Professor Rufus Black

Australian Council of Graduate Research National Meeting

28 April 2025

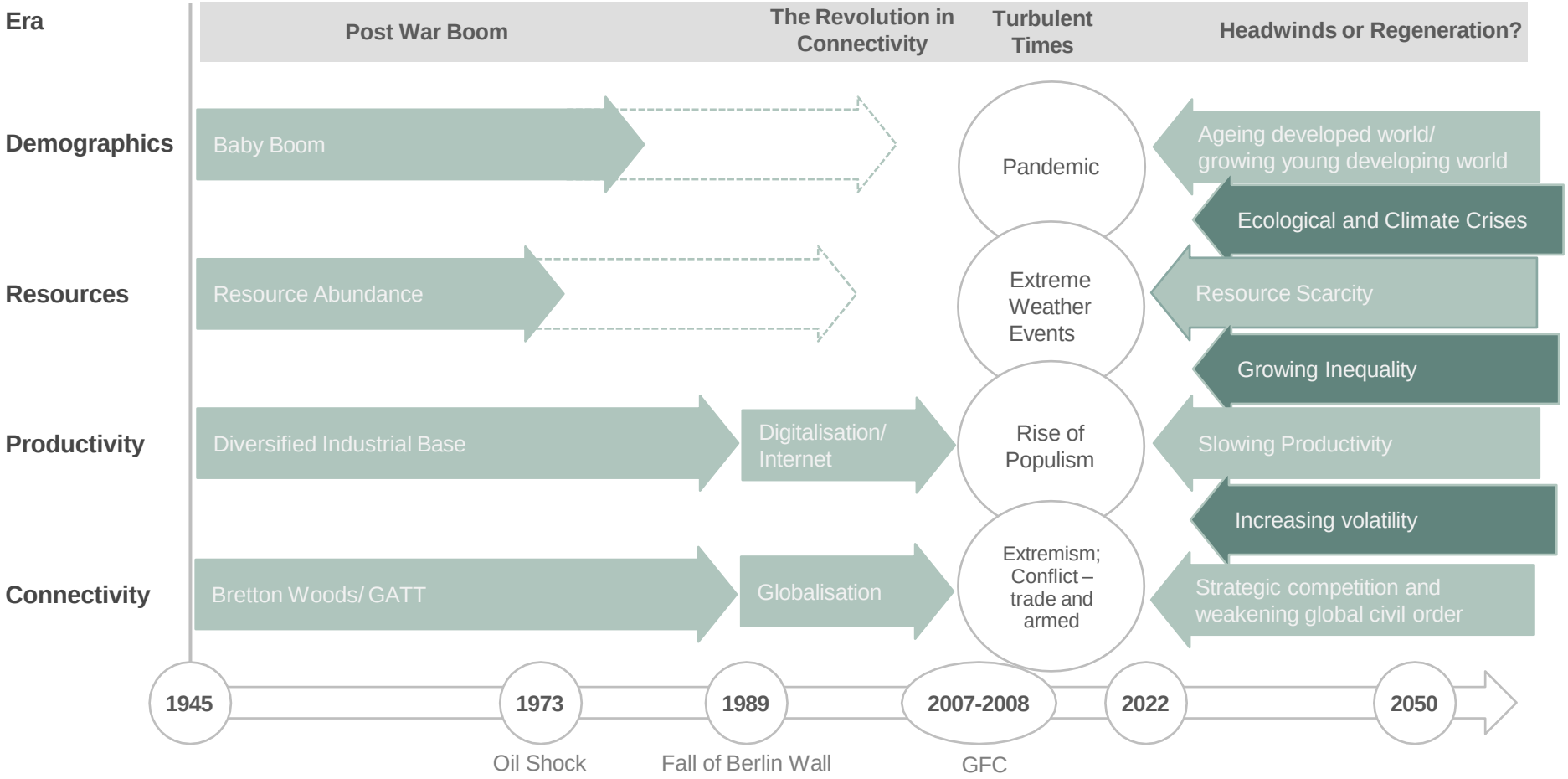
The context for our research is an era of global and local headwinds and a time when our model of social and economic development needs fundamental change

At the very moment when the world needs universities more than ever their social licence is being challenged

And our national innovation system is not delivering what the nation needs

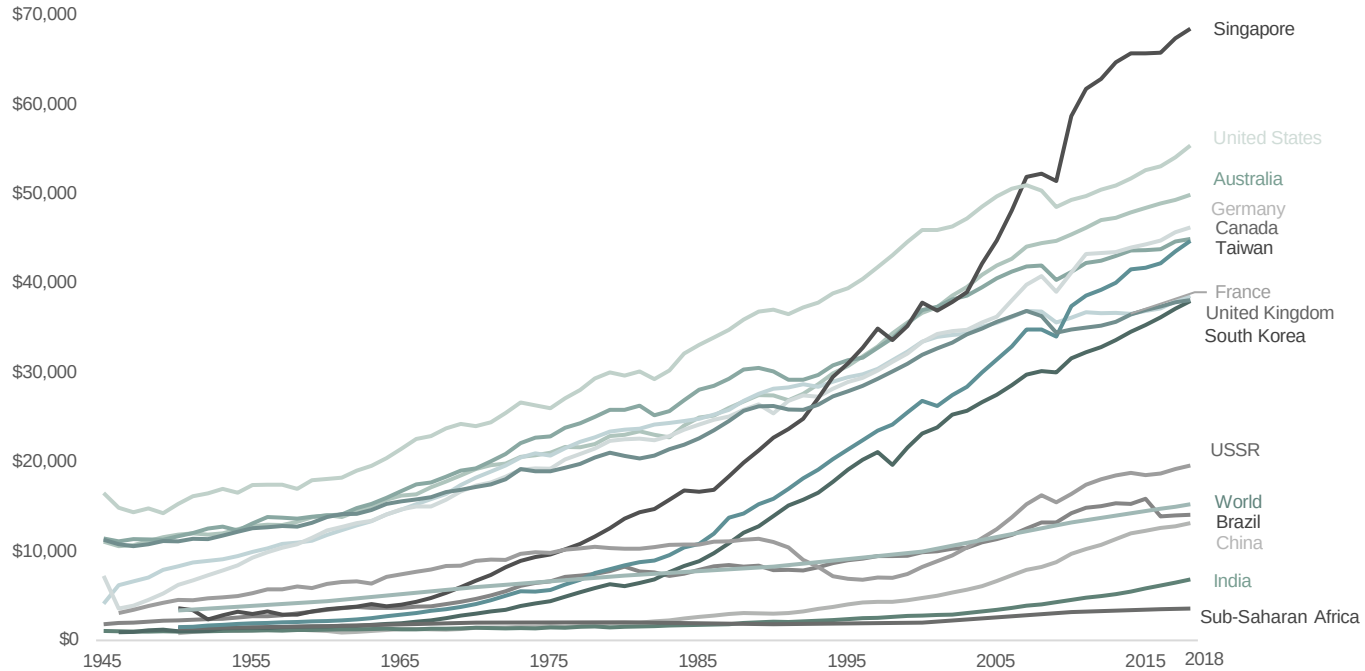
We must focus on purpose-driven programmatic research that addresses the headwinds and enables our communities to make the transitions they need to make - research that is compelling to government, business, community and future HDR students

Until the era of recent disruptions there were strong tailwinds for economic and social progress



