

# Point of Choice

Accelerating the new era our  
planet urgently needs

FIRST EDITION

UNIVERSITY of   
**TASMANIA**

Professor Rufus Black





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planet urgently needs

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## **Acknowledgement of Country**

I acknowledge the nuenonne people who did not survive invasion and genocide and on whose Country most of this text was written. May their name and truth never be lost from the memory of the world. I acknowledge the continuing sovereignty and custodianship of the palawa and pakana people of lutruwita who sustainably cared for their Country across geological time.

May their knowledge of how to care for Country help us all find a way to a sustainable global future.

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## Foreword

As a university community we are engaged in the refresh of our strategy. Central to that process has been the question, how do we organise against the challenges and opportunities the world faces as we look towards 2050?

Last year I shared some perspectives on what those challenges and opportunities could be. Those thoughts originally came from a request by colleagues in the College of Sciences and Engineering in the second half of 2022. They were working on the renewal of their college strategy. To inform that process they asked about where the world was heading. They sought out a wide range of perspectives. They asked my views. I created some slides to share my perspective. It led to further discussions and a request for a fuller account of that thinking. In the presentation I shared with them I had been very focused on the challenges. They wanted to hear more about why I had hope. I spent the summer of 2022-23 writing and thinking both to answer their request and to respond to the suggestion that I develop and share those thoughts more broadly to contribute to the wider university strategy refresh.

I shared that evolving thinking in a range of presentations in 2023. I really appreciated the thoughts and feedback from many people. This summer I went back to work on the text behind those presentations because conversations with colleagues across the university had evolved some important ideas, not least the recognition of the centrality indigenous world views could play to secure a more sustainable future.

As a continuing contribution to our strategic refresh process, what is shared here is the updated text of the thinking behind last year's presentations. Its purpose is to encourage further conversations and debate about how as a university we best respond to the world as we find it and the future we face.

**– Professor Rufus Black**

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# Introduction

Standing where we are today, when we look back, we see a most remarkable era in history. In the period since the end of the Second World War in 1945 we have seen extraordinary human progress:

- Life expectancy globally went from 46.5 to 72.6 years and in high-income countries from 61.5 to 81.2 years.<sup>1</sup>
- Incomes have increased enormously in many countries. In a high-income country like the United States they rose in real terms over 250%, in a middle-income economy like Brazil it was 524% and in one of the rapidly growing Asian economies like Singapore it was a staggering 1,784%.<sup>2</sup> The global average was a 354% increase.<sup>3</sup>
- Those in extreme poverty have decreased from 54% of the world's population to 10%.<sup>4</sup>
- Illiteracy decreased from 58% to 14%.<sup>5</sup>
- The percentage of the world's countries that are liberal or electoral democracies went from 8% to 51%.<sup>6</sup>

All of this has occurred in the span of a single lifetime. People living in their 80s today have seen a transformation of human circumstances the like of which no previous generation has ever witnessed.

Yet, there is a growing unease around the planet. Our times seem troubling. We have just been through the worst pandemic in a century. International tensions are rising. There is war in Europe again. Hurricanes, floods, wildfires and extreme heat events seem more frequent and nature more malevolent.

Economic waters are choppy. Prices have spiked, affecting everyone with expensive energy and food. Inequality is growing. Life is not getting better for many. Politics are more polarised. Populism is rising, as the solutions offered by traditional parties don't seem to be improving life for people.

Is this just an unhappy conjunction of events or is something more fundamental changing?

I will argue that these troubling experiences are indeed signs that we are entering a new era and that we face a point of choice about our future.

In this essay I will tell a big picture story in three parts. The first part is a story about where the world is today, how we got here and what the future is we are heading for if we don't make changes. The picture that emerges is a deeply troubling one. However, the second part of the essay is a hopeful story about the choices that could lead to a better future. The third part provides some different scenarios about how the world might turn out, depending on how bold we are in pursuit of these sorts of ideas.

In this introduction I will provide an overview of the whole story so that you can get a sense of where it is heading. Before I do that, I will explain the approach I have taken to tell that story.

As a big picture story, I am concerned with how our environment, society and economy function and interact around the world. They are a series of interdependent systems. Our natural environment provides the basic inputs from water and food to timber and minerals that our economy uses to meet our societal needs. Equally, how our economy works impacts on our environment and shapes the sort of society we live in. These systems are linked in so many ways as we will see as the story unfolds.

## Our Current Model

What has particularly shaped the way these systems have interacted in the post World War II period has been the dominant role played by economic development and the policies that shaped it, which were put in place by governments first in the western world and then increasingly globally.

These broad policy settings are so dominant that they represent the central features of what I will call our current 'model'. I use the word 'model' because it is an 'idea' of how an economy could and, in terms of its advocates, 'should' work but it is not a detailed description of how it actually works.

Governments around the world have applied the 'model' in a very wide range of ways. Its key features are:

- **A free market domestic economy.** The growth and maintenance of a free market economy rather than a centrally planned one has been a pivotal idea. While these markets are regulated in a lot of ways, and in many places regulation has increased rather than decreased in recent times, the fundamental idea that markets are at the centre remains key. In many countries the central role given to markets has also seen services previously provided by governments, from utilities like power and water to activities like telecommunications and transport, privatised, so the scope of markets has also increased.
- **High productivity-enabling institutional settings.** Examples include investment in science and technology, the expansion of education and advancement of the rule of law. We will explore these in more detail in the next section.
- **Freer international markets.** For much of the postwar period there was a focus not just on domestic free markets but on creating freer international trade.
- **The largely 'free' use of the environment.** The extraction of natural resources from minerals, water, soils, forests, grasslands and wild food stocks like fish to meet human needs and emitting of waste from our productive processes back into the environment have been very environmentally damaging but not economically costly. Very little of that impact has had an economic price. Economists talk about the impact of economic activity 'outside' the economic system, like the impact of pollution on the environment, as an 'externality'. There has been very little pricing of externalities. Some externalities like various forms of pollution have been 'priced' by putting a tax on them, but largely the economic damage to the environment has been 'free' in direct economic terms.
- **Economic growth measured in gross domestic product** (ie the total value of goods produced and services provided in a country during one year) and economic stability measured in low inflation rates are core objectives of economic policy. The notion of growth as a core objective is worth noting.
- **Government provision of a wide range of welfare benefits** like unemployment payments to seek to ameliorate the impacts of free market activities on people.

## Four Key Shaping Forces

The way the ideas that constitute this broad 'model' have been put into practice is what has created the 'system' we have today. I refer at many points to both this 'model' for developing and managing our economy and society and 'the system' it has created.

These policies interacted with the four major forces that shape how societies and especially their economies develop, which are:

- **Demography.** The rates of population growth and decline, the age profile of a population and levels of participation in the workforce have very large influence on society and the economy.
- **Resource availability.** The availability and with it the price of all of the materials and energy we use to make everything, from houses and all of the contents that fill them to hospitals and our transport systems, matter a great deal. Similarly, the availability and price of financial resources to invest in creating products and services play an important role in economic development.
- **Productivity.** How efficient people are at turning those resources into what humans value is a product of how those institutional settings for productivity have worked. It is very consequential. In lots of ways, it defines whether living standards improve overall.
- **Connectivity.** How connected the world is physically through trade and digitally through the internet has turned out to matter a great deal in terms of the way the global economy has grown and the shape our world has taken.





For most people over the age of 20, this is the only world they have known. They are the children of the Tailwind Years. The danger is that people have a strong tendency - a cognitive bias - to anchor on what they know. As a result, they assume the world they have known is the norm. The problem is the period we have anchored on as normal is the most abnormal period in all human history. When the world changes, that kind of anchoring can be very unhelpful and make us slow to see the change or realise that we are in a fundamentally different world.

I will argue that is exactly what has happened. In the period following the first decade of this century, all these favourable forces for economic development turned around and are now hindering it. We have gone from the Tailwind Years and into the Headwind Years.

More problematically, we don't just face headwinds. The implementation of the 'model' of market-oriented policies largely disconnected from the environment has created a climate and ecological crisis, a social crisis in the form of ever-widening inequality, and global instability.

The dominance of the economy over the environment has come home to roost. I will explain key features of this very destructive relationship between our system's economic development and the systems of the natural world. I will characterise the economic system's relationship to the environment as one of extraction to emission. This sees us extract both non-renewable and renewable resources at an unsustainable rate, process them, then 'emit' a very large portion of the goods and byproducts of our production and consumption back into the environment as pollution or other forms of waste. In telling that story we will see that rates of extraction and emission are at levels that, unless we act very quickly, we are heading towards serious planetary crises, not just with our climate but many other aspects of our environment and society.

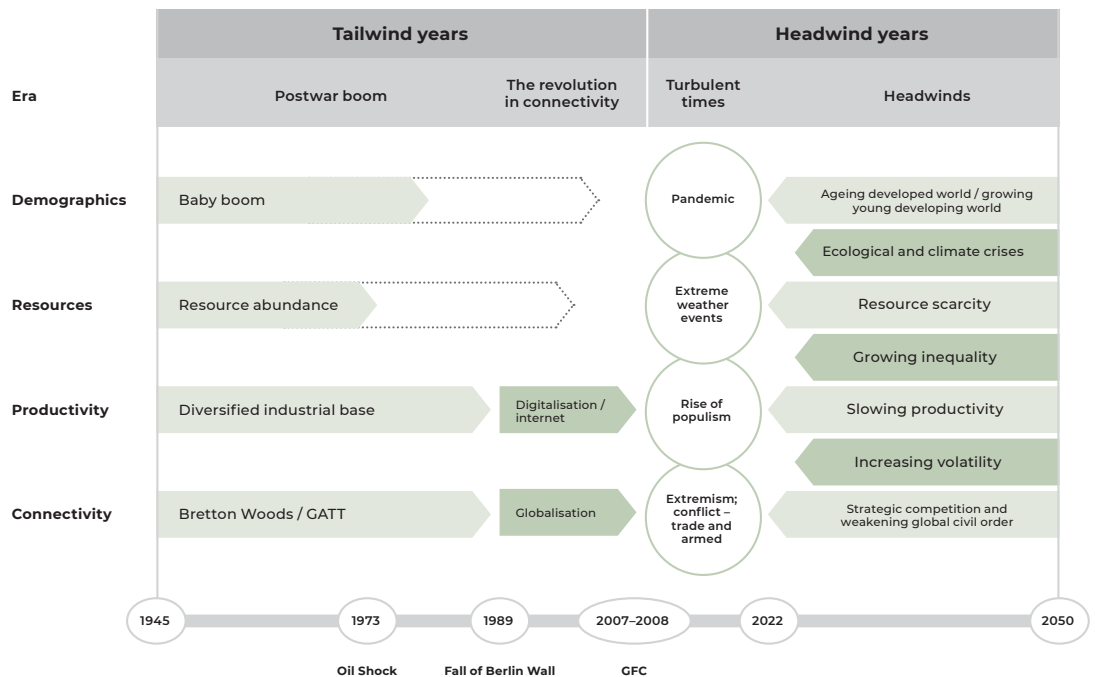
The story to this point is captured in a visual summary, Chart 1. You can see the four big forces on the vertical axis of demography, resource availability, productivity and connectivity. For each of them, there are tailwinds pushing us forward and then at the point of the global financial crisis you are seeing that this changes to headwinds. Adding to those headwinds you can see those challenges of climate and ecological crisis, social crisis and instability.

## Part 1: The Journey to the World of Today

How these four major forces interacted with the model we have for economic and social development will be the subject of **Part 1** of this essay. I will tell the story of how between the end of World War II in 1945 all the way up to the first decade of the 21st century, these major forces were all favourable. They all supported historically rapid economic development. I will call this era between 1945 and 2008-9 the 'Tailwind Years'.

**Chart 1: Tailwind and headwind summary**

Source: Professor Rufus Black





## Part 2: How to Create a Sustainable, Inclusive, Prosperous and More Stable Future

At this point, the story could feel very depressing. However, in **Part 2** I provide a case for hope. I explain that we know now what the tasks are to create a more sustainable system for the evolution of our society, economy and environment. Those tasks are to:

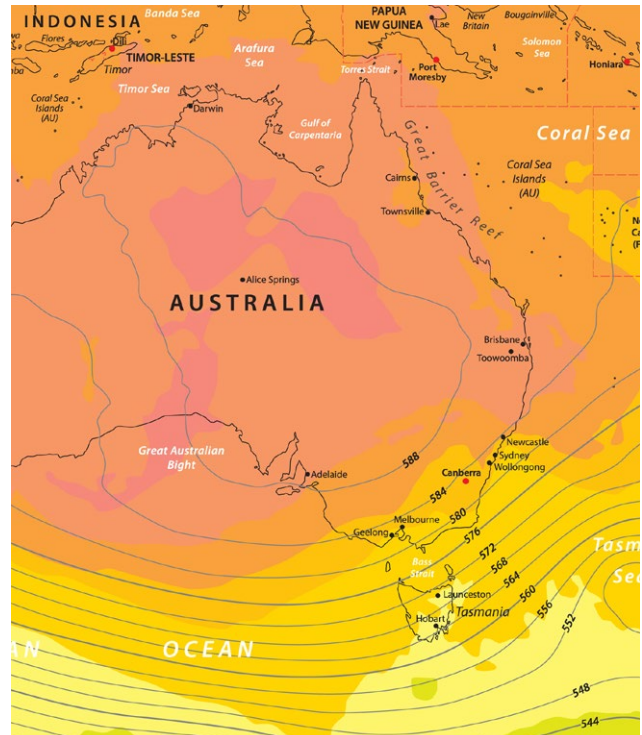
1. Accelerate the decoupling of economic growth and environmental impact;
2. Achieve regeneration at scale;
3. Transition our global population to a level that enables equitably distributed global prosperity within the limits of our planetary system.
4. Create a genuinely inclusive economy;
5. Find new engines for productivity; and
6. Create global resilience without compromising prosperity.

To meet these tasks, we need to:

1. Accelerate the creation of a circular economy;
2. Create a carbon neutral economy and society;
3. Accelerate the regenerative agenda;
4. Live the sustainable life;
5. Organise for the transition to the long participative life;
6. Plan life and policy around well-being not GDP; and
7. Transform our current model using indigenous knowledges.

More than that we have examples at scale from around the world of countries and people already taking those actions and making a difference. They have shown it can be done, from continent-wide plans to create a circular economy in Europe, to Australian households' rapid uptake of solar cells to drive the greening of their power system. The only exception to that is the task to transform our current model using indigenous knowledges. We are still in the early days on this one, but I think it will turn out to be the most critical task of all.

That is why this essay argues that we are at a point of choice. The problem is clear. What we need to do is clear. The time is short. We need to choose to act now.



## Part 3: Three Scenarios

In **Part 3** I consider the implications resulting from how boldly we choose to act on these tasks and ideas. I paint three possible scenarios, which are:

- **'The Hostile Planet'**, which is how the world could turn out if we continue broadly on our current trajectory;
- **'The Muddle Through'**, which is what could happen if climatic and ecological disruptions become severe enough to promote serious action but, as a result, we make our choices late and have to live with far worse consequences than we would have, had we acted now; and
- **'The New Relational Age'**, which is how the world could turn out if we start acting boldly now and end up living with a relational understanding of the world and our place in it that could come from a deep engagement with indigenous people and the sort of knowledge system that enabled them to live sustainably for countless generations prior to this unsustainable era.

The story overall is one that charts the shifts from a world dominated by our current model of economic development to one where we need a new model for managing our society, environment and economy.

The first of these shifts we will explore is from one where economic development is the organising idea to one where the focus is on our social, environmental and economic systems working in harmony. The second is a shift from organising around material progress to organising around human well-being, where we recognise that human well-being itself is dependent on the quality of our society and environment.

The third is a related shift from growth as a talisman of policy to the question of how do we improve human well-being within the limits of the environment?

Before we proceed to the details of the story itself, a word about how I will tell it. Over the years, when I have presented talks about where I think the world is heading, I have found it helpful to use charts to tell the story. They are the best way I know of to share the patterns in the data, so we can literally see the trends. To be clear, it is trends we are talking about. In our complex world, trends are rarely neatly linear. We need to look for the overall direction and allow for all sorts of ups and downs.

Those patterns are easiest to see in a visual picture rather than in a set of numbers or a wordy description.

When I am trying to explain where we have come from and where we are going, what I offer is a revisable hypothesis. It is the best explanation I can see at this time. Others are bound to offer insights and perspectives that will lead to better explanations. I very much look forward to those conversations.

Part of inviting others into conversation is to make the data in charts as easy to access as possible. To help with that task, as much of the data as possible comes from the free open source Our World in Data website.<sup>7</sup> Otherwise, I have tried to use data from international organisations like the Organisation for Economic Co-operation and Development (OECD), The World Bank and the International Monetary Fund (IMF) who provide publicly sourced data in documents or websites that are free to access. These are also all organisations that have shaped how our current world operates through the way they have supported and sometimes sought to modify our current model of economic development, so it is helpful to see that in their own data the issues we face are very apparent. As this essay is essentially an argument built around this primary evidence, I haven't sought to engage the large and fascinating secondary literature that explores and discusses the data. It would be a very much longer and different sort of essay had I done so. I would certainly encourage anyone interested in doing so to dive deeply into that material.

Thinking about where we are and where we are heading covers a lot of territory. It draws on the work of many experts in fields that are not my own. I present that knowledge only as someone whose academic work has often engaged the interdisciplinary dialogue between ethics and economics and whose professional expertise is as a strategist who seeks to frame the organisational and policy choices that emerge as we develop a more holistic picture of the world we face. Inevitably, there are risks in such an enterprise of various infelicities and inaccuracies. I look forward to the corrections by expert colleagues in those areas. However, as a university and as a world, we need to take the risks of these sorts of interdisciplinary projects because not to know the true nature, magnitude and urgency of the challenges we face is a far greater risk.

Equally, an interdisciplinary project like this provides a view, an interpretation. It comes with an invitation to share other views, not because we will settle one view – we almost certainly won't – but because all our understandings will be richer if we engage with a plurality of perspectives.

Just as there isn't one perspective on the future, the essay doesn't provide a single or simple answer. Rather, being a clear point of choice, it invites us all to ask the question, how should we best organise against the challenges and opportunities the world faces?

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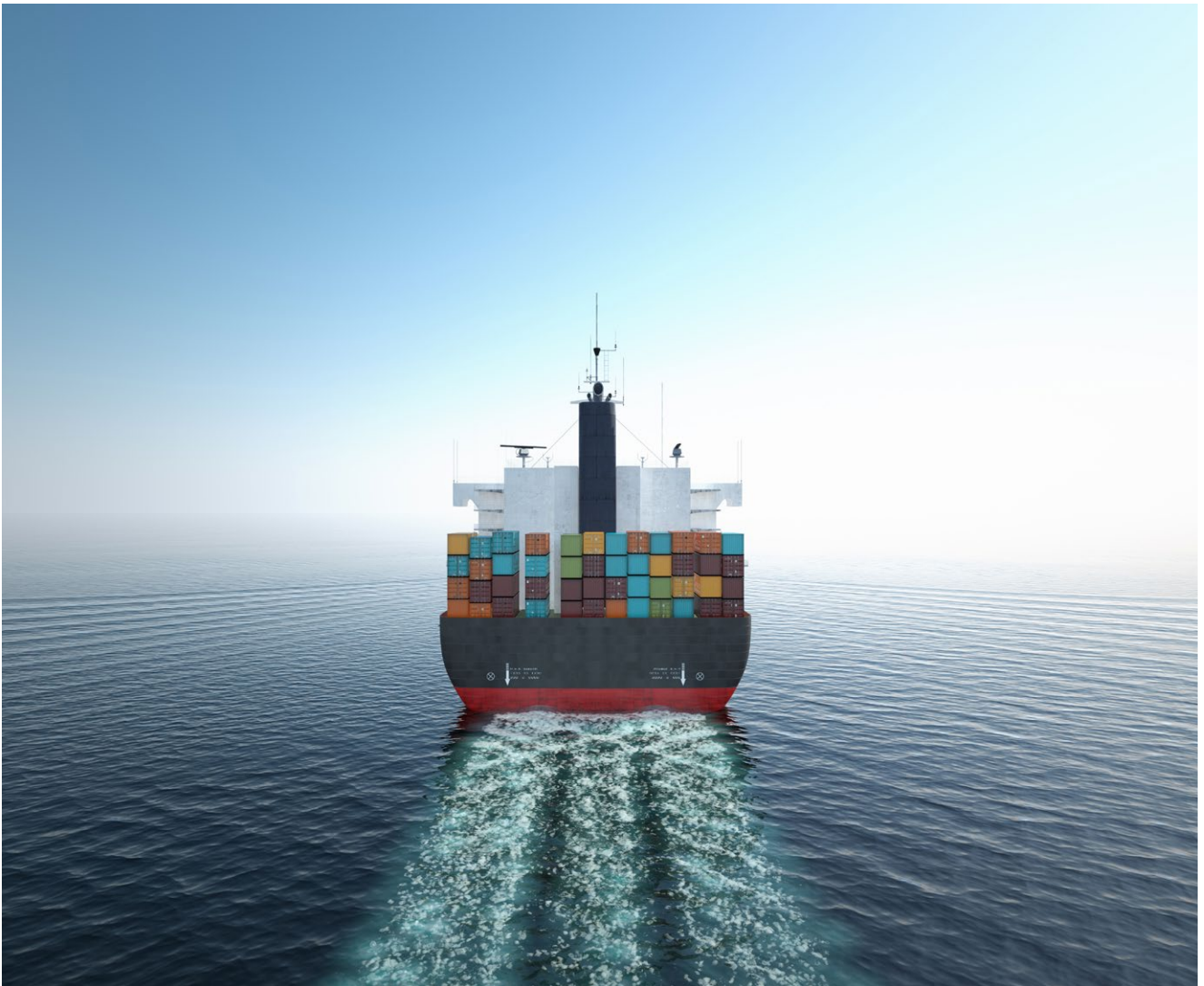






# **Part 1.**

## **The Journey to the World of Today**



Part 1 of this essay will explore how the four major forces of demographics, resource availability, productivity and connectivity shape our world.

We will then look at the role they played in global economic development post-World War II. I will tell the story of how between the end of World War II in 1945 all the way up to the first decade of the 21st century these major forces were all favourable. They all supported historically rapid economic development. I will call this era between 1945 and 2008-9 the 'Tailwind Years'. Then, all these forces turned around and they have become hinderances rather than helps. We will explore what happened in this era, which I will call the 'Headwind Years'.

During these Headwind Years we have seen events in the natural and human world from more extreme weather events to the rise of populist politicians. These events have led to the question, is there something fundamentally problematic about the system that we have? As we answer that question, we will find a world where the model for economic and social development is fundamentally environmentally and socially unsustainable and unstable.

## Section 1: Forces that Shape our World

This essay is a big picture story, and because economic development and its relationship to the environment and society have been such a dominant feature of the period post the Second World War, I have chosen to focus on four big forces. These at the highest level summarise how an economy operates, as it is shaped by and shapes our environmental and social systems.

At its simplest, an economy involves people (demographics) taking raw materials and energy (resources) from our environment, then converting them into products and services people value (productivity) and trading them with other people (connectivity). Together, these forces make a material contribution to shaping our lives. They help explain whether our standard of living is improving in real terms, whether inequality is growing or diminishing, what is happening to the environment and how predictable or uncertain are our lives.

The other reason for trying to boil this down to a limited number of forces is that we are swimming in an extraordinary sea of information, images and data every day. The big picture can be hard to see in amongst all the noise. I think when we can see how the world works at a big picture level, then even if we can't change parts of that picture, we feel less overwhelmed. I will argue that when we can comprehend how these big forces work, we can focus our efforts on what actually needs to change and we can find hope in what otherwise might be a time of despair.





## Demographics

The size and age structure of a population matter a great deal.

When it comes to economic growth, the age structure of a population plays a pivotal role. For any society, that structure is both a product of natural population changes and migration. Both are important in the postwar world because there was natural population growth and, in a small number of developed countries like the United States, Australia and Canada, very large-scale migration that materially affected the age structures of their populations.<sup>8</sup>

Whether caused by natural population growth or migration, if our working-age population grows, there are more people to do everything from farming the land and building houses to providing medical advice or engineering services. More than just having additional people to work, there are also more people to provide for the young and the old who aren't working. Finally, those who are working have a far greater propensity to save than those who aren't working and who typically draw down on savings. Overall, that means that the savings and therefore financial resources available to society increase when the dependency rate decreases. We can think of this growing working-age population and all of the positives it brings as a demographic tailwind – prosperity is being propelled forward by our population.

Equally, if the working-age population shrinks, there are fewer people to work and more of the work they do has to go to supporting children and old people. Unless there is a very large increase in productivity (the amount each person produces) to offset the decline in the number of people working, a society can easily get poorer just because it is getting older. What makes it especially challenging is that as people get older, they also tend to be less productive, so as the population gets older on average, there are not only fewer people working but they can't produce as much. As people retire, they then draw down on their savings to fund their retirement. When the number of workers retiring proportionately increases, a society's stock of financial resources tends to decrease.

The combined effects of a shrinking working-age population we can think of as a demographic headwind – we have to work harder each year just to stand still.

The other major force that shapes our working-age populations is the number of people who participate in the workforce. When it comes to participation, gender is particularly important. Across the world, albeit at very different rates, a smaller proportion of women participate in the workforce than men. As women join the workforce, not only are there more workers but there are fewer people economically dependent on the income of working people or payments from government. This again is an important demographically linked tailwind and one which improves income equality along with all the other benefits that come from a more diverse workforce.

While population structure can help or hinder economic growth, so too can size and, in our world today, size poses issues of sustainability. Just adding more people isn't necessarily an advantage or a tailwind. If a larger population just produces more in total but each person is no better off, then where is the gain?

Today, at a global scale, the real problem with population growth is the increased pressure it puts on the environment. We need to extract more resources, use more land and water, and we emit more back into the atmosphere, oceans and the rest of the natural environment just to ensure the new people we are adding to society have the same standard of living as its existing members. When the globe's population was far smaller, this wasn't a real issue, but as we will see later in this essay, it has become one of the defining challenges for our time. With that in mind, we should also remember that it is possible for an economy to shrink but people to get richer, if the population is shrinking proportionately faster than the economy. We are just so used to an absolute growth mindset that we forget sometimes that it is all about what happens at a per capita level. That is why population, whether growing, shrinking, ageing or becoming more youthful, matters so much.



## Resource availability

People are just one part of producing what we want. When we produce physical products and provide services, we need resources. In this big picture story, we are very interested in four types of resources.

The first are the non-renewable resources like the minerals which we extract from the environment. Some of these, like iron ore, copper or cobalt, we use to make physical products. Others, like oil or coal, we convert into energy.

The second are what should be renewable material resources like water, soil and stocks of wild animals like fish that we eat. We say 'should be renewable' because we know one of our global problems is that we often consume renewable resources at such a rate that they could become depleted like a non-renewable resource.

The third type of resources we are interested in are renewable energy resources like solar and wind.

How abundant these non-renewable and renewable material resources are and renewable energy is makes a big difference to how 'easy' it is to be wealthy. The most obvious example is oil. Those countries with large amounts of oil where it is easy to extract were able to create wealth much more easily than those countries with few natural resources that the world needed. Similarly, those countries with large tracts of fertile soil and abundant water can profit far more easily than those in arid places with poor soils.

While resource availability starts with their basic physical abundance, technology plays an important role. Technology can help make it profitable to extract or grow resources that otherwise wouldn't be available. If we are thinking about oil, then development of fracking technology in the United States made a huge amount of oil economically available. Irrigation technology and selective crop breeding can enable arid, lower fertility soils to be productive, so that it is profitable to farm them.

When resources are physically and economically easy to obtain, this provides a strong tailwind for economic growth. Abundance helps with productivity because if it takes relatively little effort to extract or grow resources, then all that effort, whether it is time, energy or money, can be used for other opportunities.

However, as we use up non-renewable resources like copper or iron ore, they become progressively scarce and eventually even technological innovation won't be able to make them readily available.

The costs of finding and extracting them will increasingly rise. Similarly, if we exhaust renewable resources, their costs will rise as well. We have seen that as fisheries have been depleted, the price of those fish inexorably increases. When we get into that world of rising costs because of increasing scarcity, we face a resource availability headwind. More profoundly, as we damage and exhaust the natural environment, we hit up against not economic constraints but the real physical constraints of the planet. It is those planetary limits that represent the ultimate limit to resource availability, sometimes locally and increasingly globally.

The fourth type of resource we are interested in is financial capital. This is the human store of value that we need to invest in the working hours, technology and processes that can transform the energy and materials. It is financial capital that enables us to 'buy' those working hours, property and materials, which are needed to turn our natural resources into products people value. Without financial resources, we can't buy a tractor to make farming more productive or build a factory to turn clay into bricks or to turn silicone into computer chips. So, while natural resources matter, if countries that do have abundant natural resources don't have financial resources, then they can't convert them into material progress and they remain trapped in poverty. Importantly, just getting those financial resources is only ever a part of the story because if a country can't get them on equitable terms, then as we have seen all too often, it is the owner of the financial resources that ends up benefiting rather than the people with the natural resources.

As economies evolve and they become more focused on services like health care, entertainment and education, rather than products, then their focus becomes less on the transformation of materials and far more on the use of capital to enable people to create services. That is an important transition from an environmental perspective because services typically involve far less use of material resources that have been extracted from the environment. It provides a clue that we can improve human well-being while reducing our impact on the natural world, but we return to that later.





## Productivity

Having people, materials, energy and financial capital provides the input for producing the goods and services we need. How efficiently we use them is what productivity is all about.

However, these days the term productivity often has negative associations with it. People readily see it as code for 'getting me to work harder for no extra gain or squeezing more out of me'. As we will see later, that is very understandable because in recent times it has been the reality. People have worked harder but their standard of living hasn't improved.

The 'squeezing more out of me' understanding of productivity often causes us to lose focus on the other half of the productivity story, which is we can be more productive by making products or services more valuable. The evolution of computer chips provides a great example. Their development has largely followed 'Moore's Law', which is the idea that the number of transistors on an integrated circuit doubles about every two years. It is that doubling of capacity that makes computers ever more productive because the same chip can do so much more.

There is no doubt that one of the changes we need to see in the world is that the gains from productivity are more equitably shared because productivity is at the centre of what enables us to improve life for people. It is so important that the Nobel Prize winning economist Paul Krugman famously said, 'Productivity isn't everything, but in the long run it is almost everything'.

To take a simple example, when we make a car, we are using labour and energy to turn a lot of raw materials into a vehicle. If we reduce the amount of labour, energy or materials needed to make a vehicle, we have increased productivity. The big positive of a gain in productivity is that we now have extra time, money and resources for other choices, while still having the same car.

Equally, if we make the car more fuel efficient, we have increased productivity because it will go the same distance only with less fuel. We now don't need as much fuel and what we would have paid for fuel can be spent on other goods or services. Across a whole economy and society, these gains make a huge difference.

If these sorts of gains led to an economy-wide productivity improvement that averaged just 3% a year, then roughly we would see the economy double in size in only 23 years. Assuming that the population remained the same size, then an average income per person would have doubled in a generation and quadrupled in two generations. That is the power of productivity.

But equally, if productivity fell to an average of just 1% a year, assuming that the population remained the same size, then it would take 70 years for income to double. If during that time the population had doubled in size, then no one would be better off. This relationship between the rate of productivity growth and the rate of population growth is critical. For economic progress, productivity needs to outrun population. The top line of income needs to grow a lot faster than the bottom line of population or, from the perspective of the average person, life is not getting better. The great challenge for humanity before the modern era is that this didn't happen to any great extent. Humanity made some productivity gains, but they were eaten up – often literally – by an increase in population.



While productivity grows the total size of any economy, it doesn't determine how those gains are distributed. If we think about the productivity gains that are made in private companies, which constitute a sizeable portion of most economies, there will be a question as to how they are shared. How much stays in the company as profits (all other factors being equal), goes to workers as increased real wages, or goes to the government in the form of taxes? We see in the different eras we are looking at how this equation has changed and just how consequential those changes are.

Productivity doesn't just affect human wealth and income – it affects how our economic activity impacts the natural world. The less productive we are, the more we consume the natural world, from extracting resources to using land and water through to what we emit back into nature. For example, if the efficiency of agricultural production from farm to plate doesn't keep up with increased demand for calories, whether it is because we have more mouths to feed or greater consumption per person, then we will need more and more land to produce food. Or, as we saw for a long time in the 20th century, because energy efficiency didn't keep pace with the increased use of electricity, we consumed ever larger amounts of fossil fuels to generate that extra energy.

What has shaped the way productivity has worked in the postwar world have been five interrelated, enabling, institutional settings around:

- **Science and technology:** The ability to make products and services more efficiently (ie with less resources, energy or labour) or enable them to perform better or grow food, fibre and timber more productively will be important and recurring themes. For science and technology to drive productivity, we need the whole process – from the discovery of basic knowledge to applying that knowledge, to diffusing that knowledge throughout society and industry – to work effectively. For that process to work well, we need a strong, large and healthy ecosystem of universities, research organisations and corporations with big research and development budgets generating and figuring out how to apply the knowledge. They need to be well-connected to means by which that knowledge can be applied and diffused at scale through society, which includes a healthy venture capital and start-up sector.
- **Education:** Productivity is about having inventive people throughout an economy and ever more capable people who create more sophisticated and valuable products and services. That is what makes the average level of education in a population so important to establishing and sustaining productivity.
- **Corporate organisation:** The ability to produce goods and services requires a lot of organisation. One of the biggest gains in productivity comes from being able to organise at scale, whether it is running a mine, creating products or shipping products.
- **Social organisation:** How societies organise themselves plays a pivotal role as to whether all of the other forces are able to flourish. How strong is the rule of law? Do they invest enough in what matters for productivity, like education and the creation and application of knowledge? Do they enable innovation to be diffused widely? Do they ensure people re-skill, so that they stay productive throughout life? Do they enable the formation and efficient operation of corporations, from start-ups to large corporations, and ensure that those corporations don't end up disproportionately serving their own interests? Equally, do societies make sure governments don't get in the way of productivity through corrupt practices, inefficiency in their own substantial operations running everything from health care to providing social welfare, or by trying to organise parts of the economy they aren't best placed to do?

- **Connectivity:** As we will see in the next section, the extent to which people can freely interact, move and trade within their countries and between countries is a major enabler or barrier to productivity.

As we observed in the introduction, these institutional settings have been integral to the model of economic and social development in the postwar world. How these institutional enablers came to be in place is a story that belongs to the previous era, from the 19th century through to the end of the Second World War, when all these drivers of productivity developed their modern form and came together in the western world as a productivity system. In the postwar world that system has, at least in part, been widely adopted in developing countries and prompted as part of development efforts by major international agencies like the World Bank and IMF.

In this essay, we will explore how this productivity system has worked in the postwar world and what might need to change about it if we are to have a more equitable and sustainable society and economy. On the one hand, we will see that expanding education further is critical to address the growth in inequality created by our current model; on the other hand, we will observe that the drive to organise activities from food production to manufacturing at global scale has made the world less stable. We will explore how this productivity system could evolve as some institutional features that have caused harm are changed and others might be added as we move away from an economic model where we extract from nature and then emit it back as waste.

It is important that we see it as a system because it requires these different elements to work together. Otherwise, we risk looking for 'silver bullets' to improve productivity. Invariably, new and especially disruptive innovations commonly require other parts of the system to adapt, so the gains from these innovations are usually smaller and take longer than their promoters and enthusiasts have maintained. Currently, we have a risk that artificial intelligence (AI) is just such a technology. It will no doubt contribute to a lift in productivity and in the longer run potentially a very substantial lift, but we need to be sanguine about the time and scale of that improvement and attend to the risks of very negative side effects. On the face it, AI looks like it could be yet another measure that improves productivity but increases inequality. Beyond that there are a wide range of other, lower probability but even higher consequence risks that AI could unleash, which would rapidly detract from the gains it might have helped the world to make.

## Connectivity

Once people have made goods and services, they inevitably trade them because people can make themselves better off by doing so.

The reason trade seems to make sense and to make such a difference to how productive a society can be is what economists call comparative advantage. Central to that idea is that people are better off if they focus on what they are relatively better at doing. If we think about our own lives, we can see this comparative advantage at work. If I am very good at building but only average at growing food, I am better off earning money as a builder and buying the food I need from a farmer (ie from someone who is comparatively better at growing food than building houses). In this situation, both the farmer and me (the builder) are better off, which is why we both specialise and trade with each other.

What is true of individuals turns out to be true of whole countries, where individuals and companies end up specialising in activities they are comparatively better at and using the proceeds of selling whatever that good or service is to other countries to buy what they aren't so good at producing. We have ended up with countries who are strong producers of agricultural products, others who produce a lot of manufactured goods and some who are major service providers. The more countries who trade, the more different places can do what their companies are comparatively better at doing and, at least in the short run, the better off everyone is. That is theory of course. It is never quite so neat in practice as we will see, but it holds true enough that in the short run, we can see improved connectivity as a powerful tailwind.

For most of history, how connected places were was the result of how freely countries could trade with each other, how freely financial resources could move between places, how easily people could collaborate when physically separated and how much it cost to transport goods. In each of these areas there can be many barriers to connectivity.

With trade, countries have over time created lots of barriers, from outright bans, to quotas and complex regulations, to taxes and tariffs. Financial flows are subject to similar restrictions and regulations. The transport of goods confronts the basic physical reality that moving goods any distance requires them to be packed and unpacked on and off costly vehicles like ships and trucks, and often more than once. Those vehicles require substantial and expensive energy inputs to go any distance.

Finally, collaborating remotely has also been a tricky and expensive business. Before electronic communication, it all had to be done by the physical movement of documents, and even when electronic communication arrived, it was initially cumbersome and costly.

Connectivity does have a second dimension. It is not just the free movement of goods that matters, the free movement of people can also make a real difference. Where that is most obvious is when migrants bring skills that are in short supply. These skills sometimes enable goods and services to be produced that couldn't otherwise be made, or at other times to be created at lower cost. Sometimes this is about sophisticated skills, but other times it is about people being ready to do jobs others don't want to do, from picking fruit to working in factories. When migrants bring skills and knowledge, which they share, that can increase the productivity of local people as well.

As with trade, there are downsides, from situations where local wages get suppressed, unacceptable working conditions continue, or there is skill drain from countries where, for example, much-needed doctors and nurses in poorer nations migrate to wealthier ones.





## Section 2: The Tailwind Years

In the post-World War II era all four of these forces, which affect how an economy performs, were, in the majority of places around the world, simultaneously driving economic development. Together, they created the most dramatic increases in income and living standards that history has ever known. These were the Tailwind Years.

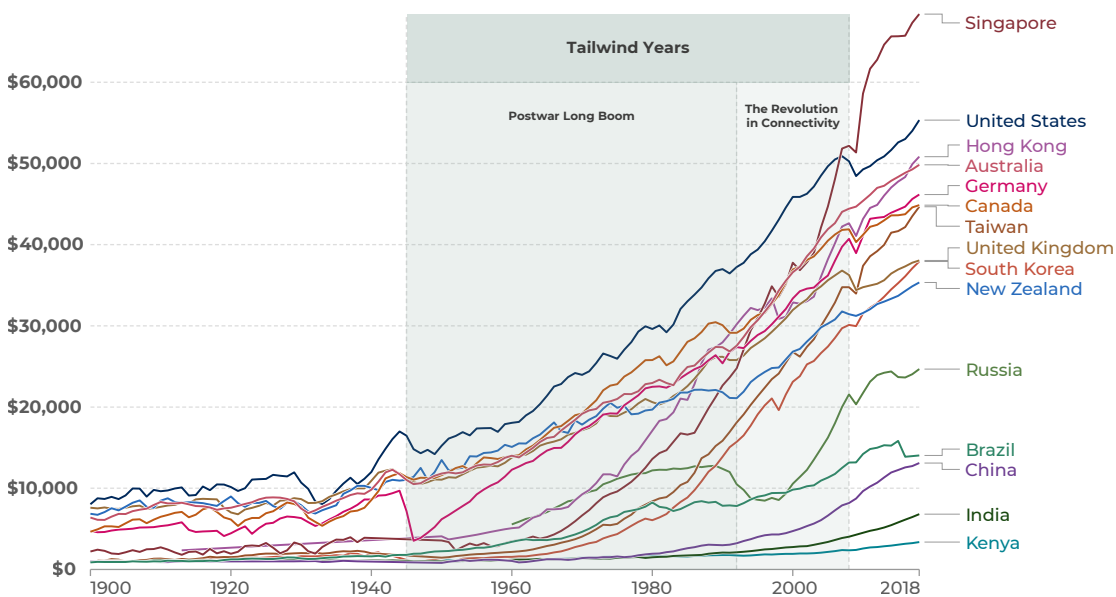
There were two distinct periods during these Tailwind Years that kept the winds of economic progress blowing. Firstly, the postwar boom, which is where the developed world particularly benefited from the demography, resource availability, productivity, and connectivity of the postwar world. Secondly, the Revolution in Connectivity, when the whole world benefited from the near simultaneous growth of the internet, the physical reconnecting

of many parts of the world that came with the collapse of western communism and a substantial fall in barriers trade. We can see the story of these Tailwind Years in Chart 2. On the horizontal x-axis are the years from 1900 through to 2018. The start of this period precedes the Tailwind Years by 45 years, as I want to briefly look at that period and contrast it with what follows.

**Chart 2: GDP per capita from 1900 to 2018**

This data is adjusted for inflation and for differences in the cost of living between countries. Note: This data is expressed international \$' at 2011 prices. OurWorldInData.org/economic-growth Source: <https://ourworldindata.org/grapher/gdp-per-capita-maddison?tab=chart&time=1900.latest>. Data source: Maddison Project Database 2020 (Bolt and van Zanden, 2020)

1. International dollars: International dollars are a hypothetical currency that is used to make meaningful comparisons of monetary indicators of living standards. Figures expressed in international dollars are adjusted for inflation within countries over time, and for differences in the cost of living between countries. The goal of such adjustments is to provide a unit whose purchasing power is held fixed over time and across countries, such that one international dollar can buy the same quantity and quality of goods and services no matter where or when it is spent.



In this one picture, we can see the world from the start of the 20th century right through to the eve of the COVID-19 pandemic. On the vertical y-axis is gross domestic product (GDP) per capita.

GDP is the total value of goods produced and services provided in a country each year. I have divided this amount by the number of people in that country. It provides a rough picture of how much income per person a country creates. Of course, it doesn't tell us about how fairly that income is distributed but it does give a useful way to compare countries and see whether, from the perspective of its whole population, income is increasing.

On the chart, I have plotted a range of countries from across the continents and different stages of development, from highly developed countries like the United States and Germany, to lesser developed countries like Kenya and Brazil. I have plotted those countries sometimes known as the Asian Tigers (South Korea, Taiwan, Singapore and Hong Kong), who in the space of this period made the full journey from developing to developed countries. I have plotted countries who have had quite different economic

systems. It contrasts broadly free market countries, like the United Kingdom and Australia, with Russia and China who sought to manage their economies centrally for at least a major part of this period.

The picture you can see on the graph is that between 1900 and the start of the Second World War, the income per capita line is fairly flat for all these countries. Over those 40 years, globally average income per capita only grew at 1.4% a year. It was a little higher in the fastest growing group of countries, which were the Western European offshoots like the United States, Canada, Australia and New Zealand where it grew at 1.7%. But even here you can see the impact of the 1930s depression, especially in the United States, where income per capita collapsed in 1929 and didn't return to pre-collapse levels until 1937. Income per capita then didn't improve significantly until the massive war effort in the United States fuelled a great deal of economic activity. In other regions, like South Asia and South-East Asia, the growth rate was a mere 0.9% per year.

When the Second World War ended, a very different picture emerged. In that postwar boom, much of the growth was concentrated in the more developed countries. Then, when the Revolution in Connectivity occurred in the 1990s, a whole new set of countries saw their growth rates rapidly accelerate to shape the world as we have come to know it. While every nation's story is different and there are always dangers when we group countries together, there is insight to be gained when we see how major clusters of similar countries have evolved through these two eras.

- The **developed countries'** income per capita took off, then climbed with relatively few downs and then just kept heading upwards. Even where there was economic disruption, like the oil shock of the 1970s when oil supplies were restricted and the price of this key commodity rose quickly and slowed down economic growth for a time, income quickly bounced back and returned to its steep ascent. There wasn't another period like the 1930s at any point. For these countries, that meant an average increase in income per capita of over 200% and a yearly growth rate of over 2%.<sup>9</sup>
- For the **less developed countries**, like India and Kenya, for most of this period they continued on a trajectory similar to the pre-war period. Change for these places came when the world entered the era of the Revolution in Connectivity. It was then that you can see incomes start to rise rapidly in those countries. If we take the example of India, between 1989 and 2018 income

per capita rose at 3.2% per year and total income per capita increased by 200% in about half the time it took for developed countries to see the same increase.<sup>10</sup> Brazil's story is a little different, as you can see with its economic growth taking off in the 1960s. This was when, amongst other changes, it refocused on global connectivity and the exploitation of its abundant natural resources, which were in strong demand as developed economies grew.

- The stories of the **communist-inspired economies** are different again. While China maintained a very strong centrally controlled economy, there was remarkably little progress. You can see this with the flat line. Then, in the very late 1970s, it starts to rise. This was when, under Deng Xiaoping's leadership, China started to introduce market reforms and to connect its economy to the rest of the world in a much more substantial way. What that meant was when the Revolution in Connectivity arrived, China was positioned to benefit from it greatly.

The story in Russia is that it did grow during its centrally planned period, aided by a young population, high levels of female participation, access to resources and some connectivity with other communist countries. You can see that when the Soviet Union collapsed, so did its economy and then in the era of the Revolution of Connectivity, Russia profited by exploiting and trading its easy access to large mineral and fossil fuel resources.





Those countries with large populations, including Brazil, Russia, India and China (sometimes called the BRICs) who all took off during the Revolution of Connectivity, brought an important new dynamic to the global economy, providing a huge amount of labour, resources and, as they got wealthier, new middle-class consumers.

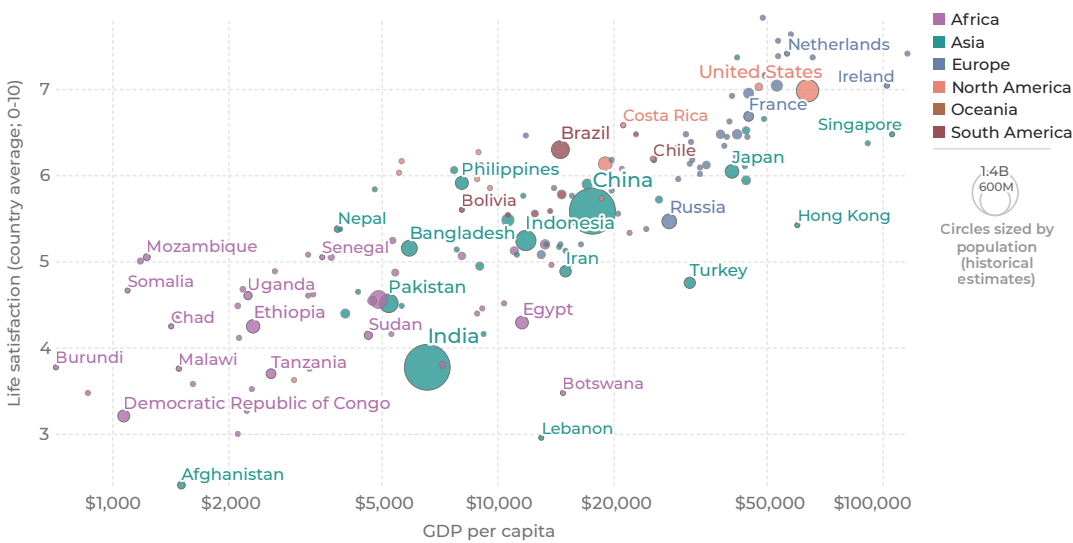
- The **Asian Tigers** provide perhaps the most remarkable story of all. In little more than a generation, they went from being poor countries to rich ones. When you think about their starting points, it is even more extraordinary. South Korea was ravaged by civil war. Taiwan was a refuge for the losing side in China's civil war. Singapore was a small island with virtually no natural resources that was cut off from Malaysia. At the core of their stories is the way that they comprehensively and systematically embraced the western system of productivity, which I described earlier, from establishing the rule of law through to the creation of high-quality mass education, the development of world class universities and support for large, highly capable modern corporations. They built on this powerful engine for productivity with very strong trade orientations, so that when global trade accelerated and international markets grew dramatically with the arrival of the BRICs, their economic growth accelerated remarkably.

Before we go any further, it is important to recognise that the story we see here is about a lot more than increases in income. It is about life improving for people – people being more satisfied with their lives, living longer, being better educated and improvements in the other qualities that make for a happier life. What is helpful, as we try to keep a focus on the big picture, is that life improving is associated with increasing income as we can see in the two charts that follow (see Chart 3 and Chart 4).

In the first of these charts, we compare GDP per capita with reported life satisfaction. I have chosen to look at 2018 because, while the picture is similar in 2022, it is affected by how well countries managed COVID, not just how life is going overall. You can see on this chart, with each dot representing a country, that there is a broadly diagonal line upwards. That shows that there is a connection between how wealthy a country is on average and how satisfied people are with their lives. It is not an exact correlation because you can see at any income level there are significant differences in satisfaction. Amongst those wealthy countries we can see that people in Finland are quite a lot more satisfied with life than those in the United States and both are a lot more satisfied than people in Hong Kong. Those differences are because income isn't everything, as we well know, and when it isn't fairly distributed, there will be plenty of people who don't even benefit from the higher incomes.

**Chart 3: Self-reported life satisfaction vs. GDP per capita, 2022**

Self-reported life satisfaction is measured on a scale ranging from 0-10, where 10 is the highest possible life satisfaction. GDP per capita is adjusted for inflation and differences in the cost of living between countries. Data source: World Happiness Report (2023); World Bank (2023) Note: GDP per capita is expressed in international \$<sup>1</sup> at 2017 prices. OurWorldInData.org/happiness-and-life-satisfaction



<sup>1</sup>International dollars: International dollars are a hypothetical currency that is used to make meaningful comparisons of monetary indicators of living standards. Figures expressed in international dollars are adjusted for inflation within countries over time, and for differences in the cost of living between countries. The goal of such adjustments is to provide a unit whose purchasing power is held fixed over time and across countries, such that one international dollar can buy the same quantity and quality of goods and services no matter where or when it is spent.

