

DOCTORS
FOR
NUTRITION



*bringing food back
to healthcare*

Food Systems and Environment

Dr Peter Johnston, APD
ASLM - December 2023



About me: Dr Peter Johnston



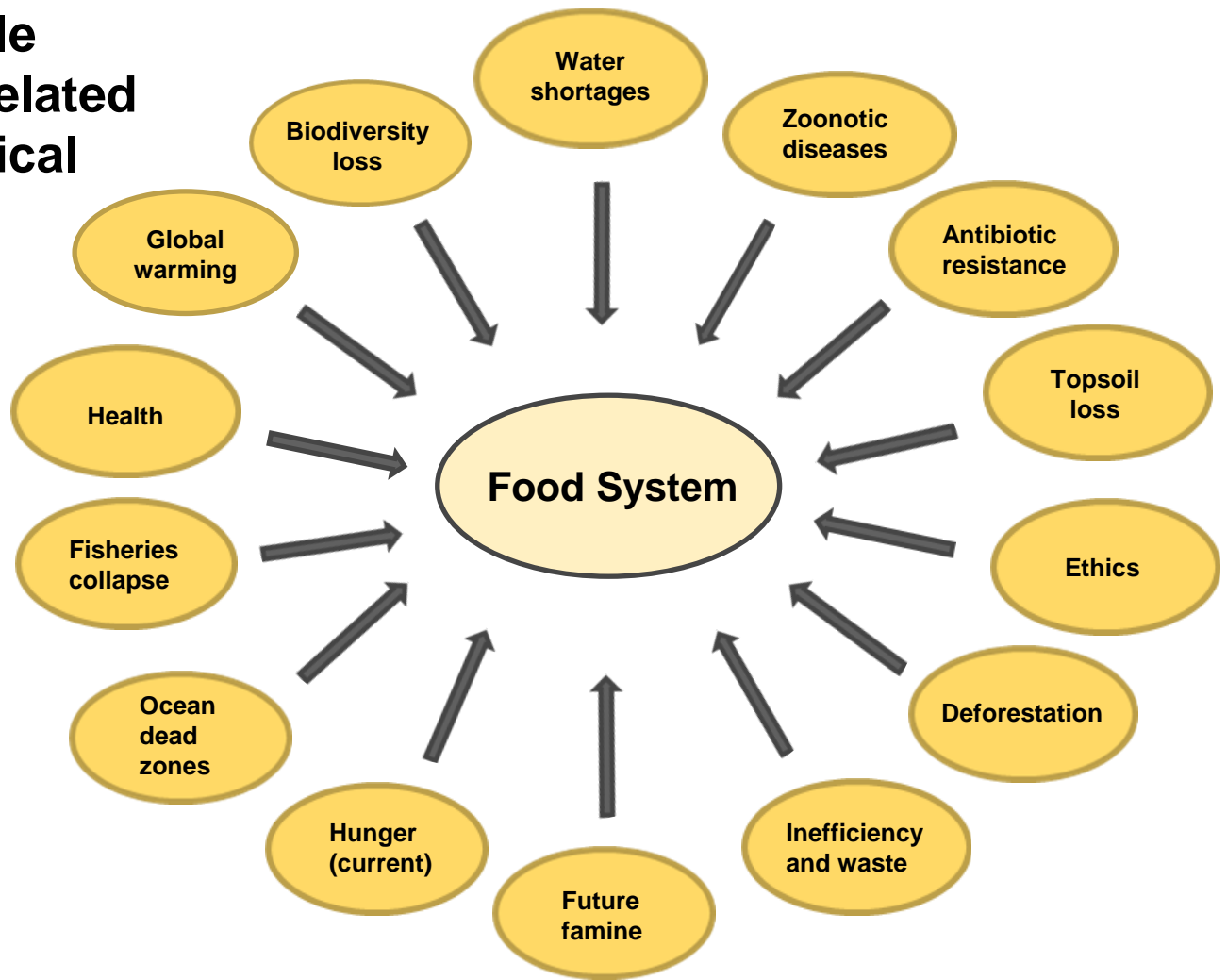
- Fellow of the Australasian Society of Lifestyle Medicine
- Accredited Practising Dietitian
- Doctors For Nutrition Advisory Council member
- B.A. (Psychology) – University of Canterbury (NZ)
- B.Sc. Hons (Zoology) – University of Canterbury (NZ)
- M.Sc. (Nutrition and Dietetics) – University of Wollongong
- Ph.D. (Human Genetics) – Australian National University
- Post-doctoral Research Fellowship – McGill University (Canada)



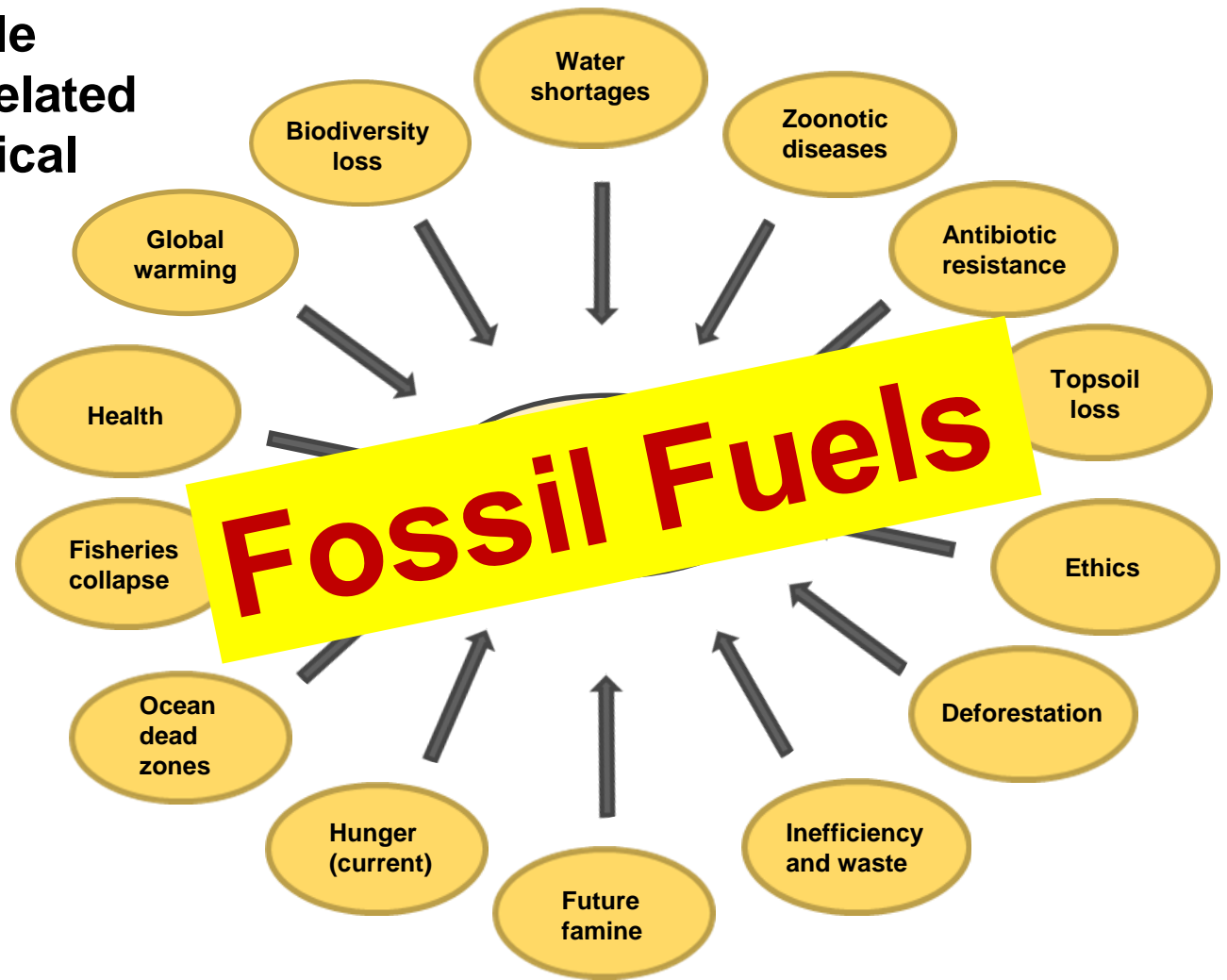
Summary:

1. We are in very big trouble!
2. Ending all fossil fuel use is not enough.
-We must change our food system.
3. You can help create change today!
4. How to benefit planetary *and* personal health
5. Industry initiatives

Multiple Inter-related diabolical crises



Multiple Inter-related diabolical crises



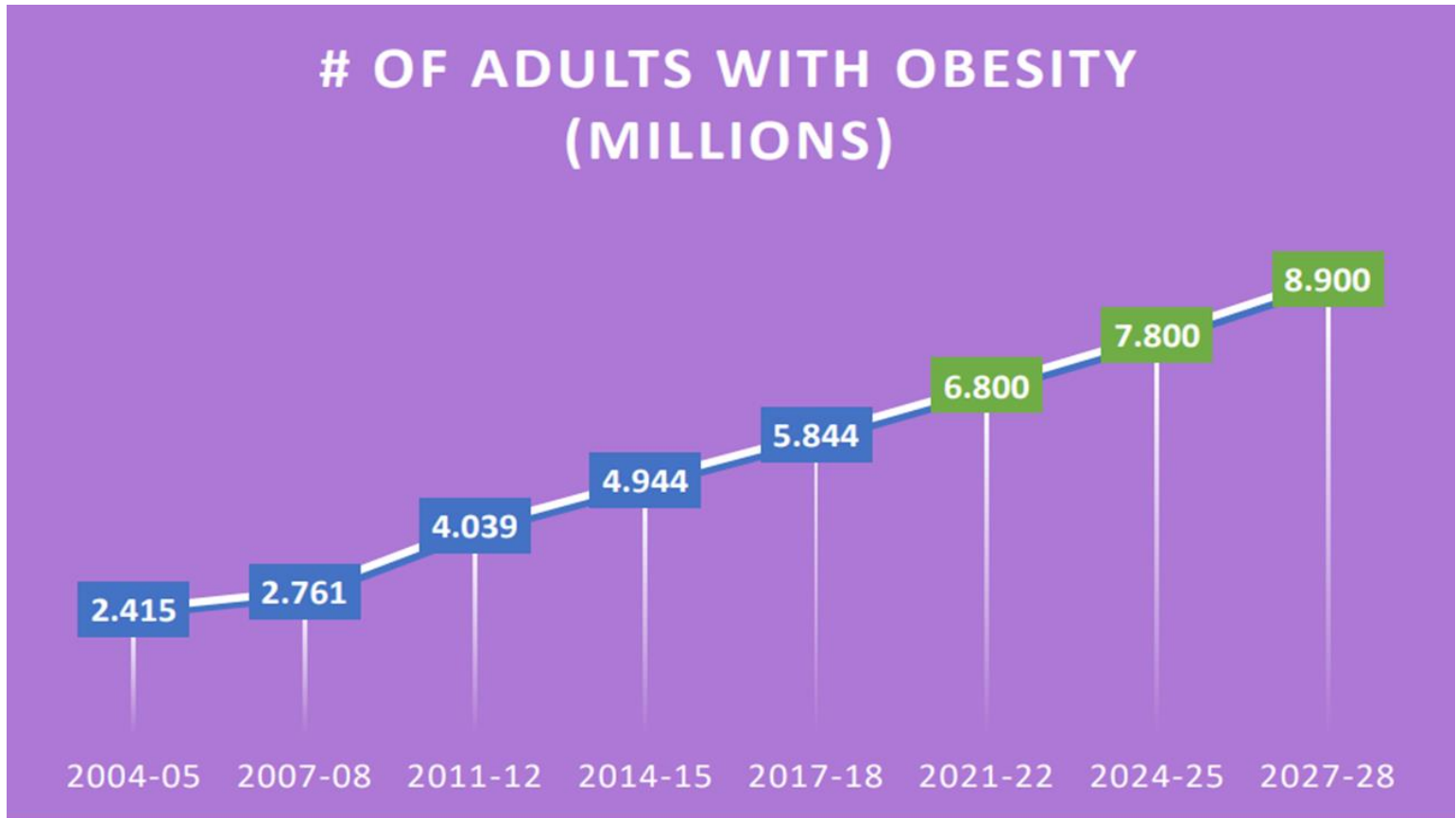


Health

- **Almost half of Australians (47%, or 11.6 million people) were estimated to have one or more of the 10 selected chronic conditions in 2020-21 (ABS 2022a).**
- **Two thirds are overweight or obese.**