The Post War period has seen economic progress unprecedented in human history

GDP per capita, 1945 to 2018



With economic progress came massive social gains

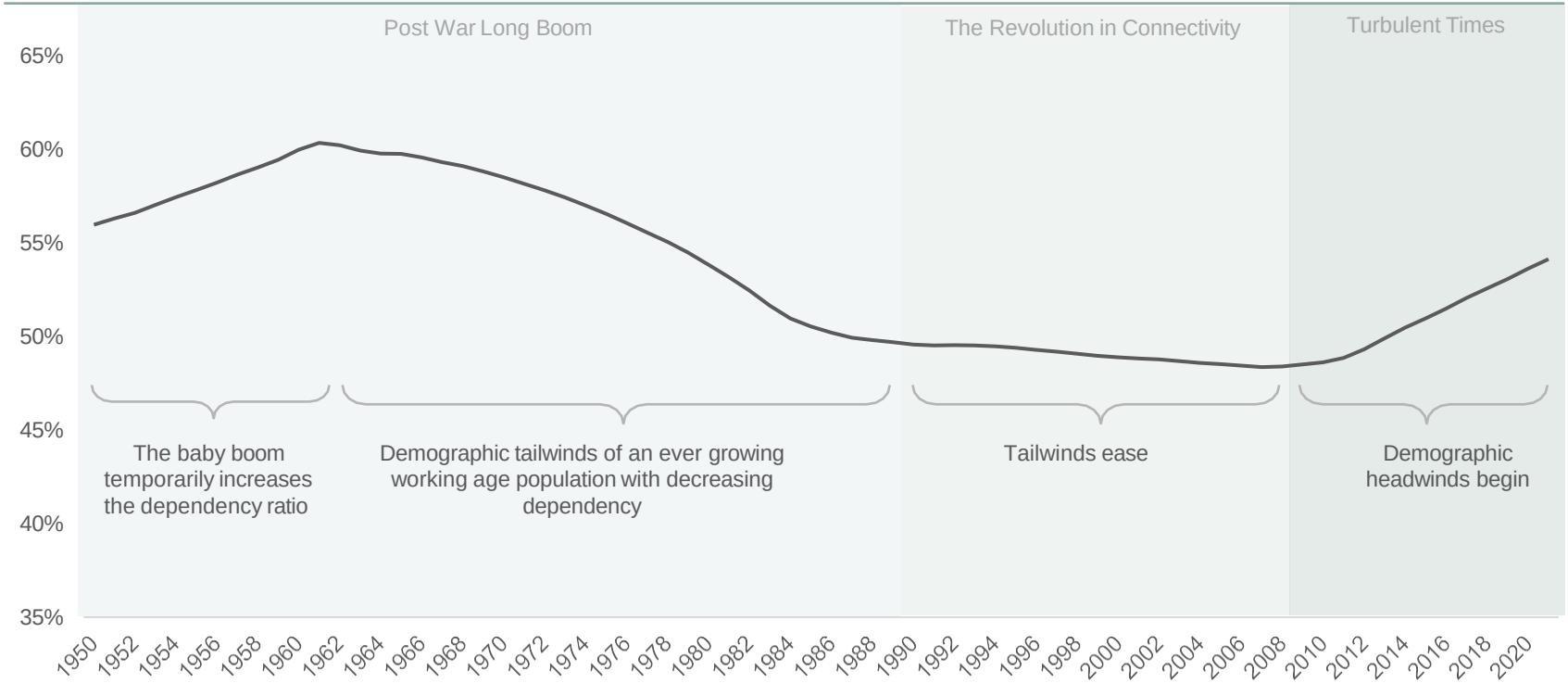
- Extreme poverty declined from 53% to 10%
- Global inequality (top 10% share) declined from 57.6% in 2000 to 52.4% in 2021
- During this period life expectancy globally went from 45.7 to 72.6 and in wealthy countries to 78
- Percentage of the worlds' countries as democracies went from 29% to 57%

Notes: GDP per capita adjusted for price changes over time (inflation) and price differences between countries – it is measured in international-$ in 2011 prices; average productivity growth in post war period is calculated as total cumulative productivity growth from year 1948 to 1973 divided by 25 years in US.

Source: Maddison Project Database 2020 (Bolt and van Zanden, 2020); World inequality database https://www.epi.org/publication/understanding-the-historic-divergence-between-productivity-and-a-typical-workers-pay-why-it-matters-and-why-its-real/

Demographics: Demographic tailwinds propelled economic progress during the second half of the 20th century

Age dependency ratio projections for high-income countries, 1950 to 2022

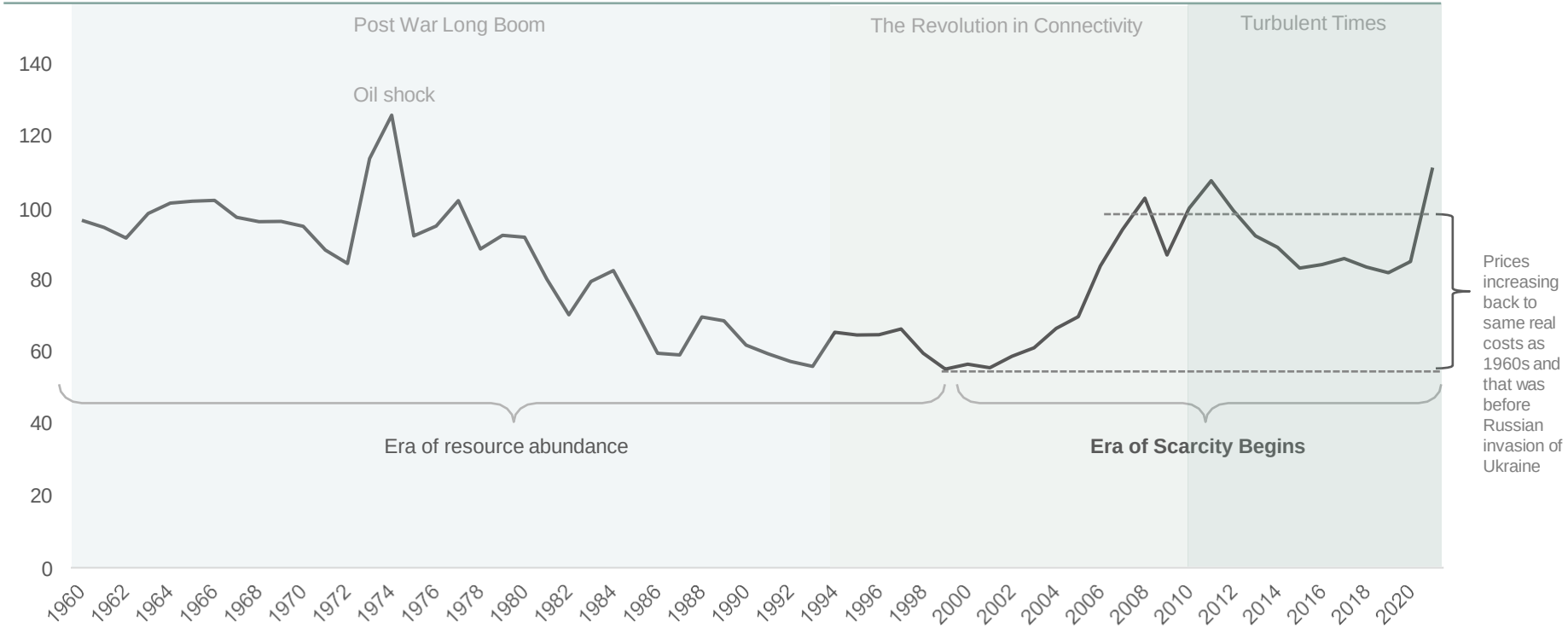


Note: Age dependency ratio is the ratio of dependents (people younger than 15 or older than 64) to the working-age population (ages 15-64)

Source: United Nations - Population Division (2022), OurWorldInData.org/world-population-growth

Resources: We went from a period of resource abundance to one of scarcity

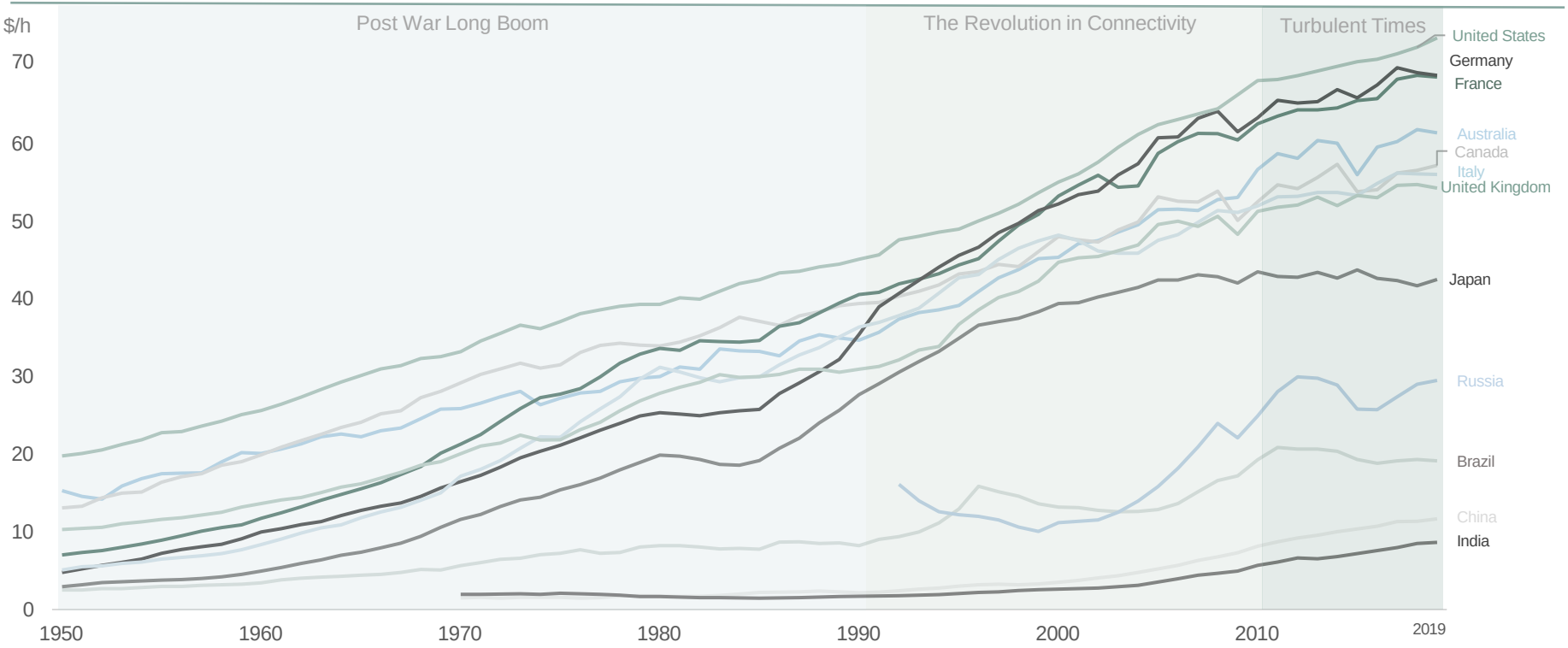
Non-Energy Commodity Price Index, 1960 to 2021



