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**Biodiversity
Council**



An energy transition that is good for biodiversity is possible and essential

Professor Brendan Wintle

Image: Nicolas Rakotopare

The image is a composite of two scenes. The top half shows a wide, flat landscape under a dramatic sky with dark, heavy clouds and patches of lighter, illuminated clouds, suggesting a sunset or sunrise. The ground is covered in dry, brownish vegetation. The bottom half of the image is a dark night scene. In the foreground, a small, light-brown rabbit is sitting on a patch of light-colored sand or dirt. The rabbit is facing left and appears to be eating several bright red tomatoes that are scattered on the ground in front of it. Behind the rabbit, there is a dense patch of tall, green grass. The background of the night scene is a dark sky filled with numerous small, bright white stars, representing a starry night sky.

The University of Melbourne
acknowledges the Traditional Owners of
the unceded land on which we work,
learn and live: the Wurundjeri Woi
Wurrung and Bunurong peoples (Burnley,
Fishermans Bend, Parkville, Southbank
and Werribee campuses), the Yorta Yorta
Nation (Dookie and Shepparton
campuses), and the Dja Dja Wurrung
people (Creswick campus).

Today

- State of nature in Australia and globally
- Glance at the state of biodiversity policy in Australia
- Renewable energy transition and biodiversity
- Opportunities to do better



Nature underpins ...



Health – 70% of medicines natural or copies (4b people – solely natural)

Wellbeing – Cognitive development in children

Prosperity – ½ of Global GDP (\$44T/yr) – 0.7% GDP loss by 2030 (WB)

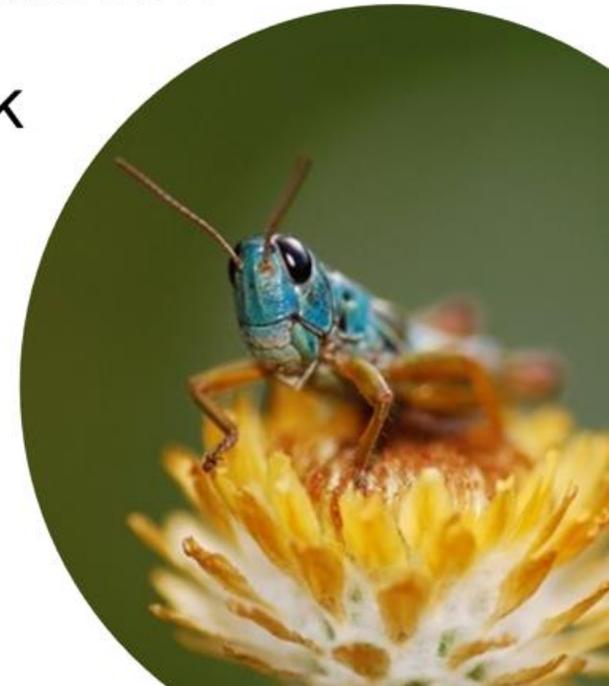
Food – 75% of crops animal pollinated, 35% of food production

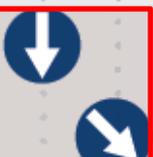
Climate regulation – Biosphere the only viable carbon sink



“When we care for Country,
Country cares for us”

*But nature’s ability to provide these
gifts is declining everywhere...*

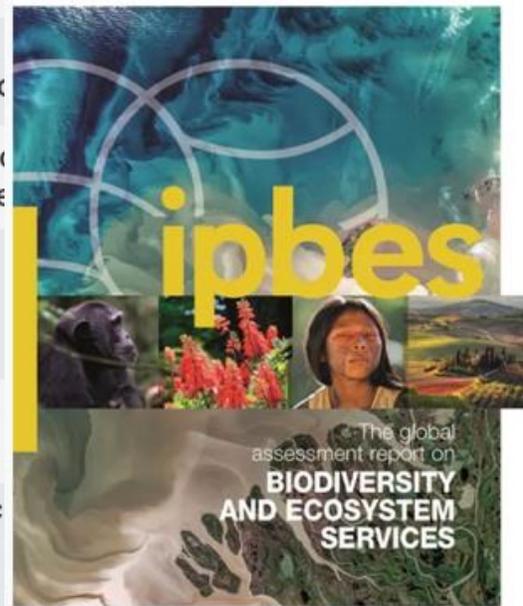


Nature's contribution to people		50-year global trend	Directional trend across regions	Selected indicator
REGULATION OF ENVIRONMENTAL PROCESSES	 1 Habitat creation and maintenance			<ul style="list-style-type: none"> • Extent of suitable habitat • Biodiversity intactness
	 2 Pollination and dispersal of seeds and other propagules			<ul style="list-style-type: none"> • Pollinator diversity • Extent of natural habitat in agricultural areas
	 3 Regulation of air quality			<ul style="list-style-type: none"> • Retention and prevented emissions of air pollutants by ecosystems
	 4 Regulation of climate			<ul style="list-style-type: none"> • Prevented emissions and uptake of greenhouse gases by ecosystems
	 5 Regulation of ocean acidification			<ul style="list-style-type: none"> • Capacity to sequester carbon by marine and terrestrial environments
	 6 Regulation of freshwater quantity, location and timing			<ul style="list-style-type: none"> • Ecosystem impact on air-surface-ground water partitioning
	 7 Regulation of freshwater and coastal water quality			<ul style="list-style-type: none"> • Extent of ecosystems that filter constituent components to water
	 8 Formation, protection and decontamination of soils and sediments			<ul style="list-style-type: none"> • Soil organic carbon
	 9 Regulation of hazards and extreme events			<ul style="list-style-type: none"> • Ability of ecosystems to absorb and buffer hazards
	 10 Regulation of detrimental organisms and biological processes			<ul style="list-style-type: none"> • Extent of natural habitat in agricultural areas • Diversity of competent hosts of vector-borne diseases

LEVELS OF CERTAINTY

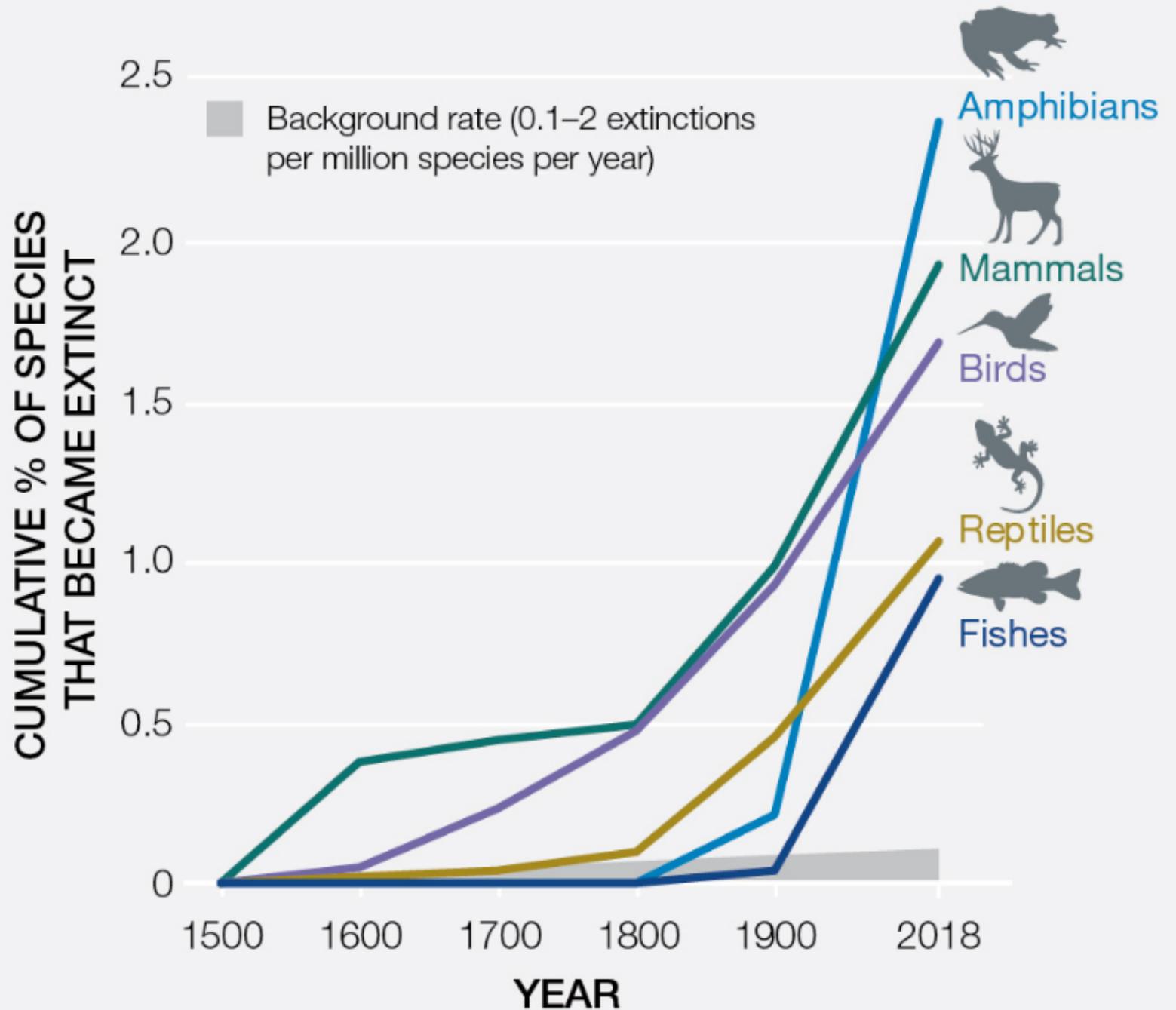
-  Well established
-  Established but incomplete
-  Unresolved
-  Consistent
-  Variable

Across regions



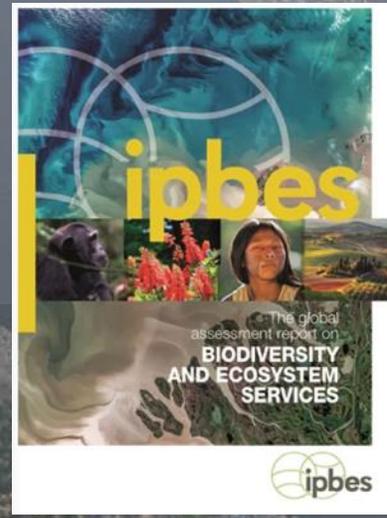
Are we in an extinction crisis?

Yes. The Anthropocene extinction event



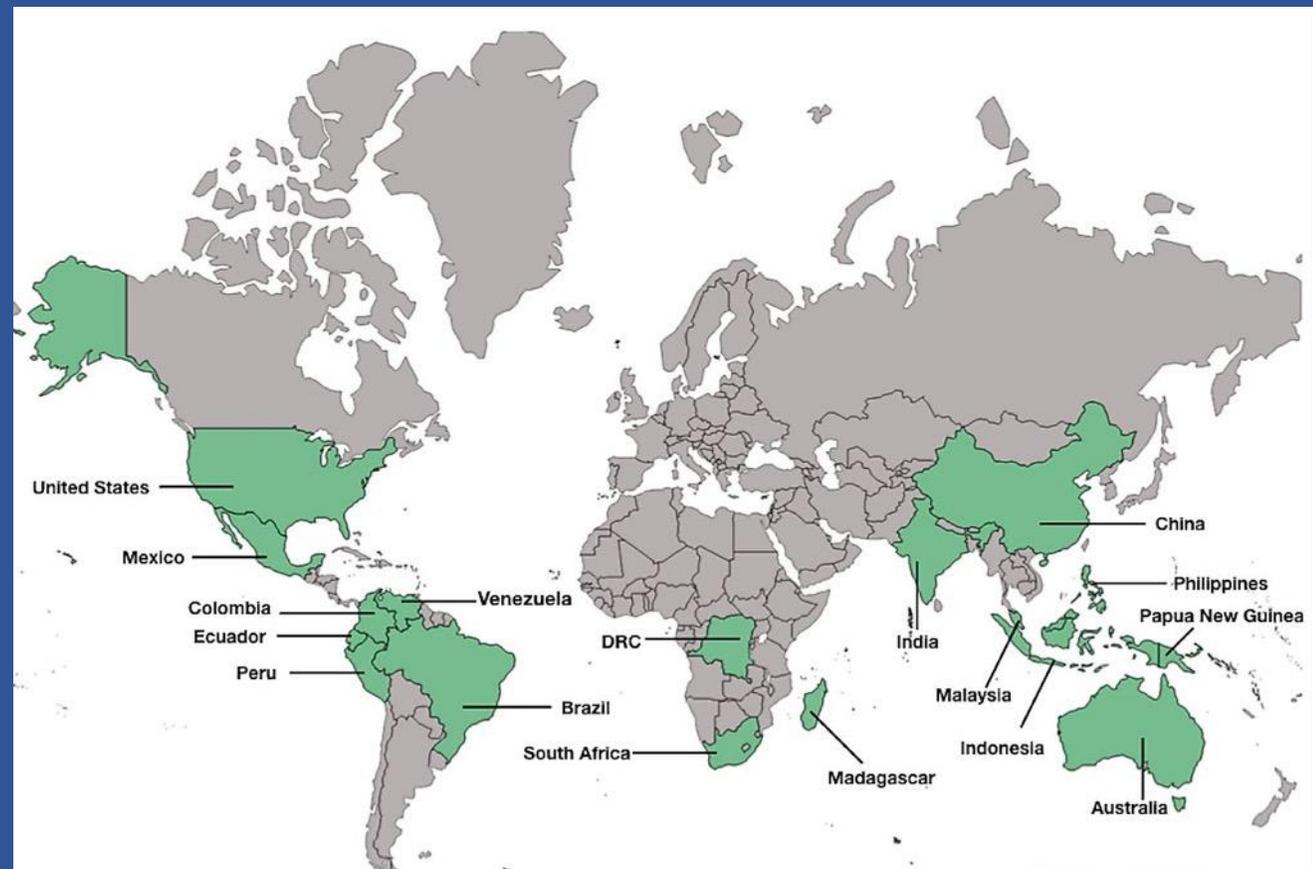
What are the global drivers of loss?

