Biodiversity Crises

Are we focusing on the right things?

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Biodiversity Exhibition 2023

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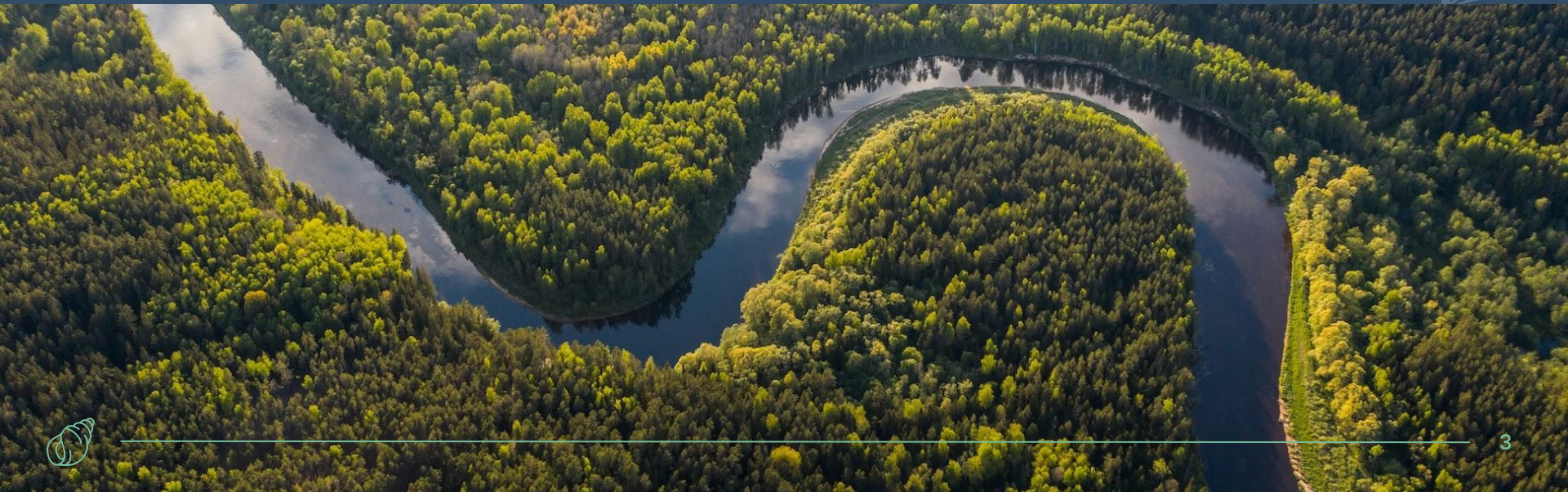


What is biodiversity?

The variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

United Nations (1992)

The importance of biodiversity

- Biodiversity provides ecosystem goods and services
  - Provides food, water, wood, biochemicals.
  - Regulates climate, diseases, water.
  - Shapes human culture, religion, aesthetics, sense of place.

Biodiversity values

Economic

- Monetary value.
- Resources including food.
- Drugs and chemicals.
- Genes for agriculture.

Utilitarian

- Direct use.
- Goods: wood, fodder, water.
- Services: prevent erosion, purify water, cycle and nutrients, regulate climate.

Psychological

- We derive pleasure from nature, directly or indirectly.
- Beauty, forest bathing.

Intrinsic

- Everything has value in and of itself, regardless of humans' views.
- These are reasons enough for conservation.

The full extent of life is unknown

- We don’t know the exact number of species on Earth.
  - ~2 million have been described.
  - Recent research suggests there are 563 million to 2.2 billion species on Earth (Li and Wiens 2023).
  - This means we’ve only documented 0.35% of life.

2 *Biodiversity loss*

Species extinction

- Extinction is when the last individual of a species dies.
  - However, **functional** extinction is when the species still exists, but not enough individuals remain for a viable population.
  - Many species are consequently closer to extinction than we realise.

Northern white rhino (*Ceratotherium simum cottoni*)

Sudan, the last male northern white rhino died in 2018, at the age of 44–45. Only two living females remain in the world, leaving the subspecies functionally extinct.

Mass extinction

- Extinction is a historically natural process.
- The background extinction rate is 0.1–1 E/MSY*.
  - This is extinction rate absent the presence of humans.

*Extinctions per million species per year.

Mass extinction

- Current extinction is difficult to estimate (Lamkin and Miller 2016), but—
  - It may be as high as 260 E/MSY, or 260,000 species in the past 500 years (Cowie et al. 2022), ~13% of all life.
- Meaning, we're in the midst of the **sixth mass extinction**, resulting from human activities.

What are the main threats to biodiversity?


HIPPO


(Not this kind)

H — Habitat destruction

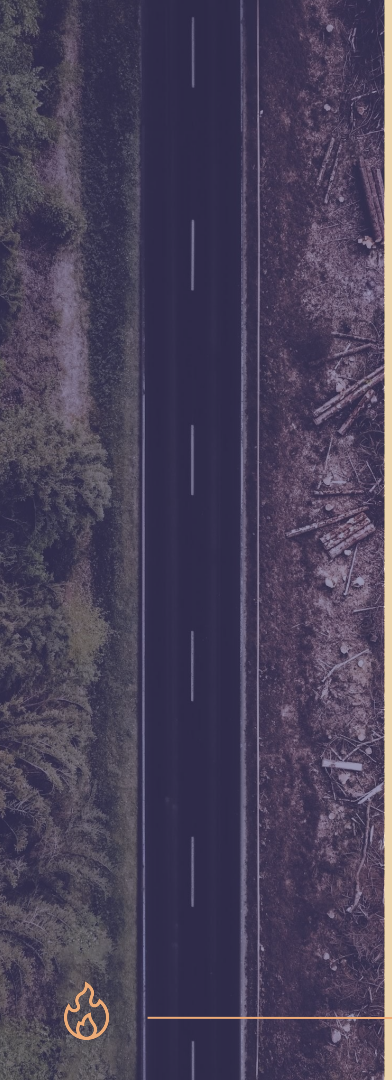
I — Invasive species

P — Pollution

P — Population

O — Overharvesting

Wilson (2002)



Habitat destruction

- Habitat destruction, degradation, and fragmentation are likely the most important causes of extinction today.
  - E.g. 85% of population decline in birds and mammals.
- Deforestation, agricultural expansion, urban development, and mining are all examples of habitat destruction.