Source: World Bank Commodity Price Data (The Pink Sheet), Non-Energy Price Index, annual indices, 2010=100, real 2010 US dollars;
Resource revolution: meeting the world's energy, materials, food, and water needs [2011]. Dobbs, R.; Oppenheim, J.; Thompson, F.; Brinkman, M.; et al.

Productivity grew strongly in the post war eras

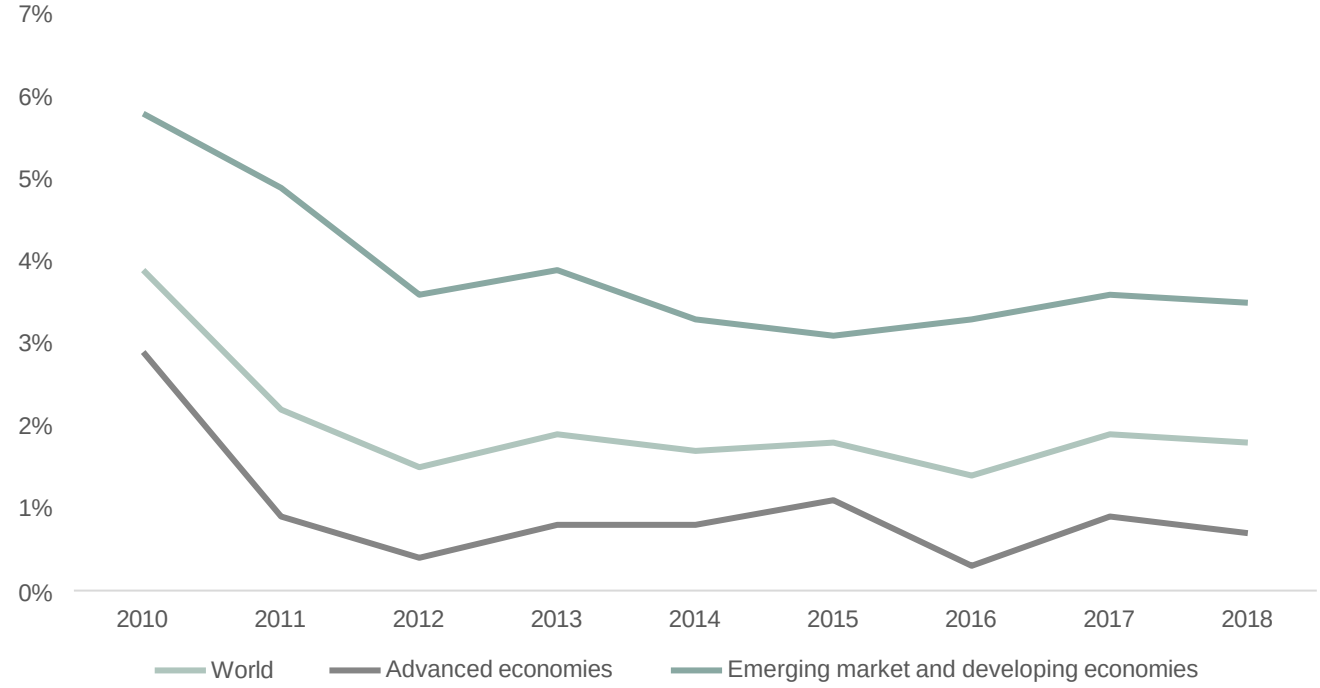
Productivity: output per hour worked



Source: Feenstra et al. (2015), Penn World Table 10.0; Productivity: output per hour worked (ourworldindata.org)

Global productivity has slowed since the Global Financial Crisis of 2007-08 across most of the developed and developing world

Productivity growth (Global vs. AEs vs. EMDEs)



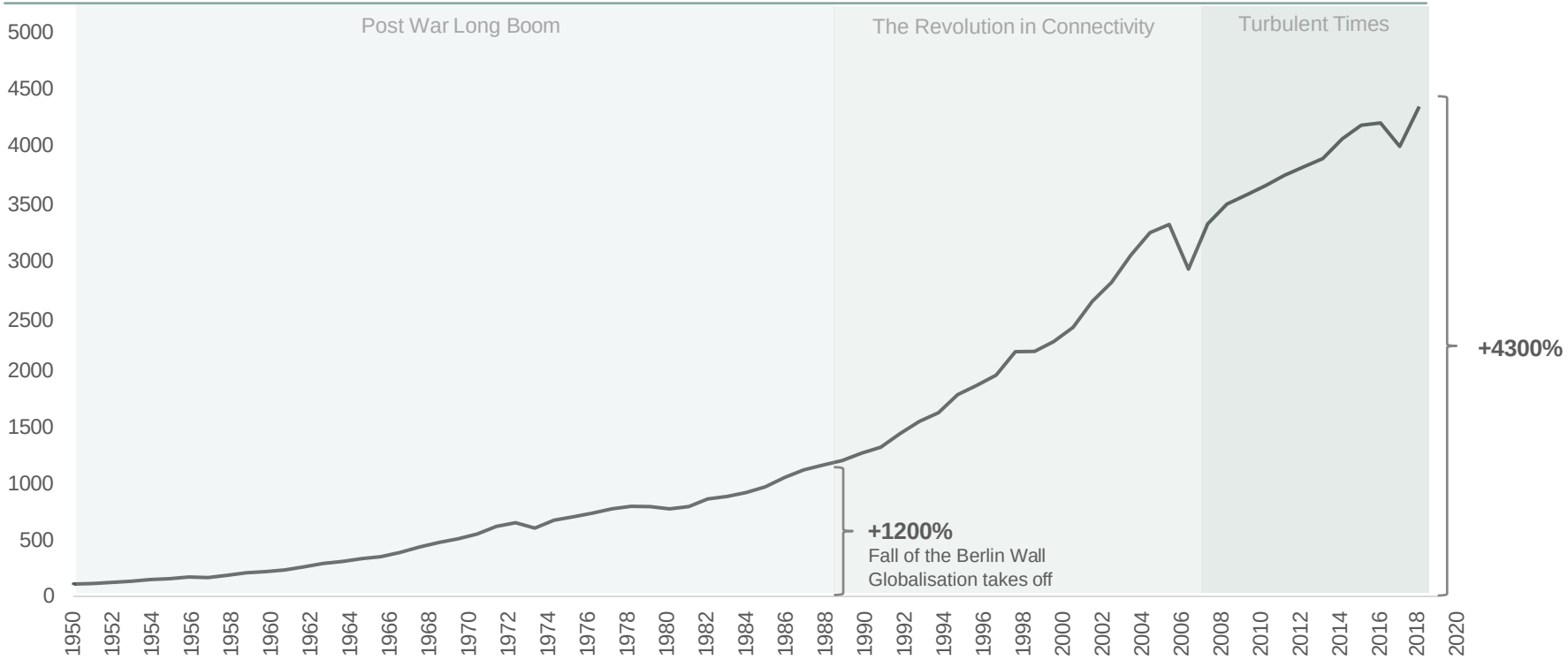
The causes are structural:

- Working age population deceleration
- Educational attainment stabilisation
- Reduced expansion into more complex and diverse forms of production as a result of the offshoring of manufacturing from developed countries

Source: Conference Board; Penn World Table; World Bank, World Development Indicators.
Note: Productivity is defined as output per worker in U.S dollars (at 2010 prices and exchange rates).