- **75%** of the land area is significantly altered;
- **66%** of the ocean area is experiencing increasing cumulative impacts;
- **85%** of wetland area has been lost
- Half the live coral cover on coral reefs has been lost since 1870 – loss accelerating
- Invasive species (cost \$420B/yr ~ 60% of extinctions)

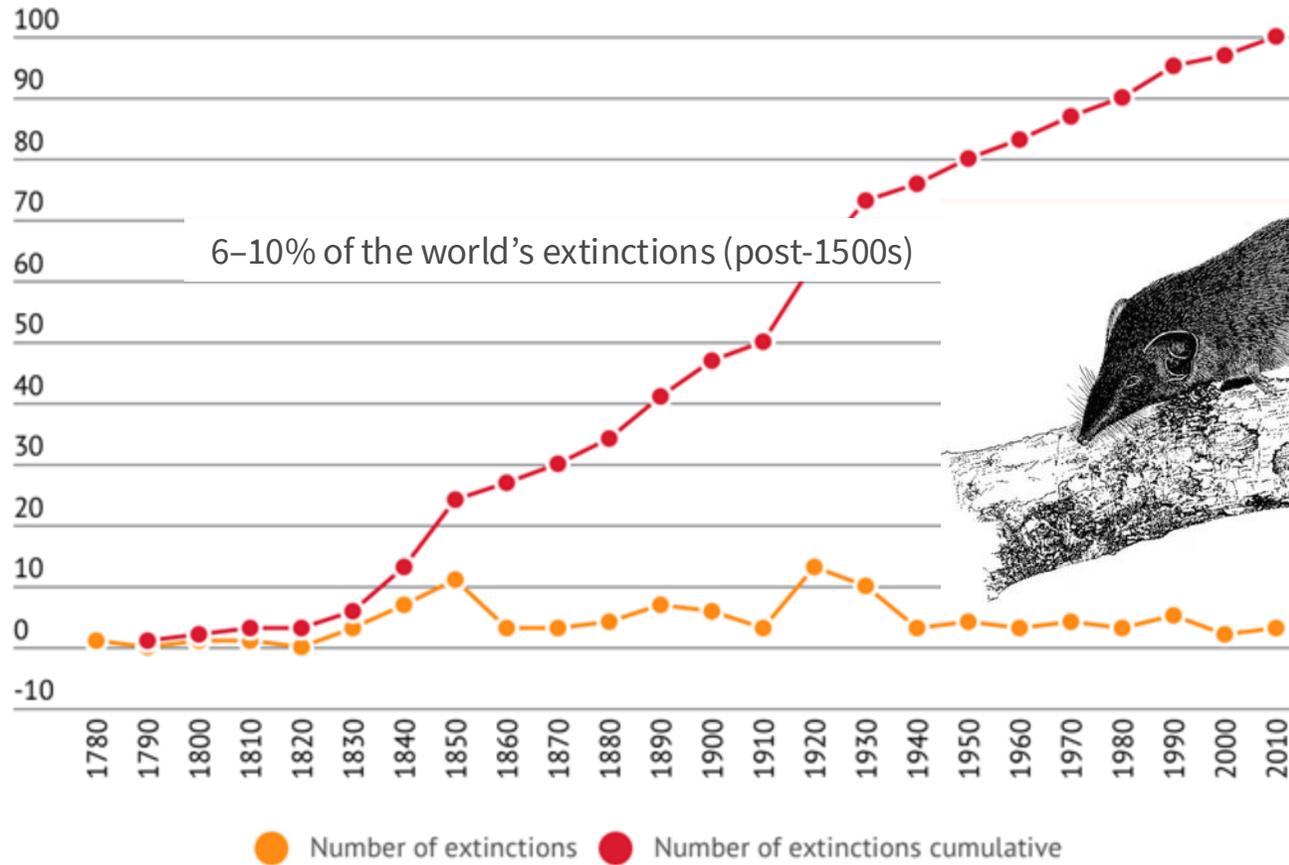


Australia – a unique, megadiverse nation

- 1 of 17 mega-diverse nations
- More species than any other developed nation
- Endemism - 87% mammals, 93% reptiles, 94% frogs found only here



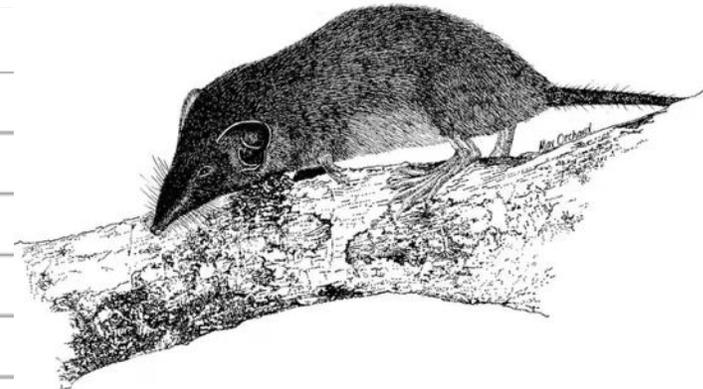
Australian extinctions



Woinarski, et. al (2019). *Biol. Conserv.*, 239, 108261.

Including 39 mammals

- 10% of pre-European mammal spp
- 30% of global mammal extinctions



2000+ now at high risk

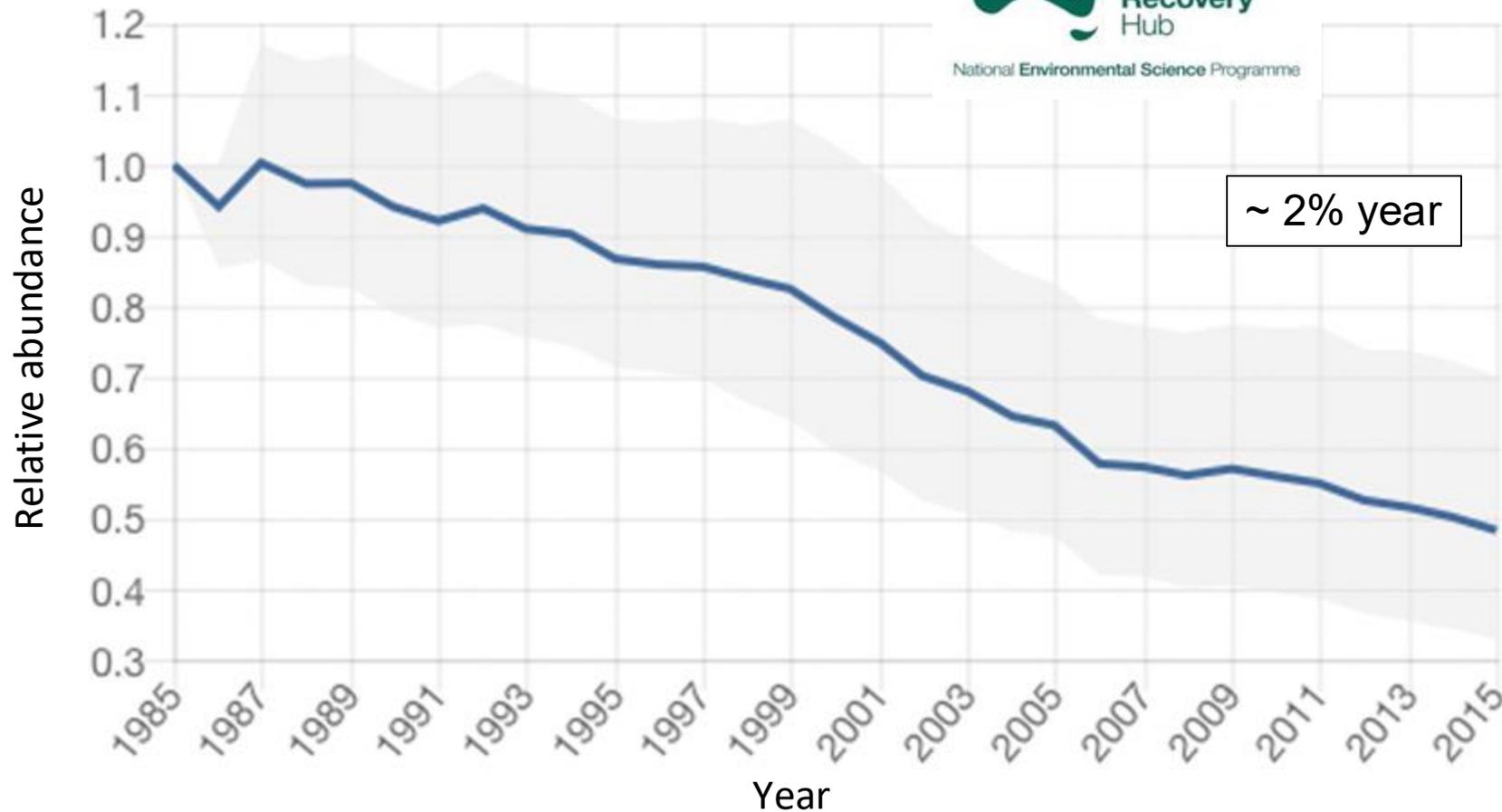
>1/3 not monitored

40% no recovery plan

Declining abundance of Australia's species



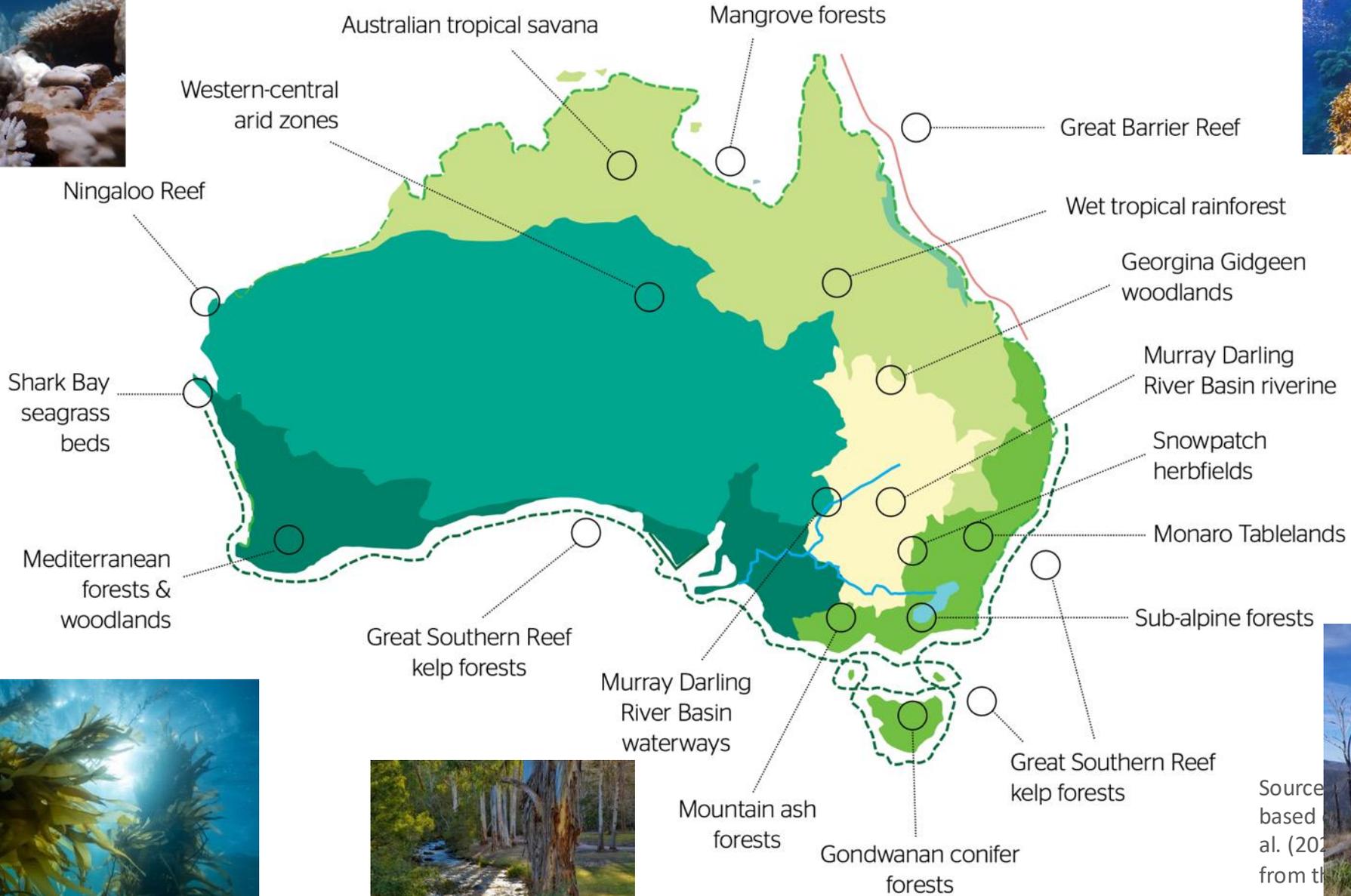
The Australian Threatened Species Index 2020