The habitat destruction of Riau

A real view of deforestation over the decades

Riau: 1992

Source: Google Earth

Riau: 2002

Source: Google Earth

Riau: 2012

Source: Google Earth

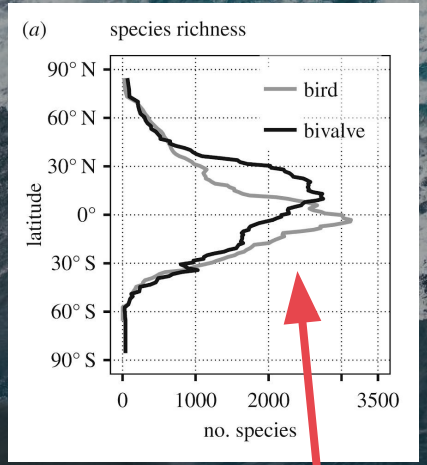
Riau: 2022

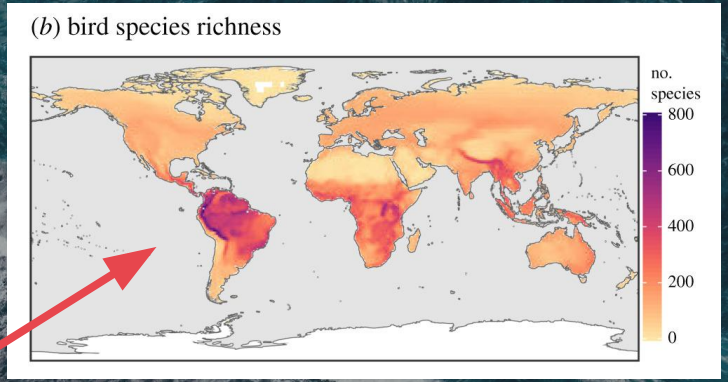
Source: Google Earth

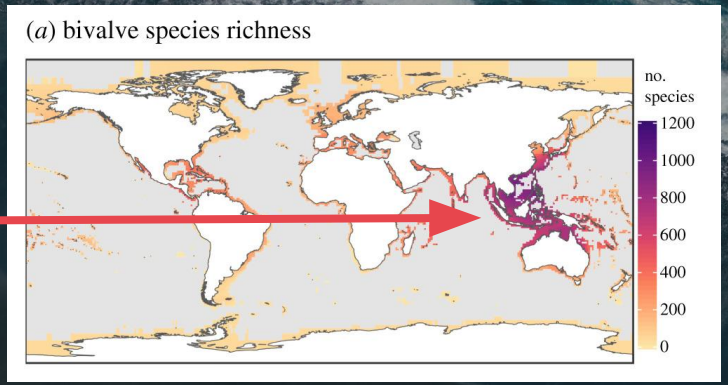
Why does the deforestation in Riau matter?

- Species are not evenly distributed.
- Some families are more abundant and diverse than others.
- Some regions are also more abundant and diverse than others.

Schumm et al. (2019)

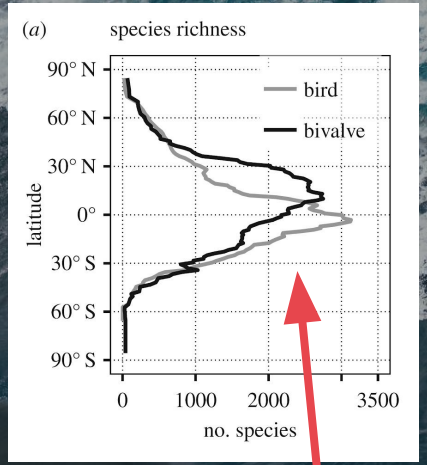


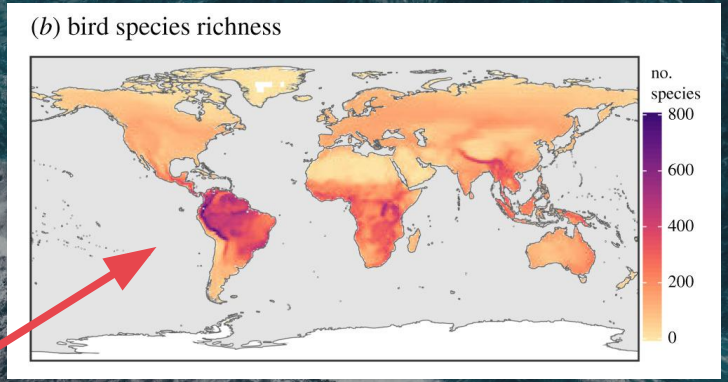


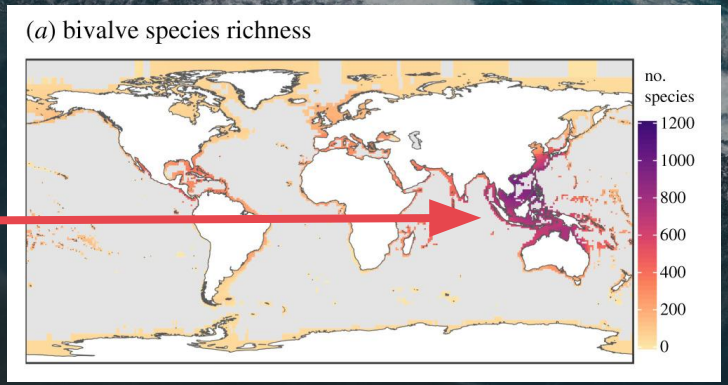


Species richness increases towards the equator.