Connectivity: Goods moved around the world in dramatically increased volumes

World trade volume, 1950-2021 (Volume index, 1950=100)



Source: https://www.wto.org/english/res_e/statis_e/trade_evolution_e/evolution_trade_wto_e.htm

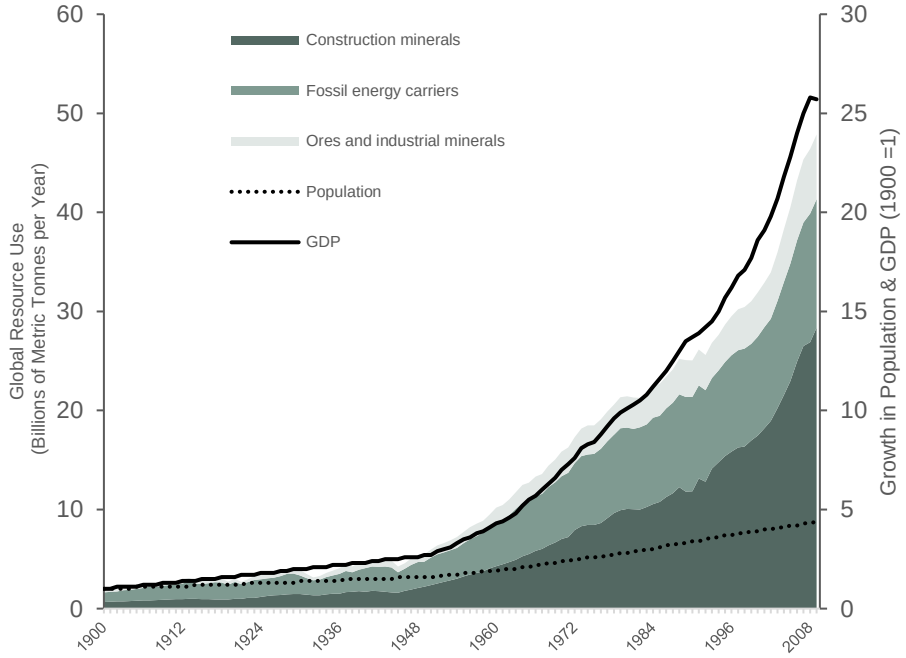
Connectivity is deteriorating as we have gone from an era of global cooperation to one of Geo-strategic competition

Dimensions of Global Competition

1. **Spheres of geographic influence:** China out to the 9 dash line, Russia across its old empire and a buffer to NATO, Iran across the Middle East
2. **Models of government:** authoritarian vs democratic
3. **International order: non-western alternatives vs rule-based order**
4. **Access to resources:** particularly accelerated in an age of scarcity
5. **Technology** that either sets global standards (e.g. 6G) or provides competitive edge (e.g. AI)

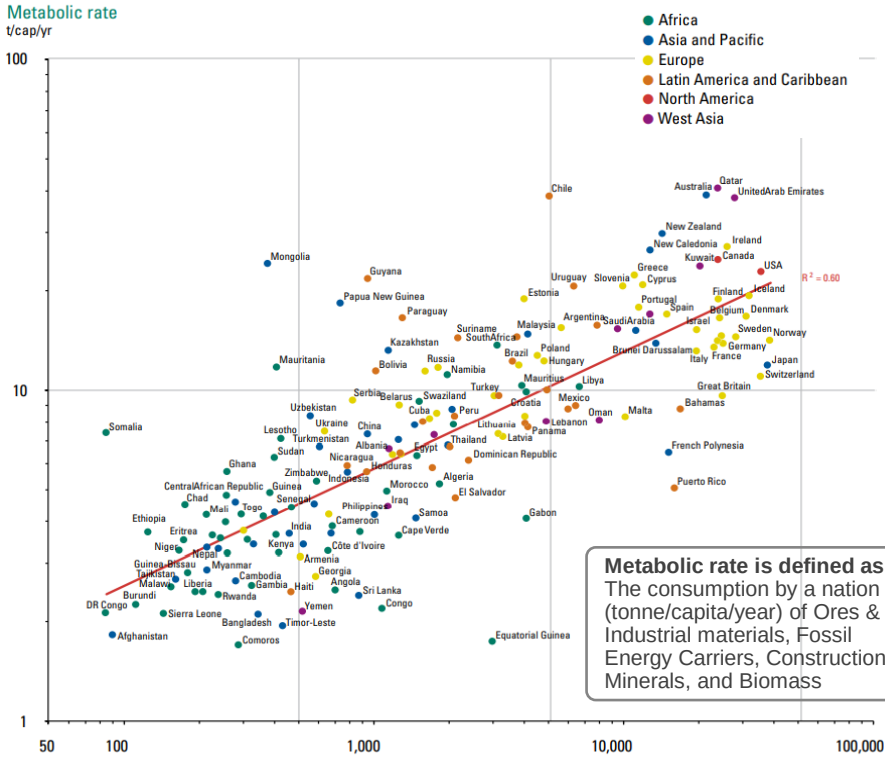
Our economic growth has been built on an extractive model

Global consumption of selected resources vs. population and GDP growth



Source: Krausmann Fridolin, Simone Gingrich, Nina Eisenmenger, Karl-Heinz Erb, Helmut Haberl and Marina Fischer-Kowalski, 2009. Growth in global materials use, GDP and population during the 20th century. Ecological Economics

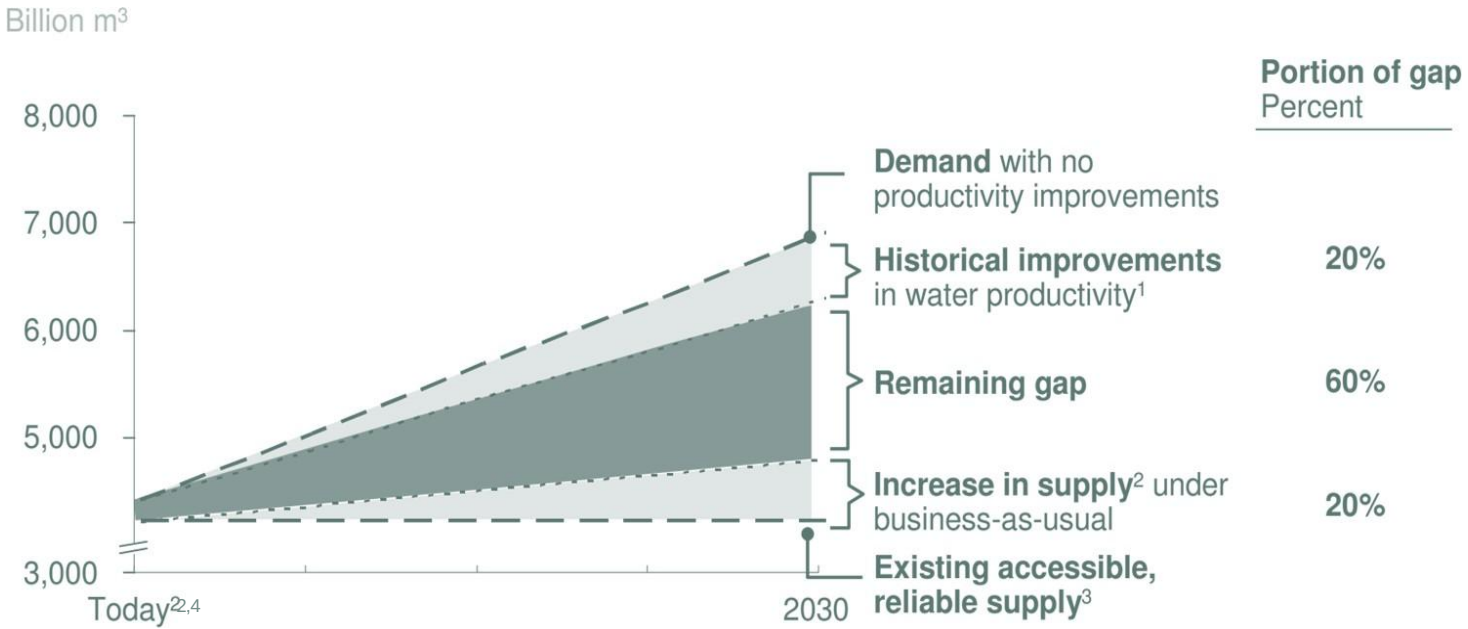
Consumption of selected resources by nation vs. GDP per Capita



Source: United Nations Environment Programme (2011). Decoupling Natural Resource Use and Environmental Impacts from Economic Growth. https://wedocs.unep.org/20.500.11822/9816.