Health



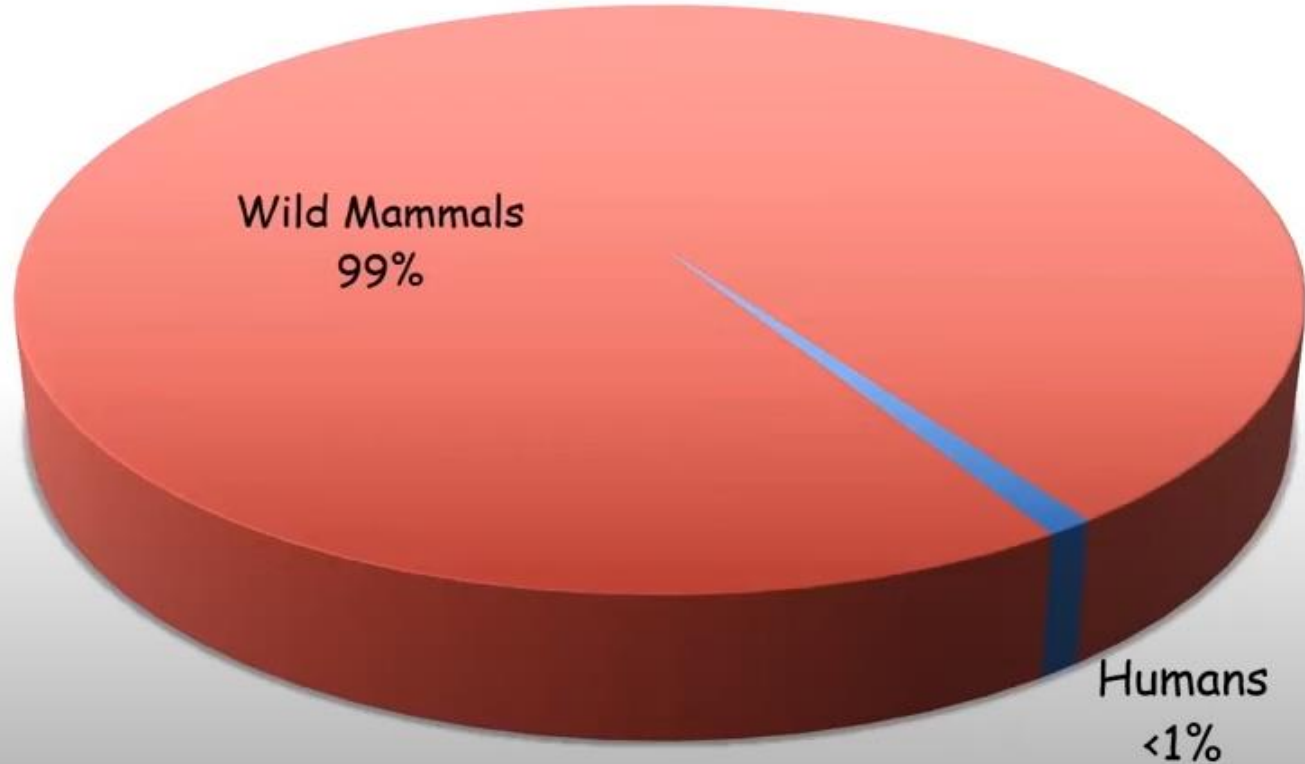
Weighing in: Australia's growing obesity epidemic. The Obesity Collective. 2019



Biodiversity Loss

Sources: 1: Smil (2011), 2: Rondinini et al. (2011), 3: Diamond (2002).

Terrestrial Mammal Biomass 10,000 years Ago

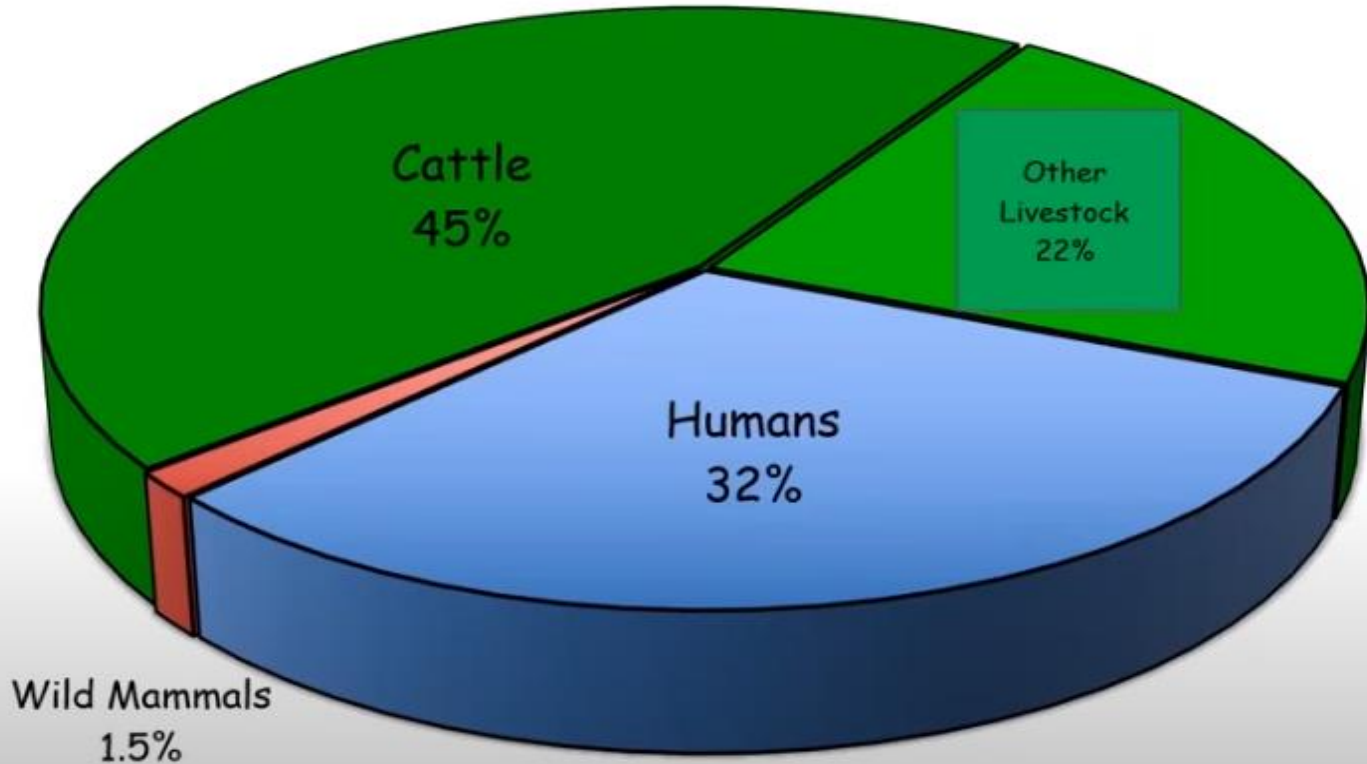




Biodiversity Loss

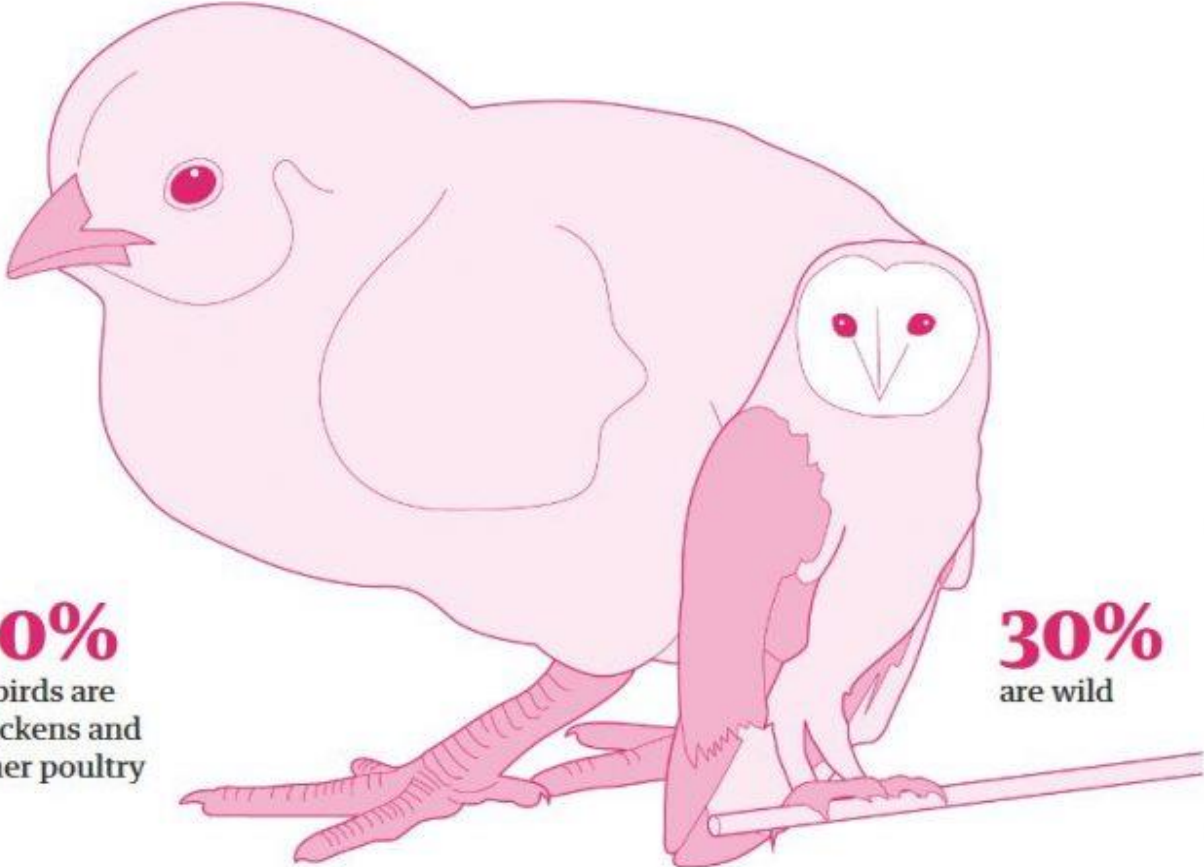
Source: Smil (2016), also Bar-On et al. (2017)
<https://www.pnas.org/content/115/25/6506>

Terrestrial Mammal Biomass 2015

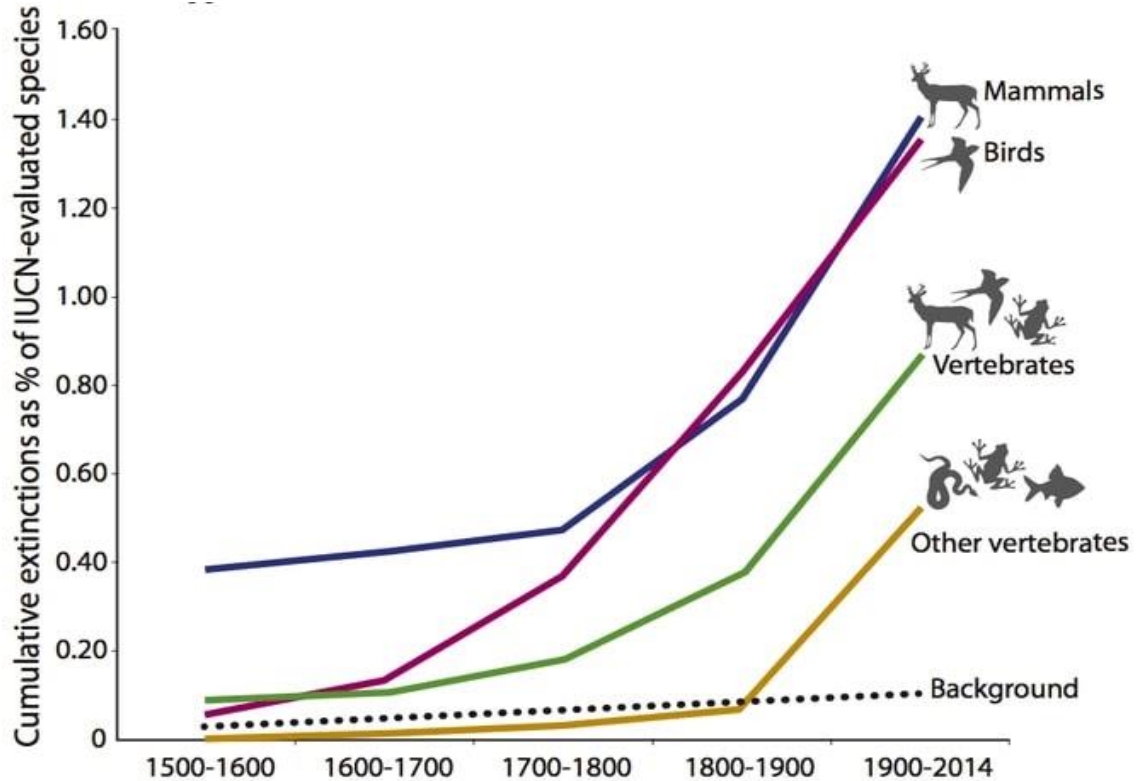


Biodiversity Loss

Bar-On Y.M. et al. 2018. The biomass distribution on Earth. *PNAS*. 115(25)6506-6511.



