/13/climate/pantanal-brazil-fires.html>
- Embrapa website 'Impactos ambientais e socioeconômicos no Pantanal' <https://www.embrapa.br/pantanal/impactos-ambientais-e-socioeconomicos-no-pantanal>
- Embrapa website 'Pecuária do Pantanal' <https://www.embrapa.br/pantanal/pecuaria-do-pantanal>
- Escravo, Nem Pensar! (2020) 'Trabalho escravo e extrativismo: Entenda como a covid-19 pode impactar trabalhadores do setor' 8 April 2020 <http://escravonempensar.org.br/trabalho-escravo-e-extrativismo-entenda-como-a-covid-19-pode-impactar-trabalhadores-do-setor/>
- Esteves B (2019) 'The environment of an obstacle: The declared war and the veiled war between the Bolsonaro government and the forces resisting deforestation' Folha de S.Paulo <https://piaui.folha.uol.com.br/materia/the-environment-as-an-obstacle/>
- Estúdio CBN (2020) 'De 95% a 98% dos incêndios florestais são causados por origem humana' 16 September 2020 <https://cbn.globoradio.globo.com/media/audiod/315729/de-95-98-dos-incendios-florestais-sao-causados-por.htm>
- European Commission (2013) 'The impact of EU consumption on deforestation: Comprehensive analysis of the impact of EU consumption on deforestation' <https://ec.europa.eu/environment/forests/pdf/1.%20Report%20analysis%20of%20impact.pdf>
- European Commission (2016) 'Action document: Conservation, sustainable use and good governance of biodiversity in four vulnerable biomes in the centre of South America' <https://ec.europa.eu/transparency/regexpdoc/rep/3/2016/EN/C-2016-8242-F1-EN-ANNEX-1-PART-1.PDF>
- European Commission (2020) 'Communication from the commission to the european parliament, the council, the european economic and social committee and the committee of the regions - EU biodiversity strategy for 2030' 5 October 2020 <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1590574123338&uri=CELEX:52020DC0380>
- European Commission website 'EU-Mercosur trade agreement' <https://ec.europa.eu/trade/policy/in-focus/eu-mercocor-association-agreement/>
- European Parliament (2020) 'European Parliament resolution of 22 October 2020 with recommendations to the Commission on an EU legal framework to halt and reverse EU-driven global deforestation' 22 October 2020 https://www.europarl.europa.eu/doceo/document/TA-9-2020-0285_EN.html
- Fantástico (2020) 'No Pantanal, imagens mostram caminho do fogo e PF suspeita de ação criminoso em fazendas' 20 September 2020 <https://g1.globo.com/fantastico/noticia/2020/09/20/no-pantanal-imagens-mostram-caminho-do-fogo-e-pf-suspeita-de-acao-criminosa-em-fazendas.ghtml>
- Federal Government of Brazil (2017) 'Rigorous inspection system ensures quality of Brazilian meat' 21 March 2017 <http://www.brazil.gov.br/about-brazil/news/2017/03/rigorous-inspection-system-ensures-quality-of-brazilian-meat>
- Federal Police of Mato Grosso do Sul (2020) 'PF deflagra Operação Matáá contra crimes ambientais decorrentes das queimadas no Pantanal de Mato Grosso do Sul' 14 September 2020 <https://www.gov.br/pf/pt-br/assuntos/noticias/2020/09-Noticias-de-setembro-de-2020/pf-deflagra-operacao-mataa-contra-crimes-ambientais-decorrentes-das-queimadas-no-pantanal-de-mato-grosso-do-sul>
- Feng E (2017) 'McDonald's to double number of China restaurants' 8 August 2017 Financial Times <https://www.ft.com/content/ae5b2e96-7c1c-11e7-9108-eda0bcb928>
- Fernandes A (2020) 'Bolsonaro defende ministra por dizer que "boi é o bombeiro do Pantanal"' 10 October 2020 Correio Braziliense <https://www.correiobraziliense.com.br/politica/2020/10/4881368/bolsonaro-defende-ministra-por-dizer-que-boi-e-o-bombeiro-do-pantanal.html>

