

Submission to Consultation on Agriculture and Land Plan

This submission is a close look at the environmental and climate harms of grazing industries in Australia. It draws heavily on two reports I co-authored: The Beyond Zero Emissions Land Use Discussion Paper¹ and the Beef.org.au report².

An unemotional evaluation of grazing industries tells us that the environmental and climate harms from these industries are far too great to allow them to continue. A plan to phase out these industries is urgently needed, but could provide profound benefits to the climate and biodiversity, as discussed below. This transition would require a large workforce, it would be a large scale job creation scheme and involve landholders and indigenous people.

Gerard Wedderburn-Bisshop, December 2023

Ruminants and Planetary Boundaries

Cattle and sheep grazing has devastated our country, our fauna and flora, more than any other industry. Grazing has been the leading cause of deforestation, wildlife loss, land degradation, Great Barrier Reef pollution, and has had a severe climate impact. These environmental damages have been estimated to be five times more costly to our country than the revenue produced by these industries³.

Our consumption has pushed planet Earth far beyond sustainability, largely due to food production. Five planetary boundaries have been propelled into and beyond the danger zones, largely from animal agriculture, as indicated by the black dots within the coloured impact zones below⁴. This endangers all life on Earth.

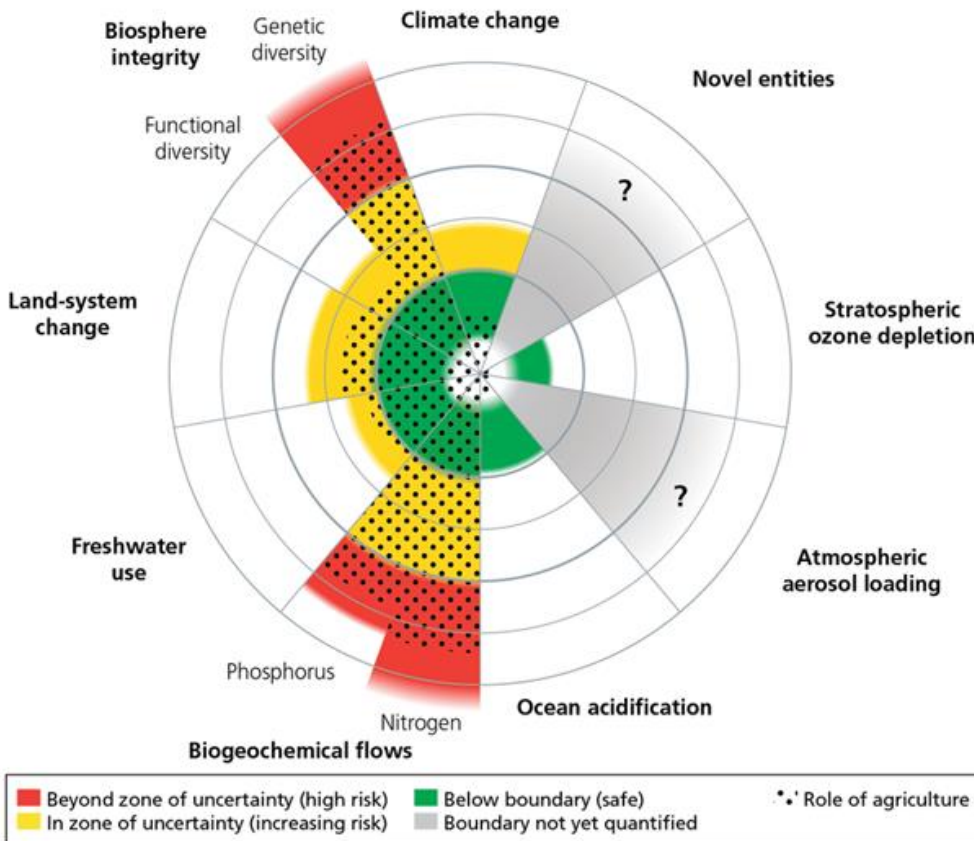
¹ <https://www.bze.org.au/research/report/land-use>

² https://www.beef.org.au/_files/ugd/781fba_c25080d88c8d49dd8a58dd82837954fa.pdf

³ TEEB. *Natural Capital at Risk: The Top 100 Externalities of Business*.

<https://www.trucost.com/publication/natural-capital-risk-top-100-externalities-business/> (2013).

⁴ Campbell, B. *et al.* Agriculture production as a major driver of the Earth system exceeding planetary boundaries. *Ecol. Soc.* **22**, (2017). <http://www.ecologyandsociety.org/vol22/iss4/art8/>



[image source here: <http://www.ecologyandsociety.org/vol22/iss4/art8/figure1.html>]

Futurist think-tank RethinkX sees a future where precision fermentation plant proteins will overtake animal proteins, particularly those from cattle⁵. They predict:

“This is primarily a protein disruption driven by economics. The cost of proteins will be five times cheaper by 2030 and 10 times cheaper by 2035 than existing animal proteins, before ultimately approaching the cost of sugar. They will also be superior in every key attribute – more nutritious, healthier, better tasting, and more convenient, with almost unimaginable variety. This means that, by 2030, modern food products will be higher quality and cost less than half as much to produce as the animal-derived products they replace.

The impact of this disruption on industrial animal farming will be profound. By 2030, the number of cows in the U.S. will have fallen by 50% and the cattle farming industry will be all but bankrupt. All other livestock industries will suffer a similar fate, while the knock-on effects for crop farmers and businesses throughout the value chain will be severe.”

⁵ Tubb, C. & Seba, T. *Rethinking Food and Agriculture 2020-2030 | The Second Domestication of Plants and Animals, the Disruption of the Cow, and the Collapse of Industrial Livestock Farming.* <https://www.rethinkx.com/food-and-agriculture#food-and-agriculture-download> (2019).

The following topics outline the environmental harms that grazing industries are imposing on Australia.

Beef vs Ecosystems

More than half the Australian continent is devoted to grazing⁶, so it's not surprising that production practices impact ecosystems. Deforestation, modification of native vegetation, overgrazing, destruction of waterway corridor vegetation, widespread erosion and soil loss, all for grazing production, along with boom/bust drought cycles all have a heavy impact on native ecosystems.