Biodiversity Loss: We are in the Sixth Mass Extinction



Biodiversity Loss

Plummeting insect numbers 'threaten collapse of nature'

- Insects could vanish within a century at current rate of decline
- Rate of insect extinction is **8x faster** than that of mammals, birds and reptiles



- Wagner, D.L. *et al.* 2021. Insect decline in the Anthropocene: Death by a thousand cuts. *PNAS*: 118(2)e2023989118.
- Sánchez-Bayo, F., & Wyckhuys, K. A. G. (2019). Worldwide decline of the entomofauna: A review of its drivers. *Biological Conservation*, 232, 8–27. doi:10.1016/j.biocon.2019.01.020

Major causes of insect population collapse:

- **Widespread pesticide use**
- **Agriculture (intensive and extensive)**
- **Elimination of trees and shrubs that normally surround fields**
- **Climate change**

Total insect mass is falling by approximately 2.5% per year





“If all the insects were to disappear from the Earth, within fifty years all life on earth would end.

If all human beings disappeared from the Earth, within 50 years all forms of life would flourish”

- Jonas Salk
(virologist who developed the polio vaccine)





Deforestation

'Relentless' destruction of rainforest continuing despite Cop26 pledge

Tropics lost 11.1m hectares of tree cover in 2021, including forest critical to limiting global heating and biodiversity loss, finds World Resources Institute

The age of extinction is supported by

the
guardian
.org

About this content

Patrick Greenfield

🐦 @pgreenfielduk

Thu 28 Apr 2022 18.01 AEST



📷 People of the Mura tribe in a deforested area in the Amazon rainforest, Brazil, 2019.

Photograph: Ueslei Marcelino/Reuters

University of Maryland.
World Resources Institute.

Deforestation

Land-clearing destroyed 90,000 hectares of Queensland koala habitat in single year, analysis finds

The Wilderness Society says 'it's time to take a good, hard look' at the state's beef industry, which is blamed for 80% of clearing





Ocean Dead Zones

Oceans suffocating as huge dead zones quadruple since 1950, scientists warn

Areas starved of oxygen in open ocean and by coasts have soared in recent decades, risking dire consequences for marine life and humanity

Causes:

- Effluent run-off
- Fertiliser run-off
- Warming oceans hold less oxygen
- Algal blooms



Breitburg D. et al. (2018). Declining oxygen in the global ocean and coastal waters. *Science*. 359(6371). DOI: [10.1126/science.aam7240](https://doi.org/10.1126/science.aam7240)

Fisheries Collapse

Key Risks for Oceans:

- Warming -> Deoxygenation
- Nutrient runoff
- Acidification (from CO₂ absorption)
- Overfishing
- Fish farming
- Pollution
- Waste

The Guardian Sat 7th Dec 2019

Oceans losing oxygen at unprecedented rate, experts warn

Sharks, tuna, marlin and other large fish at risk from spread of 'dead zones', say scientists



All fish need dissolved oxygen, but biggest fish such as tuna (above) are particularly vulnerable because they need much more to survive. Photograph: Mark Conlin/Getty Images

Oxygen in the oceans is being lost at an unprecedented rate, with “dead zones” proliferating and hundreds more areas showing oxygen dangerously depleted, as a result of the climate emergency and intensive farming, experts have warned.



Fisheries Collapse

Overfishing

**Ocean Fish
Numbers Cut in
Half Since 1970**



Dulvy *NK et al.* 2021. *Curr Biol.* Overfishing drives over one-third of all sharks and rays toward a global extinction crisis Nov 8;31(21): 4773-4787.e8. doi: 10.1016/j.cub.2021.08.062. Epub 2021 Sep 6

Link JS and Watson RA. 2019. Global ecosystem overfishing: Clear delineation within real limits to production. *Sci Adv.* 2019 Jun; 5(6): eaav0474. doi: 10.1126/sciadv.aav0474

<https://www.scientificamerican.com/article/ocean-fish-numbers-cut-in-half-since-1970/> - Sept 2015



Fisheries Collapse

Waste

**35% of all fish
are wasted
before reaching
the plate**



Approx 100,000 fish dumped off coast of France in 2022



Fisheries Collapse

Fish growth slowed by high temperatures and plastic chemical BPA

Pollution



Wu NC *et al.* 2022. Endocrine disruption from plastic pollution and warming interact to increase the energetic cost of growth in a fish. *Proc Royal Soc B*. Vol 289, Issue 1967.

Fisheries Collapse

Hundreds of thousands of endangered **whales**, **dolphins**, **seals** and **turtles** are killed every year by fishing nets.

Estimated Death toll:

- 750,000 seabirds
- 300,000 cetaceans
- 345,000 seals and sealions
- 259,000 turtles
- Tens of millions of sharks



Zoonotic Diseases

“We are overdue for another influenza pandemic which will make AIDS look like a picnic” - Prof Graeme Laver, ANU. (circa 1988)





Zoonotic Diseases

First wave of epidemics

(No epidemics until 10,000 years ago when we began domesticating animals)

- Measles – from cows and sheep (200 mill dead)
- Smallpox – likely from camels
- Whooping cough – Pigs
- Typhoid fever – Chickens
- Leprosy – Water buffalo
- Pandemic influenza – Ducks
- Common cold - Horses





Zoonotic Diseases

Second wave of epidemics

Began with industrial revolution 250 years ago

- Diabetes
- Heart disease
- Strokes
- Auto-immune diseases
- Cancers
- Obesity



NCDs or 'Diseases of over-consumption'



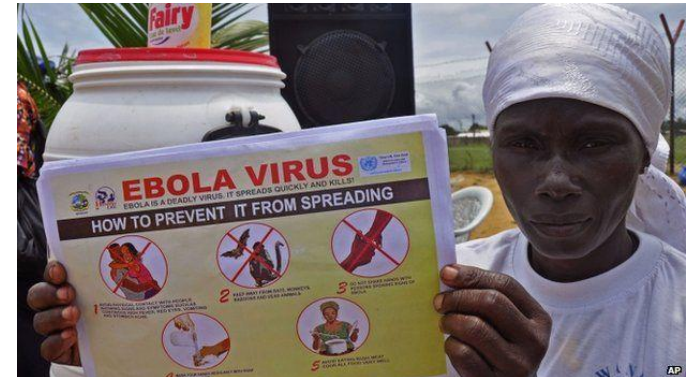
Zoonotic Diseases

Third wave of epidemics

Began in mid 1970s

(beginning of intensive agriculture, large scale logging in Amazon, Africa)

- AIDS/HIV – from other primates ('bush meat')
- Ebola - Primates
- SARS – Civet fox
- Influenza – chickens
- Swine flu - pigs
- West Nile virus – from bird smuggling
- COVID – bats? pangolins? Wet-markets
- Monkeypox - Primates





Inefficiency

Animal farming:

- Uses **83% of all agricultural land**
- But **produces only:**
 - 18% of our calories** and
 - 37% of our protein**

If the whole world went plant-based:

- **76% of all farmland could be returned to wilderness**

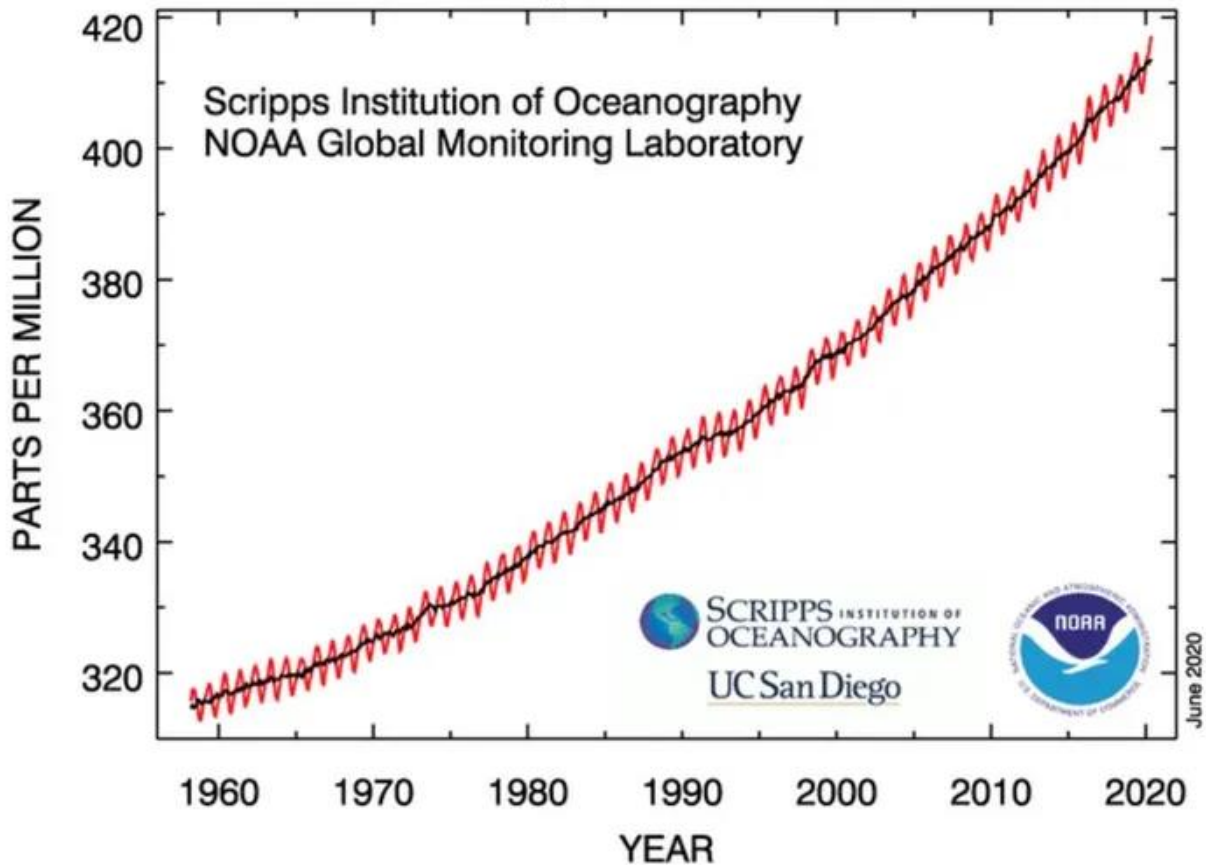


J. Poore J. & Nemecek T. (2018) Reducing food's environmental impacts through producers and consumers. *Science*



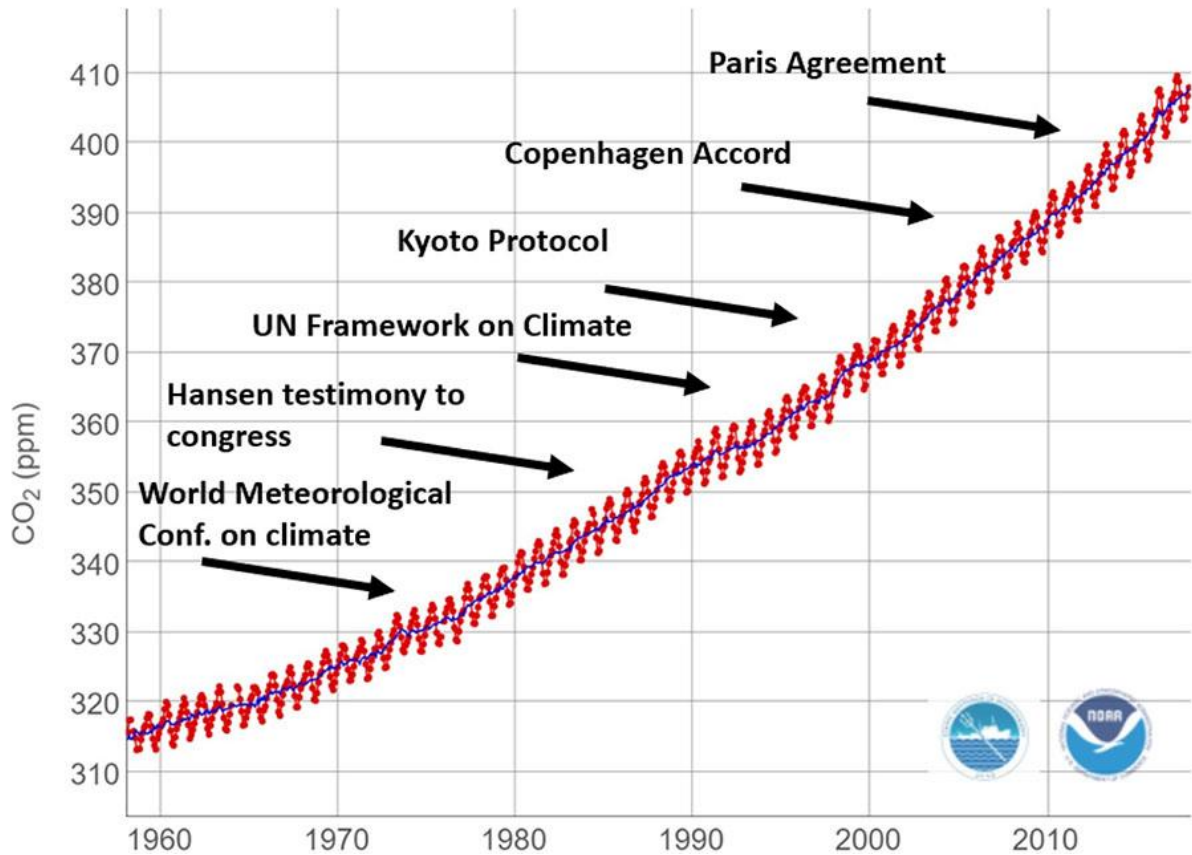
Global Warming

Atmospheric CO₂ at Mauna Loa Observatory



Global Warming

Mauna Loa Monthly Averages



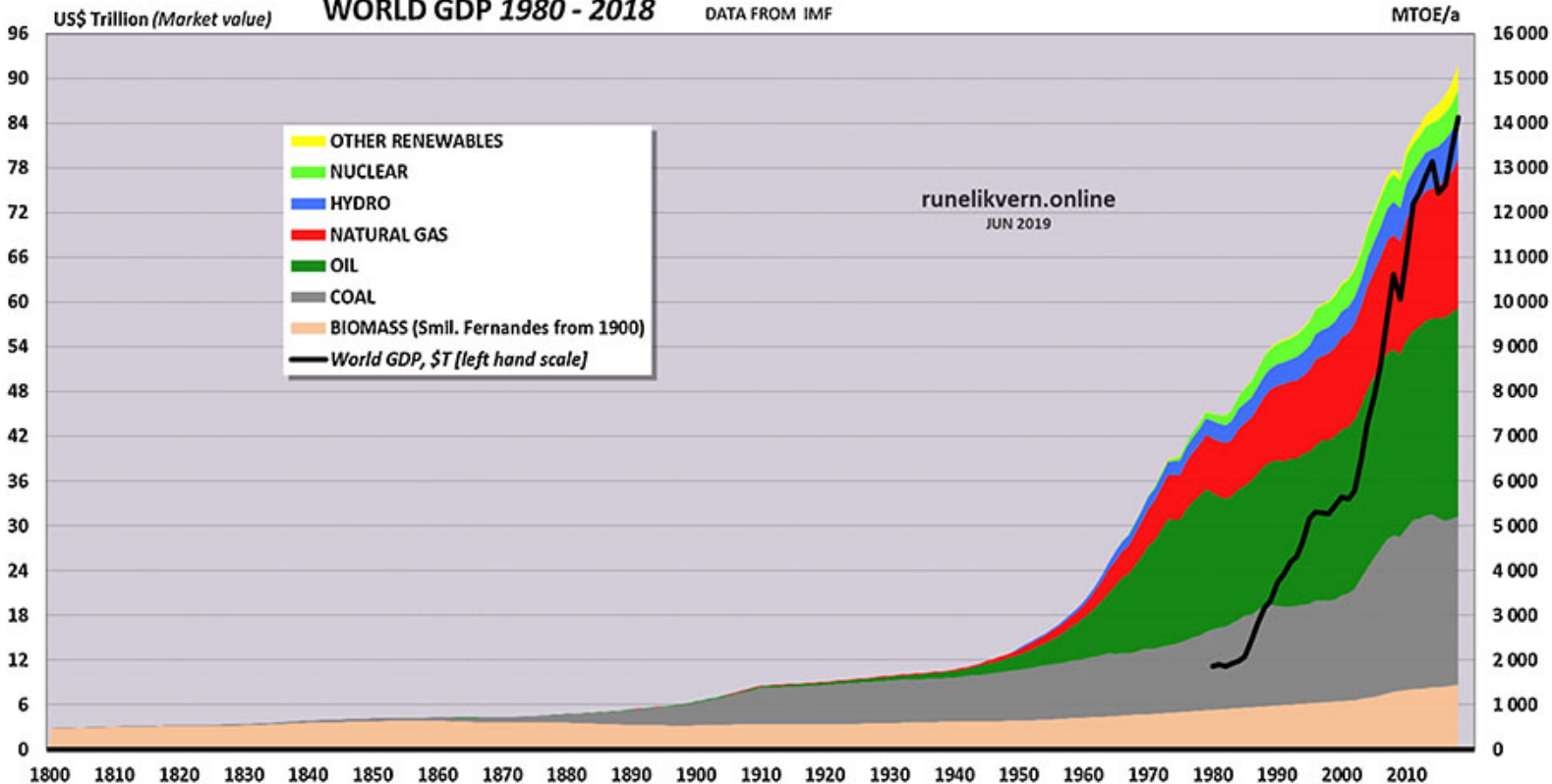
Global Warming

WORLD ENERGY CONSUMPTION AND MIX 1800 - 2018

BASED UPON DATA FROM BP STATISTICAL REVIEW 2019 (1965 - 2018), PRE 1965 FROM SMIL, BIOMASS SINCE 1900 FROM FERNANDES

WORLD GDP 1980 - 2018

DATA FROM IMF



Global Warming

JEVON'S PARADOX

FUEL EFFICIENCY GAINS TEND TO **INCREASE**,
NOT DECREASE, FUEL USE.



Global Warming

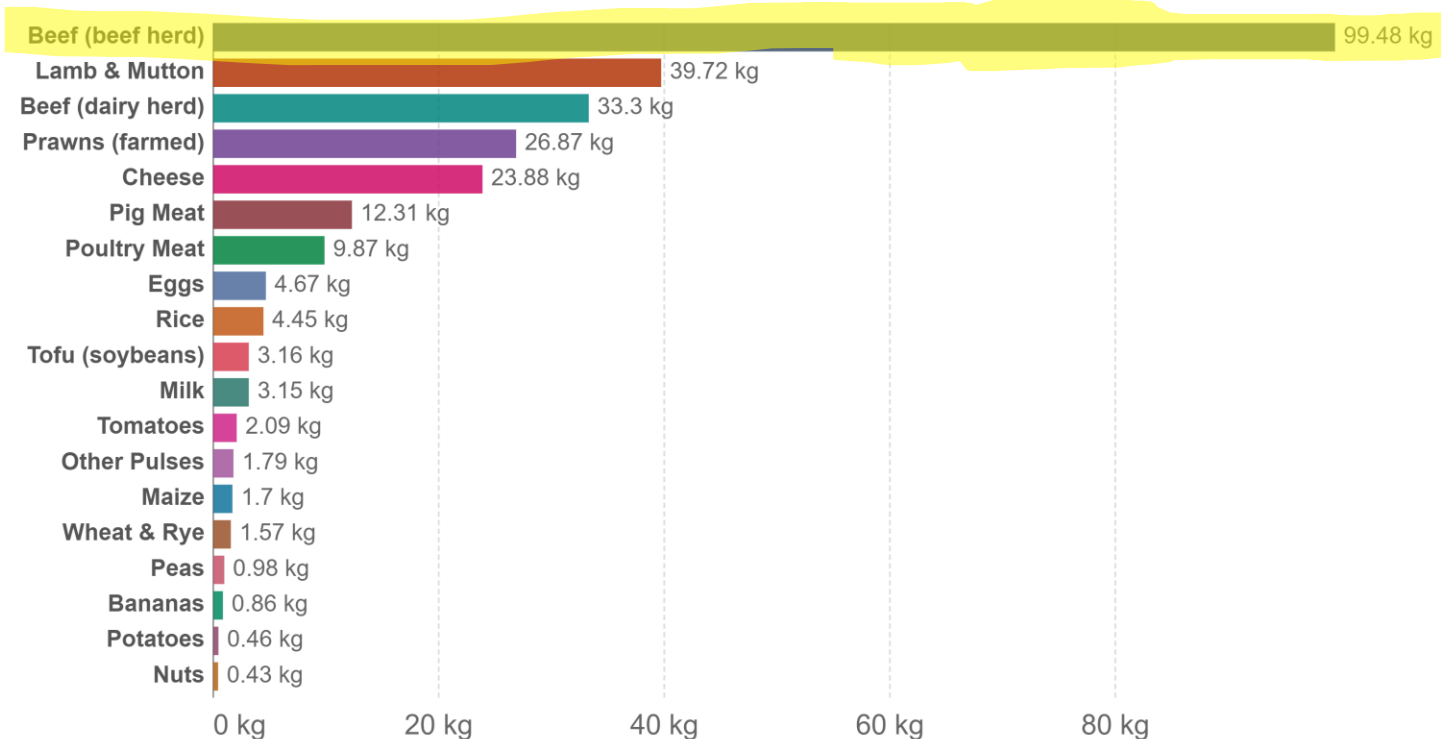
- **Agriculture is responsible for 35% of all global GHG emissions**
- **Meat production accounts for almost 60% of agricultural emissions**



Xiaoming, X *et al.* 2021. Global greenhouse gas emissions from animal-based foods are twice those of plant-based foods. *Nature Food*. Vol 2, pp 724-732

Greenhouse gas emissions per kilogram of food product

Greenhouse gas emissions are measured in kilograms of carbon dioxide equivalents (kgCO₂eq) per kilogram of food product. This means non-CO₂ greenhouse gases are included and weighted by their relative warming impact.



Source: Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers.

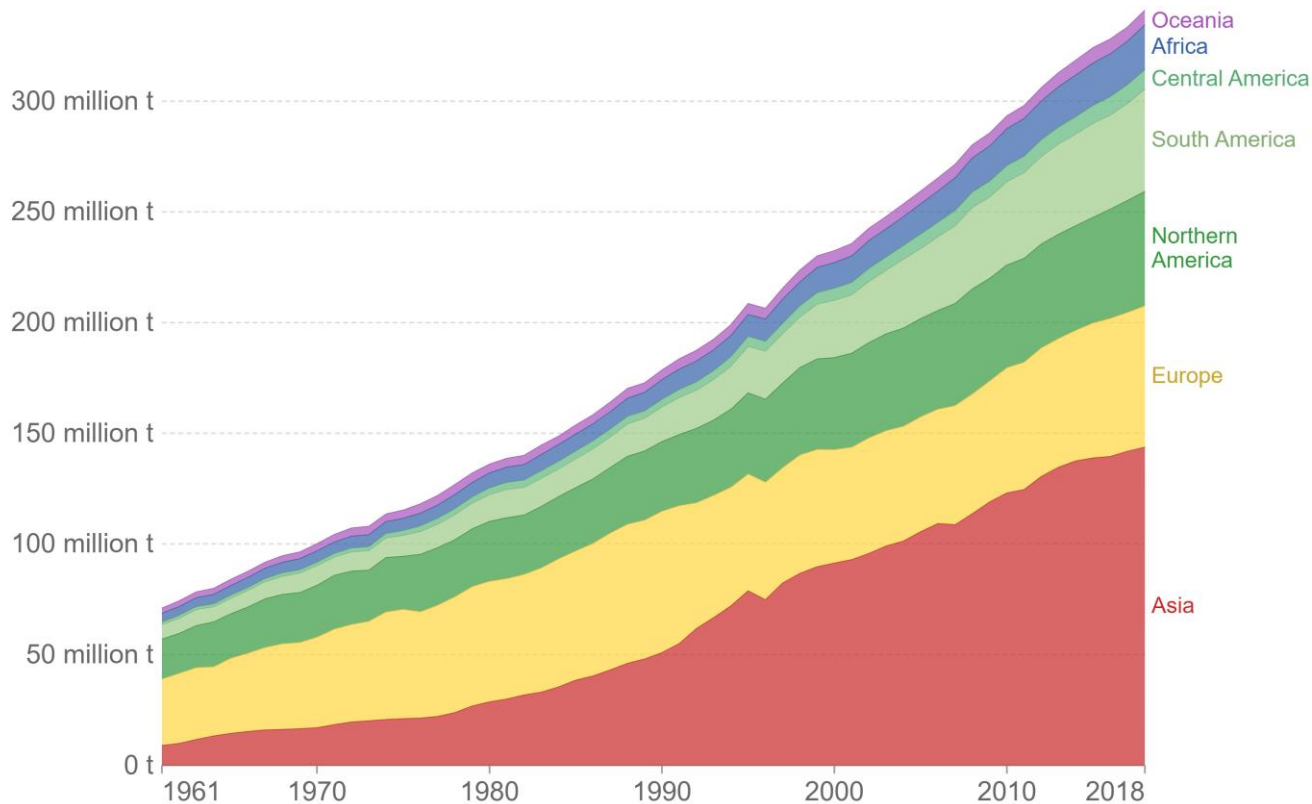
Note: Data represents the global average greenhouse gas emissions from food products based on a large meta-analysis of food production covering 38,700 commercially viable farms in 119 countries.