- Fischer L (2020) 'COVID-19 and Amazon Fires Choke the Lungs of Brazilians and the Planet' 17 June 2020 Scientific American <https://www.scientificamerican.com/article/covid-19-and-amazon-fires-choke-the-lungs-of-brazilians-and-the-planet/>
- Fregatto E (2018) 'Hambúrgueres de redes fast food são produzidos em frigorífico do Estado' 10 April 2018 Cozreio do Estado <https://cozreiodoestado.com.br/economia/hamburgueres-de-redes-fast-food-sao-produzidos-em-frigorifico-do-325507>
- Fciboi website 'Garantia de origem' <https://www.fciboi.com.br/sustentabilidade/garantia-de-origem>
- FUNAI website 'Terras Indígenas' http://www.funai.gov.br/arquivos/conteudo/cggeo/pdf/terra_indigena.pdf
- Fundación Amigos de la Naturaleza (2020) 'Incendios transfronterizos y dinámica del fuego en el Pantanal' https://ecoa.org.br/wp-content/uploads/2020/08/Reporte_Incendios_Pantanal_07_Ago_2020.pdf
- Gerretsen I (2020) 'Brazil sets "indicative" goal of carbon neutrality by 2060' 9 December 2020 Climate Home News <https://www.climatechangenews.com/2020/12/09/brazil-sets-indicative-goal-carbon-neutrality-2060/>
- Gibbs HK et al (2015) 'Brazil's soy moratorium' Science 347: 377-378 https://www.researchgate.net/publication/271213939_Brazil's_Soy_Moratorium
- Gilbert J (2018) 'Argentine drought is worst in 30 years' 1 March 2018 <https://www.farmprogess.com/weather/argentine-drought-worst-30-years>
- Global Witness (2020) 'Beef, banks and the Brazilian Amazon: How Brazilian beef companies and their international financiers greenwash their links to Amazon deforestation' <https://www.globalwitness.org/en/campaigns/forests/beef-banks-and-brazilian-amazon/>
- GLUE website 'GLUE data policy' <http://www.gibbs-lab.com/glue-data-policy/>
- Godfray HJ et al (2018) 'Meat consumption, health and the environment' Science 361: eaam5324 <https://science.sciencemag.org/content/361/6399/eaam5324>
- Goñi U, Cowie S & Costa W (2020) "'Total destruction': Why fires are tearing across South America" <https://www.theguardian.com/environment/2020/oct/09/a-continent-ablaze-why-fires-are-tearing-across-south-america>
- Gonzalez J (2020a) 'Brazil moves toward transfer of deforestation and fire monitoring to military' 29 September 2020 Mongabay <https://news.mongabay.com/2020/09/brazil-moves-toward-transfer-of-deforestation-fire-monitoring-to-military/>
- Gonzalez J (2020b) 'World's biggest trade deal in trouble over EU anger at Brazil deforestation' 6 July 2020 Mongabay <https://news.mongabay.com/2020/07/worlds-biggest-trade-deal-in-trouble-over-eu-anger-at-brazil-deforestation/>
- Goodman G & Giles C (2020) 'Amazon fires: Are they worse this year than before?' 28 August 2020 BBC <https://www.bbc.com/news/world-latin-america-53893161>
- Google Cloud website 'MapBiomas: Mapping and monitoring the world's most biodiverse country' <https://cloud.google.com/customers/mapbiomas>
- GRAIN & ITAP (2018) 'Emissions impossible: How big meat and dairy are heating up the planet' <https://www.iatp.org/emissions-impossible>, datasheet at https://docs.google.com/spreadsheets/d/1WuCuani0rciW6nRii_0zWPXCG4r7AyABoac5MzCjFQ0/edit#gid=2079315438
- Greenpeace (2009) 'Slaughtering the Amazon' <https://www.greenpeace.org/usa/research/slaughtering-the-amazon/>
- Greenpeace (2019) 'Under fire: How demand for meat and dairy is driving violence against communities in Brazil' <https://www.greenpeace.org/international/publication/27456/report-under-fire/>
- Greenpeace (2020a) 'How JBS is still slaughtering the Amazon' <https://www.greenpeace.org/international/publication/44522/how-jbs-is-still-slaughtering-amazon/>
- Greenpeace (2020b) 'Winging it: How the UK's chicken habit is fueling the climate and nature emergency' <https://www.greenpeace.org.uk/resources/winging-it-chicken-soya-climate-change/>
- Greenpeace European Unit (2020) 'EU-Mercosur: Leaked treaty has no climate protection, undermines democracy' 9 October 2020 <https://www.greenpeace.org/eu-unit/issues/democracy-europe/45133/eu-mercossur-leaked-treaty-has-no-climate-protection-undermines-democracy/>
- GST AutoLeather website 'OEM Undercuts' http://www.gstautoleather.com/company_overview.html accessed 3 December 2020
- Guevara A et al (2020) 'Drivers and projections of vegetation loss in the Pantanal and surrounding ecosystems' Land Use Policy 91: 104388 https://www.researchgate.net/publication/337858246_Drivers_and_projections_of_vegetation_loss_in_the_Pantanal_and_surrounding_ecosystems
- Harris B (2020) 'JBS bets on Amazon initiative to clean up environmental credentials' 4 October 2020 Financial Times <https://www.ft.com/content/030c3444-fe1f-4a57-9bb3-ab07f41fda58>
- Henders S, Persson UM & Kastner T (2015) 'Trading forests: Land use change and carbon emissions embodied in production and exports of forest-risk commodities' Environmental Research Letters 10(12): 125012 <https://iopscience.iop.org/article/10.1088/1748-9326/10/12/125012/pdf>
- Hermanson M (2019) 'Brazilian state declares emergency for wild-fires in the Pantanal biome' 13 September 2019 Brasil de Fato <https://www.brasildefato.com.br/2019/09/13/brazilian-state-declares-emergency-for-wildfires-in-the-pantanal-biome>
- Hiba J (2020) 'Fires ravage Argentina's Paraná River Delta' 24 August 2020 Diálogo Chino <https://dialogochino.net/en/agriculture/36975-fires-ravage-argentinas-parana-river-delta/>
- Holmes H (2020) 'Supermarkets under pressure to drop JBS following Amazon deforestation allegations' 27 July 2020 The Grocer <https://www.thegrocer.co.uk/sourcing/supermarkets-under-pressure-to-drop-jbs-following-amazon-deforestation-allegations/646810.article>
- IBAMA website 'Consulta de autuações ambientais e embargos' <https://servicos.ibama.gov.br/ctf/publico/areasembargadas/ConsultaPublicaAreasEmbargadas.php> accessed 5 November 2020
- IBGE SIDRA website 'Pesquisa da pecuária municipal: Tabela 3939 - Efetivo dos rebanhos, por tipo de rebanho' <https://sidra.ibge.gov.br/tabela/3939> accessed 11 November 2020
- IBGE website 'Biomas' <https://www.ibge.gov.br/geociencias/informacoes-ambientais/15842-biomas.html>
- Inesc (2020) 'Nota técnica: Meio ambiente e o PLOA 2021: Mais uma peça do desmonte da Política Ambiental Brasileira' https://www.inesc.org.br/wp-content/uploads/2020/10/NT_PLOA2021MeioAmbiente_V03.pdf?x44389
- INPE (2018) 'Lançamento da "Base2" de focos de queima de vegetação' <http://queimadas.dgi.inpe.br/queimadas/porta/informacoes/novidades/LanamentodaBase2defocosdequeimadevegetao.pdf>
- INPE Observação da Terra website 'DETER' <http://www.obt.inpe.br/OBT/assuntos/programas/amazonia/deter/deter>
- INPE Observação da Terra website 'PRODES - Amazônia' <http://www.obt.inpe.br/OBT/assuntos/programas/amazonia/prodes/>
- INPE website 'Banco de dados de queimadas' <http://queimadas.dgi.inpe.br/queimadas/bdqueimadas/>
- INPE website 'Banco de dados de queimadas, mapa da área queimada' <http://queimadas.dgi.inpe.br/queimadas/aq1km/>
- INPE website 'Monitoramento dos focos ativos por bioma' http://queimadas.dgi.inpe.br/queimadas/poc-tal-static/estatisticas_estados/
- Inspeção do Trabalho (2020) 'Cadastro de Empregadores que tenham submetido trabalhadores a condições análogas à de escravidão: Atualização periódica de 5/10/2020. Cadastro atualizado em 16/10/2020' https://sit.trabalho.gov.br/porta/images/CADASTRO_DE_EMPREGADORES/CADASTRO_DE_EMPREGADORES.pdf
- Instituto Centro de Vida (2020) 'Characterization of areas impacted by fires in Mato Grosso' 28 August 2020 <https://www.icv.org.br/website/wp-content/uploads/2020/09/characterization-of-areas-impacted-by-fires-in-mato-grosso.pdf>
- Instituto do Meio Ambiente de Mato Grosso do Sul website 'Cadastro Ambiental Rural CAR-MS' <https://www.imasul.ms.gov.br/cadastro-ambiental-rural-car-ms/>
- Instituto SOS Pantanal, WWF-Brasil & Embrapa Pantanal (2013) 'Monitoramento das alterações da cobertura vegetal e uso do Solo na Bacia do Alto Paraguai - Porção Brasileira - Período de Análise: 2010 a 2012' http://d3nehc6yl9qz04.cloudfront.net/downloads/monitoramento_bap_2010_2012.pdf
- Instituto SOS Pantanal & WWF-Brasil (2015) 'Monitoramento das alterações da cobertura vegetal e uso do Solo na Bacia do Alto Paraguai - Porção Brasileira - Período de Análise: 2012 a 2014' https://wwfbr.awsassets.panda.org/downloads/publicacao_bap_relatorio_2012_2014_web.pdf
- Ionova A (2020) 'Fires in the Pantanal: "We are facing a scenario now that is catastrophic"' 6 August 2020 Mongabay <https://news.mongabay.com/2020/08/fires-in-the-pantanal-we-are-facing-a-scenario-now-that-is-catastrophic/>
- IPAM Amazônia (2020) 'About 17.5% of Brazil has burned at least once in the last 20 years' 4 December 2020 <https://ipam.org.br/17-5-of-brazil-has-burned-at-least-once-in-the-last-20-years/>
- IPBES (2018) 'The IPBES regional assessment report on biodiversity and ecosystem services for the Americas' https://ipbes.net/sites/default/files/2018_americas_full_report_book_v5_pages_0.pdf
- IPBES (2020) 'Media release: IPBES #PandemicReport: Escaping the "era of pandemics"' 29 October 2020 <https://ipbes.net/pandemics>
- IPCC (2019) 'IPCC special report on climate change and land' <https://www.ipcc.ch/srcccl/>
- Ivory SJ et al (2019) 'Vegetation, rainfall, and pulsing