A 2021 study in *Global Change Biology* by 38 experts identified 19 of 20 Australian ecosystems that are showing evidence of collapse, and will collapse if we don't take urgent action⁷. Overlaying grazing areas reveals grazing production as the single largest land use on two thirds of these ecosystems, and has considerable impact on several more.

To list the more heavily impacted ecosystems, more than 80% of native vegetation has been cleared on brigalow and mallee forests; 70% of open mallee woodlands and half the eucalypt woodlands have been cleared⁸.

Even the 30% of our continent identified as *minimal use* and *protected areas* has been altered by grazing pressure and invasive pasture grasses. In the words of the Pew Charitable Trust report:⁹

“Indeed, in some ways, the impacts of pastoralism on biodiversity and other environmental values are almost pervasive across the Outback landscapes . . .”

So if you were to identify one industry that has the greatest impact on Australia's ecosystems, it would be cattle and sheep grazing.

Beef vs Forests

⁶ ACLUMP. *Land use – ABARES*. <https://www.agriculture.gov.au/abares/aclump/land-use> (2016).

⁷ Bergstrom, D. M. *et al.* Combating ecosystem collapse from the tropics to the Antarctic. *Glob Chang Biol* (2021) doi:10.1111/gcb.15539. <https://onlinelibrary.wiley.com/doi/full/10.1111/gcb.15539>

⁸ Tulloch, A. I. T., Barnes, M. D., Ringma, J., Fuller, R. A. & Watson, J. E. M. Understanding the importance of small patches of habitat for conservation. *Journal of Applied Ecology* **53**, 418–429 (2016). <https://besjournals.onlinelibrary.wiley.com/doi/full/10.1111/1365-2664.12547>

⁹ Woinarski, J. C. Z., Traill, B. & Booth, C. *The Modern Outback*. <https://www.pewtrusts.org/en/research-and-analysis/reports/2014/10/the-modern-outback> (2014).

Deforestation is rampant in Australia. Our country is now ranked as a *global deforestation front* by WWF¹⁰. To make this list, forests must be of global biodiversity significance and to have lost at least 70% of their natural vegetation. Ours is the only developed nation on that list, noting that the most significant driver by far is 'cattle ranching.'¹¹

Queensland deserves special mention here. More than 80% of the land is dedicated to livestock production; the state is home to half the national cattle herd and two-thirds of national deforestation¹². Here, detailed state government reports have documented deforestation since the mid-1980's using satellite data and ground measurements¹³. These records show that over 90% of deforestation across those three decades has been for grazing land, and the Wilderness Society has reported that conservatively, three quarters of recent state deforestation is for beef production¹⁴.

In Queensland alone, more than a hectare of bushland is cleared every two minutes, for beef and sheep production.

Several Queensland governments have attempted to control clearing, but successive policy changes have eroded these controls. The latest government report finds that nearly 400,000 ha (4,000 square kilometres) of woody vegetation was cleared in 2017-18, which is close to the 30 year average from satellite data. This report also identified that most (81%) of the clearing was of non-remnant vegetation, meaning that 81% of had been previously cleared, however this clearing could have taken place up to 30 years before, ample time for the forest and woodland ecosystems to recover, therefore regaining biodiversity value.

Other states are not blameless. Southern states have successfully carried out the majority of their deforestation before records began, but deforestation in New South Wales, Western Australia and now notably the Northern Territory have also recently seen dramatic rises, largely for grazing¹⁵.

¹⁰ Pacheco, P. *et al.* *Deforestation Fronts | Drivers and Responses in a Changing World*. https://wwf.panda.org/discover/our_focus/forests_practice/deforestation_fronts/ (2021).

¹¹ Williams, K. J. *et al.* Forests of East Australia: The 35th Biodiversity Hotspot. in *Biodiversity Hotspots: Distribution and Protection of Conservation Priority Areas* (eds. Zachos, F. E. & Habel, J. C.) 295–310 (Springer, 2011). doi:10.1007/978-3-642-20992-5_16. https://link.springer.com/chapter/10.1007/978-3-642-20992-5_16

¹² Bergstrom, D. M. *et al.* Combating ecosystem collapse from the tropics to the Antarctic. *Global Change Biology* **n/a**, (2021). <https://onlinelibrary.wiley.com/action/downloadSupplement?doi=10.1111%2Fgcb.15539&file=gcb15539-sup-0001-Data.pdf>

¹³ <https://www.qld.gov.au/environment/land/management/mapping/statewide-monitoring/slats/slats-reports>

¹⁴ Panegyres, J. & Fletcher, R. *Drivers of Deforestation and Land Clearing in Queensland*. https://www.wilderness.org.au/images/resources/The_Drivers_of_Deforestation_Land-clearing_Qld_Report.pdf (2019).

¹⁵ <https://www.theguardian.com/environment/2018/mar/05/global-deforestation-hotspot-3m-hectares-of-australian-forest-to-be-lost-in-15-years>

Australian land use is well mapped¹⁶. If we assume that conservation areas have not been cleared; that cropping and built up areas were originally forested; and that forestry areas are kept as forest, *we can identify grazing to be responsible for about 90% of Australian deforestation since colonisation.*

Looking to the future, these high rates of deforestation for beef and sheep production may become a liability for these industries. A 2019 report by the Wilderness Society¹⁷ found that supply chains were coming under greater scrutiny, to ensure that meat products were not linked to deforestation, citing McDonald's, the China Meat Association and the New York Declaration on Forests policies.

Beef vs Wildlife

Clearance of native vegetation is the single greatest threat to terrestrial biodiversity and a significant threat to aquatic and some inshore marine biodiversity¹⁸.

Over 44 million animals were killed in 2015-16 due to deforestation in Queensland alone, according to WWF¹⁹. This includes more than a million mammals (such as koalas, gliders, possums, bandicoots and native rodents), 3.7 million birds and 40 million reptiles (such as goannas, geckos and skinks). Although this report showed an increase in deaths from the previous few years, it was well down on the 100 million native animals killed per year from deforestation in the late 1990's.

Australia has a rich biodiversity, with nearly 8% of all Earth's plant and animal species finding a home on the continent. About 85% of the country's plants, 84% of its mammals and 45% of its birds are found nowhere else.

But now, three quarters of our plants and animals are listed as threatened, with the main threat being habitat destruction. Animals that lose their habitat don't just move home, they die. Biodiversity loss is caused by loss of habitat and fragmentation of habitat. Since grazing industries have been responsible for around 90% of historic deforestation, these industries are clearly culpable.