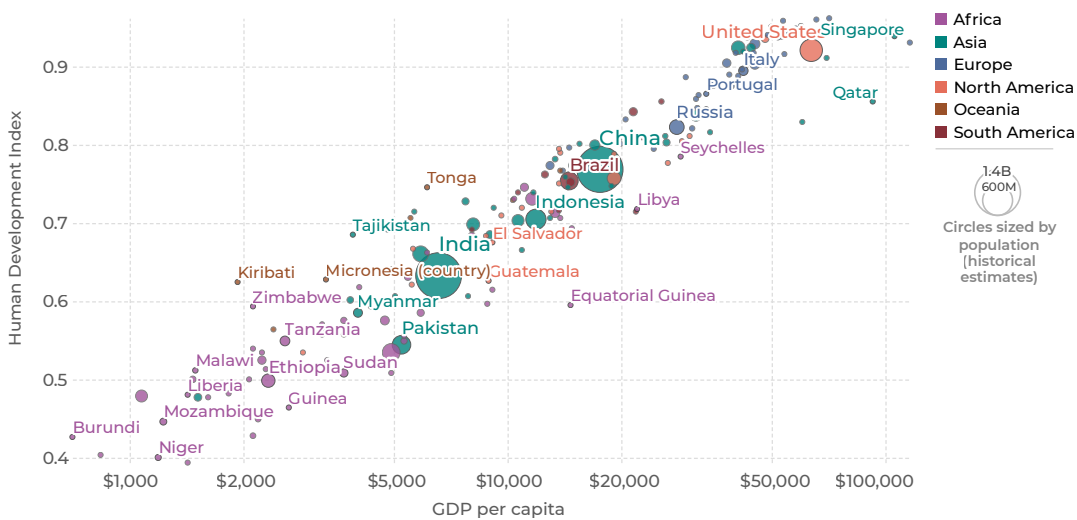
In Chart 4, we compare GDP per capita with how countries rate on the United Nations Human Development Index (HDI). This index combines measures of life expectancy, which is a good proxy for overall health, education, which it measures in terms of literacy rates and time at school, and income. To make for a better comparison, we have taken the income component out of the HDI, since we are already counting it on the other axis. Again, as with the life-satisfaction picture, there is a good correlation between GDP per capita and these other measures of human well-being. Of course, we can see some big differences. It is worth a look at the detail and to ask questions like why do Australia, Canada and Iceland do so particularly well? Why do the oil-rich Gulf States do so badly? As with life satisfaction, part of the answer is a good reminder about the dangers of averages. GDP per capita doesn't tell you how the income is distributed across the population. When it is very unequally distributed, as it is in some of those countries with lower HDI ratings on the same income as those with higher ratings, we find a small group can access the high-quality health care and education but the rest have far more limited access.

Later in this essay, we will explore the idea that rather than seeing human well-being and progress of human development as being correlated with economic development, we should shift to see them as the ideas we organise our world around rather than economic progress.

For now, let's have a look at how the big forces we introduced in the previous section created this remarkable picture of rapidly improving income, life satisfaction and human development.

**Chart 4: Human Development Index vs. GDP per capita, 2021**

The Human Development Index (HDI) is a summary measure of key dimensions of human development: a long and healthy life, a good education, and a decent standard of living. GDP per capita is adjusted for inflation and differences in the cost of living between countries.  
 Data source: UNDP, Human Development Report (2021-22). Data compiled from multiple sources by World Bank  
 Note: GDP per capita is expressed in international\$<sup>1</sup> at 2017 prices.



<sup>1</sup>International dollars: International dollars are a hypothetical currency that is used to make meaningful comparisons of monetary indicators of living standards. Figures expressed in international dollars are adjusted for inflation within countries over time, and for differences in the cost of living between countries. The goal of such adjustments is to provide a unit whose purchasing power is held fixed over time and across countries, such that one international dollar can buy the same quantity and quality of goods and services no matter where or when it is spent.

## Demographics: The baby boom and the evolution of gender roles

It may seem slightly paradoxical that people having more children and an increased proportion of women in the workforce together created a strong demographic tailwind.

The first of those forces was the postwar baby boom, which created an increasing working-age population. There isn't agreement about why it occurred. Explanations range from the growth of incomes post war that made it possible for couples to have children and the material possessions they wanted, through to an increase in the marriage rate in an age where that was socially important for having children. No doubt the reasons varied but that it occurred is very clear in the data.

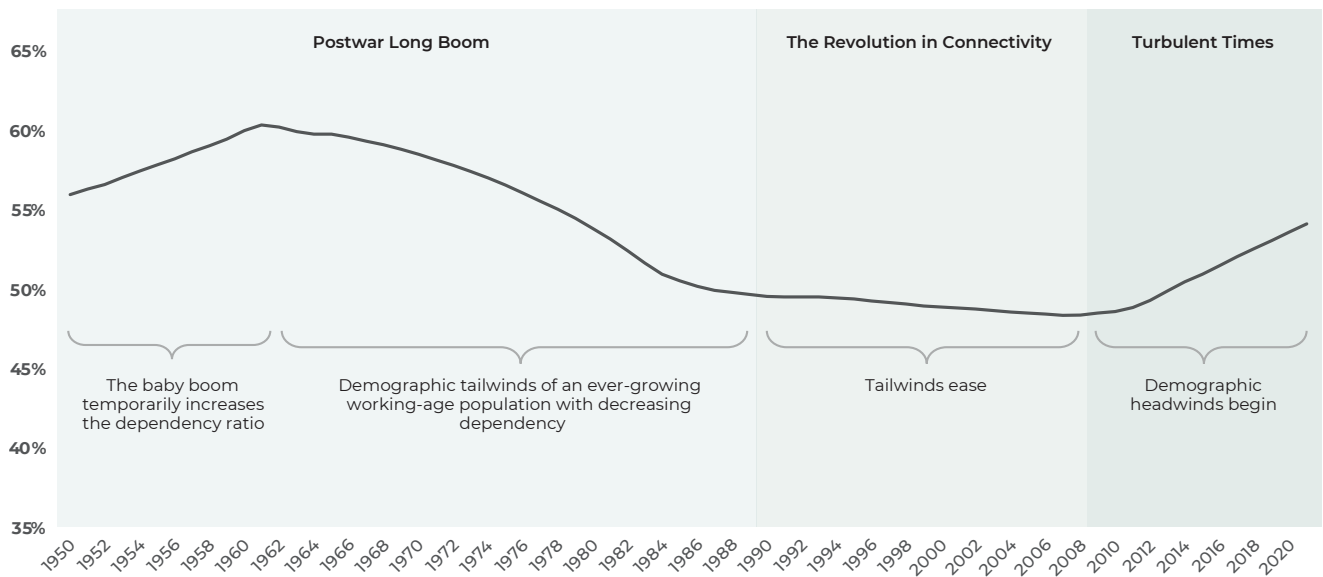
Have a look at Chart 5 below. Once again, on the horizontal axis we have years, which cover the period since the end of World War II. On the vertical axis we have what is called the 'age dependency ratio'. This is the ratio of people aged 15 - 64, which is considered the working-age population, compared to those outside of this age bracket, which is considered the dependent-age population.

Of course, this is a generalisation because some people are still dependent until they are much older than 15 and some earn incomes well beyond 65. Equally, there are too many places where child labour is still a problem. But overall, it provides a useful generalisation. I have chosen to depict the baby boom in this way because it goes directly to the economic significance of it, which is whether the working-age population is growing or shrinking. The graph shows the data for high-income countries, which is where this boom made such a difference.

You can see in the immediate postwar period the dependency ratio – the number of people who had to be provided for – increased because of all the babies who were born and needed to be cared for. Then, from the early 1960s onwards – 15 years after the end of the war – the first of those babies started to enter the workforce and the impact of the baby boom arrived.

**Chart 5: Age dependency ratio for high-income countries, 1950 to 2022**

Note: Age dependency ratio is the ratio of dependants (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





Every year after that, the working-age population grew and there were proportionately fewer people who needed care. From 1960 through to the early 1980s, this tailwind blew strongly in western economies and then it started to slow down, reflecting the decline in people having children in the developed world. Eventually, it flatlined and then coincidentally, about the time of the global financial crisis in 2008, it became negative.

While the social transformation of the baby boom was underway, an even more profound and enduring one was taking hold in most developed and rapidly developing countries, which was the increase in women's participation in the workforce. In a similar way to having a younger population, women joining the workforce increases the number of people producing economic output outside the home, for a given size of population.

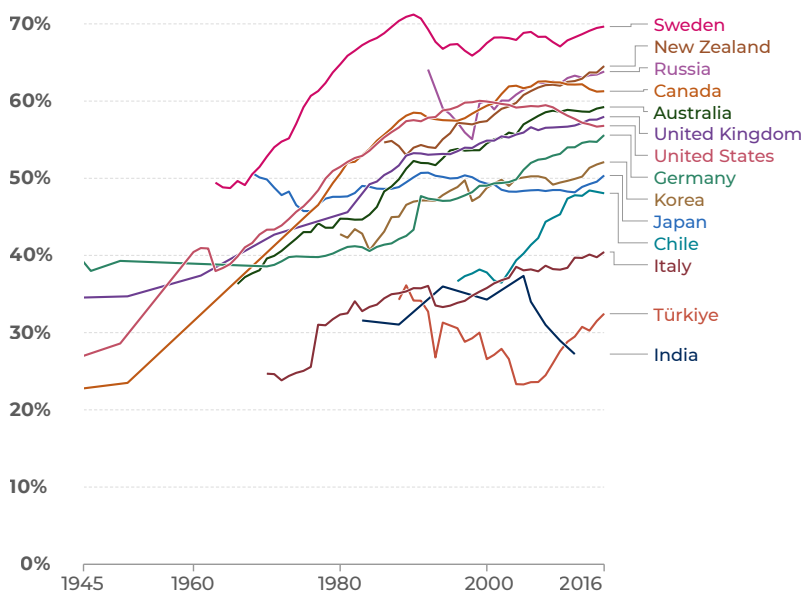
That is effectively a more productive population, at least measured as economists do, recognising that there are many other ways we could and should measure people's contributions to society and our economy.

In Chart 6 you can see that, for most countries through this period, women's participation increased 20 percentage points or even more. Some, like Italy, started from a very low base of only a quarter of women working and so they still have low numbers in absolute terms, but the fact it was increasing at a considerable rate drove relative improvement. At the top end of the scale, Sweden's participation rate started at just short of 50%, above where Italy's is today, but this has risen to nearly 70%. It is actually a slightly smaller increase than in Italy but off a much higher starting point. There are some countries that didn't follow this trend. In the world of developed economies, Japan stands out with participation rates starting at a higher level than many places at around 50% but essentially remaining stable around that number, which speaks to the stability of a range of Japanese social structures and customs. In some developing world countries, like Türkiye and India, it has even gone backwards. Nevertheless, in developed economies and many developing ones, this was a powerful economic tailwind.

**Chart 6: Female labour force participation rates**

Proportion of the female population aged 15 and over that is economically active.

Note: For some observations prior to 1960, the participation rate is taken with respect to the female population aged 14 and over. See sources for details.  
Data source: Our World In Data based on OECD (2017) and Long (1958) [OurWorldInData.org/female-labor-supply](http://OurWorldInData.org/female-labor-supply)



## Resource availability: An era of abundance

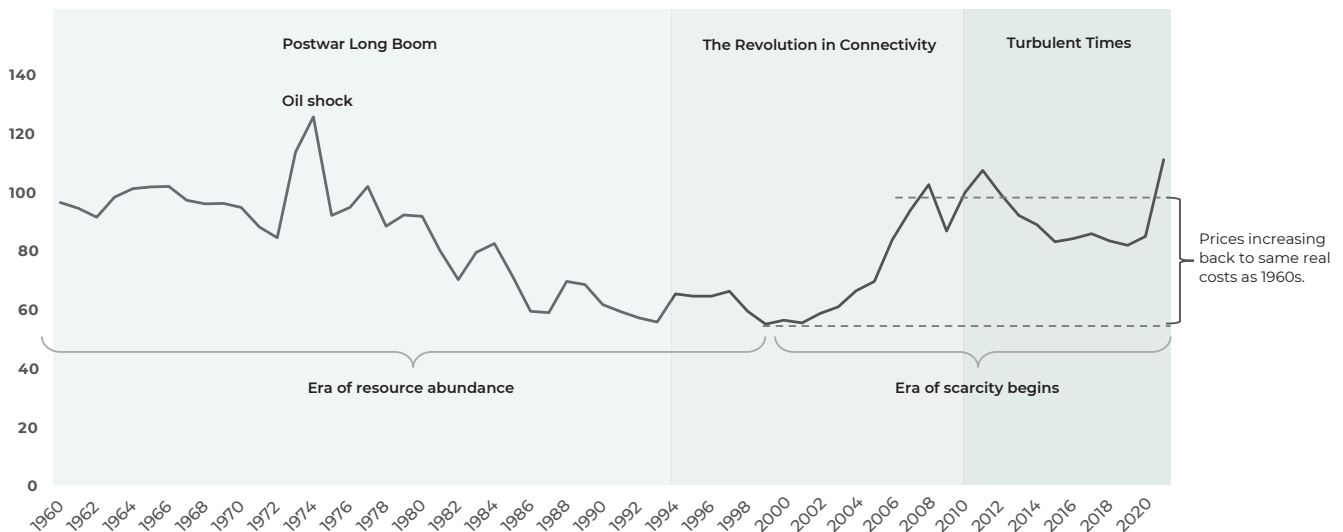
In the postwar period, not only was the working-age population growing but they had cheaper resources to turn into consumer products, from clothes and cars to household appliances. All these products were material expressions of rising living standards.

We can see this picture of cheaper resources in Chart 7, below. Again, we have years across the horizontal axis. The vertical axis measures the price of all non-energy commodities – everything from metals like iron ore and copper to foods like wheat and corn. Because we are looking at a whole bundle of different commodities, we are using an ‘index’ as a measure, which is a way of combining them together into a single number, in the same way that we track stock exchange prices using an index like the Dow Jones Index. The index also takes account of the fact that there is inflation over this period, so it only measures what the real changes are.

When you look at the graph, you can see the real change between 1960 and 1988 is a decrease in the cost of commodities by 45%. In other words, all those raw materials cost approximately half as much in real terms in 1988 as they did in 1960. There have clearly been ups and downs along the way, which reflect the rather cyclical nature of commodity markets, where prices rise as economies accelerate and they need more materials for all their increased activity and fall when activity slows down. What we are interested in is the long-term downward trend that we can see.

**Chart 7: 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.



This long-term trend is driven by factors like advances in exploration and extraction technologies, which have enabled more minerals to be discovered and extracted at lower costs. In the world of agriculture, selective breeding to improve crop productivity and the use of fertilisers and pesticides have all played a role. We will come to the sustainability issues with these practices later, but through this period as the global economy grew, these practices enabled the cost of production to fall faster than the growth in demand for all these commodities. That is a very strong tailwind in a world where these materials have provided the basic inputs for our economy and society.

How the world benefits from those falling costs has evolved. It is a feature of most developing economies that they shift from the use of those resources to produce goods to focus more on services. The production of goods, which tends to be labour intensive, moves to countries where the cost of labour is lower. We have certainly seen that around the world.

What that means is that the gains from lower resource costs often get captured in the first place in those developing countries, which may contribute to their own growth. Some of that benefit still flows through to the rest of the world, in the lower cost to produce all those products that get shipped.

If you look at this same graph, the other feature worth noticing is that around the year 2000 we can see that downward trend of falling resource costs goes into reverse. As with the demographics, the resources tailwind has turned to a headwind. I will explore what is behind that change in direction and what it means in the next section.

In parallel to the story of material resources is the availability of financial resources. This is the ability to access the investments needed to extract new resources or create new goods and services. There is both a volume and price part to this story and they are linked in important ways. The price of financial resources is their interest rate.



As the volume of financial resources that governments and banks have available to lend grows, then all things being equal it puts downward pressure on interest rates. Of course, 'all other things' are never actually 'equal'.

There are a range of other forces at work and we could write a separate essay on this story. For our purposes, we just need a very big picture view. A way to see that picture is to look at interest rates (the cost of borrowing money to invest) in the United States, which is the largest financial market in the world.

We see the long-term picture in Chart 8. The story it tells is that the cost of investment in the postwar period through to the early 1970s remained low. That is a story of financial resource abundance. Then in the 1970s, the cost of accessing money went up as the world had to deal with inflation driven by, amongst other forces, the resource scarcity of the oil shocks. However, as the Revolution in Connectivity emerged and with it a rapid growth in the total global stock of money looking for a home, the cost of borrowing once again fell.

**Chart 8: Federal Funds Rate - 62 Year Historical Chart**

Source: <https://www.macrotrends.net/2015/fed-funds-rate-historical-chart>





## Productivity: Sharing in the gains – the age of real wage increases

We have seen through the Tailwind Years, as the proportion of the working-age population grew, they used lower cost commodities and cheap capital to create new products. They also created more and more services of every kind, from entertainment and education to health care. As we will now see, they also became increasingly more efficient at creating what people valued.

To measure this productivity, we will look at how much people produce for each hour of their work. Since we are considering the economy, I will take the value of what gets produced each year in a country, which is measured as GDP, and divide it by the number of hours people worked.<sup>11</sup> So we can compare countries over time, the data we will look at is adjusted for inflation and the different cost of living in each country.

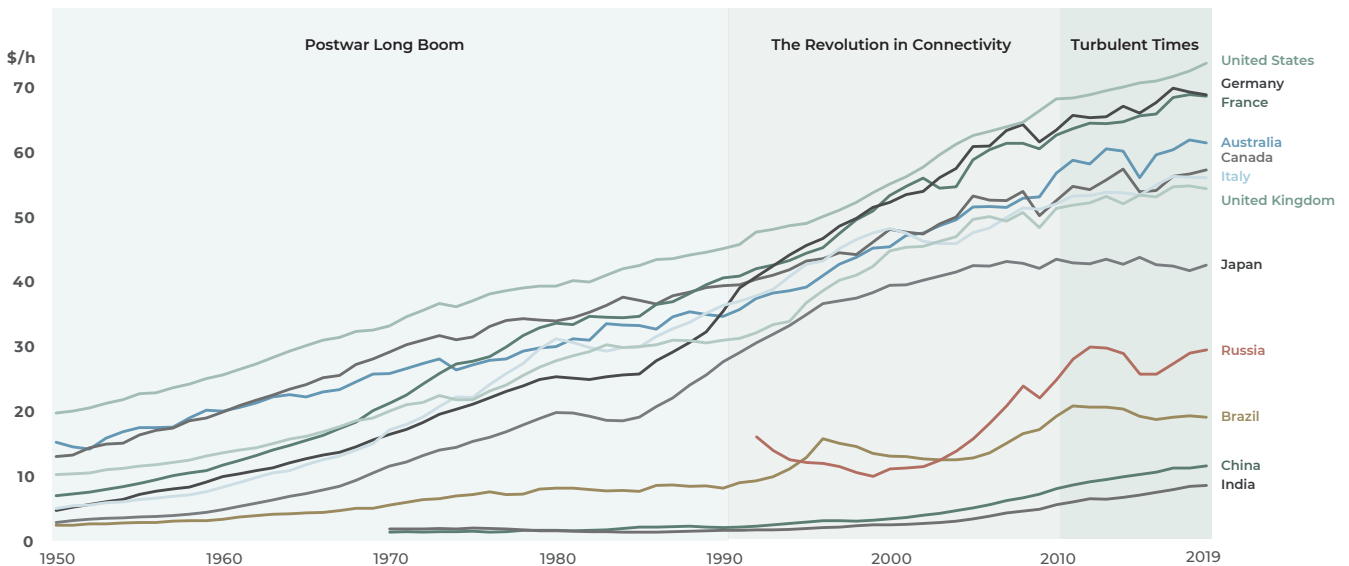
In Chart 9, you can see how much more value per hour people have been able to create over time – ie how much more productive they are. Consider the United States in 1950. An average person produced about \$20 worth of value per hour. By 2019, they produced over \$70 worth of value per hour. With a few percentage-points improvement in efficiency each year, which might not seem much at the time, over a 70-year period those small increases saw individual workers produce over three times more value per hour.

We can see on the graph that the picture of improving productivity has occurred around the world. Certainly, what has made a difference for the wealthy countries is that their improvements have been consistent for longer. However, everywhere the picture is that across a generation or two people create a lot of extra value per person.

Where does that extra value go? Some of it will be in the ability to produce more goods and services, from consumer goods to health care, from the same amount of resources, so more people can share in them. Other parts of that value will be in the ability to produce higher quality products. In terms of quality, think of the changes in cars in this period of time – they are dramatically safer in many ways, are much more fuel efficient for the same performance and they have many more features from great sound systems to reversing cameras.

**Chart 9: Productivity: output per hour worked**

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



What is important is that this extra value does get shared around. Some of it companies keep as profits, some of it governments tax, which enables them to provide more government services such as health care and education, defence and security, and some of it people keep themselves. It is that increased income which people keep that sees real standards of living improve. We can see this in Chart 10, below, which compares for the United Kingdom changes to GDP per hour worked with changes in household disposable income, which is a way to measure if people get better off. The data is adjusted for inflation, so it shows real changes. The picture is that over time, as people produce more per hour on average, their disposable income increases. You can see that, sometimes, disposable income declines and there are lots of causes for that, but over the long run it tracks well with productivity increases.

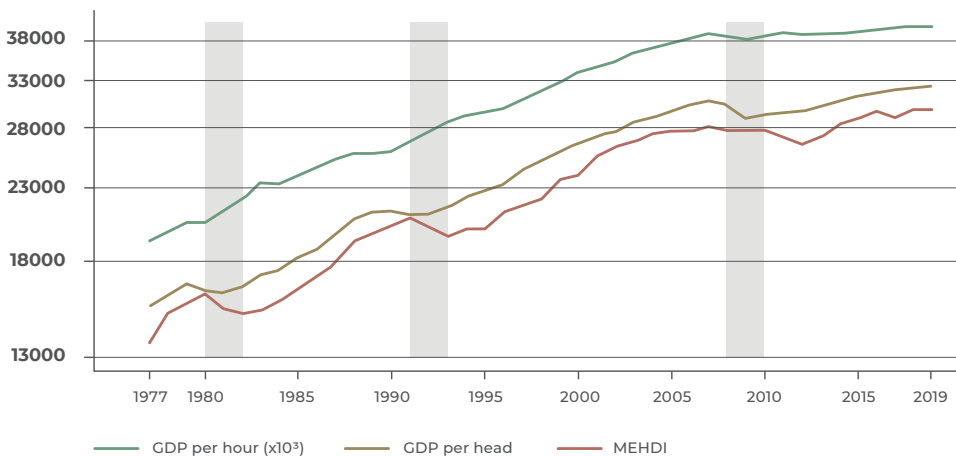
What all of this also tells us is that should the rate of productivity improvement decline, then with it the ability of people to be better off declines and the ability of governments to provide improved services also declines. If we take this long-run picture, we can see that we rarely notice gains over a single year, but we experience them over a generation. That means we might not notice or particularly care about a slowdown in productivity but then wake up 10 years later and wonder why life hasn't improved much at all.

It is important to remember as well that while the baby boom added to the population and provided a helpful tailwind, productivity increased much faster, so there was a significant overall improvement.

The final part of the story to which it is helpful to call attention is the role productivity played in driving the success of the Asian Tigers. It took them some time to put the western productivity system in place as they took steps to create confidence in the rule of law, improve school education, develop quality universities, increase investment in research and development, attract investment etc. Many of their efforts were remarkably successful. Consider Singapore, which created one of the highest performing school systems in the world and a university system that includes a university that ranks in the top 20 in the world. The result of those achievements was that from the mid-1960s onwards Singapore's productivity growth was extraordinary.

**Chart 10: Labour Productivity (GDP per Hour/Head worked) and Welfare (Median Equivalised Household Disposable Income), United Kingdom, 1977-2019**

Note: Shaded bars mark recession; MEHDI: real Median Equivalised HDI; pounds 2018 prices, log scale. Source: Oulton, N. (2022). The Productivity-Welfare Linkage: A Decomposition (No. ESCoE DP-2022-07). Economic Statistics Centre of Excellence (ESCoE).



## Connectivity: A world connected

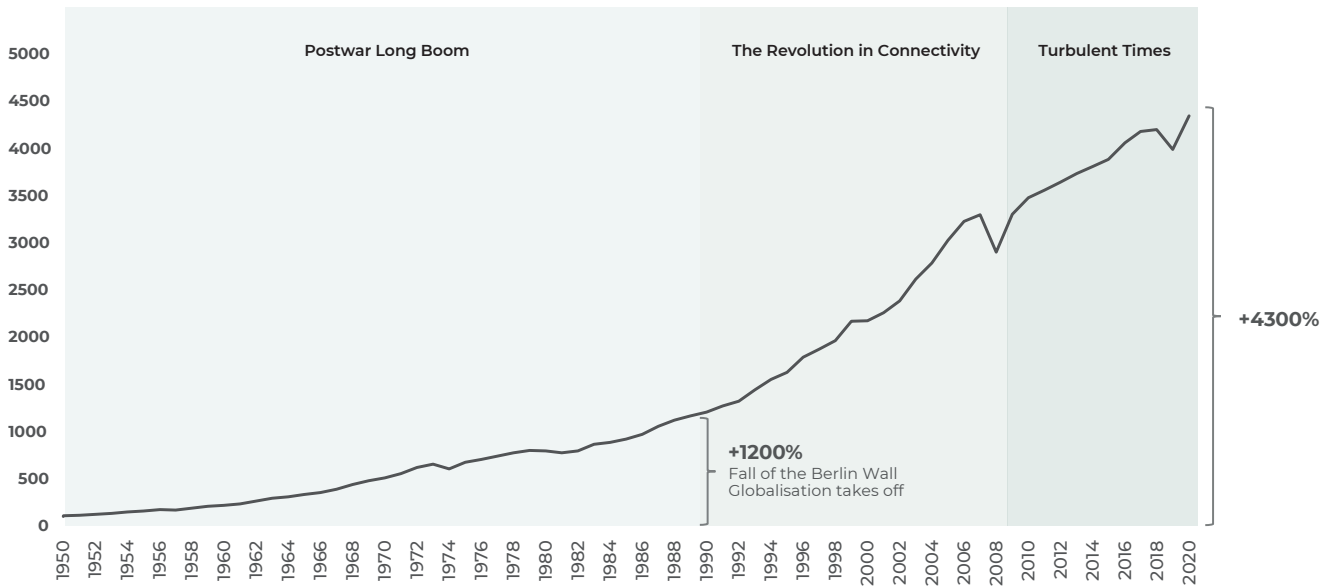
At the heart of global connectivity are container ports, airports, undersea communication cables and satellites. Since 1950, the activity through all four has grown enormously.

Let's start with ports and the trade that has flowed through them. Chart 11 shows just how much trade has increased since 1950. The graph measures how the volume of trade has changed over time. It uses an index, which starts in 1950. A focus on volume provides a picture of just how physically connected the world is. What those numbers describe is all the material from food and fuel to manufactured goods that flow from one place to another. When it comes to trade, as with many of the tailwinds, there were two periods.

During the postwar boom, between 1950 and 1989, trade volumes increased over that almost 40-year period by over 1,000%. When the Revolution in Connectivity arrived, world trade accelerated with a 3,000% increase in just 30 years.

**Chart 11: World trade volume, 1950-2020 (Volume index, 1950=100)**

Note: Volume index, 1950=100. Source: [https://www.wto.org/english/res\\_e/statist\\_e/trade\\_evolution\\_e/evolution\\_trade\\_wto\\_e.htm](https://www.wto.org/english/res_e/statist_e/trade_evolution_e/evolution_trade_wto_e.htm)



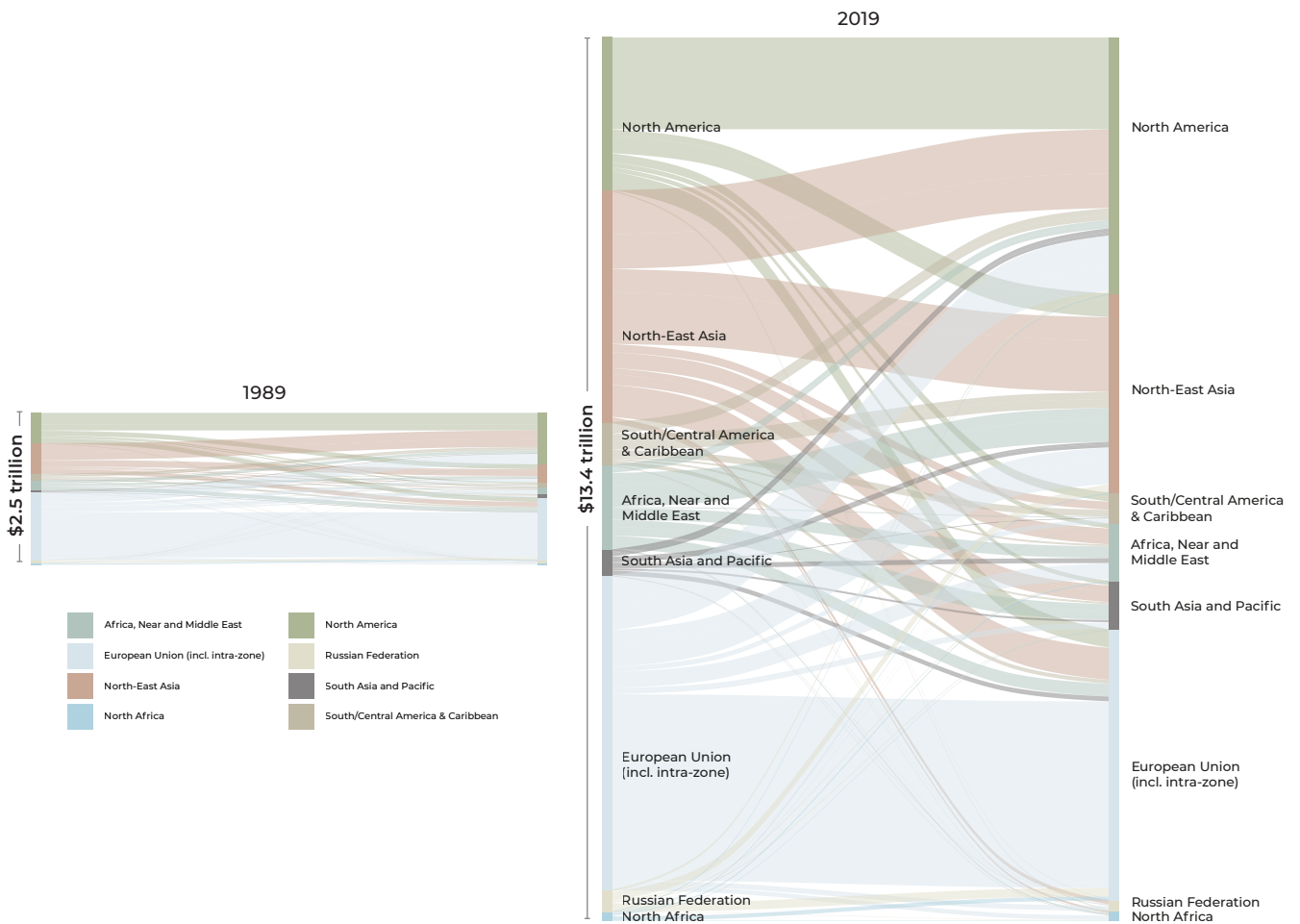


It can be hard to comprehend the sheer scale of that accelerated period, when there was a step change in the way the world was physically connected. Chart 12 provides a visual depiction of it. This time, we are looking at the value of what is traded. It has been adjusted for inflation so we can compare like with like, despite each picture being 30 years apart. On the left-hand side, you can see the total value and the locations where it went from and to in 1989. On the right-hand side, you can see the world in 2019.

There is enormous change in the total value of what is traded and you can see the massive growth in Europe, with the integration of the former communist states, the huge expansion in trade out of North Asia, which is China and places like Taiwan, South Korea, Japan and Vietnam, and, finally, the substantial growth in US exports.

**Chart 12: Total exports and left-to-right Trade Flows (1989 & 2019, Current US Dollars) for selected regions**

Note: Trade flows are depicted from left to right and amounts are in USD. Source: CEPII CHELEM – TRADE database; Selected Regions; TT - Total, million US dollars (CEPII/CHELEM-TRADE-GTAP/AFN.AFN.CAT\_TT)

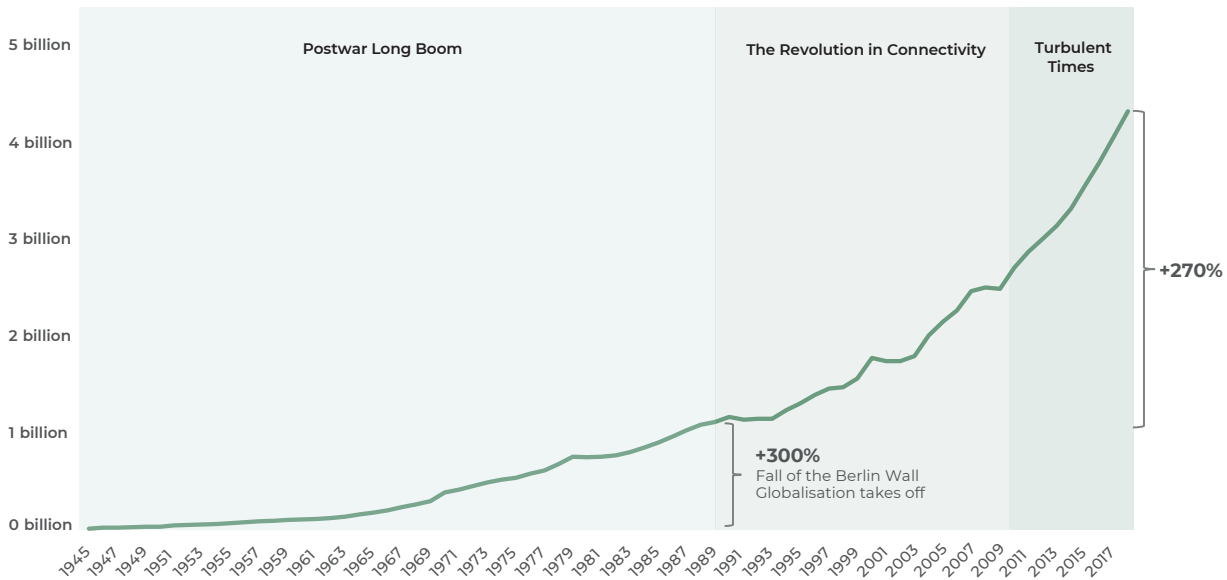


If we turn to airports, it has not just been a huge acceleration of the volume of goods moving: we have also seen a very large increase in people moving. One way to view that is air travel. Chart 13 shows the increase in air travel across this period.

As you can see in the Chart, it has been a story of constant growth. Another way to look at it is in 1950 there were 31 million passenger trips when the world's population was 2.5 billion people.

**Chart 13: Global number of airline passengers (1945 to 2018)**

Source: Number of air transport passengers carried, 1970 to 2020 (ourworldindata.org)

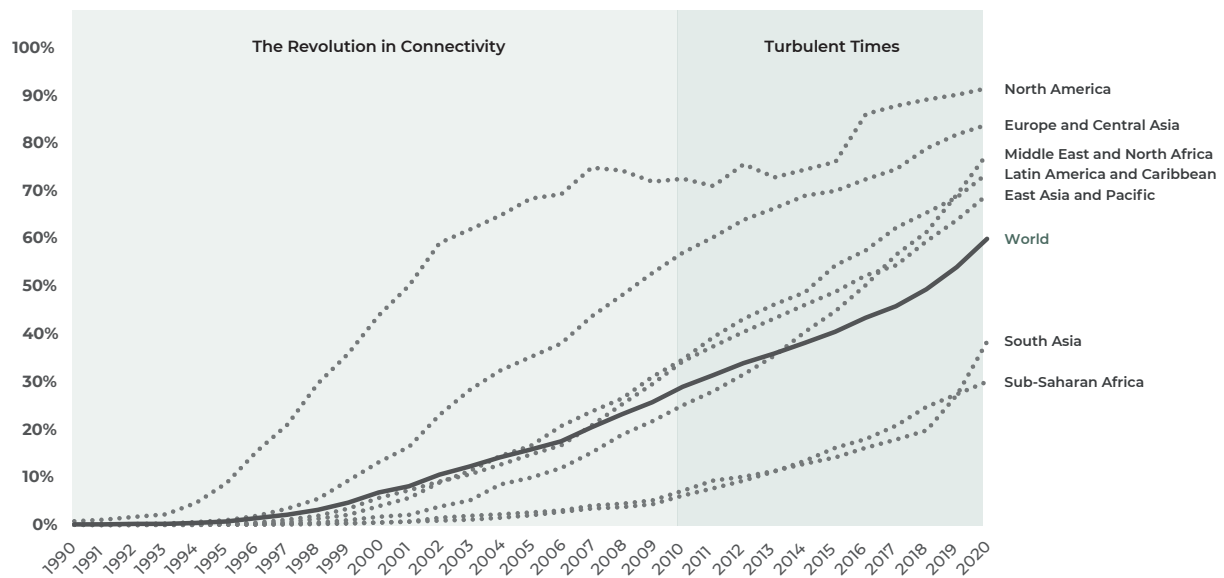


In other words, the equivalent of 1.4% of people made a trip. Whereas in 2019, there were 4.49 billion trips for a population of about 8 billion, which means the equivalent of 56% of people made a trip. Even if we allow for the fact that a lot of people make more than one trip, that is a dramatically more connected world.

Finally, to the internet and its use of all those undersea cables and satellites. We can see the extraordinarily rapid take-up in Chart 14 with now over 50% of the world plugged in, and in developed countries it is now more than 80%.

**Chart 14: Percentage of population using the internet (selected regions)**

Source: Internet - Our World in Data Share of the population using the Internet (ourworldindata.org)



It is not just that more people are linked, but the richness of those online connections has increased at an even greater rate as people engaged on more topics, more often and at greater length. We can see that in the increase in the actual internet traffic pulsing along those fibre optic cables.

What drove this global connectivity? When we introduced this question of connectivity, we talked about key barriers. What we saw in this postwar period is that they were all coming down.

The first and most significant of those barriers has been the reduction in tariffs and quotas. What drove this at a global scale was a series of multi-country agreements called the General Agreement on Tariffs and Trade, which started in 1947 and ended in 1994, with what was called the Uruguay Round. Over that time, the average tariff barriers for the wide range of major economies that participated fell from an average of 22% to 4%.<sup>12</sup> Very importantly, what also occurred was an ever-wider range of goods and services were covered by the agreements including, crucially, a great deal of agriculture in that last Uruguay Round.

Since then, the attempt to reduce global trade barriers has been the work of the World Trade Organisation. It has not been able to get similar large global agreements to reduce tariffs and other barriers, although there have been a wide range of regional and bilateral agreements.

From a long-term perspective, the regular reduction in trade barriers through this whole period provided a significant tailwind for economic activity, even though it has brought a range of

challenges. While there are certainly some further gains to be made, when the average level has been driven as low as it is now, it gets progressively harder to make these gains and easier for the process to be put into reverse.

The second big barrier to connectivity to come down has been cost. There is a general pattern that people trade far more with those close to them. You can see that in Chart 12, p33, which shows how much European trade is within European countries, and in North America nearly half the trade is between the United States, Canada and Mexico.

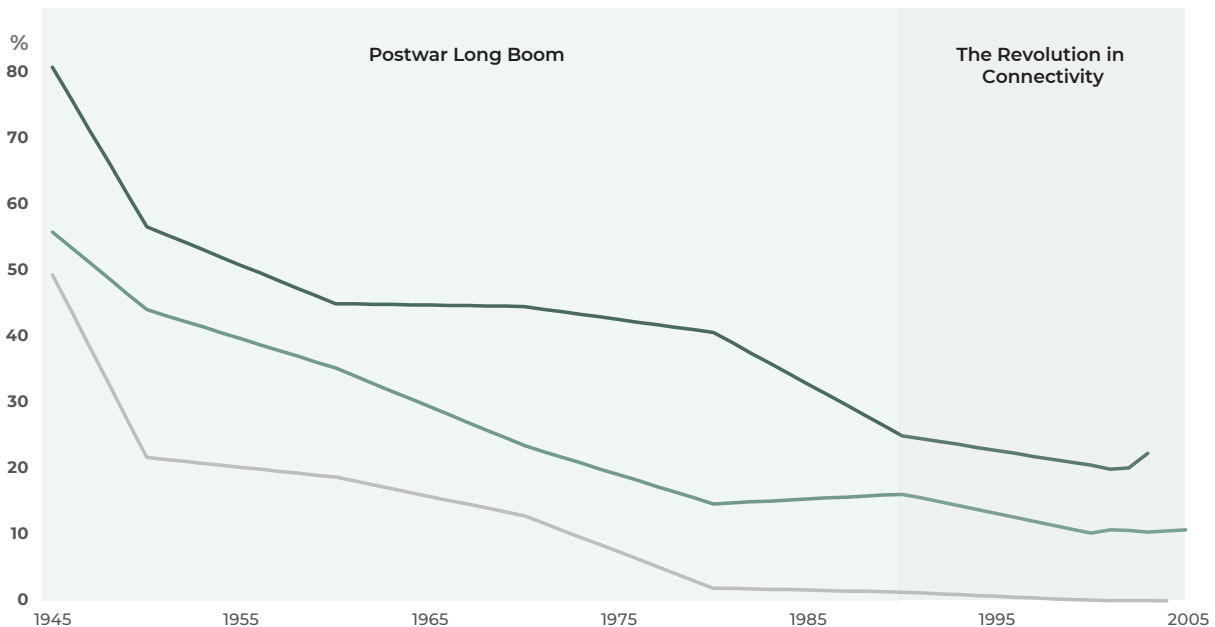
As costs, especially of long-distance trade, come down, the barriers to more distant connections also fall. The fall of these long-distance barriers was important to drive the breadth of globalisation.

In Chart 15, you can see how in the postwar world the costs of connectivity have come down dramatically for sea freight, air travel and phone calls. In each case, scale and innovation have been transformative. A few years ago, Marc Levinson in his book *The Box* provided a very compelling picture of the way those forces worked. He told the story of containerisation in the postwar world and how it dramatically simplified the task of moving goods around the world and as a result substantially lowered the costs.

It is an account about how standardisation reduced costs at every stage in the journey and enabled the processes to be scaled up, from the size of ports to the tonnage of ships.<sup>13</sup>

**Chart 15: The decline of transport and communication costs relative to 1930**

Source: Transaction Costs – OECD Economic Outlook (2007); The decline of transport and communication costs relative to 1930 (ourworldindata.org)



**Sea freight cost**  
(relative to 1930)

*Sea freight corresponds to average international freight charges per tonne.*

**Passenger air transport cost**  
(relative to 1930)

*Passenger air transport corresponds to average airline revenue per passenger mile until 2000 spliced to US import air passenger fares afterwards.*

**International calling costs**  
(relative to 1930)

*International calls correspond to cost of a three-minute call from New York to London.*



The third barrier that fell was geopolitics. In the postwar period, there were two tectonic geopolitical shifts that changed global connectivity. The first was the decision by China, in the late 1970s, to turn from its period of substantial isolation to open itself up to world trade and investment as part of liberalising its economy. That connectedness would become a great power to the world economy. The second was the collapse of the Soviet Union, which connected those former Soviet states to the whole world economy and enabled the rapid integration of Eastern European states into the European Union.

If we look at the fall in these barriers, what is remarkable is the way they occurred together. In the space of just a few years, we had the Uruguay Round trade agreements, the collapse of the Soviet

Union and the take-off of the internet. Together, they constituted the Revolution in Connectivity.

This revolution then further accelerated the adoption of the developed world's productivity system. It was both pull and push. As barriers to the flow of people and ideas fell, elements of that system were readily embraced in areas like education improvement and innovation. There was push as well. Countries who wanted to trade with the developed world found themselves required to adopt various features of their approach to productivity, from intellectual property and corporate laws, to western financing. The complex political forces which come from this sort of pressure are part of why globalisation became more contested as the years went on.

## The danger of being anchored when the wind changes

When we look at these four fundamental forces that drive economic progress, we can see that the postwar world was characterised by some very strong tailwinds.

The working-age population grew, resources became cheaper, productivity continued to improve and the world got a lot more connected. These forces persisted for long enough that, despite some up and downs, unprecedented economic progress was made. For most people over the age of 20, this is the only world they have known.

The danger in that situation is that people have a strong tendency, known as cognitive bias, to anchor on what they know, to assume that is the norm.

When the world changes, that can be very unhelpful and make us slow to see the change or realise that we are in a fundamentally different world.

We have already seen in the discussion of demographics and resources a glimpse that the world is changing. It is to those changes that we now turn.





## Section 3: The Headwind Years

Recent years have been turbulent with the pandemic, natural disasters, wars, populism and inflation. It can be hard to see what is going on behind all of that. Is it just events or is it something more fundamental changing?

I will argue that we have entered a new era, very different from that long period of postwar prosperity. Those tailwinds that gave a structural momentum to the progress we experienced have gone into reverse across the board. Where once we had tailwinds, we now have headwinds.

Just as those tailwinds positively reinforced each other, such as the way a younger working-age population is more productive, the headwinds also reinforce each other in challenging ways. I will explore the way the system of those forces has turned against us.



## Demographics: The world ages and women’s participation stalls

Let’s begin with population projections. We saw in the previous section that the global dependency ratio had started to rise again. Here is the danger of averages.

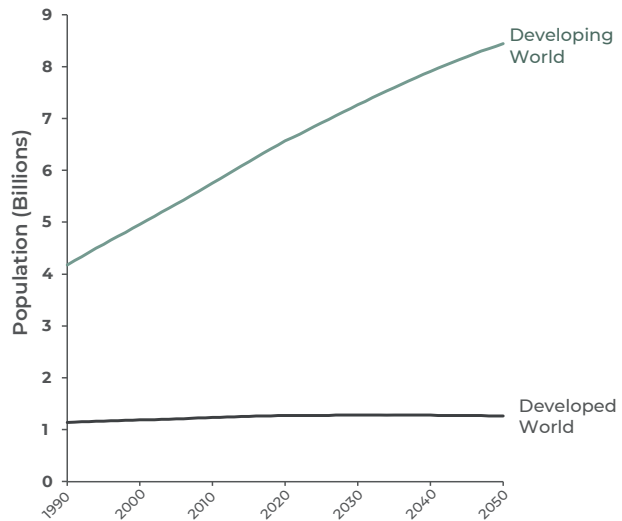
Behind that average are actually two very different trends. Both are problematic. We can see this in Chart 16 and Chart 17. On the left-hand side, we have the growth in population divided between the developed world and the developing world. You can see that they are on very different trajectories. The population in the developing world – that is places like Africa, India and South America – is projected to grow rapidly, whereas in much of the developed world, it stays essentially flat.

Even here, that average hides the fact that in some countries the population will actually shrink, while in a few it will continue to grow. The implications for these two parts of the world are very different.

Many parts of the developed world will face serious demographic headwinds and soon. We will start in Europe and take two of the most challenged countries, Italy and Germany.

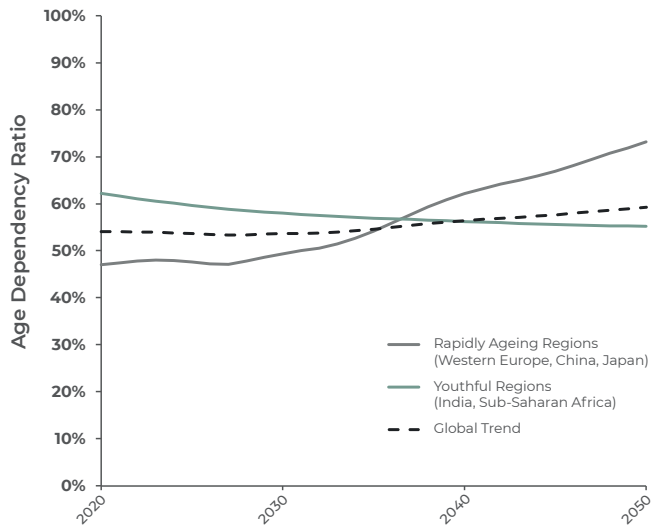
**Chart 16:** Population (1990-2050) estimates and projections for Selected Regions

Source: United Nations, Department of Economic and Social Affairs, Population Division (2022). World Population Prospects 2022, Online Edition.



**Chart 17:** Age Dependency Ratio (2020-2050) estimates and projections for Selected Regions

Note: Age dependency ratio is the ratio of dependants (people younger than 15 or older than 64) to the working-age population (ages 15-64). Source: United Nations, Department of Economic and Social Affairs, Population Division (2022). World Population Prospects 2022, Online Edition.





In Chart 18, we can see their population structure today and in 2050. The key number to look for is the age-dependency ratio in the circle.