19 Australian ecosystems at risk of collapse



\$6-7B/yr to GDP

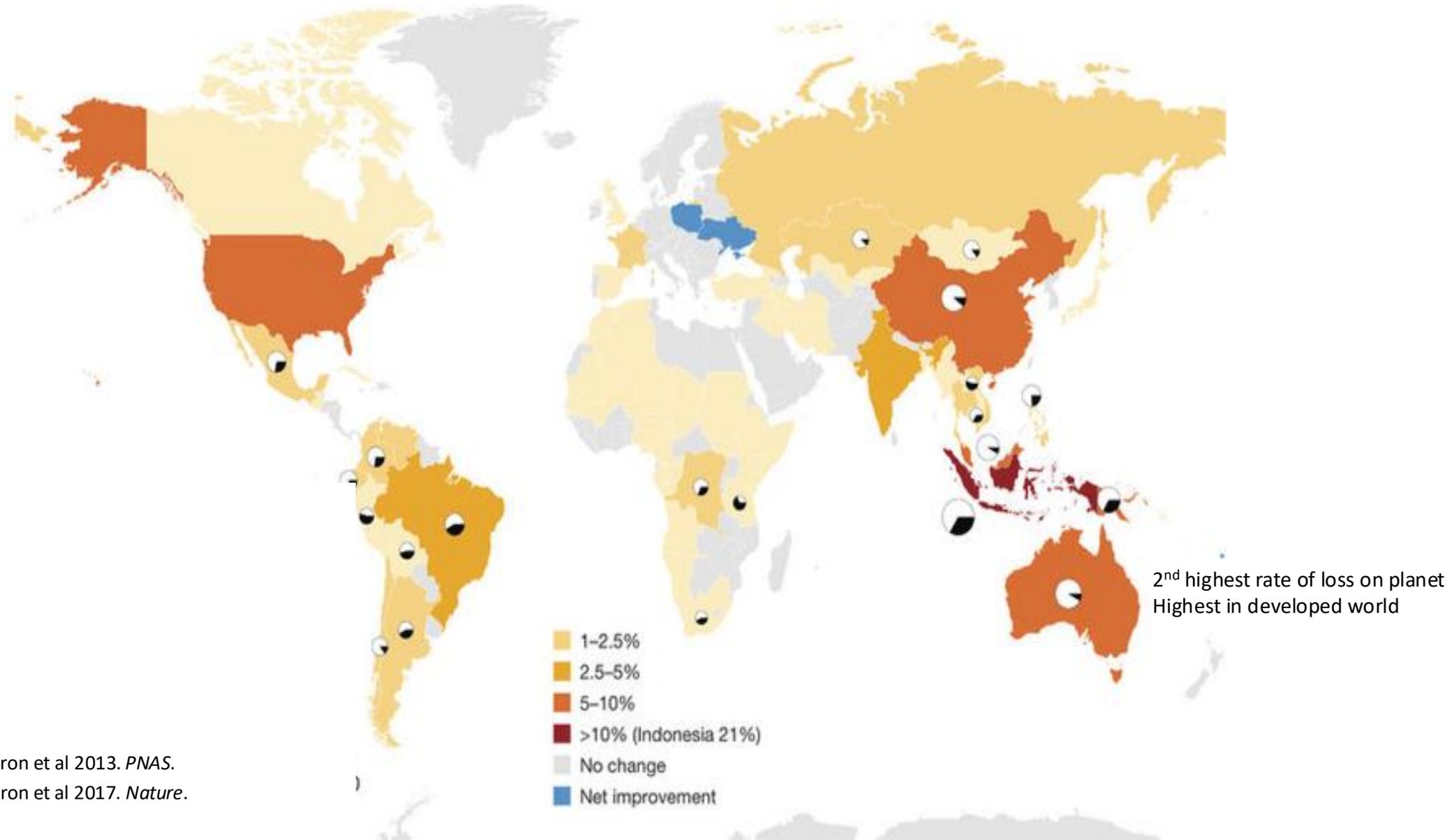


Source based on... al. (202...) from the...



\$1B/yr to GDP

Global biodiversity loss



Waldron et al 2013. *PNAS*.
Waldron et al 2017. *Nature*.

Drivers – direct habitat destruction

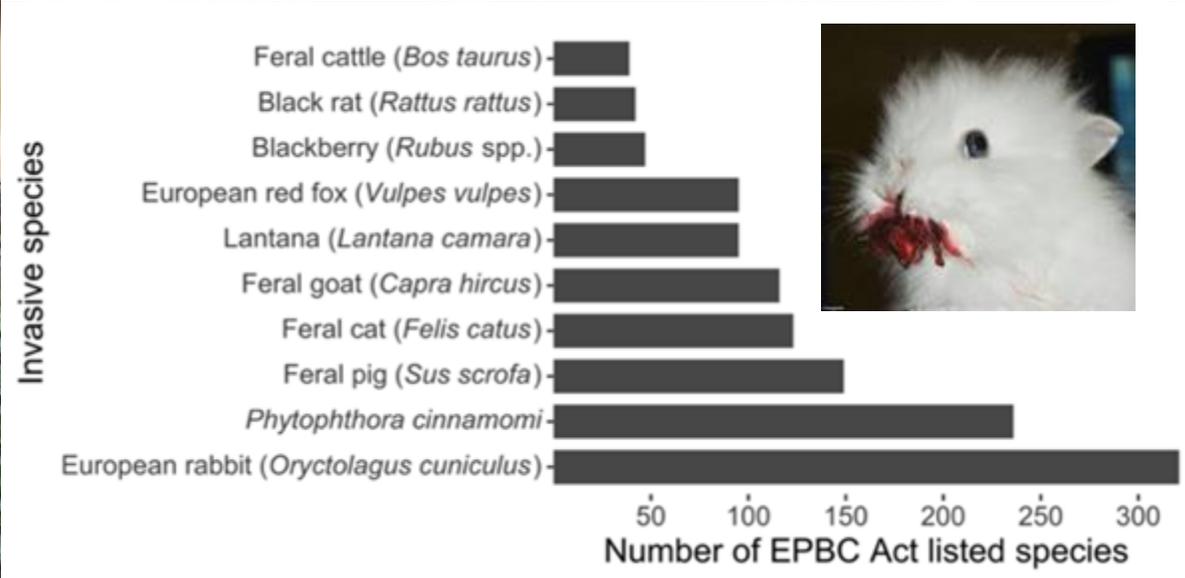
Endangered species habitat area size of Tasmania cleared since 2000 (8M ha) >half the area of England (98% not assessed under EPBC Act)

95% of private land cleared in Victoria

680K hectares cleared in Qld in 2018/19 (12 months)



Drivers – invasive species



Drivers – climate change



Long term (10 years)

1 st	Extreme weather events
2 nd	Biodiversity loss and ecosystem collapse
3 rd	Critical change to Earth systems
4 th	Natural resource shortages
5 th	Misinformation and disinformation
6 th	Adverse outcomes of AI technologies
7 th	Inequality
8 th	Societal polarization
9 th	Cyber espionage and warfare
10 th	Pollution

Biodiversity policy context

Albanese kills off deal with Greens to pass 'nature positive' legislation after intervention by WA premier

Roger Cook says he spoke to 'highest level' of federal government to reiterate his view the environment bills in their current form 'should not be progressed'

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▶ Anthony Albanese (left) with West Australian premier Roger Cook. Photograph: Richard Wainwright/AAP



Plibersek had nature positive deal in writing before Albanese vetoed without her knowledge

Exclusive: Environment minister agreed detail with Greens but the PM intervened after lobbying from WA premier and miners

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Murray Watt nears deal with Coalition to finally overhaul environment laws

Exclusive by political reporter Jake Evans

Environment

Thu 9 Oct

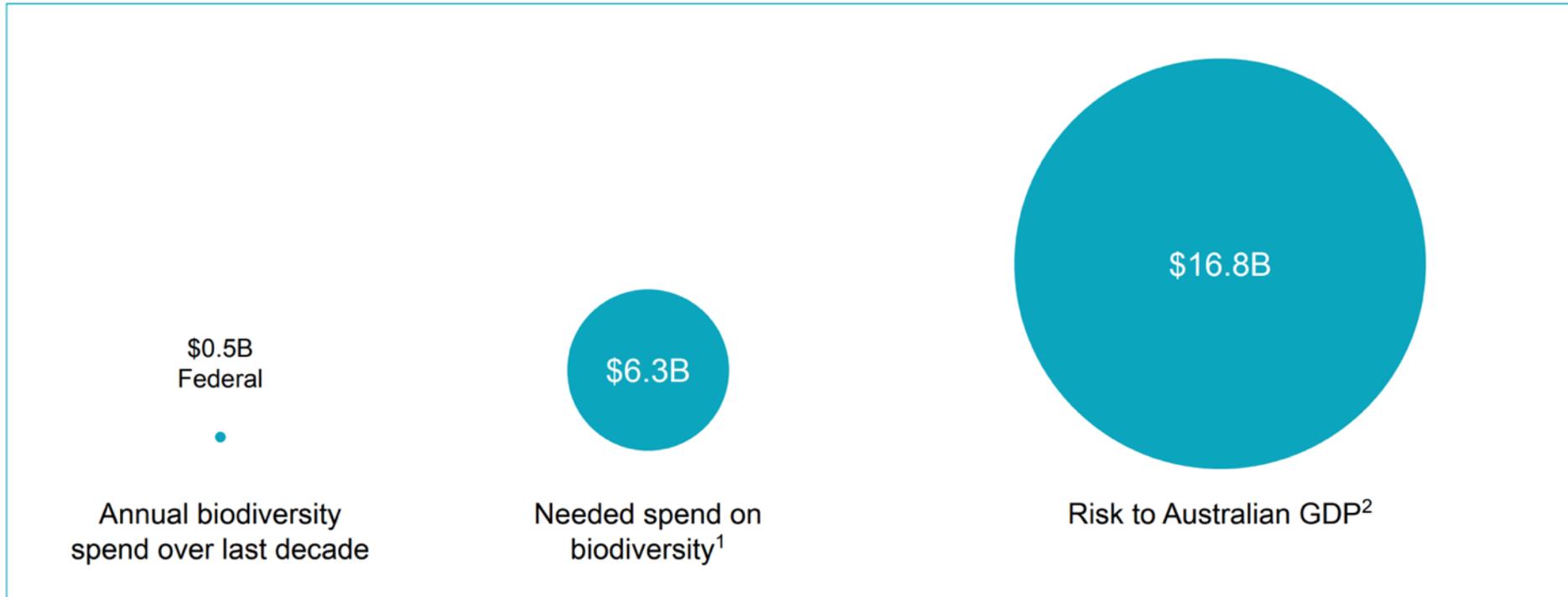


Anthony Albanese in the House of AAP

Biodiversity funding context



4 Annual Federal government spending over decade is <8% of estimated annual need, and <3% of risks posed to the economy



The World Bank has estimated high income countries could lose 0.7% of GDP by 2030 (A\$16.8B p.a.)