OurWorldInData.org/environmental-impacts-of-food • CC BY



Global meat production, 1961 to 2018

Our World
in Data



Source: UN Food and Agriculture Organization (FAO)

OurWorldInData.org/meat-production • CC BY



Antibiotic Resistance

- **Approximately 80% of all antibiotic use is for livestock (100,000 tonnes per year)**
- **Used prophylactically to prevent disease**
- **Also promotes growth**
- **3,500 deaths per day globally from resistant bacteria**
- **We are fast approaching a post-antibiotic era**



- Allel, K *et al.* 2023. Global antimicrobial-resistance drivers: an ecological country-level study at the human–animal interface. *The Lancet Planetary Health*. 7(4):E291-E303.
- Langham F and Cheng AC. 2019. Antibiotic use in animals and humans in Australia. *MJA*. 211(4).
- Martin, M.J. *et al.* 2015. Antibiotics overuse in animal agriculture: A call to action for health care providers. *Am J Pub Health*. 105(12): 2409-2410. PMID: 26469675



Ethics

- **By destroying the environment, we are stealing the future from our children and grandchildren.**
- **Trauma and violence to the people we pay to kill animals for food.**
- **Increased health problems and domestic violence amongst slaughterhouse workers.**



- Richards E. et al. 2013. A Different Cut? Comparing Attitudes toward Animals and Propensity for Aggression within Two Primary Industry Cohorts—Farmers and Meatworkers. *Society & Animals*
- Blood, Sweat, and Fear: Workers' Rights in U.S. Meat and Poultry Plants. 2003. Human Rights Watch
- Emhan A. et al. 2012. Psychological Symptom Profile of Butchers Working in Slaughterhouse and Retail Meat Packing Business: A Comparative Study. *Kafkas Univ Vet Fak Derg* 18 (2): 319-322.



Ethics

- 80 billion land animals slaughtered/year
(for 8 billion humans)
- Up to 2.5 trillion animals caught from oceans per year

(Approx 10% of fish caught globally are discarded)



- <https://ourworldindata.org/meat-production#>
- Mood, A & Brooke, P. "Estimating the Number of Fish Caught in Global Fishing Each Year". July 2010
- "Fish count estimates". Fishcount.org.uk
- Keledjian, Amanda, et al. "Wasted Catch: Unsolved Problems in U.S. Fisheries". Oceana. March 2014



Hunger/Starvation

- Worldwide, *approx 50% of all grain is fed to livestock*
- If all grain were fed to humans, we could feed an *extra 3.5 billion people*
- *Yet - 15,000 children (under 5) starve to death each day* (WHO, 2016)



"Executive Summary: Feed Supply". Food and Agriculture Organization of the United Nations.



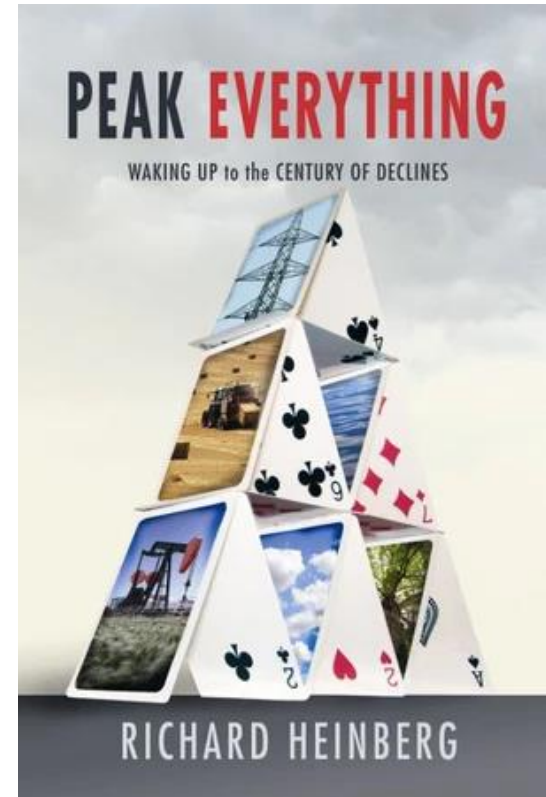
Food Security: A 'wicked' problem

Demand:

- 385,000 new babies born every day
- More babies + longer lives
- Population 10 billion people by 2050
- Fast growing demand for meat in developing nations
- Need to double food supply by 2060

Constraints:

- Peak water
- Peak land
- Peak oil
- Peak phosphorus
- Peak fish
- R&D drought
- Global warming reducing yield





Food security

- Cities cannot feed themselves
- Rely on a 'river of trucks' every night



- **“We are never more than nine meals away from anarchy”**
John J Fitzgerald, 1932



Food security

Water

- Increasing mega-droughts
- Dry rivers (over-irrigation)
- Depleting aquifers
- Increased flooding

'The real threat to our future is peak water'

As population rises, overpumping means some nations have reached peak water, which threatens food supply, says Lester Brown



Wheeler *et al.* 2022. What will it take to stabilize the Colorado River. *Science*. July 22;377(6604).
Graham N. *et al.* 2021. Agricultural impacts of sustainable water use in the United States. *Sci Rep* 11: 17917.

Food Security

The world needs topsoil to grow 95% of its food - but it's rapidly disappearing

Without efforts to rebuild soil health, we could lose our ability to grow enough nutritious food to feed the planet's population



Evans DL *et al.* 2020. Soil lifespans and how they can be extended by land use and management change. *Environ Res Lett.* 15 0940b2



Food Security

- **500 years for healthy topsoil to develop**
- **50% of global soils have a lifespan of <200 years (because of how we farm)**





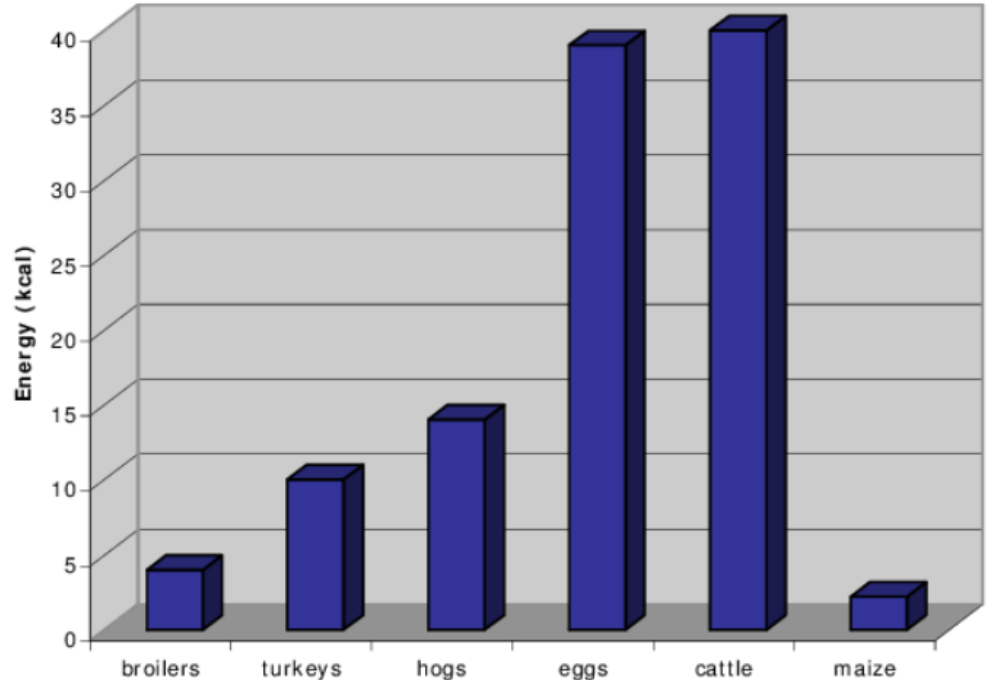
Food Security

**US Average:
13 units of fossil fuel
energy are used for
every 1 unit of food
energy produced
(negative EROI)**

**Any wild animal must
have a positive EROI or
it dies**

**How do we feed 8-10
billion people without
fossil fuels???**

Fossil fuel energy required to produce 1 kcal of protein





Food Waste

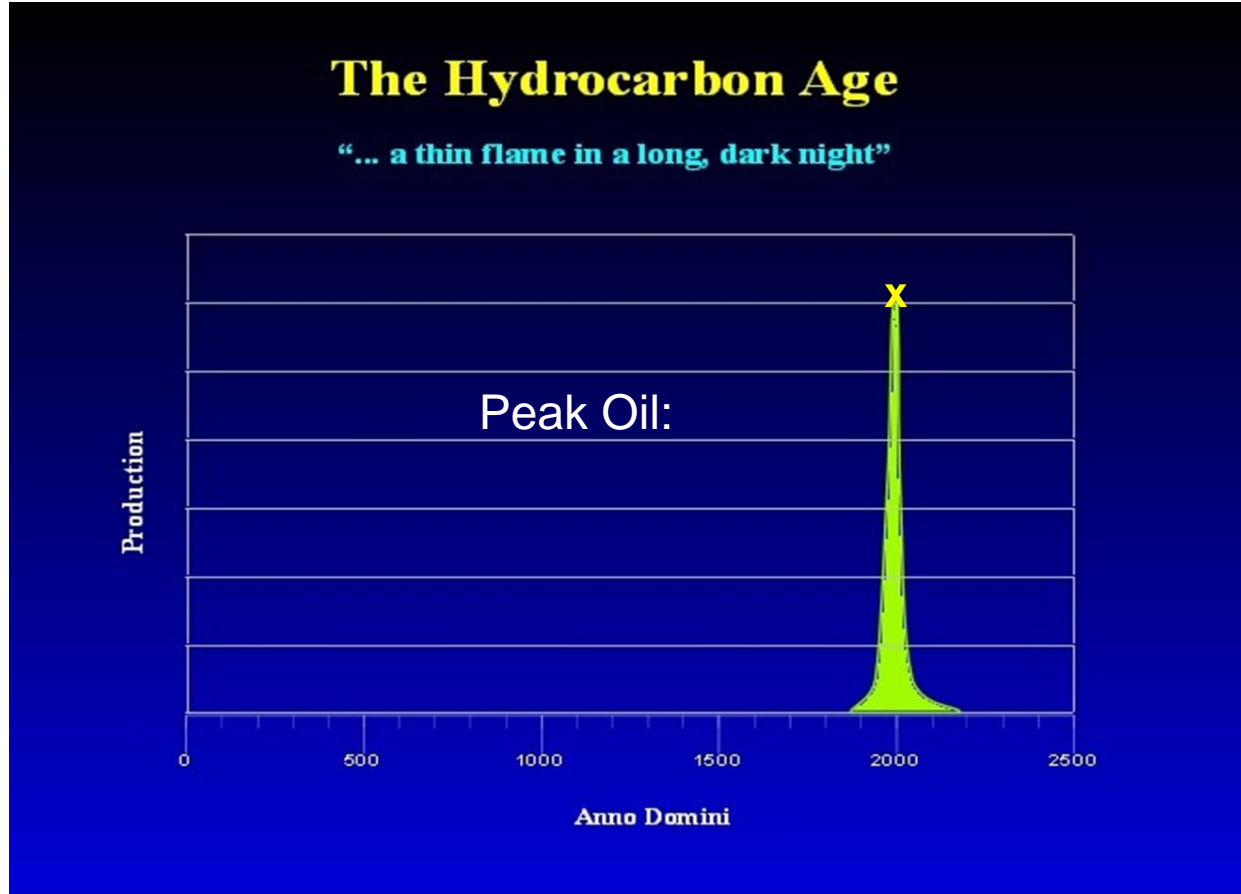
- **Approx 33% of all food produced is wasted**
- **33% of the food wasted could feed 1 billion people**
- **If food waste was a country, it would be the 3rd largest GHG emitter, behind China and the US**
- **An area larger than China and 25% of the world's freshwater is used to grow food that is never eaten**

