

# A Growth Story for the 21<sup>st</sup> Century: building sustainable, resilient, and equitable development

Lecture 1: A world re-drawn; a world in crisis; a moment in history; the agenda for growth and transformation

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*Slides sufficiently detailed to be read independently of lectures. Not all detail will be presented.*

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Lionel Robbins Lectures, 12<sup>th</sup>, 13<sup>th</sup>, 14<sup>th</sup> March 2024

London School of Economics and Political Science

# This is the time for economics and the social sciences to chart a course for fundamental and rapid change

- These lectures are about **economic analysis, ideas, policy, and action that can guide a rapid change of course** and the creation of sustainable, resilient, and equitable growth and development.
- Building on the science, they show what is necessary, and on the technology, what is feasible. The scale, speed, and nature of the necessary change imply that the **transition will not be easy. The obstacles lie mostly in economics, politics and society rather than technology.**
- The prize is the **avoidance of a catastrophic future for the generations to follow and the creation of the growth story of the 21<sup>st</sup> century.** Far more attractive than the dirty, destructive paths of the past.
- Our focus then is on the **economics of change.** But we must also recognise that **economics must itself change towards the economics of rapid structural, systemic, and technological transformation.**
- This is the moment **economics must step up.** But its analysis must be interwoven with politics, finance, law, geography, international relations, history, culture, and crucially, moral philosophy. **With the social sciences and the humanities.** I trust that the great Lionel Robbins would have recognised this clearly and lead the way.
- **This is a moment for the LSE “to know the causes of things”, “for the betterment of society”; its motto and its purpose.**

# Essence of the lectures

## Lecture 1 : A world re-drawn; a world in crisis; a moment in history; the agenda for growth and transformation (12<sup>th</sup> March)

1. Looking back: growth and development since the second world war.
2. A world redrawn: a series of crises and deepening understanding of the unsustainability of current paths.
3. Climate and biodiversity crises: science and necessity of rapid and fundamental, structural, and systemic change.
4. The ethics, the economics, and the politics of sustainable development and fundamental change.
5. A decisive decade: urgency and scale of action.
6. Implication: the agenda for analysis and action is the building of sustainable, resilient, and equitable growth and development; rapidly and effectively.

## Lecture 2 : A new growth story; structural transformation; policies and institutions (13<sup>th</sup> March)

1. The basics of the new growth story.
2. Climate action, development, and poverty reduction.
3. Investment and innovation.
4. The analytics of the new growth story.
5. Policies and institutions.
6. The role of the state.

## Lecture 3 : Recasting the global economy and international institutions: collaboration, competition, and the new growth story (14<sup>th</sup> March)

1. Vulnerability, history, and opportunity: differences across countries.
2. Technology, geography, trade.
3. International action, responsibilities, and collaboration. Five key areas: trade; technology; land; overshooting; finance.
4. Land, forests, and biodiversity.
5. Overshooting, removal, and geoengineering.
6. Fundamental reform of MDBs and international finance system.

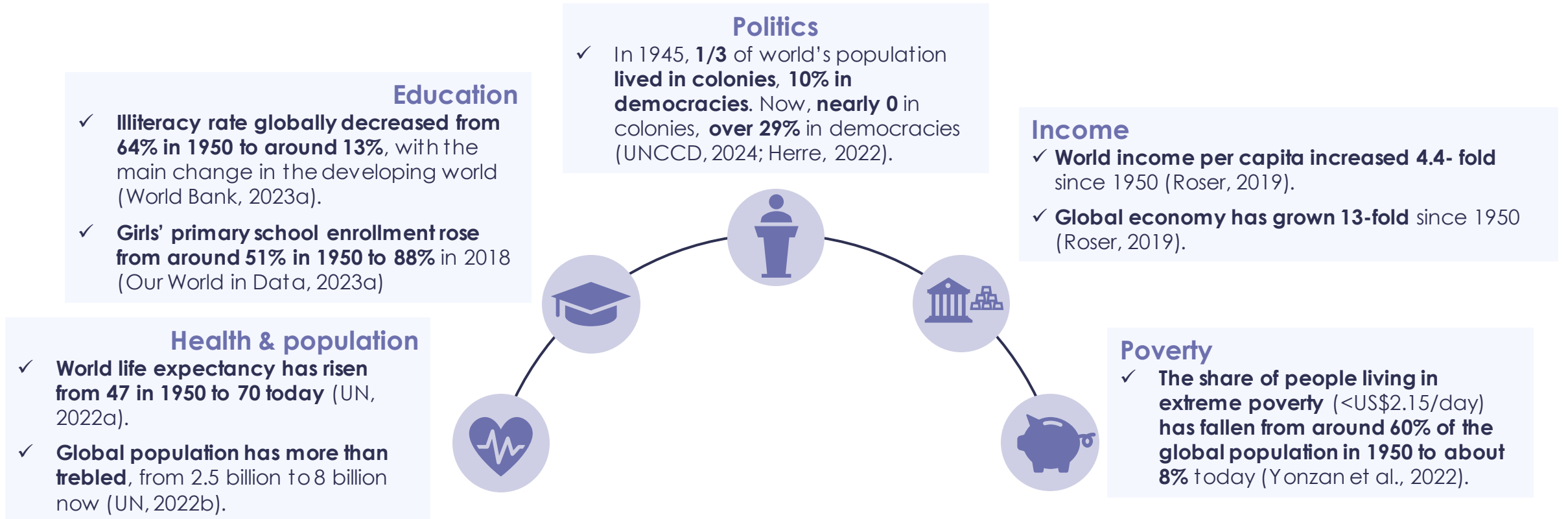
**Closing call;** optimistic about what we can do as a world; anxious about what we will do; challenge is to turn “can” into “will”.

# Structure

- **Looking back: growth and development since the second world war**
- A world redrawn: a series of crises and deepening understanding of the unsustainability of current paths
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# Looking back: growth and development since the second world war; outcomes (I)

The last seven decades have seen extraordinary achievements in life expectancy, education, income growth, and to some extent democracy and human rights. We have seen rapid and large falls in global poverty and falls in global inequality in health and education. But a 13-fold increase in economic output (narrowly measured), and dirty and destructive methods of production, particularly around energy, have put extreme pressure on climate, biodiversity and environment (see next slides).



# Looking back: growth and development since the second world war; outcomes (II)

While overall outcomes for this period are striking, there remains fragility and great variation across regions.



**Progress has been less strong in Africa** (e.g. on life expectancy and infant mortality). The illiteracy rate is higher in Sub-Saharan Africa (32%) and Middle East and North Africa (20%) compared to other developing regions - Latin America and Caribbean (5%), East Asia and Pacific (4%) – except South Asia (26%) (World Bank, 2023b).



After a strong decline between 1910 and 1980, **within-country inequality of incomes rose again since 1980**, particularly when measured in terms of the shares of income and wealth going to the top 1% (Chancel et al., 2021).



**Many people who have been lifted out of poverty remain highly vulnerable to falling back into it** (the pandemic pushed more than 70 million more people into poverty in 2020) (World Bank, 2022a). There are still large numbers living in poverty; almost 700 million people live in extreme poverty (with < \$2.15 per day), including around 400 million in Sub-Saharan Africa and 200 million in South Asia (World Bank Poverty and Inequality Platform, 2023).



**Advances in democracy have stalled in the last two decades** (Freedom House, 2023). Many countries have seen the rise of autocratic figures and populism. Despite some improvements in respect of human rights, there is much that remains deeply troubling, including declines in press freedom, democratic backsliding, and the continued marginalisation, demonisation or persecution of religious, racial, social, and national groups in many countries.



In the 1970s and 1980s, a handful of countries in East Asia grew quickly for two decades or more and attained high-income status. China grew very rapidly for more than three decades from 1980, lifting 800 million people out of poverty (World Bank & DRC, 2022). But **some emerging markets seem to be stuck in a so-called “middle-income trap”**. India, however, stands out. Despite challenges, it has shown significant economic progress; reforms contributed to strong growth over the last three decades.



International tensions have been rising in the last two decades. More intrastate conflicts being “internationalised” (Global Peace Index). Increasingly dangers of conflict arising from climate change and movements of people (Kelley et al., 2015; Abel et al., 2019).

# Underlying models of growth (capital and technical progress)

For more than half a century after World War II, the understanding of drivers of overall aggregate growth was focused on capital accumulation, technological progress, population growth, and human capital/skills. These approaches are evolving to integrate industrial dynamics and environmental factors as essential components of future growth and development. But Harrod-Solow still dominant.



The conceptual approaches of **Harrod ( $g=s/v$ )** and **Solow,  $Y=F(K, L, t)$** , were very powerful in shaping thinking; particularly on the role of increasing investment and technical progress in driving growth.

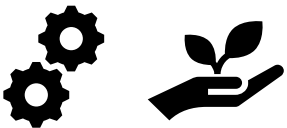


**The understanding of technical progress** and its relationship with past paths of investment and growth was powerfully influenced by **Arrow (1962) on learning by doing**.

In the 1980s and 1990s, Arrow's insights were used to **link micro learning and macro growth** (endogenous growth).



The work of Aghion and collaborators has been very productive in **bringing industrial structures and Schumpeterian creative destruction** to the understanding of technical change.



**Now, the roles of structural and systemic change and of the environment, interwoven with the above perspectives,** must be at the heart of understanding of future growth and development (see Lecture 2).

# Planning and steering of structural change gave way to market fundamentalism

Development economics transitioned from a focus on sectoral shifts and planning to market-driven policies. Some recent shift back towards emphasising structural and technological changes for sustainability.

## Early days of development economics

Strong focus on **changing sectoral structures** at the heart of growth, including fostering manufacturing.

## 1950s -1960s

Lewis (1954, 1955) highlighted **movement out of subsistence sectors** as driving forces in increasing saving/investment and productivity. Mahalanobis (1940s/50s) and Indian planning on “Machines to Make Machines”. Nurkse (1953) on **big push across all sectors**. Hirschman (1958) on “**unbalanced growth**” to induce entrepreneurship and investment.

## 1970s

Saw **reaction against “steering, direction, planning”** (Little, Scitovsky, and Scott,1970; changes in India’s planning system from 1960s).