We have applied that extraction model to what should be renewable resources so they are diminishing like non-renewable ones. That is true of fresh water

The Water Gap

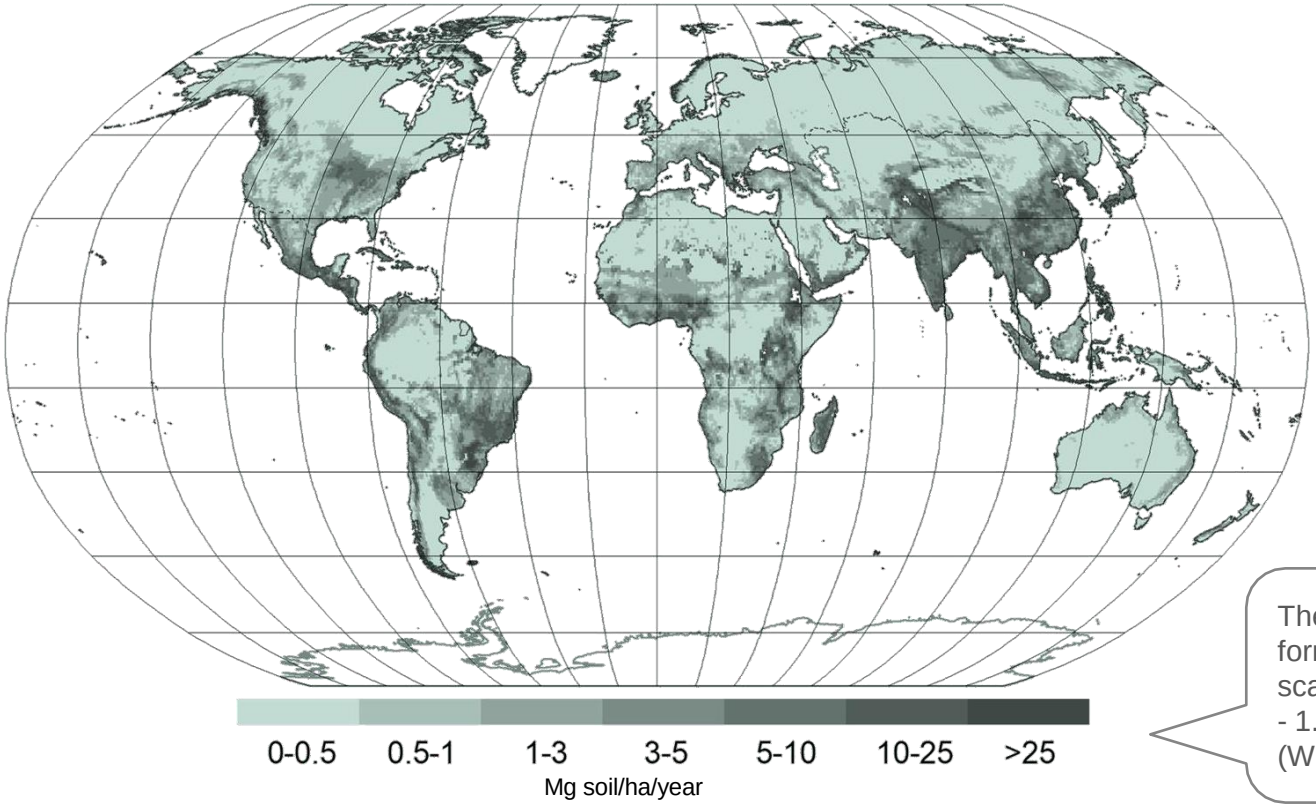


1 Based on historical agricultural yield growth rates from 1990-2004 from FAOSTAT, agricultural and industrial efficiency improvements from IFPRI
2 Total increased capture of raw water through infrastructure buildout, excluding unsustainable extraction
3 Supply shown at 90% reliability and includes infrastructure investments scheduled and funded through 2010. Current 90%-reliable supply does not meet average demand
4 The start is 2011

Source: Charting Our Water Future, Economic frameworks to inform decision-making 2009; The 2030 Water Resources Group – Global Water Supply and Demand model; IFPRI; FAOSTAT

We are using soil as a non-renewable resource

Soil erosion debt (difference between natural soil erosion and actual soil erosion), 2021

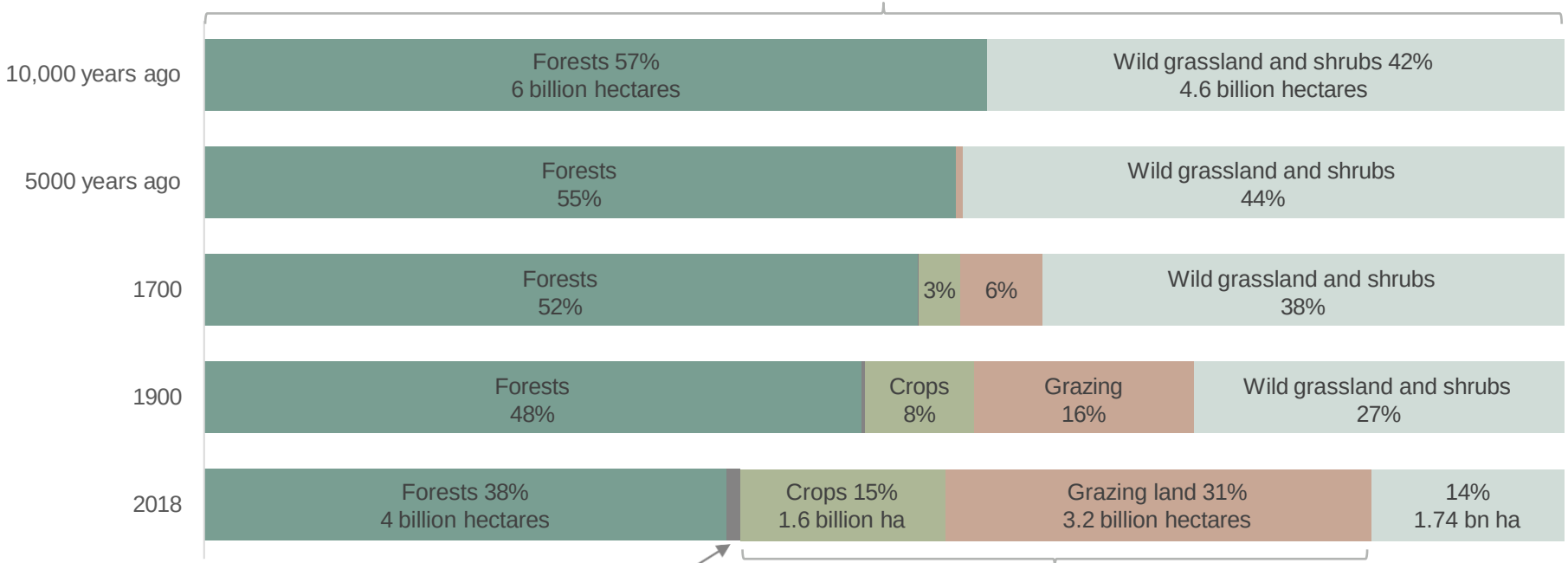


The rate of soil formation on a global scale is approx. 0.37 - 1.29 Mg/ha/year (Wakatsuki et al.)

Source: Wuepper, D., Borrelli, P., Panagos, P., Lauber, T., Crowther, T., Thomas, A. and Robinson, D.A., 2021. A 'debt' based approach to land degradation as an indicator of global change. Global Change Biology, **27(21)**: 5407-5410; Toshiyuki Wakatsuki, Azwar Rasyidin, Rates of weathering and soil formation, Geoderma, Volume 52, Issues 3–4, 1992, Pages 251-263, ISSN 0016-7061, https://doi.org/10.1016/0016-7061(92)90040-E.

We continue to destroy our forests and grasslands at an unsustainable rate to try to feed people the diets they want