<https://earth.org/facts-about-food-waste/>





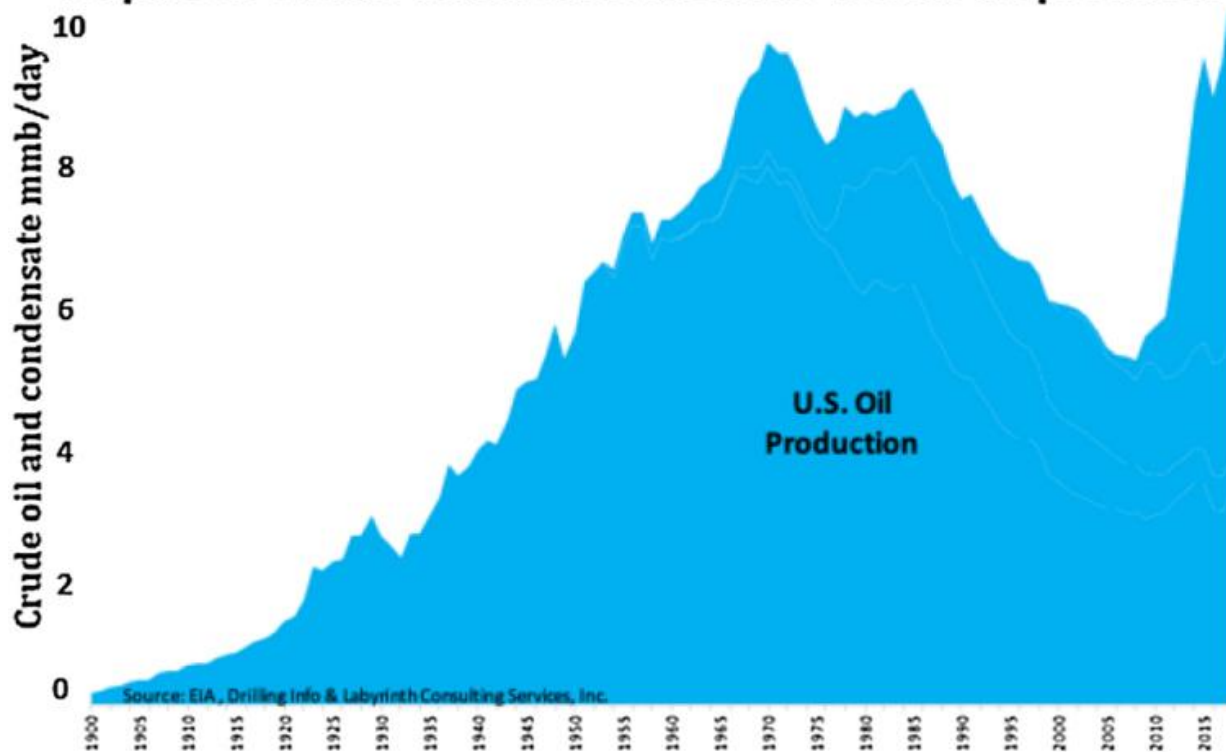
A One-off Carbon Pulse





Fossil Fuel Production

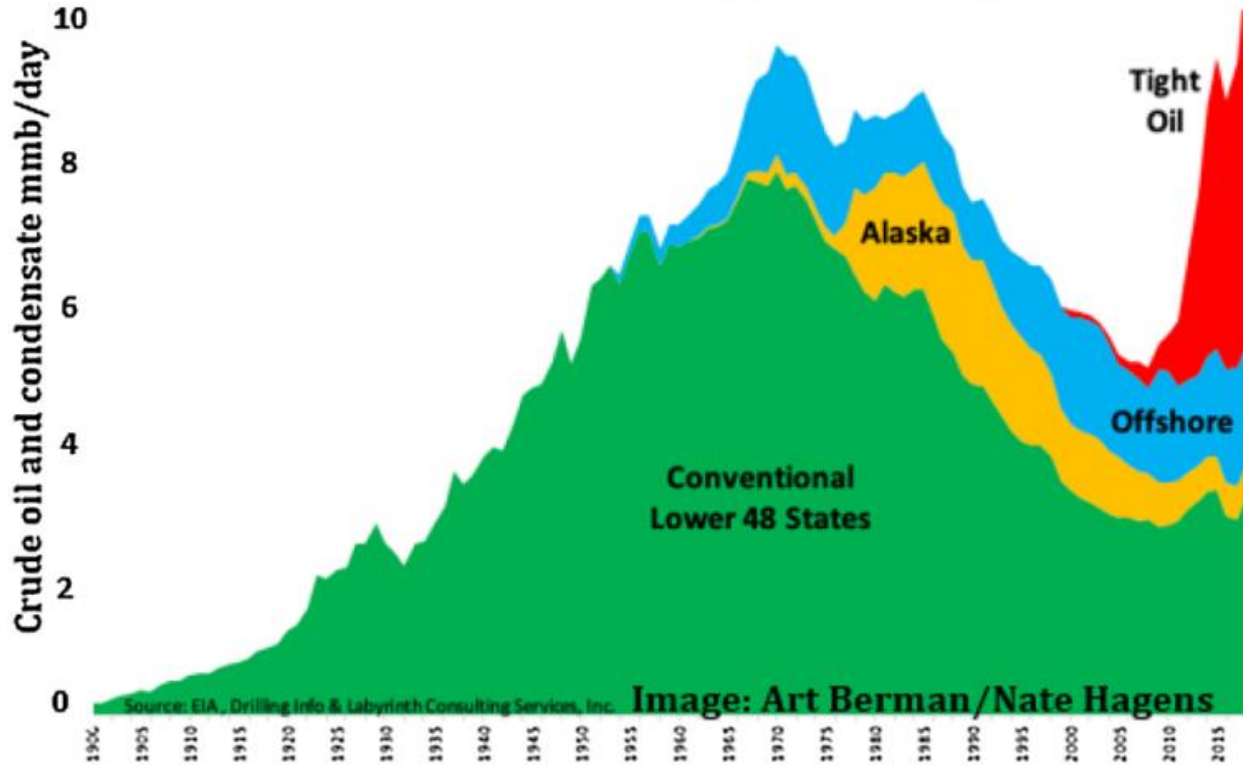
Using better technology, USA exceeds 1970 peak, surpasses Saudi Arabia and Russia as worlds #1 producer





Fossil Fuel Production

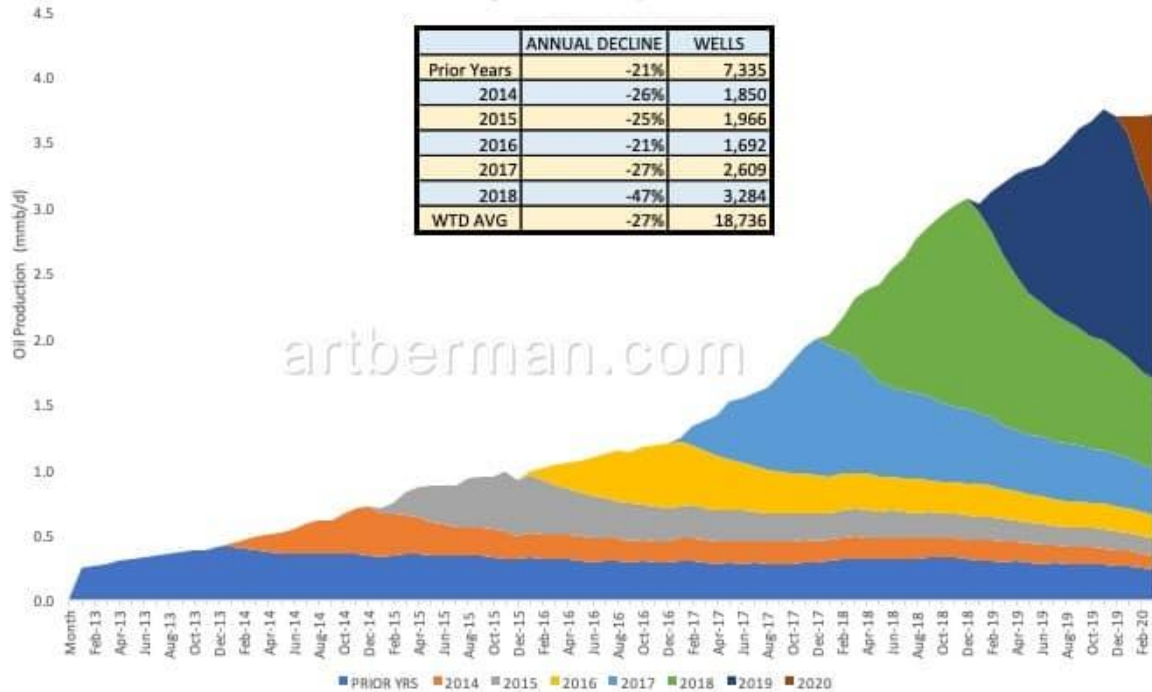
Conventional Lower 48 States production has declined 60% from 7.8 to 3.1 mmb/d
Lower 48 + Alaska + Offshore production declined 45% from 9.6 to 5.3 mmb/d
Tight oil has increased to 5.4 mmb/d, 51% of U.S. output





Fossil Fuel Production

Permian basin annual decline rate is 27% for horizontal tight oil wells
Decline rates generally increase for wells drilled in more recent years
because of higher initial production rates



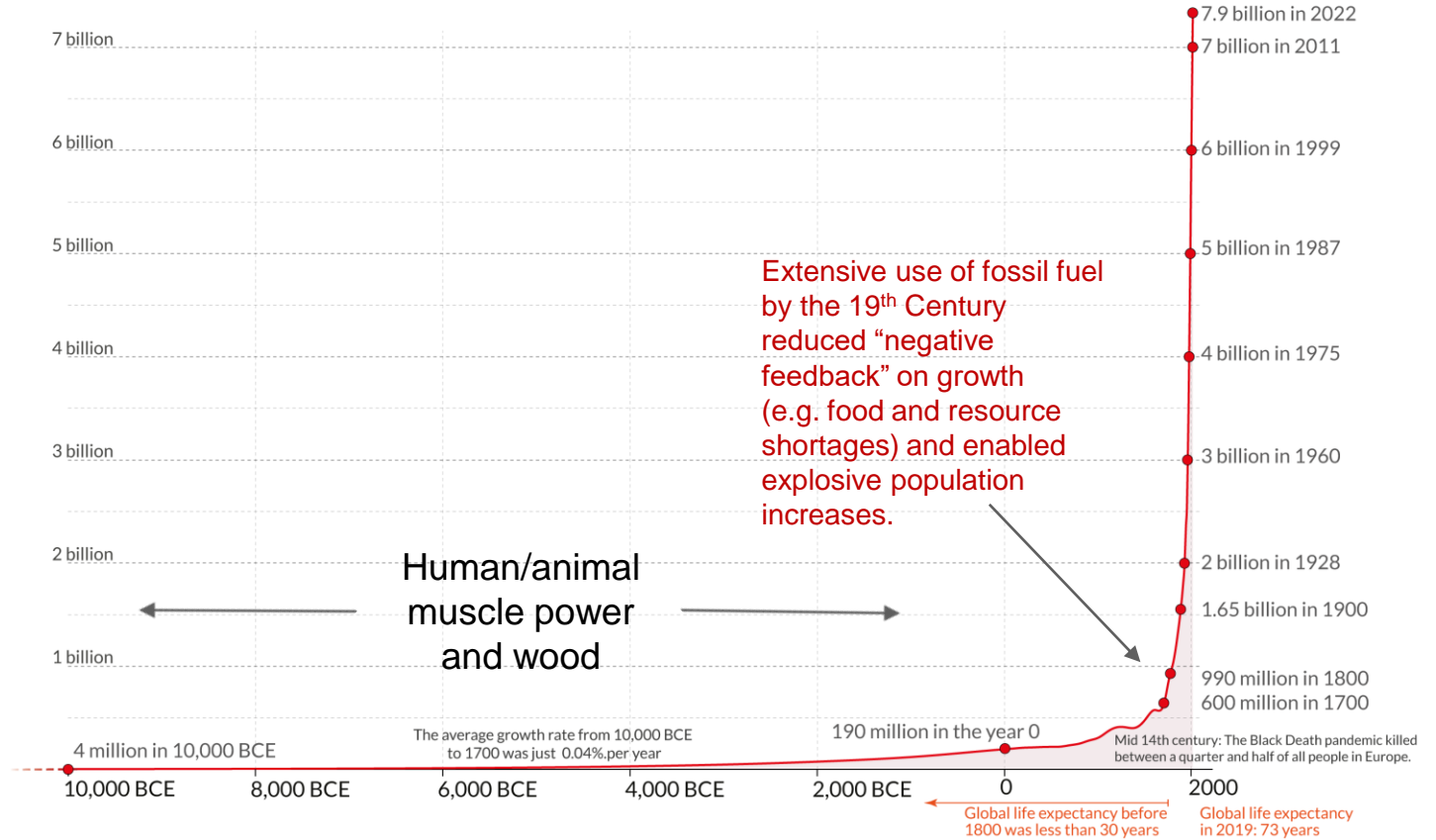
Source: Enverus & Labyrinth Consulting Services, Inc.