## 1980s -1990s

The reaction accelerated in **rise of market fundamentalism** of 1980s, 1990s and “Washington Consensus”; get “prices right, let markets hold sway, keep macro sound, and let investment fall where it may”. These ideas and actions strongly influenced policy, along with, in some cases, increased productivity. **But serious consequences for instability and inequality.**

## Now

With increasing recognition of the challenges of sustainability there is **renewed focus on structural, systemic, and technological change.**

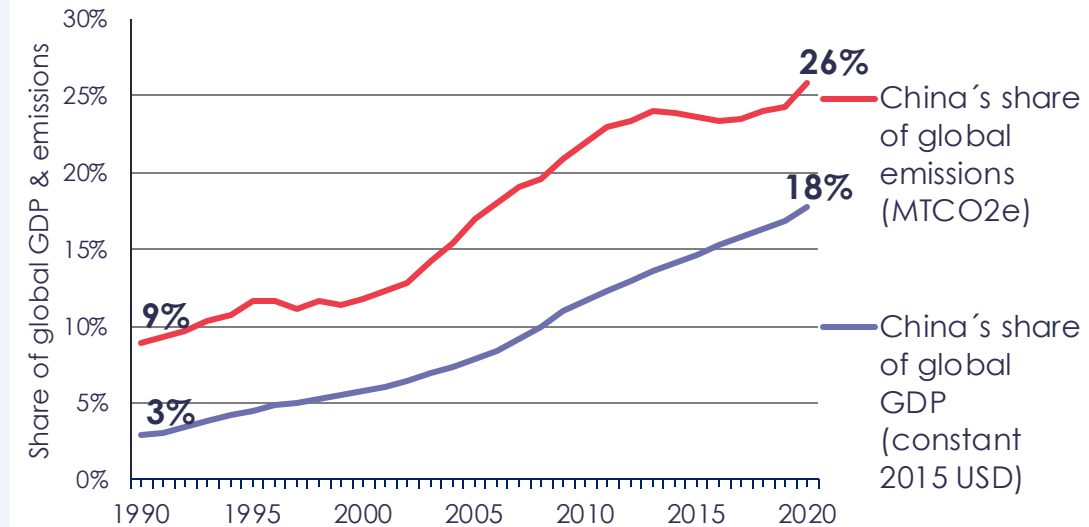


# Changing structure of world economy and the rise of China

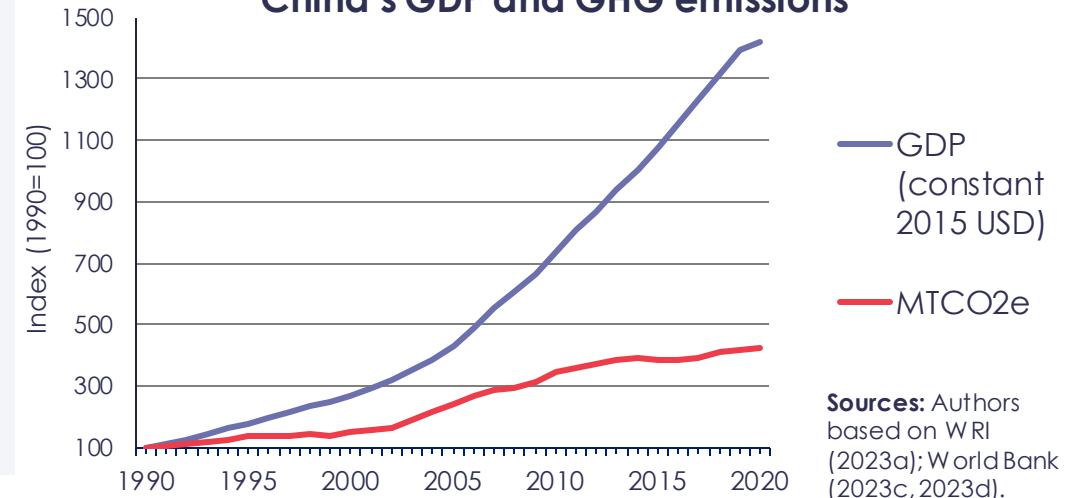
The global economic landscape has evolved from Western dominance to a multi-polar structure, notably with China's rise as a major economic power. A reshaping of global trade, production patterns. Increasingly severe environmental challenges. Demographic shifts and the digital economy signal future changes.

- From a primarily Western-centric economy in the middle/late 20th century, **the global economic landscape has diversified**, witnessing the emergence of new economic powers, notably China. A multi-polar economy.
- China's transition from a closed, largely agrarian economy (up to 1980) to an open, manufacturing and service-oriented economy has led it to become the **world's second-largest economy by GDP**, with GDP rising from \$1.03 trillion to \$16.3 trillion between 1990-2022 (constant 2015 USD) (World Bank, 2023c). China overtook USA in PPP terms in 2016 and is now 25% higher.
- China's rapid industrial growth has fundamentally **reshaped global production and trade patterns**, challenging traditional economic alliances and recasting structures for world trade.
- This energy (and coal) intensive growth also had **profound environmental impacts**; notably, China is now by far the largest GHG emitter. China's per capita CO2 emissions exceeds those of the EU27 and more than half USA.
- Growth in China and other countries including India, Brazil, and Indonesia also **altered the traditional economic power structures**.
- **Aging and declining populations** in developed countries and China will impact their labour force and economic dynamism. **Africa's booming population**, depending on complementary investment (across all forms of capital), could become a significant driver of global growth and consumer demand.
- Other important changes include: the rapid growth of the **digital economy**; increased **economic integration** (e.g. regional trade agreements like NAFTA, ASEAN); the rising influence of **multinational corporations**.

## China's share of global GDP and GHG emissions



## China's GDP and GHG emissions



Sources: Authors based on WRI (2023a); World Bank (2023c, 2023d).

# Structure

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# Important outcomes for human well-being in the last 70 years but intense pressures on natural environment

Over the last decades, growth has come with serious damage to the natural environment.

## Degraded forests and land

- ❖ In 1950, forests covered around 44% of world's land surface, **now it is 31%** (Ritchie, 2021; FAO, 2022).
- ❖ Between **20-40%** of the global land area is degraded (UNCCD, 2022).

## Disrupted marine ecosystems

- ❖ Oceans have recorded a **30% increase in acidity** since the 1980s (EEA, 2023). Further increase is projected, resulting in a pH level unseen for more than 20 million years. Warming strongly; consequences for marine life, hurricanes, etc.



## Declining species

- ❖ Global wildlife populations **have declined by 69% on average** since 1970 (WWF, 2022).

## Increasing emissions

- ❖ CO<sub>2</sub> emissions increased from around 6 GtCO<sub>2</sub> a year in 1950 to **over 40 GtCO<sub>2</sub>** now (Hausfather and Friedlingstein, 2022).
- ❖ CO<sub>2</sub> concentrations increased from 300 ppm in 1950 to **around 420 ppm** now (ibid).
- ❖ Global GHG emissions increased from 16.1 GtCO<sub>2</sub>e in 1950 to **57.4 GtCO<sub>2</sub>e** in 2022 (ibid).

## Rising health risks

- ❖ Global plastic waste surged **from negligible amounts in 1950 to 350 million tonnes** per year now (Ritchie et al., 2023). Close to 45kg per capita.
- ❖ Deaths caused by modern forms of pollution (air pollution and toxic chemicals) **increased by 66% since 2000**. (Fuller et al., 2022). Outdoor air pollution alone **kills 3-9 million people per year** (Roser, 2021).
- ❖ **Increased pandemic risks** due to evolving interactions amongst animals and between humans and animals amidst changing climate and biodiversity conditions (see e.g. work of Lucy Shapiro at Stanford).

# Important outcomes for human well-being in the last 70 years but intense pressures on social cohesion

**Market fundamentalism in the late 20th century contributed to growth but also led to increased inequality and social strife, undermining social cohesion and trust in institutions.**

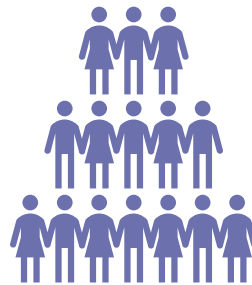
- The era of "*libéralisme triomphant*" and concepts such as "*the end of history*" epitomised a period of market fundamentalism ("free up markets, get the government out of the way and all will be fine") in the 1980s and 1990s. Greater market orientation did spur growth in China and India. And the developing world gained from greater trade openness. But a dogmatic approach to liberalisation and de-regulation brought problems of instability and **significant challenges to social cohesion** in many countries, straining the fabric of communities and societies.
- This period saw **increased social strife and inequality** in many countries, with a denigration of public services and community values. Warnings came from Tony Atkinson, Joe Stiglitz, myself and others in the late 1980s and early 1990s (e.g. Stern, 1991 and 1992). The lasting effects are evident today, especially in the Western world, with **growing mistrust in institutions and societal polarisation**.

## Decline in democratic institutions

- **The number of countries considered "free" has declined** over the past 17 years, from around 47% in 2006 to 43% in 2022 (Freedom House, 2023).
- Data from opinion surveys suggest **a decline in trust in most public bodies** since 2000 across developed and developing countries. The % of people expressing confidence or trust in their governments peaked at 46% in 2006 falling to 36% by 2019 (Perry, 2022).

## Decline in press freedom

- **Press freedom has declined globally** over the past 10 years, with the environment for journalism estimated good in 8 countries in 2023 compared to 26 countries in 2013 (RSF, 2023).



## Rising income inequality

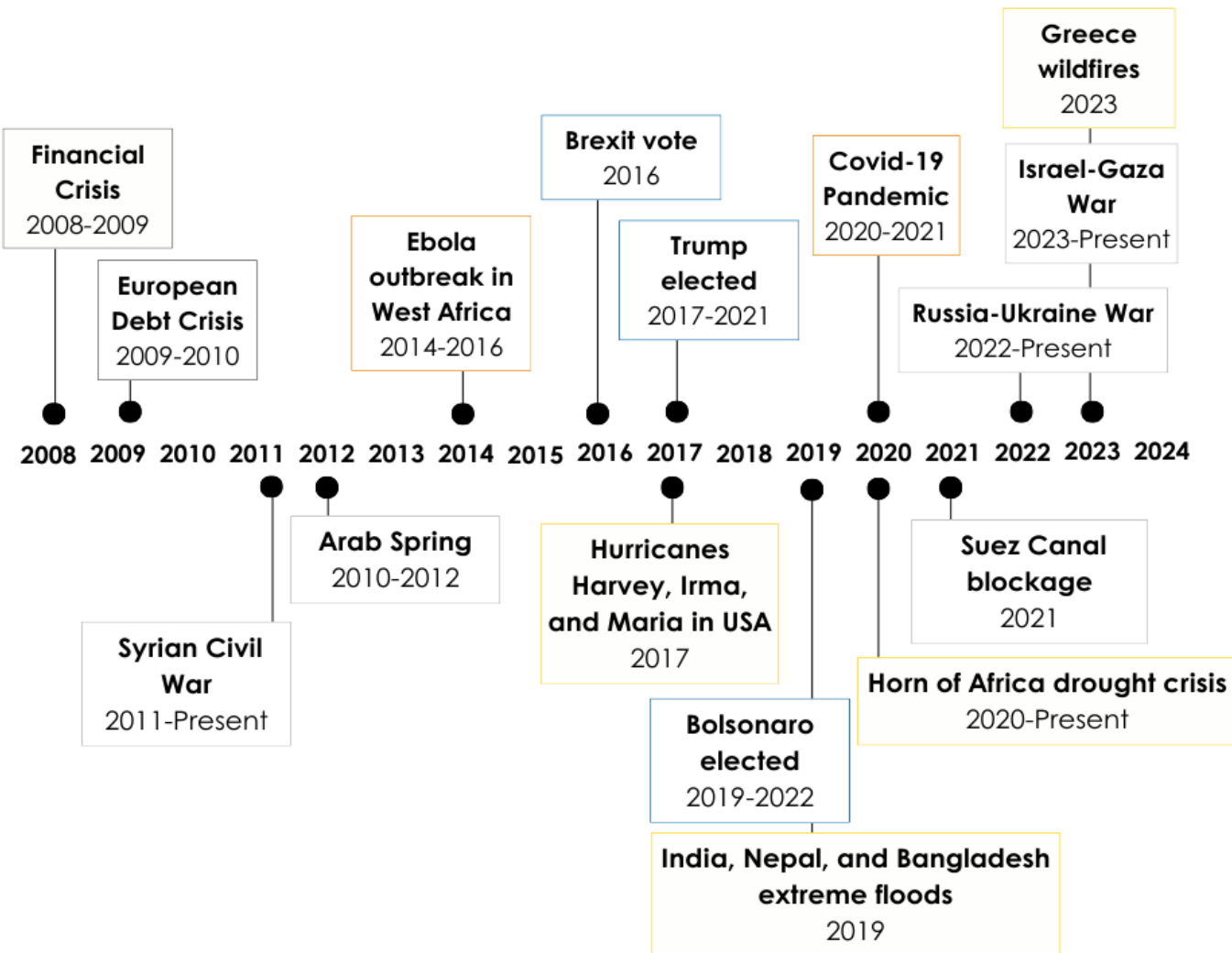
- **Sharp rise of within country** inequality over the last two decades: the gap between the average incomes of the top 10% and the bottom 50% almost doubled, from 8.5x to 15x (Chancel et al., 2021)
- **Gender earnings inequality** remains very high: women receive only 35% of global labour incomes, men receive the remaining 65% (ibid).