<https://30by30.org.au/blog/2024/05/27/the-price-of-nature/>

2

In the EU, biodiversity spending averages around A\$1.4 billion p.a.

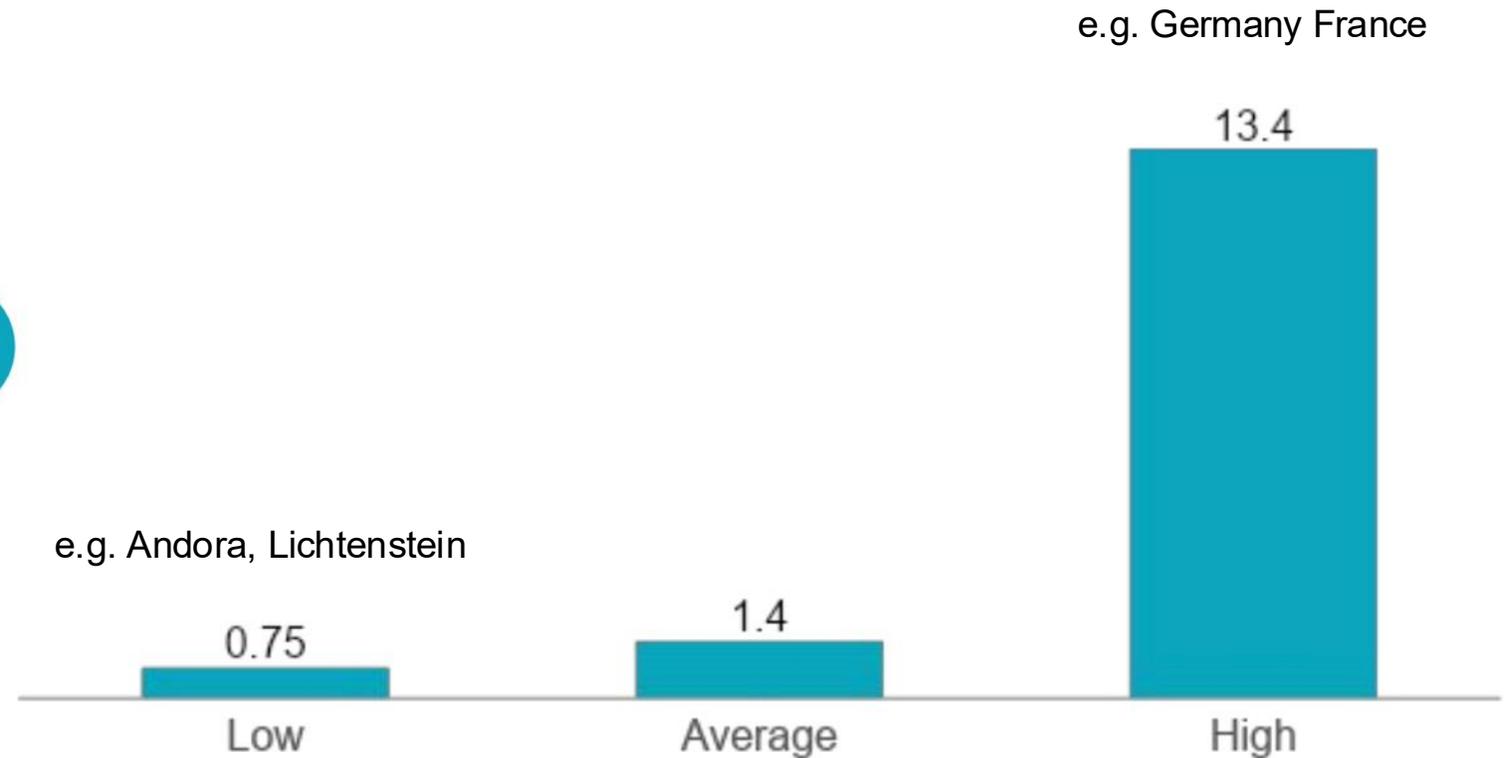
Data on global biodiversity spend is opaque and not consistent

However, EU benchmarking shows that public spending equated to 23B EUR in 2019

Average spending was \$A1.4B per member state with highest spending countries up to \$A13.4B p.a.



Annual spend on biodiversity (\$A B)



Where would \$6.3B/yr come from?



 Biodiversity Council

Identifying and assessing subsidies harmful to biodiversity in Australia

Biodiversity Council
Oct 2024

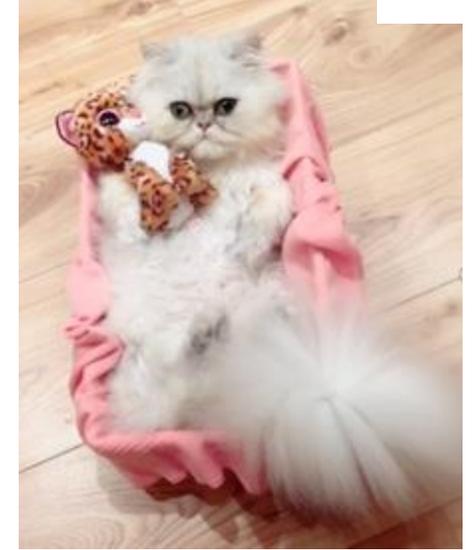


image: CUHRIG

biodiversitycouncil.org.au/resources

\$25B/yr in harmful subsidies:

- \$7.5B fuel tax credit scheme
- \$600M Pilbara ports
- \$440M Karri Karri Gas
- \$1.1B DAFF grants – Ag/Fish/Forestry
- \$1.1B DISR grants - Mining



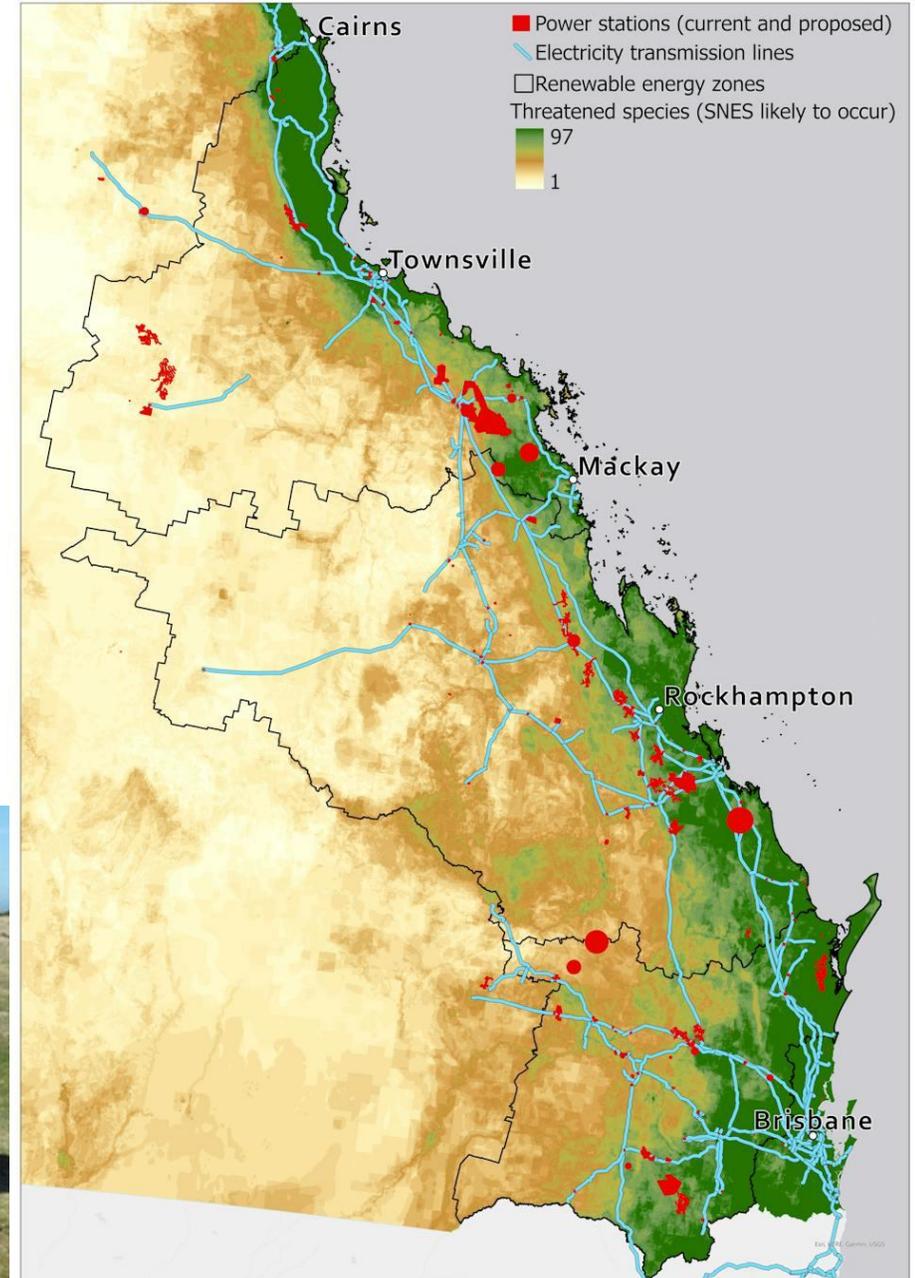
~ \$35B in 2022

Australia in summary

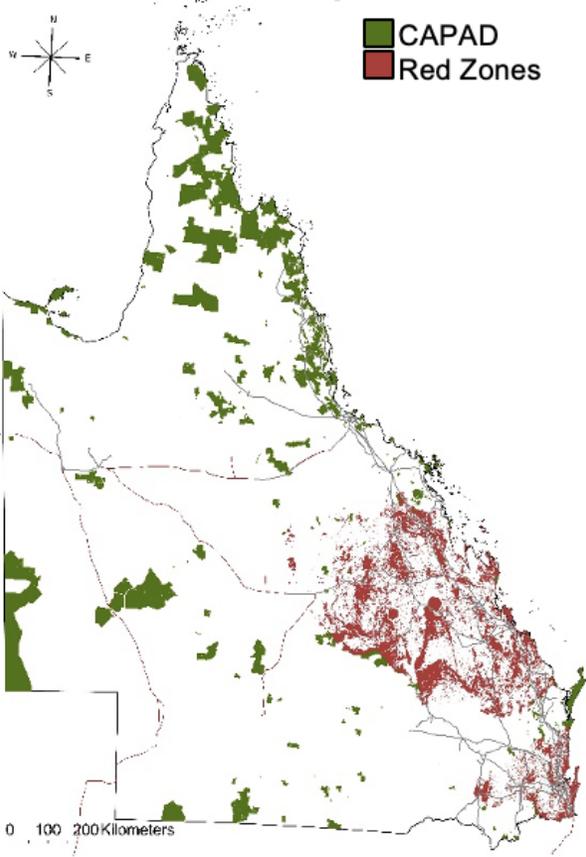
- Declining biodiversity
- Failing laws, Failed policy, Inadequate funding
- Nature positive everything is needed if we're to stop losing species
- For biodiversity, we must tackle climate through energy transition – but how to do it without trashing habitats and wind-sensitive species?