- hydrology in the Pantanal, the world's largest tropical wetland' Environmental Research Letters 14(12): 124017 <https://iopscience.iop.org/article/10.1088/1748-9326/ab4ffe>
- JBS (2019) 'JBS Responsible Procurement Policy' <https://jbs.com.br/wp-content/uploads/2019/11/04-09-2019-JBS-Responsible-Procurement-Policy-EN.pdf>
- JBS (2020a) 'Annual and sustainability report 2019' <https://jbs.com.br/wp-content/uploads/2020/05/cas-jbs-2019-eng-final.pdf>
- JBS (2020b) 'JBS 2019 results' 4Q19 earnings release <https://ri.jbs.com.br/en/financial-information/results-center/>
- JBS (2020c) 'Notice to the market: JBS announces "Together for the Amazon" program' 23 September 2020 <http://www2.bmfbovespa.com.br/empresas/consbov/ArquivoComCabecalho.asp?motivo=Protocolo=794831&Funcao=visualizar&site=8>
- JBS (2020d) 'Press release: JBS announces "Together for the Amazon" program' 22 September 2020 https://jbs.com.br/junto-spelaamazonia/wp-content/uploads/2020/09/Release_JBS-anuncias-Together-for-the-Amazon_23-09.docx.pdf
- JBS (2021a) JBS response spreadsheet 14-01-2021 - GPI cases_ENG. PDF covering individual cases, full text available in Annex 2
- JBS (2021b) Letter from Márcio Nappo, Director of Corporate Sustainability - JBS Brazil, 14 January 2021, full text available in Annex 2
- JBS website 'JBS Green Platform' <https://jbs.com.br/junto-spelaamazonia/en/initiatives/jbs-green-platform/>
- JBS website 'Our business' <https://jbs.com.br/en/about/our-business/> accessed 25 November 2020
- JBS website 'Ownership and corporate' <https://ri.jbs.com.br/en/egsinvestors/corporate-governance/ownership-and-corporate/>
- JBS-Friboi, Bertin, Mineerva & Marfrig (2009) 'Minimum criteria for industrial scale cattle operations in the Brazilian Amazon biome' <https://www.greenpeace.org/usa/wp-content/uploads/Legacy/Global/usa/report/2010/1/minimum-criteria-for-i.pdf>
- Jordan L & Athayde AT (2020) 'As deforestation surges, Brazil moves to weaken indigenous and environmental safeguards' 29 April 2020 Greenpeace Unearthed <https://unearthed.greenpeace.org/2020/04/29/coronavirus-amazon-deforestation-bolsonaro-brazil-weakens-indigenous-environmental-safeguards/>
- Jusbrasil website 'Processo nº 0000352-19.2012.8.11.0013' <https://www.jusbrasil.com.br/processos/86975201/processo-n-352-1920128110013-do-tjmt>
- Keddy PA et al (2009) 'Wet and wonderful: The world's largest wetlands are conservation priorities' BioScience 59(1): 39-51 <https://academic.oup.com/bioscience/article/59/1/39/306994>
- Kimbrough L (2020) 'In Bolivia, more than 25% of major fires this year burned in protected areas' 12 October 2020 Mongabay <https://news.mongabay.com/2020/10/in-bolivia-more-than-25-of-major-fires-in-this-year-burned-in-protected-areas/>
- Kehoe L et al (2020) 'Inclusion, transparency, and enforcement: How the EU-Mercosur trade agreement fails the sustainability test' 9 September 2020 One Earth 3(3) <https://doi.org/10.1016/j.oneear.2020.08.013>
- Khaitan R (2017) 'These 5 US fast food chains are showing big appetites for emerging markets' 6 August 2017 Frontera <https://frontera.net/news/global-macro/these-5-us-fast-food-chains-are-showing-big-appetites-for-emerging-markets/>
- Klingler M & Mack P (2020) 'Post-frontier governance up in smoke? Free-for-all frontier imaginations encourage illegal deforestation and appropriation of public lands in the Brazilian Amazon' Journal of Land Use Science 15(2-3): 424-438 <https://www.tandfonline.com/doi/full/10.1080/1747423X.2020.1739765>
- Kohaguza TC (2020) 'Flood and fire affect the soil seed bank of riparian forest in the Pantanal wetland' Rodriguésia 71 <https://doi.org/10.1590/2175-7860202071013>
- Laboratório de Processamento de Imagens e Geoprocessamento (Lapig) website 'Lapig Maps' <https://www.lapig.iesa.ufg.br/lapig/index.php/produtos/dados-geograficos>
- LASA website 'Burned area - Pantanal 2020' <https://lasa.ufrrj.br/news/burned-area-pantanal-2020/>
- Libonati R et al (2020) 'Rescue Brazil's burning Pantanal wetlands' 8 December 2020 Nature <https://www.nature.com/articles/d41586-020-03464-1>
- L6 Inform website 'Size of the geographical area - Extent of the realm measurements in hectares in England' https://lginform.local.gov.uk/reports/lgstandacd?mod-metric=232&mod-areas=E9200001&mod-group=AllRegions_England&mod-type=NamedComparisonGroup
- Lovejoy TE & Nobre C (2019) 'Amazon tipping point: Last chance for action' 20 December 2019 Science Advances <https://advances.sciencemag.org/content/5/12/eaba2949>
- Machado R (2020) 'Salles defends hybrid action against Pantanal fires' 14 October 2020 Folha de S.Paulo <https://www1.folha.uol.com.br/internacional/en/scienceandhealth/2020/10/salles-defends-hybrid-action-against-pantanal-fires.shtml>
- Mano A (2020) 'UPDATE 1-Brazil's JBS resumes U.S. share listing plan after COVID-19 fallout, CEO says' 14 August 2020 Reuters <https://uk.reuters.com/article/jbs-outlook/update-1-brazils-jbs-resumes-u-s-share-listing-plan-after-covid-19-fallout-ceo-says-idUKL1N2FG0L2>
- MapBiomas (2020) 'Pantanal - Appendix' ATBD Collection 5, Version 1 https://mapbiomas-br-site.s3.amazonaws.com/Pantanal_Appendix_-_ATBD_Col5_v1.pdf
- MapBiomas (nd) 'Pantanal: Land use and land cover annual evolution (1985-2019)' <https://mapbiomas-br-site.s3.amazonaws.com/Infograficos/Colectao5/MBI-Infografico-pantanal-5.0-EN.jpg>
- MapBiomas Project 'Collection 5.0 of the annual coverage and land use maps series of Brazil' <https://plataforma.mapbiomas.org/> accessed November 2020
- Maceno JA, Alves LM & Torres RR (2015) 'Regional climate change scenarios in the Brazilian Pantanal watershed' Climate Research 68(2-3): 201-213 https://www.researchgate.net/publication/292707527_Climate_Change_Scenarios_in_the_Pantanal
- Marfrig (2020) 'Financial statements - Management report 4Q19' available at <https://ri.marfrig.com.br/informacoes-financeiras/central-de-resultados/?Lang=en>
- Marfrig (2021a) Annex to letter from Paulo Pianez, Sustainability Director - Marfrig, 14 January 2021, full text available in Annex 2
- Marfrig (2021b) Letter from Paulo Pianez, Sustainability Director - Marfrig, 14 January 2021, full text available in Annex 2
- Marfrig website 'Conheça a origem da nossa carne' <https://rastreadabilidade.marfrig.com.br/Gadolegal/>
- Marfrig website 'Marfrig Verde+' <https://sustentabilidade.marfrig.com.br/#Compromisso>
- Mato Grosso Econômico (2019) 'Marfrig inaugura unidade em Várzea Grande' 2 April 2019 <https://www.matogrossoeconomico.com.br/comercio/marfrig-inaugura-unidade-em-varzea-grande/21355>
- Mega ER (2020) "'Apocalyptic" fires are ravaging the world's largest tropical wetland' 25 September 2020 Nature <https://www.nature.com/articles/d41586-020-02716-4>
- Mello G & Mano A (2019) 'Pilgrim's Pride Closes Tulip acquisition, strengthens position in UK pork market' 15 October 2019 Reuters <https://www.reuters.com/article/us-jbs-ppc-tulip/pilgrims-pride-closes-tulip-acquisition-strengthens-position-in-uk-pork-market-idUSKBN1WU2AS>
- Mendes L (2020) 'Marfrig amplia presença no mercado brasileiro de hambúrguer' 2 June 2020 Valor Econômico <https://valor.globo.com/agronegocios/noticia/2020/06/02/marfrig-amplia-presenca-no-mercado-brasileiro-de-hamburguer.ghtml>
- Miettinen J et al (2015) 'On the extent of fire-induced forest degradation in Mato Grosso, Brazilian Amazon, in 2000, 2005 and 2010' International Journal of Wildland Fire 25(2): 129-136 <https://www.publish.csiro.au/wf/Fulltext/wf15036#R32>
- Mineerva (2019) 'Notice to the market - Swap contract - Marfrig' 24 January 2019 http://ri.mineervafoods.com/mineerva2012/web/mobile/conteudo_mobile.asp?idioma=1&tipo=40419&conta=0&id=256421
- Mineerva (2020) 'Earnings release: 4Q19 and 2019 highlights' http://ri.mineervafoods.com/mineerva2012/web/conteudo_en.asp?tipo=40436&id=0&idioma=1&conta=44&submenu=0&img=0&ano=2019
- Mineerva (2021) Sustainability statement (including an appendix review of Greenpeace evidence) from Ticiano Custodio, Head of Sustainability - Mineerva, 14 January 2014, full text available in Annex 2
- Mineerva website 'Originação Pará' <https://mineervafoods.com/ociginacao-paca/2021/1>
- Mineerva website 'Rastreabilidade' http://ri.mineerva.ind.br/mineerva2012/web/conteudo_pt.asp?conta=28&id=152483&tipo=41008&idioma=0
- Ministério da Agricultura, Pecuária e Abastecimento, SDA, CSR (nd) 'Lista de propriedades aptas à exportação para UE' http://bi.agricultura.gov.br/reports/cwsecvlet?sigbov_cons&propriedades_aptas_rdf&nm_arquivo=propriedades_aptas_rdf&cs_aptas_srf&campo=&usuario=16614&flag=1&invoker=sibov.ap_propriedades_aptas_rep&serial=44429639¶mform=no
- Ministério da Agricultura, Pecuária e Abastecimento, Serviço de Inspeção Federal (nd) 'Relação de estabelecimentos' http://bi.agricultura.gov.br/reports/cwsecvlet?sigcif_cons&restabelecimentos_rdf&id_area=1
- Ministério da Agricultura, Pecuária e Abastecimento, Serviço Florestal Brasileiro (2020) 'Boletim informativo - Edição especial biomas Brasileiros' <http://www.florestal.gov.br/documentos/car/boletim-do-car/4418-revisao-boletim-car-encaminha-07abril2020-1/file>
- Ministério da Agricultura, Pecuária e Abastecimento website 'Consulta de estabelecimento nacional: Dados do estabelecimento nacional' http://extranet.agricultura.gov.br/sigsif_cons/lap_estabec_nacional_cons