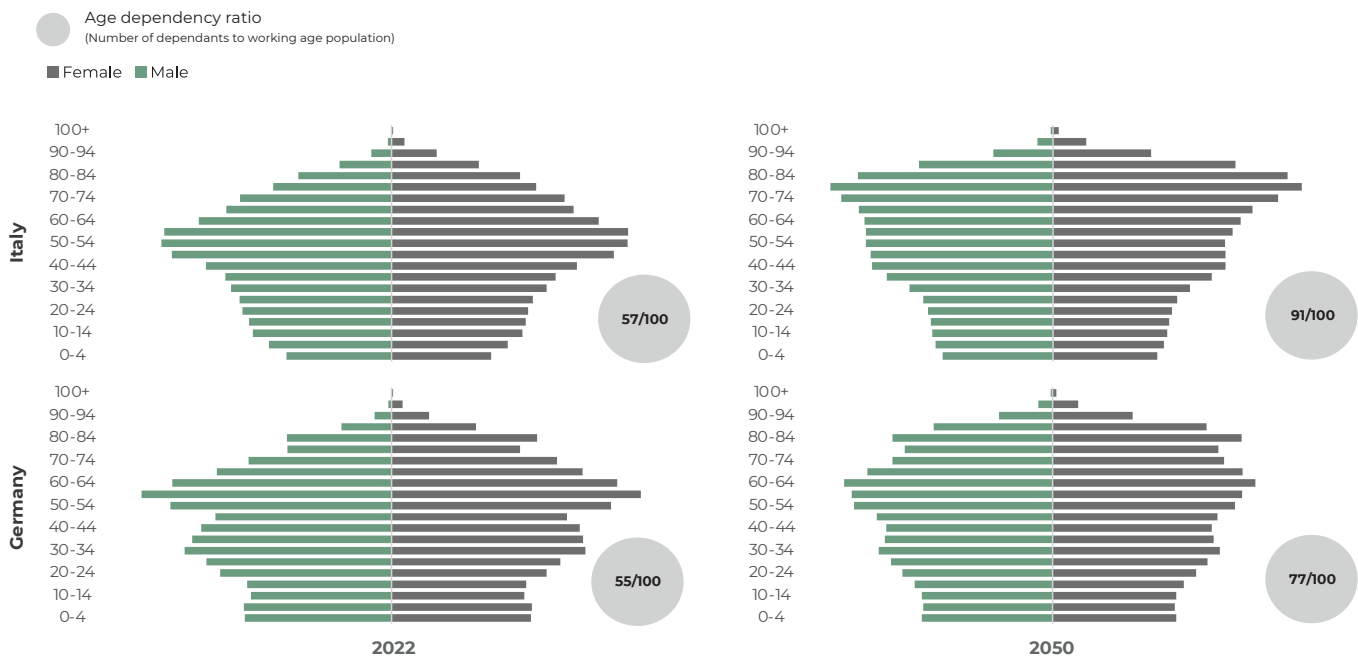
What is striking is in Italy and Germany today, for every 100 people you have working, there are about half that number who are dependent on them. By 2050, in Italy it is nearly one dependent person for every person who is working and in Germany for every 100 working, you have 77 dependent people. As you can see from the chart, most of these dependent people are old not young.

That picture presents a huge challenge. Even today, these countries struggle to make their budgets work so they can provide all the government services like health care, pensions

and aged care for people, without the need to just borrow more money. When people get older, their need for these services only increases. At the same time, there are fewer people to generate the income needed. Worse, as the population's average age increases, that puts downward pressure on productivity so the capacity of those in work to make the extra income needed to support the growth in demand for these services gets more and more limited.

**Chart 18: Demographic pyramids Italy and Germany (2022 vs 2050)**

Source: United Nations, Department of Economic and Social Affairs, Population Division (2022). World Population Prospects 2022, Online Edition.



The challenge is not just a European one. If we look across to East Asia, in Chart 19 we see the large and powerful economies of Japan and China are in similar circumstances. Japan's picture is even more challenging than Italy's. For China, the change from supporting 42 people per 100 workers to 67 per 100 will be considerable. Their population is set to shrink, so there will be fewer people to do the work needed.

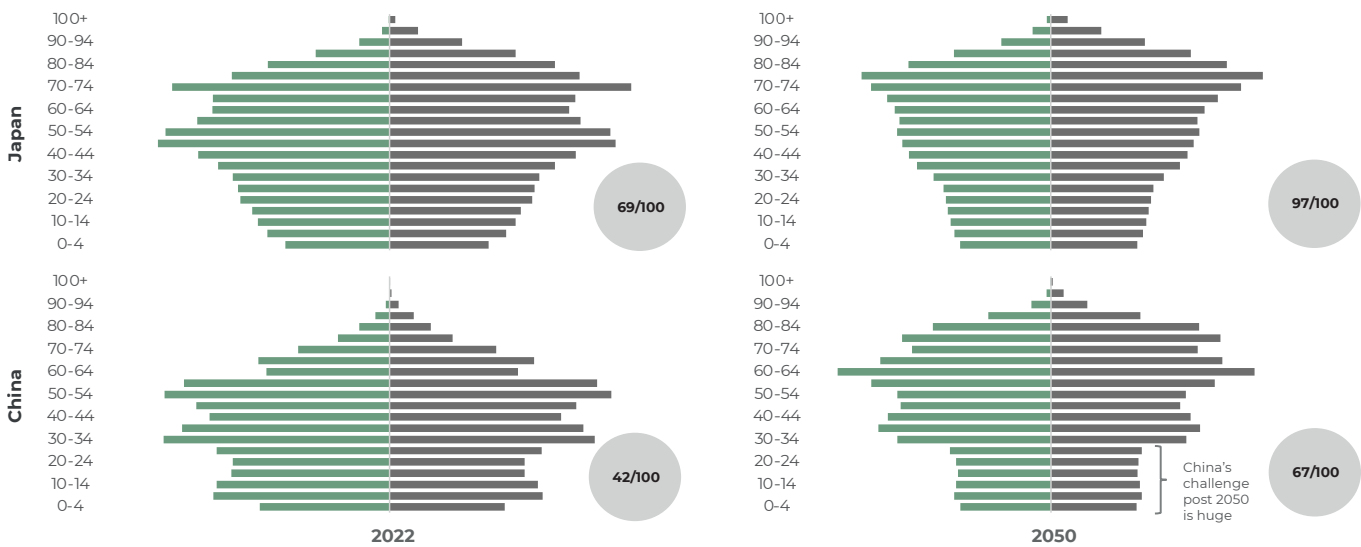
What will compound the challenge is that as China continues to grow wealthier, the expectation on the government for what will be provided for older people will continue to grow. If you look at the bottom of their population pyramid in 2050, it is very small. Unless a major change happens very soon, like a major baby boom in the next few years, their population dynamics in the second half of the century will be especially daunting for them.

**Chart 19: Demographic pyramids Japan and China (2022 vs 2050)**

Source: United Nations, Department of Economic and Social Affairs, Population Division (2022). World Population Prospects 2022, Online Edition.

● Age dependency ratio  
(Number of dependants to working age population)

■ Female ■ Male



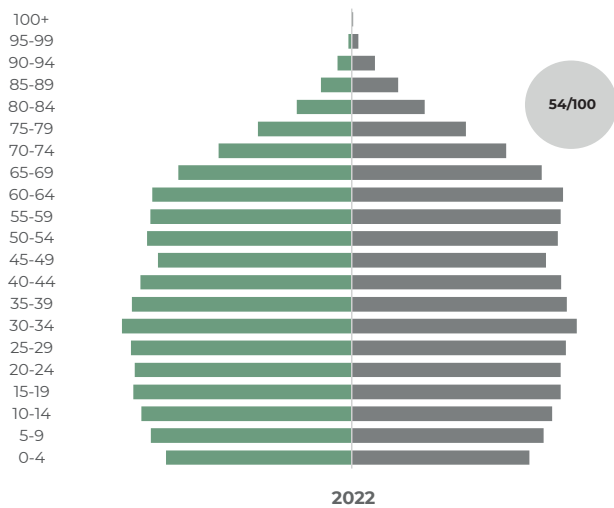
The picture is not uniform in the developed world and that is important to recognise because one of the countries that is less affected is the United States. You can see in Chart 20, that while its dependency ratio does increase, it is nothing like the increase we see in Europe and East Asia. You can see a nearly identical picture in Australia, Chart 21. The common factor in both places, and some others with happier pictures, is migration. While they have had natural population decline much like Europe, they have supplemented it over a long time with substantial migration.

While these countries still face demographic headwinds, the challenge is less existential than in parts of Europe and East Asia.

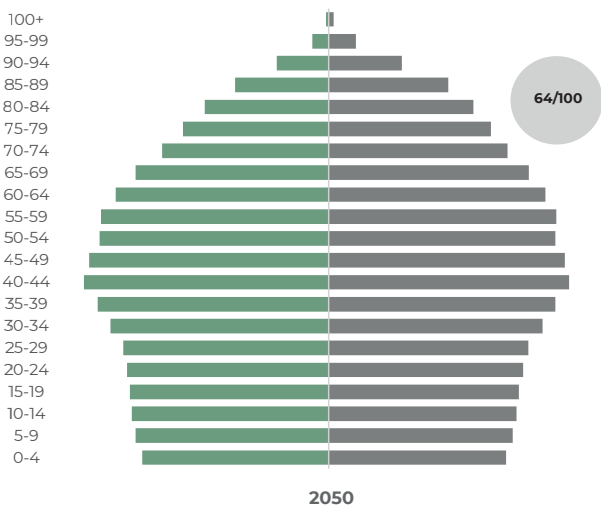
In the Tailwind Years we saw that reduced dependency ratios, that were driving economic growth, were complemented by rapidly increasing female participation rates. What is interesting and troubling is that since the late 1990s - early 2000s, the growth of those participation rates has stalled or even gone into reverse in many of the countries where they were once consistently rising. If you look back to the chart on participation rates in the previous section, you can see this effect in the way that after having a steep climb, many of the graphs flatten out. For whatever set of reasons this has occurred, what was once a tailwind has dropped away and, in some places, where women's participation rates are falling, it has become part of the demographic headwinds.

**Chart 20: Demographic pyramid United States (2022 vs 2050)**

Source: United Nations, Department of Economic and Social Affairs, Population Division (2022). World Population Prospects 2022, Online Edition.



Age dependency ratio (Number of dependants to working age population)  
 ■ Female ■ Male

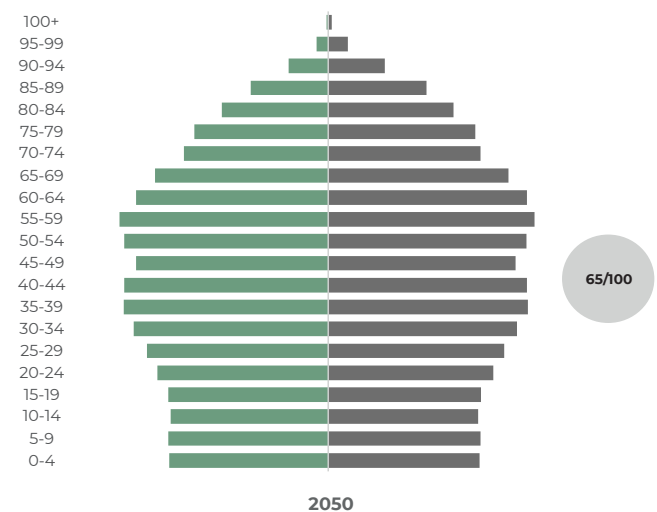


**Chart 21: Demographic pyramid Australia (2022 vs 2050)**

Source: United Nations, Department of Economic and Social Affairs, Population Division (2022). World Population Prospects 2022, Online Edition.



Age dependency ratio (Number of dependants to working age population)  
 ■ Female ■ Male





## Resources: The age of scarcity

One of the earliest headwinds to emerge was in the world of resources. If you look back to the chart on resources in the previous section, we can see that the trend in the cost of non-energy resources has been back up since about the year 2000.

With ups and downs, the general direction of those costs is heading towards the levels of the 1960s. There are both supply and demand elements driving this headwind.

On the supply side, it is getting harder to discover the next big deposits of minerals like copper or iron ore, which are important for the growing economies of the world. When they are found, they are often in places where it is harder and more costly to mine them.

On the demand side, as countries with bigger populations like China grow, their demand for these resources is proportionate to the size of their populations. In China, for example, as they improve the housing and transport infrastructure for hundreds of millions of people, it requires huge volumes of materials like steel. As these countries grow, the resource demand is massive, which will only further drive the scarcity problem. What is set to accelerate this scarcity problem beyond these normal forces of growing wealthier populations is the transition we need to make to a renewables economy.

Copper, which is at the centre of the energy transition, provides a very good illustration of these supply and demand challenges at work. Copper is used not just for a wider range of domestic and industrial uses that go with any growing economy, but it is in every electric generator such as those you find on wind turbines, every electric motor, every power transmission line and countless other uses of electricity.

On the supply side, copper is becoming harder and more costly to find. Chart 22 highlights the issue. From the early 2000s you can see the exploration budgets rising significantly and yet from 2009 onwards, the rate of discovery has dwindled to a relative trickle. Making matters more complex, much of that supply comes from unstable countries like Peru, the Congo and even Chile these days, and ones caught up in the world of strategic competition like China. Disruption in these places will only further spike up prices.

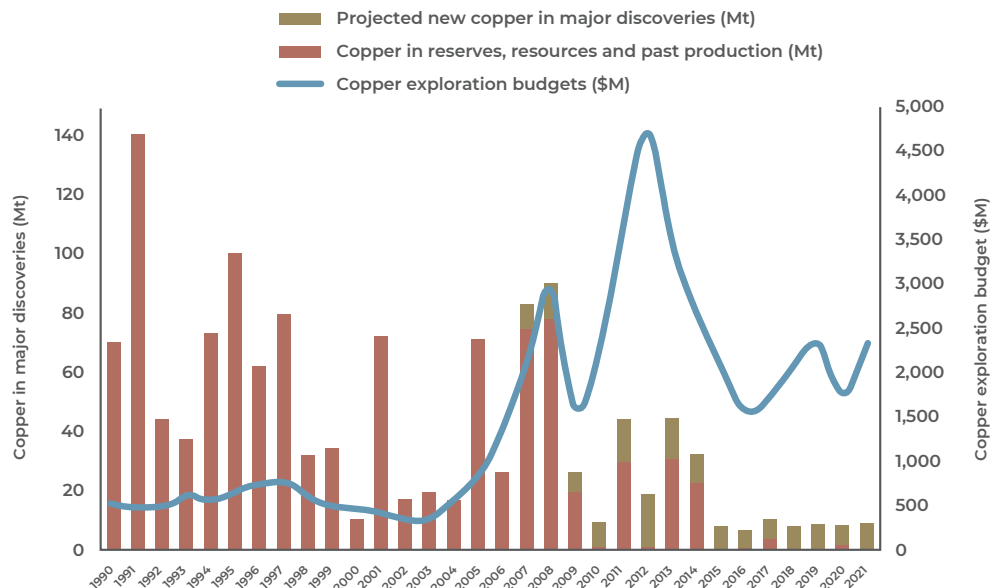
At the same time, with the energy transition starting to take off, demand is rapidly rising. Market analysts forecast that during the 2020s there will be a 600% increase in the demand for copper with nothing like that increase in its supply.<sup>14</sup>

The challenge is not just with material resources. In the discussion of the Tailwind Years, we saw that financial resources had become progressively cheaper. Recently, the increase in material and resource scarcity and the breakdown in connectivity caused by global disruptions from the pandemic, tensions between the United States and China and the war in Ukraine have contributed to rising inflation. That in turn has created new headwinds to access financial resources as central banks raise interest rates. Shortly, I will argue that our current model is much less stable than it used to be and that global shocks caused by strategic competition, natural disasters and global disruptions like pandemics will be ever more common. That has implications for financial resources, not only because it will cause inflation to spike but because increasingly the losses associated with these disruptions are being priced into the cost of financial instruments like insurance.

It is not just these disruptions that will put upward pressure on the cost of financial resources – there are structural forces at work as well. Chief amongst them is the rapid increase in government debt as a percentage of GDP. When governments borrow, they are competing for capital with private investors. Therefore, if the pool of capital isn't expanding faster than governments are increasing their debt, there is upward pressure on interest rates, which is the price of money. Just like anything else, when rate demand is growing faster than the rate of supply, we can expect prices to rise. With the large government borrowings during the pandemic, government debt in advanced economies, which had been growing anyway, is, as The Economist reports, at higher levels than any time since the Napoleonic wars.<sup>15</sup> That will take some time to reverse.

**Chart 22: Discovery drought continues**

Notes: Data as of May 10, 2022. Annual average London Metal Exchange Copper Grade A cash price. Source: <https://www.spglobal.com/marketintelligence/en/news-insights/research/copper-discoveries-declining-trend-continues>



## Productivity: The era of standing still

If you look carefully at the productivity chart considered earlier with its consistently upward trend, you will notice that for a range of countries, as we headed towards 2020, that line starts to flatten off.

Let's zero in on the end of the Tailwind Years. Chart 23 looks at that later stage from about the global financial crisis to just before the pandemic. It is a period that organisations like the World Bank, who track global growth, have looked at closely. What we can see in this chart is that in all the different parts of the world, productivity growth is slowing very significantly. In the developed world, it has dropped substantially from around the 3% range to the 1% range. Even in the developing world it has slowed substantially.

While there is still some productivity growth, it was those high rates of growth that enabled people to see substantial improvements in the quality of life over a decade and in their lifetimes. It was the rapid growth in income that resulted which enabled governments to expand their services. Now that progress in productivity has slowed substantially, there will be a slower growth in income. This comes at just the time when many governments will face the rising costs of an ageing population, the increased expenditure needed to deal with a less geopolitically secure world and the rising costs of natural disasters from wildfires to floods.

The analysis by the World Bank about why this has happened points to three big forces.<sup>16</sup>

The first is the ageing population in the developed world and in places like China. We have identified this issue before and it is where the headwinds reinforce each other.

The second is the simplification of economies. I observed earlier that one of the effects of comparative advantage was that countries specialise in what they are good at. We also observed earlier that, as countries develop, they tend to focus more on services, as manufacturing moves to places with lower cost labour.

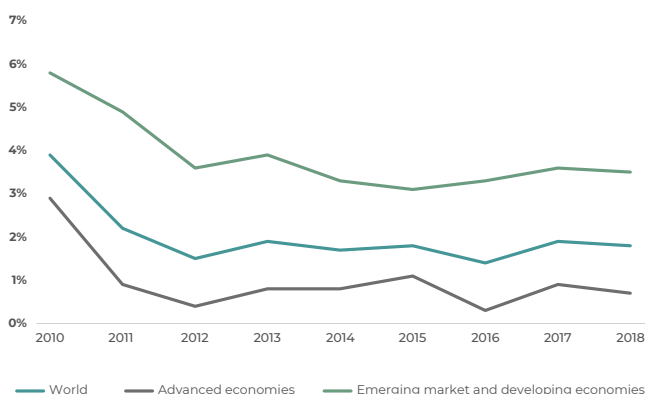
The simplification of an economy that comes with this specialisation and loss of manufacturing has a negative impact on productivity. The very nature of manufacturing with its heavy use of materials and energy seems to drive the quest for efficiency and creates opportunities for it in a way that providing services doesn't. Similarly, more complex economies seem to have more opportunities to find ways to be more efficient. Once those efficiencies are captured and the economy is made simpler, the next gains are harder to find. We have progressed so far down the road of connecting the world that we have started to see the negative side effects of trade restructuring the global economy.

Finally, the World Bank identifies that the decline in the rate of educational improvement is a drag on productivity. The more educated and skilled people are, the more value they can traditionally add to any process. As countries struggle to achieve higher levels of tertiary education, or the gains in school education slow, the opportunities for productivity gains also slow.

When we look at all three of these forces, certainly the first two are locked in for some time to come. We have seen the demographic issues will be there well beyond 2050 and even if we were to start 'reshoring' (ie bringing manufacturing and other activities from where they have moved to overseas back to their home countries) it will be a long time before we make our economies more complex with more manufacturing again. Of course, as that reshoring occurs, while it will undo some of the negative consequences of globalised trade, which we have seen, we will lose the productivity gains it has helped achieve and the benefits it can bring to developing countries. Effectively, we have created a world where, at least around these forces, headwinds are inescapable.

**Chart 23: Productivity growth**  
(Global vs. advanced and developing economies)

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



## Connectivity: From cooperation to strategic competition

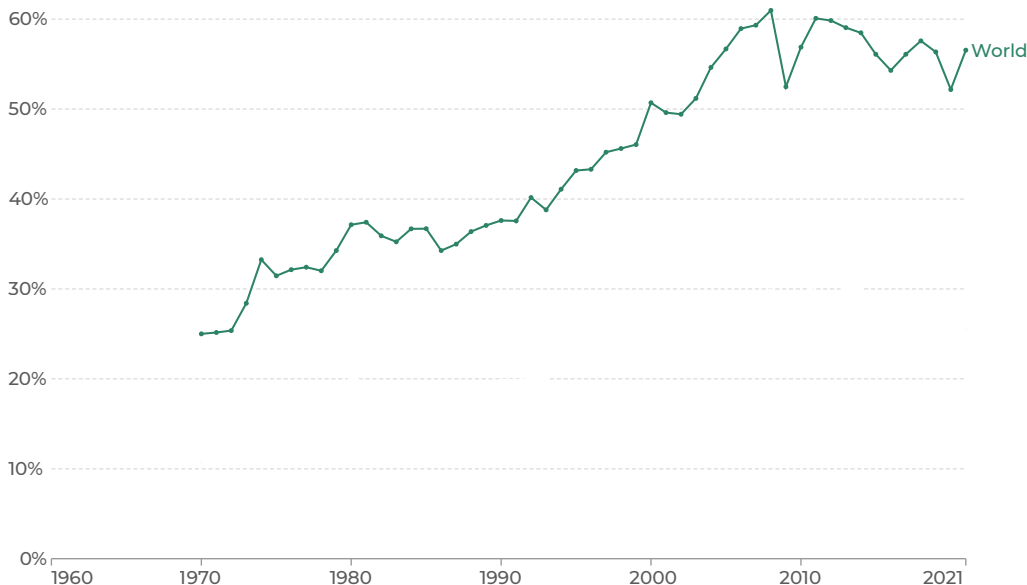
The question of what has happened to connectivity is a little more complex and will involve a bit more unpacking than the other reversals of the tailwinds.

We will see this reversal has a range of consequences, from creating further headwinds for productivity to reducing the gains we can make from trade, through to increasing inequality and reducing the capacity for international cooperation on critical issues like sustainability and global public health.

While the world remains very connected, the direction of travel has changed and global connectivity is weakening rather than strengthening. We can see that clearly in the world's trade numbers. Chart 24 shows trade as a percentage of GDP. You can see in this chart that at about the time of the global financial crisis, globalisation peaked for the world and started to go into decline.

**Chart 24:** Trade as a share of GDP, 1960 to 2021

Sum of exports and imports of goods and services, divided by gross domestic product, expressed as a percentage. This is also known as the "trade openness index".  
Data source: World Bank and OECD OurWorldInData.org/trade-and-globalization



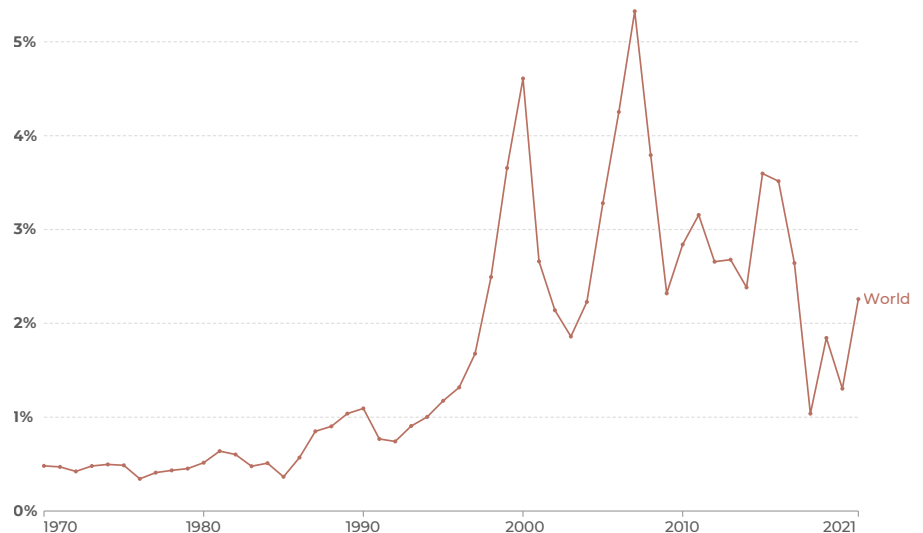
You can also see the flow of financial resources with the decline in direct foreign investment in Chart 25. Again, we can see the global financial crisis as the turning point.

This turning point marks the change from a broadly stated aspiration for global collaboration, even if at times the reality was very different to that, to an era of openly declared strategic competition.

**Chart 25: Foreign direct investment, net inflows as share of GDP, 1970 to 2021. Net inflows of foreign direct investment\* from foreign investors to the reporting economy.**

Data source: Data compiled from multiple sources by World Bank. OurWorldInData.org/trade-and-globalization

\*Foreign direct investment: A financial transaction to acquire a lasting management interest (10% or more of voting stock) in an enterprise operating in an economy other than that of the investor. It includes equity capital, reinvestment of earnings, and other long-term capital.



None of the changes are easily addressed, so we have no reason to think that the pressure to reduce collaboration around the globe will end or even ease anytime soon. Rather, what we see is the competition play out in six key spheres, being:

- Geographic influence;
- Model of government and the international order;
- Access to resources;
- Technology and technology standards; Civil order; and
- Trade.

In each of these spheres of competition, the connections that helped build the postwar world are being undermined. Some of these forces existed during the Cold War but they were far less consequential because there was so little integration between the countries in the different opposing blocs and those on the communist side were far less wealthy than they are today.

In this era of strategic competition, it is not just that there is pressure on connectivity, but also a much greater risk of sizeable disruptions. What is so different today is that with a vastly more integrated world, strategically driven disruptions risk being far more frequent and consequential. The dramatic spike in world food and energy prices that were caused by Russia's war on the Ukraine provides a good illustration of how this type of disruption will play out.

## Geographic influence

The first of those spheres is strategic competition for geographic influence. There is substantial activity, especially by authoritarian regimes, to create classic spheres of geographic influence in their regions. Some of that activity has been through normal diplomatic and economic pressures, and some through grey-zone activities, which are hostile activities that fall short of actual armed conflict.

What led to that shift is a whole story in itself. It would have sections on the internal and external dynamics that involve Russia in the years that followed the collapse of the Soviet Union, the rise of China, the West's response to 9/11 and the issues that globalisation has caused in developed and developing economies.

In East Asia, the strategy of choice has mostly been grey-zone activity. China particularly has engaged in a wide range of aggressive activities to assert its claims and increase its power in the South China Sea and to signal that it desires to expand its control even further to what is called the 'nine dash line'. On its land frontiers with India, it has also been ever more assertive.

In the Middle East, Iran has been busy contesting with Sunni nations for control in the region through its terrorist organisation proxies. In Europe and parts of the Middle East, Russia has used both grey-zone activities and also outright armed force to seize territory for itself, as it has done in the Ukraine, or to assist others in their conflicts, as it has done in Syria.

Authoritarian regimes in these places have come up against western capabilities used to support local forces, as they have in Syria and Iraq, or through military aid in the Ukraine and East Asia. In a variety of overt and covert ways, western forces have contested these spheres of influence.

This sort of competition for spheres of influence weakens and breaks bonds between countries. As we have seen with Russia's war on the Ukraine, it can significantly disrupt international trade. That can have a direct impact on economic development, but as we will see in the next section, it can contribute to global inequality as well because less-developed countries have fewer resources to respond to major economic or supply shocks. We saw, for example, a significant impact on poorer communities around the world when war in the Ukraine led to a serious spike in food prices.

The threat of this sort of impact is vastly greater today than it was in the postwar world, in the period up to the Revolution in Connectivity, because the amount of trade with the Soviet Union or China was then very small. In the era we are in today, competition for geographic influence is much more consequential.



## Models of government and the international order

Competition extends well beyond the geographic. There is now clear competition for what the model of government should be around the world – authoritarian versus democratic – and for the international order that the world should be organised around: a rules-based order versus various hegemonic alternatives.

As that competition weakens a rules-based international order, this has real consequences for the way the world is connected because long-term international collaboration has been built on that order in the postwar world. We have seen the readiness of countries to engage in trade sanctions, as China did towards Australia, in pursuit of their strategic agenda, which make a mockery of trade rules in the process.

Equally, as the international order weakens, it undermines not just the world's ability to collaborate on economic and social matters but also to tackle climate change, protect biodiversity and deal with global health and other challenges of the global commons.

## Access to resources

One of the consequences of the growth in resource scarcity in a world with heightened geopolitical strategic competition is that access to resources becomes another contested frontier. We have seen this play out everywhere, from the quest for minerals in Africa to the competition for fish on the high seas. It is a contest fought with non-economic deals and wasteful subsidies, and none of it is conducive to resources being used productively or sustainably. In too many places it comes with the added harm that local or even global governance is undermined.

## Technology and technology standards

The last frontier of competition is for the technology standards and technologies that provide a competitive edge. One of the most visible forms of this competition was the rollout of 5G infrastructure. The Chinese company Huawei was the lowest cost global provider who looked like they would dominate the global market. That was until, for security reasons, the countries of the Five Eyes intelligence alliance (US, UK, Australia, Canada and New Zealand) banned the use of its products. This effectively required telecommunications companies in those countries to use products from the western country companies of Ericsson and Nokia. While that is understandable from a security perspective, it comes at the price of productivity because western countries are paying more for 5G infrastructure.

Competition is also fierce for those technologies that will drive the economy of the future, like artificial intelligence, semiconductors, the internet of things, biotechnology, the communication technologies beyond 5G and any technologies associated with the transformation to renewable energy, from generation to storage. A growing feature of this competition is that leading-edge technologies are not being shared with strategic competitors. Again, this is understandable when viewed through a strategic lens, but limiting the diffusion of new technologies will constrain the global opportunities to lift productivity.

We see that competition play out in many ways and at times be shaped by other spheres of competition, such as the construction of semiconductor plants in the United States to reduce the risk of global supply being disrupted by Chinese hostility towards Taiwan as it seeks to grow its sphere of geographic control. The trouble is that when western countries decide to build their own factories, like chip manufacturing plants, in what are higher cost locations, the result is more expensive technology than would otherwise be the case and a further headwind for productivity.

## The breakdown of civil order: Civil conflict, extremism and organised crime

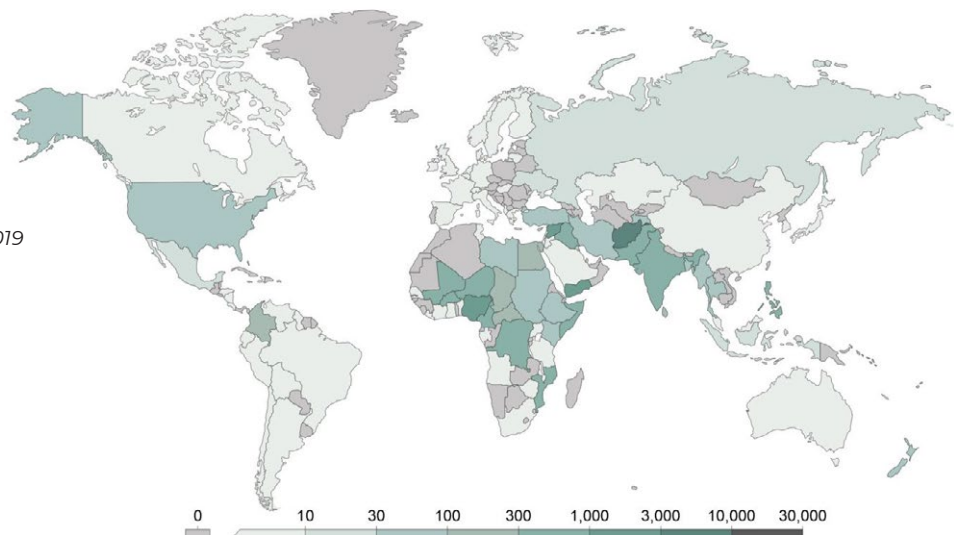
Competition between nation states is not the only force to weaken global connectivity. There are two other forces that should be on our radar.

The first is civil conflict. Around the world there are regions where governments are caught up in civil conflict or civil wars. They range from Nigeria, where centrifugal forces in multiple parts of the country threaten to tear it apart; to Ethiopia and the Central African Republic, where long-term tribal conflict plays out in civil war; to Myanmar, where its generals wage war on a large section of the population. Each of these conflicts weakens those countries' connections with global systems, risks drawing others in, and provides an easier home for other troubles to emerge and grow, from diseases like Ebola to Islamic extremism.

Islamic extremism is a force in its own right and one with which we still need to reckon. The West's attempts to disrupt terrorist organisations have successfully minimised the number of serious attacks. However, at the same time, those organisations have splintered and spread and found an even wider range of places to operate in and out of. If you look at Chart 26, which shows deaths caused by terrorism, you can see how globally active these networks still are and how they have come to be powerful forces right across large swathes of territory in Africa, where they benefit from and contribute to civil conflict.

**Chart 26: Deaths from terrorism, 2019**

Source: Global Terrorism Database (2021)



Unfortunately, we now also have to contend with homegrown right-wing extremism. In some countries, it poses just as great a threat to life as Islamic extremism.

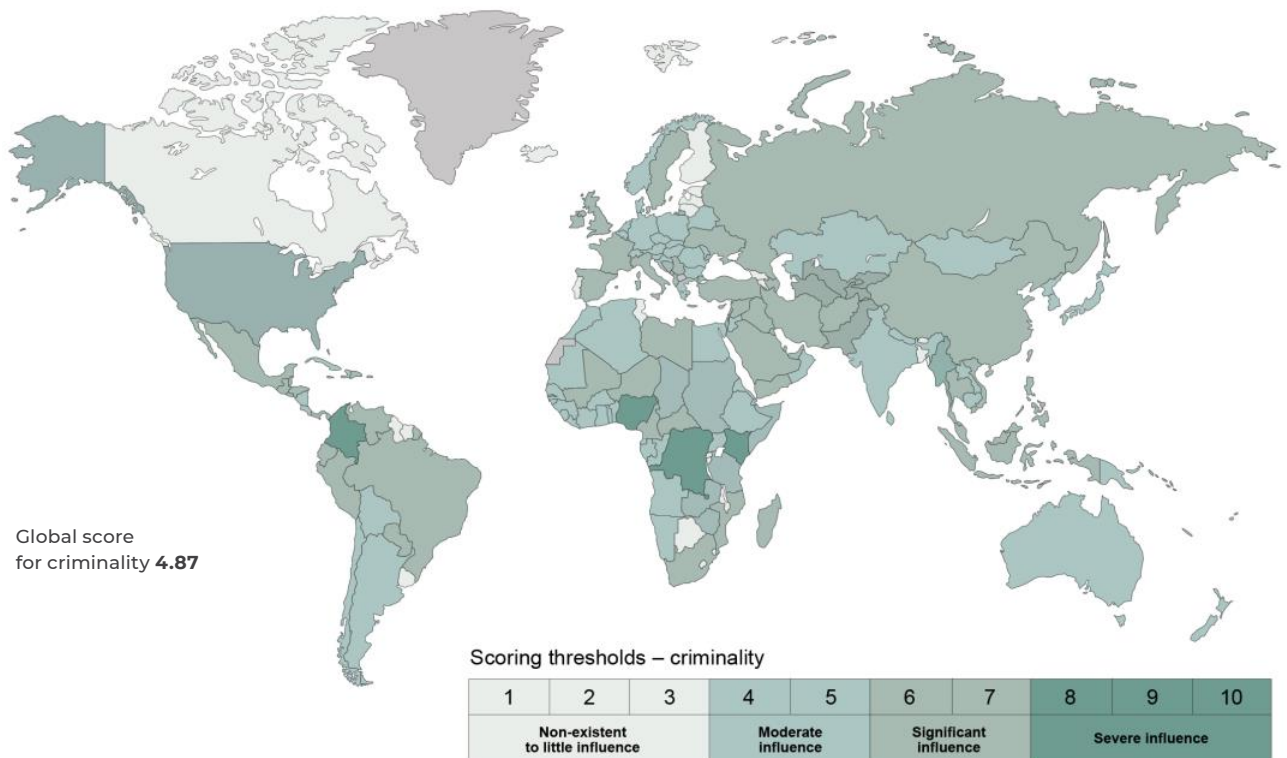
The disruptive force that we should probably be more conscious of is organised crime. Chart 27 shows its current level of influence around the world. We can only expect its influence to grow because a number of the forces we now see enable it. When there is resources scarcity, which we have in everything from minerals and timber to fish, you can expect organised crime to move in as it has done in all of those areas already. Where there is strategic competition, you can expect organised crime to be co-opted. That has already occurred with countries like Russia, who use criminal organisations to run their grey-zone operations, and states like North Korea, who run their own cybercriminal activities to raise funds.

Finally, when international and domestic order weakens, it is hard to coordinate activity to combat organised crime, and where vacuums of legal authority emerge, so do the opportunity safe havens from which organised criminals and terrorists can operate.

Any of these forms of civil disruption limit a society's capacity to improve productivity, and in severely affected places like Africa, growth in productivity may be reversed. Equally problematic is that the scale of organised crime in areas like illegal logging, fishing and mining has a globally significant impact on an already very pressured environment.

**Chart 27: Criminality Score (Global Organised Crime Index), 2021**

Source: The Organized Crime Index. (2021) Global Initiative Against Transnational Organized Crime. <https://ocindex.net/>



## Trade

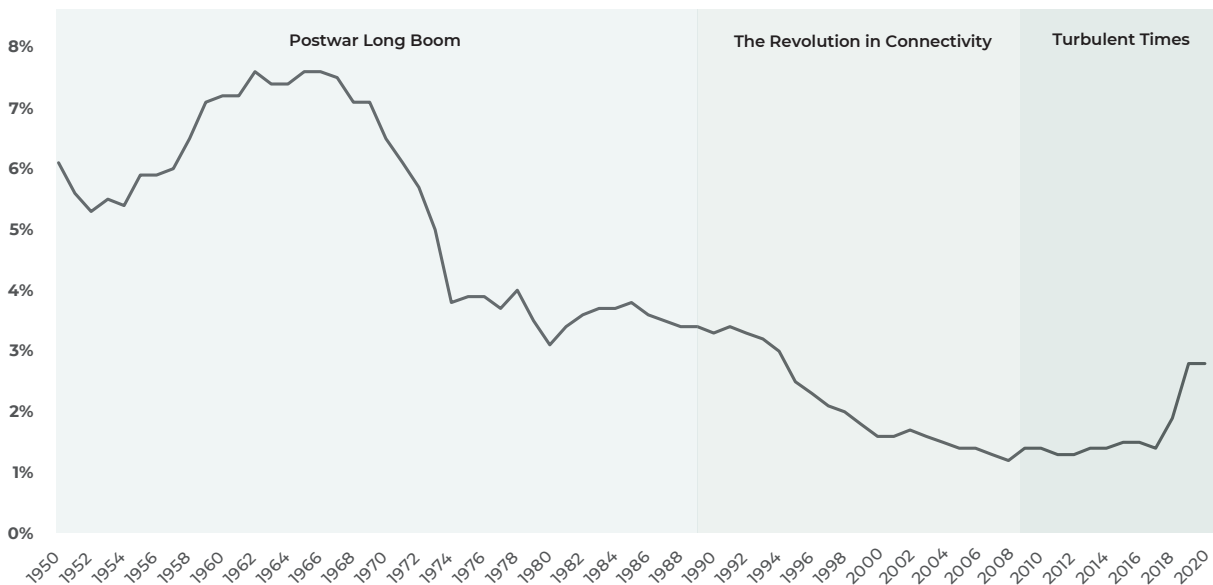
The final area of global competition is trade itself. We have seen trade used as part of the arsenal of strategic competition. The primary form that has taken is the increase of trade barriers. Indeed, “Since the global financial crisis of 2008, there have been five times as many protectionist measures enacted across the world as there have been liberalising ones.”<sup>17</sup> We can see a snapshot of that growing headwind in what has happened to tariff barriers in the United States. Chart 28 shows the way in which, during the postwar period, once the General Agreement on Tariffs and Trade was underway, the trend was of long-term decline in tariff barriers. As we have entered this new era of strategic competition, the trend is for those kinds of barriers to increase.

An important part of why trade has been weaponised is that scepticism about the benefits of trade has grown amongst both the public and a range of policymakers and political leaders in many countries. People see the loss of manufacturing jobs and its impact on whole geographic regions as a serious issue. They have a sense that others have benefited more than they have, and that life hasn’t become better for them. They worry that no longer producing goods in your own country makes you vulnerable. Something seems to have gone wrong with trade.

Overall, the pressures on connectivity only look set to increase, which will hamper productivity, restrict the benefits that come from trade and weaken the opportunities for the necessary global collaboration on critical issues we now face like climate change. Strategic competition has turned what was one of the strongest tailwinds for global prosperity into a serious headwind.

**Chart 28: US Effective Tariff rate (1950–2020)**

Source: United States International Trade Commission, [https://www.usitc.gov/documents/dataweb/ave\\_table\\_1891\\_2018.pdf](https://www.usitc.gov/documents/dataweb/ave_table_1891_2018.pdf)



## The headwinds of 2050

Before we turn to the question of whether what seems to have gone wrong with trade points to something even more deeply problematic about how all of this progress occurred, it is worth a brief summary of the overall picture of how the tailwinds of progress have turned into headwinds against it.

- **Demography:** We saw the tipping point in 2010, when the working-age population in high-income countries started to shrink and by which time the participation rate of women in the workforce had also plateaued in many countries.
- **Resources:** About the year 2000, we saw the long-term decline in the cost of non-energy commodities end and the cost of resources start to trend upwards.
- **Productivity:** About 2010, we saw productivity growth start to slow significantly in developed and developing countries.
- **Connectivity:** In 2010, we saw global trade as a share of GDP peak and begin its decline.

While the global financial crisis was not the cause of the end of the Tailwind Years – the change in these macro trends were long in the making – it does provide a memorable marker for the turning point. New forces are now clearly at work.

We have seen these trends for a decade now and they have not changed. From the analysis here and to come there is no reason to think that they will.

What the decade or more since the global financial crisis has brought is the growing realisation that the challenges we face seem to run deeper than just these headwinds. We have experienced the impact of climate change, seen the environment in crisis in so many different places and ways, witnessed the rise of populism and experienced the world as a more volatile and uncertain place, with disruption to life caused by the pandemic and the impact on energy and food prices caused by the war in the Ukraine. Is there, as it increasingly seems, something fundamentally unsustainable and unsettled about the system that delivered all of the postwar progress? It is that question to which I will now turn.





## Section 4: The Unsustainable and Unstable Foundations of our Current Progress and Prosperity

The troubles we have seen in the past decade are all signs of a model that is unsustainable and unstable.

In this section, I will argue that this is caused by three serious flaws. The first of those flaws is that it is based on the unsustainable exploitation of the natural world. The second is that it systematically creates inequality with no intrinsically self-correcting mechanism. The third is that the way it creates global efficiency simultaneously makes our economic and social system less stable and resilient.

There are of course all sorts of other issues with our current model, but I have focused on these three because they are serious and profound and, if we don't prioritise them, we will have little chance of addressing them in the very short time that we have available.



## Environmentally unsustainable

We will start with the first of the fundamental flaws in our current economic system, which is the way it unsustainably exploits nature.

The model we have relates to nature based on extraction and emissions. We extract resources from the environment or utilise the environment for food in an extractive way and then we emit waste products back into it. We do now recycle some goods, so we can reduce what we need to extract and emit. However, as we will see in all parts of the world, the rates at which we recycle materials represent, at best, a good-willed attempt to modify the system rather than a real attempt to change the basic model. The picture that will emerge here is a model of economic development where we have far exceeded the biocapacity of the planet, which is the ultimate form of being unsustainable.

### The extractive model

A very clear way to see the extractive nature of our economic model, as it applies to non-renewable resources, is shown in Chart 29.

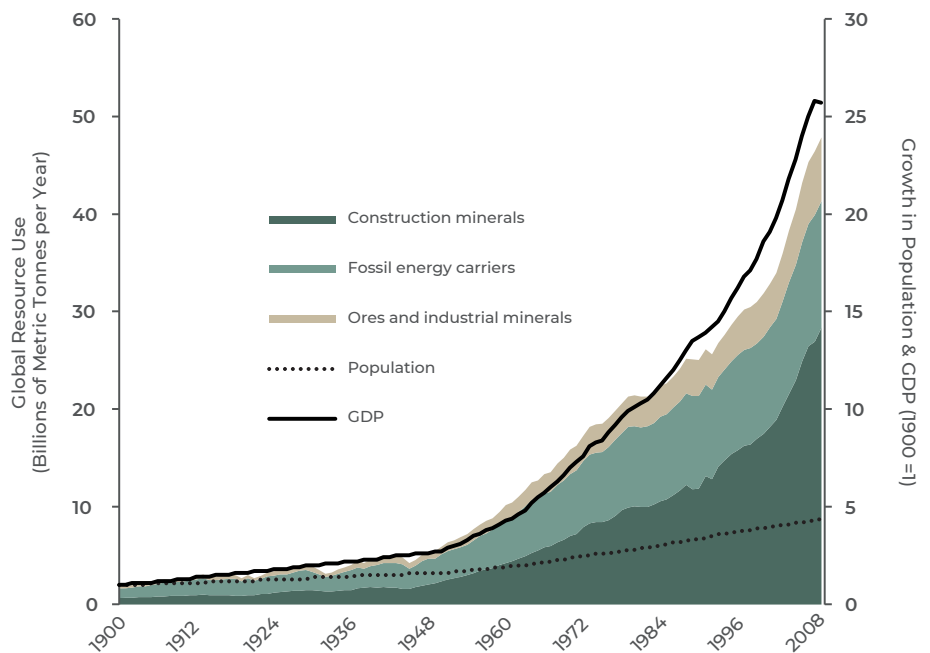
The heavy black line is growth in global GDP – a story we are familiar with now. The shaded areas are billions of metric tonnes of resources extracted from nature each year. You can see they cover different categories.

Consider the dark green area. This is construction minerals – the sorts of minerals like ore iron that you need for the steel for roofing or apartment buildings. These are the materials we use to house the world today and to build the cities we have. Clearly, some people live in far better housing than others, which is the sort of issue that Chart 30 gets to.

That graph shows the rate at which individuals consume resources per year in each country on the vertical axis and their GDP per capita on the horizontal axis. The dots on the graph show the volume of resources a country consumes per person, relative to the income they generate per person. The overall picture is that as income per capita increases, so does the volume of resources people consume. It is not an exact relationship. Some countries consume or extract large amounts of resources to earn their incomes and others less so. The general point is that as countries get wealthier, they consume more resources.

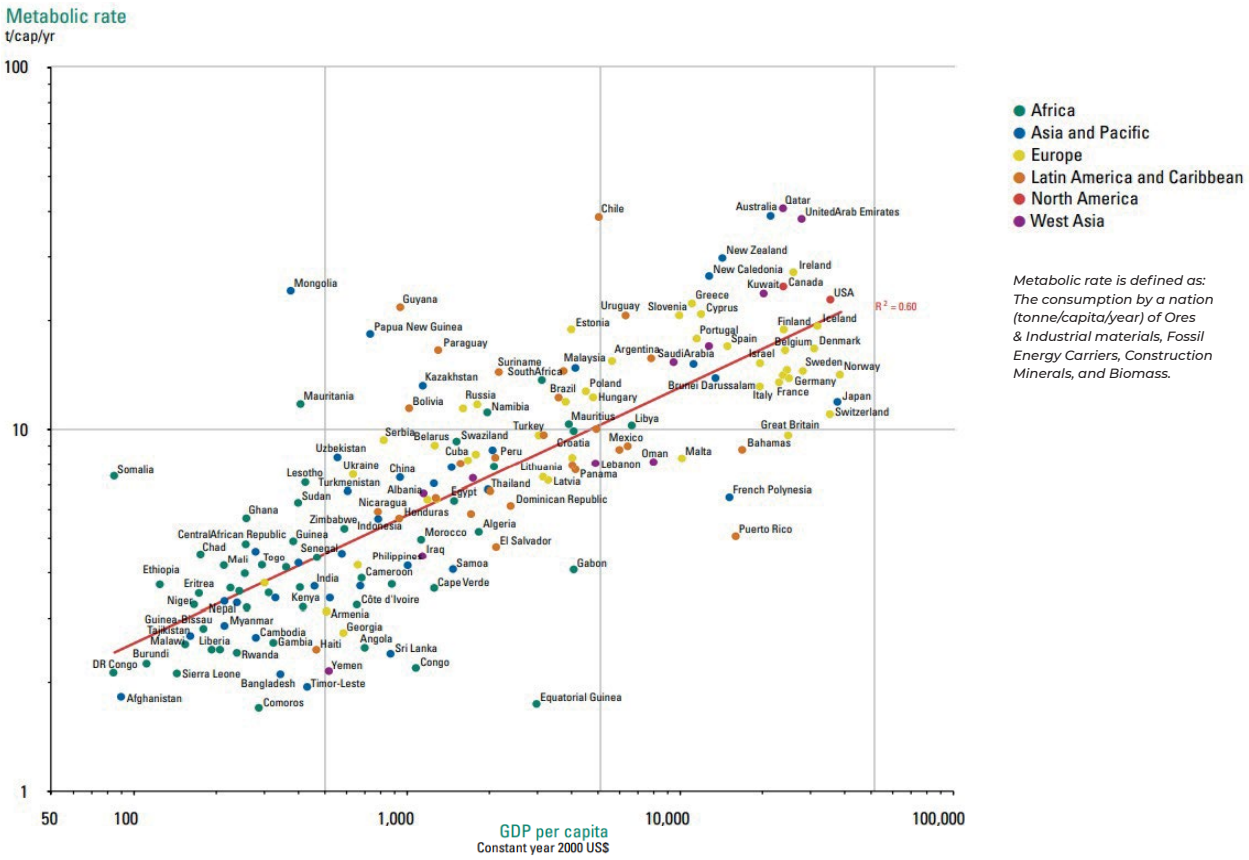
**Chart 29: Global consumption of selected resources vs. population and GDP growth**

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



**Chart 30: National consumption of resources in relationship with GDP per capita, 2011**

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



The challenge for the world is that there are a great many countries with relatively low GDP per capita who understandably aspire to see their citizens have the same standards of living as those in developed countries. Think of the nearly 3.5 billion people in just the top five developing countries: India, China, Indonesia, Pakistan and Nigeria. If they seek to achieve that higher level of GDP per capita on the same extractive model, resource scarcity will continue to grow dramatically. Even our current level of development has stretched the extractive model to the point where we see consistent and significant price rises. On our current course, the resources scarcity headwind continues to blow harder. The paradox for those developing countries is that the harder they try to develop, using the same models as the West, the more difficult it will become. For the developed countries, further development will come under ever-growing pressure. Over time, prices will signal the problem, but if we wait until that drives change we could be in for a very slow period of development, where poorer countries' progress is significantly curtailed leaving hundreds of millions of people unnecessarily in poverty.

Inevitably, as the scarcity of resources increases, so does the risk that competition for them will drive the geopolitical tensions that further disconnect the world. With oil, the world already knows how strategic resource competition can distort the rules-based international order and cause covert and overt conflict.