Schumm et al. (2019)

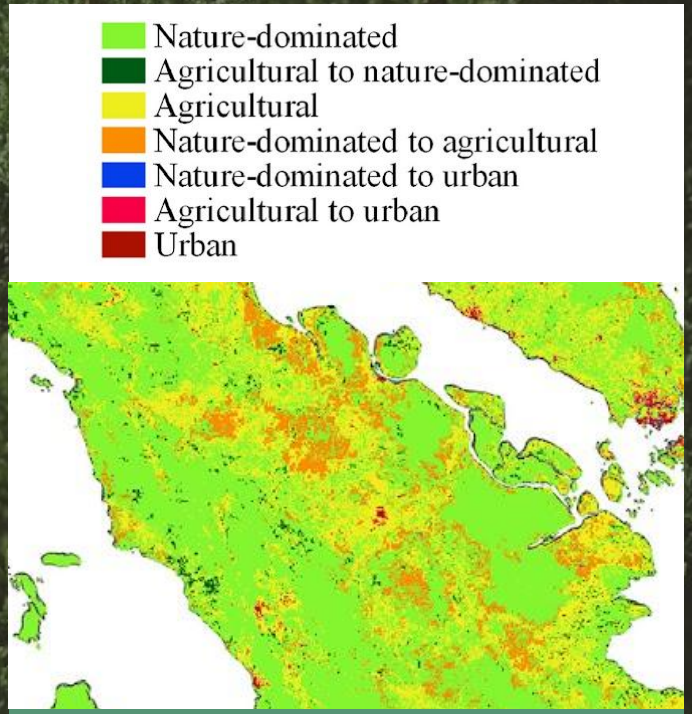




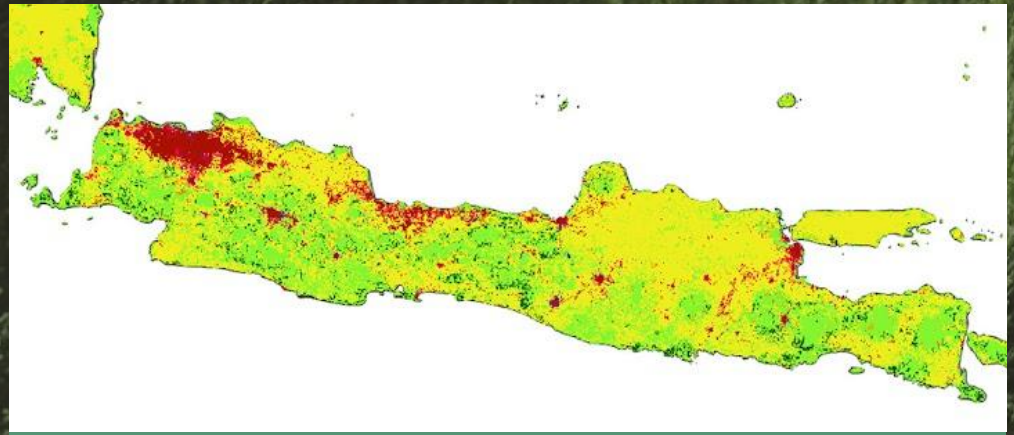


These become biodiversity hotspots.

Kong et al. (2019)



Land use change in Riau



Land use change in Java

Biodiversity hotspots account for only 1.5% of land, but if these hotspots are lost, a third of Earth's species would go extinct.

Invasive species

- Humans often introduce exotic species to ecosystems.
- These species can become invasive, where they—
  - Prey, parasite, compete with, or transfer diseases to native species.
  - Disrupt stable relationships in ecosystems.
  - Harm the local economy.

Tilapia (Tilapiini tribe)

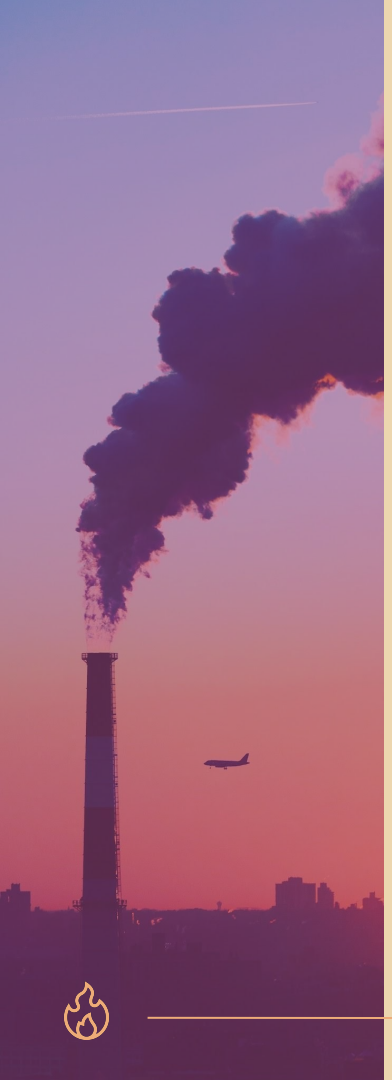
Actually native only to Africa and invasive everywhere else, including Indonesia.

Cats (*Felis catus*)

Cats are a globally invasive species and have driven many native fauna to extinction.

Burmese python (*Python bivittatus*)

Imported as a pet and escaped into the Florida Everglades, killing over 99% of some species.