- Ministério da Justiça e Segurança Pública/Fundação Nacional do Índio (2020) 'Diário Oficial da União: Instrução Normativa no 9, de 16 de abril de 2020' <https://www.in.gov.br/en/web/dou/-/instrucao-normativa-n-9-de-16-de-abril-de-2020-253343033>
- Ministério do Meio Ambiente (2019) 'Painel Unidades de Conservação Brasileiras' <https://app.powerbi.com/view?c=eyJlcIjoiMjUxMTU0NWtODkYNC00NzNiLWJiNTQ0NGI3NTI2NjliZDkzIiwidCI6IjI1MSNTdHMzMzY3LTZkMzgtNGMxZi1hNGJhLTZmMzZTM2M2M2NTBlNyJ9>
- Ministério do Meio Ambiente website 'Pantanal' <https://www.mma.gov.br/biomas/pantanal.html>
- Ministério Público Federal (2020) 'Monitoring Protocol for Cattle Suppliers in the Amazon_V1' https://www.beefontack.org/public/media/arquivos/1599054238-monitoring_protocol_cattle_suppliers_amazon.pdf
- Ministério Público Federal, Procuradoria da República no Estado de Mato Grosso do Sul (2018) 'Autos n. 0000046-79.2018.403.6000' <http://www.mpf.mp.br/ms/sala-de-imprensa/docs/2018/denuncias-lama-asfaltica/7a-denuncia>
- Ministry of the Environment (2017) 'Brazil's forest reference emission level for reducing emissions from deforestation in the Cerrado biome for results-based payments for REDD+ under the United Nations Framework Convention on Climate Change' https://redd.unfccc.int/files/brazil_frel-cerrado-en-20160106-final.pdf
- Miranda E (2020) 'Delator da Lama Asfáltica é investigado por incêndio cciminoso no Pantanal' 18 September 2020 Correio do Estado <https://correiodoestado.com.br/cidades/delator-da-lama-asfaltica-e-suspeito-de-incendio-no-pantanal/377231>
- Morrison O (2021) 'JBS doubles down on deforestation as Greenpeace denounces "five more years of inaction"' 12 February 2021 Food Navigator <https://www.foodnavigator.com/Article/2021/02/12/JBS-doubles-down-on-deforestation-as-Greenpeace-denounces-five-more-years-of-inaction>
- Moy Park website 'Awards' <https://moypark.com/about/awards>
- Moy Park website 'Moy Park chicken' <https://moypark.com/brands/moy-park-chicken>
- Mulligan J (2017) 'Moy Park sold to Pilgrim's for €1bn by Brazilian owner' 12 September 2017 Independent.ie <https://www.independent.ie/business/irish/moy-park-sold-to-pilgrims-for-1bn-by-brazilian-owner-36122881.html>
- Muniz B, Fonseca B & Ribeiro R (2020) 'Incêndios já tomam quase metade das terras indígenas no Pantanal' 17 September 2020 Agência Pública <https://apublica.org/2020/09/incendios-ja-tomam-quase-metade-das-terras-indigenas-no-pantanal/>
- Nando's website 'FAQs: Our food' <https://www.nandos.co.uk/help/section?id=3362#who-supplies-you-chicken>
- National Provisioner (2019) 'The 2019 top 100 meat & poultry processors' <https://www.provisioneronline.com/2019-top-100-meat-and-poultry-processors>
- Nestlé (2019) 'Supply chain disclosure for meat (upstream supply chain) - Snapshot: December 2018 - Published: February 2019' <https://www.nestle.com/sites/default/files/asset-library/documents/suppliers/nestle-supply-chain-disclosure-meat-upstream.pdf>
- New World Encyclopedia 'Pantanal' <https://www.newworldencyclopedia.org/entry/Pantanal>
- Nobre AD (2014) 'The future climate of Amazonia: Scientific assessment report' sponsored by CCST-INPE, INPA and ARA http://www.ccst.inpe.br/wp-content/uploads/2014/11/The_Future_Climate_of_Amazonia_Report.pdf
- Nobre CA et al (2016) 'Land-use and climate change risks in the Amazon and the need of a novel sustainable development paradigm' PNAS 113 (39) 10759-10768 <https://www.pnas.org/content/113/39/10759>
- Observatório do Clima (2021) "'Passando a boiada": O segundo ano de desmonte ambiental sob Jair Bolsonaro' <https://www.oc.eco.br/wp-content/uploads/2021/01/Passando-a-boiada-1.pdf>
- Panjiva Brazil trade data <https://panjiva.com/data/brazil-trade-data>
- Panjiva website 'Manifest confidentiality - Opt-out' <https://panjiva.com/support/show/manifest-confidentiality--opt-out2>
- Paula RC, Desbiez A & Cavalcanti SMC, eds (2011) 'Plano de Ação para a Conservação da onça-pintada no Brasil: Análise da viabilidade populacional e adequabilidade ambiental' Série Espécies Ameaçadas, ICMBio, Brasília
- Pereira J (2020) 'Greenpeace aponta que 65% das áreas queimadas no Pantanal ficam em MT e diz que fogo pode ter sido provocado para criar novos pastos' 22 September 2020 <https://g1.globo.com/mt/mato-grosso/noticia/2020/09/22/greenpeace-aponta-que-65por-cent-das-areas-queimadas-no-pantanal- ficam-em-mt-e-diz-que-fogo-pode-ter-sido-provocado-para-criar-novos-pastos. ghtml>
- Pfeifer H (2020) 'Scientists fear deforestation, fires and Covid-19 could create a "perfect storm" in the Amazon' 19 June 2020 CNN <https://edition.cnn.com/2020/06/19/americas/amazon-fires-deforestation-rise-covid/index.html>
- Phillips D (2020) 'Brazilian wetlands fires started by humans and worsened by drought' 18 September 2020 The Guardian <https://www.theguardian.com/world/2020/sep/18/brazilian-wetlands-fires-started-by-humans-and-worsened-by-drought>
- Pilgrim's Pride Ltd website 'Our story' <https://www.pilgrimsuk.com/our-story/>
- Piloto Policial (2020) 'IBAMA reduz uso de helicópteros e gera crise no Centro de Operações Aéreas (COAec)' 10 August 2020 <https://www.pilotopolicial.com.br/ibama-reduz-uso-de-helicopteros-e-gera-crise-no-centro-de-operacoes-aereas-coaec/>
- Planet website <https://www.planet.com>
- Plataforma de Gestão Agropecuária website 'Consulta pública de GTA' <http://pga.agricultura.gov.br/sispga/webclient/consultaPublica.jsp>
- Procuradoria da República do Pará (2018) 'Auditorias confirmam e aprimoram avanços no controle da origem da carne no Pará' 9 March 2018 <http://www.mpf.mp.br/para/sala-de-imprensa/noticias-pa/auditorias-confirmam-e-aprimoram-avancos-no-controle-da-origem-da-carne-no-para>
- Rajão R et al (2020) 'The rotten apples of Brazil's agribusiness' Science 369(6501): 246-248 <https://science.sciencemag.org/content/369/6501/246>
- Ramsar Sites Information Service website 'El Pantanal Boliviano' <https://csis.ramsar.org/cis/1089>
- Ramsar Sites Information Service website 'Parque Nacional del Pantanal Matogrosense' <https://csis.ramsar.org/cis/602>
- Ramsar Sites Information Service website 'Private Reserve of Natural Heritage Sesc Pantanal (Reserva Particular do Patrimônio Natural SESC Pantanal)' <https://csis.ramsar.org/cis/1270>
- Ramsar Sites Information Service website 'Taiamã Ecological Station' <https://csis.ramsar.org/cis/2363>
- Receita Federal website 'Emissão de comprovante de inscrição e de situação cadastral' http://servicos.receita.fazenda.gov.br/Servicos/cnpjceva/Cnpjceva_Solicitacao.asp?cnpj=
- Reuters (2020) 'Brazil's Amazon rainforest suffers worst fires in a decade' 1 October 2020 <https://www.theguardian.com/environment/2020/oct/01/brazil-amazon-rainforest-worst-fires-in-decade>
- Reuters (2021) 'Exportações de carne bovina do Brasil batem recorde em 2020; Abrafriego vê alta de 5% para este ano' 8 January 2021 Globo <https://g1.globo.com/economia/agronegocios/noticia/2021/01/08/exportacoes-de-carne-bovina-do-brasil-batem-recorde-em-2020-abrafriego-ve-alta-de-5percent-para-este-ano.ghtml>
- Ribeiro Jr A (2020) 'PF já tem provas para indiciar fazendeiros de MS por queimadas no Pantanal' 25 September 2020 UOL <https://noticias.uol.com.br/colunas/amaury-ribeiro-jr/2020/09/25/pf-ja-tem-provas-para-indiciar-fazendeiros-por-queimadas-no-pantanal.htm>
- Ribeiro E (2020) 'Perícia constata que incêndio em reserva no Pantanal foi provocado por ação humana' 4 September 2020 Governo de Mato Grosso <http://www.mt.gov.br/-/15327756-pericia-constata-que-incendio-em-reserva-no-pantanal-foi-provocado-por-acao-humana>
- Right2INFO.org (2012) 'Access to public information in Brazil: What will change with Law No. 12.527/2011?' 16 May 2012 <https://www.right2info.org/recent/access-to-public-information-in-brazil-what-will-change-with-law-no.-12.527-2011>
- Rocha J (2014) 'Drought bites as Amazon's "flying rivers" dry up' 15 September 2014 The Guardian <https://www.theguardian.com/environment/2014/sep/15/drought-bites-as-amazons-flying-rivers-dry-up>
- Samoza R (2020) 'Brazil's JBS vows to monitor deforestation through whole cattle supply chain' 23 September 2020 Reuters <https://www.reuters.com/article/us-jbs-amazon-idUSKCN26E20I>
- Savacese M (2020) 'AP finds Brazil's plan to protect Amazon has opposite effect' 28 August 2020 AP News <https://apnews.com/article/ap-top-news-international-news-latin-america-caribbean-0ed3562a94f5b20b561adbbd1b20731>
- Sax S & Angelo M (2020) 'Soy made the Cerrado a breadbasket; climate change may end that' 5 May 2020 Mongabay <https://news.mongabay.com/2020/05/soy-made-the-cerrado-a-breadbasket-climate-change-may-end-that/>
- Schandert S (2020) 'Cáceres port on Parana Paraguay waterway will reopen in 2020' 8 January 2020 DatamaNews <https://www.datamaneews.com/noticias/caceres-port-on-parana-paraguay-waterway-will-reopen-in-2020/>
- Schezer-Neto P, Guedes NMR & Toledo MCB (2019) 'Long-term monitoring of a hyacinth macaw *Anodorhynchus hyacinthinus* (Psittacidae) roost in the Pantanal, Brazil' Endangered Species Research 39: 25-34 <https://www.int-ces.com/articles/esr2019/39/n039p025.pdf>
- Secretaria de Estado de Fazenda de Mato Grosso do Sul website 'Consulta Pública do Cadastro Fiscal e Emissão do Comprovante de Inscrição Estadual' <https://cpe.sefaz.ms.gov.br/>
- Secretário de Estado de Meio Ambiente de Mato Grosso website 'SEMA - Navegador Geográfico Unificado' <https://monitoramento.sema.mt.gov.br/geocloud/app/webmap.html?key=1530888842000>