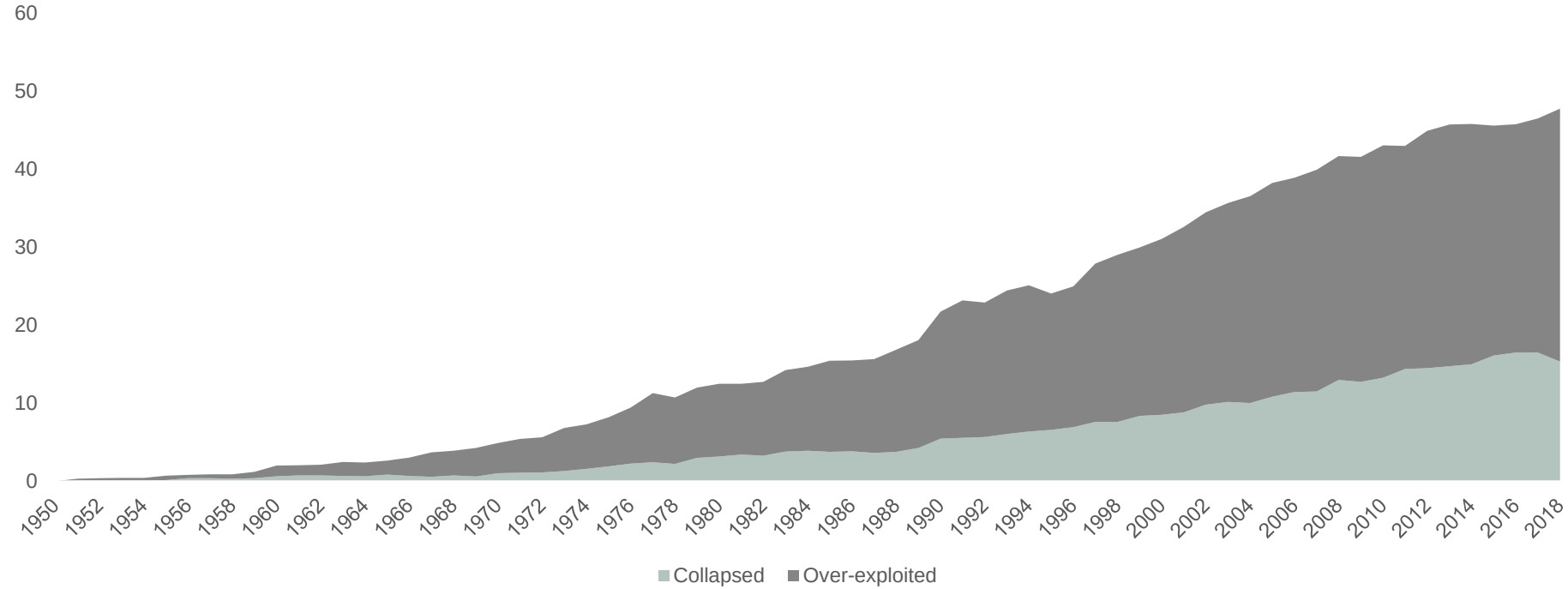
10,000 years ago, 10.6 billion hectares – 71% of the earth's land surface – were covered by forests, shrubs, and grasslands.
The remaining 29% are covered by deserts, glaciers, rocky terrain and other barren land.



Source: https://ourworldindata.org/deforestation

At sea we have an extractive approach to the oceans which is seeing our fish stocks being decimated

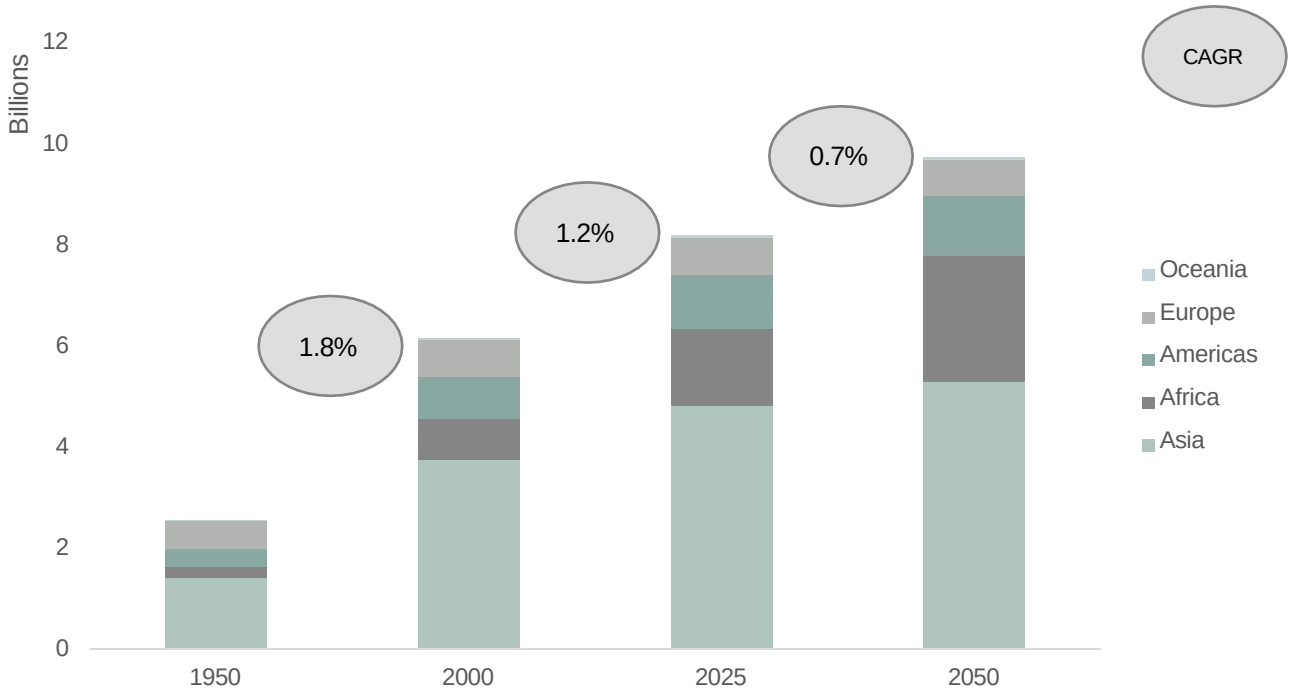
Percentage of fish stocks over-exploited and collapsed



Source: https://www.seaaroundus.org/data/#/global/stock-status

The continued rapid growth of developing world populations will continue to drive forest, grassland and fish stock destruction unless our approach to diet and food production changes dramatically

Historic and projected population growth by world regions



Meat consumption tends to rise as we get richer…

- In the last 20 years global **meat consumption** increased **by 58%**
- **Developing countries** accounted for around **85% of the increase** in consumption

Land requirements to produce 1kg of:

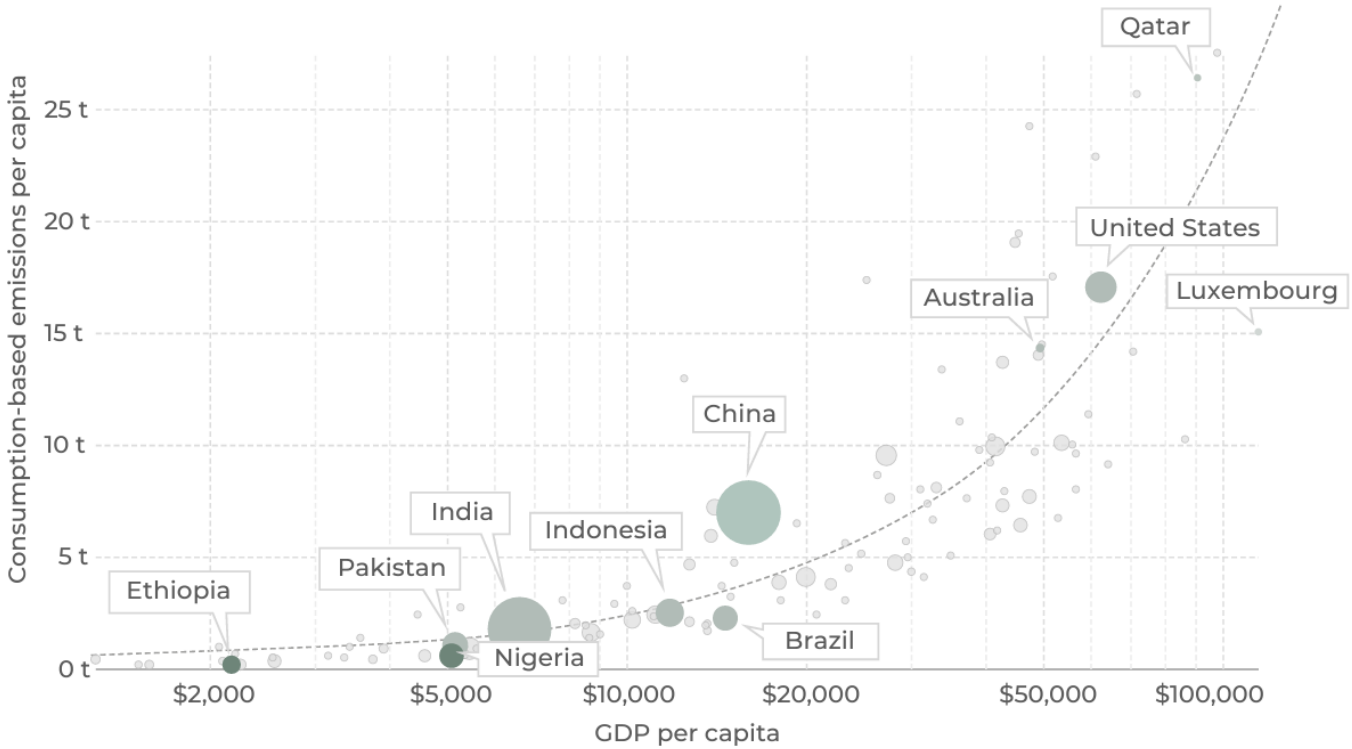
- Lamb 370 m²
- Beef 326 m²
- Pork 17 m²
- Chicken 12 m²

- Per capita **fish consumption** is **highest** in more **developed** economies, but **is expected** to **grow** more rapidly in **developing countries**

Source: Population by country, available from 1800 to 2021 based on Gapminder data, HYDE, and UN Population Division (2019) estimates. Gapminder (v6), HYDE (v3.2), United Nations Population Division (2019) (2022-2100); OECD-FAOAGRICULTURAL OUTLOOK 2015 © OECD/FAO 2015; CAGR – Compound Annual Growth Rate.