## Wealth concentration

- The **global top 1% took 38% of all additional wealth accumulated** since the mid-1990s, while the bottom 50% captured just 2% (Chancel et al., 2021).

# A series of crises

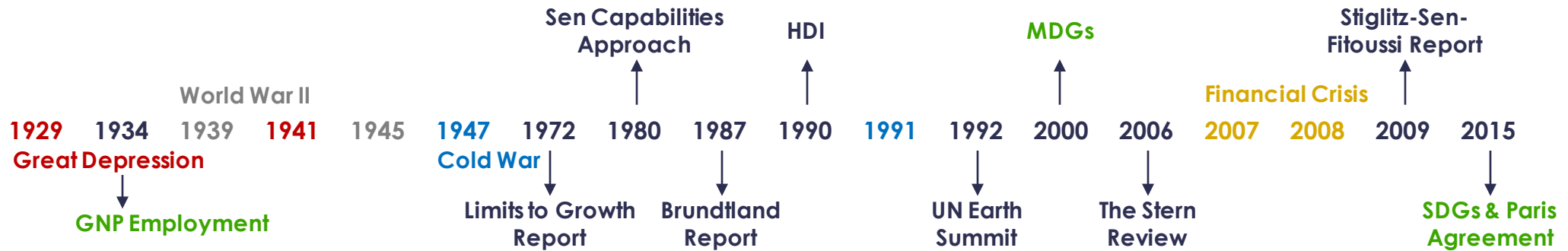
Recent crises have underscored the interconnectedness of economic, social, and environmental challenges, revealing deep vulnerabilities and the urgent need for integrated approaches to global instability, inequality, and climate change.



- **A succession of recent crises** exacerbated the weakness and fragilities of the world economy. **Backdrop** of recent crises:
  - **Falling investment rates.**
  - **Slowing growth** and productivity in many countries.
  - Increasing challenges around **social cohesion** and populism.
  - Faltering of **internationalism.**
  - Increasing **climate impacts** and destabilisation of ecosystems.
- The **financial deregulation** initiated in the mid-1980s flowed into the great financial crisis of 2008/2009.
- **Powerful and lasting influence of Covid:** major crisis in world economy, finance/debt, health, society and politics.
- **Escalation of recent wars,** contributing to global instability and exacerbating economic and political challenges.
- Recent global crises have highlighted **crucial links between economic, political, and environmental challenges.** Economic inequality and financial crises, coupled with sluggish growth, have **led to political stress.** This stress was exacerbated by **environmentally destructive models of growth, in turn heightening the risk of pandemic.** At the same time, the pandemic, and reactions to it, **undermined international cooperation, trust, and solidarity,** creating a more fragmented response to these interconnected challenges.

# Changing objectives

The new global agenda of 2015 includes at its core the SDGs (September) and the UNFCCC COP21 Paris Agreement (December). The international community was able to get together not only to identify shared values and objectives, but also to recognise the importance of sustainability and thus responsibilities to current and future generations. How can we pursue these broad-ranging objectives together while managing choices and trade-offs? (To be discussed in Lectures 2 and 3).



## From GDP to MDGs

- **The MDGs reflected a shifting focus from GDP towards key dimensions of development:** overcoming income poverty, advancing health and education. They covered 2000-2015.
- **They applied only to developing countries** but embodied a commitment from rich countries to support developing countries in achieving them.
- **Many were not achieved;** however, the commitment to halve the proportion of people in absolute poverty in the developing world was met largely due to China's growth which lifted hundreds of millions out of poverty.

## From MDGs to SDGs & the Paris Agreement

- In contrast to the MDGs, the SDGs **put sustainability at centre-stage** and set out goals for 2030 which apply to all countries. Of the 17 goals, 11 of them refer to environment, sustainability or climate explicitly.
- **Inequality** at centre stage across all dimensions.
- **They build on the MDG** dimensions of income, health, education and the environment **but are much more detailed** on sustainability, inequality, gender, cities, climate, oceans, forests, and environment more generally. The last 2 SDGs refer to peace, justice, and partnership.
- Three months later, the **major international agreement to tackle climate change** (the Paris Agreement) was adopted.

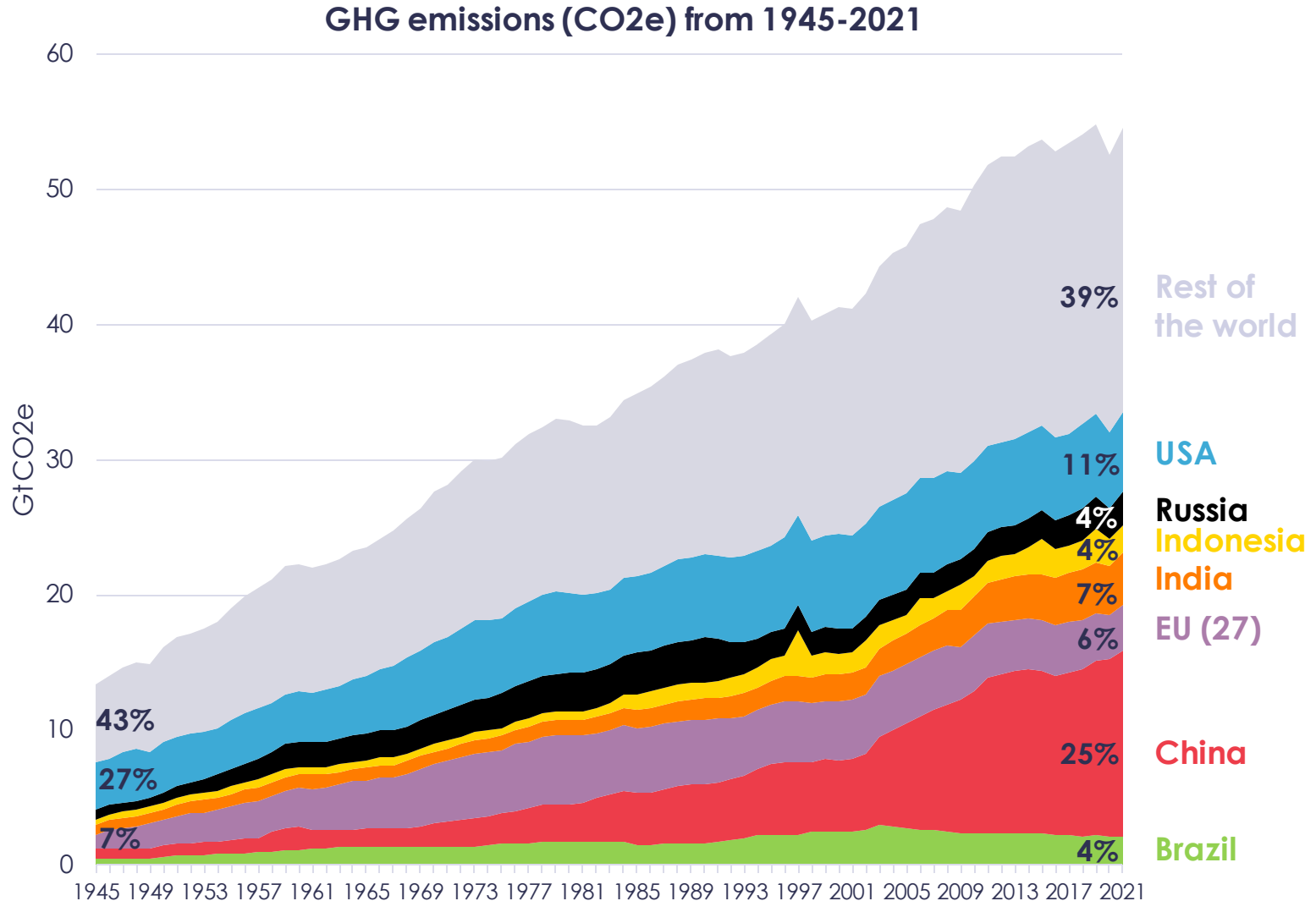
# Structure

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# History of emissions since World War II

Global emissions have increased rapidly over the last 50 years and have not yet peaked. While the growth rate has slowed recently, emissions are still rising.

**Note:** The greenhouse effect occurs when greenhouse gases (GHGs) in Earth's atmosphere trap infrared energy, preventing it from escaping into space. This process warms the planet's surface. While concentration of some GHGs is essential for life by maintaining Earth's temperature, excessive GHG emissions from human activities have amplified this effect, contributing to global warming. Temperature now already outside the benign Holocene period (since the last Ice Age) during which our arable agriculture and settlements developed.



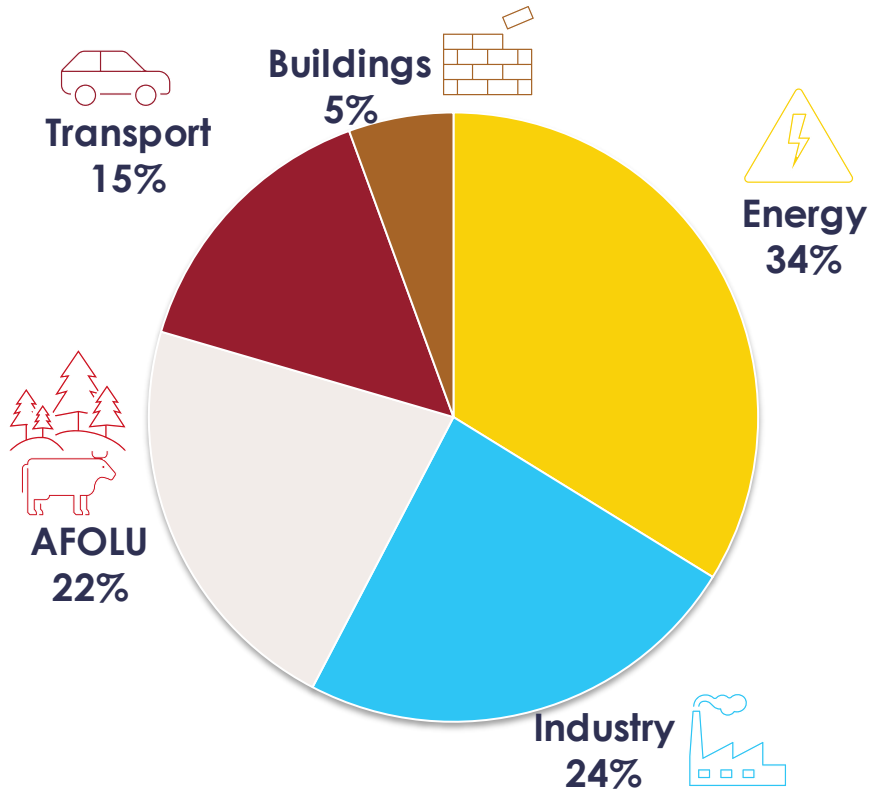
Source: Jones et al. (2023)



# The sources of emissions

Eastern Asia accounts for the largest share of emissions (with China being the 1<sup>st</sup> largest contributor), followed by North America (with the US being the 2<sup>nd</sup> largest contributor). Generally, the balance of global emissions has shifted from high-income to low- and middle-income countries in the past two decades. Emissions of GHGs have risen across all sectors and subsectors, most rapidly in transport and industry. The energy sector is the largest source of GHG emissions, driven by electricity and heating.