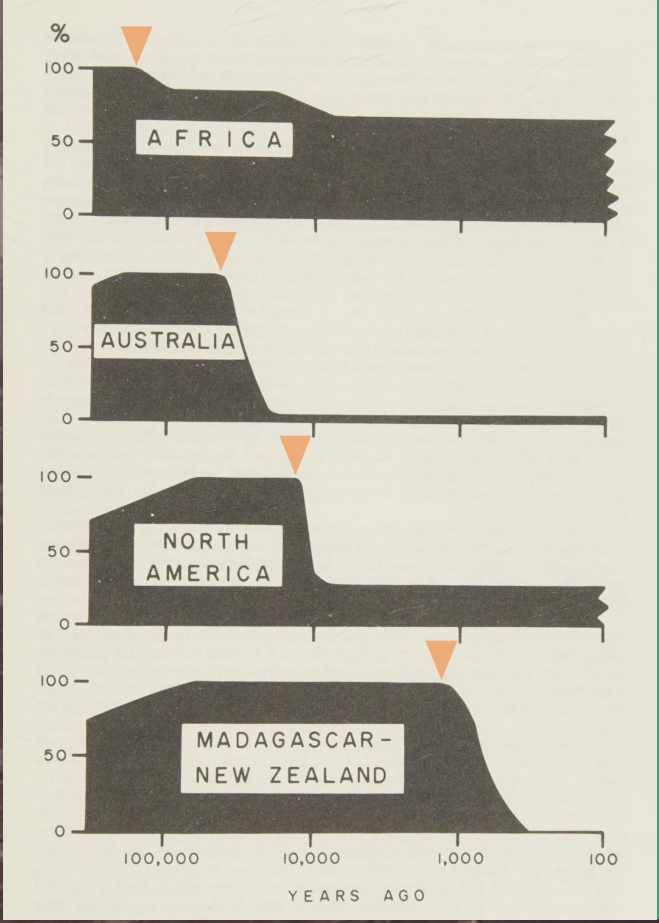


Pollution

- Direct discharge of pollutants into the environment or atmosphere.
- Has no boundaries—i.e. our neighbors often pay the price for our waste.
- Alters habitats to the point where some plants and animals cannot adapt.
- What pollution doesn’t destroy can end up in our food and eventually our bodies.
    - Bioaccumulation/biomagnification.

Population (of humans)

- This was as true 15,000 years ago as it is today: **humans have a significant impact on the environment and the animals around them.**



Arrival of humans

Humans vs. large mammals

Historically, mass extinction tends to follow us wherever we go.

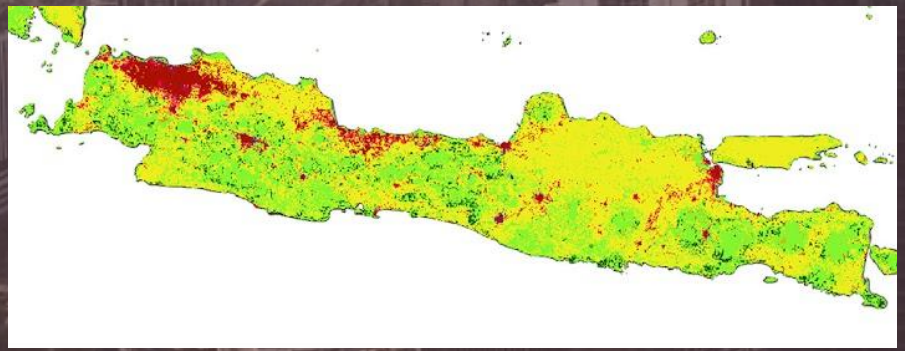
Martin and Klein (1984)

Population (of humans)

- As populations increase, so does the demand for food, water, shelter, and fuel.
  - Exacerbating our impact on the environment.
  - Compounding HIPPO.
- This inevitably means further expansion into—and exploitation of—high biodiversity areas.

The erosion of Java: urbanization and loss of nature

As humans expand, more and more land is converted to satisfy our needs, sacrificing existing ecosystems.



Buchori et al. (2017)