Finally, as scarcity grows, the pressure to extract resources in the world's ever-diminishing environmentally sensitive and unexploited areas will continue to grow, which will serve to underline the ultimately unsustainable nature of this extractive model.

The bottom line is that on a planet of finite resources you simply can't extract forever. Our challenge is that we have reached such a scale and rate of extraction that 'forever' looks a lot closer than we might have thought, especially when you consider the shape of the curves in Chart 29. It is not a linear curve. That would indicate a consistent rate of extraction. It is a curve that slopes upwards, which means we are increasing our consumption at an increasing rate. That is truly not sustainable. It also means the runway to find a different model shortens very quickly.

We can see very clearly that with non-renewable resources, the extractive model is hard at work. What compounds that problem is that our current model uses renewable resources in a non-renewable way. We are using them much faster than they are being replenished. Effectively, we have taken an extractive approach to them as well. We can see this very clearly if we look at the extractive rate at which we use renewable resources. I will walk through a series of charts that present this troubling data.



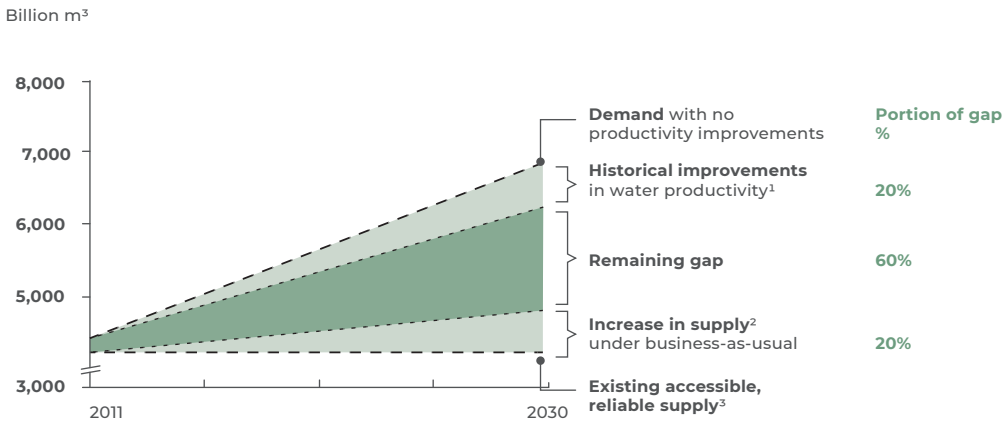
**Water**

Chart 31 shows the supply of and demand for water over time. The top line is demand and the bottom line is supply. At the start of the chart, they are close together, which indicates a small amount more water is being consumed than is supplied from rivers, lakes and aquifers.

Then you can see that demand continues to rise. To some extent supply can increase as well, through improved infrastructure like less leaky pipes and better water capture. The difficulty is that even when we allow for improvements in the ways we use water, the gap grows dramatically.

**Chart 31: Projection of global water supply and demand**

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



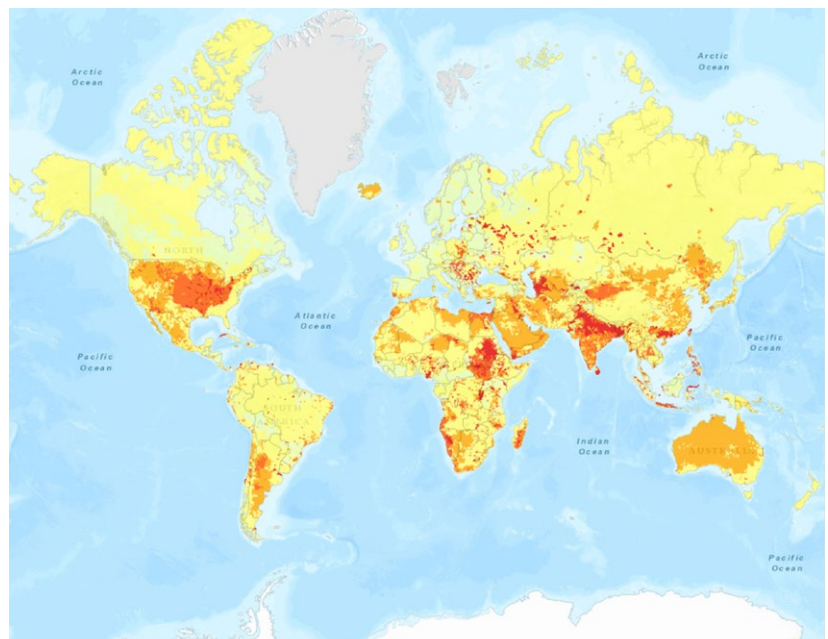
1. Based on historical agricultural yield growth rates from 1990-2004 from FAOSTAT, agricultural and industrial efficiency improvements from IFPRI
2. Total increased capture of raw water through infrastructure buildout, excluding unsustainable extraction
3. Supply shown at 90% reliability and includes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

Not only are there huge environmental consequences from water use exceeding water supply, but this extractive use of water contributes to the resource scarcity headwind and weakens global connectivity.

Chart 32 shows the many places around the world where water scarcity could create civil or international issues.

**Chart 32: WWF water risk filter, 2021**

Notes: Hydro-political Likelihood filter selected.  
Source: World Wildlife Fund (WWF) <https://riskfilter.org/water/explore/map>





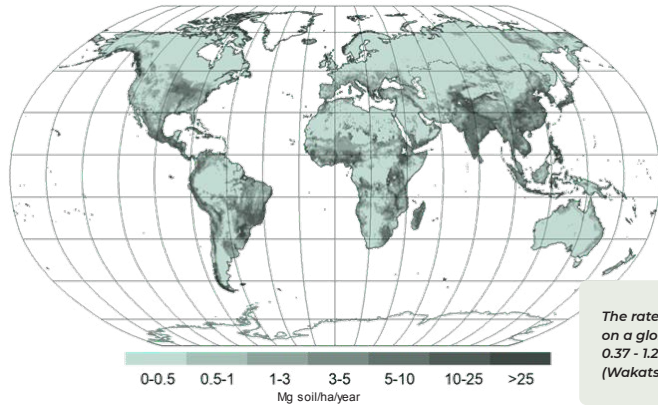
**Soil**

We need to talk a lot more about soil because around the world we effectively mine it rather than nurture and grow it. What Chart 33 shows is the soil erosion debt, which is how much faster actual soil loss is occurring compared to natural erosion rates. Almost everywhere we are losing soil at an unnatural rate. On the chart you can also see the rate at which soil formation occurs. What that means is that anywhere the soil loss is darker than the second shading bar, we are losing it at a rate faster than it can naturally replenish.

The rates of soil loss vary around the world and we don't actually know how long it will last despite some extreme claims that get made and repeated.<sup>18</sup> What we do know is that in the long run the approach is not a sustainable one. While in some places the soil crisis may be some time off, in others it fast approaches. Even for those places where it is further away, the extraordinarily slow process to build soil up means that even to get close to a crisis is very risky because of how hard it is and how long it takes to reverse the process.

**Chart 33: Difference between natural soil erosion and actual soil erosion**

Note: Soil erosion debt is the difference between natural soil erosion and actual soil erosion. 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](https://doi.org/10.1016/0016-7061(92)90040-E).



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

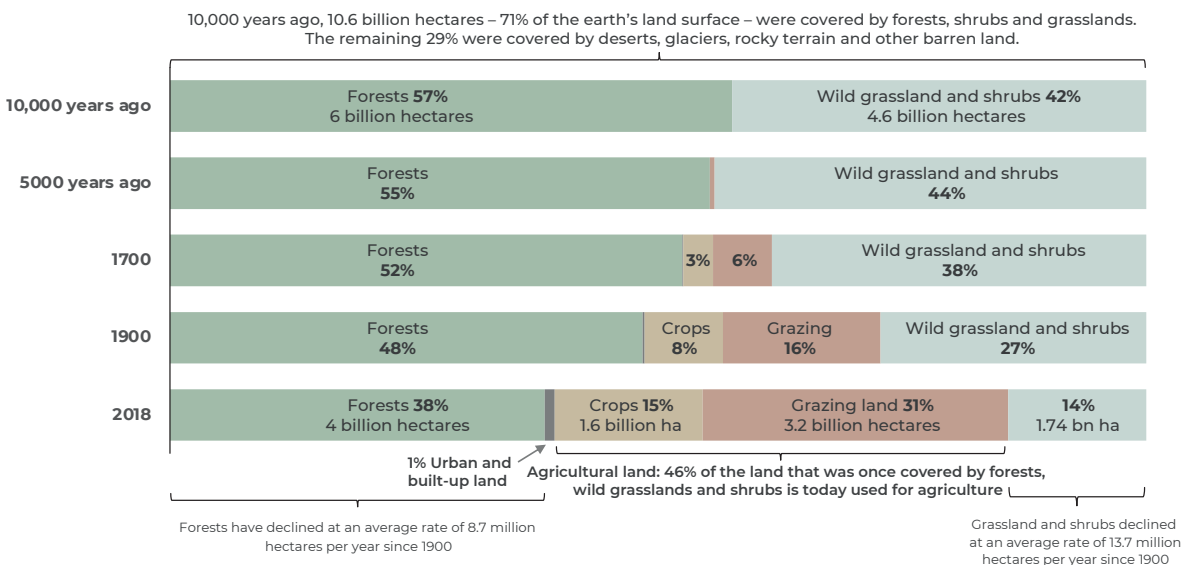
**Forests and grasslands**

We continue to fell our forests and plough our grasslands. The picture of this human transformation is well described in Chart 34. Here, you can see the journey from 10,000 years ago, when we have seen the loss of almost half the world's forests and grasslands. Apart from a modest amount of human settlement, the rest has been turned over to agriculture.

Often it is the destruction of forests that gets our attention, but we should be aware of the crisis in the loss of grasslands and shrubs. Where once they were 42% of the vegetated lands, now they are just 14%.

**Chart 34: Historical data on forests, grassland and shrubs**

Source: <https://ourworldindata.org/deforestation>

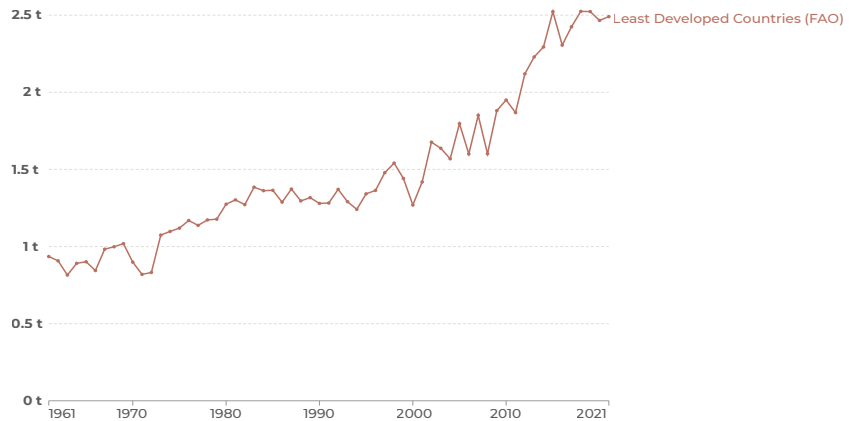


All this loss of vegetation and habitat has occurred despite dramatic increases in agricultural productivity, which sometimes gets called the Green Revolution. To get a sense of how considerable that increase in productivity has been, see Chart 35, which plots the increase in wheat yields in the least developed countries since the 1960s. The productivity per hectare has almost doubled. Many people have been fed as a result who might otherwise have gone hungry, yet still in these parts of the world forests and grasslands continue to disappear. It is a clear case where productivity improvements can't outrun the pressures from economic growth.

Again, the picture here is of an extractive model, especially when what we see is the clearing of rich, biodiverse ecologies to create vast areas of monocultures that not only use up the soils and water but also have a range of chemical inputs, such that an ever-more impoverished environment is left behind. Already, there are parts of the world where they watch the soils blow away in great clouds and they need to apply ever more intensive fertiliser and irrigation to maintain levels of production.

**Chart 35: Wheat yields**

Yields are measured in tonnes per hectare.  
 Data source: Food and Agriculture Organization of the United Nations; Bayliss-Smith & Wanmali (1984); Brassley (2000); Broadberry et al. (2015) OurWorldInData.org/crop-yields



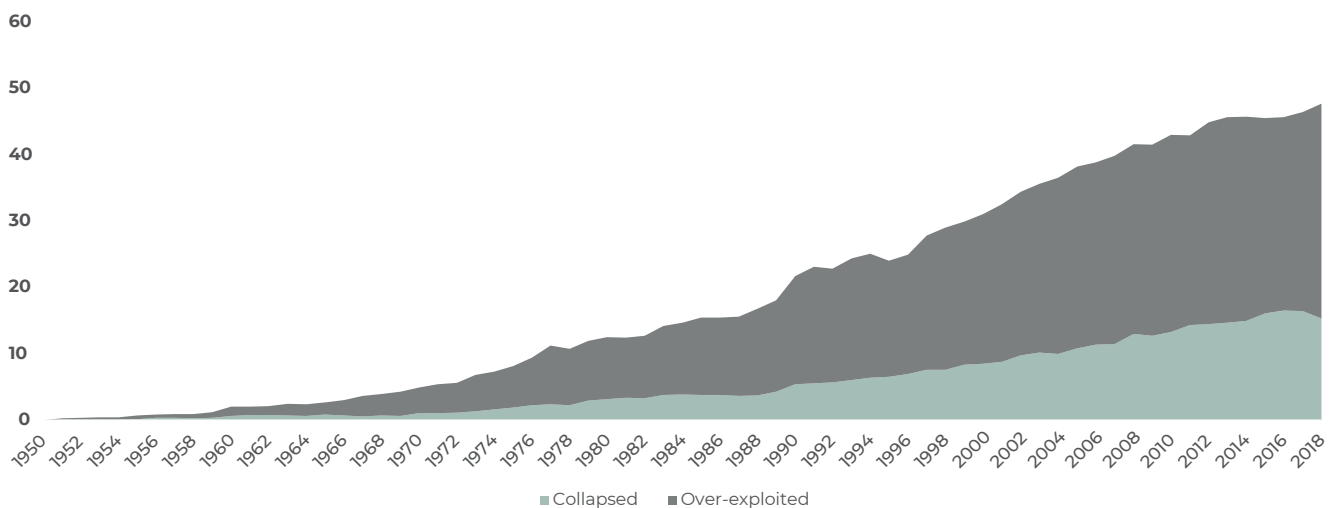
**Fish**

Wild stocks of fish, crustaceans such as lobsters, and shellfish such as oysters, scallops and mussels are one of nature's remarkable and once truly abundant sources of food: food stocks, which First Peoples all over the world managed sustainably for countless generations. The industrial extraction of fish is a tale that has been well-told in recent times and so there is no need recount it here, other than to say that the numbers are alarming, with nearly

50% of the world's fish stocks having either collapsed or been over-exploited as you can see in Chart 36. The extractive model is alive and well on our open oceans. As it has created resource scarcity, we have seen organised crime move in, international tensions created and inequalities accelerated as local coastal communities lose access to an entire way of life.

**Chart 36: Percentage of collapsed and over-exploited global fish stocks, 1950 to 2018**

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



**The unrelenting pressure of a rich world diet**

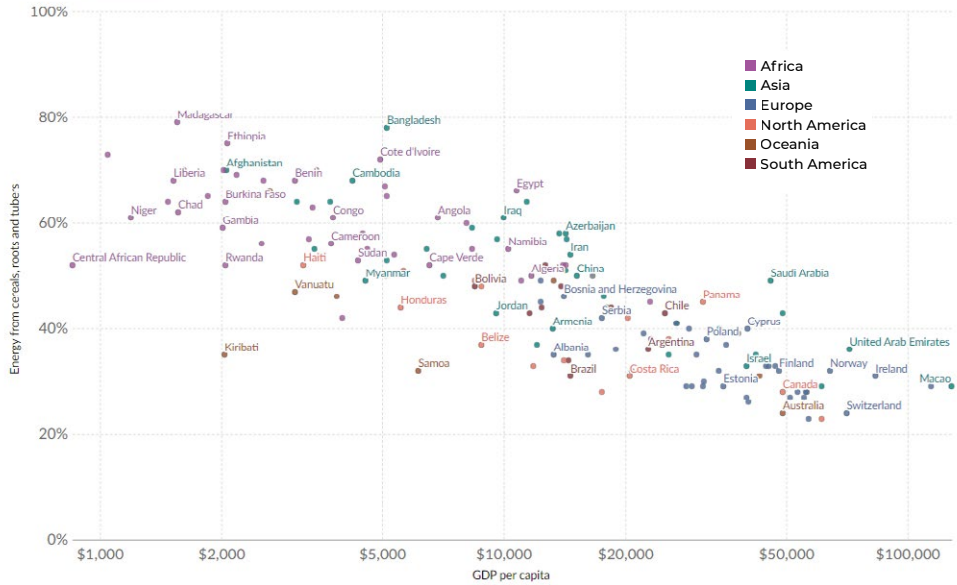
There are many causes of this unrelenting pressure on renewable resources that are caused by economic development, from the expansion of urban areas to the use of timber for construction, paper and packaging and other products, through to the industrial use of water. There is one specific feature of that relationship between economic growth and the impact on the environment that is a major challenge itself and also summarises the general problem, and that is our diets and how they change as people's

income increases. In the charts that follow, we can see how that relationship works. The share of energy people get from cereals like wheat, rice and corn, tubers like potatoes and roots declines as GDP per capita increases, as you can see in Chart 37.

**Chart 37: Share of energy from cereals, roots and tubers vs. GDP per capita, 2018**

A high share of energy from cereals, roots and tubers typically represents lower dietary diversity.

Note: GDP per capita figures are adjusted for inflation and price differences across countries. Data source: Food and Agriculture Organization of the United Nations; World Bank. OurWorldInData.org/diet-compositions



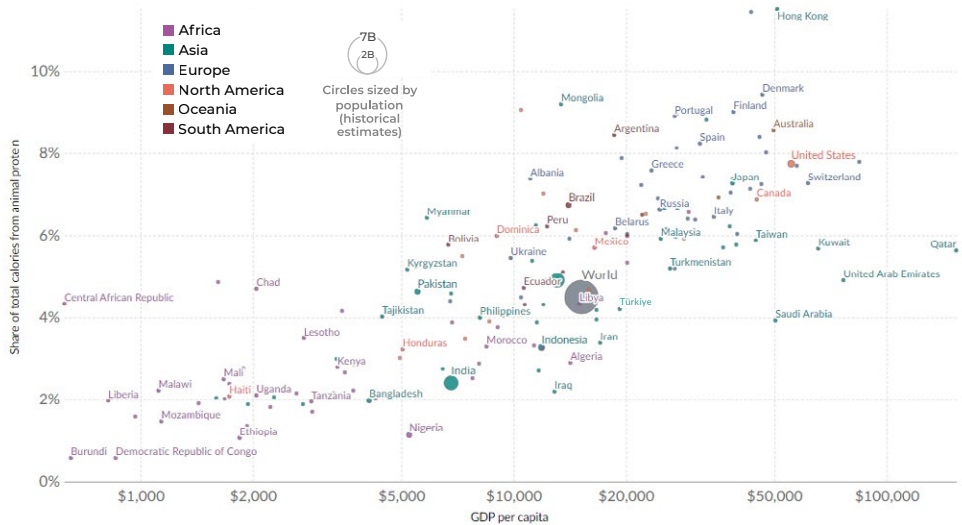
On the other hand, the share of energy from animal products increases quite significantly as countries get wealthier, as you can see in Chart 38.

It is a similar story with fish and seafood consumption, as you can see in Chart 39 where in upper-middle-income countries people are eating over five times more seafood than in low income countries.

**Chart 38: Share of calories from animal protein vs. GDP per capita, 2018**

Share of calories in the average diet sourced from animal protein (which includes meat, seafood, eggs and dairy products), measured as the percentage of daily calorific intake, versus GDP per capita, measured in 2011 international \$.

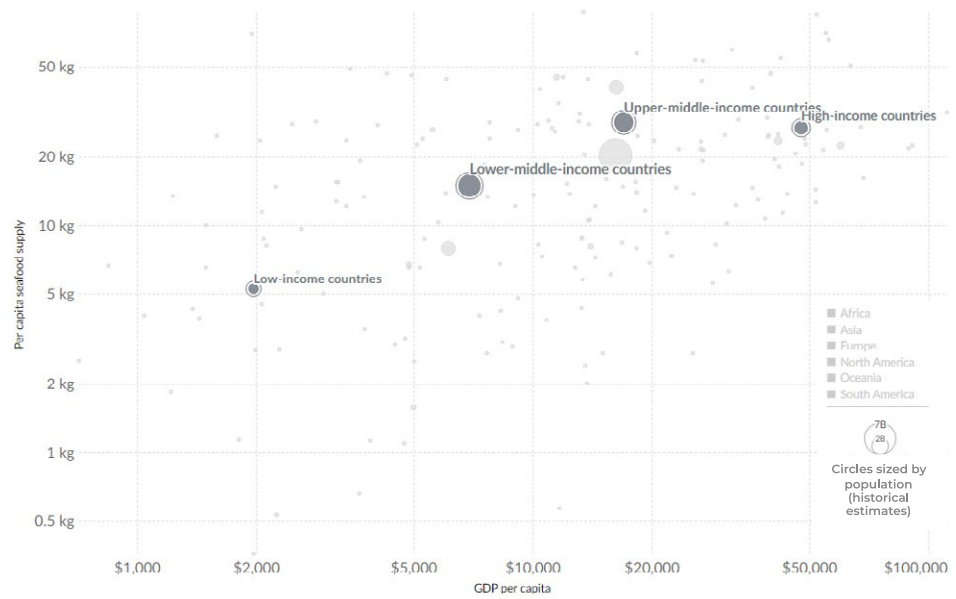
Data source: World Bank – WDI; Food and Agriculture Organization of the United Nations; Maddison Project Database 2020 (Bolt and van Zanden (2020)) OurWorldInData.org/diet-compositions



**Chart 39: Fish and seafood consumption vs. GDP per capita, 2020**

GDP per capita is measured in constant international \$. International dollars correct for price differences across countries.

Data source: Food and Agriculture Organization of the United Nations; data compiled from multiple sources by World Bank. OurWorldInData.org/fish-and-overfishing



China provides an interesting and important picture of these changes over time, and because of the scale of its population, it means that changes in its pattern of demand are consequential for the whole planet. In Chart 40 you can see how the pattern of consumption I have described unfolds over time in a single country. Both total calories consumed rises and the mix of what people eat changes.

The challenge is that as diets change in these ways it increases the pressure to use land ever more intensively for agriculture. The simplest way to see this is how much land it takes to create an equivalent amount of calories/energy by food type. The picture is a stark one. In Chart 41 you can see the vast amount more land it requires to create animal protein, especially in the form of lamb or beef. It is important to recognise that it is not just land that gets consumed but, in some areas where pastures are irrigated, it is also water and everywhere the pressure is also on soil. The pressure is immense. In the last 20 years, these changes in diet have seen global meat consumption increase by 58%, and it was developing countries which accounted for around 85% of the increase in consumption.

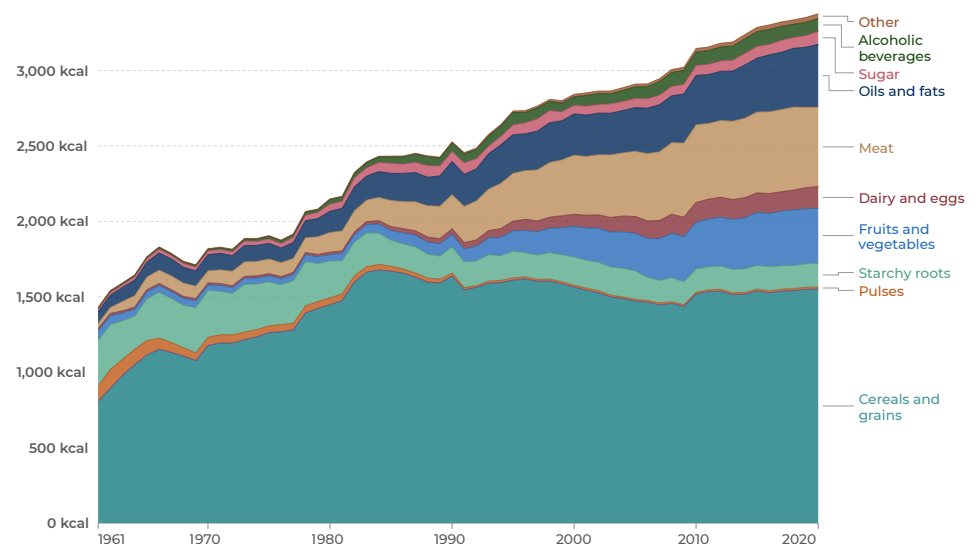
If you go back and look at that Chart 38 of animal protein consumption and GDP per capita, the real challenge is just how many countries with large and often growing populations haven't yet reached their peak meat consumption. If they all continue down that path and consumption patterns in the rich world don't go into reverse, then the extractive pressure on the destruction of forests, grasslands and soil and the consumption of water will continue to be intense.

The twist in this picture is that in the developed world, the amount of land used for agriculture has started to reduce and reforestation has begun. There is little comfort here, however, because land clearance continues in the developing world in some of the most environmentally sensitive areas, like the rainforests of tropical zones of the world. While some of this clearance is for farms that will export meat and other foods, like oils to the developed world, more than 70% is to meet local needs, which shows the pressure economic growth in these places will pose to the forests of the planet as they continue to get wealthier.<sup>19</sup>

**Chart 40: Dietary compositions by commodity group, China, 1961 to 2020**

Average per capita dietary energy supply by commodity groups, measured in kilocalories per person per day.

Data source: Food and Agriculture Organization of the United Nations OurWorldInData.org/diet-compositions

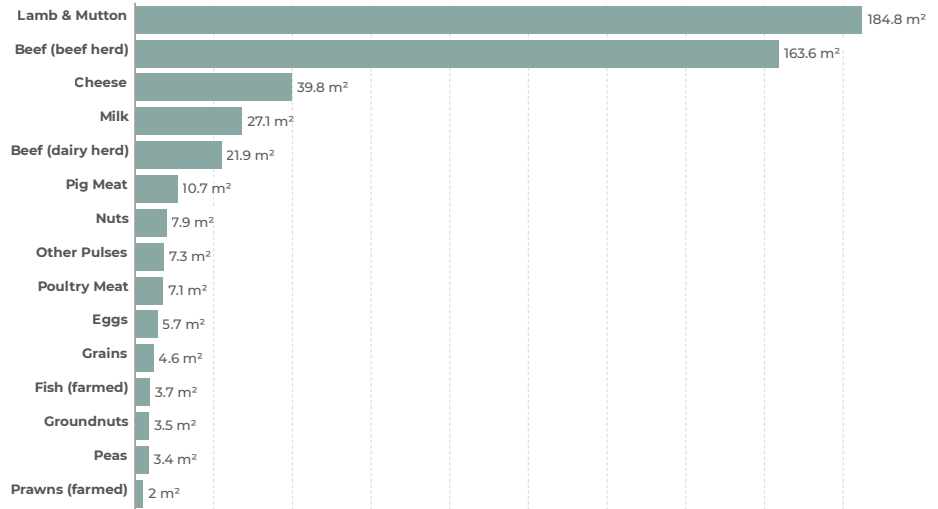




**Chart 41: Land use per 100 grams of protein**

Land use is measured in metres squared (m<sup>2</sup>) per 100 grams of protein across various food products.

Data source: Joseph Poore and Thomas Nemecek (2018). Additional calculations by Our World in Data. OurWorldInData.org/environmental-impacts-of-food



**The emissions model**

The flip side of the extraction model is the emissions model. It remains integral to the processes involved in creating the ever-growing number of products we make on the planet that we emit waste. We emit it in the production process, in the generation of the energy to run the processes and then, at the end of their life, a high percentage of these products are dumped into the environment. Over time, there has been considerable effort to reduce the emissions and waste of the model. There have been some singular successes, like the reduction of sulphur dioxide emissions, which cause acid rain, or the emission of CFCs, which degrade the ozone layer. For the most part, these efforts have resulted in adaptations to the emissions model rather than marked the start of a different model, where the creation of waste is designed out of the production process.

**Greenhouse gas emissions**

On that most critical of emissions, greenhouse gases, the world has neither mitigated their production or transitioned to a zero-carbon energy model at the required rate to avoid terrible environmental and human consequences.

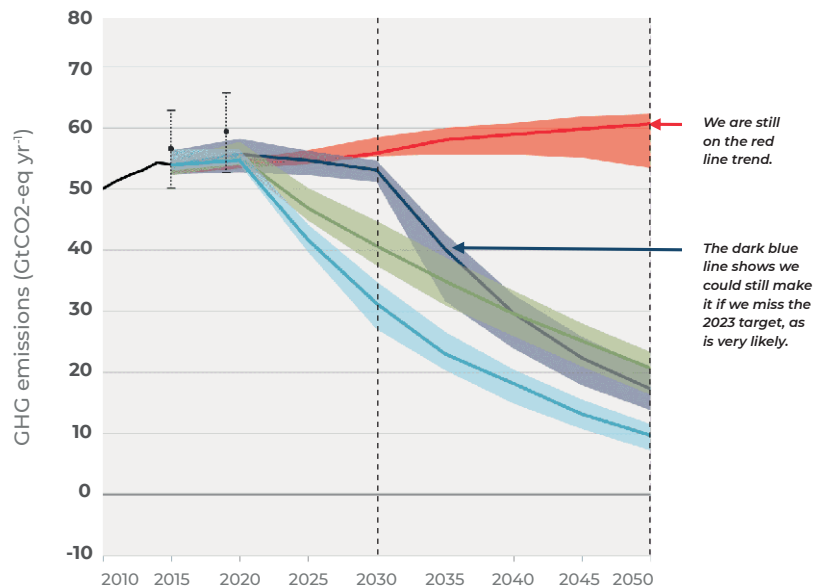
If you look at Chart 42, it shows the Intergovernmental Panel on Climate Change’s model of emissions we generate, for the different levels of mitigations we take. The vertical axis shows the level of global greenhouse gas emissions. The different coloured lines show what those emissions will be, depending on the extent of action we take. The red line is the level of emissions that will result if current policies are implemented around the world. If we stick on this line, the planet will warm to a level well above 2 degrees Celsius. If we want to reduce the warming to the safe level of 1.5 degrees, we need to be on the light blue line. This will require a very rapid and massive reduction in emissions. If we look around the world, I can’t see any sign of a wave of change of that magnitude being underway. More realistically, we might have a chance at the dark blue line, which sees us overshoot the required reduction, then get back down to where it is needed. This is based on the idea that there is a lot of focus to get major initiatives in place for 2030, which would then bring emissions down much more quickly.

**Chart 42: Modelled pathways of global greenhouse gas emissions**

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].

Modelled pathways:

- █ Trend from implemented policies
- █ Limit warming to 2°C (>67%) or return warming to 1.5°C (>50%) after a high overshoot, Nationally Determined Contributions until 2030
- █ Limit warming to 2°C (>67%)
- █ Limit warming to 1.5°C (>50%) with no or limited overshoot
- ⋮ Past GHG emissions and uncertainty for 2015 and 2019 (dot indicates the median)



As we think about these scenarios, what we have to contend with is the relationship between per capita income and per capita emissions. You can see this picture in Chart 43. The chart shows on the vertical axis emissions per capita and on the horizontal axis GDP per capita. Each dot represents a country and the size of the dot is how large its population is. The dotted line shows the trend that as countries' incomes increase per capita, so do the greenhouse gases emitted per capita. The curve isn't a simple linear curve. In the initial stages of economic development, the rate at which greenhouse gas emissions increase is quite low, relative to the increase in income. It is once countries cross the threshold into much higher levels of material consumption that the per capita emissions accelerate.

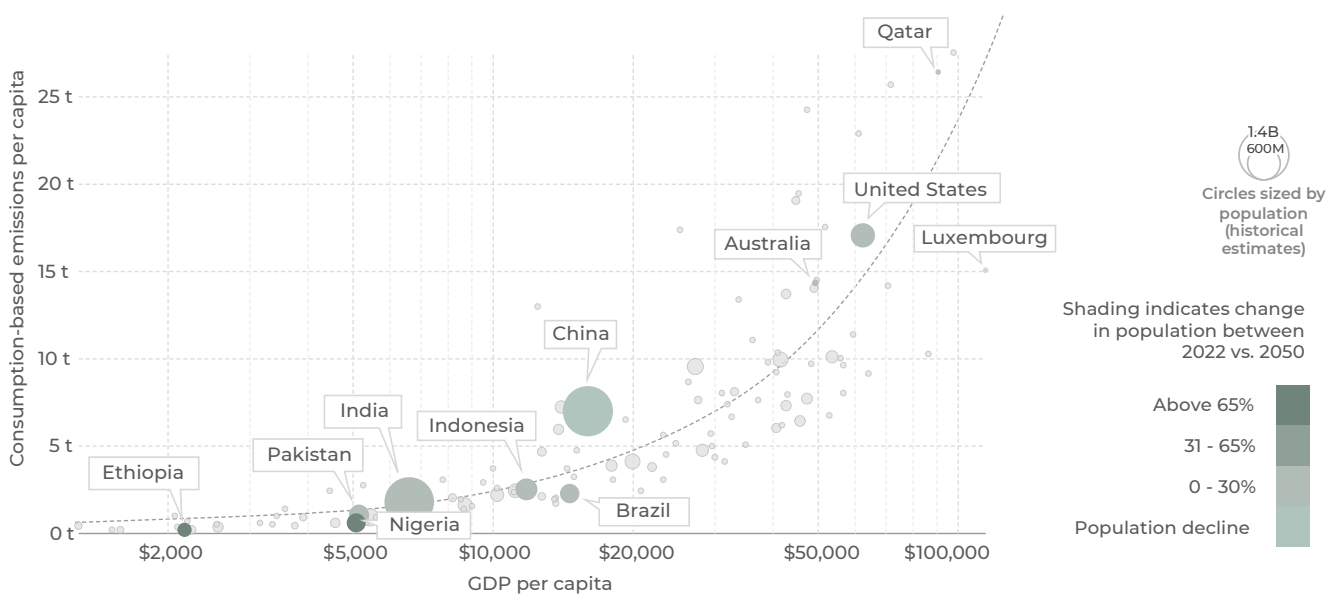
You can see why such a relationship exists. The production of all kinds of products requires energy and almost everywhere on the planet some portion of that energy currently will come from burning fossil fuels. There are also a whole range of industrial processes, like cement production, that emit greenhouse gases. In addition, transport uses fossil fuels and agricultural production involving cows, sheep and other animals directly creates greenhouse gases. Given countries with higher incomes produce and consume more of all these products and services, they will produce increased levels of greenhouse gases.

The troubling picture for the world is just how many people there are represented by those larger dots, where per capita emissions are still quite low, but they live in countries like China, India and Indonesia, where economic growth is strong. China is a particular worry because it appears to be on a high greenhouse gas emissions pathway. As a country, it sits well above the trend line for that relationship between greenhouse gas emissions and GDP per capita – it requires more greenhouse gases being emitted to achieve the same level of GDP per capita than in many other countries.

Clearly, to avoid environmental harm, it is not possible for these countries to use the same model to grow as those who are already developed, even if those developed countries significantly reduce their own per capita level of emissions. What that means is, globally, a radical decoupling of economic growth from greenhouse gas emissions is required. We need to recognise that for this to occur, the extraction to emissions model has to change. The greenhouse gas challenge is more than enough to call out the need for this fundamental model change.

**Chart 43: Consumption-based CO<sub>2</sub> emissions per capita in relationship with GDP per capita, 2019**

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



### Air pollution emissions

Greenhouse gases aren't the only problematic product we emit into the atmosphere, especially if we think in the context of harm to human health. Air pollution, in the form of particulates and ozone, whether breathed in outdoors or indoors, largely from fuels burnt inside, is the third largest contributor to deaths globally, being responsible for over 6.5 million people dying each year.<sup>20</sup> We have focused on the impact to environmental health so far, but here we have a powerful case of where this extraction to emissions model causes direct harm to the health and lives of humans, in addition to environmental harm.

When it comes to particulates, the relationship between income and emissions is different to the pattern we have seen so far. Until now, the common picture we have seen is that, as incomes grow, on average we extract more and emit more. In Chart 44 we see a different relationship.

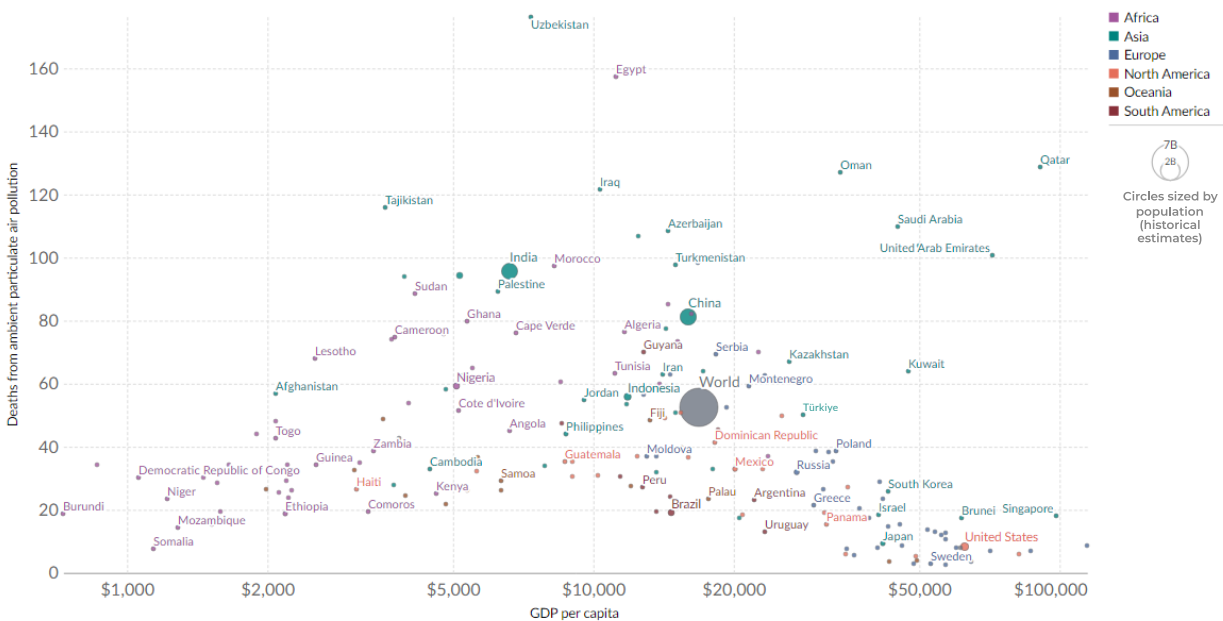
Up until a country reaches middle-income status at around \$10,000 per capita, deaths per 100,000 in the population increase. Then countries have enough wealth to tackle this problem. They ensure energy for cooking and heating is far cleaner and that industrial and agricultural emissions are dramatically reduced and we see deaths per 100,000 fall to a very low level.

There is a sobering message here. When a problem directly impacts people in the near term and is readily observable, as particulate pollution is especially when it turns into city smog, countries are ready to act as soon as they have the wealth to do so. The issue the world faces is that most of our emissions and extraction problems are not so readily observable: they are medium to long term, and the impacts are rarely as direct as with atmospheric pollution.

**Chart 44: Death rate from outdoor air pollution vs. GDP per capita, 2019**

Death rates are measured as the number of premature deaths attributed to outdoor particulate matter air pollution per 100,000 individuals. GDP per capita is measured in constant international \$.

Data source: IHME, Global Burden of Disease (2019); Data compiled from multiple sources by World Bank. OurWorldInData.org/outdoor-air-pollution



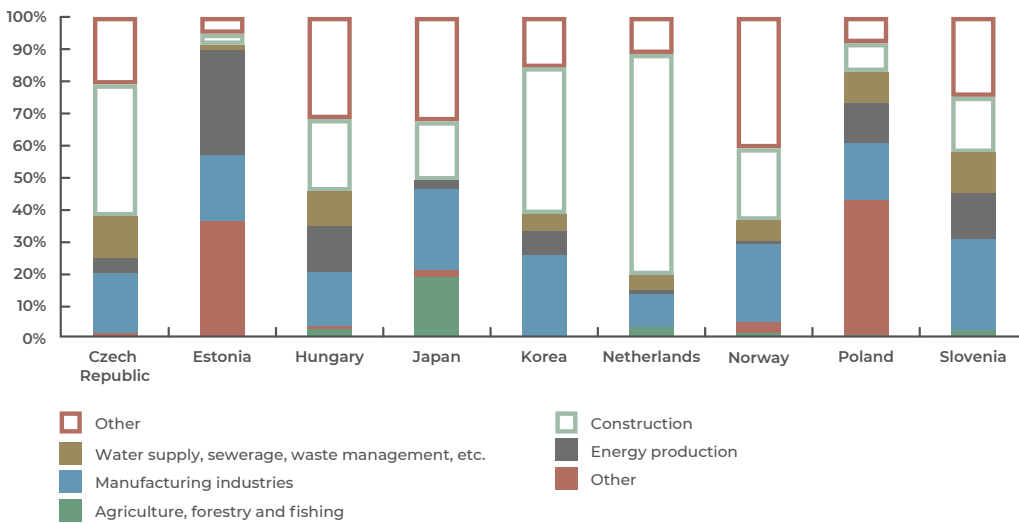
**Waste**

When we move from pollution emissions to all other forms of waste, they cover a wide variety of material from what is left over in agriculture, mining and forestry, through to the waste from construction and industry, to effluents and the kind of municipal waste we are perhaps most familiar with. It is hard to compare countries when it comes to their total waste generation because their mix of waste varies so much. Chart 45<sup>21</sup> provides a snapshot of that variety.

The key point, however, is that there is a lot of waste in whatever form it takes. Chart 46 below shows even five years ago, when this World Bank report was done, we generated over 12 kg of industrial waste per person per day on the planet. That is a pretty shocking figure. Unfortunately, it is linked to economic growth, as you can see in Chart 47.

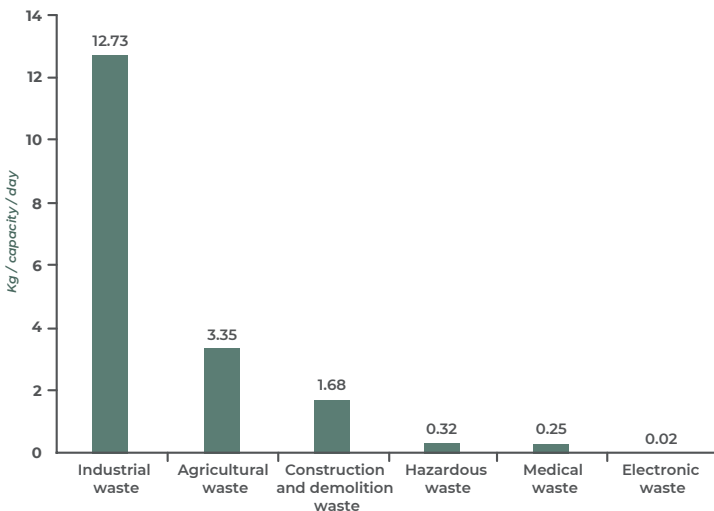
**Chart 45: Composition of waste by sector in focus countries, 2014**

Note: Total waste excluded secondary waste (eg residues from treatment operations). Japan: 2013 data. Source OECD (2017), 'Waste: Waste generation by sector', OECD Environment Statistics (database). <http://dx.doi.org/10.1787/data-00674-en>, [https://www.oecd.org/sites/9789264309395-en/1/2/2/index.html?itemid=/content/publication/9789264309395-en&csp\\_eb1a6df214d830e8947687c08b10a07b&itemIGO=oeed&itemContentType=book#figure1e2173](https://www.oecd.org/sites/9789264309395-en/1/2/2/index.html?itemid=/content/publication/9789264309395-en&csp_eb1a6df214d830e8947687c08b10a07b&itemIGO=oeed&itemContentType=book#figure1e2173)



**Chart 46: Waste generation in relationship with GDP by economy**

Source: <https://openknowledge.worldbank.org/handle/10986/30317> download the pdf, page 36



Note: kg = kilogram

**Chart 47: Industrial and electronic waste generation rates**

Source: <https://openknowledge.worldbank.org/handle/10986/30317> download the pdf, page 36

Kg/capita/day

	Industrial waste generation	E-waste generation
High income	42.62	0.05
Upper-middle income	5.72	0.02
Lower-middle income	0.36	0.01
Low income	No data	<0.01

Note: kg = kilogram



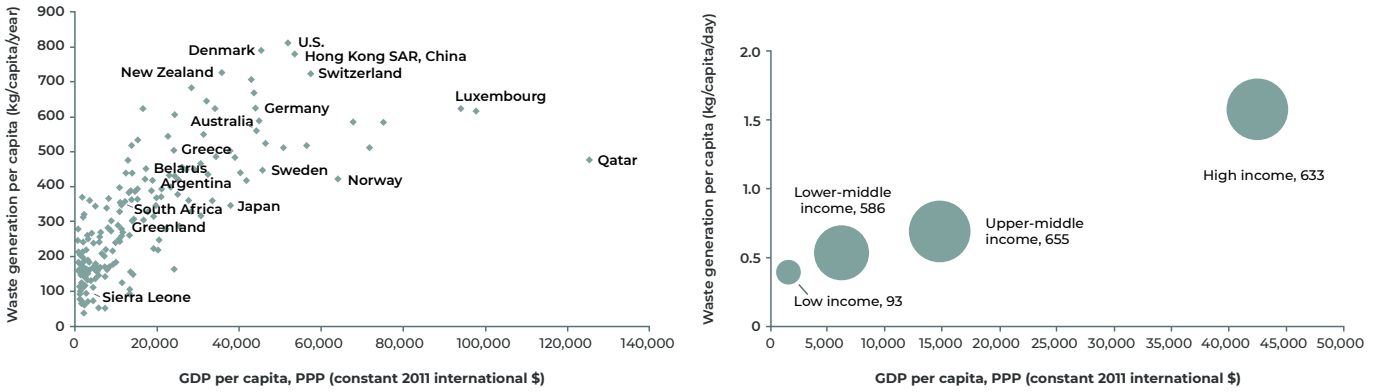
If we look at municipal waste in high-income countries, we currently produce 1.58 kg per person per day. Again, it is linked to economic growth as you can see in Chart 48.<sup>22</sup> What that relationship means is that the World Bank projects municipal

waste generation will increase from just over the 2 billion tonnes per year we produce today, to 3.4 billion tonnes by 2050.<sup>23</sup>

In various forms, this waste impacts negatively on our environment. Let's just take one often talked about example – plastics.

**Chart 48: Waste generation in relationship with GDP by economy and income group**

Note: PPP = purchasing power parity. Source: <https://openknowledge.worldbank.org/handle/10986/30317> download the pdf, page 22-23

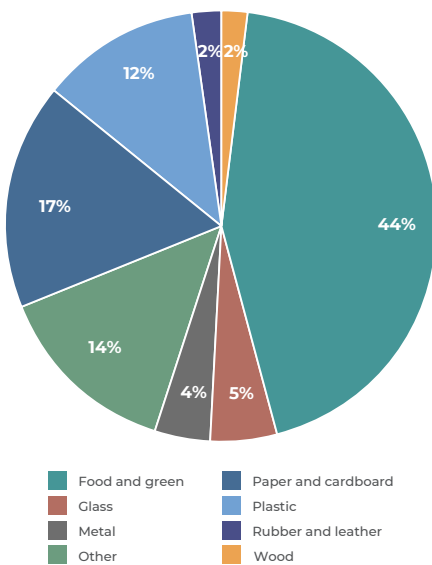


If you look at the composition of that waste in Chart 49, you can see that 12% of all our municipal waste is plastic. The total picture around plastics is even more troubling. The OECD has produced a detailed model at a global level to forecast the growth of plastic production.