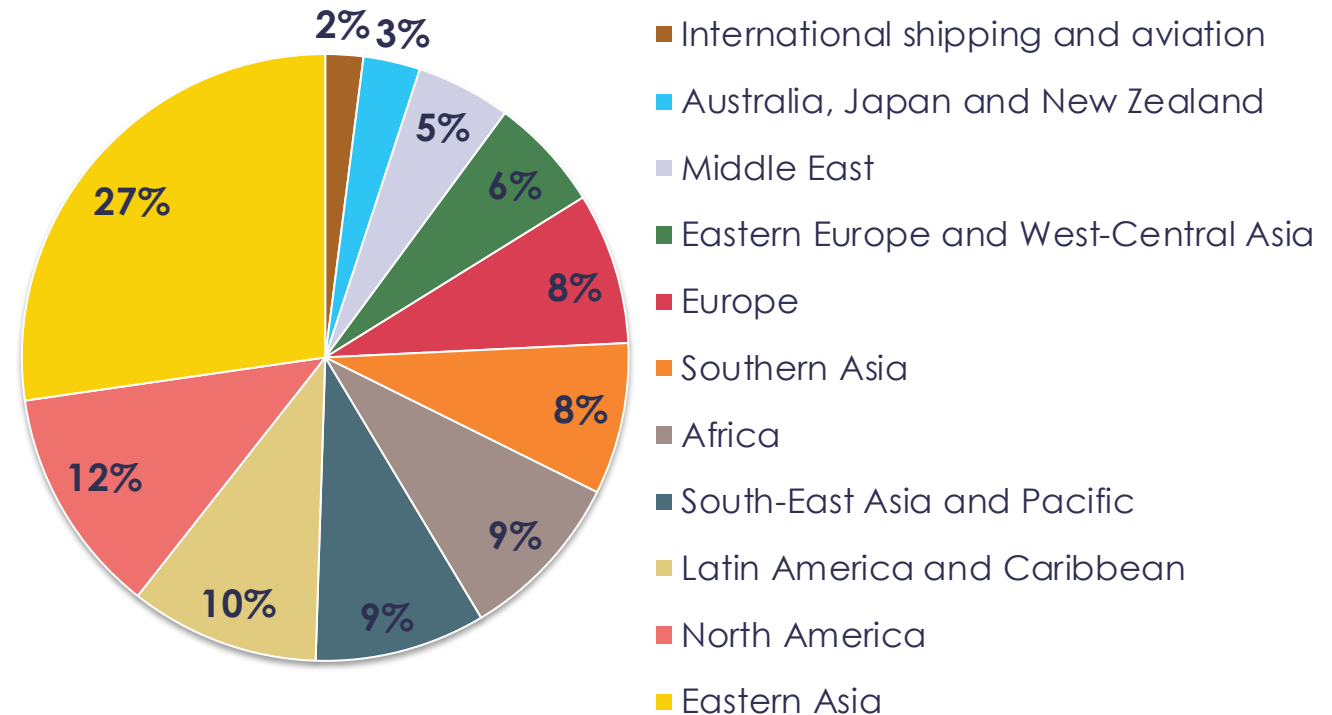
Global GHG emissions (CO<sub>2</sub>e) by sector in 2019



Source: Pathak et al. (2022)

Note: AFOLU = Agriculture, Forestry and Other Land use

Global net anthropogenic GHG emissions (CO<sub>2</sub>e) by region in 2019

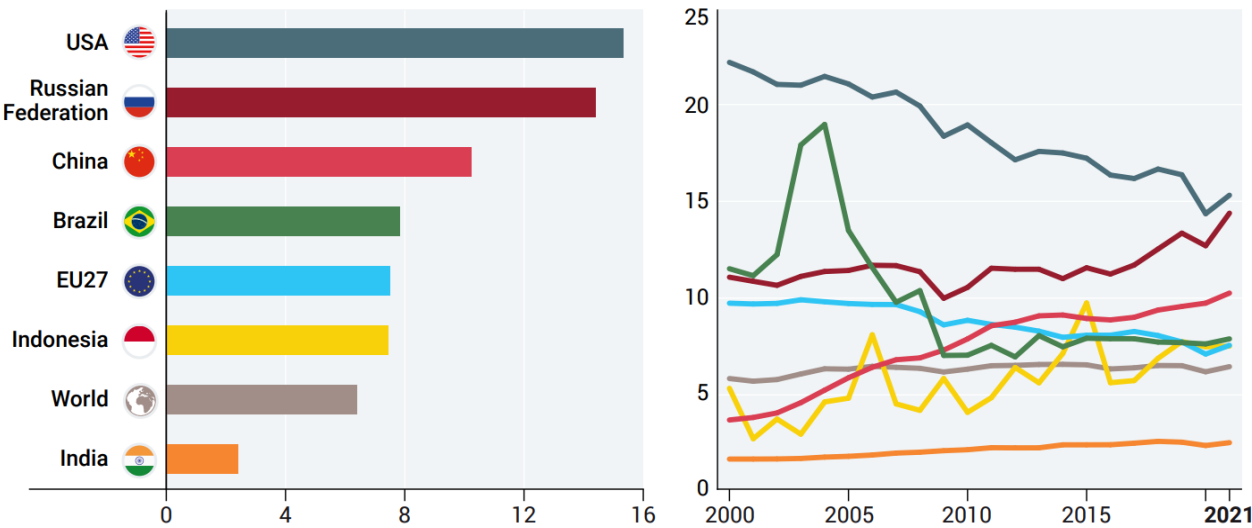


Source: Dhakal et al. (2022)

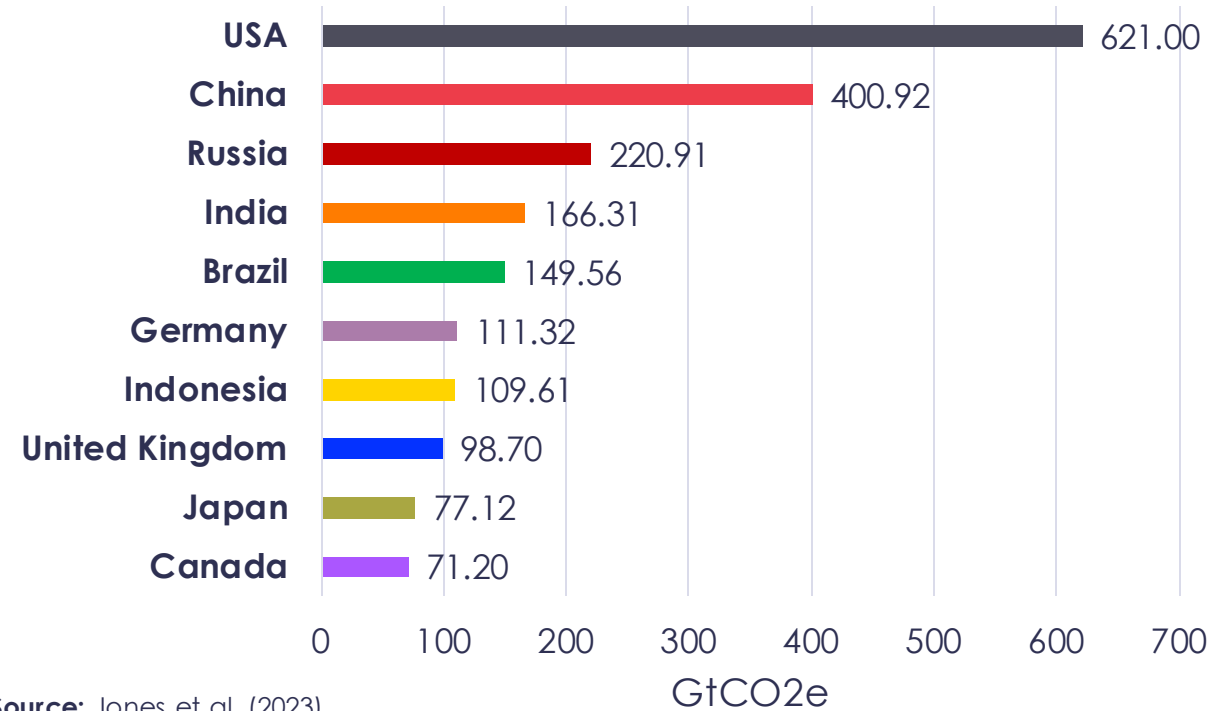
# Contributions to climate change across countries are unequal

Per capita emissions highlight great disparities across countries. In 2021, the United States and the Russian Federation emitted over double the per capita global average, while India's emissions were less than half. Historically, since 1850, a few countries, notably the United States and China, have contributed the majority of GHG emissions, with the G20 nations responsible for about three-quarters of the total CO2 emissions to date.

GHG emissions per capita in 2021 for key countries (left) and trends since 2000 (right)



Countries with the largest cumulative GHG emissions 1850 - 2021



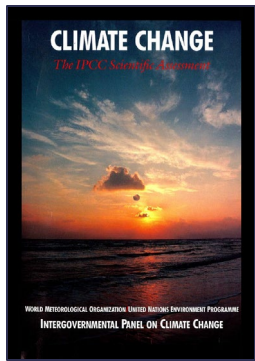
Source: UNEP (2023a)

Source: Jones et al. (2023)

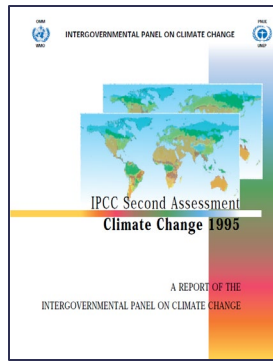
# The science of climate change is looking ever more worrying

Our current civilisations are from the last 8-9000 years, with a move to grains and to sedentary agriculture – the Holocene period, with fairly stable climate and temperature. Already on the edge of those temperatures at  $\sim 1.2^{\circ}\text{C}$ . Have not seen temperatures  $>3^{\circ}\text{C}$  for around 3 million years (when, e.g., sea levels were 10-20m higher). Even with strong mitigation, building adaptation and resilience will be crucial.

IPCC established in 1988. UN Conference on Environment and Development (Rio Earth Summit) in 1992.



1990



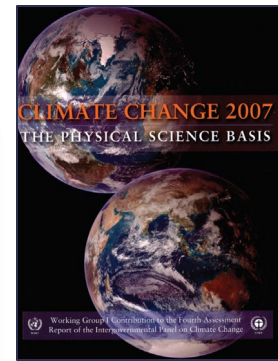
1995



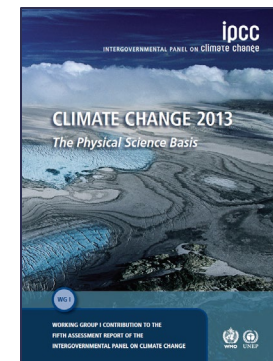
2001



2006



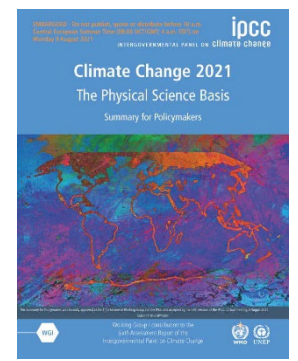
2007



2013



2018



2021

Each IPCC report has looked more worrying than its predecessors.

Effects coming through at greater speed, scale and intensity than anticipated. Emissions still rising.

Tipping points increasingly concerning and thresholds are being passed or close to being passed (West Antarctic and Greenland ice sheets, Amazon rainforest, permafrost...).

# The impacts of failure could be devastating; difference between 1.5°C and 2°C potentially very strong

Exceeding 1.5°C global warming poses severe risks, including ecological tipping points and major human and environmental impacts, with the dangers escalating rapidly with each additional half-degree of warming. Potential large-scale movement of people and extended conflict.