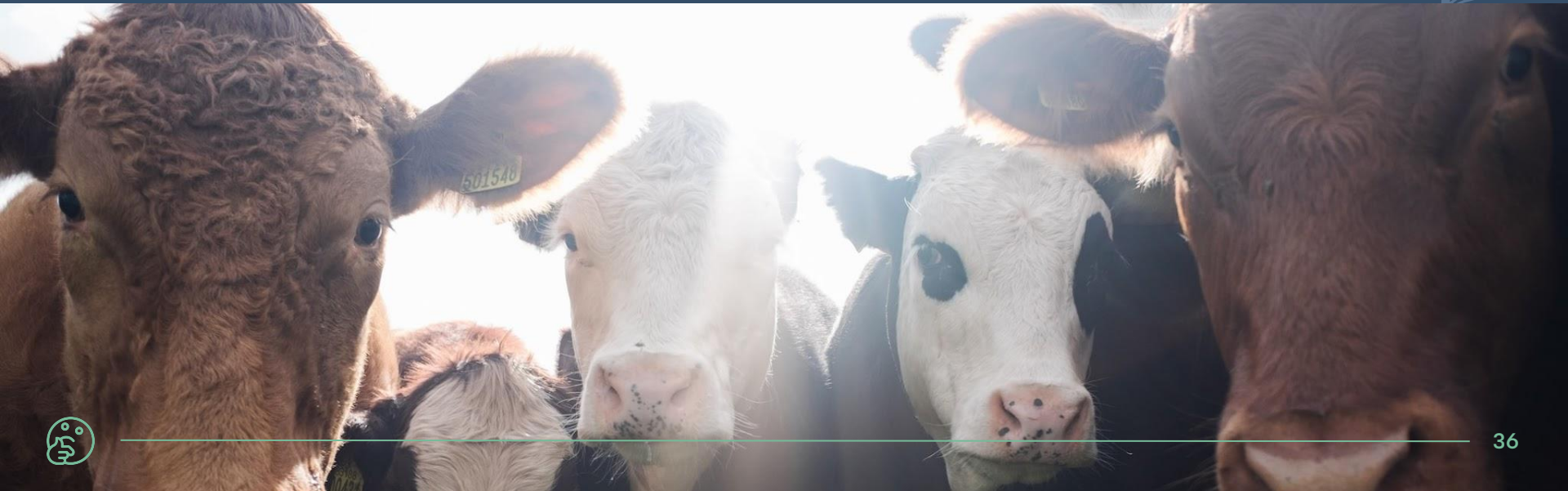
Overharvesting

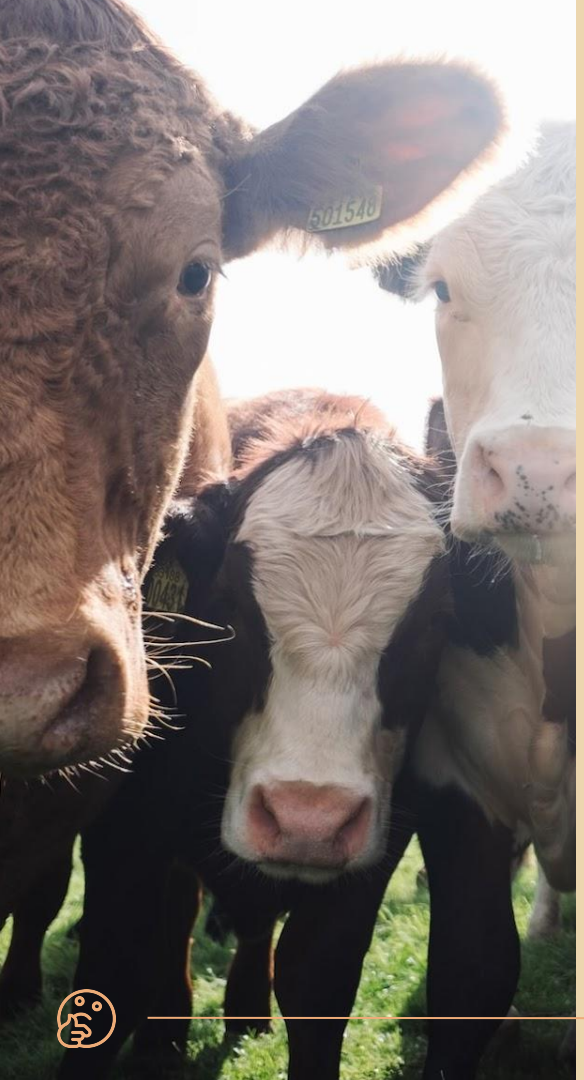
- Essentially overexploitation, with both overharvesting and overconsumption.
  - Harvesting at rates that exceed a population's ability to rebound.
    - Overhunting, overfishing, unsustainable logging.
  - Excessive use of natural resources; taking more than we need.

Overharvesting

- Overexploitation is a major cause of the emptying of the world's oceans (Rocha et al. 2014).
- Top carnivores are affected by our exploitation, because we take their prey.
- It's not just about taking resources:
  - More energy demand means more mining, drilling, and even more space necessary for renewables.

3 *What you know might not be the truth*





What you know might not be the truth

- The following slides should not discourage you or make you feel bad.
  - This is not about dunking on people trying to do good.
- Instead they warn against complacency, half-measures, and false solutions.

We cannot save every species

Conservation is always a lower priority than human progress, so we don’t have enough time, money, or manpower to save every species.

Which species would you choose to save?

How do we decide if a species is more “important” than another?

What is “worth” saving depends on our values.

Would you rather save the orangutan or have enough oil for gorengan?

It depends on how much we value exploiting Earth's resources.

“Green” energy is a misnomer

All forms of energy have emissions—including renewables. Building renewable energy arrays requires mined resources.

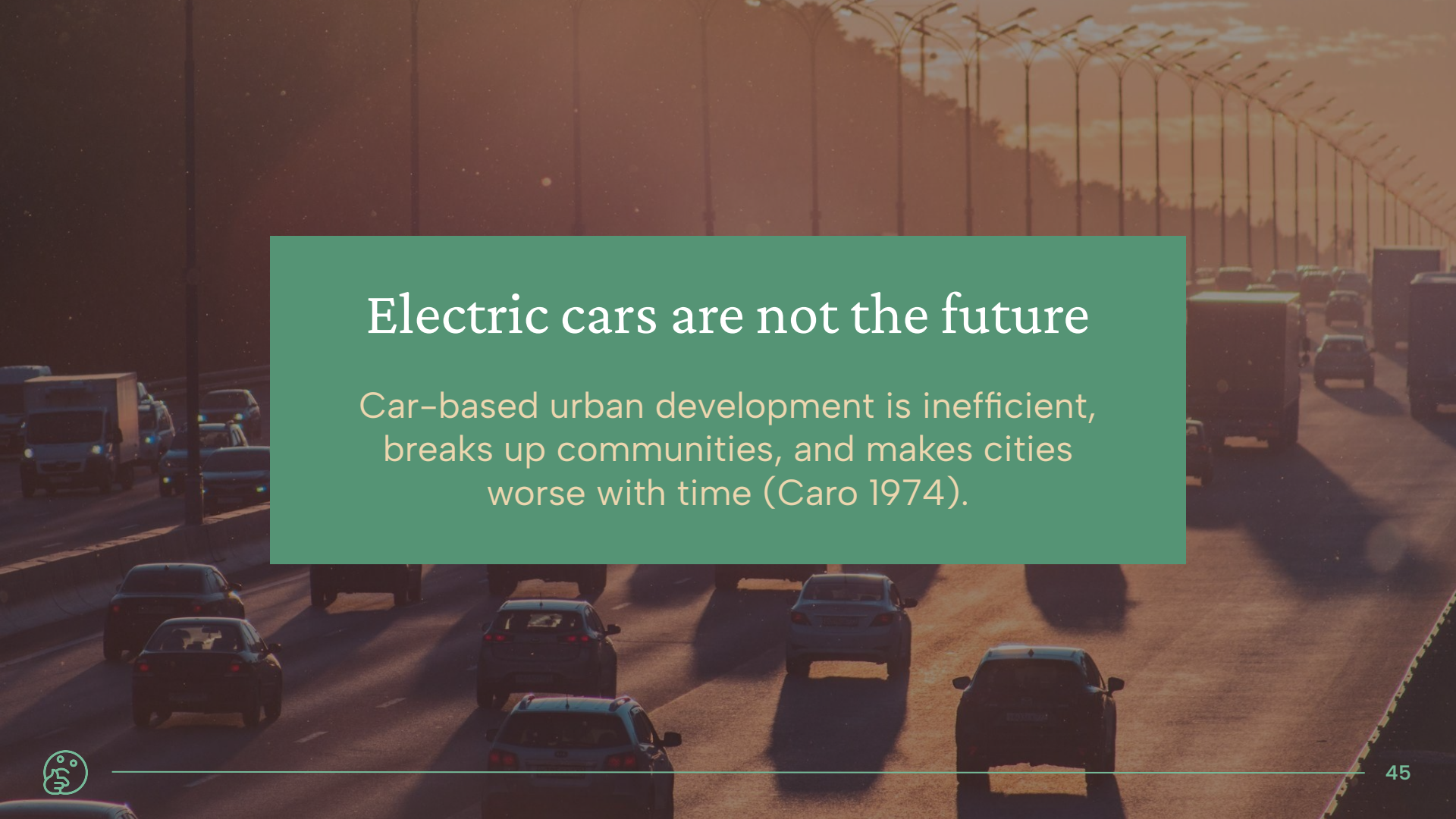
“Green” energy is a misnomer

Renewables also require massive tracts of land, with ecosystem-level effects. Land must be cleared and animals displaced.