Secretário de Estado de Meio Ambiente de Mato Grosso website 'SIMCAR portal público' <https://monitoramento.sema.mt.gov.br/simcar/tecnico.app/publico/cac>

Secretaria Estadual de Meio Ambiente, Desenvolvimento Econômico, Produção e Agricultura Familiar (SEMAFRO) Portal de Informações e Geoposicionamento de Mato Grosso do Sul (PIN MS) website 'Mapa consulta SICAR' <https://www.pinms.ms.gov.br/portal/home/webmap/viewer.c.html?webmap=3b0c2ba8c1a34c46ba6167d35d2c14ce>

Seidl AF, de Silva JSV & Moraes AS (2001) 'Cattle ranching and deforestation in the Brazilian Pantanal' *Ecological Economics* 36(3): 413-425 https://www.researchgate.net/publication/222561831_Cattle_ranching_and_deforestation_in_the_Brazilian_Pantanal

Sentinel Hub EO Browser website <https://apps.sentinel-hub.com/eo-browser/>

Shaldercs A (2020) 'Queimadas no Pantanal: muitas do Ibama despencam apesar de recorde de incêndios' 15 September 2020 BBC <https://www.bbc.com/portuguese/brasil-54159499>

Sharma S, IATP & Schlesinger S (2017) 'The rise of big meat: Brazil's extractive industry' https://www.iatp.org/sites/default/files/2017-11/2017_11_30_RiseBigMeat_f.pdf

Soares I (2020) "'Tem críticas desproporcionais à Amazônia e ao Pantanal', diz Bolsonaro" 16 September 2020 *Correio Braziliense* <https://www.correio braziliense.com.br/politica/2020/09/16/4875851-tem-criticas-desproporcionais-a-amazonia-e-ao-pantanal-diz-bolsonaro.html>

Soares-Filho B et al (2014) 'Cracking Brazil's Forest Code' *Science* 344(6182): 363-364 https://www.researchgate.net/publication/261882221_Cracking_Brazil's_Forest_Code/link/54ef69100cf2495330e23978/download

Spring J (2018) 'Soy boom devours Brazil's tropical savanna' Reuters special report <https://www.reuters.com/investigates/special-report/brazil-deforestation/>