Chart 50<sup>24</sup> shows the projected growth. What makes this picture worse is that on the current trajectory, by 2060, rates of recycling which globally are 9% today, will only reach 17%. This is our extraction to emissions model in full flight.<sup>25</sup>

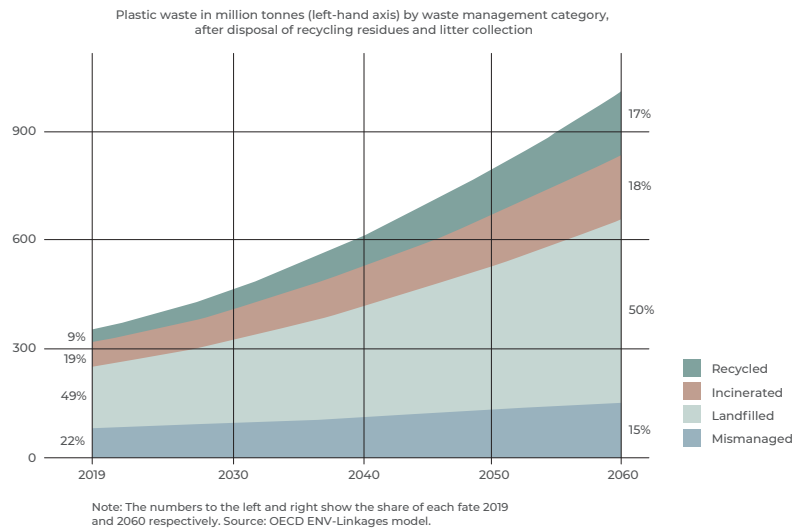
**Chart 49: Global waste composition**

Source: <https://openknowledge.worldbank.org/handle/10986/30317> download the pdf, page 29



**Chart 50: Plastic waste projections after disposals of recycling residues and litter collection, 2019 to 2060**

Source: <https://openknowledge.worldbank.org/handle/10986/30317> download the pdf, page 29

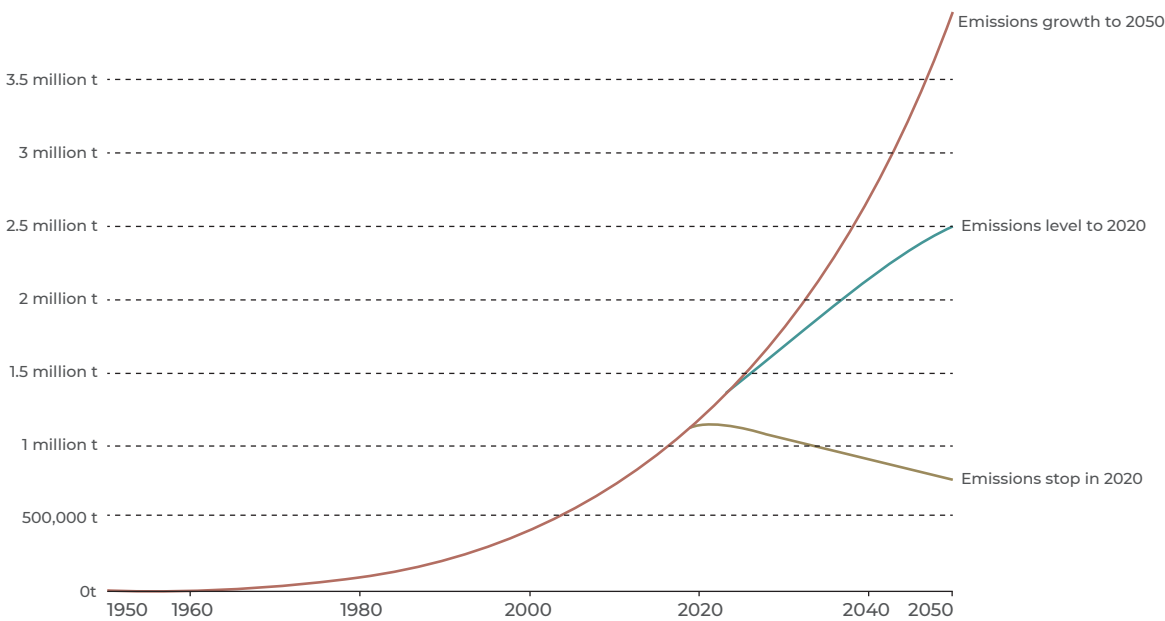


What adds to this problem is the leakage of these plastics into the natural world. The OECD's model shows that 'The annual leakage of macroplastics increases from 19.4 Mt in 2019 to 38.4 Mt in 2060, while the leakage of microplastics doubles, to reach 5.8 Mt in 2060.<sup>26</sup> Sadly, one of the places that plastics end up in is our oceans, as Chart 51 shows, and this story of extraordinary growth of plastics in the ocean will continue if we don't stop it.

Plastics are typical of what we have seen right across the extraction to emissions model. While there are modest modifications of it, like recycling, when the forecast is that by mid-century less than 20% of plastics will be recycled, it is clear that the essential character of the model remains dominant and unsustainable.

**Chart 51: Macroplastics in the surface ocean, 1960 to 2050**

Note: Macroplastics are buoyant plastic materials greater than 0.5 centimetres in diameter. Future global accumulation in the surface ocean is shown under three plastic emissions scenarios: (1) emissions to the oceans stop in 2020; (2) they stagnate at 2020 emission rates; or (3) continue to grow until 2050 in line with historical plastic production rates.  
Source: <https://ourworldindata.org/grapher/macroplastics-in-ocean>. Original Source: Lebreton et al. (2019). A global mass budget for positively buoyant macroplastic debris in the ocean.



**An unsustainable model**

We have seen in this section just how unsustainable the current extraction to emissions model of economic growth is. While, on the one hand, the increase in income we have seen globally since the Second World War is very impressive, it should be very apparent that this is completely environmentally unsustainable for our current levels of income, let alone if all the world were to achieve similar levels of income to those enjoyed in high-income countries today. Not for a moment do I suggest that the solution is for those lower-income countries not to develop further. They equally have the right to higher standards of living. Rather, the model for everyone will have to be different. Before we come to that, we need to consider carefully the second big issue with the current model, which is the way it creates inequality.

## Inequality

The second flaw with our current economic system is that it systematically creates inequality with no mechanism that self-corrects these disparities.

In a world of plenty, perhaps the most ethically egregious form of inequality is that people live and die in absolute poverty. As we observed earlier, this is an area where the world has made great gains. If you consider Chart 52, you can see the progress. At a world level, we have gone from, in 1945, over 50% of the world's population living in absolute poverty to around 10% today. Of course, 10% is still 10% too many, especially given the total levels of income and wealth the world has now achieved.

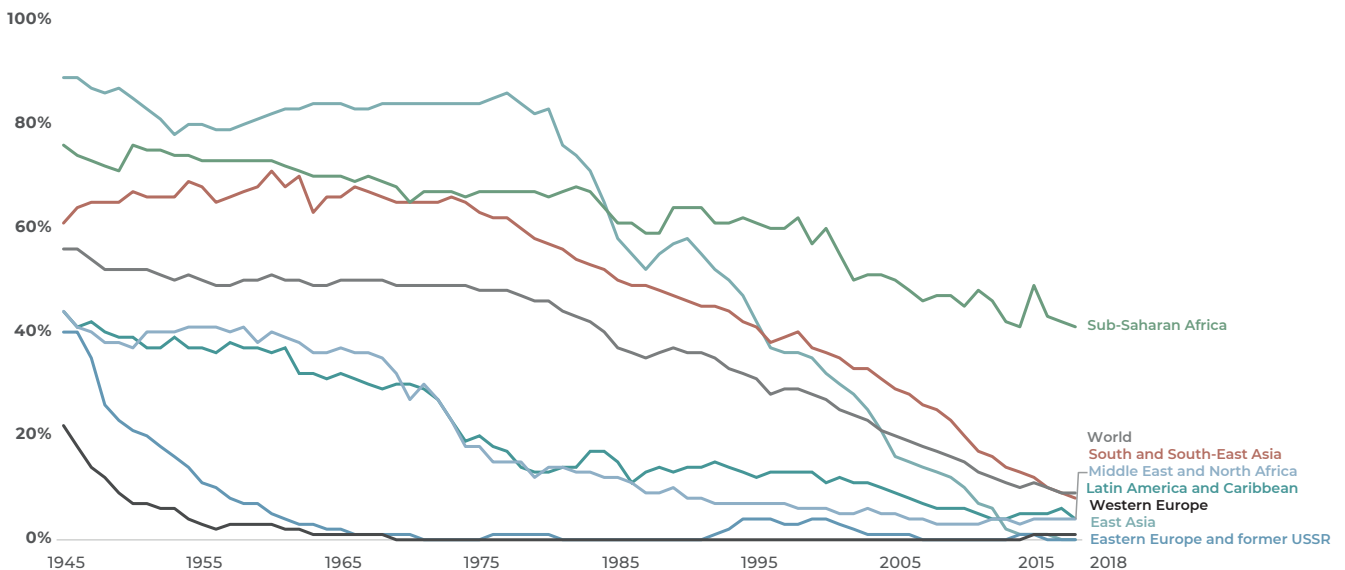
The most extraordinary transformation was in East Asia, where in the early 1980s, over 80% of people still lived in absolute poverty and today it is just a few percent. That is the direct result of China's opening-up to the world and the huge acceleration of economic development in the region in the era of the Revolution of Connectivity. More broadly, you can see that it was during this Revolution of Connectivity that, across the world, the greatest gains were generally made.

Just as East Asia's transformation was impressive and showed that absolute poverty can be driven close to zero, other parts of the world did not fare nearly so well. Once again, global averages can hide serious regional differences, as we will see with other aspects of inequality. Of particular concern is Sub-Saharan Africa, where while absolute poverty has fallen, it is only very modestly below where the world average was back in 1945.

Absolute poverty, or earning less than \$2.15 a day, still represents a very precarious existence where the chance of people fulfilling their potential is extremely low. If we look at the next poverty threshold, which we can see in Chart 53, the number of people in this cohort has been falling as well. You can see that the percentage of people on \$3.65 a day fell dramatically over this almost 30-year period, from over 50% to just above 20%. There were still very real gains being made up to about \$10 a day. After that the gains are marginal.

**Chart 52: Share of population living in extreme poverty, 1945 to 2018**

Note: Data after 1981 relates to household income or expenditure surveys collated by the World Bank; before 1981 it is based on historical reconstructions of GDP per capita and inequality data. Data is measured in international \$ at 2011 prices  
 Source: Moatsos (2021) Share of population living in extreme poverty, 1945 to 2018 (ourworldindata.org)



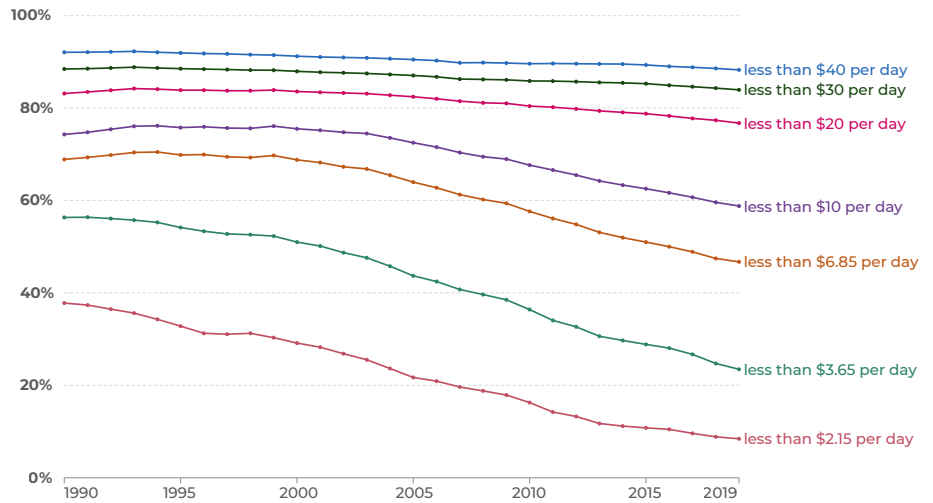
**Chart 53: Share in poverty relative to different poverty thresholds, World, 1990 to 2019**

This data is adjusted for inflation and for differences in the cost of living between countries.

Note: This data is expressed in international dollars<sup>1</sup> at 2017 prices. Depending on the country and year, it relates to income measured after taxes and benefits, or to consumption, per capita<sup>2</sup>.  
Data source: World Bank Poverty and Inequality Platform (2022) OurWorldInData.org/poverty

1. The international dollar is a hypothetical currency that is used to make meaningful comparisons of monetary indicators of living standards. Figures expressed in international dollars are adjusted for inflation within countries over time, and for differences in the cost of living between countries. The goal of such adjustments is to provide a unit whose purchasing power is held fixed over time and across countries, such that one international dollar can buy the same quantity and quality of goods and services no matter where or when it is spent.

2. 'Per capita' here means that each person (including children) is attributed an equal share of the total income received by all members of their household.



If the gains start to get marginal at about \$10 a day, which isn't a large amount of money at all, who did the rest of the massive income gains go to that the world made in the postwar period? We can see the power of the modern global economy to lift people out of absolute poverty. The question is, why can't it do more for more people? That is where the inequality issue arises.

When I consider inequality there are a number of important distinctions, which are widely used, that I will organise the rest of the discussion around.

The first distinction relates to who the inequality is between. I will consider inequality between countries, between people within countries and between places within countries. The way our current model works, the patterns of inequality differ, so inequality between countries could decrease, as it has done, while inequality between people within those countries increases.

The second distinction relates to what the inequality is between. Largely, I have focused on income in the discussions so far and income inequality is one important lens. The other I will consider is wealth inequality.

Wealth inequality is particularly important because it persists through time, and because wealth generates its own income that adds further to someone's stock of wealth, it can also accelerate inequalities.

Inequality in all of these dimensions is impacted by our current model.

### Inequality between countries

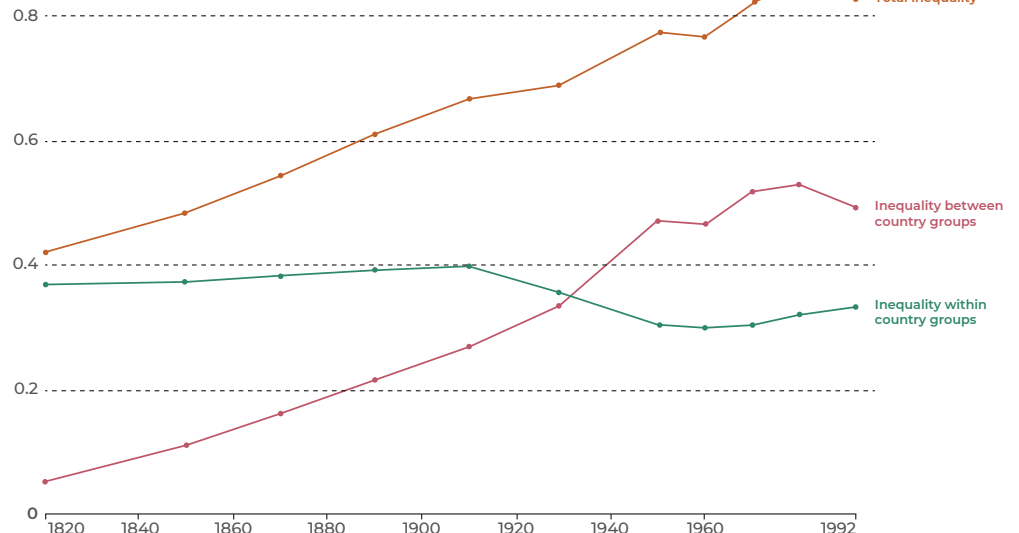
Until recently the positive story was that since the 1980s inequality between countries was narrowing. We can see this story in Chart 54. The latest UN Sustainable Development Goal report, where Goal 10 is a reduction in inequality between and within countries, records that between 2013 and 2017 inequality between countries fell an average of 3.8%.

The reason inequality has reduced between countries is the result of a phenomenon we have already observed, which is that the less developed countries have higher productivity rates than the more developed countries. These higher productivity rates will drive higher income per capita.

**Chart 54: Global inequality between world citizens and its components, 1820 to 1992**

Source: <https://ourworldindata.org/grapher/global-inequality-between-world-citizens-and-its-components?time=1820.latest>

Data source: Inequality Among World Citizens - Bourguignon and Morrisson (2002)



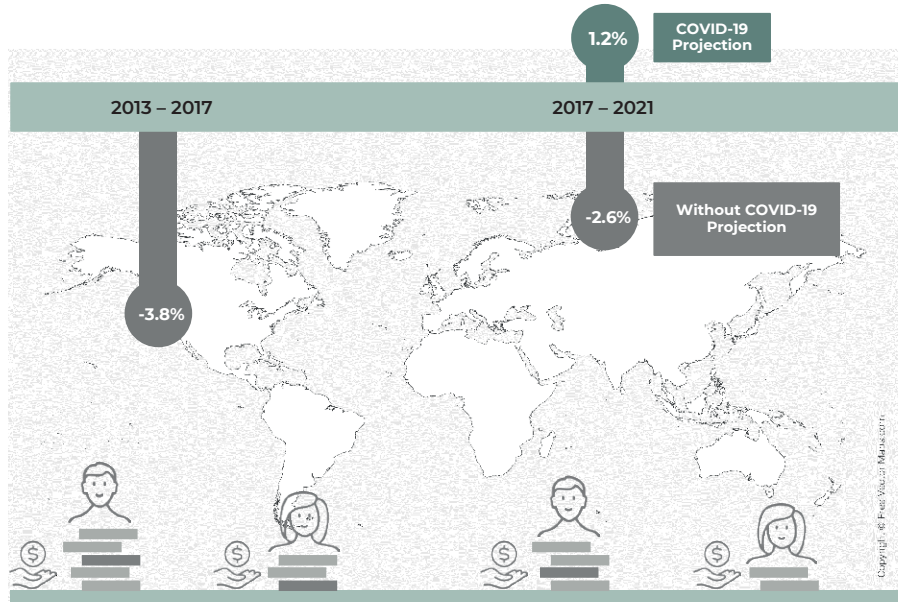


While productivity rates for all countries continue to slow, they are still on average higher for the less developed countries, so the gap should in theory continue to shrink until their productivity rates equalise. I say 'in theory' because major disruptions like pandemics, wars and natural disasters can change that picture. We have already seen that with COVID. If it hadn't been for COVID, inequality between countries would have fallen another 2.6%. However, the impact of COVID has seen an actual increase of 1.2% since 2019, Chart 55.

In the next section I will set out why we can expect these sorts of disruptions to be more frequent and severe. We don't know whether that will permanently stall the reduction in inequality between countries but at a minimum it will slow down any closing of the gap.

**Chart 55: Change in between-country income inequality (2013 to 2021)**

Source: <https://unstats.un.org/sdgs/report/2022/Goal-10/>

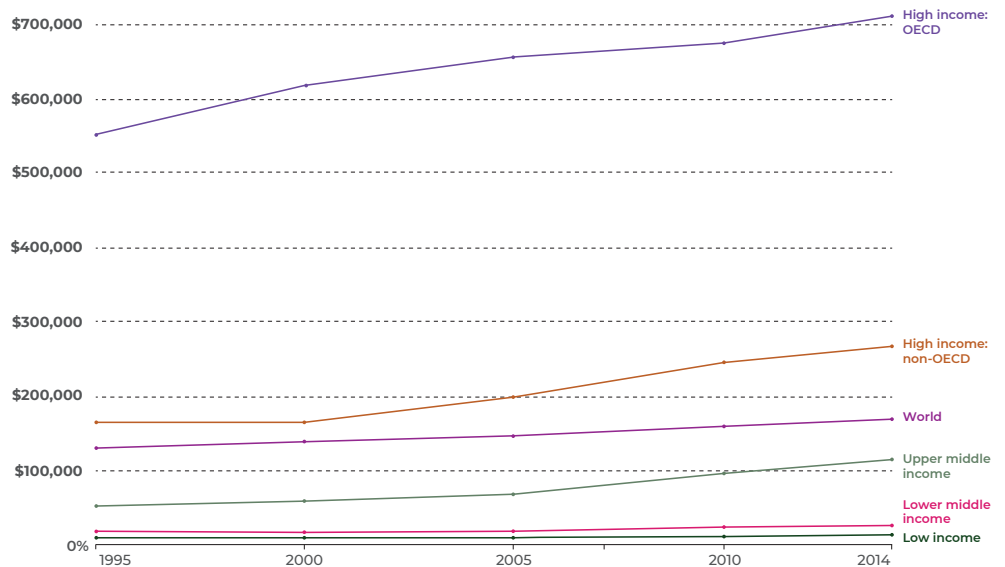


While there is uncertainty about whether the income inequality gap between countries will decrease we do know wealth inequality is growing. In Chart 56 you can see that the wealth of high and higher middle-income countries continues to grow, but what has barely moved is lower-middle income and low-income countries.

Essentially, we see those countries that already have significant stocks of wealth benefit from the compounding returns of those investments versus those who started with far less. This effect is much more pronounced when we look at inequality between people and we will now explore it in more detail in that context.

**Chart 56: Total wealth per capita, by income groups, 1995 to 2014**

Note: Total wealth is calculated by the World Bank as the sum of natural capital, produced capital, human capital, and net foreign assets. Source: <https://ourworldindata.org/grapher/total-wealth-per-capita-by-income-groups-in-2014-us-dollars>



### Inequality between people: Income inequality

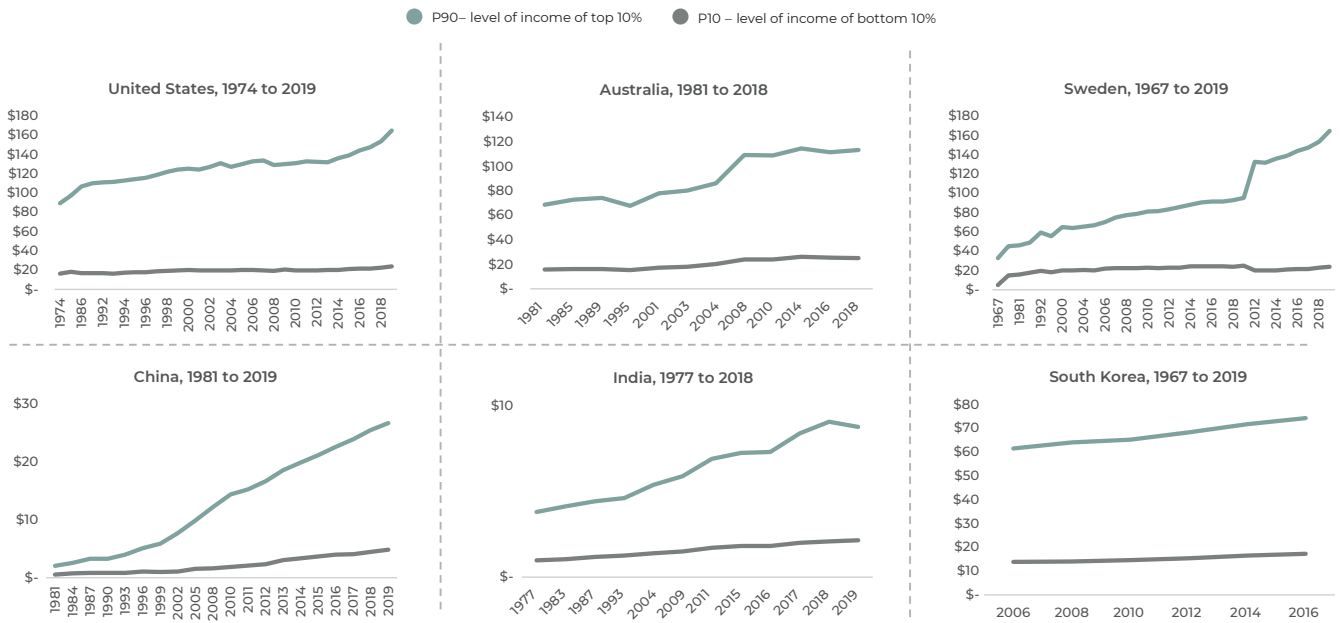
When it comes to inequality between people within a country, it is growing around the world. While the gaps between rich and poor are expanding at different rates, that the gaps are widening is a remarkably consistent pattern. Chart 57, which shows how the income of the highest-earning 10% of the population has increased

faster than then the bottom 10%, provides a useful snapshot of what is occurring.

If we look at wealthy non-European countries, like the United States and Australia, we see the gaps growing. If we look at European countries or even specifically at Scandinavian countries famed for their focus on equality like Sweden, we see inequality growing.

**Chart 57: Level of income per day in select countries top 10% of the population against the bottom 10%**

Source: World Bank Poverty and Inequality Platform

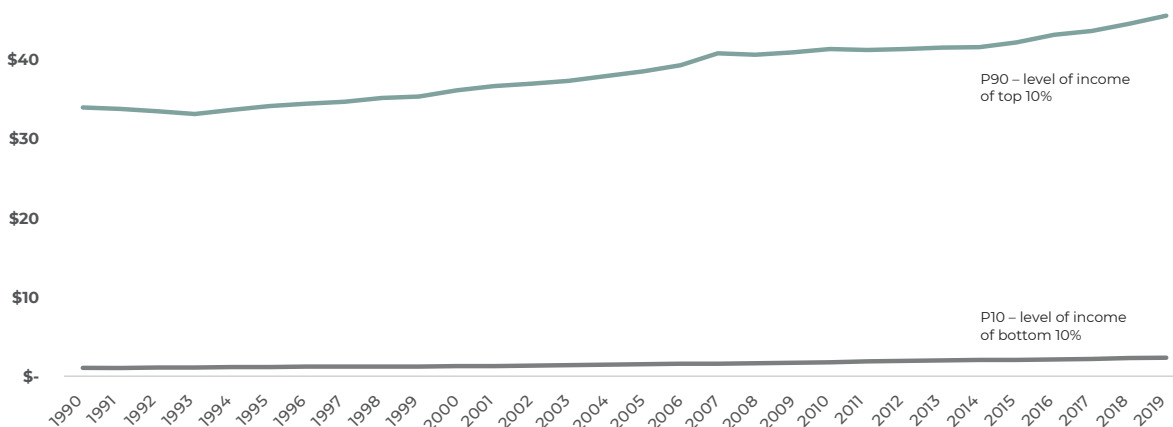


In large developing countries, like India and China, we see it growing very rapidly and in the Asian tigers, like South Korea, it is growing. Just about wherever you look it is growing.

That is why when we see the global aggregation of these changes in Chart 58 we can see that, on average, around the world income inequality is growing.

**Chart 58: Level of income in global top 10% of the population against the bottom 10%, 1990 to 2019**

Note: This data is measured in international \$ at 2017 prices. Depending on the country and year, it relates to either disposable income or consumption per capita. Source: World Bank Poverty and Inequality Platform

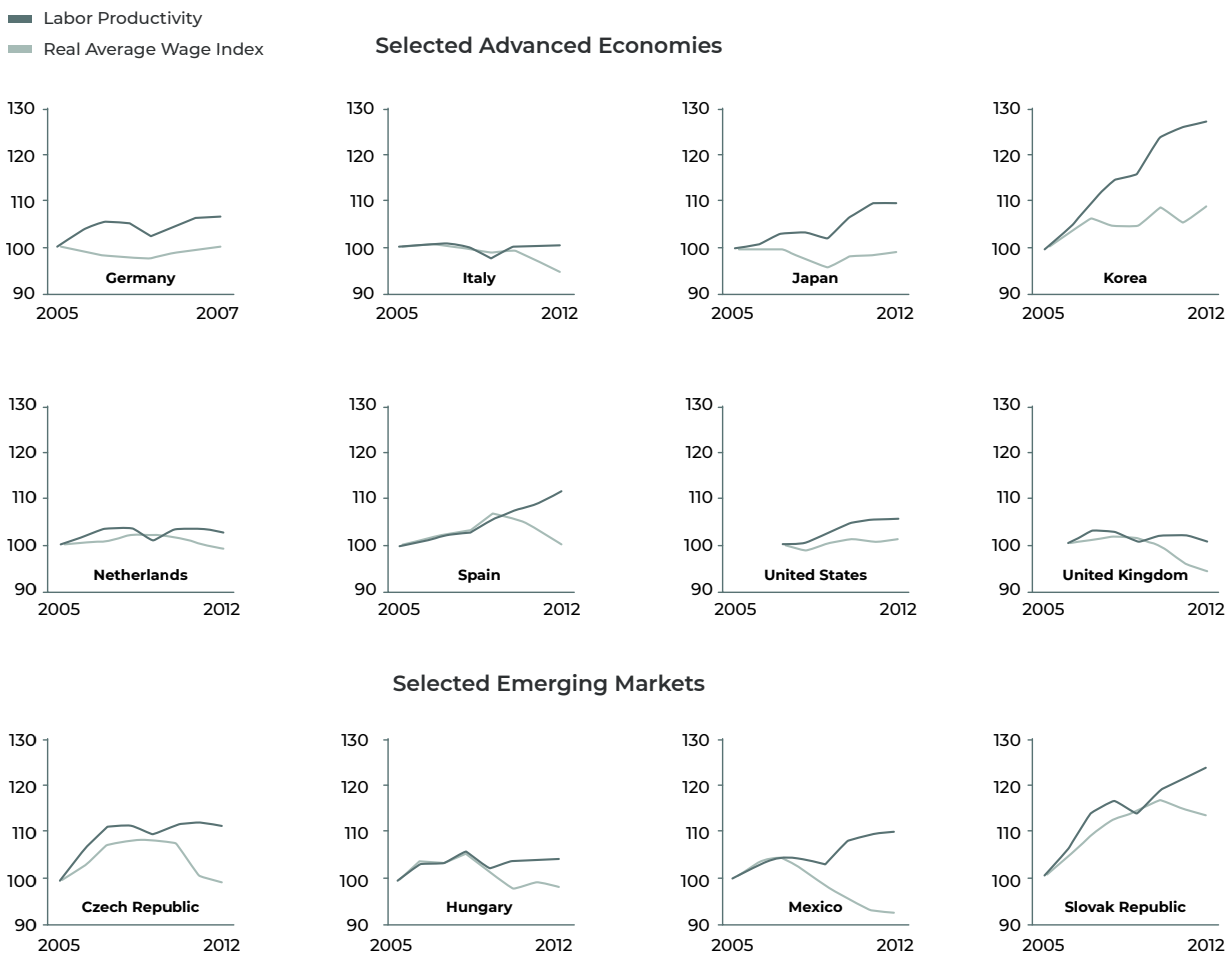


Why is this happening? Earlier on, I explained that it was through improvements in productivity per capita that we made gains in wealth and that over time we have seen a pattern of those gains being shared at least in part with the workers who generated them, so that average real wages increase. Since the end of the Tailwind Years, that relationship has started to break down. The International Monetary Fund (IMF) has provided very clear data around this problem. When even institutions who played formative roles in the creation of the current model name the problem, you know we have serious issues.

In Chart 59, you can see for a whole series of different countries in Europe, Asia and North America the disconnect, with productivity increasing but real wages falling or staying flat, or at best increasing at a much lower rate.

**Chart 59: Select country's labour productivity in relationship with real average wage index**

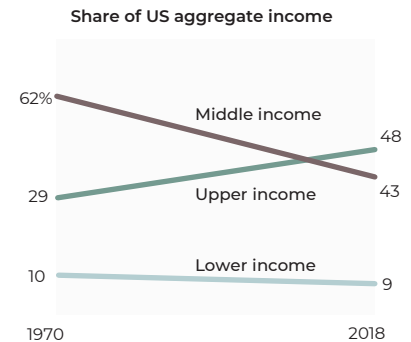
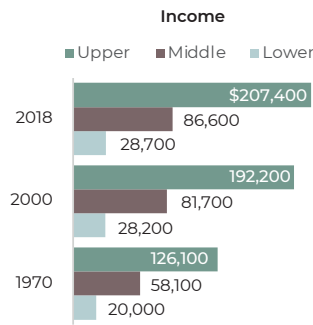
Note: Earnings reflect gross remuneration—in cash and in kind—paid to employees deflated by the consumer price index. Labor productivity represents real output per hours worked. Source: Era Dabla Norris, Kalpana Kochhar, Frantisek Ricka, Nujin Suphaphiphat, and Evridiki Tsounta, Causes and Consequences of Global Inequality, IMF Staff Discussion Note, International Monetary Fund, Paris, 2015, p.14



The group most impacted by this fall in real wages has been the middle class. It is a pattern we have seen right across the world but nowhere is it more obvious than in the United States. The picture in Chart 60 shows this clearly. You can see that the share of income generated in the United States that goes to middle income earners has fallen from 62% to 43% between 1970 and 2018, but the share that goes to those in the upper income band has gone from 28% to nearly 50%.

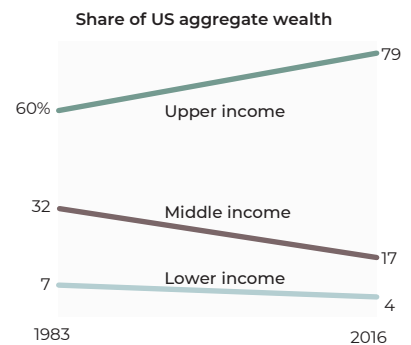
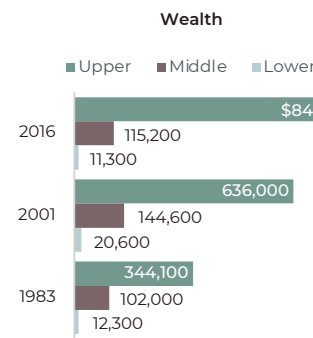
**Chart 60: The United States median household income and share of aggregate household income by income tier, 2018**

Note: Households are assigned to income tiers based on their size-adjusted income. Incomes are scaled to reflect a three-person household. Revisions to the Current Population Survey affect the comparison of income data from 2014 onwards. See Methodology for details. Source: Pew Research Center analysis of the Current Population Survey, Annual Social and Economic Supplements (IPUMS). "Most Americans Say There is Too Much Economic Inequality in the U.S., but Fewer Than Half Call It a Top Priority".



**Chart 61: The United States median family wealth and share of aggregate family wealth by income tier, 2018**

Note: Families are assigned to income tiers based on their size-adjusted income. Source: Pew Research Center analysis of the Survey of Consumer Finances. "Most Americans Say There is Too Much Economic Inequality in the U.S., but Fewer Than Half Call It a Top Priority".



Why aren't the productivity gains being shared? A range of forces are working together to cause this issue. While there is still debate about the relative contribution of these different forces, there is broad consensus that the ones I will step through all play a role.

**Trade and finance**

While we have seen that there are very real gains from trade, there are also problematic side effects. What has particularly troubled the developed world is that as less skilled work has migrated from higher wage, developed countries to lower wage, developing countries, there has been a decline in middle-class jobs, especially in manufacturing. When jobs are being lost in the middle-skill band of the economy, if those affected don't have the level of education for the higher skill jobs, they find themselves in lower skill, lower paid and often more casualised roles.

While these workers have contributed to productivity gains at a whole of economy level, they aren't personally participating in that gain. One of the very noticeable and unfair ways in which they miss out is that consumer products may be cheaper because they are now produced in lower income developing countries, but all these developed world workers now have much lower incomes, so these cheaper goods aren't more affordable for them. Indeed, they may be less affordable. This 'downward job mobility' occurs because these workers aren't being re-educated and re-skilled for the higher value jobs that are being created and they haven't and can't move to where these jobs are located. So, whatever nice economic theory there might be about economies rebalancing themselves, the fact is that this requires action by governments and that hasn't happened at the required rate.

Those in the lower income band have seen a slight decrease in the share that they receive. Given that those in the middle and lower income bands are far more numerous, what this tells us is that the benefits from those productivity gains have gone disproportionately to the wealthy (see Chart 61).

It is not just trade that has caused this loss of jobs. What has enabled it in many ways has been the freer flow of financial resources around the world that has come with greater connectivity. An important part of those increased flows has been direct foreign investment, which has played an important role in facilitating the movement of factories from the developed to the developing world.

**Migration**

Like trade, migration can bring a wide range of benefits. We have seen how pivotal it can be to maintaining a healthier age profile when a country's natural population growth is in decline. Migration can lift productivity if it enables countries to import skills that are in short supply.

While migration may provide overall gains for a country, the effects of it are unequally distributed. There are some situations where it can depress wages, when migration of lower skilled workers is high, relative to the number of lower skilled jobs in those countries.

For example, if there is a decline in manufacturing jobs in a city or region and a relatively high number of migrants arrive in those places, it is no surprise that there is downward pressure on wages. Once again, if people don't have the education to move to higher skilled jobs and the ability to move to where those jobs are located, migrants can help maintain a large pool of low-cost labour which contributes to wages staying depressed.

The impact of migration can be negative not just in developed countries but also in developing ones if it drives a 'brain drain' of skilled people or professionals, like doctors and nurses, who are often in very short supply in those countries.



**Technology**

It is well studied that technology eliminates the lower skill part of jobs. In some cases, that leads to elimination of whole jobs but very often it means those jobs evolve to require higher skills and more education. Either way, the trend in the economy towards higher skillset jobs continues and with that development the opportunities for those with higher education levels grow, and shrink for those with lower levels of education. Simultaneously, because technology does, over time, increase productivity, those with the higher levels of education needed to access these more technologically advanced jobs have a greater capacity to share in the productivity gains.

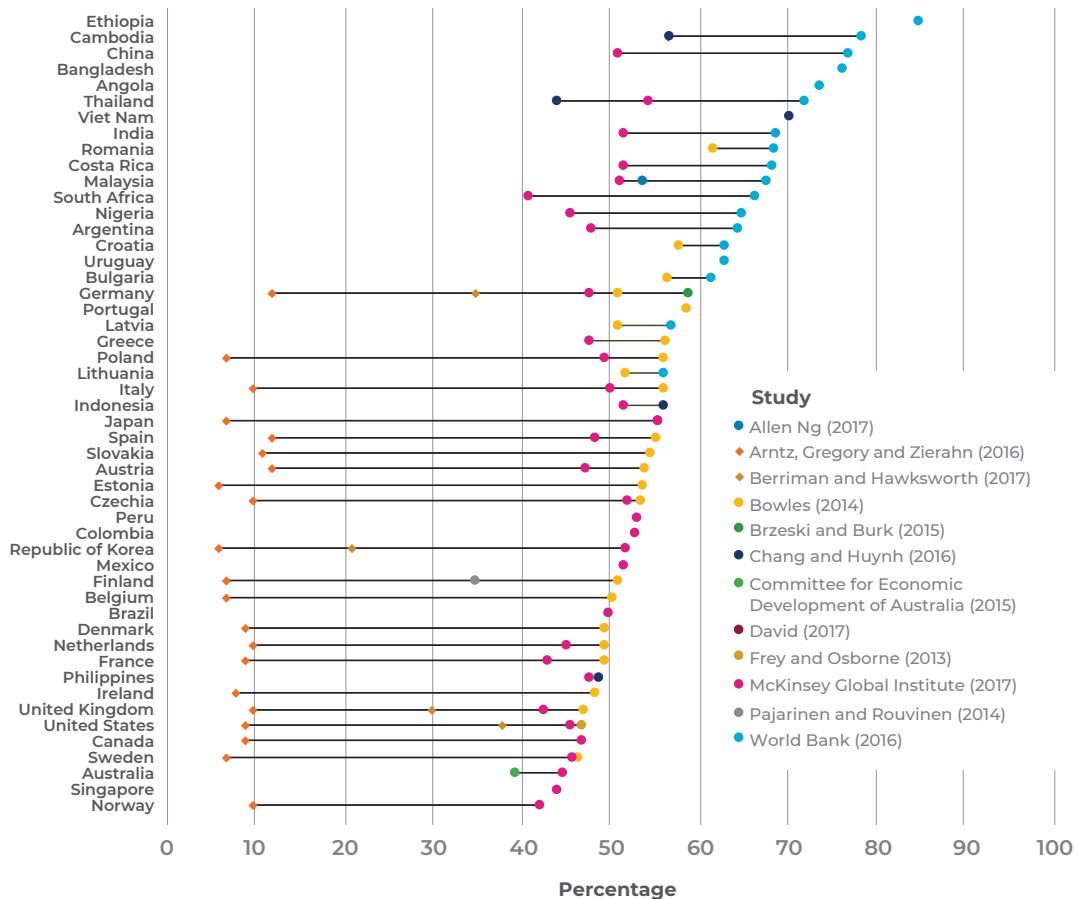
While technology is a standalone force that drives inequality, the more connected the world is, the more technology is able to spread rapidly and with that its capacity to drive inequality in more places increases. The importation of technology into developing countries can also see them import inequality. The workers who do skill up, to participate in the new technologically rich factories, end up earning far more than those who still do unskilled labour in low-technology agricultural jobs.

What we can be sure of is that technology will continue to reshape our economy and with it drive inequality, unless we do something dramatic about it. The UN's World Social Report provides a very helpful summary of a range of the bigger studies on the impact of technology. You can see in Chart 62, countries right around the world will be impacted by technological progress.

The common theme that runs through the impact of trade, migration and technology is the need for those whose work these forces displace to be retrained, educated and supported to move if needed, so they can participate in the benefits that all three forces bring. What we see here is the start of an argument that while a range of actions are needed to tackle inequality, an increase in the access to and quality of education is a particularly powerful lever.

**Chart 62: Estimates of the share of jobs at risk of being lost to automation technologies**

Source: <https://www.un.org/en/desa/world-social-report-2020> page 70. Data Source: Calculations based on various studies.



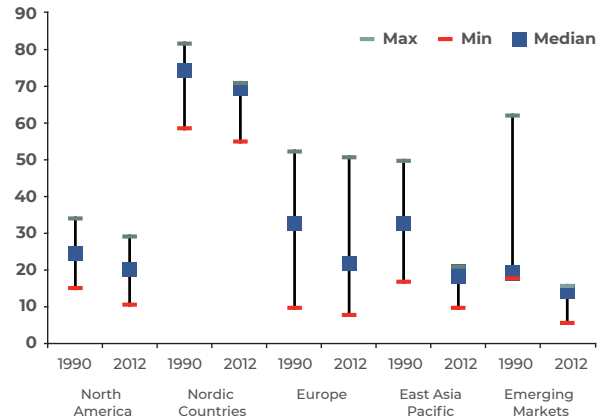
### Decline in unionisation and labour market protections

Education is not everything. An IMF literature review shows that there is good evidence that a decline in unionisation, minimum wage requirements and weakening of labour market protections has contributed to a growth in inequality.<sup>27</sup>

The weakening of all these forces reduces the capacity or power of lower skilled workers to capture a proportionate share of productivity gains in the economy. There are clearly institutional settings that need to be adjusted if labour markets are to distribute the productivity gains made by workers more equitably, Chart 63.

**Chart 63: Union rate by country group, 1990 to 2012**

Source: <https://www.imf.org/external/pubs/ft/sdn/2015/sdn1513.pdf> page 21  
Data sources: Organisation of Economic Co-operation and Development; and IMF staff calculations.



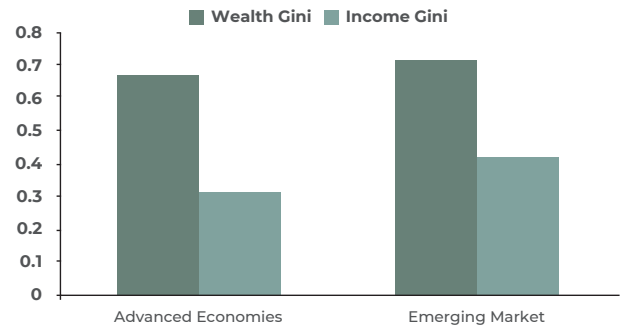
### Inequality between people: Wealth inequality

We have seen how problematic income inequality is, but wealth inequality is far worse and even harder to solve. We can see just how much worse wealth inequality is in Chart 64, which compares it with income inequality. That picture, which was done in 2000, has just continued to get worse. A helpful snapshot of the global trend can be seen very clearly in the Australian data of the change in net worth by income groups in the last decade.

In Chart 65, you can see the net worth of the wealthiest 40% of households increased by about 20%, whereas the wealth of the poorest 20% decreased during this period and those in the middle saw only very modest growth. The bottom line is those who were wealthier got a lot wealthier and those who were not didn't or went backwards.

**Chart 64: Wealth and income inequality in market economies**

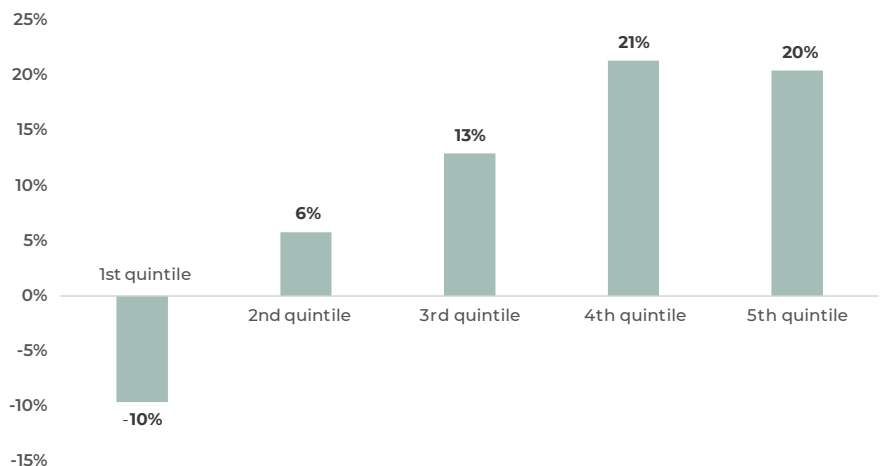
Note: Emerging markets include China, India, Pakistan, Thailand, Türkiye, Argentina, Mexico, Indonesia and Brazil. Source: <https://www.imf.org/external/pubs/ft/sdn/2015/sdn1513.pdf> page 16  
Data sources: Davies and others (2008); Luxembourg Income Study Database; Organisation for Economic and Co-operation and Development; Socio-Economic Database for Latin America and the Caribbean; World Bank; and IMF staff calculations.



**Chart 65: Change in net worth by quintile, 2009-2010 to 2019-2020**

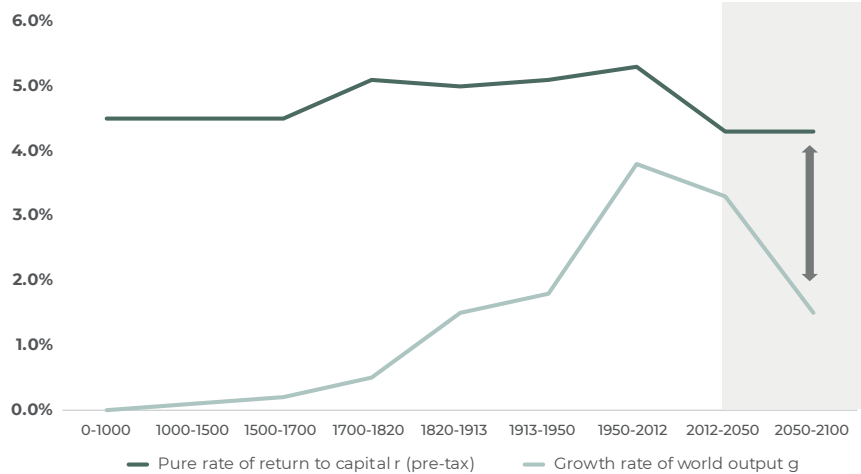
Source: ABS Household Income and Wealth. Underlying data indexed to 2019-2020 dollars based on Consumer Price Index.

In each quintile there are approximately 2 million households



**Chart 66:** Global rate of return in relationship with growth rate, from Antiquity to 2100

Source: piketty.pse.ens.fr/capital2lc; Chancel, L., Piketty, T., Saez, E., Zucman, G. World Inequality Report 2022



Why does this serious problem occur? The French economist Thomas Piketty sought to explain this in his widely influential book *Capital in the Twenty-First Century*, through a very extensive analysis of the available evidence. His overall conclusion was that the rate of return on capital was greater than the rate of economic growth over the long run, see Chart 66. We have seen what drives economic growth in this essay and that sometimes forces help it and sometimes they hinder it. We have also seen that sometimes people benefit from that growth and sometimes they don't. We have seen too that different places and indeed different industries grow faster than others.

The advantage capital has is that you choose where to invest it in the economy and can find those industries, places and businesses in which growth is faster than others. While you won't always be successful and if the whole economy is going backwards, you will make some losses, overall, if you put your money in the industries, businesses and places that are doing better than the economy in general, then your investments will necessarily grow faster than it. Unlike individuals, who can't easily move between industries or places and only slowly between businesses as opportunities change, capital can move fast.

When the opportunities to invest are global, as they largely now are thanks to the Revolution in Connectivity, the advantage is even greater because capital can seek the best opportunities for growth wherever they are in the world and when new opportunities emerge, it can cross borders in ways wage and salary earners never can. What is more, if you get a greater return, you can then reinvest it and your advantage compounds.

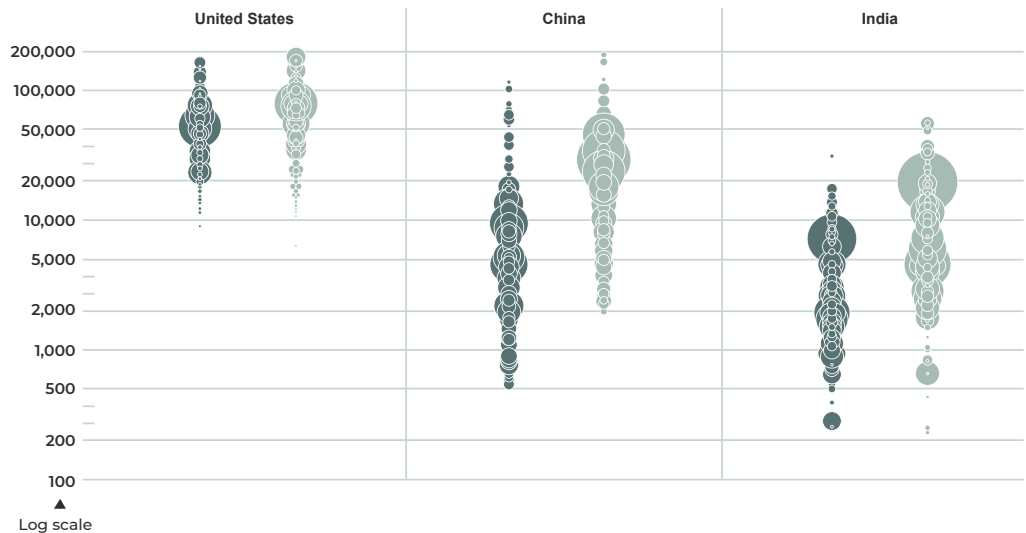
**Inequality between places**

When it comes to inequality, the focus tends to be on differences between countries and people. What that misses is the very place-based nature of much inequality. A recent piece of analysis by McKinsey & Company makes this starkly clear. They broke down GDP per capita to a microregional level, with each region covering about 180,000 people in an average 3,000 square km area, which globally is about 40,000 subregions. So far in this essay we have just been looking at GDP per capita at a country level, so this a dramatic increase in resolution. What it reveals most of all is the disparity between places. Chart 67 below compares the subregions of the United States, China and India. Each of the circles is a microregion. It is a log scale on the vertical axis, so the top regions are exponentially more wealthy than the bottom ones.

**Chart 67:** Microregional GDP per capita by country, 2000 and 2019, \$

Source: <https://www.mckinsey.com/mgi/our-research/pixels-of-progress-introduction>

■ 2000    ■ 2019  
○ Circle size = microregion population



What you can readily see in each of these countries are the massive regional inequalities. In the United States, there are regions where GDP per capita is \$20,000 a year and regions where it is on average 10 times greater per year. What that means if you look across at China and India is that there are whole microregions in those countries that are wealthier than regions in the US. The McKinsey report observes that 'Bao', a district of Shenzhen, for instance, had comparable GDP per capita to Queens, New York, in 2019. Inhabitants of Karaikal in the Union Territory of Puducherry in India, lived on average with a GDP per capita equivalent to that in Pasco, Florida.<sup>28</sup>

When you look at China and India, the regional inequality is actually even more extreme than in the US.

One of the features of this regional inequality is the way in which major highly globally connected cities pull away from small and less globally connected cities and regions. It was another McKinsey & Company report that made this particularly clear. Amongst the world's 3,000 largest cities, they identified 50 which significantly outperformed, in GDP per capita growth, the other 2,950 cities, and another 75 city regions, that while not performing at the level of the top 50, were still doing far better than the rest. These top 50 cities can be found right around the world, from São Paulo and Istanbul to Mumbai and Singapore, along with the global capitals you might expect like New York, London, Tokyo and Beijing. Chart 68 shows just how much they outperform the rest.