	1.5°C	2°C	2°C vs 1.5°C
Extreme Heat <sup>1</sup> (Proportion of global pop. exposed to severe heat at least once every 5 years)	14%	37%	2.6x
Number of sea-ice-free Arctic summers <sup>2</sup>	At least 1 after ~100 years of stabilised warming	At least 1 after ~10 years of stabilised warming	10x
Bioclimatic range loss of >50% <sup>3</sup>	Vertebrate species: 4% Plant species: 8% Insect species: 6%	Vertebrate species: 8% Plant species: 16% Insect species: 18%	Vertebrate species: 2x Plant species: 2x Insect species: 3x

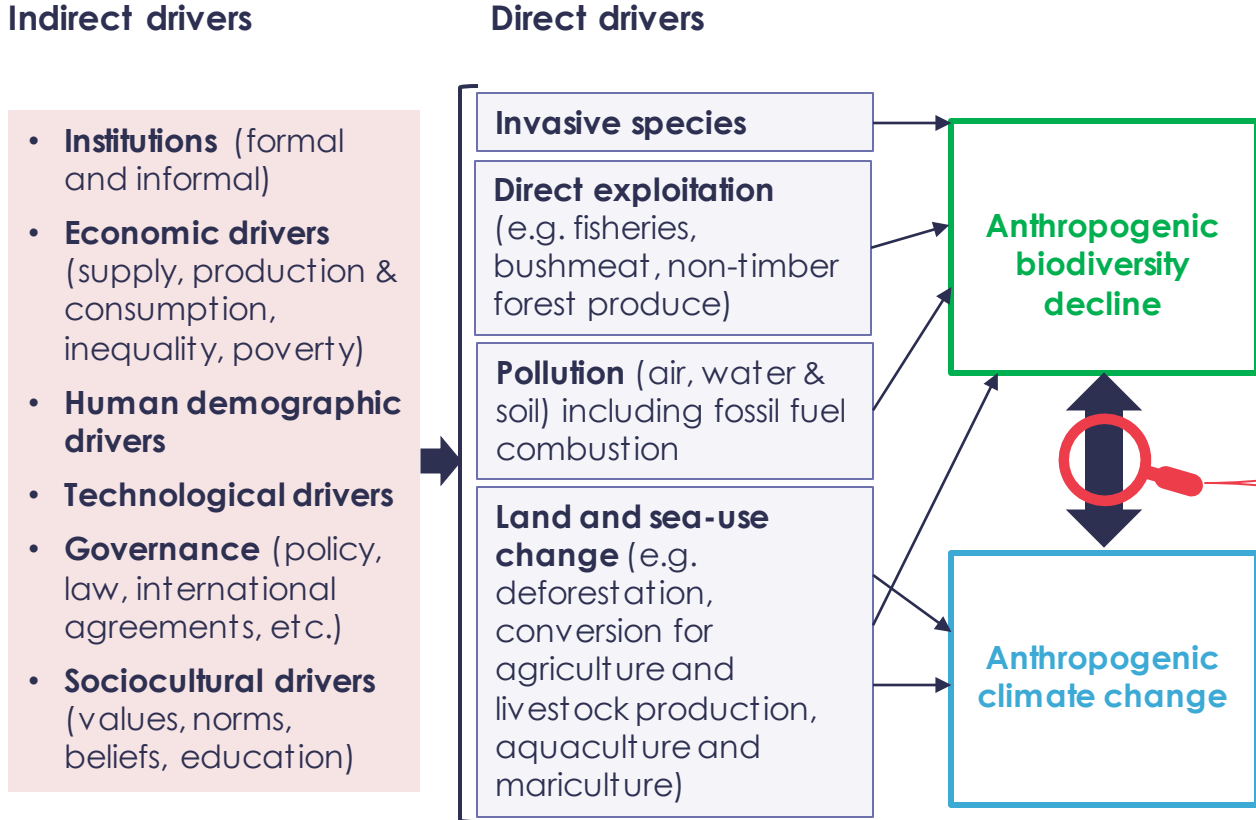
Sources:  
 1 Dosio et al. (2018)  
 2 IPCC (2018)  
 3 Warren et al. (2018)

**Differences between 1.5°C and 2°C are major.** Differences from 2°C to 2.5°C, and then to 3°C likely still bigger. Current policies likely to lead to close to 3°C, with real risks of still higher temperatures. **Current commitments** (unconditional and conditional NDCs), if delivered, **might lead to around 2.5°C** (UNEP, 2023a).

**Exceeding 1.5°C could trigger multiple tipping points** including for Greenland and West Antarctic Ice Sheets, coral reefs and the boreal permafrost (Armstrong Mckay et al., 2022). **2°C and above carries further risks** of tipping points, dynamic instabilities and accelerating feedbacks, including to Amazon forest systems and oceans, with immense risks to lives and livelihoods across the world. **Hundreds of millions will likely have to move, with possibility of widespread, severe and extended conflict.**

# Linking climate and biodiversity (I)

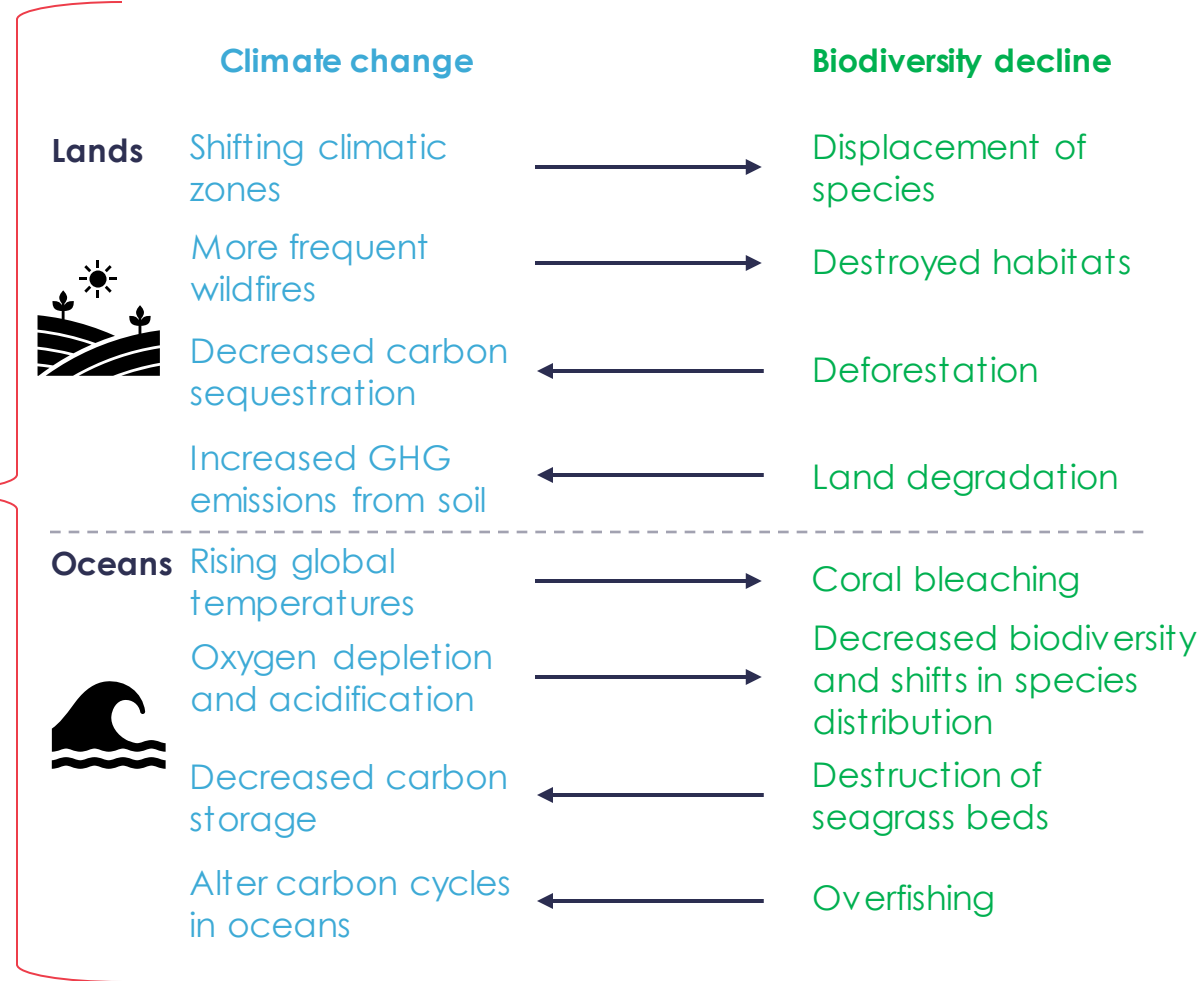
## 1 Climate change and biodiversity loss have common indirect and direct drivers



**Note:** Biodiversity loss and climate change are also interconnected with a range of global crises, including pandemics and migration.

**Source:** Authors based on Pörtner et al. (2021)

## 2 Climate change and biodiversity loss mutually reinforce each other



# Linking climate and biodiversity (II)

Importance of deepening our understanding of the links between biodiversity loss and climate change, and examining the policies and institutions that can deliver nature and climate objectives together. Funding and action are skewed towards developed countries.

There has been increasing attention from policymakers, civil society, business and finance on halting biodiversity loss.



- ✓ Kunming-Montreal Global Biodiversity Framework (GBF) adopted by nearly 190 countries in 2022 at the United Nations Biodiversity Conference (COP15). The framework included the headline target of “30x30” to protect or conserve 30% of the world’s land and sea by 2030.
- ✓ The High Seas Treaty adopted by UN Members in 2023 to protect oceans and sustainably use marine biodiversity.
- ✓ The Glasgow Leaders’ Declaration on Forests agreed in 2021 by 145 countries vowing to halt and reverse forest loss by 2030.
- ✓ Taskforce for Nature-Related Financial Disclosures (TFND) in similar spirit to Taskforce on Climate-Related Financial Disclosures (TCFD).
- ✓ UK government’s Dasgupta Review of the Economics of Biodiversity (2021).
- ✓ Finance for Biodiversity Pledge launched in 2020 now counts 163 signatories.
- ✓ Business for Nature coalitions’ “Call to Action” launched in 2020 counts over 1,400 signatories.

But progress in achieving these commitments is slow.



One year on after the Glasgow Declaration (agreed in 2021), in 2022 global deforestation reached more than 1 million hectares above the level needed to meet the 2030 target (WRI, 2023b).