Photos: Goncalves and Pereira (2022)

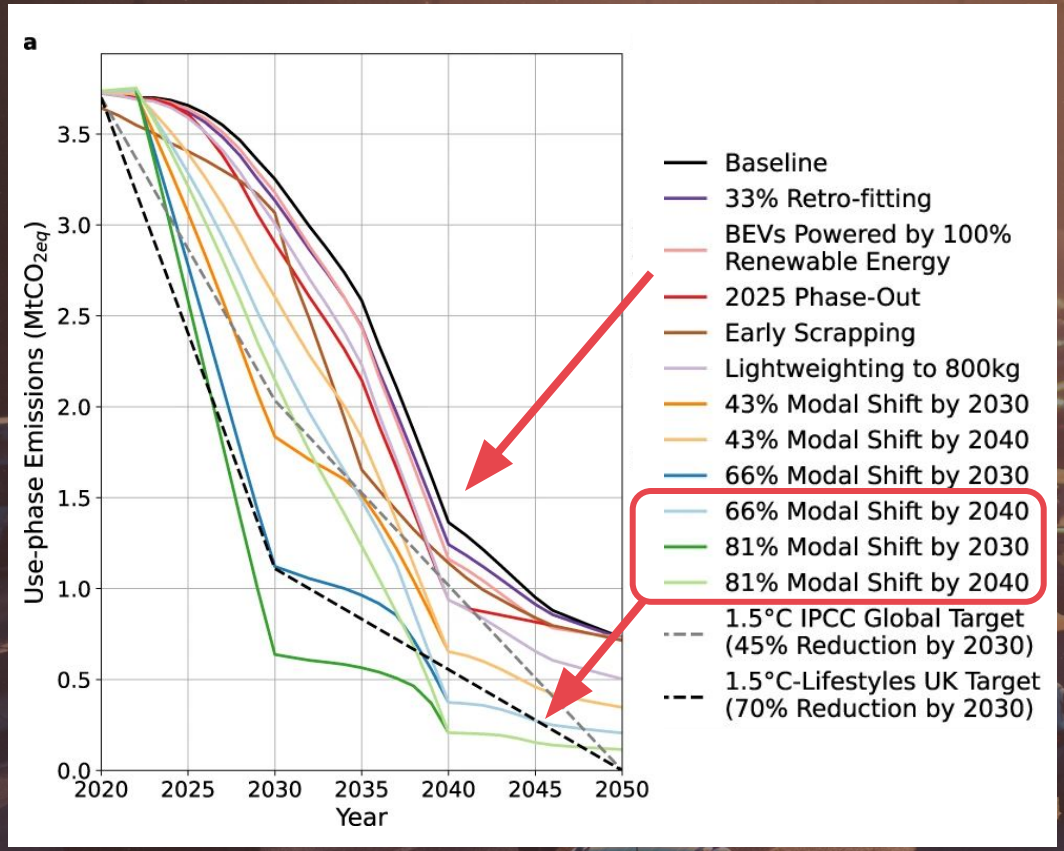
“Green” energy is a misnomer

Floating solar panels solve the land availability problem, but… what happens to aquatic species?



Electric cars are not the future

Car-based urban development is inefficient, breaks up communities, and makes cities worse with time (Caro 1974).



Winkler et al. (2023)

Electric cars are not the future

A UK study suggests we must abandon the status quo and change our transportation habits radically—more than a 100% switch to EVs.

Countries in the Global South struggle to meet development and climate goals because they are drained by the North

Southern resources are used to service Northern consumption, creating ecologically unequal exchange.

“In 2015 the North net appropriated from the South [$10.8 trillion] – **enough to end extreme poverty 70 times over.**”

“For **every dollar [countries] receive in aid they lose resources worth 30 dollars** through drain.”

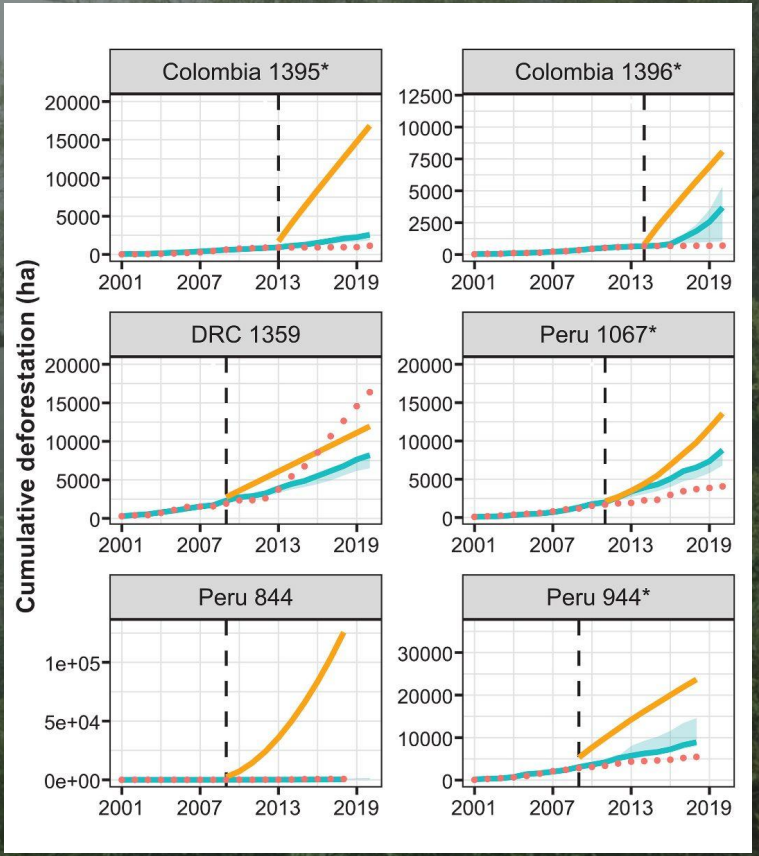
Hickel et al. (2022)

We will feel climate change more than others, but Indonesia has a global responsibility

Under a 2.7 °C scenario, over 100 million Indonesians will suffer from unprecedented heat exposure (Lenton et al. 2023). It might be unfair, but as a biodiversity hotspot, protecting forests is not just a national responsibility.