¹⁶ ACLUMP. *Land use – ABARES*. <https://www.agriculture.gov.au/abares/aclump/land-use> (2016).

¹⁷ Panegyres, J. & Fletcher, R. *Drivers of Deforestation and Land Clearing in Queensland*. https://www.wilderness.org.au/images/resources/The_Drivers_of_Deforestation_Land-clearing_Qld_Report.pdf (2019).

¹⁸ Alexander, N. & Taylor, R. *Australia State of the Environment 1996*. <https://soe.environment.gov.au/sites/default/files/1996-soe.pdf> (1996).

¹⁹ Cogger, H., Dickman, C., Ford, H., Johnson, C. & Taylor, M. *Australian animals lost to bulldozers in Queensland 2013-2015*. (2017). <https://www.wwf.org.au/ArticleDocuments/353/pub-australian-animals-lost-to-bulldozers-in-queensland-2013-15-25aug17.pdf.aspx>

In 2019/2020, unprecedented bushfires burned over 17 million hectares, killing three billion animals²⁰. This was a tragic event which made international news headlines. Little known, however, is that each year an area three times this size is burned in the tropical savannas and woodlands of northern Australia, and these fires are intentionally lit, not natural. Their sole purpose is pasture maintenance for beef production²¹. Each year, the dead unpalatable grass is burned to make way for new pick when the monsoon rains come. This also has the effect of killing tree seedlings, 'woody weeds', that compete with grasses.

This yearly burn has a devastating impact on biodiversity, particularly birds²². Two factors have made this annual burning more destructive. Firstly, the introduction of gamba grass, a highly invasive, high biomass pasture grass introduced to increase grazing productivity that is now out of control. Gamba grass has 4-10 times the fuel load of native grasses, so the yearly burns are far more intense, killing trees and shrubs, changing entire ecosystems²³. Secondly, the Carbon Farming initiative has now had the perverse effect of encouraging more regular and widespread burning²⁴, originally justified by research indicating that early dry season burns released half the emissions as late burns.

Feral cats have been identified as a major threat to wildlife in Australia, implicated in mammal extinctions²⁵. The apex predator that would keep feral cats under control, the dingo, has been largely removed from the landscape due to their impact on livestock. Biodiversity loss due to feral cats is therefore an unintended result of grazing production, as thousands of dingoes are killed as 'wild dogs'.

Beef vs the Great Barrier Reef

It's no secret that the Great Barrier Reef is in a perilous state, having suffered three major die-off events in the past five years that have killed half the reef. Rising water temperatures and

²⁰ WWF. *Australia's 2019-2020 Bushfires: The Wildlife Toll*. <https://www.wwf.org.au/ArticleDocuments/353/Animals%20Impacted%20Interim%20Report%2024072020%20final.pdf.aspx?OverrideExpiry=Y> (2020).

²¹ Longmire, A., Taylor, C. & Wedderburn-Bisshop, G. *Land Use: Agriculture and Forestry Discussion Paper*. <http://bze.org.au/land-use-agriculture-and-forestry/> (2014). https://bze.org.au/research_release/land-use/

²² Woinarski, J. C. Z. & Legge, S. The impacts of fire on birds in Australia's tropical savannas. *Emu - Austral Ornithology* **113**, 319–352 (2013). <https://www.tandfonline.com/doi/abs/10.1071/MU12109>

²³ Rossiter-Rachor, N., Setterfield, S., Douglas, M., Hutley, L. & Cook, G. *Andropogon gayanus* (Gamba Grass) Invasion Increases Fire-mediated Nitrogen Losses in the Tropical Savannas of Northern Australia. *Ecosystems* **11**, 77–88 (2007). <https://link.springer.com/article/10.1007%2Fs10021-007-9108-x>

²⁴ Cook, G. *et al.* Managing Sources and Sinks of Greenhouse Gases in Australia's Rangelands and Tropical Savannas. (2010) doi:10.2111/08-101.1. <https://publications.csiro.au/rpr/pub?pid=csiro:EP092373>

²⁵ <https://theconversation.com/one-cat-one-year-110-native-animals-lock-up-your-pet-its-a-killing-machine-138412>

ocean acidification are now seen as major threats, but equally as important, is deteriorating water quality.

Each year the Queensland government reports on the water quality and progress towards 2050 targets²⁶. These report cards focus mostly on sediment, nitrogen and phosphorus loads sent onto the reefs from coastal rivers, notably the Fitzroy and Burdekin rivers. The most recent report from 2019²⁷, documents a disastrous drop in vegetation ground cover of 58%. This loss of ground cover, mostly from overgrazing, will have a disastrous impact in 2021, as the soil inevitably erodes and flood rains empty this sediment onto the reefs.

Another round of this vicious cycle, known as the 'hydro-illogical cycle' is playing out before our eyes. Grazing land management practices in reef catchments are poor. Forests and watercourse vegetation are routinely cleared for beef production, and pastures are overgrazed, particularly in drought, leaving bare ground exposed to erosion when it rains. There are control measures to prevent this, but just 17% of graziers adhere to this voluntary code²⁸. The result is that when it rains, particularly in flood rains after cyclones, the reef endures extreme pollution. 70% of the fine sediment, which stays in solution far from land and impacts the reef, is from grazing lands, mostly from beef production. Grazing lands are also a major source of nitrogen and phosphorus pollution.

Despite criticism²⁹, governments have shied away from mandatory controls on reef catchment water pollution, ensuring this vicious cycle continues.

Deforestation in reef catchments has increased dramatically, now causing three to four times more soil deposited onto the reef³⁰. A 2013 Queensland Government report estimated that more than 75% of total sediment in the Fitzroy and Burdekin rivers was soil lost from grazing land³¹.

Sediment, particularly the fine sediment, acts to suppress coral growth, and enhances the growth of algae and crown-of-thorns starfish³². As a concrete demonstration that sediment from grazing lands must be controlled, in 2016 the Queensland government spent \$7 million purchasing a cattle station in the far north, to stem the source of 40% of Normanby River sediment emptying out on the then pristine far north reefs³³.