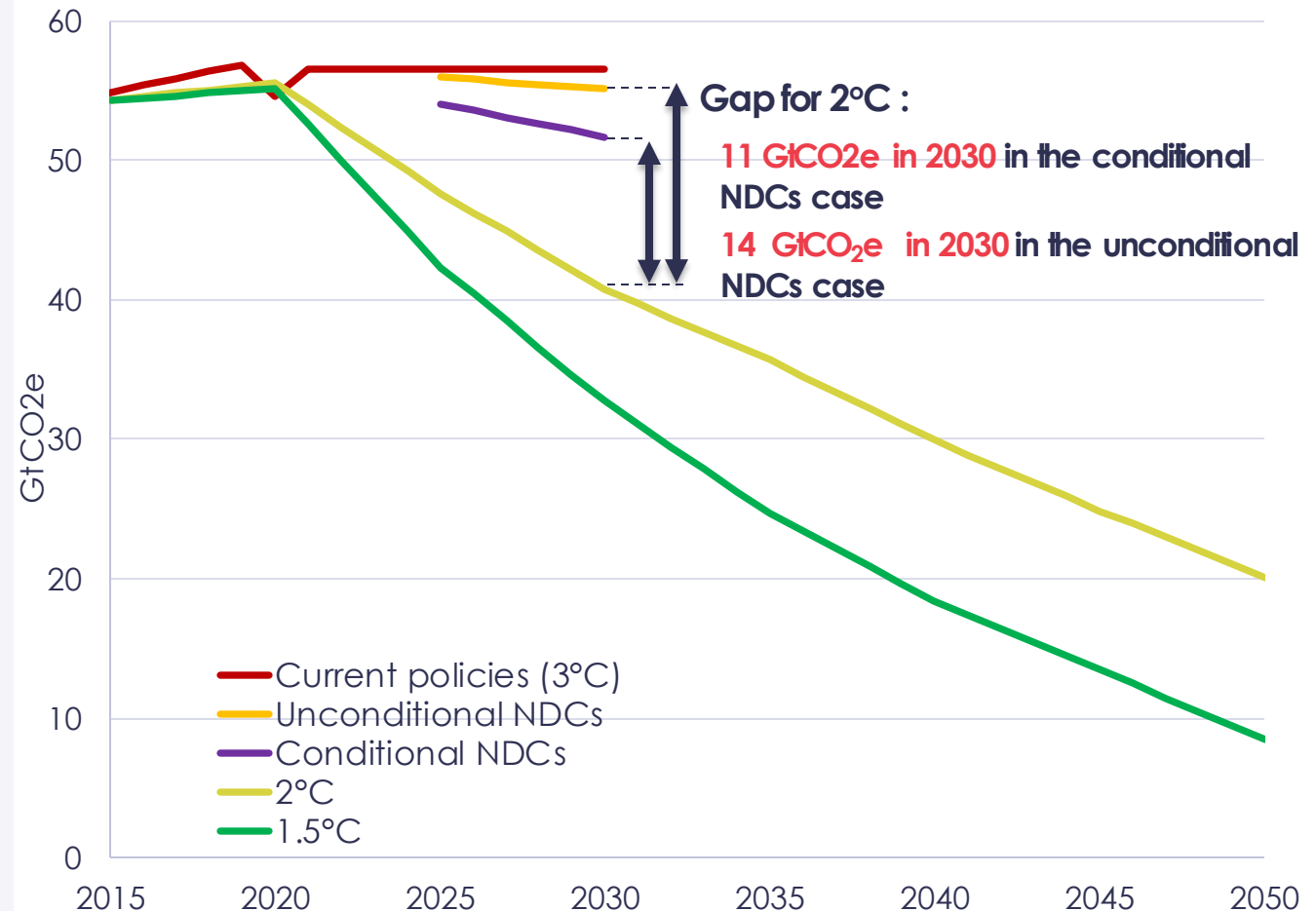


Funding to protect and restore nature remains weak and skewed towards developed economies. **EMDEs represent 90% of the investment opportunity** in nature conservation and restoration and 80% of the investment opportunity in regenerative agriculture but **receive around 20% of global nature finance flows (Systemiq, 2021a; Ishii et al., 2023).**

# Immense consequences of unmanaged climate change; urgency of change

Current climate policies are pushing the planet towards potentially catastrophic warming close to 3°C or beyond; urgent and integrated actions to reduce emissions and adapt are crucial to prevent severe impacts on civilisation.

- Global GHG emissions **are on the wrong track** (1.2% rise between 2021-2022) (UNEP, 2023a). Current NDCs<sup>1</sup> would reduce emissions by 5.3% by 2030, far from the 43% drop by 2030 needed for 1.5°C (UNFCCC, 2023).
- In 2023, the global temperature increase averaged 1.55°C (Copernicus), highest on record, and **crossed 2°C for the first time** in modern recorded history (Freedman, 2023) and on a trend basis, likely to cross 1.5°C between 2030 and 2035. Under current policies, temperatures are **headed to close to 3°C** (1.9 -3.8 °C range) (UNEP, 2023a).
- “If we can keep warming below 1.5°C then we can preserve this fragile moment. But if we go beyond 3°C, it's likely we can't. **In between where we're rolling the dice.** [...] 1.5°C is already really bad but **3°C is potentially civilisation-ending bad**” (Michael Mann, 2023).
- Fast action to **reduce methane emissions** is critical due to their potent short-term impact on global warming.
- Challenges of adaptation, loss and damage and natural capital also intensely urgent. Must integrate **adaptation, mitigation, development and natural capital.**
- Suggesting that can or should **delay** is usually implicitly downplaying, denying or **distorting the science.** Negligent and unrealistic.



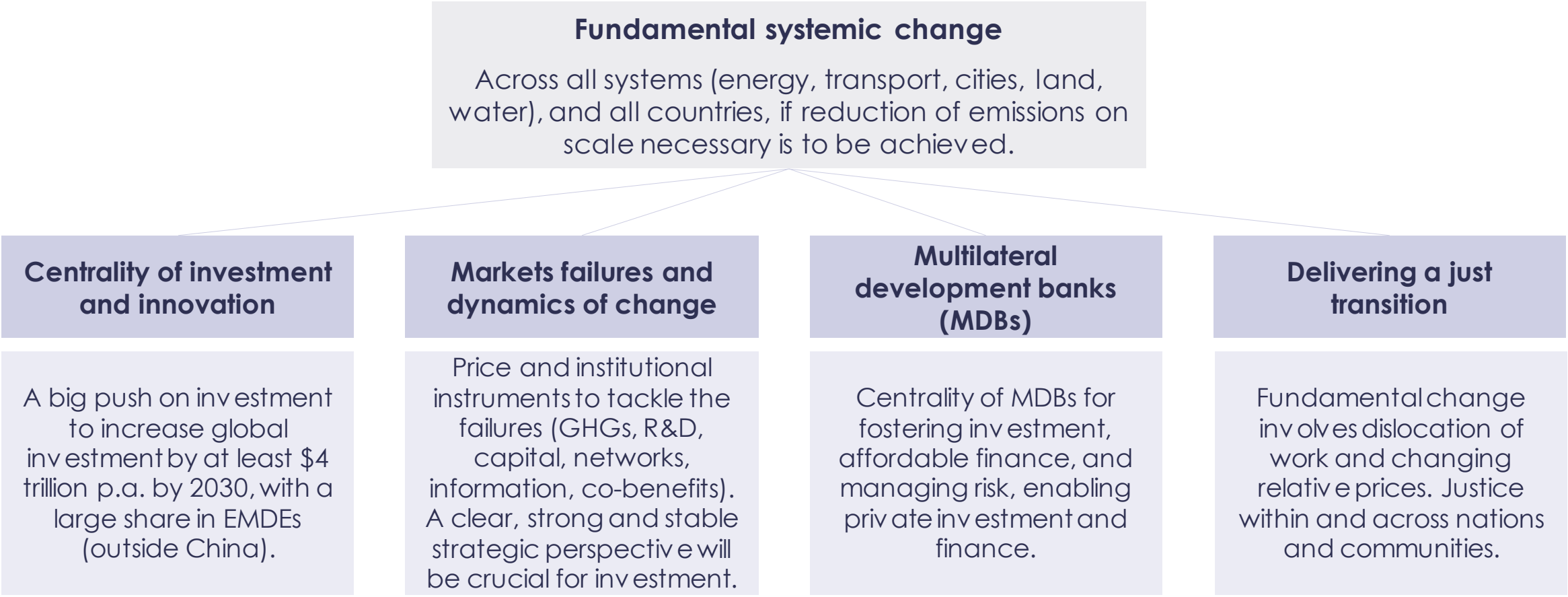
Source: Trajectories based on UNEP (2023a)

Note: The 1.5°C scenario used by the UNEP report relies on the widespread use of negative emissions technologies (NETs) later in the century.

<sup>1</sup> Naturally Determined Contributions in UNFCCC framework.

# The scale of change must be fundamental, rapid and systemic if the Paris targets are to be achieved

Rapid structural, systemic and technological change and a big push on investment/innovation are at the core of the new growth story (Lecture 2). International action crucial (Lecture 3).





# Structure

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# The ethics: understanding sustainability

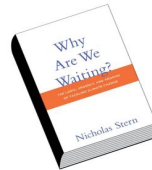
Combining different ethical perspectives and dimensions; beyond simplistic optimisation.



**Definition:** offering opportunities, in terms of potential well-being for future generations, which are at least as good as our own.

- **Ethics/values**

- ❖ Aristotle (virtue)
- ❖ Rousseau/Rawls (social contract)
- ❖ Consequentialism (most standard economics)
- ❖ Kant (categorical imperative)
- ❖ Rights, justice, common humanity (Paine, Wollstonecraft, Sen...)



See *Why Are We Waiting?* (Stern, 2015b), chapters 5 and 6.

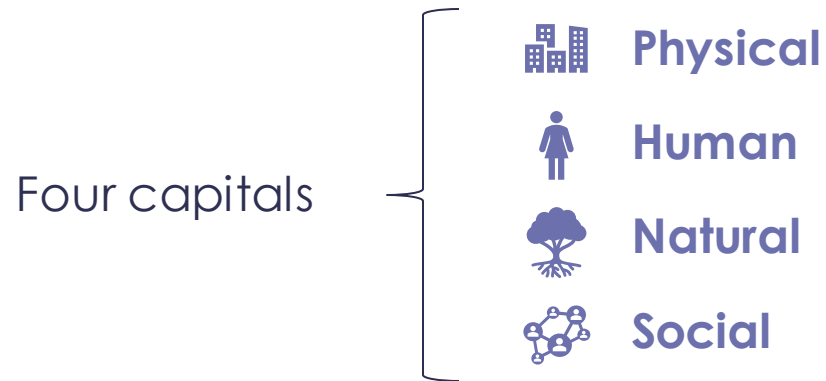
- Consequentialism is basis of most “**cost-benefit**” approaches. Often narrowed to use of **social welfare function** of form  $W (u^1, u^2, \dots, u^N)$ .
- Most of these approaches, and many religions, carry with them a notion of common humanity, symmetry, and equality of right to pursue “what they have reason to value” (Sen). **Within generations and across generations.**

Ideas of **common humanity** point to rights (Paine, Wollstonecraft, Sen...) with the **right to development**, or shaping one’s life, at the core. US Declaration of Independence an example. Deprivation of rights constitutes injustice (Sen). A principle of **human equality** in relation to justice runs through many moral perspectives including Aristotle, Kant, many religions...

# The ethics: values and capitals

Economics and other social sciences cannot duck discussion of ethics and values. They cannot be “read off” from markets. They are inevitably normative and no one particular answer is “correct”. But they can and should be discussed explicitly and with rigour. Those drawing out the implications of values for action have much to contribute to discussion of values.

- Ideas of sustainability and development take us to **a consideration of goals and metrics** (e.g. SDGs).
- Ideas of sustainability point to the **importance of the endowments** that shape future opportunities; four capitals.



- Focus in past growth analyses has been primarily on first two. All four count. Social capital has difficulties in measurement, but includes **social cohesion, institutions, etc.**
- A case also for including **cultural capital**, such as respect for others and the environment, and behavioural and social norms. Overlaps with social capital.

# The ethics: responsibilities in relation to rights to development

Sustainability is focused on rights to development across generations. Rights to development and injustice are of great importance within generations. None of this implies a right to emit GHGs. Most of the moral perspectives indicated would suggest that the rich countries, given their polluting history, their wealth and their technology, have a moral obligation both to take strong domestic action to reduce emissions and to support developing countries to adapt to climate impacts and to transition to a low-carbon economy.

## A "right to development" does not imply a right to emit GHGs:

- X GHG emissions and the degradation of ecosystems harm or extinguish people's lives and livelihoods. Difficult to assert with any plausibility a right to harm or kill in this context.
- X Development needs energy but energy does not need GHG emissions and the destruction of the natural environment.
- X Fossil fuels do not guarantee growth and energy security.