We have an emission model where economic growth is coupled to emissions

Consumption-based CO_2 emissions per capita vs GDP per capita, 2019



Emissions tend to rise as we get richer because we gain access to and increase our consumption of:

- Electricity
- Heating,
- Transport
- and other goods that require energy inputs

Δ Population 2022 vs 2050

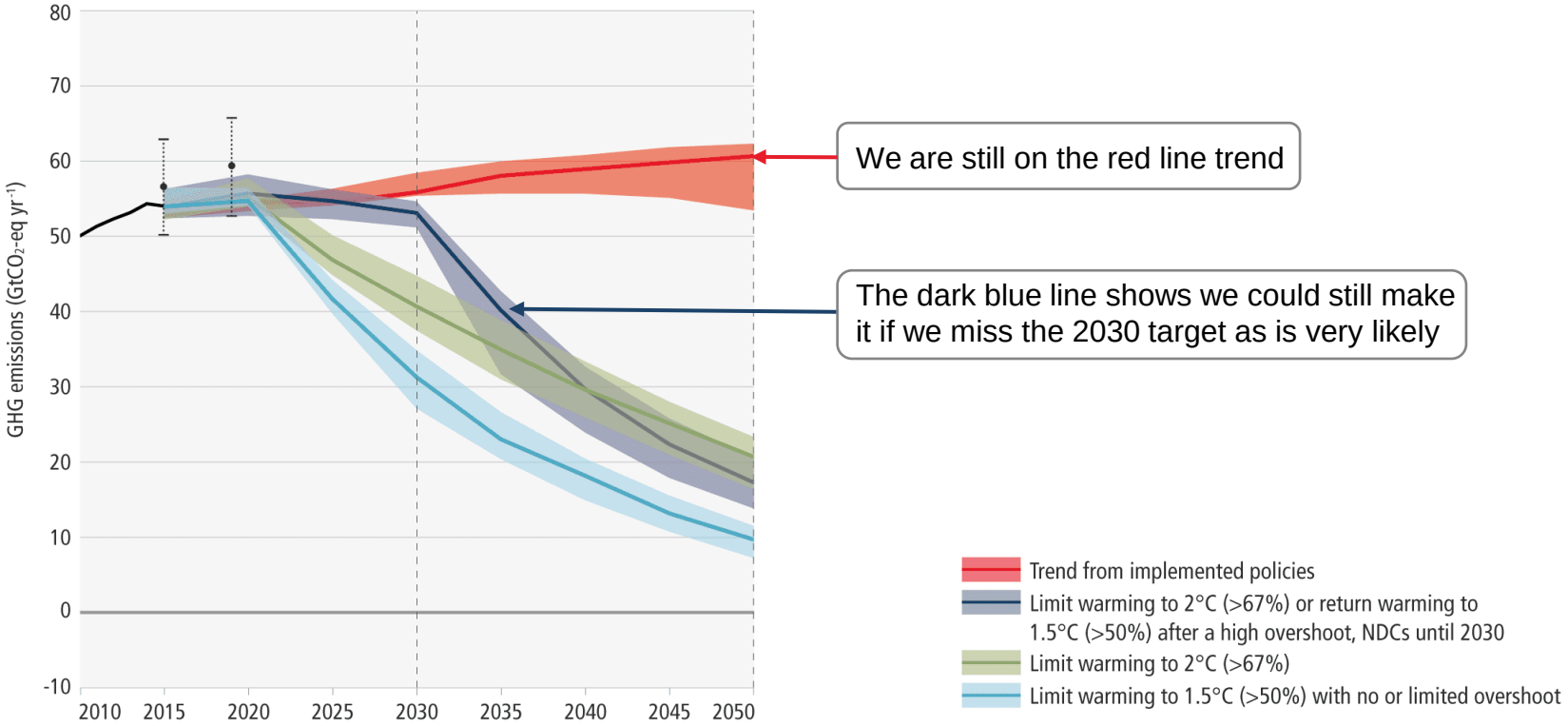
- Above 65%
- 31 - 65%
- 0 – 30%
- Population decline

Dots sized by Population

Source: Our World in Data based on the Global Carbon Project, Data compiled from multiple sources by World Bank - World Bank (2022.05.26)

We are still tracking toward Greenhouse Gas emissions levels that will cause the sort of temperature increase that will severely damage the planet

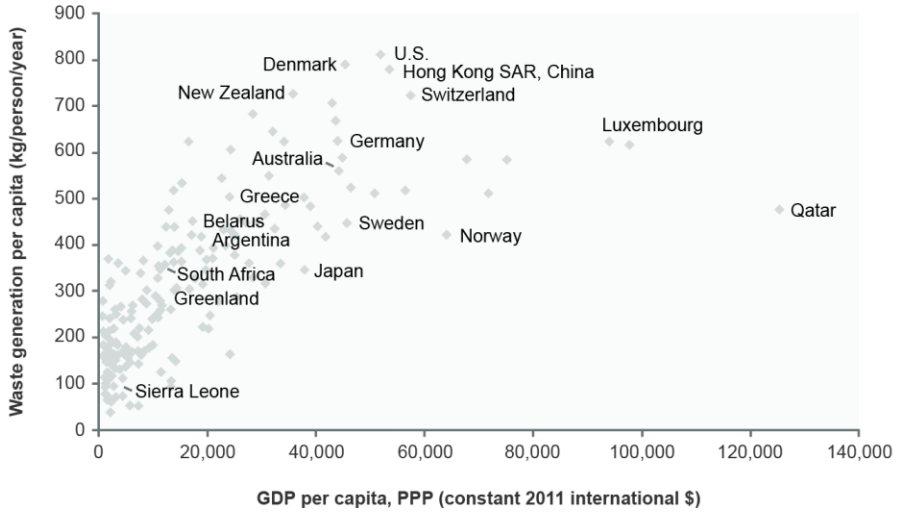
Global GHG emissions of modelled pathways



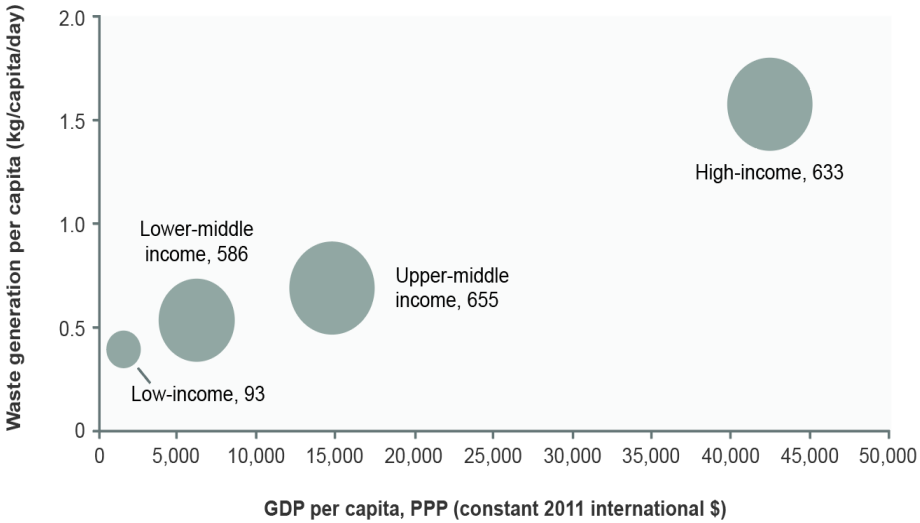
Source: IPCC, Climate change 2022: Mitigation of climate change. IPCC Intergovernmental Panel on Climate Change. Available at: https://www.ipcc.ch/report/ar6/wg3/ [Accessed August 29, 2022].