Spring J (2020a) 'Brazil minister calls for environmental de-regulation while public distracted by COVID' 23 May 2020 Reuters <https://uk.reuters.com/article/us-brazil-politics-environment/brazil-minister-calls-for-environmental-de-regulation-while-public-distracted-by-covid-idUKKBN22Y30Y>

Spring J (2020b) 'Fires in Brazil's Amazon the worst in a decade, data shows' 1 October 2020 Reuters <https://www.reuters.com/article/us-brazil-environment/fires-in-brazils-amazon-the-worst-in-a-decade-data-shows-idUSKBN26M6EA>

Spring J & Eisenhammer S (2019) 'Exclusive: As fires race through Amazon, Brazil's Bolsonaro weakens environment agency' 28 August 2019 Reuters <https://www.reuters.com/article/us-brazil-environment-ibama-exclusive-idUSKCN1V114I>

Statista website 'Area planted with soybean in Brazil from crop year 2010/11 to 2019/20' <https://www.statista.com/statistics/740030/area-planted-soybean-brazil/>

Straits Times (2019) 'KFC not chickening out of expansion plans in China' 7 March 2019 <https://www.straitstimes.com/business/companies-markets/kfc-not-chickening-out-of-expansion-plans-in-china>

Swiss Re (2020) 'Biodiversity and Ecosystem Services: A business case for re/insurance' <https://www.swissre.com/dam/jcr:a7fe3dca-c4d6-403b-961c-9fab1b2f0455/swiss-re-institute-expertise-publication-biodiversity-and-ecosystem-services.pdf>

TerraBrasilis dashboard 'PRODES (deforestation)' <http://terrabrasilis.dpi.inpe.br/app/dashboard/deforestation/biomes/amazon/increments>

Terras Indígenas no Brasil website 'Brasil' <https://terrasindigenas.org.br/pt-br/brasil>

Thielen D et al (2020) 'Quo vadis Pantanal? Expected precipitation extremes and drought dynamics from changing sea surface temperature' *PLoS ONE* 15(1): e0227437 <https://doi.org/10.1371/journal.pone.0227437>

Tognolli C (2019) 'Learn how JBS sucked BNDES to expand its business' JBS: A Brothers Mob <https://abrothersmob.com/learn-how-jbs-sucked-bndes-to-expand-its-business/>

Tomas W et al (2011) 'Mammals in the Pantanal wetland, Brazil' in Junk W et al. (eds) *The Pantanal: Ecology, biodiversity and sustainable management of a large neotropical seasonal wetland*, 563-595 (Sofia, Bulgaria: Pensoft) https://www.researchgate.net/publication/236840786_Mammals_in_the_Pantanal_wetland_Brazil

Tomas W et al (2019) 'Sustainability agenda for the Pantanal wetland: Perspectives on a collaborative interface for science, policy, and decision-making' *Tropical Conservation Science* 12: 1-30 <https://hal.univ-angers.fr/hal-02473423/document>

Trace platform 'Brazil - Beef' https://trase.earth/#ows?tool-LAYOUT=1&countries=27&commodities=46&selectedContextId=6&selectedColumnsIds=0_2-1_10-2_19-3_15 accessed 5 November 2020

Trace website 'Home' <https://www.trace.earth/>

UNDP Green Commodities Programme (2020) 'COVID-19 pandemic adds to drought and pricing concerns in the Paraguayan Chaco' 17 April 2020 <https://www.greencommodities.org/content/gcp/en/home/media-centre/covid-19-pandemic-adds-to-drought-and-pricing-concerns-in-the-pa.html>

UNESCO website 'Pantanal Conservation Area' <https://whc.unesco.org/en/list/999/>

Unilever (2020) 'How we're using technology to help end deforestation' 18 August 2020 <https://www.unilever.com/news/news-and-features/Feature-article/2020/how-wece-using-technology-to-help-end-deforestation.html>

United Nations Climate Change website 'The Paris Agreement' <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>

United Nations Environment Programme & International Livestock Research Institute (2020) 'Preventing the next pandemic: Zoonotic diseases and how to break the chain of transmission' <https://wedocs.unep.org/bitstream/handle/20.500.11822/32316/ZP.pdf>

Universidade Federal de Minas Gerais (2020) 'Revealing Brazil's rotten agribusinesses' 16 July 2020 *EurekAlert!* https://www.eurekalert.org/pub_releases/2020-07/b-cb071520.php

UOL (2020) 'PF investiga delator de esquema de corrupção por incêndios no Pantanal' 20 September 2020 <https://noticias.uol.com.br/meio-ambiente/ultimas-noticias/cedacao/2020/09/20/pf-investiga-delator-de-esquema-de-corrupcao-por-incendios-no-pantanal.htm>

USGS website 'EarthExplorer' <https://earthexplorer.usgs.gov>

Vale P et al (2019) 'The expansion of intensive beef farming to the Brazilian Amazon' *Global Environmental Change* 57: 101922 <https://www.sciencedirect.com/science/article/pii/S0959378018312093#sec0070>

Vannoni CE (2020) 'Por qué el Pantanal sufre los peores incendios de las últimas décadas' 24 September 2020 EFE <https://www.efeverde.com/noticias/por-que-el-pantanal-sufre-los-peores-incendios-de-las-ultimas-decadas/>

Visipecc (nd) 'Frequently asked questions' https://www.visipecc.com/wp-content/uploads/2020/02/Frequently_Asked_Questions.pdf

Visipecc website 'Home' <https://www.visipecc.com/>

Voiland A (2020) 'Fierce fires in Bolivia' 10 October 2020 NASA Earth Observatory <https://earthobservatory.nasa.gov/images/147408/fierce-fires-in-bolivia>

Wasley A & Heal A (2020) "'The pressure's on': HSBC warns meat company JBS over Amazon deforestation' 12 August 2020 The Bureau of Investigative Journalism <https://www.thebureauinvestigates.com/stories/2020-08-12/hsbc-jbs-deforestation-risk>

Wasley A et al (2019) 'JBS: The Brazilian butchers who took over the world' 2 July 2019 The Bureau of Investigative Journalism <https://www.thebureauinvestigates.com/stories/2019-07-02/jbs-brazilian-butchers-took-over-the-world>

WCS Brazil website 'Jaguar status' <https://brasil.wcs.org/en-us/wildlife/jaguars/threats.aspx>

Webb J (nd) 'Bleeding the Aying river dry: Deforestation, climate change and drought in the Amazon' Health on the Frontlines blog series, Amazon Frontlines <https://www.amazonfrontlines.org/chronicles/bleeding-river/>

Wenzel F (2019) 'JBS reduz transparência sobre fazendas de pecuária' 6 October 2019 *o(eco)* <https://www.oeco.org.br/reporg-agens/jbs-reduz-transparencia-sobre-fazendas-de-pecuaria/>

World Health Organization website 'Zoonoses' <https://www.who.int/topics/zoonoses/en/>

World Land Trust (2020) 'Fire reaches the home of jaguar, otter and macaw in Paraguay' 6 August 2020 <https://www.worldlandtrust.org/news/2020/08/fire-reaches-the-home-of-jaguar-otter-and-macaw-in-paraguay/>

WWF-Brazil (2016) 'Brazil's new Forest Code: A guide for decision-makers in supply chains and governments' http://assets.wwf.org.uk/downloads/wwf_brazils_new_forest_code_guide_1.pdf