What is more, the gap continues to grow. 'Superstar cities . . . [in 2008] had 30 percent higher per capita GDP, relative to their peer cities in the same region and income group. Today that gap is wider; their per capita GDP is 45 percent higher than their peers.'<sup>29</sup>

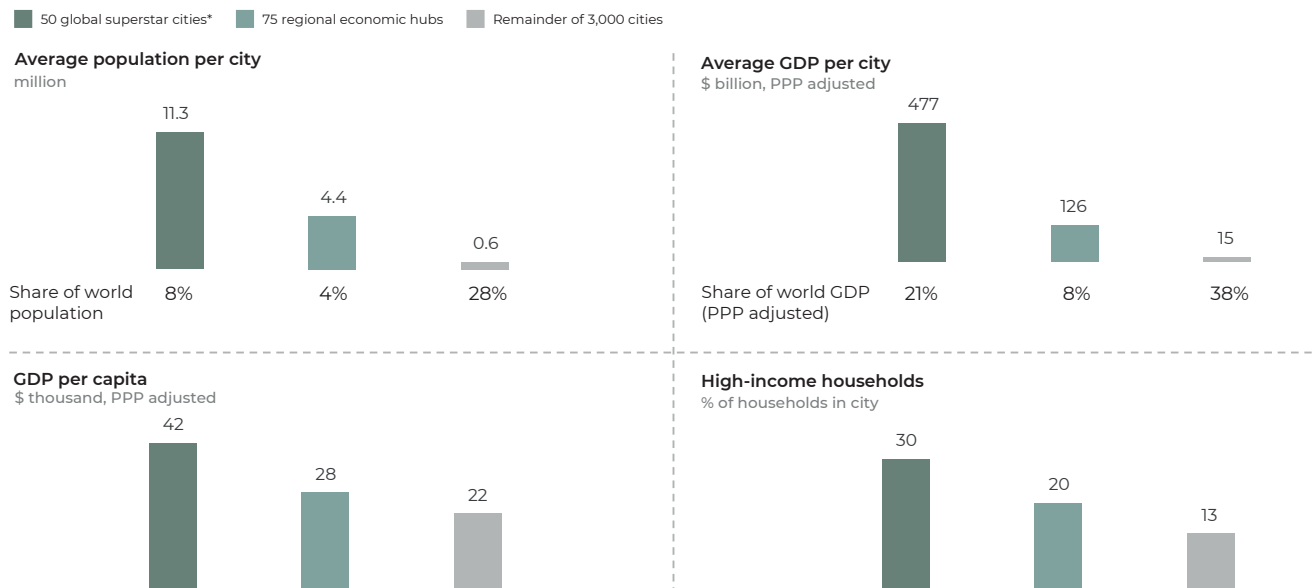
One of the features that sets these cities apart is that they have captured the benefits of global connectivity. They represent 31 of the 50 most globally connected cities, 26 of the world's most highly ranked financial centres and 22 of the world's largest container ports.

An important part of the explanation for why we see these phenomena is what economists call agglomeration economics. This is where the advantages of place multiply. Sometimes, the advantage begins because there was a natural locational upside. A classic example is a city with a port that serves a large inland area. Whatever the cause of the initial and sometimes continuing advantage, as cities grow, they capture the advantage of scale. Where large volumes of goods of any kind are being produced or handled, the costs of doing so are lower. Where the real edge comes in is when they capture the advantage of talent. A larger and more diverse pool of skilled people can make a city more competitive. Where there are multiple people with the skills for a job, it is easier and costs less to find the right person and the chance of optimum fit is much higher. Talent isn't just an individual advantage. Cities with a diverse pool of skilled and creative people who can work together also have a much better chance of developing the sorts of innovative products and services that drive growth. Once you combine all these different sorts of advantage, from location and cost to talent and innovation, a city can acquire a distinctive and hard to replicate productivity advantage. Being highly globally connected enables those cities to use their productivity advantage to attract more investment, trade and talented people, which accelerates the competitive edge they have.

The real challenge for all the smaller places is that they are structurally disadvantaged, which means that the inequalities between the large globally connected competitive cities and smaller cities, towns and regional areas will keep growing.

**Chart 68: Geographic concentration of economic activity of the 3,000 largest cities in the world by population**

\*These cities house 45% of all \$1billion+ firms' headquarters. Source: McKinsey CityScope; McKinsey Global Institute analysis





## Why inequality is both an intrinsic problem but also a serious headwind

The forces that drive inequality have been with us for a long time and well pre-date the Tailwind Years. Some of those forces, like technology, have caused large-scale social upheaval since the industrial revolution. However, the Revolution in Connectivity has seen the forces of trade and migration operate at a different scale and created opportunities for capital to move far more freely around the globe, which has accelerated the inequalities of wealth. While there are forces that can be corrective, like education, there is nothing in the system today that ensures they automatically cut in to rebalance the equation. It is an issue that should be tackled because it points to the intrinsically unfair nature of our global system but also because it is a headwind to progress in itself.

### Intrinsically unfair

The ethics of inequality of our global system is worthy of an essay on its own. The reason to raise it here is that any discussion about inequality needs to begin with ethics not economics. Any economic system is an expression of the values we design it around. When one of its outcomes raises profound values questions, in the way inequality does, we need to return to the foundations and ask whether we have designed the system the right way – ‘right’ in the fullest meaning of the word. Have we designed it not just logically but ethically?

To analyse the ethics of how the system is designed, I still return to John Rawls<sup>30</sup> because he provides clarity on what is ethically problematic about inequality. His basic idea is that when you suffer because of circumstances outside your control it is unfair, whether that suffering comes from the ill-luck of the society and time into which you were born or life events that are no fault of your own, like becoming ill, having an accident, or being caught up in human and natural disaster like a war or flood. We have seen in this essay what a substantial role the big impersonal forces that shape the world play to determine the incomes people earn in different countries and times and how this shapes their living standards and quality of life.

Rawls thought is: if so much of a person’s life circumstance is determined by forces outside their control, then the only fair system is one we would choose if we didn’t know where we would end up in it. What features, he asked, would such a system have if we designed it behind a ‘veil of ignorance’ about the place we would have in that society. We need to ask, would people choose our current system?

We saw in the earlier Chart 53, shown again below as Chart 69, that nearly 80% of people on the planet earn less than \$20 a day and a great many far less than that. If you didn’t know whether you would be one of the 80% or the 20%, it seems implausible to think that people would choose the current system that leads to this sort of income distribution. It seems especially unlikely that most people would think that our current system was a reasonable choice, if instead of the risk of spending their whole life earning a maximum of \$20 a day, there was an alternative system, to see universal health care and disability insurance and the opportunity for people to access all the education they needed to expand their opportunities to earn a greater income, which was funded by additional taxes on the income and wealth of the top few percent. There of course could be many other alternatives people might prefer, but the point is we are unlikely to design the system we have if we don’t know the country and place we will end up in. There is a simple but profound conclusion: we need to design a fairer system.

Although it is not for further exploration here, it is important to highlight we can use the same ethical logic to ask would you choose to live in a system that was rapidly destroying our ecosystems, reducing biodiversity, depleting our renewable resources, harming the natural beauty of the earth and driving a decline in the diversity of human cultures?

### Impedes growth

There has been substantial theoretical and empirical discussion about whether inequality impedes growth. I won’t seek to examine all of that discussion here, but rather I will give attention to a particularly pivotal argument, which brings us back to the relationship between education and inequality. It is the argument Galor and Zeira<sup>31</sup> put forward and many others have built on that inequality leads poorer people to under-invest in their skills and education and therefore to limit their growth. That under-investment could happen either because people need to work to get by instead of studying or to study part-time and so defer the benefit for themselves and the economy of their higher skills. Given that a key role of education is to provide people with opportunity, in an economy being transformed by technology, trade and migration, it is easy to see that if people don’t get up-skilled, then not only do they individually miss out on the opportunities but the potential increases in productivity for the whole economy will be reduced. If we assume this argument holds, then inequality becomes a drag on productivity. That makes inequality not just a headwind in its own right but one that adds scale and reach to other headwinds.

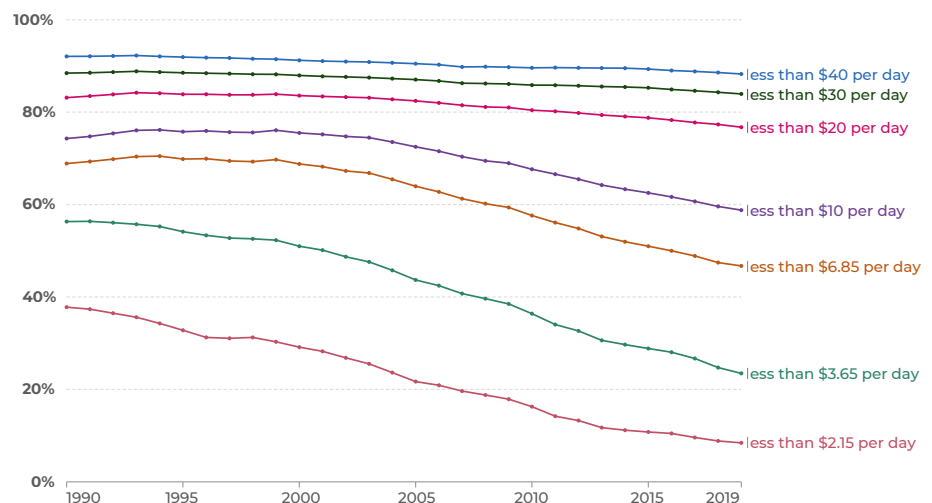
**Chart 69: Share in poverty relative to different poverty thresholds, World, 1990 to 2019**

This data is adjusted for inflation and for differences in the cost of living between countries.

Note: This data is expressed in international dollars<sup>1</sup> at 2017 prices. Depending on the country and year, it relates to income measured after taxes and benefits, or to consumption, per capita.  
Data source: World Bank Poverty and Inequality Platform (2022) OurWorldInData.org/poverty

1. The international dollar is a hypothetical currency that is used to make meaningful comparisons of monetary indicators of living standards. Figures expressed in international dollars are adjusted for inflation within countries over time, and for differences in the cost of living between countries. The goal of such adjustments is to provide a unit whose purchasing power is held fixed over time and across countries, such that one international dollar can buy the same quantity and quality of goods and services no matter where or when it is spent.

2. ‘Per capita’ here means that each person (including children) is attributed an equal share of the total income received by all members of their household.



## Volatility and instability

Pandemics, fires, floods, wars, financial crises, terrorist events – so many of these seem to be causing global disruption. It certainly feels like we are living in more volatile and less settled times. Is it just an unlucky time of more disruptive events, or has something more fundamental changed?

I will argue that during these Headwind Years we will systematically face more such events, be more vulnerable to them and have less resilience. This represents the third serious flaw in the system we have created.

### More events

We have seen in this section that the model that delivered all economic growth has put our climate, ecological and social systems under real pressure and has made them intrinsically less stable. One of the features of all kinds of systems is that they typically maintain a dynamic equilibrium, but when you push them past a certain point, they start to exhibit much wider fluctuations and can then collapse. We have certainly seen a range of examples of both those fluctuations, such as more extreme weather events, but also collapses, for example, in various fish stocks around the world or even in whole ecological areas like the Aral Sea, with many more dangerously close to doing so.<sup>32</sup>

Our climate, ecological, social and geopolitical systems are also not systems on their own. They interact with each other, which can increase the instability. For example, where we see more protracted drought periods and at the same time we are over-consuming both water and soil, the impact of these dry periods is much more severe. Think of the circumstance where these forces saw a major global city like Cape Town nearly run out water or when rivers in Europe ran dry in the summer of 2022. We observed earlier that in many places around the world these sorts of water issues can also be geopolitical ones. If we stay in Africa, consider the international tensions being created by Ethiopia building its Grand Ethiopian Renaissance Dam on the Blue Nile against the protestation of Egypt and Sudan as downstream countries.

While all these systems are interlinked, it is helpful to step through the roles each play in generating disruptive events.





### **Climate change**

Climate change is already with us because of the way our emissions-driven model of economic growth has seen the rapid increase of greenhouse gases in our atmosphere. While the details of particular events get debated, the overall picture is clear: our changing climate contributes to more extreme weather and weather-related events around the world, from floods and cyclones to periods of extreme heat, droughts and wildfires. The changing climate causes increases in both the frequency and severity of these events.

These events, which are highly disruptive in the lives of people and ecosystems, create long-term disruptions as they force both people and species out of the areas in which they have long lived. In wealthy countries, that may mean internal migration out of flood and wildfire zones, but in less-developed countries, the likelihood is that it will put further pressure on unplanned international migration, as people literally seek higher ground and cooler climates.

The changes to ecosystems, especially river systems that traverse international boundaries, and the pressures of climate refugees all add extra instability to the increasingly unstable international order.

Climate challenges readily turn into health events, not just weather events. As areas of the world warm further away from the equator, dangerous tropical diseases, especially mosquito-borne ones, are suddenly creating new public health challenges in regions that never had to face them before.

We have seen the poor progress we have made to reduce greenhouse gas emissions, so if there is not dramatic change to our emissions-driven model of progress, then we can expect the disruption caused by these events to continue to grow.

### **Environmental pressures**

We have seen the pressure on our renewable systems create disruptive events when a system tips, so it no longer functions, whether temporarily or permanently. We see it when rivers run dry, soils blow away, fish stocks collapse and ecosystems and the species within them reach critically endangered status, as they are diminished in scale by the growth of agriculture, forestry and urbanisation. Wherever systems are pressured, disruptions to the ecological functions, which we take for granted, become more likely.

Climate change is an accelerant to many of the ecological pressures directly caused by human activity and, therefore, makes disruptive events more likely. Temperature changes make it harder for some species to survive and easier for others to enter ecosystems they previously didn't inhabit. Whether it is species loss or the arrival of invasive species, the risk of ecosystems not being able to adapt successfully is growing, as the level of environmental stress and rate of change grows. Near where I live, I have witnessed such a change firsthand. Over a very short time, I have watched warming waters fell giant kelp forests and invasive sea urchins, drawn by those warming waters, create underwater barrens. For all the creatures that relied on these majestic forests, it is a crisis as great as any terrestrial forest loss. For the communities of professional and recreational fishers that fished these waters, it has disrupted their lives. While these changes aren't as overnight as a hurricane or a bushfire, in terms of natural and human adaptability, they are happening at a disruptively rapid pace.

The pressures we have put on our ecosystems increase the likelihood of disruption in other important ways. As people have encroached ever-more deeply into some ecosystems, the risk of transmission of zoonotic diseases like COVID-19 continues to grow.

### **Inequality**

We have seen the disproportionate negative impact of global connectivity on the middle class and the substantial inequality that has emerged between places. The place dimension is particularly important because it means that, in representative democracies, the disenfranchisement from inequality can be given not just political but electoral expression. Perhaps the first time we saw the course-of-history-altering consequences of this place-based inequality was with Brexit. Outside of prosperous London, cities and regions that had fallen behind voted to leave the European Union. With middle-class people increasingly finding their worlds going backwards for the first time in the postwar period, there was no longer a majority for whom the system was working and dissatisfied voters had a vehicle to give expression to their disenchantment.

Brexit was followed up by the populist Trump-inspired politics in the United States, where again there is a very clear place-based dimension as cities of labour, displaced by trade, voted against a system that was doing them no favours. In Europe, we have seen the right wing rise in major democracies, like Germany and France, and actually obtain power in Hungary and Italy. In lots of ways, the same forces are playing out in Türkiye and India.

These significant groups of disenfranchised citizens have demonstrated that they can create surprising electoral results. However, the real disruption comes, as we saw in Trump's period as president of the United States, when those populist politics crudely throw into reverse features of the postwar world that have so greatly aided prosperity, like maintenance of an international rules-based order and free trade. At the same time, these politics refuse to face up to critical, pervading problems created by the system, such as climate change and inequality. All this populist politics did was to impede progress and delay action on the unsustainable features of our current world, which in turn further alienated those already disadvantaged by the system. None of this is to say that we don't need action to address the issues created by global free trade, or other problematic features of the system we have identified. What this highlights is that the responses risk being disruptive rather than creative.

More broadly, as a majority of people experience a system that does not work for them, confidence in democracy and the rule of law gets eroded. Over time, as these forces are weakened, that both makes the risk of unexpected political events greater, but it also weakens the necessary foundations for deep reforms that are needed to make the system work again.

### **Strategic competition**

Earlier, we mapped the multiple dimensions of strategic competition. As the intensity of the competition grows, so do the risks that it will take disruptive forms.

There is a wide arc of elevated risk. We have already seen that geographic competition has resulted in the outbreak of war in Europe and before that other illegal annexations by Russia. Conflict threatens in Asia over Taiwan but has already been occurring through all sorts of coercive activities that fall short of outright military conflict in the South China Sea, and where the risks of an incident have grown as a result. Iran, with its desire to reach the threshold of nuclear weapons capability, creates a deep instability because of the existential threat that would pose to Israel and potentially others in the Middle East.

The competition for whose model of the international order prevails is already the cause of disruptions. Trade has been weaponised for strategic purposes. Australia's refusal to accept a series of Chinese propositions about how the world should be viewed and run led to China imposing tariffs and import bans to disrupt a range of Australian industries.

That strategic arm-wrestling is playing out in the world's major trade relationships. China and the United States have already engaged in a series of serious exchanges of trade restrictions, which have survived a change of administration in the United States. This sort of strategic trade competition tends to occur with sudden moves that cause real disruption to the affected industries and the people employed in them.

Beyond strategic competition, the risk of disruptive threats from the breakdown of civil order continues to rise. Earlier we noted that, to date, the largely successful efforts to suppress the terrorist threat have also seen it develop a larger geographic footprint, especially in Africa. There is a real possibility that we will be surprised by it again. Similarly, global organised crime is powerful and can cause serious disruptions especially in the cyber domain. We have created a more hospitable environment for it to flourish, so we should expect more attacks.

### Greater vulnerability

Not only in these Headwind Years are there systemic reasons why there will be more disruptive events, but the development model we have pursued has made us more vulnerable to them. In our discussion of connectivity and trade, you will recall that one of the features of freer trade is that, as businesses and countries pursue their comparative advantage, it leads to greater specialisation.

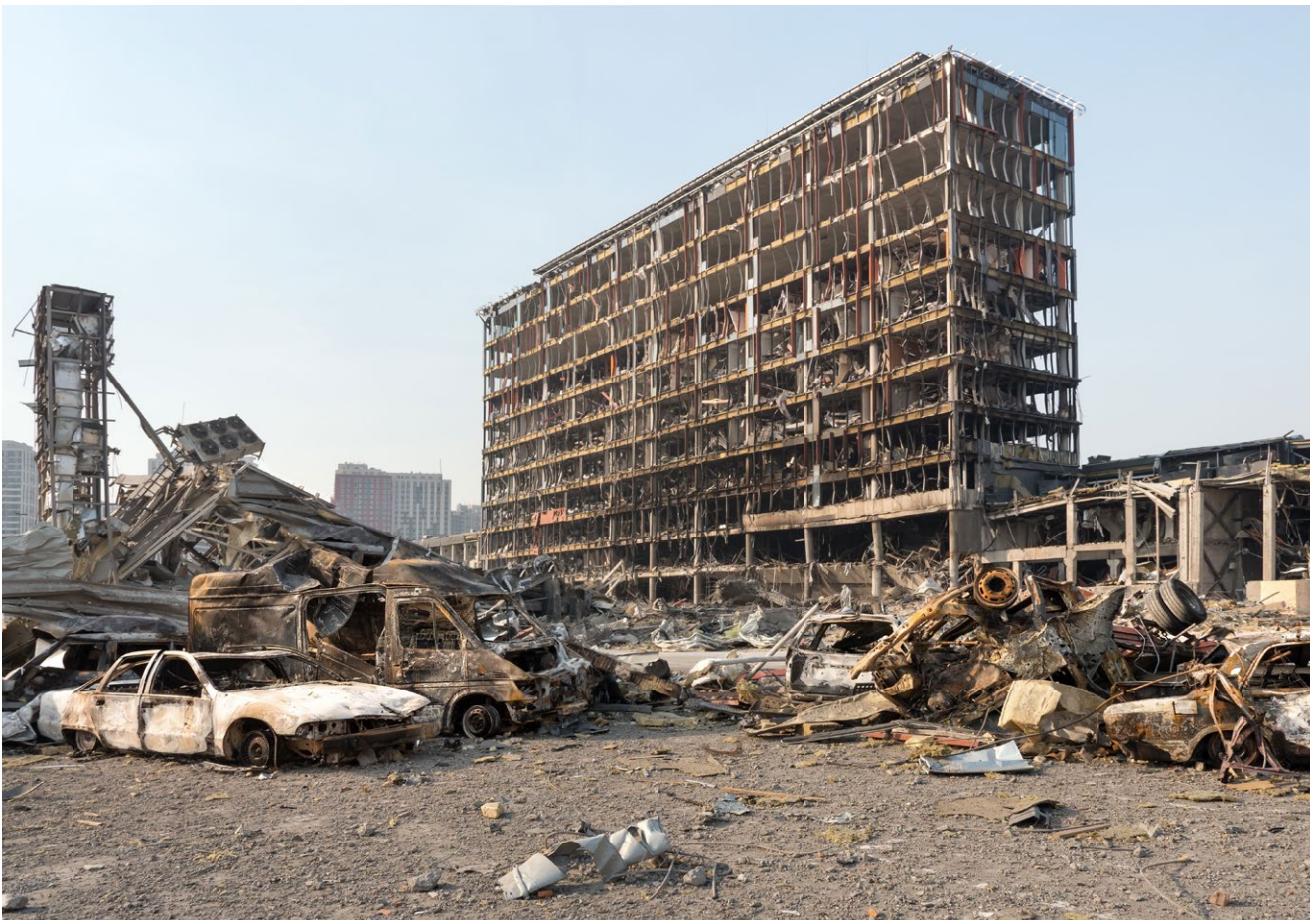
Often those who specialise also grow in scale. As more businesses and countries become more specialised, they also become more dependent on one another. A 2023 McKinsey Global Institute report has mapped these dependencies.<sup>33</sup> The picture is a startling one: 40% of global trade is concentrated, which is defined by a country's economy relying on a maximum of three countries to supply a particular good or resource.

In the Philippines, for example, 80% of its wheat comes from the United States and Australia. Turkey, before the invasion of the Ukraine, relied on the Ukraine and Russia for 90% of its wheat. Or, if we look from the supplier side, just two countries – the United States and Brazil – supply 90% of the world's soybeans.

The areas where this concentration is greatest are in agriculture and minerals. In the minerals world, 50% of the value of all traded minerals are produced by just three countries. There are also manufactured products that require highly specialised technology and skills, like silicone chip manufacture, where the production is also very concentrated. A feature of these concentrated sectors is that they provide fundamental inputs to both societies and economies. That means if disruption occurs in one of these places, as we saw with the Ukraine, one of the world's largest agricultural producers, then the disruption propagates widely and has a major impact not least because there are few alternative suppliers.

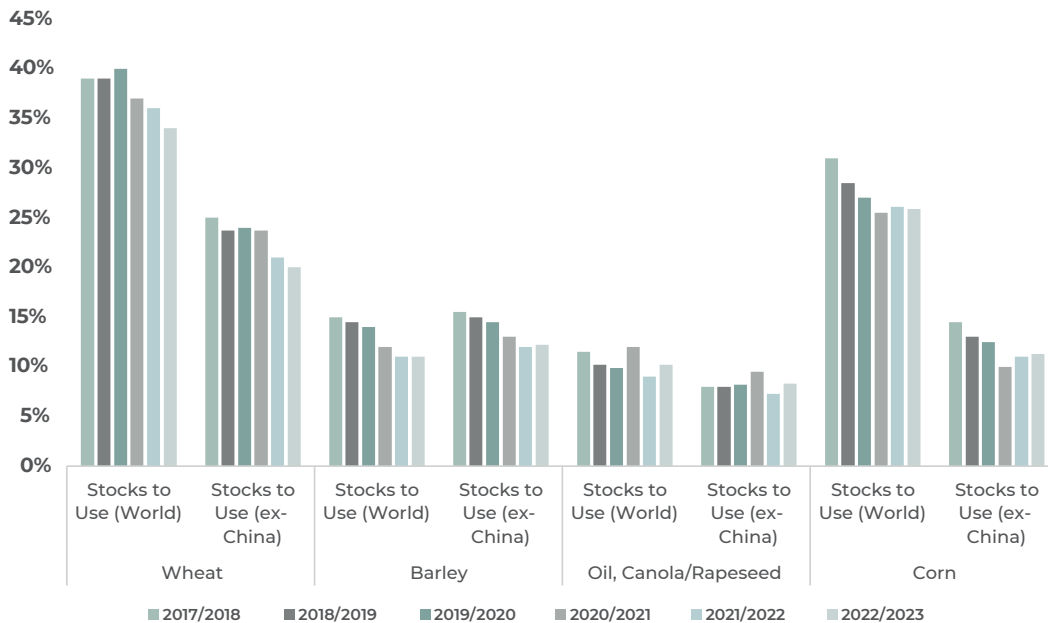
It is smaller economies that are more vulnerable than larger ones, with smaller economies 50% more concentrated than the larger ones, yet another feature of the global inequalities of the current system.

With these sorts of concentrated trade relationships, we are more vulnerable to the types of disruption I have just mapped. In recent years, we have seen war interrupt global food production, a pandemic from a zoonotic disease disrupt many supply chains, drought in Taiwan in 2021 disrupt silicone chip production, and in the same year in a particularly ironic twist, floods derail coal production in Australia.



**Chart 70: Global grains stock-to-use ratios**

Source: ANZ AGRI INFOCUS, Commodity Insights, 2022; USDA (<https://www.anz.com.au/content/dam/anzcomau/pdf/commodity-insights-april-2022.pdf>)



What makes these sorts of disruptions even greater is the way commercial imperatives have reduced the stock buffers that can cushion them. For a corporation to hold stockpiles is expensive because it effectively ties up their capital in assets from which they aren't making money. The result is they have strong incentives to keep stockpiles as low as they can. The reason that these imperatives are very strong in the global trading system is that two-thirds of global exports come via multinationals.<sup>34</sup> A good illustration where we can see this play out is in global food production. In Chart 70, you can see the way the world's big food companies reduced their stockpiles. When the Ukraine crisis arrived, there wasn't much buffer left.

Overall, the picture we have is that the globally connected world we have created has seen efficiency increase vulnerability.

**Less resilient**

The fact that our model has made us more vulnerable to disruptive events is problem enough, but the headwinds we face have also made us less resilient.

On the demographic front in the developing world, as the dependency ratio rises, we have increasingly vulnerable populations. Where the disruptions are to health, such as from heatwaves caused by climate change and from disease, we have proportionately more people at greater risk.

Where the disruptions are economic, older dependent people have less capacity to respond. In the developing world, we have a rapidly growing population of people on lower incomes whose lives can be severely disrupted. As we saw earlier, the disruption of COVID-19 was great enough to reverse the trend of decreasing inequality between countries because of its impact in these lower income nations.

When we turn to productivity, the challenge is that lower productivity rates mean that countries now have less capacity to spend to address the issues or crisis that they face, because it will take a lot longer to earn the surpluses needed to pay back what they spent in the crisis.

What adds to the challenge is that these disruptions are a drag on productivity themselves. The recent World Bank analysis of global productivity calculated that in the developing world, natural disasters, 70% of which were climate-related, reduced countries' productivity growth by 0.2% between 1981 and 2015;<sup>35</sup> and on the health-front, 'the swine flu (2009-10) pandemic, SARS (severe acute respiratory syndrome, 2002-03), MERS (Middle-East respiratory syndrome, 2012), Ebola (2014-15) and Zika (2015-16)... left lasting scars on labour productivity and output by 4% cumulatively after three years'.<sup>36</sup>



## An unsustainable and unstable system

In this section, I have argued that the era we have entered is not just one where we face serious headwinds from demographics, growing resource scarcity, declining productivity and fracturing global connectivity, but where we have to face the reality that the model that created the progress in the postwar era is profoundly unsustainable and unstable.

The further we push on with the current model, the more it will push back against us and become even less stable. If we don't change the model, the system will break. The nature of systems that are unsustainable is that they can collapse at some point.

The issue is that the time between when it looks like the system is still working and when it collapses can be very short indeed. We are at a point of choice. The need to build a truly sustainable system is urgent and it is that question to which we will now turn.



Image courtesy of Christopher Traill, AAP, IMAS.

# **Part 2.**

**How to Create a Sustainable, Inclusive,  
Prosperous and More Stable Future**



The futures people want will reflect what they value in life. That is not fundamentally an economic question, although too often in the policy and political world we have seen income and wealth operate as the goal not the means. The role of the economy is to provide the income and wealth to enable people to have the future of their choice.

What we have learnt so far is that the model that got us here doesn't provide a sound or long-term way to provide that wealth and income. It both destroys our environment and leaves a great many people without the income or wealth to choose their future.

At the same time, as we look to make changes to that model, we face challenging headwinds of demography, resource scarcity, declining productivity and weakening connectivity. The changes we make not only need to address the underlying issue of our current model but, to the greatest extent they can, turn these headwinds back into tailwinds.

I will argue in this part that we have just crossed a threshold that is the basis for hope. I will point to a series of big, potent, organising ideas that have just become sufficiently mainstream that if we accelerate their implementation, we may be able to make enough change in time to avoid real catastrophe.



## Objectives

If we want to be clear on where we are going, it is important to be clear on the objectives. The future the world seems to be looking for has four broad qualities to it: it is sustainable, inclusive, prosperous, and stable and resilient. We might argue and debate about just how we characterise them but across at least the wide-middle of politics, most people would subscribe to some version of these objectives.

### Sustainable

What do we mean by sustainable? Basic fairness would suggest one approach – to ask the question our children and grandchildren could ask, 'will you provide us with the same opportunities that you had to live a good life?' Given that a great many of them will still be alive in 2050 and some even beyond 2100, it is a demanding question. If we generalise this argument, we can see the foundation of the broader ethical obligation to create a sustainable system that was so persuasively and enduringly laid out in the 1987 *Report of the World Commission on Environment and Development: Our Common Future*, chaired by Gro Harlem Brundtland – also known as the Brundtland Report.<sup>37</sup>

The report defined sustainable development as:

*Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*<sup>38</sup>

The one qualification we need to ask is, 'what point in time is the reference point for judgements about the present and future?'

Given the sheer damage to the planet's environment and with it the reduction of future generations' ability to meet many of their needs, today isn't an appropriate reference point. For those generations who have benefited from that consumption of the planet, there is, therefore, an obligation to engage in regenerative activity to restore the lost functions of ecosystems, the health of soils, the levels of rivers and aquifers, and to reduce the risk of further biodiversity loss.





While there could be much argument about what is the year to which we should seek to restore the planet's environment, I will put a stake in the ground and say our long-term objective should be as close as possible to the era when the current model took off – in other words, around 1945. That may not be achievable given massive loss of species and habitats, but what was consumed between 1945 and now is what enabled this generation to meet its needs. Whatever date we set, the key point is that regenerative actions need to be integral to our plans for the future.

### Inclusive

Whether you look at it with an ethical lens, a political lens concerned to address the dangers to democracy when people feel excluded, or an economic one based on the lost human potential to create prosperity when people are arbitrarily excluded from the economy, one of our core objectives needs to be inclusion in all its forms.

I prefer to frame this type of objective with the concept of inclusion rather than equality. Inclusion assumes there is diversity and that the task is to enable people in all their diversity to participate fairly in society and the economy. Inclusive is an adjective, which we use when we want to describe the whole way a society and economy works, rather than equality, which is a noun that describes an end state. If we are wanting to point to the ethical nature of an inclusive society, we can certainly call it an equitable one.

### Prosperous

There is a level of income and wealth that people need to prosper, which I take as the capability for a person to pursue a life of their choice, compatible with the capacity for others to make similar choices now and in the future. It is that future which marks it as a concept of sustainable prosperity because it has intrinsic limits to it, governed by what the planet can support on a per capita basis.

Any discussion of prosperity in a world where growth is constrained by the finite limits of the planet and there is substantial inequality within and between countries will require us to tackle the question about the distribution of income and wealth. When you can't simply keep making the pie bigger, we need to find ways to distribute it to enable inclusive and equitable access to it. Equally, any pursuit of prosperity within the limits of the planet needs to focus on productivity. As we have seen, it is greater productivity that provides the opportunity for real increases in people's income, but just as importantly, it enables us to see living standards rise with the use of less resources and energy.

As I will argue at the end of this essay for a truly sustainable future, our very concept of prosperity needs to change from an income and wealth orientated idea to one built upon a broad characterisation of human well-being.

### Stable and resilient

While there will always be uncertainty and disruption in the world, today it is at levels we can't manage well or use creatively. Whether caused by natural or human events, or some combination of them, the sort of disruption that is a real problem is where it derails people's lives in ways that make it difficult or impossible for them to get back on track, causes harm at levels you can't reasonably insure against and makes planning difficult. That is the sort of disruption that creates an unfair world in which forces outside people's control shape their life outcomes. It is the sort of unfairness we talked about earlier in the discussion of inequality. What this means is that by finding systematic ways to reduce this sort of disruption and its impact, we are also making a fairer world.

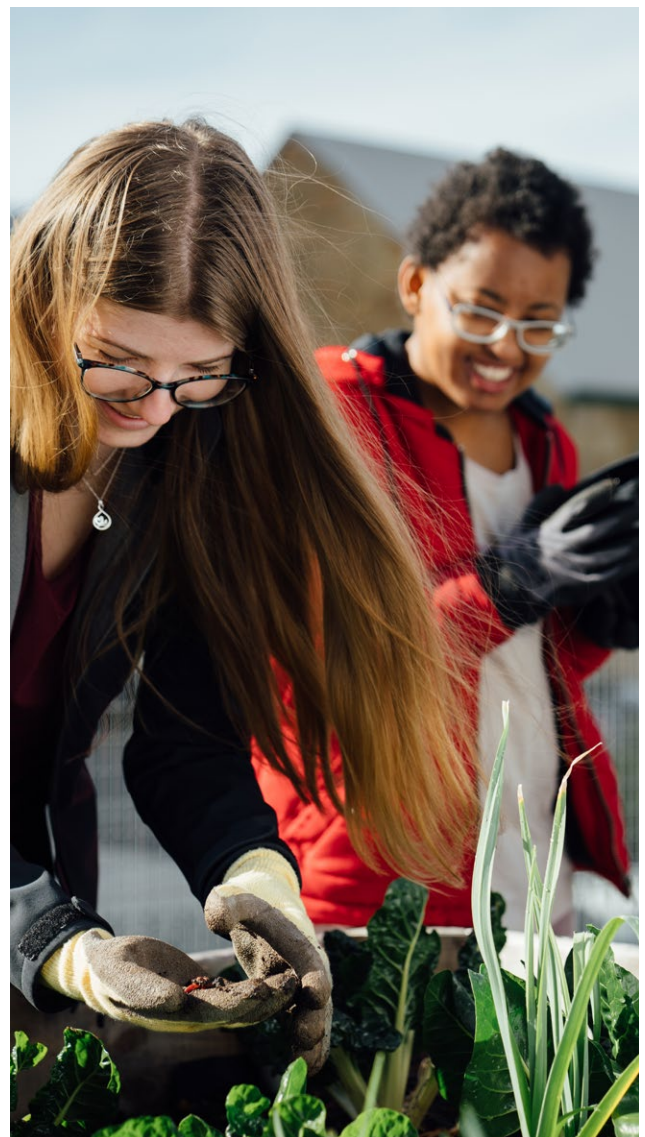
Instability is about both the frequency and magnitude of disruptive events in our natural and human systems. With natural systems, we know that reducing global warming and keeping it within the global climate targets will prevent an increase in

disruptive weather events, from extreme heatwaves to flooding. If we can restore ecosystem functioning, we will reduce the impact of these events because natural systems will be able to better manage extremes, from excess rainfall to prolonged dry periods.

On the human front, stability increases when the causes of international and domestic disruption and the propagation of its consequences decrease.

Given that there will always be instability and that it will take time to reduce both the frequency and magnitude of disruption, increasing resilience will be particularly important. Resilience speaks to our capacity to restore normal functioning quickly enough that the trajectory of individual lives and societies isn't changed, and to do so using a level of resources that doesn't itself cause long-term issues.

In the natural world, that makes restoring ecosystems a high priority because in their undamaged states they are far better at recovering from the very events that they evolved to handle. In the human world, planning and preparedness by public and private organisations and institutions is central. Over the longer term, the level of productivity of a society impacts its resilience because societies with high productivity rates can both afford to invest more resources in resilience measures but also to rebuild lost capacity more quickly.



## Achieving our objectives within a finite system

The singular constraint on these objectives is the finite character of our planetary system. We have seen those ecological boundaries clearly in the discussion of the extractive use of our renewable resources and the damage to them from our emissions.

The biocapacity of the planet has hard limits. We need to live within them to be sustainable. As we will see, that will require fundamental changes to levels and patterns of our consumption of food and other renewable resources.

When it comes to non-renewable materials, theoretically there is still a huge stock of these materials on the planet. However, we have already seen that they are getting ever harder and more costly to extract in economic terms. Without revolutionary new discovery and extraction technologies that lower costs significantly, there seem to be economic limits to the extraction of some minerals starting to come into view. However, those shifting economic boundaries don't address the fundamental issue of what are the environmental limits? Even with improved and lower environmental impact approaches to extracting these materials, the total environmental impact continues to grow as more materials are mined in more places.

For quite a long time now, many countries have set limits on where and how materials can be extracted to protect biodiversity, ecosystem health and human communities. Those levels of protection vary widely, and in some countries they are minimal or practically non-existent. Equally, the international community has set boundaries on where resources can be extracted, notably excluding the entire Antarctic continent from use for mining.

One of the critical tasks of our time is to figure out what those limits should be and how can they be equitably set: countries who have profited from environmentally destructive extraction practices shouldn't be able to profit at the expense of those who haven't. The same kind of issue exists on the emissions side as well, notably with greenhouse gas emissions. This problem of equitably setting environmental limits at a global level, whether on extraction or emissions, when some countries have economically developed using our unsustainable model whereas others haven't, is one of our great practical and ethical challenges.

As we determine what those limits are, distributional questions will become fundamentally important to any equitable or practical answer. To take the obvious case of housing, it is very unlikely that we will have enough non-renewable materials or sustainably sourced renewable materials, like timber, for the whole world to live in houses that have grown to the size that they now are in developed countries like the United States, Canada or Australia.

Those materials will need to be shared, so everyone can access what is required for decent, if modest-sized, housing. This will require government intervention because market solutions will not solve such scarcity issues by price. As it is in the world today, with relative material abundance, world markets have already priced basic building materials beyond the reach of many people's incomes. How we design these redistribution systems is one of the great policy challenges of our era.

Importantly, while ending the extractive model of growth raises some complex questions of how we fairly share those limited resources, it doesn't mean, contrary to what some argue, that there can't be economic growth at all. However, when it comes to the use of materials, that growth can only occur if materials are 'upcycled' (ie used for a more valuable purpose) rather than simply recycled.

For example, when we replace steel in building construction with sustainably sourced timber, that steel is available for higher value purposes like the creation of fine medical instruments. When that 'upcycle' happens we see economic growth occur but within the limits of the planet. Ultimately, of course, there are diminishing

returns on 'upcycling', which only highlights the importance of gains in the quality of life coming from progress that doesn't rely on material consumption.

The one fundamental parameter that over the long run changes the way the finite resources and ecological boundary constraints affect our standard of living, is population size. We still live in a world where we think about economic growth in terms of total growth, whereas what this essay has argued is that what matters is per capita growth because, from the perspective of the individual, that is what counts.

What is of enormous consequence for our objectives to be both sustainable and prosperous is that our total economy could shrink but we could all be better off if our population shrank at a proportionately greater rate than our economy. Put another way, if there were fewer people on the planet, then within the given limits of biosphere and the materials we have available, we could live wealthier lives.

We don't need radical schemes or dystopian fantasies to achieve natural global population decline. As we have seen in the developed world it is happening already. A sufficient level of prosperity has consistently brought about that demographic transition. That means a central task is to enable developed countries to make those transitions successfully, rather than to stoke natural population growth. Equally, it is to help the developing world to cross that prosperity threshold as quickly as possible, so that they also begin the demographic transition to smaller populations. Of course, any other evidence-based measures consistent with the respect of human rights that help to drive population growth down, like investing in girls' education, women's empowerment, men's education, and contraception should be of the highest priority. Even with the best of measures, this task will take some generations, which only adds to the absolute necessity to do all that we can to produce a more sustainable system as fast as we can.



## The tasks to change our finite system in a time of economic headwinds

If we are to create a new economy for our finite planet that is sustainable, inclusive, prosperous, and stable and resilient, and to do so in a time of headwinds, there are six tasks that we have. We need to:

1. Accelerate the decoupling of economic growth and environmental impact;
2. Achieve regeneration at scale;
3. Transition our global population to a level that enables equitably distributed global prosperity within the limits of our planetary system;
4. Create a genuinely inclusive economy;
5. Find new engines for productivity; and
6. Create global resilience without compromising prosperity.

Let's step through each of these tasks in some more detail.

### Accelerate the decoupling of economic growth and environmental impact

To be sustainable, we need to decouple economic growth from environmental impact, both at the extractive end and the emissions end. Even with our current model, countries should be able to grow GDP per capita to some extent without extracting more resources than can be replaced, emitting more greenhouse gases or creating more waste than can be naturally processed.

If you look back at the chart showing the relationship between resource consumption and GDP (Chart 30), shown again at Chart 71, we can see that the relationship between GDP creation and resources consumption varies between countries.

Amongst high-income countries with very similar levels of income, we can see that countries like Japan, Switzerland and Norway consume significantly less resources to achieve their levels of income than do countries like the United States, Canada and Australia. Similarly, when it comes to emissions, Brazil has a slightly

higher GDP per capita than China but generates less than half the greenhouse gases per capita than China does or, at higher income levels, the United Kingdom generates a very similar GDP per capita to South Korea but with less than half the greenhouse gases per capita emissions. It is possible to achieve higher levels of GDP per capita and lower levels of resources consumption and greenhouse gas emissions. That is a modest decoupling. The task is to go much further, so that whatever growth we do achieve does not exceed the natural capacity of the planet either to replace what we have used or to process what we have created but don't or can't use.

While decoupling is critical, we also need to be careful with the concept. It sounds like an attractive pathway to growth, but it doesn't offer the opportunity for limitless growth. To start with, materials are involved in value creation, even in creating many services not just products. In a finite world, growth can't exceed the most efficient use of those materials. Secondly, we run into the second law of thermodynamics, which is while energy and matter are conserved under the first law, their order does decay.

What that means is that, over the long run, materials can't be used in the same way continuously. Thirdly, in practice it is extremely technically challenging to go anywhere close to fully recycling material so that there will be no material loss.

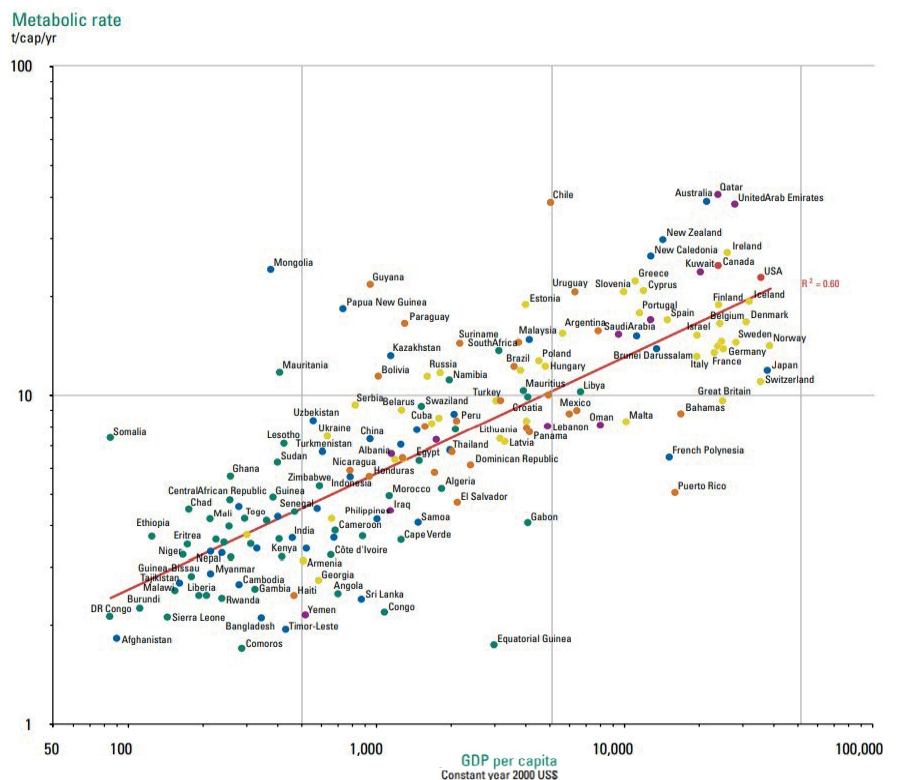
When we come up against these physical limits, the one substantial positive that can push us closer to a more 'circular' use of materials is that when it comes to energy, the earth is not a closed system. Solar energy is a constant and massive input to the planet, whether that comes directly, in the form of sunlight, or through wind it creates by heating the surface of the planet. We can use those inputs of 'extra' energy to work against the decay caused by the second law of thermodynamics.

**Chart 71: National consumption of resources in relationship with GDP per capita, 2011**

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

- Africa
- Asia and Pacific
- Europe
- Latin America and Caribbean
- North America
- West Asia

Metabolic rate is defined as: The consumption by a nation (tonne/capita/year) of Ores & Industrial materials, Fossil Energy Carriers, Construction Minerals, and Biomass.





When it comes to the task of decoupling economic growth from the environment, some of that growth, of course, comes from the direct use of the environment, for example, for agriculture, forestry and fisheries. In these cases, we need to talk about decoupling economic growth from an unsustainable use of the environment.

Whatever the specific form of the decoupling, it will do more than just help create a sustainable economy. Firstly, it will increase global stability in a number of ways. It should decrease the disruption from climate events, reduce geographic competition for resources as a source of global instability and make conflict over water less likely. Secondly, the way we decouple the economy from nature will help us address the headwind of resource scarcity because it will require us to be recycling materials, rather than extracting new ones, and using renewable energy rather than fossil fuels we have extracted.

As this decoupling occurs in a world of finite resources and ecological boundaries then, as we observed a moment ago, the nature of economic growth changes. Central to that change is that it requires the use of materials for more valuable purposes (upcycling) and equally to increase ecological functioning rather than diminishing it. In this sort of sustainably bounded economy, in so far as the policy agenda measures GDP, it always needs to focus on per capita GDP rather than total GDP, so there will be a constant incentive to shrink our population rather than to grow it.

### **Achieve regeneration at scale**

If we are to meet the requirements for sustainability, outlined above, we will need to engage in large-scale regeneration. Even if we didn't have those requirements, we need to engage in regenerative practices to ensure that our ecosystems, from forests and fisheries to freshwater supplies and soils, can provide the renewable resources the planet needs. Regenerative activity will deliver a third benefit through increased stability. As we restore ecosystem functioning it will dampen the impact of otherwise disruptive events. Regrowing tree canopies in urban areas will reduce the impact of a warming climate significantly, and increasing the function of ecosystems in urban catchments will reduce the risks of flooding, to cite just two examples.

### **Transition our global population to a level that enables equitably distributed global prosperity within the limits of our planetary system**

Even when we have decoupled economic growth from harming the natural world and regenerated that world at scale, there will still be a trade-off between the size of the population and the per capita living standards that can be supported within the finite limits of the planet. In the end, there are only so many fish that can be eaten while wild stocks remain stable, and there is only so much land that can be devoted to agriculture or the creation of urban areas while we retain our biodiversity and healthy functioning ecosystems. The more people there are, the fewer fish people can eat, the smaller their houses need to be and the fewer material possessions it will be possible to have. Conversely, with fewer people, the standards of living can rise without impact on the environment.

The material boundary that will set that trade-off will be the answer to the important question identified earlier, as to what is the state to which we should restore the planet if we are to be intergenerationally fair? The further back we go, the tighter the limits will be. There is no right answer to the question of this trade-off between population size and per capita standard of living.

These are debates about different conceptions of the common good that are the essence of good democratic politics. However, right now, with a still rapidly growing global population, we are not in a position of any real choice. Rather, that growing population is putting constant downward pressure on the standard of living that could be equitably experienced around the globe.

### **Create a genuinely inclusive economy**

If we are to overcome both the issues of inequality and the developed world demographic headwind of rapidly rising dependency ratios, then we need to see economic participation increase not decrease. We need to see it not just increase in numbers but in value. We need people to be able to participate in ever more value-adding activities, so that their lives go forwards not backwards, as they have for too many people in the developing world, and too many middle-class people in the developed world.

As we increase inclusion, we will also increase social stability, as people can see the system helps them, their families and communities to flourish and their circumstances to improve.

### **Find new engines for productivity**

We have seen that productivity has stalled around the world, driven by more specialised economies, a fall in manufacturing in developed economies, education levels flattening out and populations ageing. Given that productivity is critical if we are to grow that extra wealth needed for more inclusive prosperity and to fund some of the big transitions like the great decoupling, we need to find new sources of it. Critically, we need those new sources of productivity growth to increasingly focus on the sorts of improvements like upcycling that drive sustainable growth in a finite world.

### **Create global resilience without compromising prosperity**

We have seen the way our global system has created high levels of dependency, specialisation and low levels of buffer stocks, and how this has caused increased instability and volatility. We need to find a way to create a more resilient economy with less instability and volatility. There are a wide range of ways to increase resilience, but many come at the cost of productivity. For example, to reduce dependency on other countries you can erect tariff barriers to protect local industries from lower price foreign competition, to help keep manufacturing or food production local. Similarly, you can provide subsidies to bring production back 'on shore' from other countries. The trade-off is that a country can end up with manufactured goods, food, etc all costing a lot more because they aren't the most efficient producer. If you shift from lower cost imported products to higher cost local products, there will be downward pressure on standards of living and you will make the economy less productive. We need to find smarter ways to achieve that resilience in an age where we need to look for ways to increase productivity not to decrease it. This sort of resilience will help to slow the headwinds fracturing global connectivity because it will reduce the incentive to disengage from international cooperation.