²⁶ <https://www.reefplan.qld.gov.au/tracking-progress/reef-report-card>

²⁷ <https://www.reefplan.qld.gov.au/tracking-progress/reef-report-card/2019>

²⁸ <https://theconversation.com/great-barrier-reef-report-in-time-to-make-polluters-pay-16073>

²⁹ <https://theconversation.com/governments-are-not-protecting-the-great-barrier-reef-16107>

³⁰ McKergow, L. A., Prosser, I. P., Hughes, A. O. & Brodie, J. Sources of sediment to the Great Barrier Reef World Heritage Area. *Mar. Pollut. Bull.* 51, 200–211 (2005).

<https://pubmed.ncbi.nlm.nih.gov/15757721/>

³¹ Brodie, J. *et al.* Sources of sediment and nutrient exports to the Great Barrier Reef World Heritage Area. (2003). <http://eprints.jcu.edu.au/1714/>

³² <https://www.marineconservation.org.au/pollution-great-barrier-reef>

³³ <https://www.abc.net.au/news/2016-06-22/great-barrier-reef-government-buys-cattle-station-protection-bid/7533216>

So beef production is a major factor killing the Great Barrier Reef.

Beef's climate impact

The Beyond Zero Emissions Land Use Discussion Paper found that grazing industries were responsible for between a third and half Australia's emissions, if emissions accounting were done honestly, including deforestation for grazing. If it were not tragic it would be amusing that deforestation emissions, rejected by the industry as not being 'agriculture' emissions, are now being offered as part of the solution for carbon neutral beef calculations.

Meat and Livestock Australia have countered climate criticism by announcing a plan for 'carbon neutral beef' by 2030³⁴. This plan is to reduce emissions from red meat production and increase carbon sequestration in trees and vegetation to offset remaining emissions.

But reading the fine print³⁵, their task is to offset emissions *relative to a 2005 baseline*, and there is no plan on how current deforestation (the main industry emission source) will be stopped. How the 2005 baseline will be factored in is unclear, but if it is intended to be implemented in the same way as the Kyoto Agreement, it will set baseline emissions from deforestation. If this is so, deforestation emissions reductions will be relative to 2005 emissions, making the 'carbon neutral' claim a farce, continuing to allow rampant deforestation that would wipe out other emissions reductions. So it looks like the Carbon Neutral Beef campaign is marketing, nothing more.

Seaweed extracts have been acclaimed as a means of reducing enteric fermentation emissions, capable of reducing methane from cattle by 80%. On the surface this looks highly promising, however it disappoints in practice. Feeding cattle this (unpalatable) supplement can only be achieved in a feedlot situation, which is the source of just 4% of enteric methane³⁶. An 80% reduction of 4% is a total reduction of enteric methane of just 3.2%.

'Regenerative grazing' is also claimed to be an industry saviour, but unfortunately it lacks peer-reviewed evidence. While some smaller producers whose pastures are not drought-prone may benefit, most of Australia's beef is produced on rangelands, which are particularly vulnerable to degradation. Climate change, particularly changes to the intensity and frequency of droughts, accelerates the degradation process. Most Australian pastures have a significant capacity for increased carbon, because they have been severely depleted of carbon due to grazing practices. However, soil carbon can be increased to saturation within a few years, negating ongoing benefits.

³⁴ <https://www.mla.com.au/research-and-development/Environment-sustainability/carbon-neutral-2030-rd/cn30/#>

³⁵ https://www.mla.com.au/contentassets/e501cd2919064183b57372897a0e1954/2689-mla-cn30-roadmap_d7.pdf

³⁶ Longmire, A., Taylor, C. & Wedderburn-Bisshop, G. *Land Use: Agriculture and Forestry Discussion Paper*. <http://bze.org.au/land-use-agriculture-and-forestry/> (2014).

While grazing practices can improve soil, this comes at the expense of productivity. Only with substantial external inputs can both production and soil health/carbon be increased. Without external inputs, either soil is improved, or production, but not both. The Food Climate Research Network has published a report on this topic, *Grazed and Confused*, which shows that soil can gain carbon in the short term, but this offsets a small fraction of ruminant emissions³⁷.

The cost of red meat production on climate and biodiversity loss is heavy. Scientists now believe that the only way to meet climate targets and protect biodiversity is to reduce red meat demand and production³⁸. The Beyond Zero Emissions Land Use report found that when deforestation is included, ruminants were responsible for 36% or 50% of national emissions, using 100 year or 20 year greenhouse gas accounting. This makes beef and sheep production Australia's biggest climate polluter by far.

The big picture gives us cause for great optimism. If red meat and dairy (ruminant) production were to cease globally, this would free up 40% of the ice-free land for carbon sequestration. Re-wilding these grazing lands could draw down all current fossil fuel emissions and more³⁹. The benefit of this approach cannot be understated. This re-wilding offers the only proven, safe, natural, large scale solution to drawing down legacy carbon dioxide, and it costs just one fifth of the alternatives⁴⁰.

Grazing dominates our use of planet Earth, thereby offering a solution of the scale needed to stop this existential climate crisis we face. This solution comes at the cost of foregoing a few percent of our food – meat and dairy⁴¹. Surely having a planet that can sustainably support our kids and grandkids is worth a small change in diet.

Methane's Unique Impact

Methane is a unique greenhouse gas that causes both extreme concern and great hope.

³⁷ Garnett, T. *et al.* *Grazed and confused?* http://www.fcrn.org.uk/sites/default/files/project-files/fcrn_gnc_report.pdf (2017).

³⁸ Bajželj, B. *et al.* Importance of food-demand management for climate mitigation. *Nature Climate Change* **4**, 924–929 (2014). https://www.researchgate.net/publication/275118744_Importance_of_food-demand_management_for_climate_mitigation

³⁹ Searchinger, T. D., Wiersenius, S., Beringer, T. & Dumas, P. Assessing the efficiency of changes in land use for mitigating climate change. *Nature* **564**, 249–253 (2018). <https://www.nature.com/articles/s41586-018-0757-z>

⁴⁰ Stehfest, E. *et al.* Climate benefits of changing diet. *Clim. Change* **95**, 83–102 (2009). <http://link.springer.com/article/10.1007/s10584-008-9534-6>