Economic growth is also coupled to the production of waste

Waste Generation vs GDP, by economy



Waste Generation vs GDP, by income group



Source: Kaza, Silpa, Lisa Yao, Perinaz Bhada-Tata, and Frank Van Woerden. 2018. What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050. Urban Development Series. Washington, DC: World Bank. doi:10.1596/978-1-4648 -1329-0. License: Creative Commons Attribution CC BY 3.0 IGO

That same model of development has seen the growth of inequality in all its forms

Inequality between:

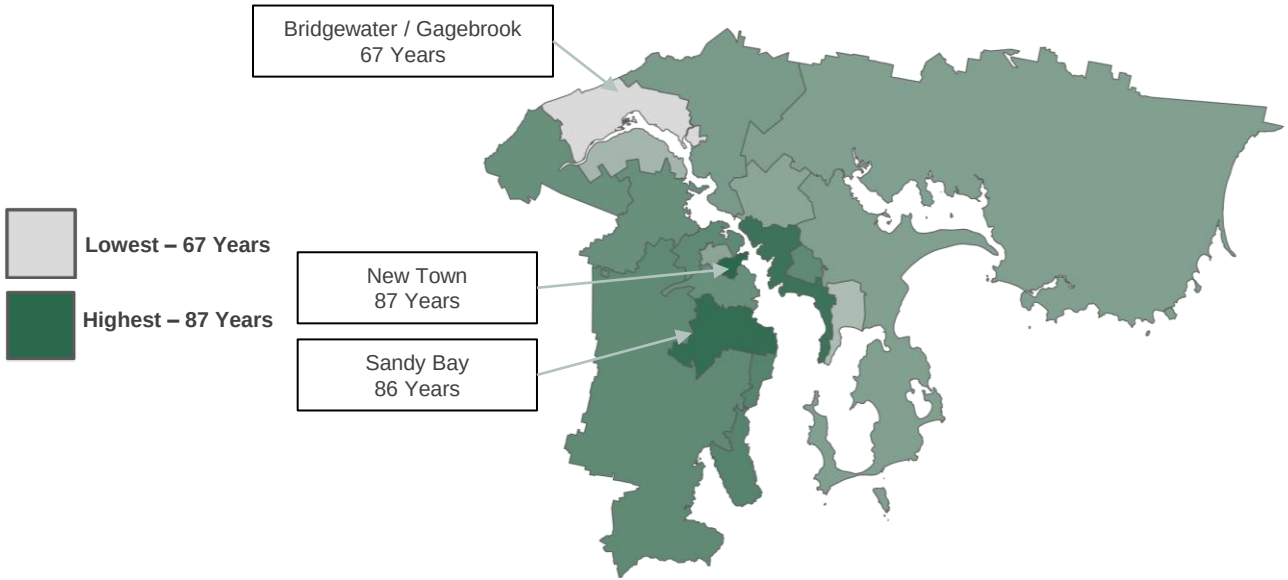
- **Countries**
- **People**
- **Places**

Inequality of:

- Income
- Wealth

Even here in Hobart there are shocking inequalities - life expectancy is a way of summing them up.

Life Expectancy in Greater Hobart, by Public Health Area, 2017 - 2021



- The difference between Bridgewater and New Town or Sandy Bay is stark.
- For every kilometre you travel north away from Sandy Bay you effectively lose a year of life expectancy.
- It is like comparing one of the richest places in the world (Hong Kong - 85 years) with one of the poorest (Eritrea - 67 years).
- These patterns are not exclusive to Hobart

PHIDU, Social Health Altas of Australia: Population Health Areas, Median Age at Death by PHA, 2017 - 2021

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And our national innovation system is not delivering what the nation needs

We must focus on purpose-driven programmatic research that addresses the headwinds and enables our communities to make the transitions they need to make - research that is compelling to government, business, community and future HDR students

Universities are under attack and their social licence is declining at a time when what they offer is needed more than ever

FINANCIAL REVIEW

— Opinion

How do our universities get their social licence back?

There are four issues that universities need to address if they are to revive their troubled reputations in Australian society.

Shamit Saggar *Policy expert*

THE WALL STREET JOURNAL.

Trump Is Going After Universities' Federal Funding. Here's What to Know.

By Roshan Fernandez Follow

Updated April 13, 2025 12:28 pm ET

news.com.au

'Had enough': Peter Dutton predicts anti-woke revolution for Australia

Peter Dutton has predicted that political correctness "isn't cutting it" anymore when people can't afford to pay their bills and their mortgage.

Samantha Maiden

@samanthamaiden 4 min read January 22, 2025 - 1:54AM news.com.au

"I think this is turning and I think there is going to be a near revolution that comes with the Trump administration," Mr Dutton told Sky News.

"In relation to a lot of the woke issues that might be fashionable in universities and at the ABC that just aren't cutting it around kitchen tables at the moment where people can't pay their bills.

"They can't pay their mortgage, their insurance has gone up, their grocery bill has gone up, they just see a government with the wrong priorities.

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Our national research and development system is not working

"Australia is a high performer in research…[b]ut much of this research rarely addresses the needs of the main users of research and innovation in Australia – industry, government and the community. There is the challenge." ***Strategic Examination of R&D Discussion Paper*****, Feb 2025**

Nationally

- R&D investment is below our peers (1.66% of GDP in 2021-22 vs OECD 2.73%)
- We have a diffuse system of funding and incentives
- Commonwealth R&D investment is spread broadly and thinly
- The importance of First Nations knowledge and knowledge systems is under-represented
- There are gaps in R&D infrastructure
- Research collaboration and alignment across sectors is weak
- Our workforce is not aligned to the needs of our economy

Institutionally

- Connection between researchers and end users remains poor – basic research capacity is not matched to investment in translation
- There are pressures on operating models
- Researchers face mobility and career challenges
- The PhD model has not changed at scale to reflect the needs of graduates and the broader economy

Business and Industry

- Declining R&D investment by business
- Manufacturing has relatively low R&D intensity and is critical to improved R&D performance
- Start up scene that is vibrant and maturing, yet poorly connected to universities
- Reliance on SMEs to lift business R&D, while SMEs are facing growth and scale challenges
- Large enterprise investment in R&D is in decline

Source: Strategic Examination of R&D Discussion Paper, Australian Government. 12 February 2025

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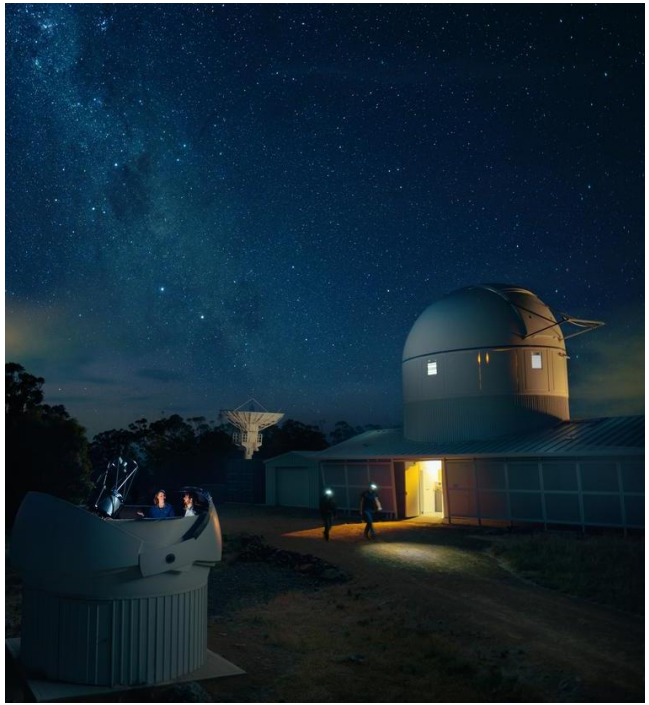
We need a healthy research ecosystem that includes discovery and application



Central to the University of Tasmania's plan is collaborating with our partners to enable the transitions Tasmania needs to make by 2050

	From	To
Education	A system where participation and attainment are well below average	90% of Tasmanian school students are well prepared for tertiary education
Health	A strained health system, poor health outcomes and deep inequalities	Substantially narrowing the life expectancy gap so Tasmania reaches the national average and reducing the gaps between Tasmanian regions
Productivity	A productivity rate that lags the nation's already low rates	Lifting productivity to exceed the national average and closing the income gaps
Climate	A climate in crisis, exacerbating ecological challenges and impacting on Tasmania	Positioning Tasmania as a leader in the move to a zero emissions economy and helping create a resilient Tasmania
Tasmanian stories	Giving expression to our place in Tasmanian stories, told through words, music, film, art and buildings and sharing these to effect the transitions we need to see	


MGC DIAGNOSTICS


UNIVERSITY of TASMANIA
#1 in climate action globally
TIMES HIGHER EDUCATION IMPACT RANKINGS 2024
#2 uni globally
TIMES HIGHER EDUCATION IMPACT RANKINGS 2024
17 PARTNERSHIPS FOR THE GOALS
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
15 LIFE ON LAND
14 LIFE BELOW WATER
13 CLIMATE ACTION
11 SUSTAINABLE CITIES AND COMMUNITIES
9 INDUSTRY,
8 DECENT WOR
AFFORDABLE
6 CLEAN WATER A
5 GENDER EQUALITY
QUALITY EDUCATION
3 GOOD HEALTH AND WELL-BEING
2 ZERO HUNGER
Thank you