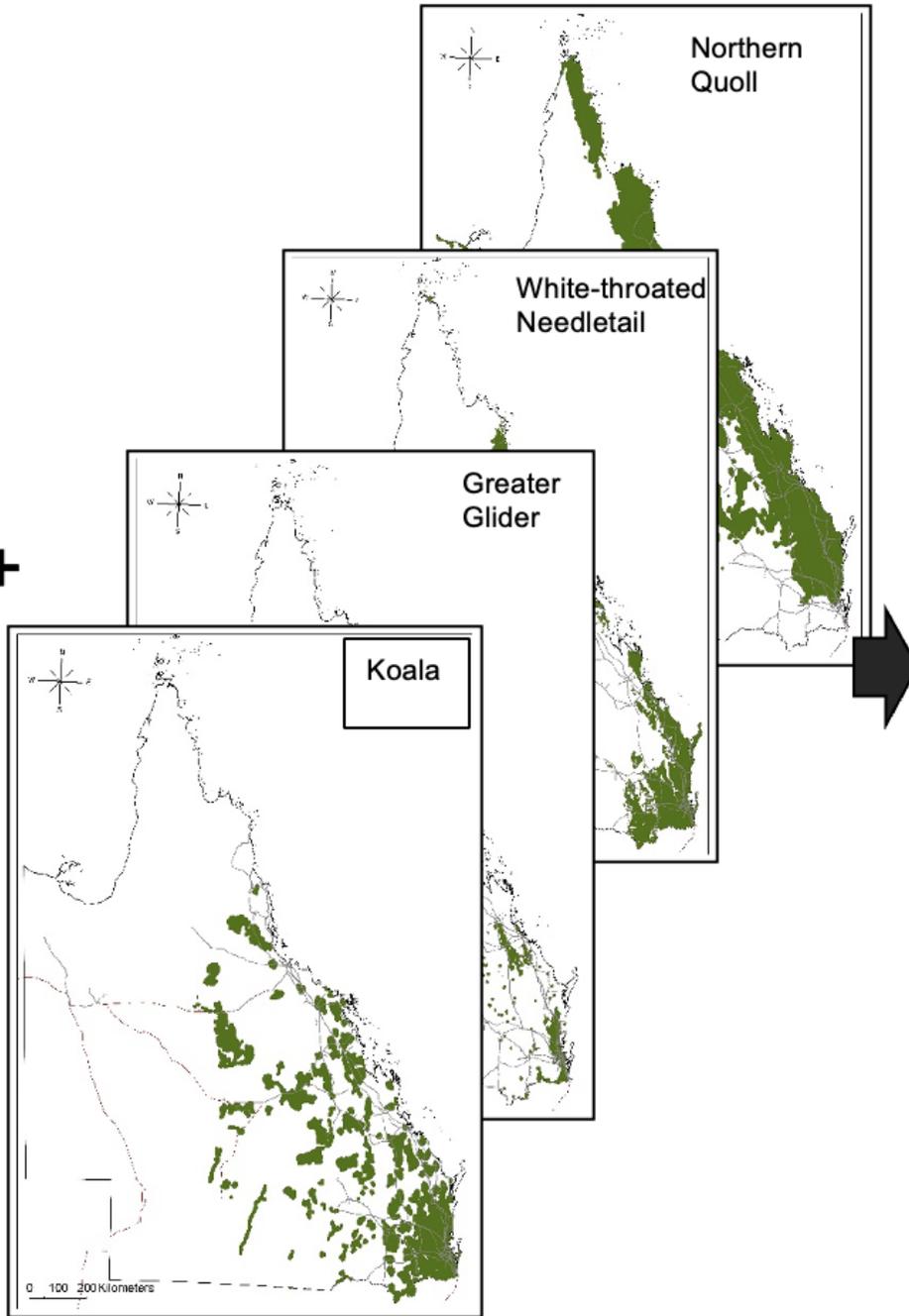
Australian biodiversity and the energy transition



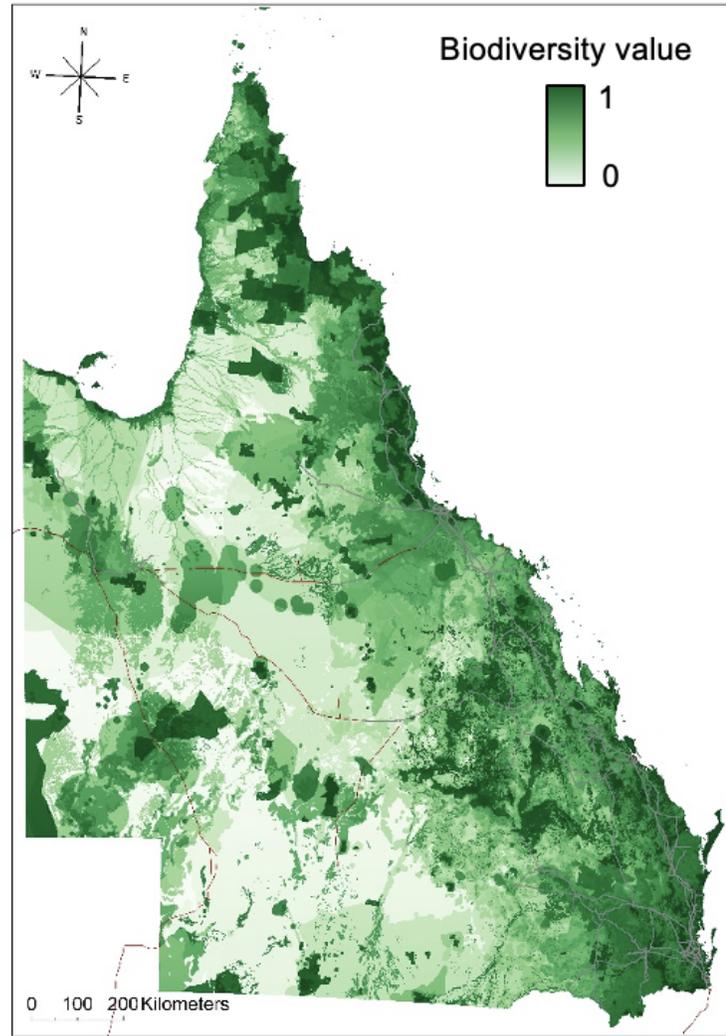
Conservation priorities



+



Prioritization



Species and ecological community data

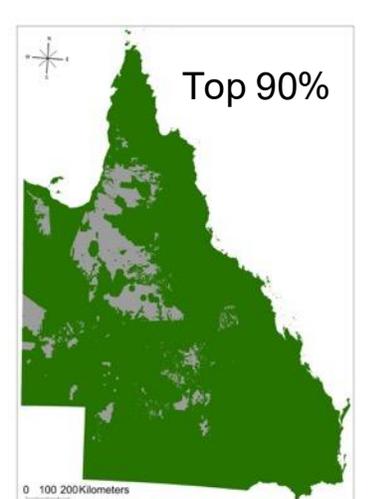
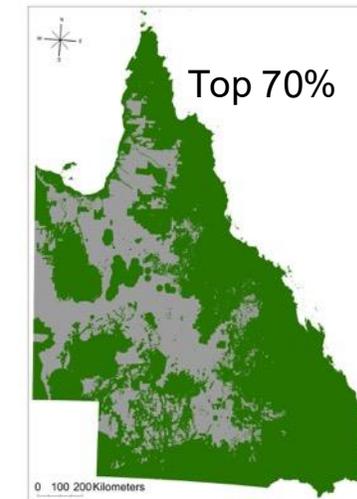
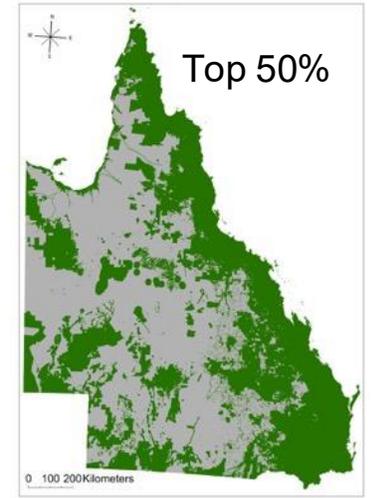
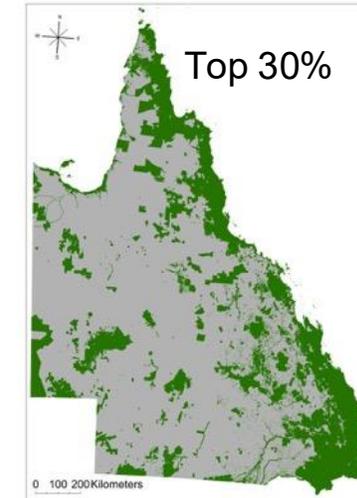
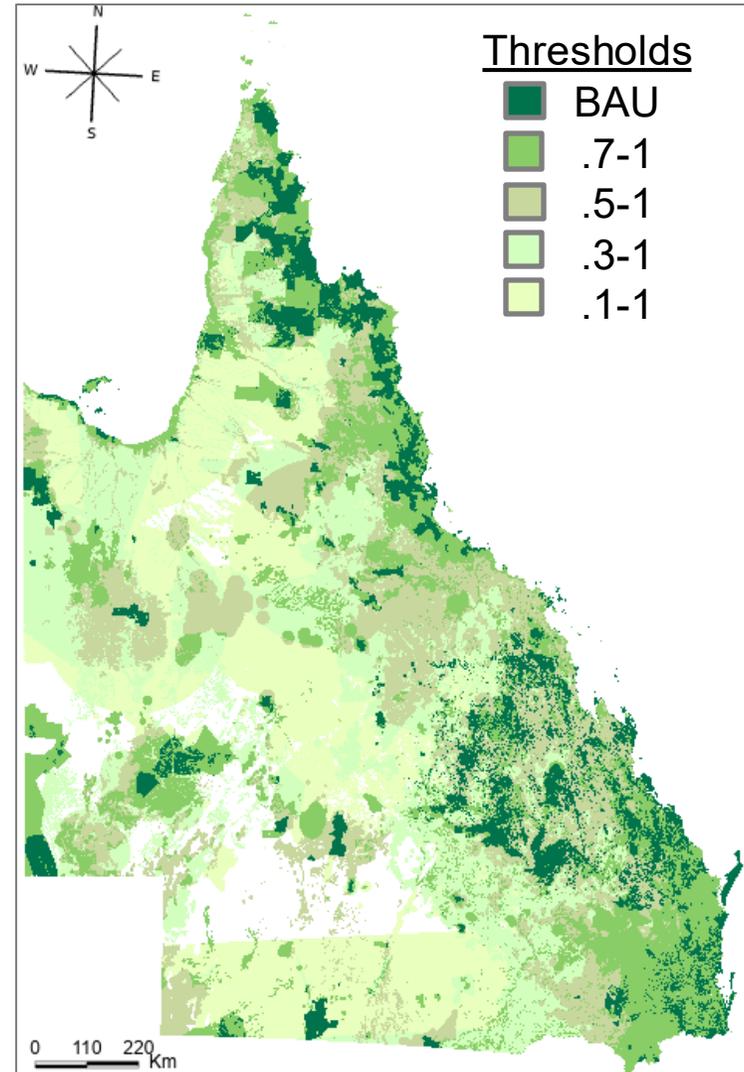
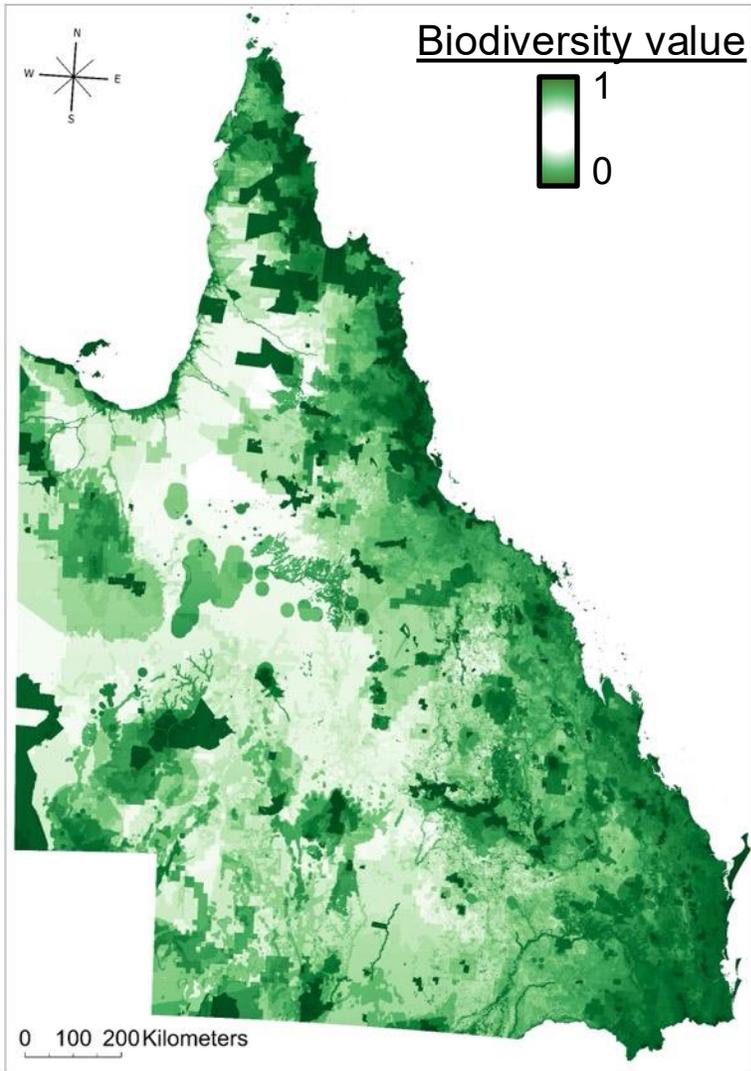
Andrew Rogers