Carbon offsets feel good but have mostly failed

94% of carbon credits are worthless (Greenfield 2023); REDD+ projects have struggled to actually reduce deforestation (West et al. 2023), can harm forest communities (Poudyal 2018), and may create a false sense of security.



West et al. (2023)


We’re underestimating the impact of consuming meat and dairy

Where people rank the biggest contributors to global warming

Biggest contributor Smallest contributor

% ranked 1st (biggest contributor)	USA	UK	DE	FR	BR
Fossil fuels (coal, oil and gas)	21%	28%	18%	18%	19%
Deforestation →	12%	14%	19%	18%	33%
	12%	8%	9%	8%	9%
	9%	9%	10%	9%	4%
	7%	9%	4%	10%	7%
	3%	6%	11%	8%	2%
	10%	5%	4%	5%	8%
	4%	4%	5%	6%	2%
	3%	**3%**	**6%**	**3%**	**3%**
	4%	2%	1%	3%	2%

Northstar (2023)

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	9%	9%	10%	9%	4%
	7%	9%	4%	10%	7%
	3%	6%	11%	8%	2%
	10%	5%	4%	5%	8%
	4%	4%	5%	6%	2%
	3%	**3%**	**6%**	**3%**	**3%**
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Northstar (2023)

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	7%	9%	4%	10%	7%
	3%	6%	11%	8%	2%
	10%	5%	4%	5%	8%
	4%	4%	5%	6%	2%
Industrial meat →	**3%**	**3%**	**6%**	**3%**	**3%**
	4%	2%	1%	3%	2%

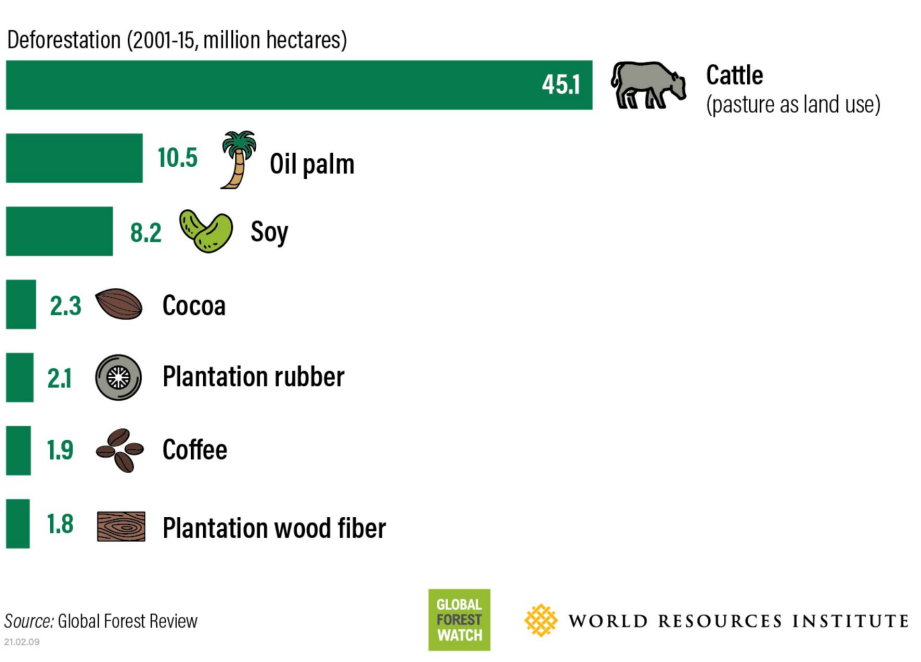
Northstar (2023)

Where people rank the biggest contributors to global warming

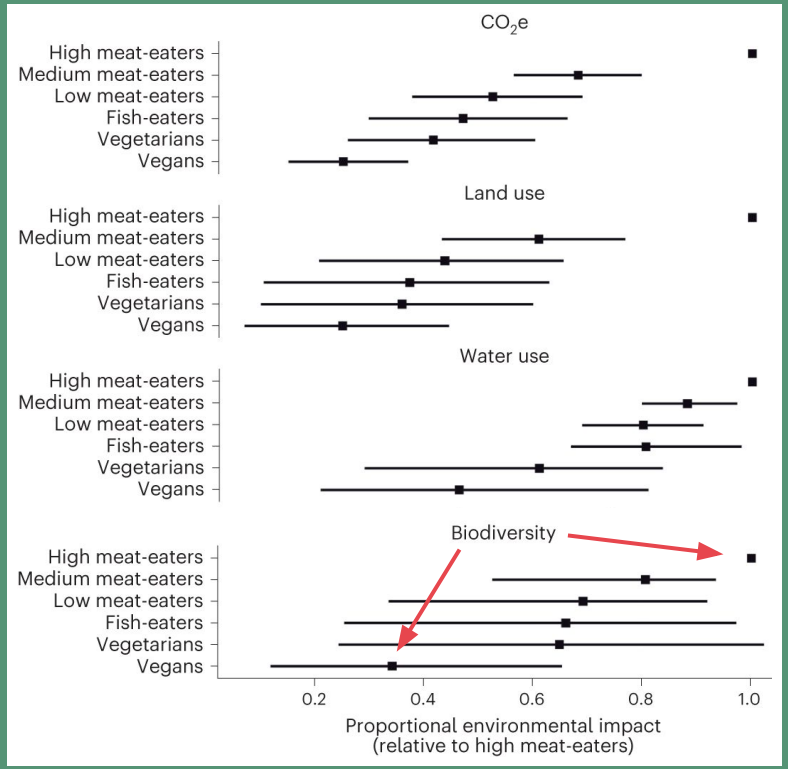
Biggest contributor | Smallest contributor

% ranked 1st (biggest contributor)	USA	UK	DE	FR	BR
Fossil fuels (coal, oil and gas)	21%	28%	18%	18%	19%
Deforestation	12%	14%	19%	18%	33%
Cars	12%	8%	9%	8%	9%
Overpopulation	9%	9%	10%	9%	4%
Overuse of plastics	7%	9%	4%	10%	7%
Aviation (airplanes)	3%	6%	11%	8%	2%
Chemicals manufacturing	10%	5%	4%	5%	8%
Overconsumption of goods	4%	4%	5%	6%	2%
Industrial meat	**3%**	**3%**	**6%**	**3%**	**3%**
Energy inefficient buildings	4%	2%	1%	3%	2%

Northstar (2023)



More than palm oil and soy production, cattle ranching is by far the primary cause of forest replacement (Goldman 2020).