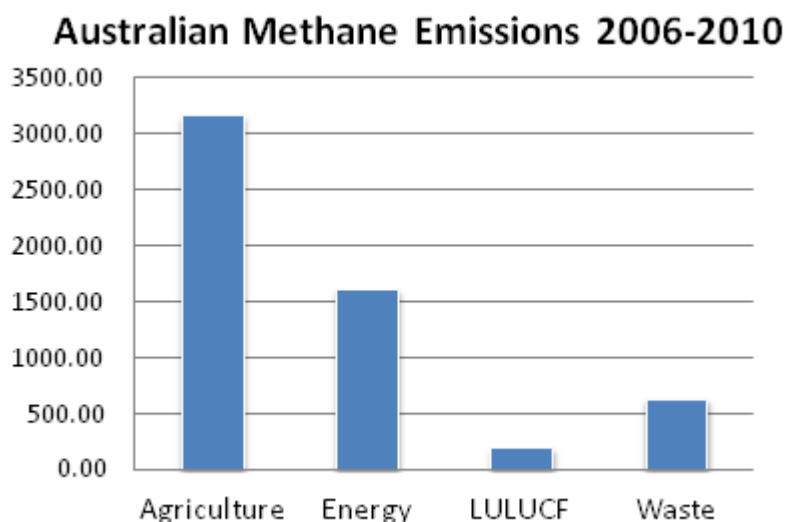
⁴¹ IPCC. IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse gas fluxes in Terrestrial Ecosystems Summary for Policymakers. (Intergovernmental Panel on Climate Change (IPCC), 2019). https://www.ipcc.ch/site/assets/uploads/2019/08/4.-SPM_Approved_Microsite_FINAL.pdf

Extreme concern because existing and projected methane emissions will warm the atmosphere a further 1.4°-2°C, driving us into dangerous climate change by mid-century, *whether or not carbon dioxide emissions are reduced*⁴².

Conversely, methane is the only means we have to slow global warming in coming critical decades⁴³, buying us time to 'de-carbonise 'our economies.

But what everyone seems to miss is that quickly reducing fossil fuel emissions will have a perverse effect, leading to more warming for several decades. This is due to the co-emitted sulphur dioxide, which actually causes cooling for several decades, masking about a third of the warming from carbon dioxide⁴⁴. Of course, the carbon dioxide continues to warm past that time, but the next few decades are critical to life on Earth. So methane then offers a unique transformative means to tackle global warming.

And as we know, the greatest source of methane is livestock, particularly ruminants (cattle, sheep and goats)⁴⁵.



⁴² Howarth, R. W. A bridge to nowhere: methane emissions and the greenhouse gas footprint of natural gas. *Energy Sci. Eng.* **2**, 47–60 (2014).

<http://onlinelibrary.wiley.com/doi/10.1002/ese3.35/abstract>

⁴³ Smith, K. R., Desai, M. A., Rogers, J. V. & Houghton, R. A. Joint CO₂ and CH₄ accountability for global warming. *Proc. Natl. Acad. Sci.* (2013) doi:10.1073/pnas.1308004110

<http://www.pnas.org/content/early/2013/07/10/1308004110>

⁴⁴ Hansen, J., Kharecha, P. & Sato, M. Climate forcing growth rates: doubling down on our Faustian bargain. *Environ. Res. Lett.* **8**, 011006 (2013). <https://doi.org/10.1088/1748-9326/8/1/011006>

⁴⁵ Gerard Wedderburn-Bisshop, unpublished data 2014.

The Beyond Zero Emissions Land Use discussion paper gives a very useful explanation of the power of methane⁴⁶. It re-calculates Australian emissions using the conventional 100 year greenhouse gas accounting, as well as 20 year accounting, showing that over this shorter timeframe, ruminant emissions make up half of national emissions. This demonstrates the high climate impact of methane and argues strongly for methane reductions for a habitable planet.

So removing ruminants, particularly cattle, offers a transformational climate solution: the long term solution with regrowth on re-wilded grazing lands, as well as methane's unique short term fix. We need both these benefits if we want a liveable planet for our future generations.

Beef vs Soils

Healthy soils are at the heart of a sustainable future, one in which we live within a 'safe operating space' of our finite resources. But soil degradation is fast approaching these limits, threatening food security: the capacity to provide us with sufficient food⁴⁷. Indeed, experts are now declaring that humanity's future success as a species is interwoven with how we directly and indirectly manage our planet's soil⁴⁸.

Clearing bushland accelerates soil loss, particularly soil carbon loss, from our ancient, weathered soils⁴⁹. We now lose 50 to 150 million tonnes of soil each year as dust⁵⁰ and similar amounts as sediment in water flows. The drought/flood cycle accelerates this soil loss dramatically. Australian soils are being lost five times faster than their natural regeneration⁵¹.

Organic matter in the soil (containing most of the carbon) is lighter, and therefore easily lost to erosion. More than 80% of Australia's soil carbon loss has been on grazing lands⁵². Gully erosion, the source of most sediment and water quality issues, is caused mainly by overgrazing

⁴⁶ Longmire, A., Taylor, C. & Wedderburn-Bisshop, G. *Land Use: Agriculture and Forestry Discussion Paper*. <http://bze.org.au/land-use-agriculture-and-forestry/> (2014).

https://bze.org.au/research_release/land-use/

⁴⁷ FAO and ITPS. *Status of the World's Soil Resources (SWSR) – Main Report*. (Food and Agriculture Organization of the United Nations and Intergovernmental Technical Panel on Soils, 2015). <http://www.fao.org/3/a-i5199e.pdf>

⁴⁸ Amundson, R. *et al.* Soil science. Soil and human security in the 21st century. *Science* **348**, 1261071 (2015). <https://www.ncbi.nlm.nih.gov/pubmed/25954014>

⁴⁹ Prosser, I. P. *et al.* Large-scale patterns of erosion and sediment transport in river networks, with examples from Australia. *Mar. Freshw. Res.* **52**, 81–100 (2001).