Poorest countries are the most vulnerable to the climate crisis but have **contributed very little** to historical GHGs. Yet, all countries must be part of the global climate response and much of future growth will be in EMDEs. **Justice is about a right to development not a right to pollute.**



**Development decisions** in the next few years will in large measure determine whether the world will succeed in the fight against climate change. Developing countries can **capitalise on the opportunity** to follow a different path and deliver sustainable, resilient and inclusive growth. **Leapfrog the dirty, destructive stages** followed in past by rich countries.



This will require **scaling up investments** and **introducing new technological options** that can deliver better results for both development and climate.

**"It is not justice to foul the planet because others have fouled it in the past"**

– Meles Zenawi speaking at COP17, Durban (Africa day; Dec 2011)

# The ethics/economics: discounting (I)

Decisions now affect lives and livelihoods, and the risks faced, in the future. Intertemporal evaluations are central.

- Key concept in relation to discounting is the **social discount factor**: the relative social evaluation of an extra unit of account (e.g. consumption) in the future, relative to an extra unit now. The proportional rate of fall of the social discount factor is the **social discount rate** (can be both state and person contingent). Will depend on unit of account and on time. The social discount factor is a relative shadow price; it is logically prior to its rate of fall.

The valuation of an extra unit at time  $t$  will depend, for most ethical observers, on:

- i. the levels of living at time  $t$  relative to now;
  - ii. the valuation of a future life (or utility) relative to one now.
- The valuation **does not have to be utility based** but such a basis can be useful in some contexts or constructs.
  - The former consideration will, for most ethical observers, point to a **high valuation if future generations are likely to be poor** and low if they are likely to be rich.
  - The latter issue concerns “**pure-time discounting**”, effectively “**discrimination by date of birth**” (remember that the influence of levels of living are in i) not ii)). Other than the **possibility** of exogenous extinction, it is hard to provide a **serious ethical argument in favour of pure-time discounting**, if one is using an ethical framework embodying symmetry or human equality, as most ethical frameworks do.
  - For discussion of exogenous extinction and discounting see e.g. Stern (2015a); Chichilnisky, Hammond & Stern (2020). The extinction-discounting link goes back, at least, to Arrow & Mirrlees in 1960s; also examined by Dasgupta, Heal, Solow, Stiglitz....Could “justify” only very small pure discount rates. A pure-time discount rate of 2% p.a. would imply a one-third probability of exogenous total extinction in the next 20 years.

# The ethics/economics: discounting (II)

Capital markets tell us little about social discounting. Discount rates depend on future conditions and those depend on decisions now. Discount rates are not “exogenous”.

**Levels of living in the future are endogenous** – they depend on choices now. Unmanaged climate change could make future generations poor, leading potentially to negative discounting. In any case, we cannot read off from external sources, or exogenously impose, a rate of discount for capturing effect (i) (in preceding slide).



**Risk** in these analytical frameworks would often be reflected in expectations of utility (where a utility framework is used), or some other aggregation across states of nature, rather than through discount rates. That former approach is much more analytically transparent and less rigid than “burying” risk issues in a discount rate. Policy towards **extreme risks** could be set in the strategic context of a **guard-rail approach** (Stern, Stiglitz, Taylor, 2022).

If **discount rates** are used to try to capture risk, then it is important to note that investments which bear stronger fruit when climate outcomes are bad should face lower discount rates.

The **capital or financial markets do not give us information** of relevance to social discounting because: 1) they do not reflect ethical social decisions; (2) they embody expectations and views about risk that are hard to identify; (3) they involve many imperfections.

Social discounting should be examined largely through effect (i). **The discounting that emerges depends fundamentally on how we choose to manage climate change** and the outcomes that could emerge. **Discounting is not an exogenous determination of those choices.** Valuations of different outcomes will depend on social welfare functions used.

# The economics

The science, as seen above, demonstrates that fundamental, rapid, structural, systemic and technological change is necessary. But there are several analytical and modelling issues limiting the usefulness or relevance of many existing modelling approaches to climate change in economics (explored further in Lectures 2 and 3).

## Use of IAMs

Many modelling analyses, using “integrated assessment models” (IAMs), examine the issues in terms of equilibrium economic growth models with **very limited, or zero, structural and systemic change**. In other words, **by construction they are silent on the key issues** of fundamental change relevant here.

## Capturing risks

They have also **failed to capture the immense risks, existential for many**, associated with climate change. Indeed the “expected utility” frameworks often used are largely inadequate in capturing the potential devastating effects, because they struggle to cope convincingly with outcomes involving the possibility of many deaths.

## Market failures

One central analytical approach to policy is often expressed by saying “the most efficient approach to the issue is ‘carbon pricing’”. Such pricing is indeed important but **there are many further, and highly relevant and crucial, market failures** (Lecture 2). **Carbon pricing alone does not drive systemic transformation** (e.g. of cities). It is a **serious mistake** to portray the problem as a static Pigovian problem with **just one market failure**, which can be fixed by just one Pigovian tax (on emissions).

## Role of the state

There have been lines of argument from those of “market fundamentalist persuasion” (often coupled with elements of climate denial or arguments that climate is a minor issue) who say government should avoid the issue entirely, indeed portray it as “**creeping stateism**”. That is to **confuse dogmatism with rigour; the science says the risks are so large, and economics says the market failures so deep, as to demand public action on economic policy**. See later in this Lecture and in Lecture 2.



# The politics: disruption, vested interests; opportunity, inclusion

The transformations necessary to tackle climate change will be both disruptive and full of opportunity. Complex politics: pressure for and resistance to action; participation in decision-making, inclusion in opportunities; investing and protecting people; political leadership.

Working towards an equitable distribution of the costs and benefits of the climate transition, including dislocation. **Just transitions.**

Further discussion in Lecture 3.



Managing and tackling vested interests, misleading arguments and false information (see e.g. work of Oreskes and Conway, 2012).



E.g. renewed opportunistic push from oil and gas vested interests to expand as a result of the Ukraine war, to give “energy security”. Wrong: security is enhanced by **avoiding dependence on fossil fuels.**



**Building cross-society collaboration.**

E.g. public-private partnerships to leverage the innovation capacity and financing resources of the private sector. Involvement of civil society, including young people, in key choices.



**Building international cooperation and fostering sustainable development and poverty reduction across the world.**

Further discussed in Lecture 3.











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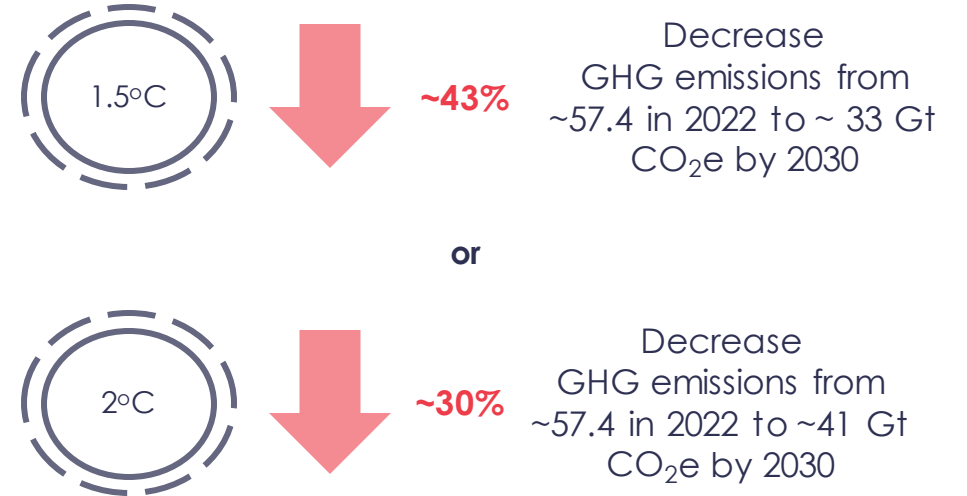
# A critical decade

The next decade is critical. Choices made on infrastructure and capital now will either lock us in to high emissions or set us on a low-carbon growth path which can be sustainable, resilient, and inclusive.

## Likely global growth and change in the next decades: three doublings

15-20 years	Stock of Infrastructure			2x	Strong growth in EMDEs through income levels with strong demand for infrastructure.
20-25 years	GDP			2x	Growth of approximately 3% per annum. Led by emerging and developing countries.
30 years	Urban Population			>2x	Urban population will more than double by 2050, at which point 7/10 people will live in cities. Towns and cities shaped in the next 20 years.

## At the same time (to meet Paris targets)



Source: UNEP (2023a)

Infrastructure and cities will be built in coming years. **The challenge is to both change nature of investment and to increase it.** If we fail to do this quickly, then growth and development likely halted, reversed or undermined as a result of hostile environment created.

# The centrality of investment

Investment is at centre stage of transformational growth/net-zero. If well executed, the increment in investment will have high returns in terms of productivity, new opportunities and the environment. Failing to take strong, internationally coordinated action on investment would give us a deeply dangerous world. A key moment in world history.

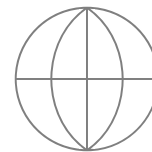
The urgency of the need to tackle climate change while simultaneously advancing development has never been more evident – yet we are far behind on climate action globally. This is because **global investment in the new, clean, and resilient falls far short of what is needed** to tackle critical needs in mitigation, adaptation and nature, while **at the same time too much investment continues to be channelled towards the old and dirty fossil-fuel economy.**

Global investment rates have been low over the last decade. Need to invest to drive out of stagnation or slowing growth and to re-establish growth of a new kind: strong, resilient, sustainable. We now know much about what we need to invest in, and how much. Global investment deficiency (relative to savings) indicates global aggregate demand could accommodate. Would roughly **restore levels of investment rates** to those of two decades or so ago.

Aggregate investment requirements for climate-related investments are estimated of at least **\$4 trillion p.a. globally by 2030** (UNEP, 2022) and at around **\$2.4 trillion p.a. in EMDEs** other than China (Songwe et al., 2022). More on this in Lectures 2 and 3.

This climate-related investment is a core element in tackling **simultaneously**: health/ education; unemployment/ growth; inequality/ social cohesion; climate/ biodiversity. Part of overall action towards SDGs (see Lectures 2 and 3).

The realisation of the necessary investment requires **sound policy**, a positive investment climate, and the right kind of **finance**, on the right scale, at the right time.



# Why investment in the new, clean and resilient has been far too low

Challenges to generating change at pace we need are economic, political, social rather than technological.

## Main causes of low investment in the new, clean and resilient

### Imagined trade-off between growth/development and climate action

And thus weak policy (Mistaken; see Lecture 2).

### Undervaluing future generations and co-benefits

Because fail to look directly and rigorously at ethical issues (see Lecture 2); and adopt overly narrow approach to CBA.

### Cost of capital too high

Particularly in EMDEs. Requires policies for confidence in a better investment climate – country platforms – and finance that manages, reduces, and shares risk; strong role for MDBs and DFIs; see Lecture 3.

### Perceived political difficulties

In managing dislocation and adjustment costs (requires policies for a just transition; see Lectures 2 and 3).

### Resistance from vested interests

Requires political leadership, social pressure, and management of change (see Lectures 2 and 3).

### International tension and friction

Based in part on mistrust from developing countries around finance from developed and their behaviour during Covid. And in part on fractiousness around conflict and energy security. Requires delivery on finance from developed countries and MDBs, and deeper understanding of potential mutual gains from collaboration. **Collaboration around climate can enhance collaboration on other dimensions.**

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# Issues, values/objectives, metrics

Tackling the climate and nature crises requires investing in natural capital and social cohesion and justice (within and across nations and generations), as well as big increases in investment in physical capital (particularly infrastructure). Guided by values and metrics that emphasise sustainability and fostering equity.