A non-meat diet is consistently less harmful to the environment (Scarborough et al. 2023).

4 *Our ecological footprint*

What can we do?

- Everyone has a carbon footprint… but before we can act, we must highlight the most harmful people on the planet: **billionaires**.
  - Billionaires' carbon footprint is hundreds to thousands of times that of yours.

Roman Abramovich

Emitted ~34,000 metric tons of CO_2... equal to 8,500 people.

Annual emissions in 2018, based on Wilk and Barros (2021).

Bill Gates

Emitted ~7,500 metric tons of CO_2... equal to 1,875 people.

Annual emissions in 2018, based on Wilk and Barros (2021).

Elon Musk

Emitted ~2,100 metric tons of CO_2... equal to 525 people.

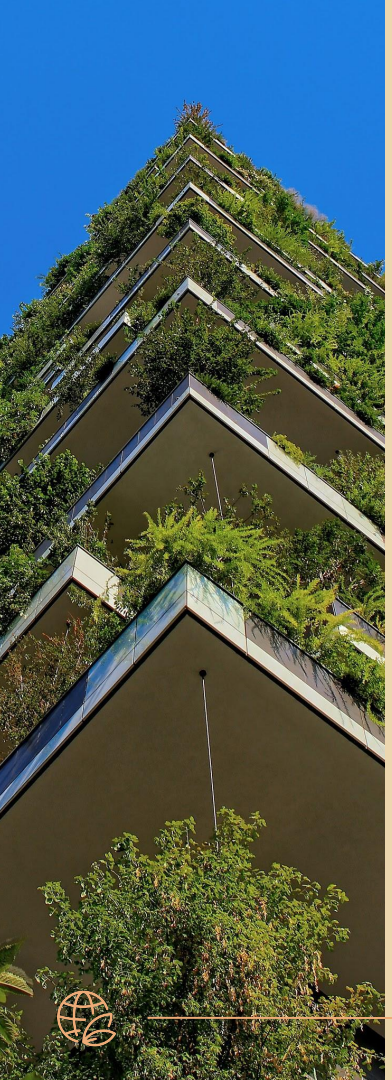
Annual emissions in 2018, based on Wilk and Barros (2021).

What can we do?

- It helps to reduce meat, dairy, and energy consumption, but...
- Without addressing the emissions of the world's richest people, focusing on our personal footprint is meaningless.
- We have to work together, and **advocate societal changes**.

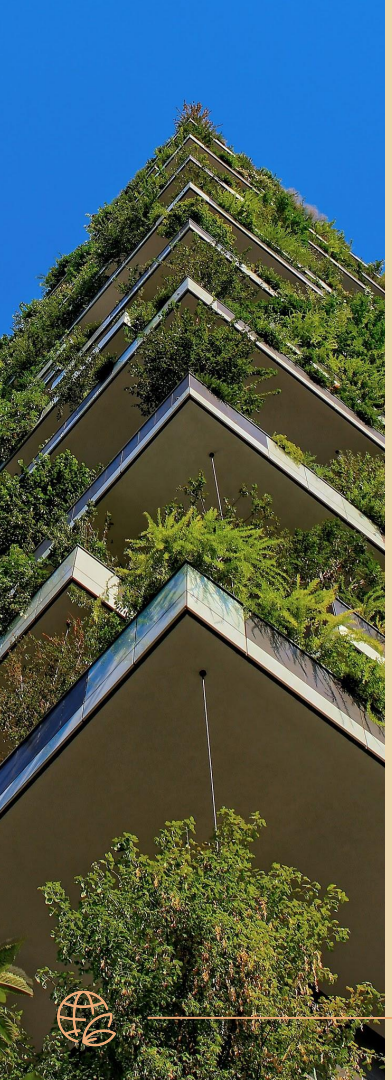
Two potential ways

- Green growth:
  - It's possible to maintain economic growth *and* ensure a sustainable future; e.g. with better technology.
- Degrowth (or post-growth):
  - A sustainable future means we must slow economic growth, consumption, and energy usage (Hickel et al. 2022).
- No consensus on best way (Boston 2022).



What we can do!

- With degrowth, we acknowledge the *intrinsic* value of Earth and our place in it.
- Scale down the destructive industries.
- End planned obsolescence, encourage reuse and longer-lasting products.
- Universal public services.
  - Healthcare, education, housing, food, internet, energy.



What we can do!

- Train and mobilize labour towards restoration, retrofitting, and social care.
- Protect and support forest communities so they don’t depend on exploitation.
- Reduce working time, so people can focus on rehabilitative tasks.
- Debt Jubilee focused on the poorest nations, ending the uneven exchange (Graeber 2011).
- And finally… we can organize.

Russ Hanneman (Chris Diamantopoulos) in *Silicon Valley*

Billionaires don’t want to become millionaires.

Corporations don’t want to stop.

“We can't stop oil today. We can’t stop oil in the next 10 to 20 to 30 years, and in fact, we don't need to ever stop oil because it's really about the emissions, it's not about the fuel source," Hollub said. “We believe that using CO2 and enhanced oil recovery provides a means to generate net zero-carbon oil so that we can help to decarbonize aviation and maritime industries.”

Johnson (2022)

Organize!

- We must accept that the greatest polluters won’t change willingly.
- And also that we will have to change our own lifestyles and habits.
- But working alone won’t get it done.
- If we develop community resilience, whatever hardship comes, we will be able to tackle it together.

Thank you

https://allisfoundintime.com

@LellyBaeta

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