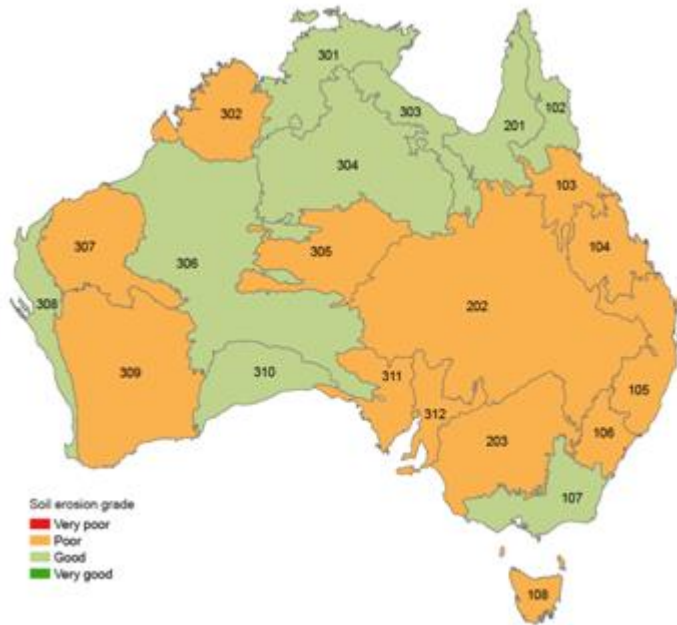
<https://publications.csiro.au/rpr/pub?list=BRO&pid=procite:2a62cc7b-35c1-4e90-9359-3638d6b28fe6>

⁵⁰ Shao, Y. *et al.* Dust cycle: An emerging core theme in Earth system science. *Aeolian Res.* **2**, 181–204 (2011). <https://www.sciencedirect.com/science/article/pii/S1875963711000085>

⁵¹ Pimentel, D. & Burgess, M. Soil Erosion Threatens Food Production. *Agriculture* **3**, 443–463 (2013). <http://www.mdpi.com/2077-0472/3/3/443>

⁵² Longmire, A., Taylor, C. & Wedderburn-Bisshop, G. *Land Use: Agriculture and Forestry Discussion Paper*. <http://bze.org.au/land-use-agriculture-and-forestry/> (2014).

and animal trampling removing ground cover, notably where grazing animals are allowed access to water courses⁵³.



[original file here: https://soe.environment.gov.au/sites/default/files/report2016/land/SoE2016-Land-web-resources/image/soe2016_lan_fig25_soil_erosion-01.png]

Figure: State of the Environment assessment of soil erosion⁵⁴.

'Regenerative grazing' has been proposed as a means of addressing soil loss, and it does increase soil health and soil carbon. But most of our beef is produced on the rangelands and drylands, where regenerative grazing can only be practiced where there is sufficient regular rainfall. Drought, particularly multi-year drought, now occurs more frequently on our rangelands. This renders higher stocking rates unfeasible, no matter what grazing system is used.

Meat and Livestock Australia confirmed this with their Wombiana Trials. They found that production could only increase at the expense of vegetation cover and soil condition, and that grazing systems made little difference to this conclusion. By grazing animals we are effectively 'mining' the land, and even in high rainfall grazing areas increased productivity can be achieved, but only with substantial external inputs such as fertilizer and more productive pasture species.

⁵³ Prosser, I., Hughes, A., Lu, H. & Stevenson, J. *Waterborne Erosion - an Australian Story*. <https://publications.csiro.au/rpr/download?pid=procite:f135002e-5899-434b-9d5e-9588a1dfc4e2&dsid=DS1> (2001).

⁵⁴ <https://soe.environment.gov.au/theme/land/topic/2016/soil-formation-and-erosion#Malthus-et-al-2013>

Soil loss and degradation is a prime example of an unpaid external environmental cost. Farmers do not pay for the damage, the cost is not passed on to consumers, and rarely do governments get involved in remediating land. This 'environmental deficit' is why our environmental footprint is so heavy, and why we are driving these systems beyond their boundaries.

The True Cost of Beef

A 2013 report by The Economics of Ecosystems and Biodiversity (TEEB) found that the external (and therefore unpaid) natural capital costs of beef production from 'cattle ranching and farming' globally was 710% of revenue⁵⁵. In the case of Australia and New Zealand (analysed together), they found that the unpaid external cost of cattle ranching and farming was US\$17.3 billion, compared to a revenue of US\$3.4 billion per year.

This means that if the true cost to the natural environment was included, beef prices would rise by 500%. Most Australian beef is produced in the north of the country, often *bos indicus* (Brahman cross) cattle grazed on low productivity rangelands, and is destined for export markets as lower value 'industrial' beef (ie. hamburger beef). Therefore, a price signal of this order would almost guarantee the end of the industry.

These external environmental costs are impacts on forests, soils, water use, greenhouse gases, land and water pollution and waste. Producers pay none of these costs, but they have taken a heavy toll on our environment, and in time we all must pay for this.

If we look at just two aspects, we see how these costs take a heavy toll. If, for example, we removed all grazing animals from the land, we would effectively free up more than half the continent. Returning that much land to nature would be the most effective step we can take to turn around the sixth great extinction that is overtaking us now⁵⁶.

⁵⁵ TEEB. *Natural Capital at Risk: The Top 100 Externalities of Business*.
<https://www.trucost.com/publication/natural-capital-risk-top-100-externalities-business/> (2013).
Environmental cost of cattle ranching is 710% of revenue.

⁵⁶ Ten Brink, P., Kram, T., van Oorschot, M. & Arets, E. J. M. M. *Rethinking Global Biodiversity Strategies: Exploring Structural Changes in Production and Consumption to Reduce Biodiversity Loss*. (2010).
https://www.researchgate.net/publication/48199948_Rethinking_Global_Biodiversity_Strategies_Exploring_Structural_Changes_in_Production_and_Consumption_to_Reduce_Biodiversity_Loss

Not only that, re-wilding that much land would draw down all fossil fuel emissions and more, effectively halting climate change⁵⁷. And removing ruminants with their methane emissions is the most effective means we have of reversing global warming in coming critical decades⁵⁸

Should we even be farming the rangelands and drylands?

An industry that takes up half the land mass of Australia must be accountable to the Australian public for environmental damage. Erosion of public confidence may cause the industry to lose its social licence.

Barely two years ago, mass media frequently portrayed hardship in the bush due to extreme drought. *Rural Aid, Drought Angels, Aussie Helpers, Hay Mate* became household names and sympathy for farmers was high. Images of starving animals were common. As seasons changed and more extreme weather beset the nation, these images turned to fire-ravaged animals, then news of thousands of animals dying in floodwaters. Still, convoys of hay were being sent to the people on the land and billions of taxpayer dollars were funnelled to farmers⁵⁹.