## How we create a better system in challenging times

These tasks are seriously challenging. There are a wide range of ideas and suggestions about how we tackle these sorts of challenges, whether they are framed as I have done or in other ways.

What I will offer are seven ideas, which I will argue can make a real difference, especially when taken together. I don't claim that they are the only ideas or even the best ones. They come as a prompt to say that there are workable ways forward. I would welcome their replacement by even better ideas that would make an even bigger difference sooner.

To select the seven ideas, I have applied a number of tests to help find a set of ideas that would make a difference between now and 2050. I have prioritised making a difference in this limited timeframe because the evidence makes it clear that, unless we are on a very different trajectory by 2050, just on climate change alone we will push our global system to the point of instability where we risk the loss of the capacity for choice about the future of the planet and our place on it.

The first test is whether at the centre of each suggestion is a shift in the organising ideas for our system. In the first of them, you will see the suggestion to shift from a 'linear' conception of how our economy works to a 'circular' one. The reason for the focus on ideas is that one of the lessons of history is that ideas are the most powerful agent for change. If we look back on the 20th century, central to the story of progress were changes in ideas about how to run an economy and society. Through that period, we have considered ideas about economics that substantially shifted policy. The immediate postwar period was shaped by the work of John Maynard Keynes. His ideas that governments needed to play an active role to shape domestic economies sat alongside the ideas of other economists about the international economy, who argued for the gains to be made from freer trade and movement of capital. By the 1970s the ideas landscape started to shift, and building on the work of Friedrich Hayek there was a strong push, especially in the Reagan and Thatcher years, to see the government's role reduced, public entities privatised, markets deregulated and an even stronger free trade and finance agenda. Equally, they prioritised economic development over the environment and resisted attempts to price externalities like pollution, in a further reinforcement of a very linear model of the economy that didn't systematically pay attention to the connection between the economic, natural or social worlds. Although interestingly, by the late 1980s, Thatcher at least saw need for the world to address the issues of climate change, biodiversity loss and damage to the ozone layer – something right-wing thinkers should probably take more note of than they do given her status in their panoply.

For those issues to be addressed properly a shift in ideas is needed again. We need to organise around a new set of ideas like circularity, zero-carbon energy, regeneration and non-GDP based measures of progress. More deeply, we need to shift to an understanding of the world that centres on interdependence, relationality and the way all parts operate within their whole. As with earlier changes, the topography of these ideas is not new. If we think about the last great change, Hayek's ideas emerged and were well articulated by the mid-20th century but took 20 or 30 years before his collaboration with people like influential economist Milton Friedman and his colleagues at the Chicago School saw them reach prominence. Many of the ideas we will consider have had a similar gestation. Now their time has come.

The second test is whether the idea has some maturity to it. Another lesson I take from the history of ideas is that, generally, maturity matters. If, as with Keynes' or Hayek's ideas, they have been tested and a body of allied thinking has grown up around them, there is a much greater likelihood that once their time has come they will get traction and help to shift the world view of their time. You will see that the ideas I will focus on have some longevity to them.

Many of them have been discussed and explored in academic and policy circles for some time around the globe.

The third test is whether the idea has gained sufficient practical traction to support its widespread adoption. The circularity idea, for example, has been around for quite some time. For much of that time, there was real scepticism about whether governments would ever take it seriously enough to start to redesign the economic system around it. Until they did, it was just one of a range of potentially transformative ideas that could help achieve a more sustainable economy. When the European Union and its member states started to build it into key policy instruments, the idea crossed over into one that could make a real difference.

The fourth test is whether the idea complements the other ideas. If we are to shift the system, then the ideas need to work together to address the collective tasks that we face. Some ideas address a number of the tasks simultaneously while others have a more specific focus.

Then, across the portfolio of ideas I have applied two further requirements. First, I have sought to find ideas that collectively meet the tasks identified. Second, to find a set of ideas that address the tasks, both from a societal and individual level. The type of transformation we need requires changes at both levels, so it is important that we think both bottom-up and top-down. As importantly, when problems are societal in scale or global in nature, they can feel disempowering. There can be a sense that there is nothing we can do to make a difference. Highlighting the role that each person can play gives us a sense of personal agency and helps us create a sense that change is possible. That feeling is very important because, in a lot of ways, the issue is not whether we have the solutions but rather whether we can make the changes fast enough?

The concept of this complementary portfolio of organising ideas designed to transform our system so it meets our objectives of a sustainable, inclusive, prosperous and stable world is very much an invitation to add other ideas. At this point in the global discussion and in an essay of this length, which aims to provide a big picture view, each of the ideas is just a sketch and an outline of the idea. Again, sketches of an idea are an invitation for them to be reframed, refined, corrected and built upon.

If we consider the portfolio of ideas, the first three are focused on how we change the transformative process, to create what we need and value, from a fossil fuel driven extraction to emissions model, to one that is sustainable for the long run and restores important lost functioning to nature.

The fourth speaks to the role we can and need to play as individuals to support the transition to a sustainable system, so that our per capita impact on the planet is reduced to a sustainable level.

The fifth focuses on the social changes we need, to enable more inclusive participation in our social and economic system as we transition to a smaller global population where lives are longer.

The sixth idea invites us to think about a more profound shift in terms of what our whole social and economic system is organised around, from GDP-based measures to a much broader concept of well-being.

The final idea doesn't meet the tests I have set out because it is still an emerging field of thought, which is the role indigenous knowledges can play to transform the very thinking that our current model relies upon, so that it becomes a truly sustainable one. I have included it because often the most powerful way to create a new model is to take two existing ones that seem incompatible and figure out a new model that is a synthesis of both.

# Idea 1: Accelerate the creation of a circular economy

A cornerstone to transition our system and turn around the headwinds we face is to accelerate the creation of a circular economy. In this section, I will step through what the circular economy is, why it makes such a difference, and how we can pursue it.

## What is the circular economy?

The idea of the 'circular' economy is to contrast with the sort of 'linear' extraction to emissions economy that we currently have. In various forms, it is an idea that has been around for a while. Chart 72 provides a conceptual picture of probably the most influential account of what is meant by the circular economy. It comes from the Ellen MacArthur Foundation who have been thought leaders and champions of this idea.<sup>39</sup>

You can see it identifies that we have to address both non-renewable materials and what should be renewable products, like those from agriculture and forestry.

The chart then maps the way non-renewable materials are maintained in continuous use rather than just being discarded. That can occur through their repair so they have longer life, their reuse, their refurbishment and finally, the recycling of the component materials so that they can be made into new products.

An important feature of that recycling and reuse is that materials need to be able to be used for at least as valuable a function as

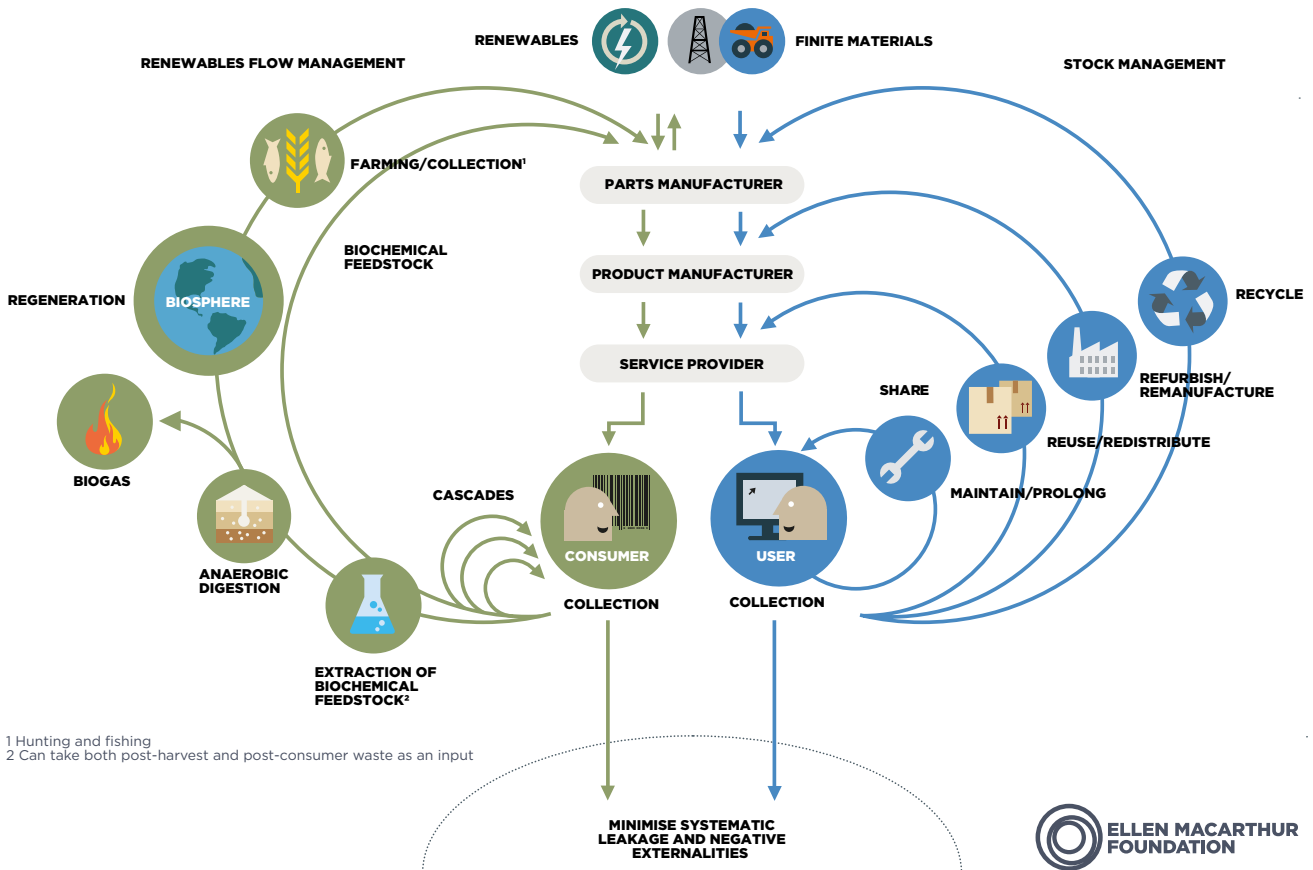
the original use, or it is just a slow-motion extraction to emissions system. So, for example, when we put used plastics into road base this is often seen as progress. But it is not a circular use of those materials. The value they are used for is much lower and they will be nearly impossible to extract from the road base when it comes to the end of its life.

On the renewable side the approach is different. It starts with only taking from wild stocks, like fish and other sources of marine protein, an amount that could be harvested each year. However, before that time there may be an extended period when we need to take a much smaller amount so those stocks can regenerate.

It requires a change in agricultural practices so that soil is not consumed, water is only used in amounts where healthy natural system levels can be maintained, and runoff from agriculture does not disrupt the healthy functioning of the surrounding ecosystems. This version of the picture suggests that the unused materials from the food and forestry industries can be turned into other value-added products including compost, which can be used to restore soil health.

Chart 72: Ellen MacArthur Foundation butterfly diagram

Source: Ellen MacArthur Foundation, Circular economy systems diagram (February 2019) [www.ellenmacarthurfoundation.org](http://www.ellenmacarthurfoundation.org)  
 Drawing based on Braungart & McDonough, Cradle to Cradle (C2C).



1 Hunting and fishing  
 2 Can take both post-harvest and post-consumer waste as an input



There are inputs into this system, which you can see at the top of the chart. One of them is renewable energy. I will address the energy question in more detail in the next section, on the major actions we need to take. It is important to recognise the role of energy because the system in one way isn't completely circular. This is because substantial 'new' energy is required for each step of the process to transform products through their lifecycle. This 'opening' in the circle has the same character as the natural world where the sun continues to provide energy for its functioning.

As we discussed at the start of this section, any circular economy needs to address the question of how much and what kind of material can be within the loop at a given time.

When it comes to the question of how much material we have in the cycle, as we observed that might require us to reduce the total amount of materials we use even today, so that we can live within the ecological boundaries of the planet. Even when we settle on the total amount we can sustainably use, we will need some form of per capita limit so that resources can be fairly shared across the planet. We already do this in various places around the world where we have quotas on what can be taken from the wild, restrictions on the amount of water we can use and limits on what we can emit.

Sustainable circularity will push us to the next level of challenge. We will need to ask hard questions about how to reduce the size and number of all that we consume and use materials in. How do we live with smaller houses and smaller cars? How do we live well with fewer material possessions? These questions are critical for the developed world because as it reduces its footprint it can start to share those materials with the rest of the world. If we cut our average car size by one-third and make them fully circular, then as the old vehicles are recycled, all that steel and other materials will be available to make the equivalent of roughly one-third more vehicles.

Hopefully a good proportion of this material would also be used for making public transport vehicles and not just cars. We could then reduce the total material footprint from transport and ensure that everyone has more equitable access to places requiring transport, along with the many other benefits which public transport provides.

We may also need to change the mix of materials in our system, to enable the operation of a circular economy with a fully renewable energy system. Right now, we know that for the transition to the use of renewable electricity we will need a vast amount more copper for all the wiring, both to connect up the system and in all the electric motors that will be required. Similarly, we are going to need a very large supply of lithium and rare earth minerals for all the batteries that the system requires. What matters is that as we bring these new materials into the circular system, we take that opportunity to ensure they will be used in a recyclable way. For example, there should be no new batteries designed where all their components can't be economically and sustainably recycled to have at least as valuable a function as their original use.

The other way the mix might need to change, which we will explore in more detail later, is in relation to renewable resources like food. For example, we have already seen that at present our growing consumption of meat drives the unsustainable destruction of forests and grasslands and increases greenhouse gas emissions.





## How the circular economy helps with the tasks to change our system

The reason a transition to a circular economy is so important is that it drives the decoupling of the economy from the environment.

The circular economy is also a new engine for productivity, with each of the features of the circular economy offering opportunities to improve productivity.

First, a product with a longer life cycle, which can be repaired for less than the cost of replacing it, delivers a lot more value for what it costs. That does require products to be designed for repair, which many aren't today, with most product design leaning towards built-in obsolescence.

Second, in principle it requires far less energy to reprocess a finished material than it does to take it from its raw state to its end state. While that is true in principle, for it to be true in practice means that it needs to be possible efficiently to collect the used material for that reprocessing in sufficient volume. That is largely a product life-cycle design challenge. Some elegant work from the Ellen MacArthur Foundation determined that 'the cost of remanufacturing mobile phones could be reduced by 50% per device – if the industry made phones easier to take apart, improved the reverse cycle and offered incentives to return phones.'<sup>40</sup>

Third, where products are shared or reused, they will deliver a productivity gain. A shared product is much more likely to be highly utilised, which is an important productivity gain because it does more work for no extra fixed cost. Products that reuse raw materials, where we have a system to recycle/upcycle those materials at lower cost than extracting them, will provide another productivity gain.

Fourth, and more broadly, circularity produces a whole new form of manufacturing. Instead of just assembly lines, we have disassembly lines and reprocessing plants. The creation of these new facilities provides the opportunity to increase manufacturing again in developed countries, without the need to take it away from developing countries. As we have seen, manufacturing is an

important driver of economy-wide productivity, which means this growth in manufacturing further increases the role of a circular economy as an engine for higher productivity.

The circular economy offers opportunities to create global resilience without compromising prosperity. For countries concerned to increase their resilience, there is a strong incentive to keep as much reprocessing of the materials their industries need as close to home as possible.

It will make their supply chains more resilient and reduce exposure to disruptive global commodity price cycles. There could, of course, be efficiency gains in moving reprocessing offshore, especially in some areas where the volume of material being reprocessed is small but there are other forces at work. It is important to pay attention to China's 2017 ban on the importation of plastics for reprocessing. The volume they were receiving exceeded their capacity to reprocess it so they ended up just disposing of it, which came at high environmental cost. Their experience suggests that part of accelerating the transition to a circular economy is to make countries or blocs of countries with well-integrated markets, like the European Union, responsible for their waste. Such a move will do much to keep disassembly local.

The development of local collection systems and disassembly and reprocessing plants will help create a more inclusive economy. When more manufacturing returns to developed countries, we build a broader base of more middle-class jobs, exactly the sort of jobs that were lost with the offshoring of manufacturing.

The jobs that will be created stretch back right into the recovery process. One of the most wasteful areas of our whole economy is construction, but the deconstruction of buildings offers both big materials gains and labour gains. The demolition of old buildings is a low-skill and extraordinarily wasteful process. The disassembly of a building and the recovery of materials is a far more skilled task. The Ellen MacArthur Foundation reports pilot studies of the deconstruction of 1950s and 1960s housing which saw 76% of the materials recovered, increased local job creation, and improved working conditions that came with the more skilled work required.<sup>41</sup>





The impact on employment of all these new kinds of work is substantial. Economic analysis done for the European Union showed the shift to a more circular economy in Europe could add around 700,000 new jobs by 2030.<sup>42</sup> We can expect to see similar gains across the developed world. In the developing world, the need for these new types of jobs will increase the number of middle-skill roles, which in turn will help create a broader-based and more participative economy.

Even this brief overview makes it clear how the transition to a circular economy can play a critical role to decouple the economy from the environment, create a more inclusive economy, provide a new engine for productivity, and increase resilience without compromising prosperity.

## How we can accelerate the creation of a circular economy

What is particularly hopeful is that, in Europe, there is a substantial policy focus to make this transition happen and a great deal of work underway. Europe provides a helpful roadmap. In 2020, the European Commission released its *Circular Economy Action Plan: For a cleaner and more competitive Europe*,<sup>43</sup> which was an integral part of its European Green Deal. The action plan provides an overall policy framework and then sector-by-sector initiatives to see it implemented, all complemented by a set of policies designed to ensure the benefits are shared widely.

It is worth noting a little of the detail because it helps to provide a picture of what is needed while also showing that these changes aren't implausible. If we look at some of this detail, the policy framework focus has three elements to it.

First is the design of circular products. The reason it puts the focus here is that, as it observes, 80% of the environmental impact of a product can be determined at the design stage. To make sure that the design of circular products happens, they set out a strategy of required design standards, enablers, incentives and penalties:

*The [European] Commission will consider establishing sustainability principles and other appropriate ways to regulate the following aspects:*

- *improving product durability, reusability, upgradability and repairability; addressing the presence of hazardous chemicals in products and increasing their energy and resource-use efficiency;*
- *increasing recycled content in products, while ensuring their performance and safety is not detrimentally impacted;*
- *enabling remanufacturing and high-quality recycling; reducing carbon and environmental footprints;*
- *restricting single-use products and countering premature obsolescence;*
- *introducing a ban on the destruction of unsold durable goods;*
- *incentivising product-as-a-service or other models where producers keep the ownership of the product or the responsibility for its performance throughout its lifecycle;*
- *mobilising the potential of digitalisation of product information, including solutions such as digital passports, tagging and watermarks; and*
- *rewarding products based on their different sustainability performance, including by linking high-performance levels to incentives.*<sup>44</sup>

Second is the empowerment of consumers and public institutions from school and universities to government departments. As we observed earlier, right across the transformation agenda for our system there is a need for both 'top-down' and 'bottom-up' change.

This European approach aims to provide citizens with the information and rights to be able to act. They summarise their approach as follows:

*Empowering consumers and providing them with cost-saving opportunities is a key building block of the sustainable product policy framework. To enhance the participation of consumers in the circular economy, the Commission will propose a revision of EU Consumer Law to ensure that consumers receive trustworthy and relevant information on products at the point of sale, including on their lifespan and on the availability of repair services, spare parts and repair manuals. The Commission will also consider further strengthening consumer protection against green washing and premature obsolescence, setting minimum requirements for sustainability labels/logos and for information tools.*<sup>45</sup>

Third is the support for the acceleration of circularity in production processes. The role the Commission see for governments here is largely facilitative, but they also make sure that other policy instruments, like the approach to emissions and their plans for the bio-economy all line up with their approach to circularity. The key initiatives they outline are:

- *assessing options for further promoting circularity in industrial processes in the context of the review of the Industrial Emissions Directive 17, including the integration of circular economy practices in upcoming 'Best Available Techniques' reference documents;*
- *facilitating industrial symbiosis by developing an industry-led reporting and certification system and enabling the implementation of industrial symbiosis;*
- *supporting the sustainable and circular bio-based sector through the implementation of the Bioeconomy Action Plan 18;*
- *promoting the use of digital technologies for tracking, tracing and mapping of resources; and*
- *promoting the uptake of green technologies through a system of solid verification by registering the EU Environmental Technology Verification scheme as an EU certification mark.*<sup>46</sup>

The overall European agenda is supported by individual countries within the Union who have developed their own strategies to drive a circular economy.<sup>47</sup> It is not just the countries you might expect to have such strategies, like Sweden, but it reaches right across Europe from Ireland to Romania. In turn, to cascade the national agenda, cities across the continent have committed to the changes needed at municipal levels.<sup>48</sup> It is precisely this type of change, at all levels of government from the supra-national to the municipal, that we need to see right across the world, to simultaneously drive structural change and support citizens to make positive changes.

We need to be clear that these changes are substantial. George Monbiot provides a helpful summary of the actions by the French government:

*The French government has passed a circular economy law, which seeks to stop the unnecessary use of resources. Single-use plastics are forbidden in public procurement. Shops must allow people to bring refillable containers and charge lower prices when they do. Anywhere that people gather in large numbers must be equipped with drinking fountains, as part of a wider plan to phase out plastic bottles. Manufacturers, wholesalers and retailers are forbidden to throw away unsold items: they must instead be given away or recycled, creating an incentive to avoid overproduction.*

The government is seeking to eliminate planned obsolescence. Major commercial sectors – electrical and electronic equipment, toys, sports, leisure, DIY, gardening, textiles, footwear and furniture – must pay into a repair fund. Companies have to provide spare parts and repair instructions. Next year, some sectors will need to display a “durability index” on their products. Manufacturers are banned from using any strategy to restrict the repair or longevity of the devices they sell, such as the software updates that slow down phones and tablets.

Producers and distributors of a wide range of goods – from sanitary towels to cars – are, or will shortly be, financially responsible for their processing and disposal once they have been used. Manufacturers must produce new eco-design plans every five years to cut their resource use and improve recyclability. By 2025, single-use plastic packaging will be reduced by 20%, all new washing machines will have filters to catch plastic microfibres and supermarkets and caterers will have to reduce food waste by 50%.<sup>49</sup>

France has one of the largest and most sophisticated economies in the world. If they can take these sorts of measures now, there is little reason why others in advanced economies shouldn't follow suit. So, there is much from the European experience that can be directly borrowed or used as inspiration in other places. Importantly, there is a very strong set of aspirations in the European agenda to see a full transition to a circular economy by 2050 - 2060. From all that we have seen, that is the timeframe that needs to be the focus. A concrete point in time helps when we need to recalibrate the effort if we aren't getting there fast enough.

Of course, the European way is just one way to go about this transformation. Others might choose a different policy approach with, for example, more use of financial levers like taxes or regulatory requirements. Whatever the particular choice of levers, planning these transitions is now a mainstream policy project.

To show just how mainstream and contemporary this sort of thinking is, in 2022 the OECD produced valuable material to help with the design of these sorts of policies to drive the transition to a circular economy.<sup>50</sup>



## Idea 2: Create a carbon neutral economy and society

Of all the transitions we need to make, the one with the greatest focus globally is to create a carbon neutral economy and society.

We will take as a given the following: the science of climate change, the fact that the transition to carbon neutrality by 2050 is necessary and that we are seriously struggling to achieve that goal. For our purposes, there are two specific themes we need to focus on.

### Theme 1: Renewable energy and removal of greenhouse gases is integral to a circular economy

We have seen in the discussion we have just had that renewable energy and the elimination of both non-regenerative materials and emissions going back into nature are an integral part of a very different overall circular economy. It is important to see carbon neutrality as an integral part of how we create that very different type of overall economy, rather than as its defining feature.

The removal of greenhouse gases deals with an important part of ending the emissions part of our current extraction to emissions model.

### Theme 2: How carbon neutrality helps transition our system to a sustainable, inclusive, prosperous and stable one

*When we consider the tasks to transform our current system, the creation of a carbon neutral economy is a critical part of the decoupling of the environment from the economy. This is not just a theoretical idea and in fact it has already started to happen. In recent years, we have seen 33 countries both decrease their carbon emissions and increase their GDP per capita.<sup>51</sup> The reductions in greenhouse gas emissions that are recorded in this report by The Economist include the greenhouse gas emissions involved in the manufacture of products imported from other countries.*

This approach to the calculation of emissions matters because it means one country can't decarbonise its economy by getting another country to produce the greenhouse gas intensive products for them.

This is real change of the type we urgently need. It shows it is possible.

Significantly, 60% of those 33 countries are in Europe, which again shows it is possible for a significant group of large, developed economies to accelerate the transition. It is not just about developed countries though. The Economist, reporting on this decoupling, observed that:

*It would be wrong, however, to characterise decoupling as a luxury reserved for the most affluent countries. Thanks to energy-efficiency improvements, emissions in eastern Europe have fallen since the collapse of the Soviet Union, at the same time as living standards have converged with western Europe. Argentina, Mexico and Uruguay have also joined the decouplers. In Mexico, for instance, emissions have fallen by 16% since their peak in 2012.<sup>52</sup>*

The fact that decoupling is possible in developing as well as developed countries points to the role decarbonising can play to help with the task of creating a more inclusive economy and a more stable and resilient one. In addition, it demonstrates that decarbonising can, at the same time, help to overcome the headwinds of resource scarcity and fragmentation of connectivity. Decarbonisation helps with these agendas at both the national and local level.

On the stability and resilience front, most countries will be able to produce all of their own renewable energy to power households, industry and ground transport. That means they will no longer be exposed to globally created energy shocks from supply constraints on fossil fuels. Given that renewable energy can be produced at a lower cost than if it were derived from burning fossil fuels, this energy independence comes without compromising productivity and prosperity. Such national energy independence is a major stabilising force for any economy.



Paradoxically, that energy independence will help to reduce the pressure of one of the major forces of global strategic competition, which is the competition for access to energy resources. Imagine what a difference to international tensions and conflicts it would have made in the second half of the 20th century if there had not been the contests over Middle Eastern oil. We have seen with Europe's dependence on Russian energy that energy in the 21st century can still be a major driver of international tensions and the breakdown of connectivity.

From the perspective of the task to create a more inclusive economy, the advantage of national energy self-reliance is that countries won't have to spend valuable income on fossil fuel imports, which have come at artificially high prices because the cartel of oil producing countries (OPEC) collude to constrain supply. Even more than that, countries, especially developing ones, won't have to spend money on fuel subsidies to help make it affordable for their citizens on low incomes. These savings will be substantial. Governments around the world in 2019 spent \$320 billion on fuel subsidies.<sup>53</sup> The same dollars could be spent on far more effective measures to increase inclusivity, such as education.

The decarbonising agenda also supports a more inclusive, resilient and stable economy at a very local level, by reducing the percentage of household income spent on energy and reducing people's exposure to energy price rises. Part of the decarbonising project is to make houses more energy efficient. That is a gain for the environment while there are still fossil fuels in the grid, and it is also a gain for the householders who will need to spend less of their income to heat and cool their houses, whatever the form of energy. The International Energy Agency (IEA) calculates that these measures could reduce household heating bills by 5-15% over just a five-year period.<sup>54</sup> That is a real increase in living standards for everyone. As low-income households typically spend a disproportionate amount of their income on heating, they will also disproportionately benefit from these sorts of savings..

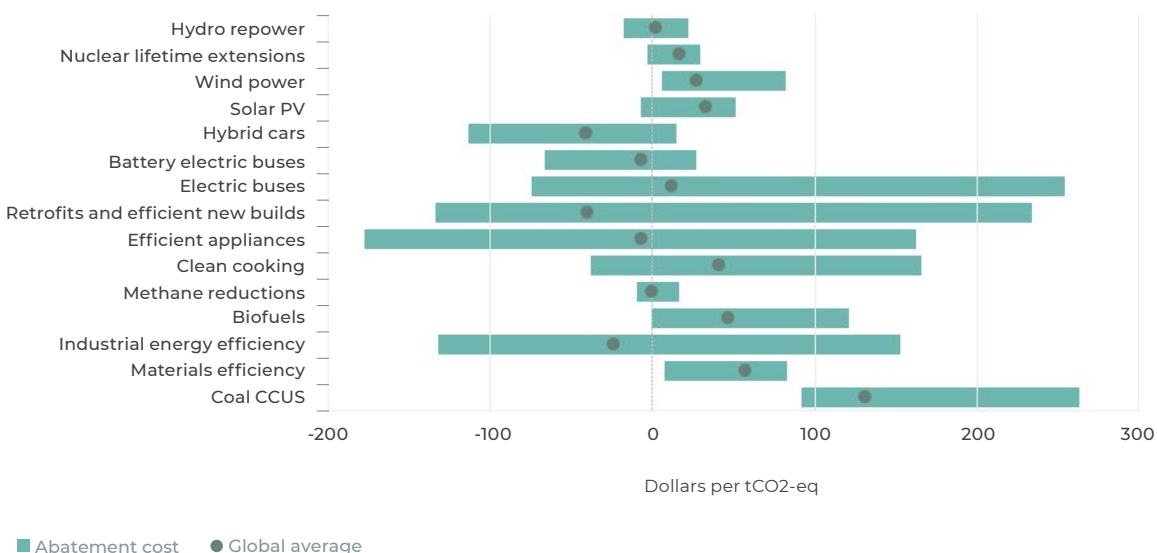
In many places, people are driving decarbonisation themselves through the installation of solar panels on their houses. Not only will that reduce their power bills, over time it will also reduce their exposure to disruptive increases in energy costs because they will need to buy far less energy. As electric vehicles become more widespread and people start to recharge them from energy they have generated, they will further reduce their energy costs and their exposure to spiking petrol and diesel prices. In some places, governments are helping to accelerate this agenda by providing assistance to low-income households to install solar capacity. Such measures help harness this carbon transition to create a more inclusive economy.

Cost savings, of the sorts I have just discussed, are central to the way the carbon neutral transition can be a new engine for productivity improvement. At an economy-wide level, the transition presents both opportunities for savings and to harness the world's extraordinary research and development capacity to increase the productivity of the new technologies even further.

To get a picture of this opportunity for even greater productivity gains, it is worth a look at the analysis from the IEA and International Monetary Fund (IMF), who considered the costs and savings of different measures to remove greenhouse gases.<sup>55</sup> You can see this in Chart 73. On the vertical axis they have a wide range of different measures, from the production of renewable zero-carbon energy and the introduction of electric vehicles, through to energy-efficiency measures. On the horizontal axis are the costs of these measures. For some measures the costs are negative, which means that there is a saving if you introduce them. For each of the measures, they have put a bar that represents the range of lifetime costs per tonne of carbon dioxide or equivalent (tCO<sub>2</sub>-eq) that are saved. There is a grey dot to represent the global average of the cost per tCO<sub>2</sub>-eq saved. For example, if you consider battery electric buses, on average around the globe, they both reduce emissions and save money. You can see from the extent of the bar that some buses save quite a lot of money per tonne of emissions saved, but there are some vehicles that over their lifetime do cost money to make those carbon savings.

**Chart 73: GHG abatement costs for selected measures of the Sustainable Recovery Plan**

Source: IEA, GHG abatement costs for selected measures of the Sustainable Recovery Plan, IEA, Paris  
<https://www.iea.org/data-and-statistics/charts/ghg-abatement-costs-for-selected-measures-of-the-sustainable-recovery-plan>, IEA.





When you look at the overall picture on this chart, when it comes to vehicles and domestic and industry efficiency measures, there are already clear opportunities to make cost savings. Those savings represent productivity opportunities to run transport, factories and houses at lower costs than we do today. Given the central role all of these play in the economy, these are substantial opportunities to see economy-wide productivity improvements.

We can see from the range of the bars that to realise the productivity improvements, people, companies and governments will need to choose those more efficient technologies that deliver savings of carbon and cost. The ability to make those dual savings will be aided by exactly the sorts of measures the European Union have proposed in their requirement that producers provide the information that will enable purchasers to make comparisons of carbon and cost.

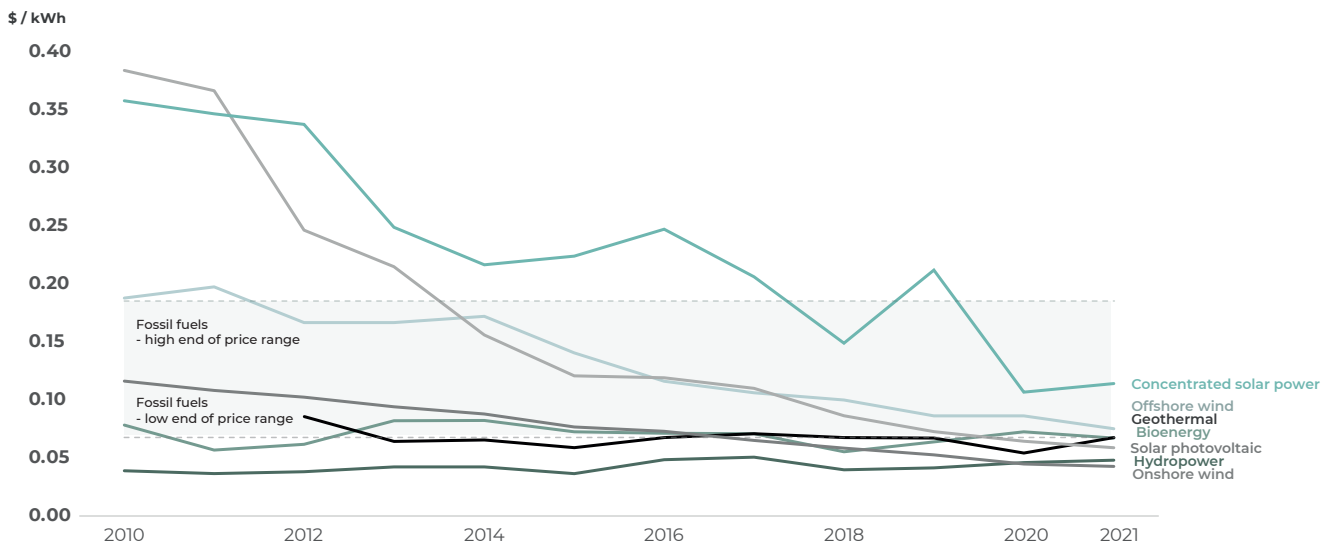
When it comes to renewable energy, the rate at which productivity is improving for all of these associated technologies should give us considerable confidence that they too are on the cusp of being big drivers of productivity gains and will support a more inclusive economy as well.

We can see this very clearly in Chart 74. What this chart shows is the period since 2010 on the horizontal axis. On the vertical axis, we have what is called the levelized cost of energy, which is a measure that enables us to compare the costs of electricity production by different means. What it shows is the average cost, measured in US dollars per kilowatt hour, of energy produced across the lifetime of an energy-generating plant opened in that year. The chart also maps the spectrum of costs to produce fossil fuel-based energy from the low to high-cost ends.

This chart illustrates the way key technologies that can produce very large amounts of electricity in a wide range of areas, like onshore and offshore wind and photovoltaic cells, have seen their cost per kilowatt hour of energy produced fall substantially in a very short time. In 2021, onshore wind energy production cost less than 50% of what it did in 2010, and photovoltaic energy production cost only ~12% of what it cost to produce the same amount of energy a little more than a decade earlier.

**Chart 74: Levelized cost of energy by technology, World, 2010 to 2021**

Source: International Renewable Energy Agency (IRENA) Levelized cost of energy by technology, World (ourworldindata.org)



While the rate of improvement in the cost of photovoltaic energy production has reduced, the cost is still coming down. Even if the improvements only came from an increased scale of production, which the world needs, there are clearly still significant financial savings to be made. With onshore wind, it has been a story of constant productivity improvements for a long time. If we go back to the early 1980s, onshore wind cost \$0.32 per kilowatt hour of energy produced in 1982, compared to \$0.03 per kilowatt hour in 2021, which is a 10-fold improvement.

In many countries around the world, both onshore wind and photovoltaic generation have already crossed the critical threshold where they can produce energy at lower cost than can be done with burning fossil fuels. In many places, especially in higher latitudes, offshore wind will also shortly cross that threshold. The rest will follow very soon and, as that happens, in all those places there will not even be an economic reason to build new fossil fuel powered stations, and every time they close one and replace it with renewable energy generation, they will improve the productivity of their economy.

## Idea 3: Accelerate the regenerative agenda

In Part 1, we explored the way in which we have brought an extractive approach to renewable resources, from fishing and farming to forestry. The result has been a huge global loss of habitat, species, soil and water.

It is clear we can't continue further down that road. The damage is so extensive that we need to do a U-turn. We discussed earlier that there is an important discussion to be had about how far back down the road we need to go. That we need to turn around and start large-scale restoration is not in question.

For that turnaround, we need a clear regenerative agenda for the world's natural ecosystems, agriculture and cities.

### Natural ecosystems

An enormously important step was taken to set the regenerative agenda the world needs, especially in relation to natural ecosystems, in late 2022. At the Conference of the Parties of the International Convention of Biological Diversity, which was, significantly, chaired by China, representatives of 188 countries, including the United States which isn't a party to the Convention, agreed on the Kunming-Montreal Global Biodiversity Framework (GBF) that sets out four goals with clear targets to reach them.

The goals are worth setting out in full because they go to the core of the broader change agenda we have been discussing.

#### GOAL A

- *The integrity, connectivity and resilience of all ecosystems are maintained, enhanced, or restored, substantially increasing the area of natural ecosystems by 2050;*
- *Human induced extinction of known threatened species is halted, and, by 2050, extinction rate and risk to all species are reduced tenfold and the abundance of native wild species is increased to healthy and resilient levels; and*
- *The genetic diversity within populations of wild and domesticated species is maintained, safeguarding their adaptive potential.*

#### GOAL B

*Biodiversity is sustainably used and managed and nature's contributions to people, including ecosystem functions and services, are valued, maintained and enhanced, with those currently in decline being restored, supporting the achievement of sustainable development for the benefit of present and future generations by 2050.*

#### GOAL C

*The monetary and non-monetary benefits from the utilisation of genetic resources, and digital sequence information on genetic resources, and of traditional knowledge associated with genetic resources, as applicable, are shared fairly and equitably, including, as appropriate, with indigenous peoples and local communities, and substantially increased by 2050, while ensuring traditional knowledge associated with genetic resources is appropriately protected, thereby contributing to the conservation and sustainable use of biodiversity, in accordance with internationally agreed access and benefit-sharing instruments.*

#### GOAL D

*Adequate means of implementation, including financial resources, capacity-building, technical and scientific cooperation, and access to and transfer of technology to fully implement the Kunming-Montreal Global Biodiversity Framework are secured and equitably accessible to all Parties, especially developing countries, in particular the least developed countries and small island developing States, as well as countries with economies in transition, progressively closing the biodiversity finance gap of \$700 billion per year, and aligning financial flows with the Kunming-Montreal Global Biodiversity Framework and the 2050 Vision for Biodiversity.*



To realise these goals, 23 clear targets have been set. There is a goal to increase the conservation of ecologically important terrestrial areas from the current 17% to 30% and marine areas from the current 10% to 30% by 2030. Coupled with this goal is the objective to restore or have underway the restoration of a further 30% of degraded terrestrial, coastal and marine ecosystems.<sup>56</sup>

There is a target by 2030 to cut by half the risk from the emissions of highly hazardous chemicals and pesticides, another to cut by half the volume of pollution from excess nutrient waste from agriculture, and a rather more general commitment to work towards the elimination of plastic pollution.

These goals and targets set the agenda we need for tasks to fix our global system more broadly.

The task it addresses most directly is our need to create restoration at scale. Given the planetary nature of the damage, a global framework is required. Global frameworks do, of course, come with challenges. The approach of this framework, which is to have a clear time horizon of 2050 with a strong vision but then break this down into specific and ambitious nearer-term targets, follows the broadly similar approach the world has taken to tackle climate change. This type of approach is vulnerable to insufficient national ambitions and actions. However, specific goals, regular reporting and international gatherings on the issues support national political parties, non-government organisations and the media to keep the pressure on their governments to drive change.

A common global approach and aligned timelines help with the needed international cooperation and good-practice sharing, which are also important enablers of change. Importantly, this agreement does address, at least in part, the financial challenges that these sorts of efforts involve, where both action and equity require support for the developing world from the developed world.

Critical momentum was added to the Kunming-Montreal GBF when, on 4 March 2023, after almost 20 years of work, a UN intergovernmental conference held under the auspices of the United Nations Convention on the Law of the Sea finalised the High Seas Treaty. Its full title explains its significance: 'Agreement under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction'. Amongst its many important features, it has a mechanism for the creation of Marine Protected Areas in international waters, where currently barely 1% of the areas of high seas are protected. While 60 nations need to ratify it for it to come into force, once that has occurred nations concerned for the future of the oceans can play a critical role to drive the creation of these much-needed areas.

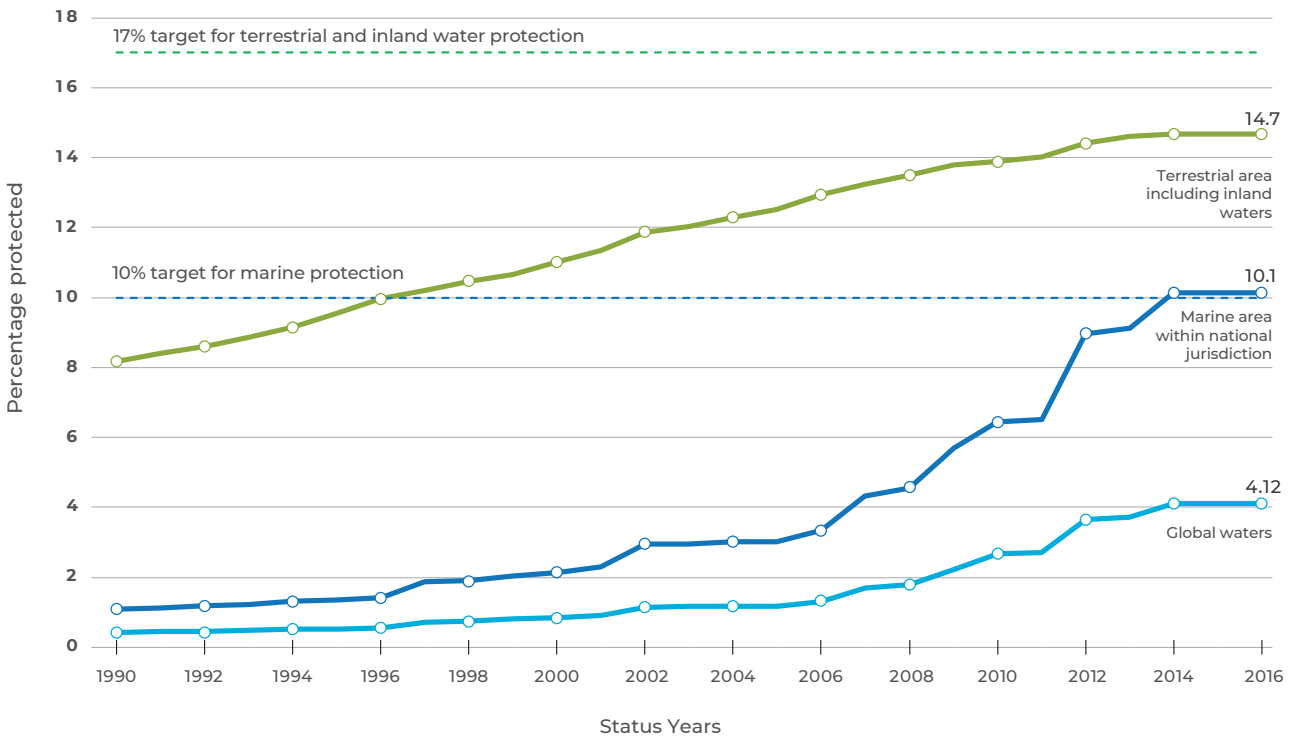
It is easy to be cynical about these sorts of agreements. In these moments, it is good to remember that progress is possible.

Think of the ozone treaties – the Vienna Convention on the Protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer – and the role they have played to see governments take action, at a national level, to arrest the very serious threat to the planet's protective outer layer.

It is also important to remember that in the last decade we have seen significant increases in Marine Protected Areas. If we look at Chart 75, you can see the increases in recent times. Of course, there is a long way to go, but it represents the ability of national governments to overcome often strong commercial interest groups to create these sorts of important areas. With the High Seas Treaty, those governments will have a powerful mechanism to drive that kind of protection into international waters.

**Chart 75: Trends in global marine and terrestrial protected area coverage over time**

Source: <https://www.oecd.org/environment/resources/Marine-Protected-Areas-Policy-Highlights.pdf>, p5.



To support global work on this agenda, the UN declared the 2020s the Decade on Ecosystem Restoration.<sup>57</sup> The program is a very practical one with the first 10 flagship initiatives underway. They have the scale and significance to help give the GBF momentum to build on – it is certainly not starting from scratch. The 10 initiatives aim to restore about 60 million hectares, which is an area about the size of Madagascar.<sup>58</sup> From the forests of South America to the rivers of China and the grasslands of Africa, these are an important set of initiatives in themselves from which considerable knowledge will be generated to inform other efforts. An important feature of many of them is that an integral part of their design is not just the restoration of the natural ecosystems but also the human social systems, which once relied on those natural systems functioning well. The human dimension to these projects helps with the task to create the local and national buy-in to them, to support the sustained commitment that they require.

The GBF's target of areas to protect and restore provides a set of boundaries on the application of the extraction model, and its goals around reduced pollution help to set limits on the emissions end of our economic growth model. Both sets of constraints help with the task of decoupling the economy from nature. Whether they are ultimately what is required is yet to be determined, but to have agreed that there are very real and demanding limits is to have crossed the Rubicon on this issue.

The other task the GBF clearly aims at is to help create a more inclusive economy. Goal C seeks to ensure that the economic value of biodiversity is kept as local as possible and with the indigenous people who are so closely connected to that biodiversity. It is a very important marker to set out. Not least because there is still such huge potential in the molecules and genes of the diverse natural world that they may help with the task to find a new engine for productivity. Those molecules and genes could underpin the broader transformations we need. They could be used to cure diseases, to enable longer lives to be more productive, to break down harmful pollutants that are already in the environment or waste like plastics, or even help to create more sustainable forms of food.

Every much-needed step we take to restore damaged ecosystems at scale is also a step towards creating stability and resilience without harming prosperity. Healthy, well-functioning ecosystems are a force for stability in many ways. They are an important buffer to, and indeed mitigate, extreme weather events. They underpin healthy local stocks of wild resources like fish and support local agriculture with natural pollination and pest control, all of which reduces reliance on the globally concentrated production of essential foods.

Overall, the acceleration of the restoration agenda is central to our task to transition our global population to a level that enables equitably distributed global prosperity within the limits of our planetary system. The restoration goals are a very practical step towards setting the planetary limits within which we need to operate. If we add the goals of protected and restored ecosystems, we are drawing an initial development limit which is 60% of the area of the natural world, including places outside national jurisdictions by 2050. While in lots of ways that isn't a sophisticated way to think about boundaries from a scientific perspective, it is an actionable solution and right now that really matters.

## Agriculture

While the GBF does cover agriculture, it does not establish a concrete agenda. Rather, beyond some welcome specific targets on nutrient waste, it just speaks broadly about the move to more sustainable practices. We need a stronger and more concrete agenda that makes it clear how soil, water and agriculture are integral to the broader regenerative agenda.

The foundation for such an agenda is the group of ideas captured under the broad term of regenerative agriculture. Practitioners and theorists of regenerative agriculture are come together around a shared concern to see the quantity of healthy soil increased and, with it, carbon sequestered, watershed functioning restored, biodiversity increased, and the use of fertilisers and pesticides reduced or eliminated.<sup>59</sup>

Regenerative agriculture is one of those concepts that has migrated from the margins to the mainstream. It has been practitioner and theorist led, with scientists playing catch-up to some extent. It is now crossing the threshold to shape policy and practice. There are some good indicators of its arrival as an agenda-shaping idea.

A particularly important indicator is the 2022 report by the European Academies' Science Advisory Council (a council formed by the national science academies of the EU member states to enable them to collaborate with each other to give advice to European policymakers). The report, *Regenerative Agriculture: A critical analysis of contributions to the European Union Farm to Fork and Biodiversity Strategies*, sets out the ambitious goals of these European strategies, which include by 2030:

- reaching 25% of agricultural land under organic farming;
- agriculture to contribute to a reduction of at least 55% in net GHG emissions;
- reduction by 50% in the use and risk of chemical pesticides and reduction in the use of more hazardous pesticides by 50%;
- reduction of nutrient losses by at least 50%, while ensuring that there is no deterioration in soil fertility; and
- reduction in the use of fertilisers by at least 20%.

It then observes, 'the concept of regenerative agriculture is increasingly viewed as a promising set of tools to meet the main goals and targets of both the Farm to Fork and Biodiversity Strategies' and that their 'extensive review' of the evidence does indeed show that the effectiveness of a range of regenerative agriculture practices is sufficient for them to be recommended as the basis for agriculture and land management policy.

Across the Atlantic, the policy landscape is also shifting. Joe Biden's Secretary for Agriculture, Tom Vilsack, gave a clear signal of this shift at his confirmation hearing in February 2021 when he said that he wanted to see \$30 billion from the United States Department of Agriculture's Commodity Credit Corporation scheme to provide incentives for farmers to shift to more sustainable practices. In a widely quoted statement, he explained that:

*It is a great tool for us to create the kind of structure that will inform future farm bills about what will encourage carbon sequestration, what will encourage precision agriculture, what will encourage soil health and regenerative agricultural practice.<sup>60</sup>*

We can see this shift to focus on sustainable and regenerative strategies not just at a policy level but amongst some of the large global corporations, who play such a major role in setting the directions for agriculture at scale. While there is always a danger such initiatives are green-wash, maybe too small scale to make a difference or too vulnerable to being watered down, the fact that they are working with and legitimising these ideas in the corporate world is at least a step in the right direction.