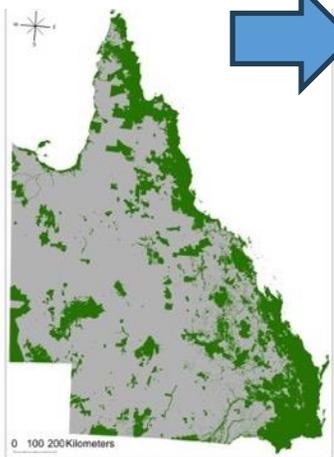
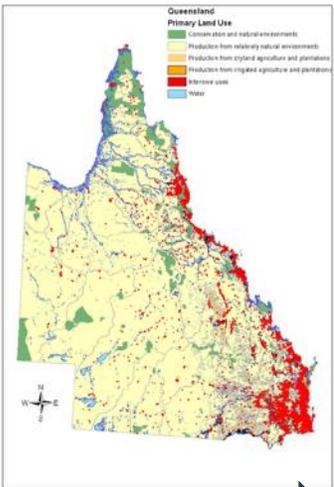
Zonation Thresholds

546 Biodiversity features: SNES, ECNES

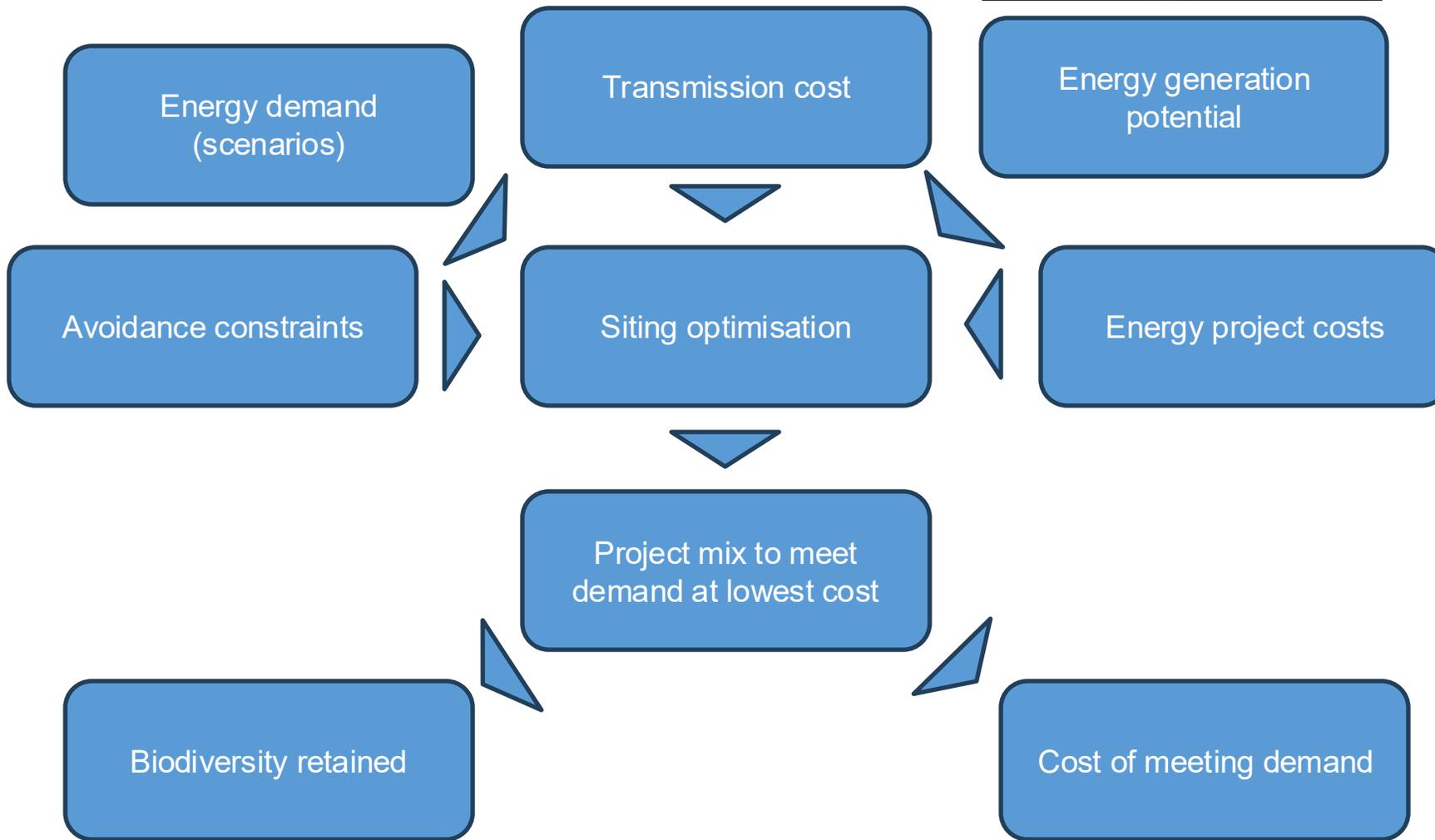
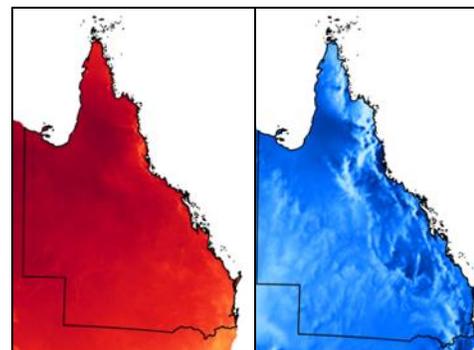
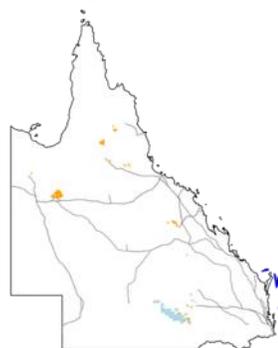
Net Zero infrastructure model exclusion layers



Cities, towns, irrigated and dryland ag, plantations

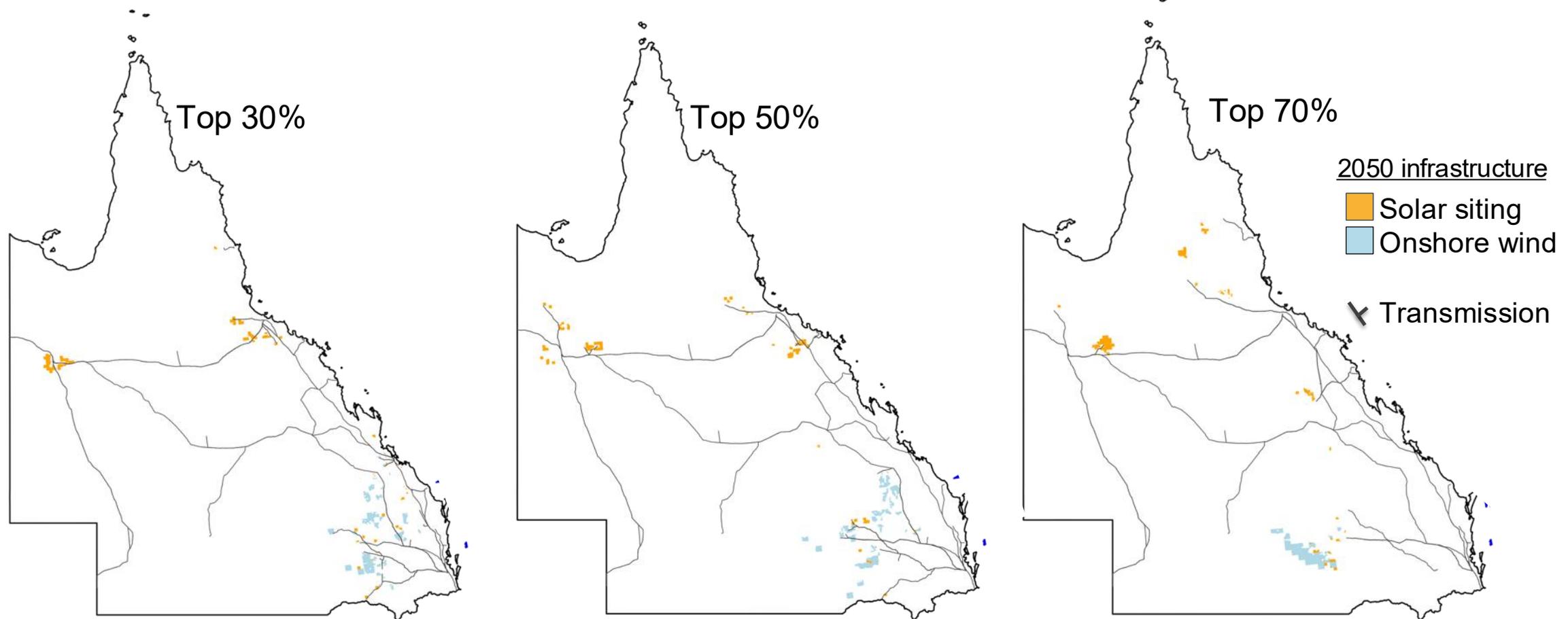


High biodiversity, RAMSAR, IPA, National Parks, State Forests



Energy system planning – Results: VRE with increasing biodiversity protection

	Solar PV	Onshore wind
Capacity GW	49	19
Area available km²	1,244,394	1,179,494
Direct footprint (% of available area)	992 km ² (~0.1%)	69 km ² (~0.01%)



System built-out costs under different conservation thresholds

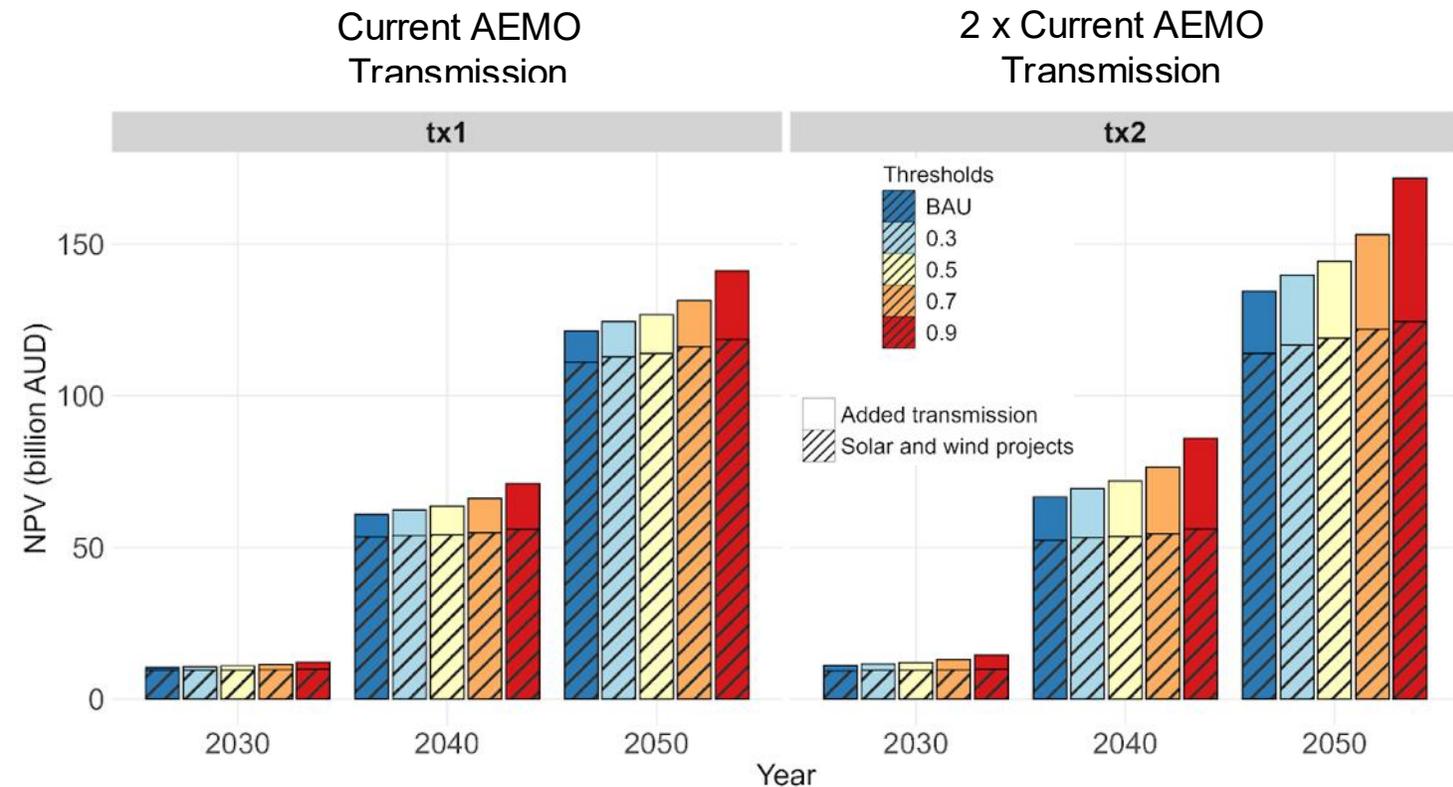
Cost increases with increasing biodiversity avoidance