Shale Plays/Permian 2020/PERMIAN TIGHT OIL DECLINE JUN 2020



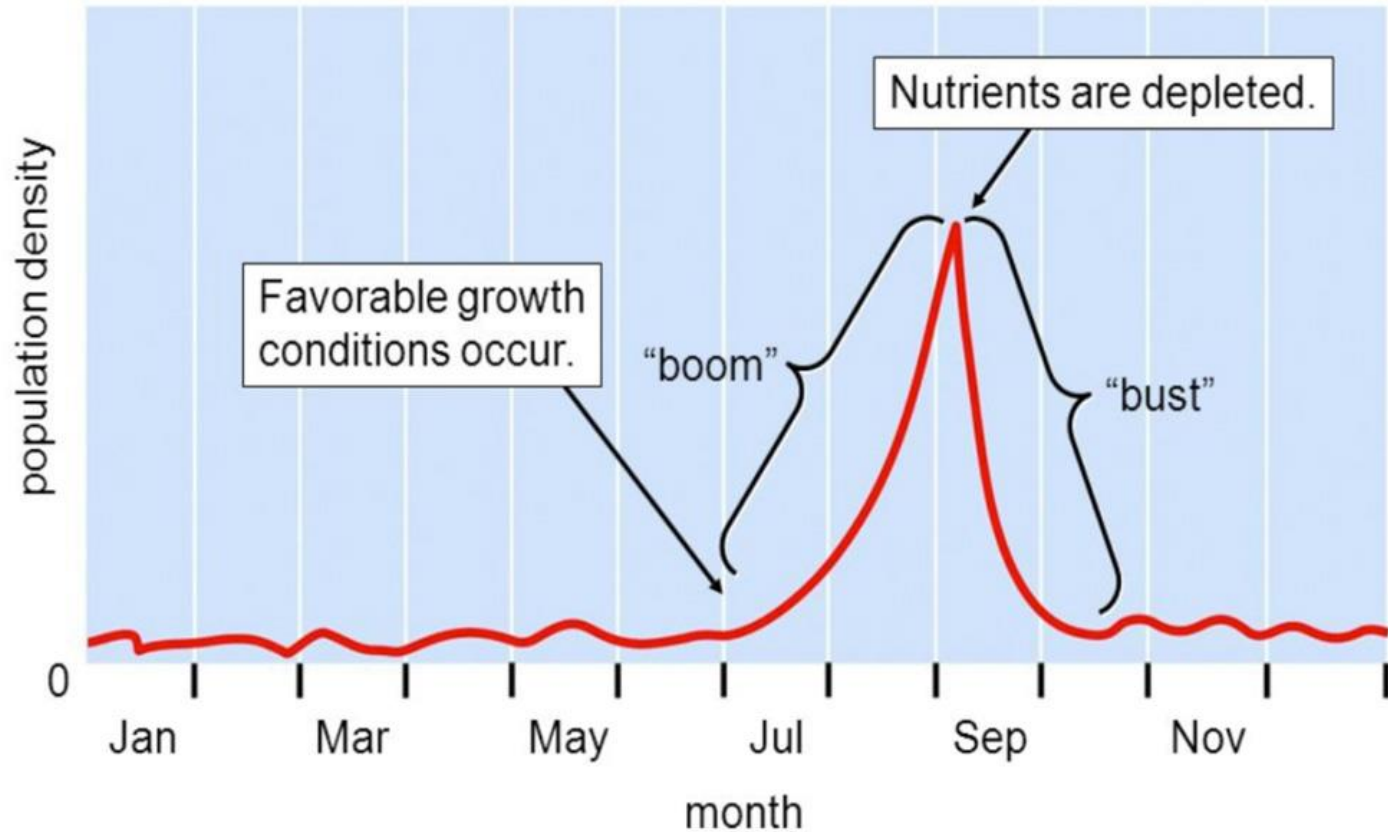
The size of the world population over the last 12,000 years

Demographers expect rapid population growth to end by the end of the 21st century. The UN demographers expect a population of about 11 billion in 2100.



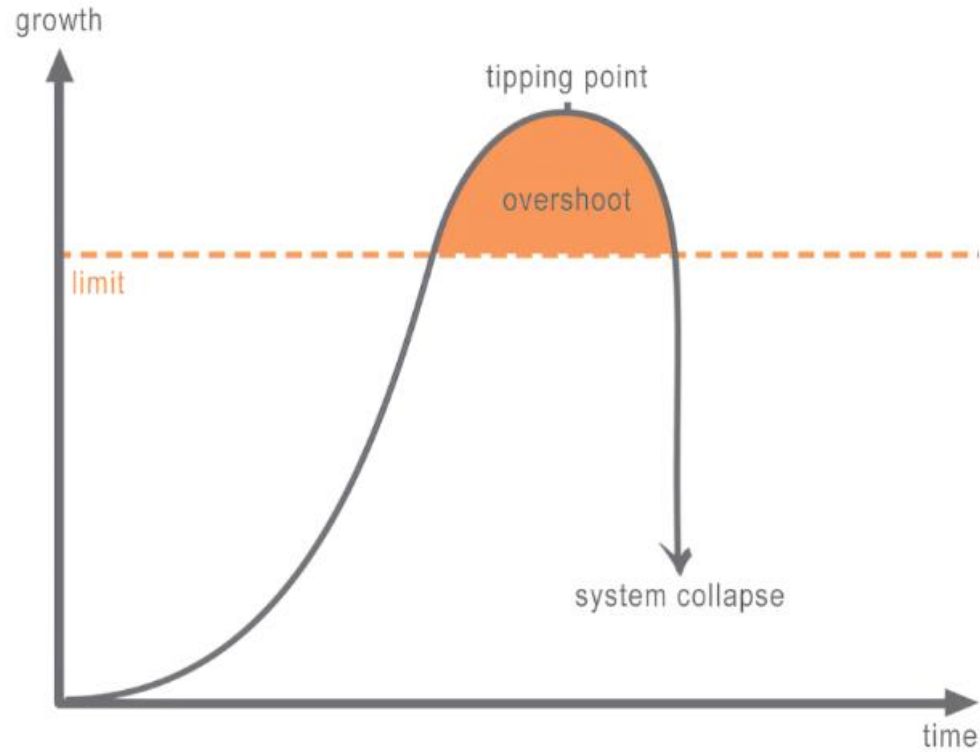


Ecological Overshoot





Ecological Overshoot



Ecological Overshoot

Yes, the Climate Crisis May Wipe out Six Billion People

Creator of the 'ecological footprint' on life and death in a world 4 C hotter.



[William E. Rees](#) / 18 Sep 2019 / [TheTyee.ca](#)

William E. Rees is professor emeritus of human ecology and ecological economics at the University of British Columbia.

     210 Comments





Actual Costs

We pay for cheap animal food ***three times***:

- At the checkout
- In subsidies (which come from our taxes)
- In the enormous costs to our health and environment.





Taxes and Subsidies

- **US\$700bn-1tn in subsidies to agriculture globally, the vast majority is to animal agriculture (Just 1% of this is to help the environment)**
- **Fossil fuel subsidies globally last year surged to a record *US\$7tn* (imf.org), much of this for agriculture.**
- **Subsidies should be redirected to soil regeneration, producing healthier food, cheaper plant foods**
- **Meat and dairy should be taxed to capture externalities (environmental and health damage)**





We must change how we produce food

“Even if fossil fuel emissions were eliminated immediately, ***emissions from the global food system alone would make it impossible to limit warming to 1.5°C*** and difficult even to realize the 2°C target”.

Thus, ***major changes in how food is produced are needed***

- Ivanovich, C.C et al. 2023. Future warming from global food consumption. *Nature Climate Change*. 13, 297-302.
- Clark et al. 2020. Global food system emissions could preclude achieving the 1.5° and 2°C climate change targets. *Science*. Vol 370. pp 705-708. DOI: 10.1126/science.aba7357



Farming is the single biggest cause of:

- Habitat loss
- Deforestation
- Wildlife loss
- Species extinctions
- Soil loss
- Desertification
- Water pollution – including rivers and ocean dead zones
- Fresh water depletion



“Agriculture is the single most destructive technology ever devised by humans” – Prof William Rees



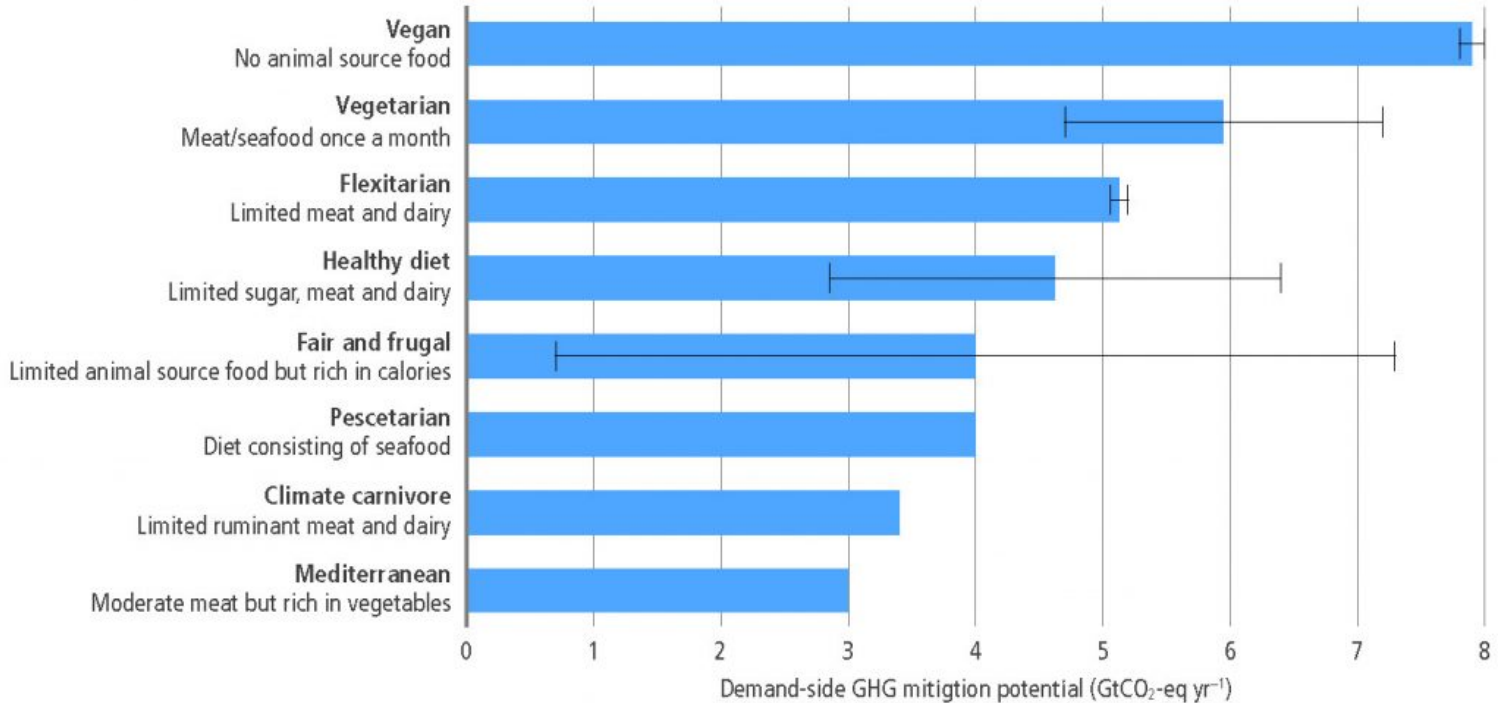
“Food is the single strongest lever to optimise human health and environmental sustainability on Earth”



From the 2022 IPCC report:

Demand-side mitigation

GHG mitigation potential of different diets





This is bad!