But for many, these lamentable events were inevitable; every picture of a starving animal was an indictment on farmers for bad management. Every convoy of hay was rewarding poor animal husbandry.

In 2021, as this is being published, the price of beef is at an all-time high. Graziers are desperately stocking up and accelerating breeding programs because widespread flood rain has laid the basis for good pastures, for at least another season.

Right in front of our eyes, we are mindlessly repeating this very cycle that inevitably ends in animal deaths.

⁵⁷ Searchinger, T. D., Wiersenius, S., Beringer, T. & Dumas, P. Assessing the efficiency of changes in land use for mitigating climate change. *Nature* **564**, 249–253 (2018).
<https://www.nature.com/articles/s41586-018-0757-z>

⁵⁸ Wedderburn-Bisshop, G., Longmire, A. & Rickards, L. A. Neglected Transformational Responses: Implications of Excluding Short Lived Emissions and Near Term Projections in Greenhouse Gas Accounting. *The International Journal of Climate Change: Impacts and Responses* **7**, 11–27 (2015).
<https://cgscholar.com/bookstore/works/neglected-transformational-responses>

⁵⁹ <https://www.abc.net.au/news/2018-10-16/where-has-drought-aid-been-allocated/10378278>

We know that in our changing climate, droughts in Australia are more frequent, more severe and more prolonged⁶⁰. We know that vegetation is coming under increased stress, with declining rainfall, extreme floods and increasing evapo-transpiration⁶¹.

Must we see more dying animals, more dead fish, more emergency feed relief to make us understand this is the new normal, no longer the exception? Do we accept that graziers have the right to profit from the 'good years' and be propped up by taxpayers in the drought years, at the expense of degrading the land?

The Wentworth Group of Concerned Scientists believe that our reactive planning drives long term degradation to this fragile land, noting that native tree clearing and other practices have resulted in 1,600 species of plants and animals now threatened with extinction⁶². Many scientists now believe we should accept the new climate normal in Australia⁶³, and we should be making a planned retreat from those areas no longer dependable⁶⁴.

It won't take much more for the public to react negatively to the media portrayal of animal suffering, and for grazing industries to quickly lose their social licence.

⁶⁰ Dijk, A. I. J. M. van *et al.* The Millennium Drought in southeast Australia (2001–2009): Natural and human causes and implications for water resources, ecosystems, economy, and society. *Water Resources Research* **49**, 1040–1057 (2013).

<https://agupubs.onlinelibrary.wiley.com/doi/10.1002/wrcr.20123>

<https://theconversation.com/why-2-of-global-warming-is-much-worse-for-australia-than-1-5-77548>

<https://theconversation.com/australias-dry-june-is-a-sign-of-whats-to-come-80469>

<https://theconversation.com/yes-australia-is-a-land-of-flooding-rains-but-climate-change-could-be-making-it-worse-157586>

⁶¹ Chiew, F. H. S., Young, W. J., Cai, W. & Teng, J. Current drought and future hydroclimate projections in southeast Australia and implications for water resources management. *Stoch Environ Res Risk Assess* **25**, 601–612 (2011). <https://link.springer.com/article/10.1007/s00477-010-0424-x>

Nicholls, N. The Changing Nature of Australian Droughts. *Climatic Change* **63**, 323–336 (2004). <https://link.springer.com/article/10.1023%2FB%3ACLIM.0000018515.46344.6d>

Delworth, T. L. & Zeng, F. Regional rainfall decline in Australia attributed to anthropogenic greenhouse gases and ozone levels. *Nature Geoscience* **7**, 583–587 (2014). <https://www.nature.com/articles/ngeo2201>

⁶² Byron, N. *Et al.* *Blueprint for a Healthy Environment and a Productive Economy*. (2014). <https://wentworthgroup.org/wp-content/uploads/2014/11/Blueprint-for-a-Healthy-Environment-and-a-Productive-Economy-November-2014.pdf>

⁶³ https://www.wentworthgroup.org/docs/Can_We_Myth_Proof_Australia.pdf

⁶⁴ <https://theconversation.com/warmer-wetter-hotter-drier-how-to-choose-between-climate-futures-39561>

A rational, national discussion of future farming is long overdue, we must engage, not stand by as passive observers while our fauna, flora and land suffer, while thousands of livestock die and the graziers responsible for them suffer.

Our short-term thinking and political responses are breath-takingly inadequate. Let's start thinking like this is our country to care for, for future generations.

Opportunities

Climate change

What we do now and over the next two decades will be critical to our children's future and indeed all life on Earth. Animal agriculture - and in particular beef - is one of the largest contributors to climate change, due to methane emissions and deforestation. Beef and sheep production offers one of our greatest opportunities to reduce global warming. Unlike road transport and aviation, for example, which may take decades to decarbonise⁶⁵, reducing our cattle herd does not require new technology or millions of new electric cars or charging stations.

Grazing industries give us a unique and powerful means of fighting global warming. Unique because methane has the highest impact on short term heating: projected methane emissions alone will drive us past the Paris agreement limits⁶⁶, driving us into an alarming 'hot house Earth' future⁶⁷. Powerful, because no other industry offers anything like the drawdown available on grazing lands. Globally, returning 41% of current grazing land to native vegetation would draw down three decades of current emissions⁶⁸. It's alarming that as we face an increasingly hostile climate, current deforestation for grazing alone makes up a fifth our national emissions⁶⁹.

It's as simple as that: beef and sheep production stands in the way of a climate that can support future generations in the way we have enjoyed.

Reducing cattle numbers and dramatically cutting methane emissions is no longer a nice to have 'green' policy, but an imperative if we are to prevent the worst impacts of dangerous climate change.

Plant-based proteins

⁶⁵ <https://www.climatecouncil.org.au/wp-content/uploads/2017/09/FactSheet-Transport.pdf>

⁶⁶ Nisbet, E. G. *et al.* Very Strong Atmospheric Methane Growth in the 4 Years 2014–2017: Implications for the Paris Agreement. *Glob. Biogeochem. Cycles* **33**, 318–342 (2019).

⁶⁷ Steffen, W. *et al.* Trajectories of the Earth System in the Anthropocene. *Proc. Natl. Acad. Sci.* **115**, 8252–8259 (2018).