- Net present value of total costs from 2020 to 2050

Threshold	% Cost increase	
	Current trans costs	2x Trans costs
30	2.4	4
50	4.4	7.4
70	8.2	13.9
90	16.2	27.8

- Transmission costs are 10-20% of the renewable built-out costs

Cost of solar and wind projects, and transmission costs 2020-2050



Results: Estimated total electricity costs relative to BAU

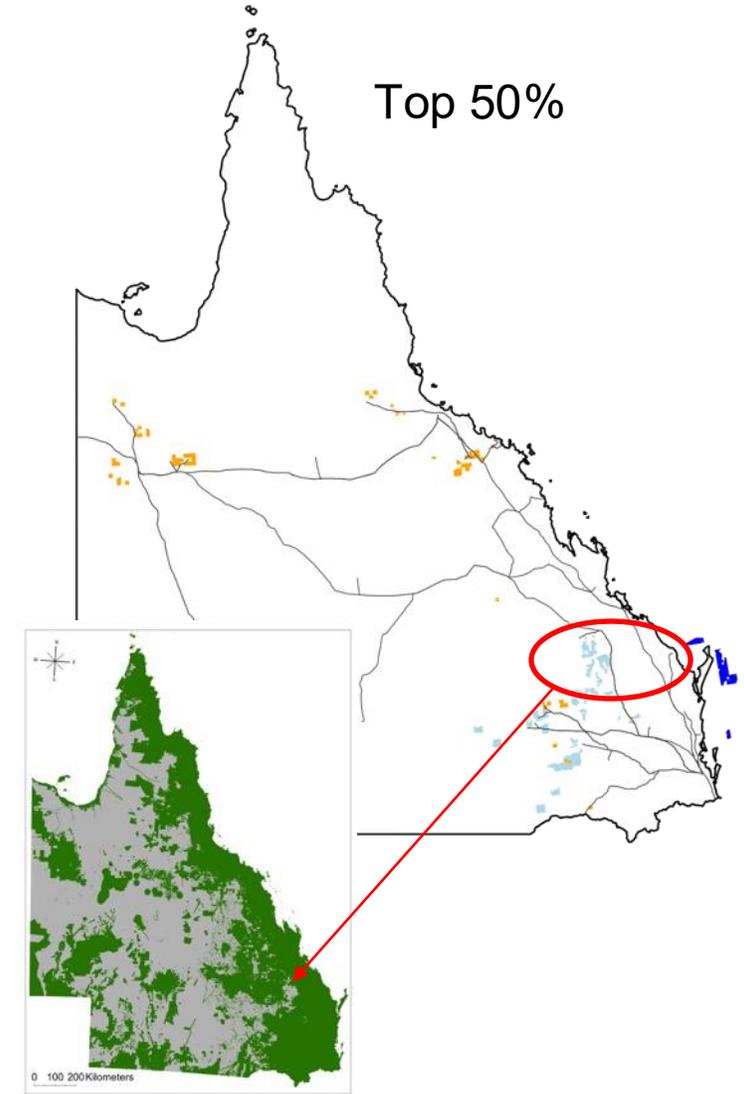
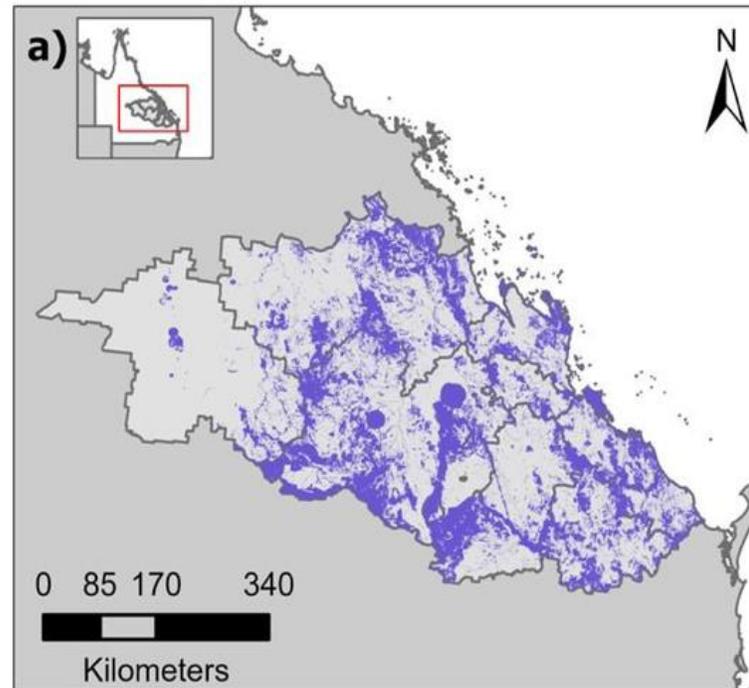
	x1 TX costs					x2 TX costs				
	BAU	Top 30	Top 50	Top 70	Top 90	BAU	Top 30	Top 50	Top 70	Top 90
% species distributions conserved	46	91	96	98	99	46	91	96	98	99
Wholesale market \$/MWh	174	174	174	174	176	174	174	174	175	176
TX cost \$/MWh	44	47	49	53	62	59	64	69	78	96
DN cost \$/MWh	131	131	131	131	131	131	131	131	131	131
Industrial \$/MWh	218	221	223	228	239	233	238	243	252	272
Increase vs BAU %		1%	2%	5%	10%		2%	4%	8%	17%
Residential \$/MWh	349	352	355	359	370	364	370	375	384	403
Increase vs BAU %		1%	2%	3%	6%		2%	3%	5%	11%
Renewable Availability TWh	215	211	205	206	216	225	221	212	215	225
Demand Twh	101	101	101	101	101	101	101	101	101	101

Modest cost increases for both industrial and residential customers with most of biodiversity protected

Manuscript: <https://www.researchsquare.com/article/rs-7014207/v1>

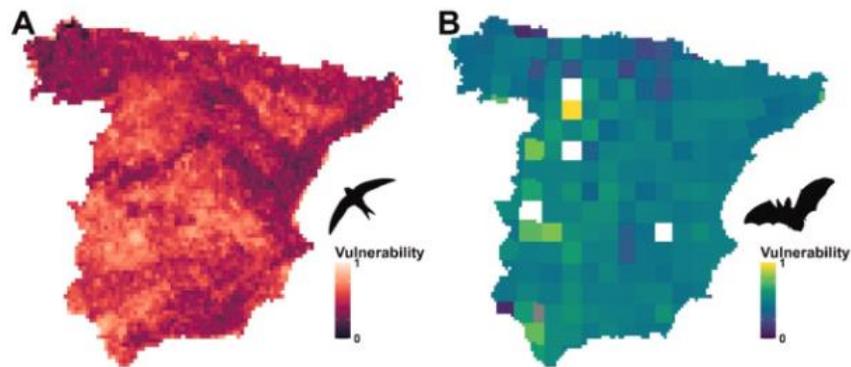
These maps are for broad scale prioritization

- Broad prioritisation at state/national scales
- Low accuracy/relevance habitat mapping
- No community priorities/willingness considered



Matching impact to vulnerability

- Wind generation impacts depend on where they occur – mapping vulnerability is needed -birds, bats, ... Avistep...
- Solar arrays, land clearing but maybe not for all vegetation types?



Journal of Environmental Management
Volume 380, April 2025, 124961



Research article

Mapping bird and bat assemblage vulnerability for predicting wind energy impact

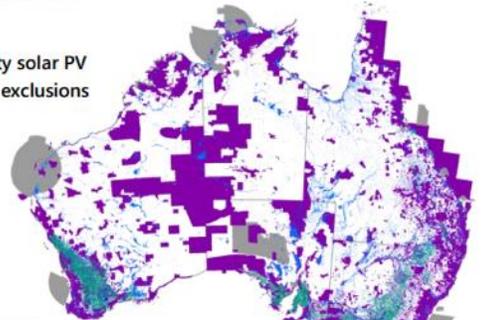
Jon Morant ^{a, b, c, d, e}, Lara Naves-Alegre ^a, Henar Macías García ^c, Elena Tena ^d,
Sonia Sánchez-Navarro ^d, Jesús Noguera ^a, Carlos Ibáñez ^a, Esther Sebastián-González ^b, Juan
Manuel Pérez-García ^a



National priorities to regional plans?

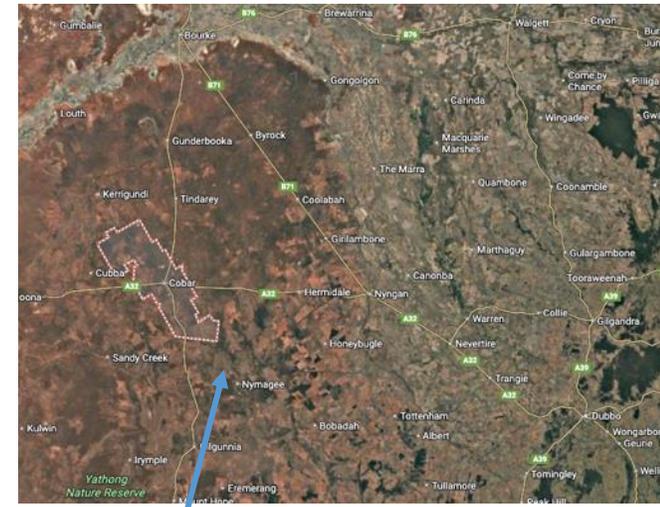
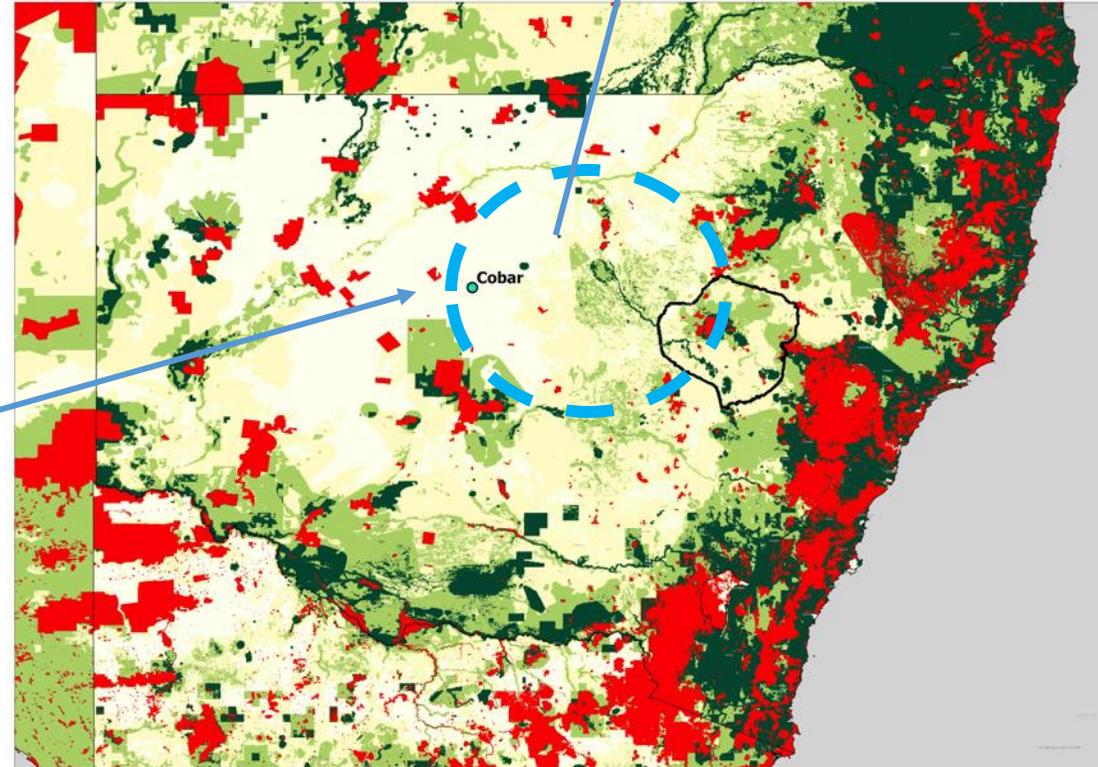
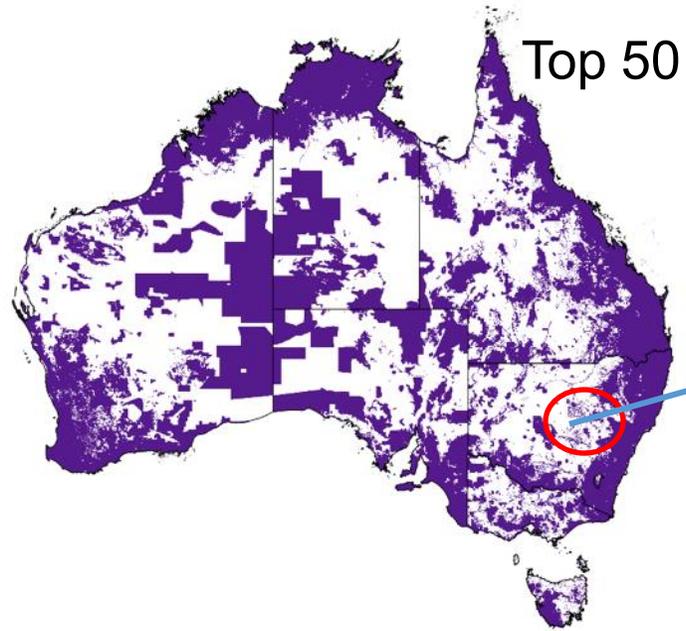
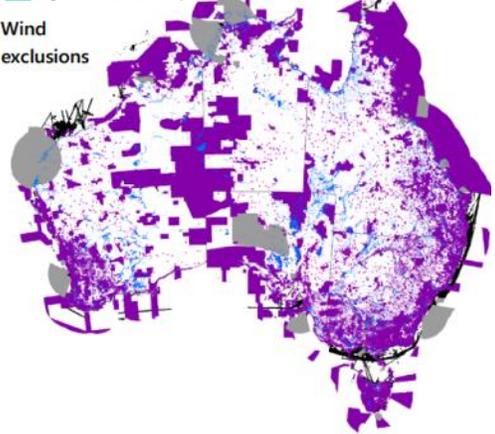
Figure 1 | Base utility solar PV (top) and wind (bottom) land exclusion layers used for the identification of candidate project areas.