What can I do??

Avoiding meat and dairy is 'single biggest way' to reduce your impact on Earth

Biggest analysis to date reveals huge footprint of livestock - it provides just 18% of calories but takes up 83% of farmland



J. Poore J. & Nemecek T. (2018) Reducing food's environmental impacts through producers and consumers. *Science*



Every time you spend money,
you're casting a vote for the
kind of world you want.

Anna Lappé

 quote fancy



What can I do?



What can I do?



What can I do?

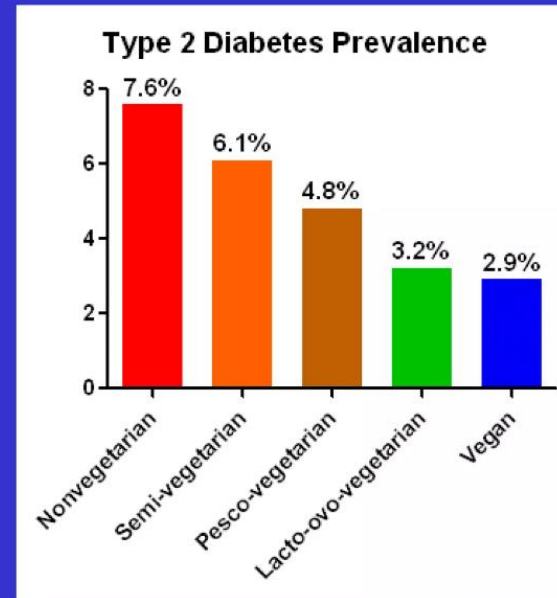
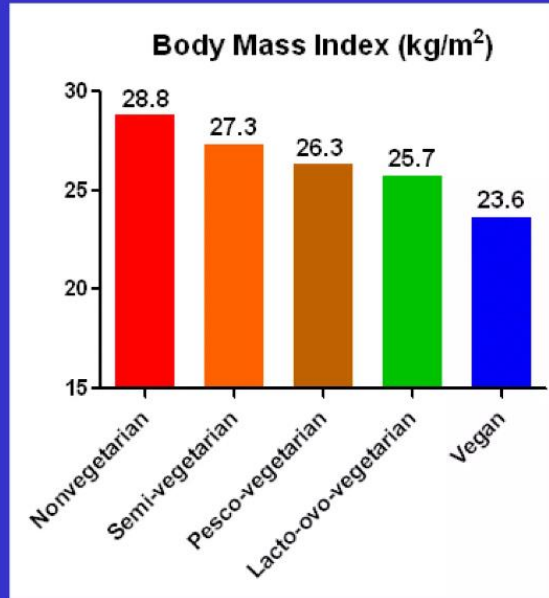




Health Benefits

Adventist Health Study – 2

60,903 participants, aged ≥ 30 , enrolled 2002-2006



Tonstad S, et al. Type of vegetarian diet, body weight and prevalence of type 2 diabetes. *Diabetes Care* 2009;32:791-6.

What can I do?

Learn to grow your own food



What can I do?

Join a local permaculture group



What can I do?

Buy and eat organic produce
- Especially if it uses regenerative techniques

- **Better for soil microbiome**
- **Better for insects**
- **Better for increasing soil quality and quantity**
- **Healthier for farmers**
- **Likely healthier for you**



What can I do?

Support local organic farmers

- Join a CSA scheme
- Get a weekly fruit and veggie box delivered
- Get to know local farmers
- Volunteer on a local farm



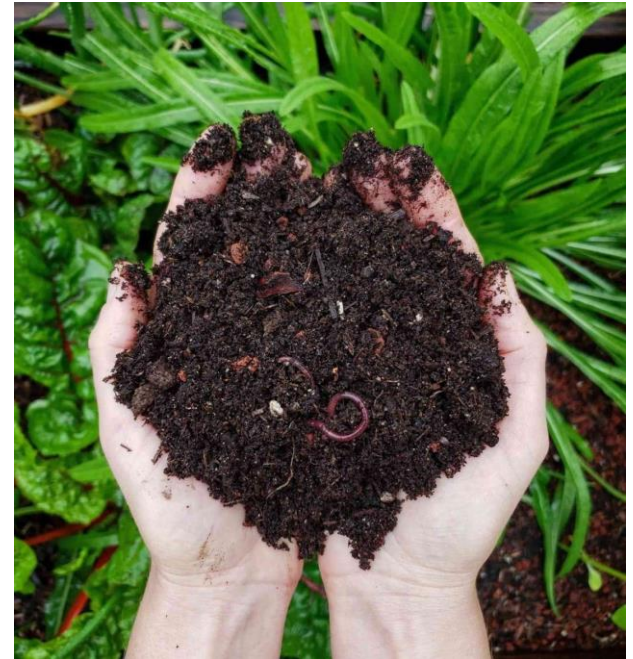
What can I do?

Reduce Food Waste



What can I do?

Compost organic matter



What can I do?

Join (or start) a Local Exchange Trading System (LETS)





What can I do?

Get to know your neighbours

- **Sharing will be essential in a resource-constrained world**
- **We will need each other's help**
- **We will need people around us who we can trust**
- **“It takes a village to raise a child”**
- **Organise a street party**





What can I do?

Downsize now – beat the rush!

- **Buy less**
- **Consume less**
- **Repair**
- **Re-use**
- **Swap/trade**
- **Share**
- **Fly less**

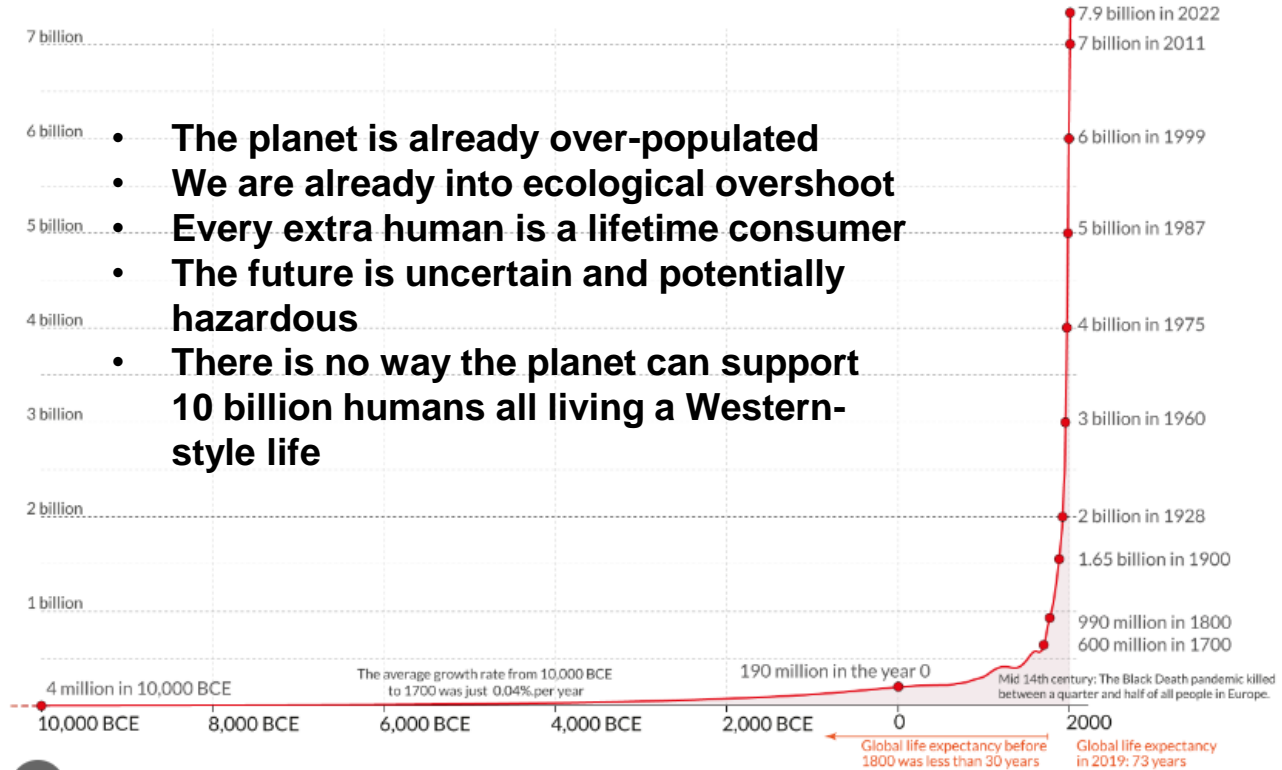
Get used to living more simply and with less





What can I do?

Consider having fewer or no children - or adopt





What can I do?

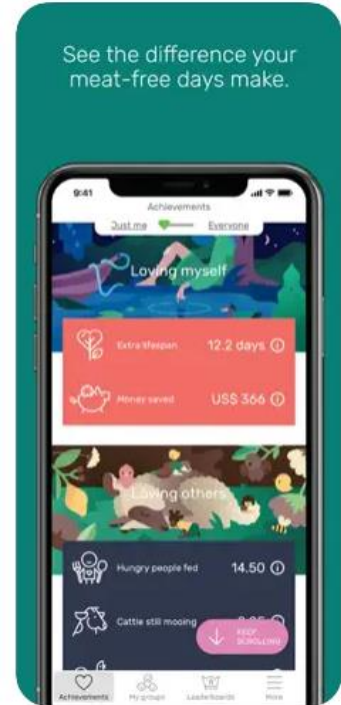
Download **The Darwin Challenge app**

Commit to 1 or more meat-free meals per week.

The app lets you see the real impact of your meat-free meals.

E.g. Just 2 meat-free meals per week for one year can lead to the following:

- You will live 1 day longer
- Equivalent of taking 10 cars off the road/year
- Saves 54 fish
- Saves 4 chickens
- Raises 2 people out of chronic malnutrition
- Saves 600 baths of water
- 3 tennis courts sized marine reserve saved
- Saves 3 tennis courts of forest





Industry Initiatives

“We are on the cusp of the fastest, deepest, most consequential disruption of agriculture in history.”

– RethinkX *Food and Agriculture Report*

- **Forecasting the rise of precision fermentation**
- **Fermentation products will cost 50% to 80% less than foods from an animal by 2030.**
- **Massively lower environmental footprint for replica meats/dairy/eggs**
- **By 2030 animal agriculture will be all but bankrupt**
- **Animal food industries will be stranded assets**



Industry Initiatives

Food

Plant-based meat by far the best climate investment, report finds

Exclusive: Non-animal proteins can play critical role tackling climate crisis, says Boston Consulting Group

Damian Carrington
Environment editor

@dpcarrington

Fri 8 Jul 2022 02:00 AEST



Malte Clausen, a partner at BCG: 'Widespread adoption of alternative proteins can play a critical role tackling climate change.' Photograph: Nathaniel Noir/Alamy



Industry Initiatives

Multi billion-dollar investments!

- **Perdue** – making Chicken-veggie nuggets for kids
- **Tyson** – now calling itself a “protein” company, launched own brand of plant-based products
- **JBS** (world’s largest meat producer) acquired a plant-based meat start-up and plans to sell lab-grown steaks, sausages and hamburgers in 2024
- **McDonalds** is introducing the McPlant burger
- **Burger King** sells Impossible Whoppers and, in the UK, aims for half of its menu to be plant-based by 2030
- **Ikea** plans for its restaurants to be 50% plant-based by 2025
- **Tesco** (largest supermarket chain in UK) has five-year goal of increasing sales of plant-based proteins by 300%
- Some European universities have eliminated most meat options
- **Investment** in plant-based meats, eggs, dairy has jumped from US\$1bn in 2019 to US\$5bn in 2021



Further Learning

- ***Regenesis*** by George Monbiot
- ***Food or War*** by Julian Cribb
- ***The Coming Famine*** by Julian Cribb
- ***Comfortably Unaware*** by Richard Oppenlander
- ***Food Choice and Sustainability*** by Richard Oppenlander
- **RethinkX.org**
- ***The Great Simplification*** - YouTube channel with Nate Hagens
- **Doctorsfornutrition.org** – for health information
- **Nutritionfacts.org** – for health information
- ***Green Karma*** charity – for health talks



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