ENDNOTES

- 1 Morrison O (2021)
- 2 Clack MA et al (2020)
- 3 Fundación Amigos de la Naturaleza (2020) p7, Hermanson M (2019), Mega ER (2020)
- 4 Banks V (1991)
- 5 As of 27 October 2020 (the period covered by the analysis in this report), 28% of the biome had been consumed by fire; by 22 November 2020, 30% - 4.49 million ha - had burned. Source: LASA website 'Burned area - Pantanal 2020'.
- 6 Estúdio CBN (2020), Vannoni CE (2020)
- 7 Estúdio CBN (2020), Fantástico (2020)
- 8 See Carvalho D (2020), Instituto Centro de Vida (2020) p1 and Ionova A (2020).
- 9 WCS Brazil website 'Jaguar status', citing Paula RC, Desbiez A & Cavalcanti SMC, eds (2011)
- 10 See eg Alho CJR, Camargo G & Fischer E (2011), IPBES (2018) pp223-225 and Tomas W et al (2011).
- 11 Based on data from Ministério da Agricultura, Pecuária e Abastecimento, Serviço Florestal Brasileiro (2020) p44. See below in text.
- 12 Greenpeace Brazil mapping analysis of CAR data shows rural properties cover 124,401 ha of the approximately 443,050 ha within recognised Indigenous lands in the Brazilian Pantanal - two territories are entirely covered.
- 13 Rural properties cover 256,398 ha of the 446,081 ha in public conservation units - principally one national and three state parks - within the Brazilian Pantanal, with two of the three state parks 80% covered and one almost entirely covered (source: Greenpeace Brazil mapping analysis of CAR data). This figure excludes private reserves, which generally fall entirely within registered rural properties.
- 14 Seidl AF, de Silva JSV & Moraes AS (2001)
- 15 In this report, mentions of 'Greenpeace' should be read as references to Greenpeace International unless otherwise indicated.
- 16 2018-2019 supply chain links between ranchers and meat processing facilities and other analyses were established through Greenpeace investigations, based on the integration of a number of sources of public data and information including:
Land cover and land cover change
The locations of fire hotspots and burned areas (burn scar)
The location and boundaries of the Pantanal biome, Indigenous lands, conservation units and other public lands
The locations, boundaries, ownership and CAR registration status of cattle ranches
Environmental sanctions linked to ranches and their owners
Meat processor traceability websites
Trade from processing facilities to the global market and/or consumer goods and fast food companies.
Documentation is held by Greenpeace. The sources used for each of these types of data and information are listed in the references section at the end of the report.
Greenpeace provided the meat processors named in this report with the opportunity to comment prior to publication on the historic trade links it had established between ranchers with operations in the Pantanal and specific slaughterhouses, as well as any legal/policy irregularities (eg embargoes, irregular CAR status) it had identified in those ranchers' operations. The comments have been reflected at all relevant points. The full text of the replies received from each of the meat processors in response to Greenpeace's opportunity to comment letters can be found in Annex 2.
- 17 The total area of Singapore is 71,900 ha (CIA World Factbook website 'Country comparisons - area'). The Greater London area covers approximately 159,500 ha (L6 Inform website 'Size of the geographical area - Extent of the realm measurements in hectares in England').
- 18 Sources include Greenpeace Brazil field investigations conducted in October 2020 and February 2021, Nestlé (2019) p5 and Panjiva Brazil trade data <https://panjiva.com/data/brazil-trade-data>; see also Fregatto E (2018) and JBS (2020a) p129.
- 19 Panjiva Brazil trade data <https://panjiva.com/data/brazil-trade-data>
- 20 JBS (2020b) p14, Marfrig (2020) p8 and Mineerva (2020) p1. See also Chain Reaction Research (2020a) pp2-4.
- 21 Reuters (2021); the reported results were in line with end-of-year projections from the Brazilian Beef Exporters Association (ABIEC (2020)).
- 22 Net revenue from Marfrig's North American operations totalled R\$35.1 billion in 2019; revenue from the company's South American operations totalled R\$14.8 billion. See Marfrig (2020) pp6,8.
- 23 JBS (2020e) p2
- 24 JBS (2020a) pp16,20-21
- 25 JBS's Friboi brand supplies big names including Bob's, Burger King, McDonald's, and Pão de Açúcar (JBS (2020a) p129). Its Seara subsidiary has global accounts with Burger King, KFC, McDonald's and Subway, among others, and holds certifications for customers including Costco, Mars, M&S, Nestlé, Walmart and YUM (JBS (2020a) pp196-198). JBS reportedly also supplies corned beef products to UK and European supermarkets including Asda, Carrefour, Lidl, and Sainsbury's (see Earthsight (2019) and Holmes H (2020)). British subsidiary Moy Park (which JBS sold to another of its subsidiaries, Pilgrim's Pride, in 2017; see Casey S & Freitas T (2017)) supplies Nando's and several supermarkets, including Tesco Ireland and Lidl; see Nando's website 'FAQs: Our food', Moy Park website 'Moy Park chicken' and Moy Park website 'Awards'. Moy Park reportedly also supplies several other fast food chains, including KFC and Pizza Hut, and supermarkets such as Marks & Spencer and Sainsbury's; see eg Belfast Telegraph (2018) and Mulligan J (2017).
- 26 Greenpeace (2009)
- 27 The G4 Agreement's signatories pledged to exclude from their supply chains any 'rural property which directly supplies cattle for slaughtering (fattening farms) and is engaged in deforestation in the Amazon biome' within six months of signing the commitment. This condition was to be extended to all supplies, including third-party suppliers and supplies from rearing and nursery farms, within two years. See JBS-Friboi, Bertin, Mineerva & Marfrig (2009) p1.
- 28 These ranchers and the companies they supplied were:
Adevaire de Oliveira - JBS / Marfrig / Mineerva
Ário Barnabé Neto - JBS
Celso Miura - JBS
Daniel Martins Filho - JBS / Marfrig
Eduardo Mariani Bittencourt - JBS / Marfrig / Mineerva
Eliana Maria Lemos Monteiro Conceição - JBS
Fabio de Oliveira Luchesi - Mineerva
Francisca Evangelista Teodoro da Silva - JBS / Marfrig / Mineerva
João Felix Pereira Neto - JBS / Marfrig
Jose Dalbem - JBS / Marfrig / Mineerva
Luiz Carlos Ziliani - JBS / Marfrig / Mineerva
Raul Amaral Campos - JBS / Marfrig / Mineerva
Sergio Jacinto Costa - JBS
- 29 Greenpeace identified 37 supply chain links between the case study properties and the big three meat processors, plus a further three rancher-level links not involving the case study properties. Of these 37 links, 23 were indirect. Of those 23, 17 of the links were through ranches owned by the same individual.
- 30 Based on responses to Greenpeace's opportunity to comment letters; see Annex 2.
Marfrig did not indicate current compliance. Also, JBS failed to comment on the current status of ranches linked to Celso Miura, Francisca Evangelista Teodoro da Silva or João Felix Pereira Neto, who were identified by Greenpeace as tier-one suppliers during the period studied.
The following ranchers all had at least one property that was described as either 'compliant with [JBS's] Responsible Procurement Policy', 'able to commercialize raw materials with [JBS]' or 'listed in Mineerva's database and ... eligible for commercialization':
Adevaire de Oliveira - JBS / Mineerva
Ário Barnabé Neto - JBS
Daniel Martins Filho - JBS
Eduardo Mariani Bittencourt - Mineerva
Eliana Maria Lemos Monteiro Conceição - JBS
Fabio de Oliveira Luchesi - Mineerva
Francisca Evangelista Teodoro da Silva - Mineerva
Jose Dalbem - JBS / Mineerva
Luiz Carlos Ziliani - JBS
Raul Amaral Campos - Mineerva
Sergio Jacinto Costa - JBS
- 31 Based on responses to Greenpeace's opportunity to