Utility solar PV
land exclusions



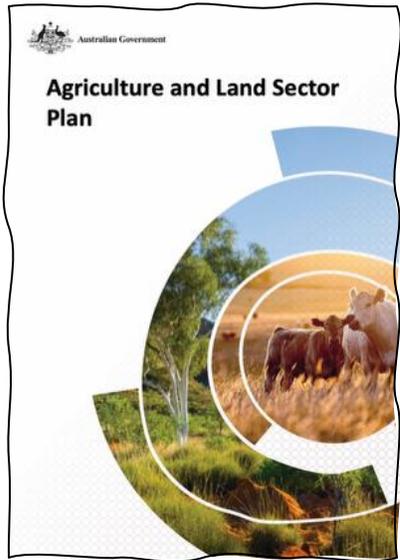
- National Map Reserves
- Mining and shipping lanes
- Urban areas and transportation
- Water and wetlands
- Defence
- Protected areas and reserves
- Irrigated lands and rainfed croplands

Wind
land exclusions



Not trivial – but definitely possible...

A couple of other complications...



 Land sector	-74 Mt CO₂-e	Environmental plantings	
		Plantation forestry	
		Farm forestry	Blue carbon
		Savanna fire management	Biochar
		Managing lands to increase soil carbon (e.g. pasture improvements)	

74Mt/10t/ha ~ 7.5M hectares >> > area of Tasmania



Ingredients for good regional energy planning

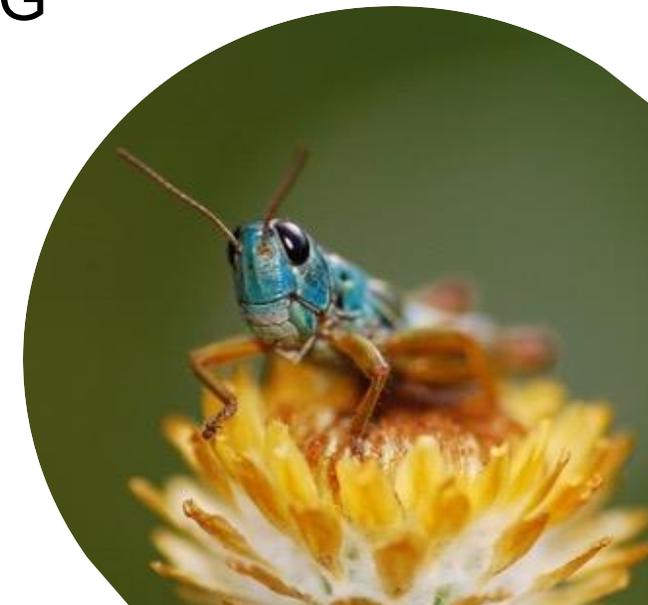
- Good species, ecosystem mapping, culturally significant species/places
- Mapping and elicitation processes for *all* community values, including cultural heritage, farming and aesthetic values
- Participatory processes - power sharing – benefit sharing
- The right trade-off between speed and trust
- Doing it right now!
- Existing and emerging pressures - cumulative impacts (e.g. mining, new commodity demands)
- Scheduled review, contingencies for new information, emerging priorities

Conclusions...



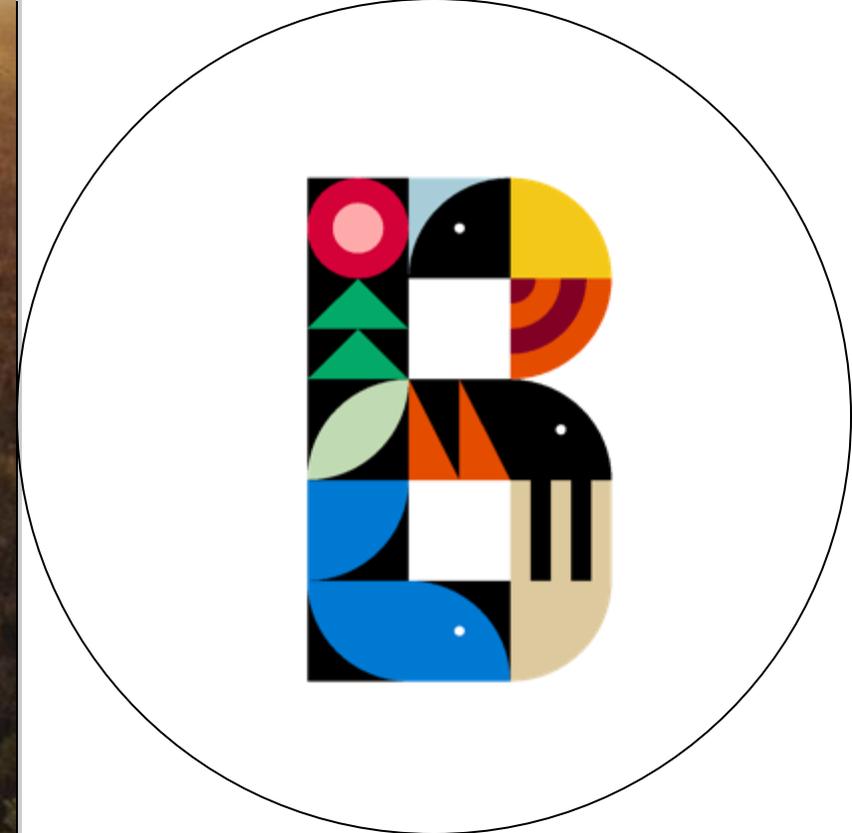
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- There is currently enough degraded (usually ex-ag) land to build a LOT of renewables without trashing nature
- BUT a LOT of engagement and planning are needed to achieve a net-zero energy system that is good for nature and communities
- There could be a land squeeze with sequestration – PLANNING
- Political leadership is lacking – no investment in:
 - transmission infrastructure
 - necessary data (critical and irreplaceable)
 - necessary planning and community engagement
- What is the solution to lack of political leadership?



Thanks for having me

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Our founding donors

The Ian Potter Foundation, The Ross Trust, Trawalla Foundation, The Rendere Trust, Isaacson Davis Foundation, Coniston Charitable Trust and Angela Whitbread

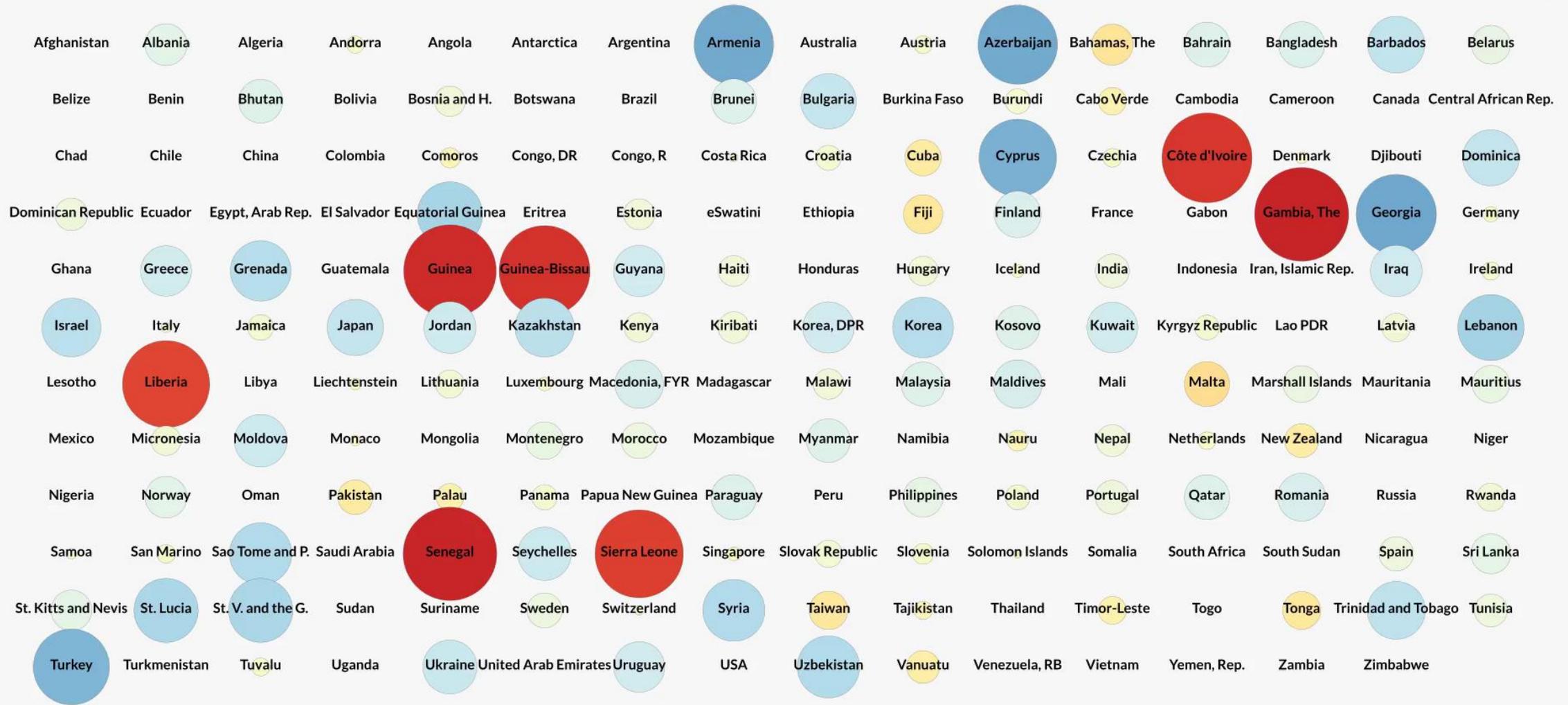
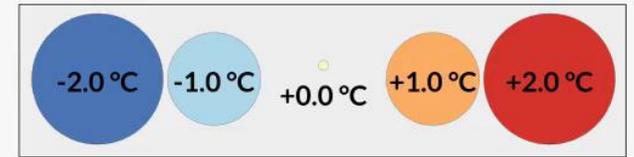


<https://biodiversitycouncil.org.au/>
<https://biodiversity.unimelb.edu.au/>

Image: Nicolas Rakotopare

Temperature Anomalies by Country Years 1880 - 2017

1880



Data Source:
 NASA GISS, GISTEMP Land-Ocean Temperature Index (LOTI), ERSSTv5, 1200km smoothing
<https://data.giss.nasa.gov/gistemp/>
 Average of monthly temperature anomalies. GISTEMP base period 1951-1980.

Video license: CC-BY-4.0
 Antti Lipponen (@anttilip)