⁶⁸ Rao, S., A. K. Jain, and S. Shu. 2015. "The Lifestyle Carbon Dividend: Assessment of the Carbon Sequestration Potential of Grasslands and Pasturelands Reverted to Native Forests." *AGU Fall Meeting Abstracts* 13 (December): GC13E-1206. <https://ui.adsabs.harvard.edu/abs/2015AGUFMGC13E1206R/abstract>

⁶⁹ <https://ageis.climatechange.gov.au/QueryAppendixTable.aspx>

A new report by Blue Horizon and Boston Consulting Group has projected the 'alternative protein' market to be worth US\$290 billion by 2035⁷⁰. The report also predicts that by that time, 11% of all meat, eggs, dairy and seafood will be sourced from alternative proteins, but that with the right support from the government this could accelerate to 22%.

Local studies here in Australia found similar opportunities. According to recent modelling by Deloitte Access Economics for Food Frontier, the plant-based meat sector in Australia has the potential to be worth almost \$3 billion in domestic sales by 2030⁷¹.

Australia is exceptionally well-placed to take advantage of these opportunities and become a global leader in the market for new and alternative proteins. We have ripe local growing demand, world-class science and technology capability and a reputation for safe and high quality food⁷². But just how quickly this sector grows and what part local production plays in the global marketplace will depend largely on government response, and the level of support and incentives that can be provided.

Recommendations

Imagine a world where billions of innocent animals don't needlessly suffer, just to be slaughtered for their meat; where 'livestock' farmers and meat workers have moved to more sustainable jobs and are not a victim of boom and bust cycles and poor working conditions; where we avoid the most dangerous impacts of climate change; where we free up much of the continent for trees and wildlife. We don't need to kill animals and destroy the environment and risk disastrous climate change for our food.

By redirecting our resources away from beef and towards plant-based alternatives, we can not only save millions of individuals every year from a life of suffering and slaughter, but we can help to meet Australia's climate commitments as well as reducing land clearing and improving our biodiversity, soils, and water.

Government

Federal and state governments must adopt policies that support reducing the national cattle herd. Importantly, governments must stop subsidising the beef industry - and the animal agriculture industries more broadly. There are currently numerous subsidies, grants, support payments totalling hundreds of millions of dollars given to these industries at state and federal levels.

⁷⁰ Food for Thought - The Protein Transformation (March 2021) BCG & Blue Horizon. <https://web-assets.bcg.com/a0/28/4295860343c6a2a5b9f4e3436114/bcg-food-for-thought-the-protein-transformation-mar-2021.pdf>

⁷¹ State of the Industry 2020, Food Frontier

⁷² <https://www.foodfrontier.org/why-au-nz/>

Rather than subsidising an industry that is destroying the environment, a leading contributor to climate change, and killing millions of animals, the government should be redirecting these funds to assist farmers to transition away from animal agriculture to more sustainable alternatives. With the right support, the government could also rapidly accelerate our stake in the rapidly growing plant-based meat market.

Furthermore, with Australia's reputation for safe food and our access to high-value markets overseas, we have a great opportunity to export plant-based protein to the rest of the world.

The shift to plant-based meats has already started, and Australia has a terrific opportunity here. The role that Australia plays in the global market for plant-based meat as well as associated plant crops, and also whether local demand is fulfilled through domestic production or imports, will be heavily influenced by government policy.

Industry

The beef industry is not sustainable. With the increasing impacts of climate change, a large portion of our land will gradually become less and less suitable for livestock grazing. Industry should be looking for opportunities to transition to more sustainable income generation such as carbon capture, restoring the land, renewable energy, or crops (for example the crops that are increasing in demand with plant-based meat alternatives).

As we discussed in the *True Cost of Beef* section above, the cost to the environment is **five times greater** than income from grazing industries in Australia. This reflects the grazing industry's true impact on soils, water use, greenhouse gases, land and water pollution and waste. Producers pay none of these costs, but grazing has taken a heavy toll on our environment, and in time we all must pay for this.

It's ironic that an 'iconic' industry is 'killing our country'.

Futurists *RethinkX*, as mentioned in the section above on planetary boundaries, believe that the environmental costs and economic factors alone will compound, bankrupting grazing industries by the 2030's.

Meat and Livestock Australia could be playing a key role in boosting grazier's incomes by lobbying for an adequate price on carbon. No other industry has the same ability to sequester carbon, and an appropriate price would see programs such as the Carbon Farming Initiative expand dramatically. Graziers are well placed to manage carbon sequestration.

We all have a responsibility for our shared future. So if Meat and Livestock Australia had its member's best interests at heart, it would be rapidly looking for exit strategies, such as appropriate carbon prices for carbon farming, as mentioned above, and transition plans that will enhance biodiversity and a better climate.

Consumers

There is now a growing abundance of plant-based meats available in supermarkets as well as restaurants and fast-food outlets. In fact, according to Food Frontier, the number of plant-based meats in supermarkets has doubled over the last 12 months to 30 June 2020, and grocery sales have increased 46%⁷³.

Vegetarianism and veganism are also on the rise, as are those actively reducing meat. Recent data shows that 42% of Australians are now eating less meat or none at all⁷⁴. Roy Morgan data also shows that the percentage of Australian adults that are vegetarian or “almost vegetarian” is on the rise, at currently more than 12% of the adult population, and rising by 1% every 3 years⁷⁵⁷⁶. Industry sources also confirm that per capita red meat consumption in Australia has been on a steady decline over the last two decades⁷⁷. Consumers have the power to accelerate the shift towards more ethical and sustainable alternatives. In fact, there’s never been an easier time to shift to a plant-based diet.

⁷³ 2020 State of the Industry. Food Frontier. <https://www.foodfrontier.org/reports/>

⁷⁴ Plant-based meat: A healthier choice? Food Frontier. <https://www.foodfrontier.org/reports/>

⁷⁵ The slow but steady rise of vegetarianism in Australia. Roy Morgan. 2016. <http://www.roymorgan.com/findings/vegetarianisms-slow-but-steady-rise-in-australia-201608151105>

⁷⁶ Rise in vegetarianism not halting the march of obesity. Roy Morgan. 2019. <http://www.roymorgan.com/findings/7944-vegetarianism-in-2018-april-2018-201904120608>

⁷⁷ Meat & Livestock Australia - State of the Industry Report 2020. <https://www.mla.com.au/news-and-events/industry-news/state-of-the-industry-report-2020-released/>