The intensity of the crises and particularly stresses on climate/nature require that **natural capital** play a central role in the analytical approaches used. So too **social cohesion**, within and across nations and generations. Alongside **big increases in physical and human capital**.



**Values** included in the analyses will have to embody climate/nature, sustainability, inequalities, and social cohesion directly. Public discussion of underlying ethics necessary.



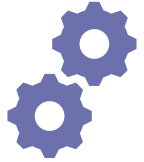
The **metrics** used, such as those based on SDGs, should reflect social values, natural capital, and social cohesion. A major shift in public discussions and analytical approaches.



The discussion of values, of metrics, and of the capitals should be focused on and reflect the potential **magnitude and nature of consequences**.

# Theories and perspectives of growth and change

The challenges now concern a rapid increase in investment, creation of new technologies, innovation, systemic and structural change. These should be core analytical concerns of economics and social sciences.



The magnitude and nature of change imply that perspectives on economic analysis and modelling must put the dynamics of growth and change across the whole range of activities, systems, and structures at centre stage. **No one single approach or model will suffice.** Action must be based on insights from a set of perspectives and analytical approaches.



**Analysis will look very different** from aggregate growth models and standard general equilibrium models and IAMs of the past.



**Understanding and action in economics, politics, and society will be critical.** That is where most of the obstacles/difficulties lie. Technology has a central role, but progress has been remarkable. Hence centrality of the social sciences.

# Fostering public action, nationally and internationally

Key role for economists and social scientists in guiding global and national actions through new and better focused analyses, recognising pace and magnitude of necessary change. Central issues: investment in emerging markets; affordable and accessible finance; fostering a just transition; linking national action to supporting global public goods.

## Shape expectations

**Key to investment.** Role of governments, international institutions, private sector and civil society in creating a shared sense of direction. Public discussion, participation, leadership; examples of role of different players. Sharing information and understandings of risk.

## Scale up and reorient investment towards EMDEs

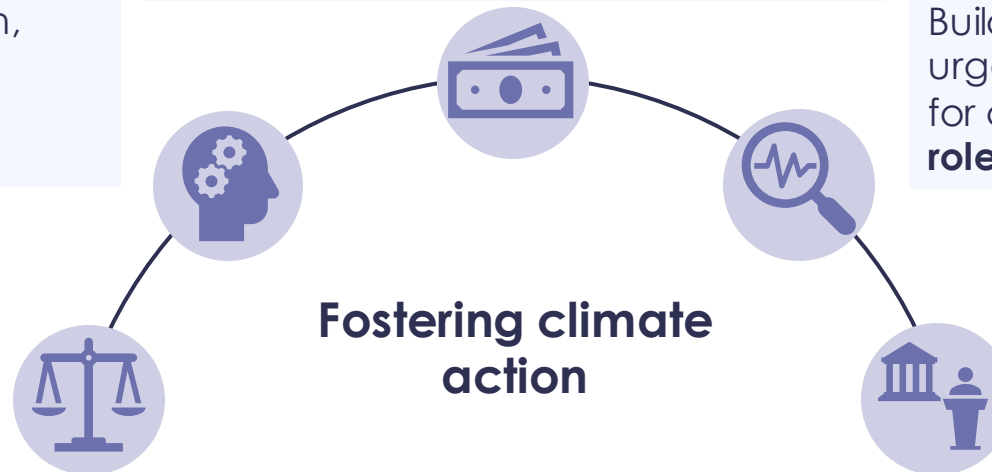
Fostering **affordable and accessible finance**, particularly private sector. Creating an international approach to global investment.

**Offer social and economic analyses**  
**Key challenge for economists and social scientists** more generally to **offer analyses to support these processes and decisions.**

Building clear understanding of purposes, urgency, processes, institutions, and policies for change. New perspectives necessary on **role of state.**

## Create a just transition

Recognising the **challenges of dislocation and of inequities** across and within nations. But also the dangers, particularly for poor people, of inaction.



**Tackle challenges of governance, financial institutions, debt**

All too often inhibiting investment. **Requires international action.**

All these challenges present difficulties for national and global action in pursuit of both development and global public goods. But **much we can do**, as argued in Lectures 2 and 3.



# International and national action are possible and momentum is building

The Paris Agreement and subsequent COP sessions highlight growing global momentum towards climate action, with significant contributions from both national policies and private sector engagement.



**The Paris Agreement** (COP21, December 2015) was a **fundamental achievement**.

- ✓ **An innovative structure.** First, agree overall global goal (well below 2°C and efforts for 1.5°C), and, then, “national contributions” set by each country. Included adaptation, forests, finance.
- ✓ **Methods for revision** to bring aggregate national contributions in line with goals (ratchet).
- ✓ No formal enforcement but **mutual monitoring and assistance**.

Strong progress in **COP26 Glasgow** (2021) (private sector involvement, reinforcement of 1.5°C, “breakthrough” technologies, methane...). Progress in COP27 and 28, including movement away from fossil fuels and stronger focus on adaptation and “loss and damage”.



**Importance of collaboration** between major powers; special role in each of Paris and Glasgow around US-China understanding.



Growing recognition of new opportunities, and strengthening commitment to acting responsibly, of **private sector, nationally and internationally**.



Progress greatly enhanced by increasing understanding of **new growth story**, of investment, of technological possibilities, and from private sector.



Importance of public pressure from **young people**.

# The “Paris Effect”

Since the Paris Agreement, progress on low-carbon responses, investments, and markets has been much faster than many realise. The dynamics set in train since the Paris Agreement have created conditions for dramatic progress in low-carbon opportunities and markets over the last five years (Systemiq, 2020).

- The Paris Agreement – with its in-built ‘ratchet’ mechanism – laid out a clear pathway for 195 countries to cut their reliance on fossil fuels and invest in attractive new alternatives. **This shared direction of travel** increased the confidence of leaders to provide policy signals. In turn, these, although sometimes weak and inconsistent, have created the conditions for companies to invest and innovate, and for the markets for zero-carbon solutions to start scaling – from electric vehicles to alternative proteins to sustainable aviation fuels (Systemiq, 2020).



**Countries** accounting for 92% of global GDP (PPP) now have net-zero targets (Net Zero Tracker, 2023).



**Around 54% of the world’s largest 2,000 publicly listed companies by revenue** have set or pledged to set net-zero targets (Net Zero Tracker, 2023).



35 nations and regions are rolling out mandatory climate risk disclosures, with these markets representing **56% of global GDP by 2025 (Carbon Cloud, 2023)**.

- These movements have created the conditions for sectors to **move towards market tipping points** where low-carbon responses and activities can out-compete legacy, high-carbon businesses. Stronger policies could accelerate the movement that is building. See Lecture 2 on rapid changes in cost.

# International collaboration beyond UNFCCC

International collaboration on climate change is expanding beyond UNFCCC frameworks. Now building a whole-economy approach involving leaders and economic policymakers to drive investment, technology, and systemic changes for sustainable growth.

The UNFCCC, particularly COP21 (Paris) and 26 (Glasgow), have built a **foundation for mutual understanding**.

The challenge is to **create a transformation of growth and development via investment, technology, and structural/systemic change**. A whole economy approach beyond the environment ministries that usually discuss at UNFCCC.



**Presidents, prime ministers, ministers of finance, and central bank governors** look across the whole economy. Their strong involvement is crucial. They “put the pieces together” and should offer vision and leadership across the economy. This is about **both the economy and the climate**: see e.g. work of Global Commission on Economy and Climate (2013-2023).

**The beginning of international collaboration amongst the leaders and economic decision makers:** NGFS, Coalition of Finance Ministers on Climate Action, G20 agenda; India's G20 leadership in 2023; Brazil's in 2024.

**And this is now at centre of the agenda of many international organisations** (e.g. IMF, OECD, UN).

Fractious and conflictual international politics makes climate collaboration more difficult. **But recognition of and collaboration around shared climate challenge can mitigate “fractiousness” on other policy dimensions.**

**More in Lecture 3.**



# The agenda: new approaches to growth and international action

We do not get to net zero via zero consumption or population. We get there by re-casting production and consumption so that these activities do not undermine or destroy the environment. This is a story of investment in and growth of these new ways over next three decades. Not “growth forever”.

The analyses of where we are, of how we got here, and of the fundamental problems and challenges we have created, together set a critical **agenda for new approaches to growth and development and public action.**

Structural, systemic and technological change at pace and scale are now essential. Economics and social sciences must be at the heart of the discussion working alongside technologists, engineers and scientists. **The engineers/technologists/scientists have moved faster than the economists/social scientists. Likely that the key obstacles will be in the economy, politics, society.**

The elements of the **new story of growth and development** will be set out in Lecture 2.



Arguments that **must stop growth now fail to understand** the centrality of re-casting production and consumption to avoid damage to the environment, the centrality of investment to that challenge, and the great potential productivity of that investment. And **they undermine political will** to tackle climate change.

The challenges are **quintessentially global**. Actions at all levels from the firm, to the city, to the nation are crucial. Communities will be at heart of decision-making. But international action will be critical to success. **Will need to build a new and purpose-driven internationalism.** That is the subject of Lecture 3.

# Summary of Lecture 1

## Looking back

In the past 70 years, advances in **human welfare and economic output have been remarkable and unprecedented**, albeit with persistent regional disparities. **The structure of the world economy has been transformed**; now multi-polar. **Severe climate, biodiversity, and environment stresses** have emerged from weight of output and dirty, wasteful and destructive processes.

## A world redrawn

A series of crises, the transformation of the world economy, and the recognition of the **unsustainability of our economic methods and models**, where gains in well-being are marred by environmental damage and social division, has prompted **a re-evaluation of global objectives**. Sustainability and social cohesion as central issues. In particular, the SDGs and Paris climate agreement of 2015.

## Climate and biodiversity crises

**Accelerating climate and biodiversity crises** demand urgent and fundamental systemic change. Meeting Paris Agreement targets crucial to avoiding severe impacts of warming and further damage to biodiversity. Need for **integrated and economy-wide and rapid action on mitigation, adaptation and sustainable development** in all countries.

## The ethics, the economics and the politics

The underlying ethics point to an approach to sustainable development founded in **human rights and intergenerational justice**, based on the right to development, itself embodied in a notion of common humanity. Rejection of discrimination by date of birth. Recognition of role of past historical emissions and injustice. All this goes beyond standard “welfare function” approaches of most economics; but sensible application of standard “consequentialism” points in similar directions for actions. The necessary **transformative change requires public action and decisive political leadership** to navigate the disruption, foster intragenerational equity, and seize the opportunities the transformation presents. The **obstacles lie more in the economics, politics, and society** than in science and technology.

## A decisive decade

The decisions of next decades, particularly on infrastructure in EMDEs, will dictate whether we lock in high carbon emissions or transition to **sustainable, resilient, and inclusive development**. **A big push on investment is central to this transformation**, requiring at least \$4 trillion p.a. globally by 2030. **A new model of growth and development** is in our hands but action must be swift and strong. Much more attractive than the dirty, destructive paths of the past. A growth story for the 21<sup>st</sup> century: many opportunities along the way; rewards are great; obstacles and difficulties are real; but failure risks catastrophe.

## Implication

Sustainable, resilient and equitable growth requires **integrating natural capital and social equity into economic analyses and actions**. And placing rapid **structural, systemic and technological transformation** at centre stage. As technology advances, we can see that the **major difficulties lie in economics, politics, and society**. International collaborations that foster and finance investments in new clean and robust activities in affordable ways, particularly energy infrastructure and resilience, are essential for transformative change at the pace now required. **Global cooperation and a new multilateralism are crucial**. **Economic analysis, policy, and action** should be oriented to fostering the transformation, realising the new growth opportunities, and underpinning global co-operation. **This is the new agenda for economics and the social sciences**.