- comment letters; see Annex 2. The current approved suppliers that appear to violate JBS's policy are:
- Adevair de Oliveira / Fazenda Boa Sorte
- Luiz Carlos Ziliani / Fazenda Santa Tereza
- Samoel Alexandroni Santos / Fazenda Sete de Setembro (Santos is an intermediary rancher identified in one of the case studies; this ranch's property registration is currently suspended)
- The historic trading relationship that appears to have been in violation of JBS's policy at the time was with Raul Amaral Campos / Fazenda Esperança. JBS failed to confirm the current status of this ranch as a supplier.
- Minerva drew different conclusions on the compliance of two of these suppliers (Luiz Carlos Ziliani / Fazenda Santa Tereza and Raul Amaral Campos / Fazenda Esperança).
- 32 The historic trading relationship that appears to have been in violation of Marfrig's policy was with João Felix Pereira Neto / Fazenda Pederneiras Novas.
- 33 Morrison O (2021)
- 34 JBS (2019)
- 35 See 'High-risk regimes - how the Bolsonaro government has fanned the flames'. See also eg Observatório do Clima (2021).
- 36 Marfrig's latest zero deforestation commitment extends to the Cerrado, but not the Pantanal. See Marfrig website 'Marfrig Verde+'.
- 37 Ranchers (including intermediary ranchers) with identified environmental violations and/or property registration irregularities on one or more of their ranches during the 2018-2019 trade period assessed for this investigation include:
- Adevair de Oliveira (note, the CAR status of Fazenda Recreio is just one of the multiple issues associated with this rancher's operations; it was recategorised as active as of 9 November 2020 but prior to that had been listed as pending since 4 August 2018)
- Ário Barnabe Neto
- Daniel Martins Filho (note, Filho received a US\$930,000 fine from IBAMA for the illegal construction of levees along the river boundary of Fazenda Santa Cecília II)
- Fabio de Oliveira Luchesi (the CAR status of Fazenda Santa Helena I was recategorised as active only as of 17 November 2020; prior to that it was listed as pending)
- Ivanildo da Cunha Miranda
- João Felix Pereira Neto
- Jose Dalbem
- Luiz Carlos Ziliani
- Raul Amaral Campos
- 38 See JBS-Friboi, Bertin, Minerva & Marfrig (2009).
- 39 As promised by the European Commission. See European Commission (2020) and European Parliament (2020).
- 40 As proposed by the UK Government. See Department for Environment, Food & Rural Affairs (2020).
- 41 Compared with 2012 levels. Source: Godfray H CJ et al (2018), reporting on Alexandratos N & Bruinsma J (2012).
- 42 See eg Business Insider India (2020), Feng E (2017), Khaitan R (2017) and Straits Times (2019).
- 43 Greenpeace (2020a)
- 44 JBS (2020a) p38
- 45 JBS (2020a) p16
- 46 JBS (2020c) p3
- 47 Between 2002 and 2013, BNDES released a total of R\$12.8 billion (US\$5.9 billion) for companies controlled by J&F Investimentos, according to the NGO Contas Abertas. Source: Tognolli C (2019). See also Wasley et al (2019).
- 48 JBS website 'Ownership and corporate'
- 49 ExxonMobil, Shell and BP were responsible for 577, 508 and 448 MtCO₂e Scope 1+3 GHG emissions in 2015, respectively (source: Carbon Majors Database (2017) p15).
- In 2016, JBS's Scope 1+3 GHG emissions from processing and production of beef, pork and chicken totalled 280 MtCO₂e, with the vast majority being accounted for by beef production. Scope 1 emissions are direct emissions from company-owned facilities, processing plants and machinery. Scope 2 emissions are indirect emissions related to energy consumption. Scope 3 emissions include all other indirect emissions resulting from the production of a commodity, both upstream and downstream (farm emissions from livestock, food production for livestock, land-use change etc). For fossil fuel producers this includes all emissions related to the burning of the products they sell. Source: GRAIN & IATP (2018).
- 50 Soya is the second most significant driver of global deforestation after beef, and about 90% of it is used for animal feed. See European Commission (2013) pp21-22, Henders S, Persson UM & Kastner T (2015) p6 and Sharma S, IATP & Schlesinger S (2017) p25.
- 51 Greenpeace (2009)
- 52 See JBS-Friboi, Bertin, Minerva & Marfrig (2009).
- 53 See reporting in Greenpeace (2009) and Greenpeace (2020a).
- 54 Bautzer T, Alves A & Mandl C (2020), Mano A (2020)
- 55 See eg Harris B (2020), Samora R (2020) and Wasley A & Heal A (2020).
- 56 JBS (2020c) pp3-4 and JBS (2020d)
- 57 Ministry of the Environment (2017) p65
- 58 Trace platform 'Brazil - Beef'
- 59 Critical Ecosystem Partnership Fund (2017) pp147-148, Guerra A et al (2020)
- 60 IPCC (2019), Chapter 4
- 61 According to data from the Brazilian National Institute of Space Research (Instituto Nacional de Pesquisas Espaciais, INPE). See Spring J (2020b).
- 62 A federal moratorium was imposed on the use of burning for agricultural purposes in the Amazon and Pantanal in mid-July, extending for 120 days (see Carvalho D (2020) and Ionova A (2020)). Regional prohibitions on dry-season burning were also put in place in Mato Grosso, from 1 July to 30 September, and Mato Grosso do Sul, extending for 180 days from late July; see Instituto Centro de Vida (2020) p1 and Ionova A (2020).
- 63 The G4 Agreement promised 'zero deforestation in the supply chain'. Its signatories pledged to exclude from their supply chains any 'rural property which directly supplies cattle for slaughtering (fattening farms) and is engaged in deforestation in the Amazon biome' within six months of signing the commitment. This condition was to be extended to all supplies, including third-party suppliers and supplies from rearing and nursery farms, within two years. See JBS-Friboi, Bertin, Minerva & Marfrig (2009) p1.
- 64 JBS (2020c) pp3-4 and JBS (2020d)
- 65 JBS (2020c) p3
- 66 With the exception of Areas of Permanent Protection (Áreas de Preservação Permanente, APPs) and restrictions on the exploitation of wetlands. APPs are areas that have been identified as critical to essential ecosystem functions, such as preserving hydrological resources or biodiversity, ensuring geological stability, facilitating the movement of fauna and flora and protecting the soil. The remaining 20% is classed as Legal Reserve. In areas classified as pantanal wetlands (pantanaais) or flood plains (planícies pantaneiras) - which covers about 16% of the Brazilian Pantanal - permits for clearance may only be issued for activities deemed 'sustainable and ecological', which includes traditional cattle raising. Per Articles 3, 10 and 12 - the full text of the law is available at http://www.planalto.gov.br/ccivil_03/ato2011-2014/2012/Lei/l12651.htm. See also WWF-Brazil (2016) p18.
- 67 The area of the UK is 24.4 million ha. Source: CIA World Factbook website 'Country comparisons - area'.
- 68 Soares-Filho B et al (2014)
- 69 Casey S & Freitas T (2017), Mello G & Mano A (2019), Pilgrim's Pride Ltd website 'Our story'
- 70 For details on Greenpeace's vision 'for a healthier life and planet', see Greenpeace (2018).
- 71 Libonati R et al (2020)
- 72 Estimates of the size of the Pantanal vary widely, depending on the source cited. It is variously described as covering between 14 million ha (Keddy PA et al (2009) p43) and 22 million ha (Fundación Amigos de la Naturaleza (2020) p4).
- 73 Estimates of the percentages of the Pantanal located in each of these countries similarly vary; the largest portion (70-80% of the biome) is in Brazil and the smallest (5-10%) in Paraguay, with the remainder located in Bolivia. See eg Ecosystem Alliance (2014) p7 and New World Encyclopedia 'Pantanal'.
- 74 Banks V (1991)
- 75 Couto EG & de Oliveira VA (2010) pp72-73
- 76 Bao F et al (2017)
- 77 IPBES (2018) p225
- 78 Scherer-Neto P, Guedes NMR & Toledo MCB (2019)
- 79 Alho CJR, Camargo G & Fischer E (2011)
- 80 WCS Brazil website 'Jaguar status', citing Paula RC, Desbiez A & Cavalcanti SMC, eds (2011)
- 81 Tomas W et al (2011)
- 82 The Parque Nacional del Pantanal Matogrossense (<https://csis.camsac.org/cis/602>), the SESC Pantanal Private Reserve of Natural Heritage (<https://csis.camsac.org/pt/cis/1270>) and the Taiamã Ecological Station (<https://csis.camsac.org/cis/2363>).

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