It is also interesting who is reporting these initiatives. Fortune Magazine reported in 2021 on 'Nestlé's \$1.3 billion investment in regenerative agriculture';<sup>61</sup> Fast Company in its World Changing Ideas section reported in 2021 on how PepsiCo 'plans to work with the tens of thousands of farmers in its supply chain to spread regenerative agriculture—practices that can help improve sustainability—across 7 million acres, or roughly its entire agricultural footprint';<sup>62</sup> and they had reported in 2019 on General Mills' (a very large agricultural company) plans to bring 1 million acres into regenerative agriculture by 2030.<sup>63</sup> What is important here is that formerly marginal ideas are being embraced in the corporate and media mainstream. This is the kind of tectonic shift in the landscape of ideas that is needed for our system to change.

The mainstreaming of regenerative agriculture is important. Some of the next steps for that agenda need to be its integration with the substantial work that has been done on water management. Being practice led, regenerative agriculture has tended to build from farm level up. When it comes to water, we also need to start at whole-of-watershed level and to recognise the complex relationships and tensions that surround the use of water resources for human consumption, industry and – in places with hydro systems – the generation of electricity.

There are well-established strategies to use water pricing, water-saving technologies and changed agricultural practices that can make a very large difference. The challenge is not in the ideas but in making the changes, especially as most of them involve some sort of increased cost and new practices for current water users who have built businesses, farms and lifestyles on currently unsustainable but cheaper ways to use water.

From the discussion of a regenerative agenda in the first section, it should be clear that regenerative agriculture will be a real help with the task to create regeneration at scale by 2050.

Regenerative agriculture could be a significant driver of productivity because it aims to sustain high levels of agricultural outcomes with far fewer or no costly inputs from artificial fertilisers and pesticides. Similarly, good water management will see far greater value created from the same volumes of water. Native creatures large and small will also benefit from these changes.

Regenerative agriculture aims to make farming lands and their nearby communities more resilient to climate extremes and so helps with the task of increasing resilience without reducing prosperity. It has a role to play in creating a more inclusive economy because farmers become less reliant on inputs from large corporations and are in a better position to capture more of the value they create locally.

Finally, the outputs from land farmed with regenerative agriculture techniques will be critical to the process to set the boundary for transitioning our global population to a level that enables equitably distributed global prosperity within the limits of our planetary system. Those agricultural outputs will depend on the mix of what is grown and where it is grown, which means there is no simple, fixed limit to what can be produced with the practice of regenerative agriculture. Similarly, how many people that output will support depends on the per capita consumption of different foods. What matters for the production of sources of nutrition through agriculture (which doesn't rule out other means by which humans might create sources of nutrition) is there are limits.

## Cities

Just as we have seen the mainstreaming of the idea of regenerative agriculture, we are on the same journey with the idea of regenerative cities. It is a topic worthy of a specific focus for two reasons.

First, so much of humanity already lives in cities and that trend will continue at a considerable pace. In Chart 76, you can see that by 2050, nearly 7 billion people will live in cities, while numbers in rural regions will barely have changed. Much of that growth will come in the developing world in those places like Africa, India and South America, which we identified when we explored demographic trends earlier. In some places in Europe and East Asia, cities might shrink, but that won't be nearly enough to change the overall trend.

Second, cities often represent our global system at a smaller scale and in many places have some form of governance, through their mayors and city or regional councils, that can see them make very real changes.

There is a rich body of ideas about how to create a regenerative city. A useful orientation to the whole discussion is a document called 'Regenerative Cities' created by a body called the World Future Council, based in Hamburg, Germany in 2010.<sup>64</sup> This is helpful because it summarises a lot of the key ideas and is a constant reference point. The core idea that it advocates for is to reconnect cities with ecosystems.

The first part of the World Future Council's strategy in this area should be very familiar, which is to decouple cities from the way they damage ecosystems. Central to that agenda is to transform cities from being the embodiment of the linear extraction to emissions model we have described to a regenerative model.

Given the ability of cities to organise around their energy systems and how they manage waste, they can be a powerful force to create the shift to greater circularity. Active and public transport strategies both reduce the use of fossil fuels, but equally importantly, they return space in the cities for people and nature.

The second part of their strategy is to reintroduce nature into the urban environment. They offer a wide range of approaches to do that from creating new nature corridors through city parks, planting strategies and restoring waterways, to encouraging households to create gardens that support greater biodiversity. They promote urban food production to tackle food poverty and promote connectivity with the natural world. They then offer complementary strategies to capture and use water so that, to the greatest extent possible, the city doesn't draw water from the surrounding ecosystems.

There are extraordinary examples around the world of initiatives in cities in both developed and developing countries alike that demonstrate how realistic this agenda is. For everyone who is a citizen of a city, the ability to champion and support these sorts of changes provides a practical way to help the broader system change.

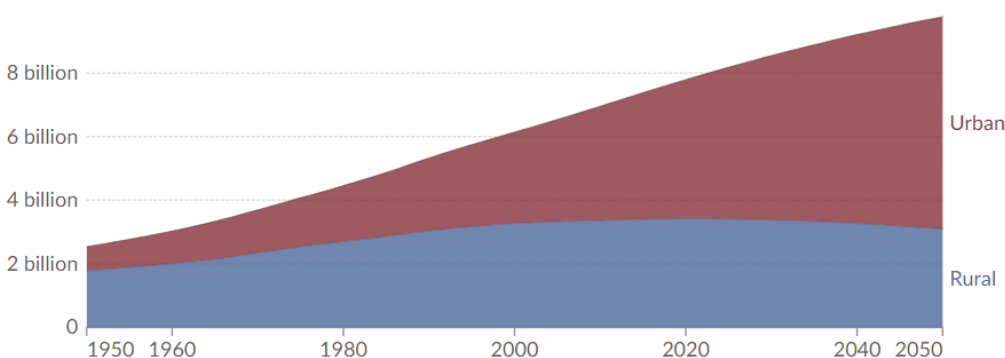
The connection to our tasks for change are very clear. Regenerative cities could make a huge contribution to decoupling economic growth from nature.

- They present countless opportunities to improve productivity through reduced waste and energy consumption.
- They are much more resilient because water is captured and used rather than simply flooding or going into drains.
- Temperatures are reduced because of the tree canopy.
- Food production is less vulnerable to supply chain disruptions.
- They are also more inclusive because more energy and food are produced at the household level.
- Transport costs less with a focus on active and public transport.

**Chart 76: Urban and rural population projected to 2050, World, 1950 to 2050**

Total urban and rural population, given as estimates to 2016, and UN projections to 2050. Projections are based on the UN World Urbanization Prospects and its median fertility scenario.

Data source: OWID based on UN World Urbanization Prospects 2018 and historical sources (see Sources) [OurWorldInData.org/urbanization](https://ourworldindata.org/urbanization)



## Idea 4: Live the sustainable life

To this point we have explored the ideas we need to put into action for a sustainable, inclusive, prosperous and stable world at an international, national, regional and city level. As we have looked at these ideas, we have seen there are steps being taken in the right direction. There are sources of hope.

What matters is that we accelerate the change before the harm that has happened, which we have caused, catches up with us. The slower the change, the more costly and risky it becomes. The picture that will emerge in this section is that, when we look at the data, in area after area, we are simply not on track to make the necessary changes in time, despite the fact that we both know what to do and, in most cases, can afford to do it.

We can help accelerate the broad change that is needed by the choices we make in how we organise our lives, what we buy, the expectations we set for the organisations we work in, and with and through the governments we elect. The more changes we have made personally, the stronger position we are in to insist that others change, whether they be organisations or governments.

As I discussed earlier in Part 2, ultimately deep change is driven by changing ideas that influence how the world works. Our part in that process is to build those ideas into the choices we make about the way we live our lives. What won't work are long lists of actions and tasks we need 'to do'. The chances are we will forget some of them, the lists won't be comprehensive anyway and they will become out of date as better options appear. More importantly, lists of actions aren't ideas we can organise around. For that, we need a few simple, big questions to focus us on what matters and some ideas to help us make our choices. If we consider the big changes we have discussed so far in relation to this idea about what needs to happen at a societal level, they do invite us personally to ask some powerful questions.

**Circularity** Is what I am doing circular?

**Zero carbon** Are the energy and materials I am using zero carbon?

**Regenerative** Is what I am doing going to add to or take from our natural ecology and is it compatible with the planetary system's ecological limits?

In some cases, we might need to take the question to the next level of detail. In the case of 'is what I am doing circular?', we can ask 'is what I am doing reducing, reusing and recycling?' They are questions with big implications.

If we think about 'am I reducing?', it can lead us to ask, 'am I reducing the amount of energy I use?', which could include everything from embracing living with a broader temperature range in our houses, to reduce heating and cooling, to cycling rather than using a car to get to work.

Or we can ask, 'am I reducing the material I use?', which can lead us to ask, 'should I buy the more expensive but much longer lasting tool rather than the cheaper one that will need replacing sooner?', or 'what is the smallest car I can buy?', or 'do I really need what I am looking at buying, will it get the use that justifies me owning it rather than borrowing or renting it on the occasions I need it?'

These sorts of questions about how we reduce our energy and material use lead us to give priority to quality over quantity, to flexibility, adaptability and repairability in the material possessions in our lives and to look at how we can share and borrow rather than always own. This is how apparently simple questions and ideas can lead to change in the much larger landscape of ideas and in doing so positively change how our world works.

The reason it matters so much to ask these sorts of questions is that we need to accelerate the rate of change dramatically. With the current level of government action, we have not achieved a rate of change that will stop the destruction of the planet through the extractive model, nor it being overheated and polluted by emissions. We need grassroots change, so that governments and companies will respond to clear signals and messages from citizens around the planet, whether in the marketplace or the ballot box, or other forms of messaging to government where democratic means aren't available.

To make this point, I will step through a short series of examples that illustrate that change is possible in key areas, that individuals do make a difference, but that much more is needed to accelerate change if we are to reach a circular, zero-carbon, inclusive, prosperous and more stable model in the time we have.





Before we work through those illustrations of what individuals can do, we need to consider the global perspective. Given that we live on a finite planet whose resources and ecosystems we need to share with peoples and all creatures, whatever changes we make need to set us on the path to both sustainability and equity.

We need to remember that one of our great challenges is the rapidly growing population in the developing world, whose current per capita material and resources footprint ranges from very small to modest. We saw earlier that if their pathway to economic growth followed that of the developed world, we will just accelerate ever further beyond our planet's ecological limits. Equally, we observed that the people in those countries are also entitled to a sustainable level of prosperity.

The only fair way we can get there is if the developed world's per capita ecological footprint shrinks dramatically and that, in doing so, we free up physical materials for reuse in the developing world and the ecological capacity of the planet, to help them meet their legitimate aspirations for a good quality of life. That is why I will start with the question of diets because it is the best-defined case of where change at the individual level is needed in the developed world, to make it possible for people in the developing world to have their share of a good quality of life, in this case through a healthy diet, that is also sustainable for everyone.

These changes in diet are about how we share the ecological capacity of the planet more fairly, and they show the way that changes in how we live enable the redistribution of planetary resources. They also offer a pathway to redistribution that doesn't rely on large-scale transfers by governments; rather it focuses on the way individuals, non-government organisations and governments work together to shift to a sustainable way of living, so that others may do the same. Governments in the developed world will still need to make various transfers, as they do with foreign aid and development programs today, albeit on a greater scale, but they will be able to use established mechanisms and draw on a body of evidence about what types of development and aid approaches work and those which don't.

### Chart 77: Healthy diets

Note: Although the planetary health diet, which is based on health considerations, is consistent with many traditional eating patterns, it does not imply that the global population should eat exactly the same food, nor does it prescribe an exact diet. Instead, the planetary health diet outlines empirical food groups and ranges of food intakes which, combined in a diet, would optimise human health. Local interpretation and adaptation of the universally applicable planetary health diet is necessary and should reflect the culture, geography and demography of the population and individuals.

Source: Summary Report of the EAT-Lancet Commission, p10.
















## Eating

We saw earlier that the increased consumption of meat has contributed to the extractive approach to clearing our forests and grasslands. It was a particularly clear case of where the developing world following the developed world's pathway to prosperity is causing the issue. You will recall that much of the pressure for increased land clearance came from the growth in meat consumption in the developing world. The only solution is for diets to shift right across the world.

From an individual perspective, this means we need to apply the regenerative principle, 'is what I am doing going to add to or take from our natural ecology and is it compatible with the planetary system's ecological limits?' This question prompts us to find out what it takes to eat healthily but sustainably. Happily, there are now guidelines to answer that question. This is thanks to the work of an extraordinary group of 18 leading scientists from 16 countries who cover the full range of fields that are needed to answer this question, from health and agriculture to environmental sustainability.

Their work is published in the leading medical journal *The Lancet*, which means it is subject to review by their peers in their fields.<sup>65</sup> To help make their work accessible, they have also published a practical guide.<sup>66</sup> I would encourage everyone to read the detail in that guide because you can plan dietary changes based on it, and for those of us in the developed world, they may not be as radical as you think. You can see this in Chart 77, which sets out the ranges of food intake for a globally sustainable and healthy diet.

This work has become a key reference point for the global discussions about healthy eating and sustainability and is yet another example of us crossing the threshold, so we now know what we need to do. The question remains will we do it in time?

	Macronutrient intake grams per day (possible range)	Caloric intake kcal per day
 Whole grains <b>Rice, wheat, corn and other</b>	<b>232</b>	<b>811</b>
 Tubers or starchy vegetables <b>Potatoes and cassava</b>	<b>50 (0-100)</b>	<b>39</b>
 Vegetables <b>All vegetables</b>	<b>300 (200-600)</b>	<b>78</b>
 Fruits <b>All fruits</b>	<b>200 (100-300)</b>	<b>126</b>
 Dairy foods <b>Whole milk or equivalents</b>	<b>250 (0-500)</b>	<b>153</b>
<b>Protein sources</b>		
 <b>Beef, lamb and pork</b>	<b>14 (0-28)</b>	<b>30</b>
 <b>Chicken and other poultry</b>	<b>29 (0-58)</b>	<b>62</b>
 <b>Eggs</b>	<b>13 (0-25)</b>	<b>19</b>
 <b>Fish</b>	<b>28 (0-100)</b>	<b>40</b>
 <b>Legumes</b>	<b>75 (0-100)</b>	<b>284</b>
 <b>Nuts</b>	<b>50 (0-75)</b>	<b>291</b>
<b>Added fats</b>		
 <b>Unsaturated oils</b>	<b>40 (20-80)</b>	<b>354</b>
 <b>Saturated oils</b>	<b>11.8 (0-11.8)</b>	<b>96</b>
 <b>Added sugars</b>		
 <b>All sugars</b>	<b>31 (0-31)</b>	<b>120</b>



For our purposes, if we consider the level of change needed, the guidelines for sustainable and healthy meat consumption would require people in the developed world to cut their meat consumption by 50%. This is a case where the current situation is troubling but not without hope.

Let's start with the worrying part of the picture. Between 2000 and 2019, world meat consumption per capita increased from 29.5 kg to 34 kg.<sup>67</sup> Where the hope can be found is at the individual country level. If you look at Chart 78, the authors of this work have divided the countries up into two groups.

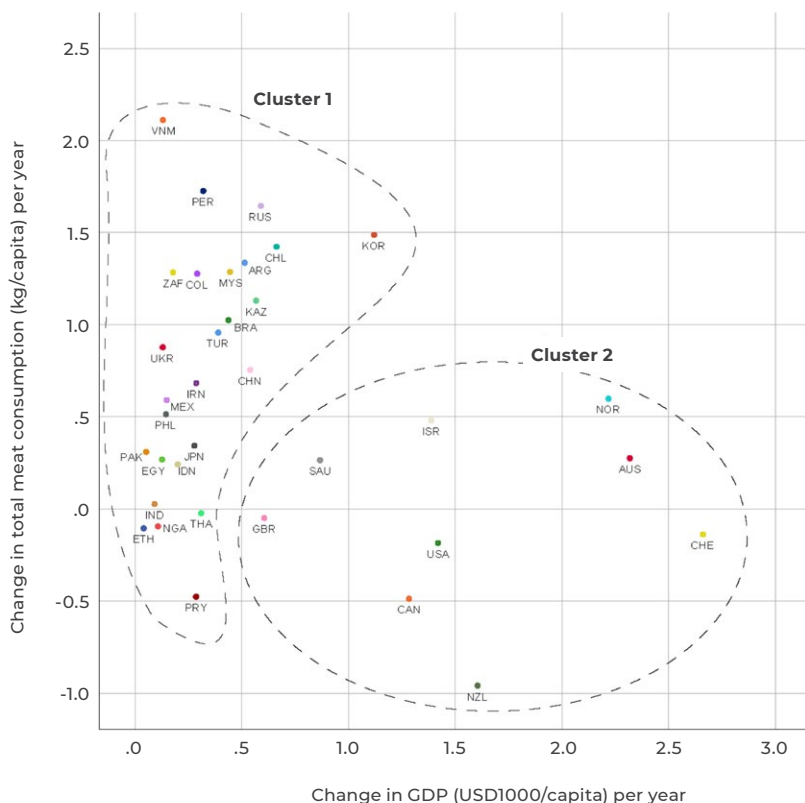
In the first group, Cluster 1, are the majority of countries where meat consumption has increased in line with GDP growth.

In the second group, Cluster 2, that hasn't happened. In some cases, like Ethiopia, that is because of the very difficult circumstances the country has faced. However, for three significant countries, Canada, Switzerland (CHE) and New Zealand, meat consumption per capita has decreased in absolute terms, despite GDP increasing. The authors of this analysis identify the cause to be the change in diet in these countries, all of which have seen rates of vegetarianism rise significantly.<sup>68</sup> What this tells us is that cultural change at an individual level can add up to change at a whole of country level. We don't even all need to be vegetarian, but just to see a significant reduction in meat consumption, especially beef consumption.

If there is another positive sign in these numbers, it is that there has been a shift away from the consumption of beef and sheep meat towards other forms of meat, like poultry and pork, whose environmental footprint is lower. The percentage of beef amongst total meat consumed fell from being 22.8% of all meat in 2000 to 18.9% in 2018 and for sheep meat over the same time frame the fall was from 5.6% to 5.1%.<sup>69</sup> These are not big shifts, but they are in the right direction and they show that change is possible. Part of what may shift attitudes is that it is not just for the sustainability of the planet we need to reduce meat consumption, but there are a range of other serious ethical and practical questions around the industrial production of meat, from the very instrumentalised way animals are treated, to the excessive use of antibiotics. If the world ate a lot less meat, then the animals that remain could be reared and turned into meat in ways that reflect far greater respect for them.

**Chart 78:** Change in GDP per capita vs change in total meat consumption, 2000 to 2019

Source: Whitton, Clare, Diana Bogueva, Dora Marinova, and Clive J. C. Phillips. 2021. "Are We Approaching Peak Meat Consumption? Analysis of Meat Consumption from 2000 to 2019 in 35 Countries and Its Relationship to Gross Domestic Product" *Animals* 11, no. 12: 3466. <https://doi.org/10.3390/ani1123466>



There is reason to think that some of the attitudes needed to underpin further change are already in place around the world. The United Nations Development Programme and Oxford University conducted a huge public opinion survey of 1.2 million people around the world about climate change. The survey picked up a question relevant to dietary changes, as you can see in Chart 79, because forest clearance and diet have a big climate impact.

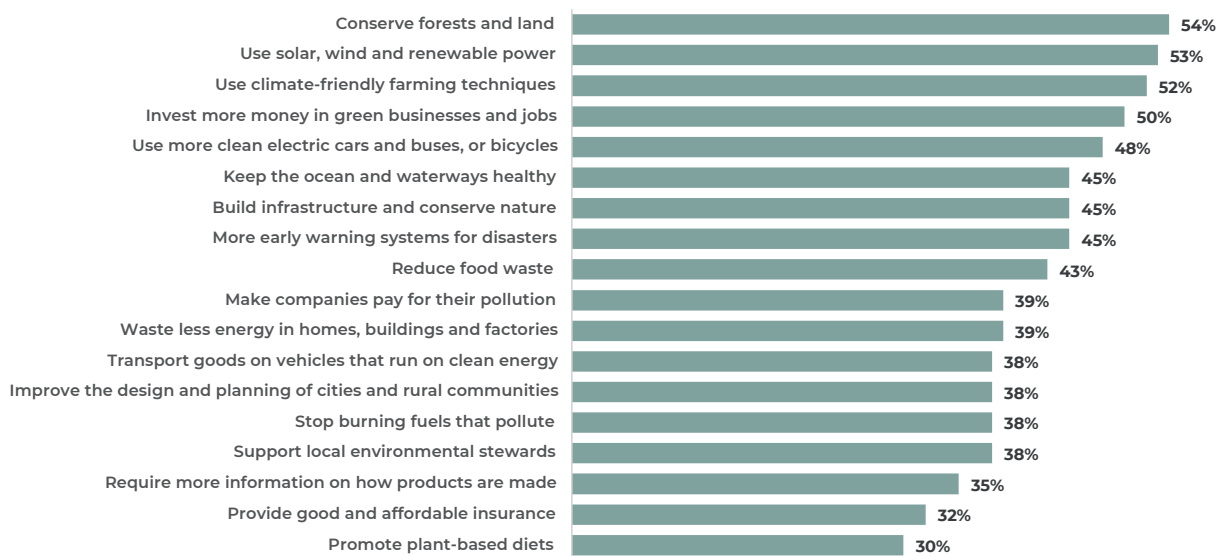
Changes in diet were the least favoured policy. Some have framed this in pessimistic terms.<sup>70</sup> A more hopeful view is that nearly a third of people thought it was a policy that governments should act on. Furthermore, the survey showed conservation of forests and land had more than 50% support. While there is work to do to help people connect changes in diet to the conservation of forests, it suggests that the beliefs exist for a change in diets by a significant portion of the world's population.<sup>71</sup>

Consumer signals are powerful. Some people will see the imperative to accelerate the change and will become vegetarian. For many people that will be a step too far, too soon and if they think the only option is to become vegetarian, they may be discouraged to make the changes that they can. Similarly, there are still very poor parts of the world where increased intake of animal protein may be the only realistic way that people in those places get sufficient protein in their diets to be healthy.

What that means is that anywhere it is possible, every bit of reduction matters. If in total that reduction can see the start of a negative trend in meat consumption, as it has started to trend in a handful of countries, that will be a powerful signal to the market that meat consumption is not growing anymore and that therefore we don't need to continue to destroy forests and grasslands. Everyone with already adequate diets can play their part to create that trend. They can reduce their total meat consumption, change from red to white meats and increase their consumption of vegetable proteins. While we are doing so, we should reduce our consumption of fish and make sure that we only buy species where the stocks aren't under threat.

**Chart 79: The world's most popular climate policies**

Source: The People's Climate Vote Survey – UNDP and Oxford University's Department of Sociology



## Housing

To reduce our material footprint significantly we need to go from the kitchen to the whole house. Our approach to construction and the operation of our buildings, including our residential housing, needs to change, both to achieve the transition to a net zero economy by 2050 and to free up materials so they can be more equitably shared across the planet, so everyone can have adequate housing.

What makes this such an urgent task is that the world is building at a prodigious rate. The IEA's forecast makes the point well:

*Floor area in the building sector worldwide is expected to increase 75% between 2020 and 2050, of which 80% is in emerging markets and developing economies. Globally, floor area equivalent to the surface area of the city of Paris is added every week through to 2050. Moreover, buildings in many advanced economies have long lifetimes and around half of the existing building stock will still be standing in 2050.<sup>72</sup>*

We can all bring two of our big personal questions to this situation: 'is what I am doing circular?' and 'are the energy and materials I am using zero carbon?' If we are fortunate enough to own a house, we can take action directly, for example by retrofitting it with circular insulating materials. If we are renting, we can let landlords and authorities know about what we value in our housing. To support those choices about housing and the choices made by people building commercial and public spaces, the architectural, building, engineering and planning professions have major roles to play.

They are starting to step up to the challenge in a number of developed world countries with public commitments like 'Architects Declare' and 'Engineers Declare'. These statements are a good start, but they don't go far enough. They lack the sort of specific targets and public accountability that we know are important features of other public instruments designed to help achieve the pace of change required.

These professions also need to consider their professional ethics. One wonders in the world today whether it is ethical to design a large luxury house that consumes vastly more materials and represents far more than what could possibly be considered the owner's fair share.

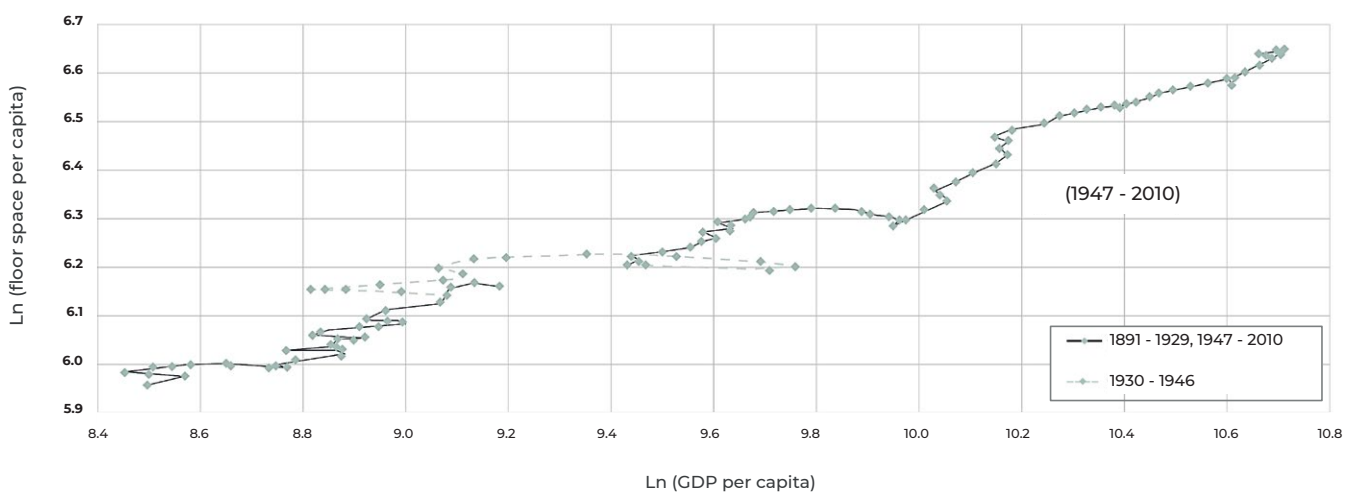
Whatever the building we are involved with, the first step is to ensure that what we design is circular. Again, this is an approach to design that has become mainstream even if we still aren't building that many buildings this way yet. There are plenty of good books and materials available on how to design and build in circular ways, that anyone involved can consult, just as everyone should become familiar with The Lancet's sustainable diet. A good starting point is the Royal Institute for British Architects' publication *The Handbook to Building a Circular Economy*.<sup>73</sup> When such a well-established and mainstream professional body like the RIBA is providing and promoting this sort of guide, there is hope.

This sort of circular building design starts with the theme of 'reducing'. The bigger the space, the more materials it consumes and the more energy it takes to heat and cool. Unfortunately, as we get wealthier, we seem to just make houses bigger and bigger. Chart 80<sup>74</sup> shows this relationship in the United States over a very long period. The same sort of relationship can be found around the world. It is not a remotely sustainable trend.

We know from the countless people who do live well in smaller spaces, often in relatively dense but very liveable cities, that the key question is how the space is designed that makes the difference. That should invite us to think about living in smaller spaces. Rather than extending houses, we should be redesigning them so that they work better. Idle rooms, which are only used for a few hours a day, are unlikely to represent a sustainable way of building for the planet.

**Chart 80: Log-linear relationship between floor space per capita and GDP per capita**

Source: Moura MCP, Smith SJ, Belzer DB (2015) 120 Years of U.S. Residential Housing Stock and Floor Space. PLoS ONE 10(8): e0134135. doi:10.1371/journal.pone.0134135.



With commercial and public buildings, we need to ensure that they are highly utilised to reduce their footprints. The ways we work, which are already evolving, need to continue to develop so spaces are both humanly highly functional, so people want to use them, but also that they are very well used.

When we are building in a circular way, we are not just building less, we are also constructing differently, so at the end of the building's life it can be disassembled and the materials reused. Even buildings that weren't designed in a circular way need to be disassembled rather than demolished, so that we can recover as much of the materials as possible.

That shift to much smaller and more highly utilised spaces is critical to free up the materials needed now to build the adequate housing and commercial spaces required in the developing world. Circular approaches to the actual construction of buildings will mean that their materials become available again and can be redistributed to the places that need them. That redistribution will be driven by the fact that much of the building materials market is very global. Steel products, timber, insulation, building services equipment like air conditioners and countless fixtures and fittings move seamlessly around the planet. That does mean that if there is less demand in the developed world and more supply from the reuse of materials from disassembled buildings, these materials will be more available and more affordable in the developing world.

That flow of materials to the developing world is particularly important because much of the global growth in building is in countries where they need to improve their housing stock and build the commercial space for their growing economies. We will need far more than materials to flow. Even more critical will be for circular know-how to flow, so they can build in these new ways. We need significant development programs aimed at this kind of knowledge transfer, which includes both technical knowledge but also the regulatory codes and schemes to ensure that this knowledge is used effectively.

If we turn from the materials to the energy question, the IEA, who closely track the global energy picture, report that 'in 2021, the operation of buildings accounted for 30% of global final energy consumption and 27% of total energy sector emissions (8% being direct emissions in buildings and 19% indirect emissions from the production of electricity and heat used in buildings).'<sup>75</sup> To tackle this challenge requires attention to both new and existing buildings. Given the vast scale of our current building stock, we will need to 'retrofit' those existing buildings, so that they are more efficient

and electrified. The IEA has calculated that for the world to achieve net zero emissions, the rate of global retrofits needs to be 2.5% of the housing stock a year by 2030<sup>76</sup> and that if we don't achieve that rate in time, then it will be close to practically impossible to meet that target.<sup>77</sup>

To meet the building energy challenge, three strategies will help with both our houses and buildings more generally.

First, eliminate fossil fuel use from our houses and indeed all buildings. This is what in the policy world people talk about as making housing 'zero-carbon ready' so that when the grid is fully decarbonised, then houses won't create greenhouse gases through their energy use. At a household level, that means we need to eliminate the use of natural gas for cooking and heating. If there was to be a future for gas, it would need to be hydrogen created from 100% renewable energy. I suspect on current trends, if we are to meet our 2050 targets, there will be few places where the opportunity to switch from natural gas to hydrogen will come soon enough, if it ever does.

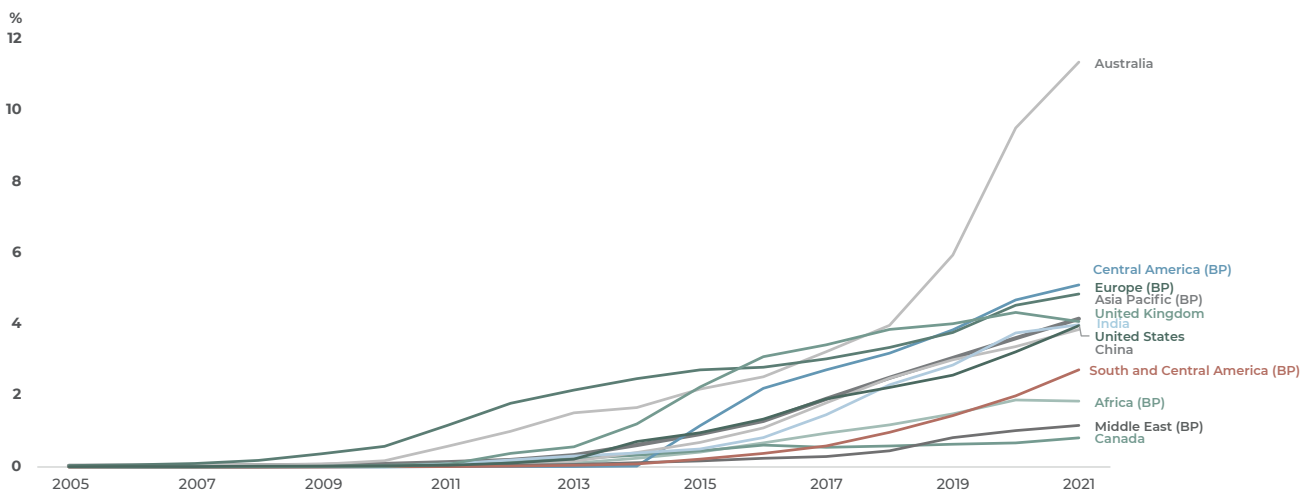
Second, accelerate the transition to zero-carbon energy through the self-generation of renewable energy. Individual households who put solar panels on their rooftops do just that. The standout feature of Chart 81 is the dramatic growth in the share of solar energy in Australia, which has almost entirely been driven by individual houses putting solar photovoltaic panels on their rooftops. There have been various government subsidies, incentives and initiatives, which supported the virtuous cycle of increased scale and industry capacity and with them reduced installation costs. In time, that has allowed the government to step back. It is a very similar pattern to the one with electric vehicles in Northern Europe, which we will see shortly. In both cases, well-designed government initiatives can catalyse a rapid transformation of consumer behaviour to the great good of the planet.

Third, pursue energy efficiency. Even if someone has their own solar power, unless they also have battery storage, in most parts of the world they will still draw power from grids that have electricity generated from fossil fuels. When it comes to efficiency, every appliance we choose makes a difference – as does not owning so many appliances in the first place. Do we really need kitchen benches lined with devices like bread makers? Every light bulb matters. Every device on standby power matters. They all add up.

While the most expensive means to achieve efficiency gains are insulation and the ways we heat and cool spaces, the reduced energy costs from insulation and implementing highly efficient systems do pay off in relatively short periods of time.

**Chart 81: Share of electricity production from solar, 2005 to 2021**

Source: Our World in Data based on BP Statistical Review of World Energy (2022); Our World in Data based on Ember's Yearly Electricity Data (2022); Our World in Data based on Ember's European Electricity Review (2022); Share of electricity production from solar (ourworldindata.org)





The challenge for many households are the upfront costs, which is where government or commercial schemes to assist with those investments can be very helpful to support individual choices.

The choices people make about heating and cooling appliances, whether it is to replace an old one or to install a new one, are collectively very material. In the period 2021-2030, the world is predicted to install 650 million more air conditioners and 2 billion more by 2050.<sup>78</sup> The technology of choice for heating and cooling is the heat pump. When compared to natural gas heating, they are 3 to 5 times more efficient.<sup>79</sup> Consumer choice, especially if supported by government, can make a huge difference. In Norway, 60% of buildings have heat pumps and in Sweden and Finland it is over 40%.<sup>80</sup> Rates of uptake are growing rapidly globally and the increased price of energy is pushing sales further. This is certainly an area where consumers can help to create a market at the scale that accelerates one part of the energy transition.

Beyond the zero-carbon and circular tasks, sustainable housing supports our other agendas. When we make houses sustainable in these ways, we also help with the inclusion and resilience/ stability project at a very local level because households will be less exposed to volatile and rising energy costs and smaller houses will make those costs more affordable in the first place. This kind of housing is also integral to regenerative cities. Collectively, more efficient use of energy will lift productivity.

### Travelling

The third area to focus on where our choices about living a sustainable life can make a difference is how we travel.

A way to approach sustainable travelling is to think about the circular strategies of reducing, reusing and recycling. Reducing occurs when we only travel when needed, especially on higher carbon forms of transport like airplanes. Reusing occurs when we are involved in schemes to share modes of transport, whether communal cars, scooters or bicycles. Recycling should guide choices about the purchase of any personal mode of transport. Already, some European car companies have set the target to make 100% circular vehicles, where all the components can be recycled.

For those journeys we need to make, our zero-carbon questions will push us to seek zero-carbon energy modes of transport. The first choice would be active transport like bicycles or public transport, which even if it is not electrified will have a smaller carbon footprint than individual cars.

A lot of what influences the modes of transport we can plausibly choose will be governed by how the transport systems in different cities have evolved. You can see this very clearly in Chart 82.<sup>81</sup> In the chart on the left-hand side, on the horizontal axis we have bicycle ownership per capita. At around 0.8 - 1 bicycles per person, we have a large cluster of developed countries. On the vertical axis, that shows the percentage of journeys by bicycles, and we can see a very wide spread amongst these countries.

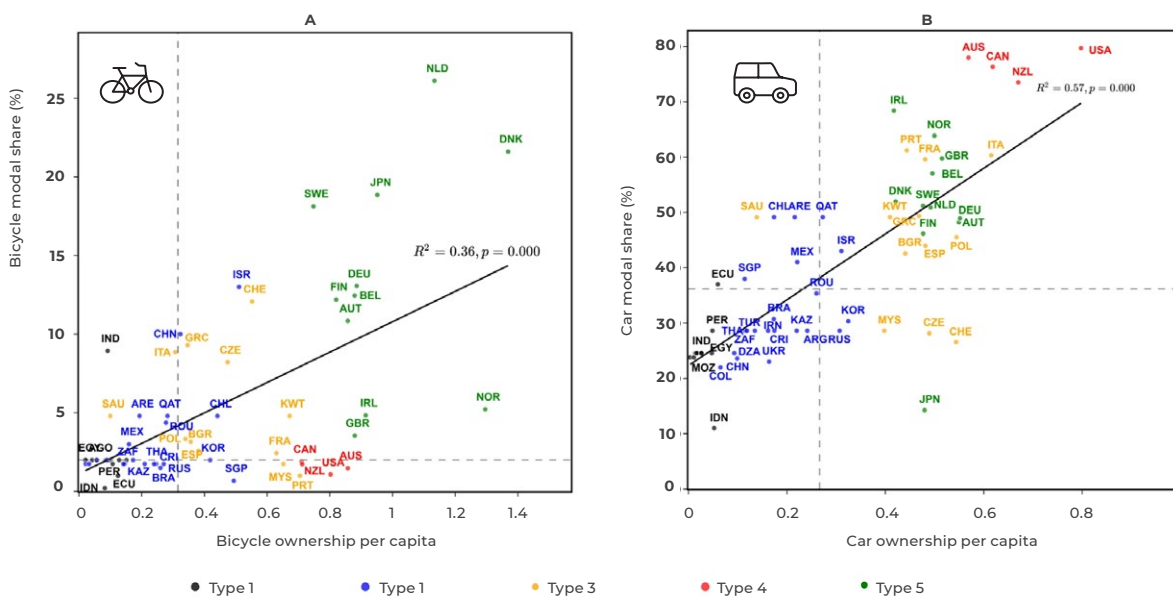
Places like the United States, Canada and Australia who have organised around the car, have very low uses of bicycles for transport, whereas countries like the Netherlands, Denmark and Japan see much higher percentages. On the chart on the right-hand side, we can see the same picture for cars. You can see not just the implications for bike but public transport as well. In those countries that have organised around the car, most journeys are made in them.

For those people who live in car-dominated cities, the action of joining or initiating efforts to expand active and public transport options will matter. It is important to recognise that this can be effective. I will share just one example that I experienced personally. After considerable local activism by cyclists and inner-city residents in Melbourne, Australia, the State Government developed a Cycling Strategy and the City Council developed a Cycling Plan. The result was that both levels of government have been investing in bike paths, so in the space of a decade, cycle movements into the city went from 8% of all transport movements to 16% during peak hour.<sup>82</sup>

When we have to use a private car, we do at least get choices when we decide what type of car to purchase. I thoroughly appreciate that questions about carbon and electric vehicles are complex.

**Chart 82: Bicycle ownership and bicycle modal share and Car ownership and modal share**

Notes: a) Bicycle modal share against bicycle ownership per capita, and b) car modal share against car ownership per capita. The dashed lines indicate the median values of the x-axis and y-axis, which splits the figures into four quadrants. The solid lines in a and b show results of the linear regression fitting. Source: Wu Chen, Trine Agervig Carstensen, Ranran Wang, Sybil Derrible, David Rojas Rueda, Mark J. Nieuwenhuijsen, and Gang Liu, 'Historical patterns and sustainability implications of worldwide bicycle ownership and use', Communications Earth & environment, (2022) 3:171, <https://doi.org/10.1038/s43247-022-00497-4> www.nature.com/commsenv



Today, whether and by how much they reduce a carbon footprint depends on the source of the energy we charge them with, the source of the energy used to manufacture them, their size and their lifespan. However, for our long-run sustainability, we need to change the world's fleet over from fossil fuel vehicles. While in the short run the gains in some places may be marginal, by 2050, it is imperative that we have a renewable energy fleet of vehicles.

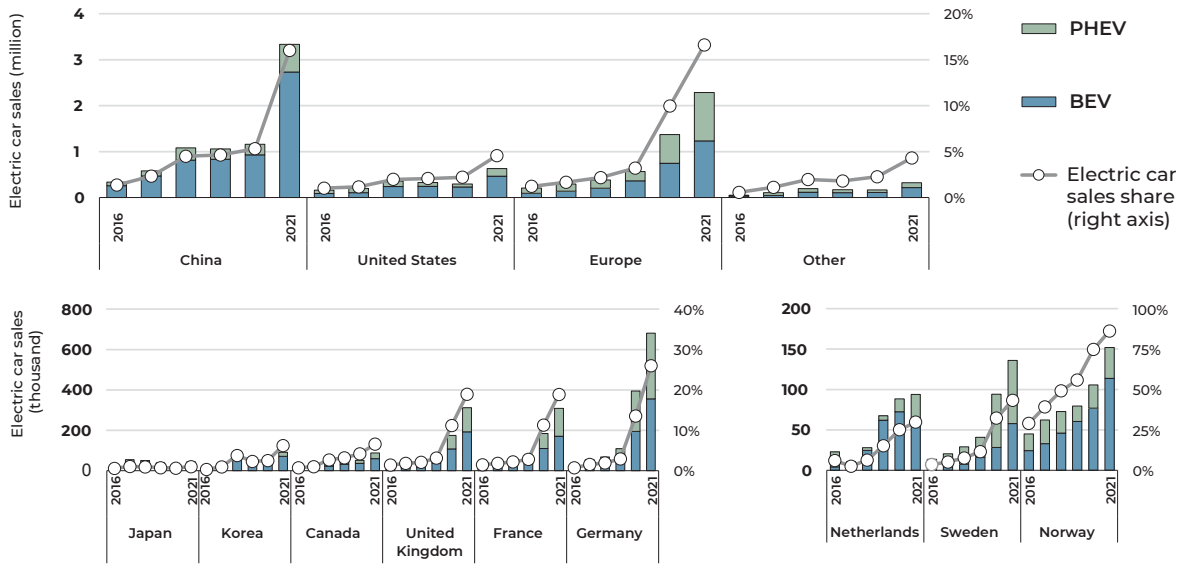
Everyone who buys a car can make a difference to whether we make the transition in time. For us to make that global transition, the IEA has modelled that, by 2030 around the world, we need to see 64% of new car sales being either battery electric, plug-in hybrids, or fuel cell electric vehicles.<sup>83</sup>

Where are we today? Globally in 2021, total sales of all kinds of electric vehicles were just under 10% but the real story is of very rapid growth, where just four years earlier it was less than 2.5% of sales.<sup>84</sup> The regional differences are telling. Chart 83 from IEA paints this picture clearly.

**Chart 83: Electric car registrations and sales share in selected countries/regions, 2016 to 2021**

Notes: The countries/regions shown are the world's largest EV markets and are ordered by size of the total car market (i.e. all powertrains) in the upper half of the figure and by sales share of electric cars in the lower charts. Acronyms and geographic groupings are defined in the Notes of the previous figure. Regional EV registration data can be interactively explored via the Global EV Data Explorer.

Source: International Energy Agency, Global EV Outlook 2022, 2022, p.4. <https://www.iea.org/reports/global-ev-outlook-2022> [Accessed 27 Jan 2023].



We can see in the right of the chart that Norway, which has a very strong set of policies to support EV uptake, strong consumer values about sustainability and a wealthy population, already has sales rates that exceed the 2030 goal. Other countries with strong sustainability commitments like Sweden, the Netherlands, Germany and France are also on a positive trajectory towards that 2030 goal. The fact that Germany and France are also major car manufacturers is a positive part of that story. There is every reason in these places for individuals to accelerate this trend.

China represents an important new trend with very rapid recent rises in electric vehicle sales, much aided by the fact that the gap between the cost of electric vehicles and internal combustion engine vehicles has narrowed to just 10%.<sup>85</sup> To see a huge economy whose transition will be critical to the planet's future on this sort of trajectory is a hopeful sign.

The picture is more challenging in the rest of the world, where a huge amount will need to be done to see the sales rate reach

the levels the world needs by 2030. Hopefully, governments in those countries will embrace some of the policies that are proving successful in Northern Europe. In the meantime, individual consumers can play a key role. Where consumers are willing and able to pay a bit more, it will help to create the scale to bring costs down and drive the availability of charging infrastructure, which in turn will lower the barriers to further people choosing to switch to electric vehicles.

The picture we have with travel, as well as other areas of life we have considered, is that we know what it is to live sustainably and we know what the time frame is that we have to get there. In some places around the planet, we can see that people either will, or they will have a reasonable chance to, live that life within the time frames needed. It shows it is possible. However, our challenge is there are just not enough of these places. Therefore, we need to combine action and advocacy to support those changes so everyone can live a sustainable life.

## Idea 5: Organise for the transition to the long, participative life

Ultimately, that sustainable life will be dependent not just on a sustainable level of consumption but on a sustainable population size, where there is equitable participation in economic opportunity. That extraordinary human transition to a stable, smaller, long-lived population is a transformation we need to start to manage now.

If we take that broad sustainability lens, then we can see what looks like the very major challenge of the ageing population in the developed world as a major opportunity. If we can successfully navigate the world of ageing population without reigniting population growth, we will pass through a key gateway to a sustainable future. The developed world faces that challenge now. In time, hopefully sooner rather than later for the sake of the planet, the developing world will face the same transition when fertility rates fall below replacement levels as income, education, women's empowerment, and access to contraception rises. Already, fertility rates in Africa are falling significantly faster than had previously been expected as some of those forces take hold.<sup>86</sup>

To pass through that demographic gateway is not easy. Ageing populations are a challenge to both the inclusion and prosperity agendas. Already with people living long lives, today's pension and superannuation schemes, which were not designed to fund people to live as long as they do, see too many retired people lose their freedom to choose the life they want to live and find themselves in poverty. That is even before the rapidly rising dependency ratios start to put significant pressure on what can be provided. On the prosperity side, a workforce that both shrinks and sees productivity rates decline will not be able to generate the same increases in income as it has in the past, just when more is needed.

As we pass through that gateway, we also want to emerge into a world where the trends to growing inequality have been reversed and we have a consistently more inclusive economy and society.

Perhaps the best way to get through this gateway is to recognise that the model we have for organising life was designed for the very different human reality of a short life. Our current model, born in an Industrial Age, is of linear life stages of education, work during which time we find a life partner and have a family, retirement and then death. The gap between retirement and death when this model was put in place was short and since then has progressively lengthened.

The focus on the problems caused by that growing gap has led to strategies to try to adapt this short life model to serve the long lives people now live. That is causing trouble. We have seen turmoil when countries like France have tried to push up the pension age by a couple of years. Nor does it seem an enduring solution to just keep lengthening the working stage of life.

As we think about how the model might evolve, we should recognise that there are other changes which have put the model under pressure.

People are delaying having families. That has created what we might call 'the overcrowded middle of life' when people are trying to find a life partner, have a family and raise children and do all that is required at work to progress their career through that critical stage from initial levels to managerial or executive roles or to see their own business really grow.

People are having more than one career. The idea that work is a stage of life doesn't hold in the world. It is multiple stages and increasingly it is punctuated by some further education to re-skill for new roles.



Collectively, these changes suggest we should consider alternative, less linear models to organise life. If we weren't trying to get working life done by 65 years of age and we valued older workers more, we might also create more room in often overcrowded working lives for people to take periods out of work to participate more fully in the raising and educating of children and in personal and professional renewal.

We should look at income support at multiple points in life not just once someone is over 65. Those who advocate for a universal basic income to some degree point in this direction. While there are many issues with that model, its basic instinct, that we need to upset the traditional linear model, is right. This kind of approach would also see us create greater incentives and better enablers for people to work later in life. Today, pension schemes typically have quite strong disincentives to paid employment built into them where, as people earn income, they lose their pension.

If we enabled greater movement in and out of paid work and, by choice, enabled people to extend their working lives, we would need to do more to support re-education. Higher education institutions and their regulators would have a role to play. They would need to provide shorter, better targeted programs people could complete during short periods out of the workforce and which could, if needed, be integrated into their busy lives, whether they are working or fulfilling other responsibilities. Governments would also have a role to provide income support to enable people to take short periods out of work to study full time, so they could rapidly get the next set of skills.

This kind of model creates systematically more space in life for education to occur. That is fundamentally important, not just to enable the long life but also a more inclusive life. It was a consistent theme in the discussion of inequality that the best corrective action available was education. There are also a range of labour market design strategies, from supporting collective bargaining to assisting with workforce mobility, that will be helpful, but nothing will help more than education.

Higher levels of education enable people to get better paid jobs in the first place, and when automation, trade or migration see them lose their jobs, re-education – that takes them to higher levels of attainment than they currently have – will see them far more likely to return to a highly paid job than a less secure, lower paid job.

The evidence for the impact of raising educational attainment levels to increase participation and fight inequality is very clear. Every year, the OECD publishes a remarkable compendium of information on education around the world called Education at a Glance – a slightly odd title for a document of nearly 500 pages.

If we consider whether someone is likely to be employed, the OECD data shows what a difference the level of education makes. You can see this in Chart 84. In this chart, the vertical axis shows the average unemployment rate across the OECD by education level. The horizontal axis shows this picture over time. As a general observation, we can see that the unemployment rate for those with a tertiary education is generally under 5%, which is not far short of full employment given that some people, perhaps around 3%, will always be unemployed as they enter the labour force or move between jobs. The level of unemployment for tertiary educated people is much lower than for those with 'below upper secondary qualifications' and still a good few percentage points better than those with 'upper secondary or similar'.

The picture of the advantages education provides is very clear if we look at what happened around the time of the global financial crisis in 2008-9. The global economy slowed and unemployment rose. However, the people who were most impacted were the people with less education. Unemployment only edged up a few percentage points for those with tertiary education, but it jumped substantially for those with lower levels of education and hit especially hard those with no upper secondary education.

**Chart 84: Trends in unemployment rates, by educational attainment**

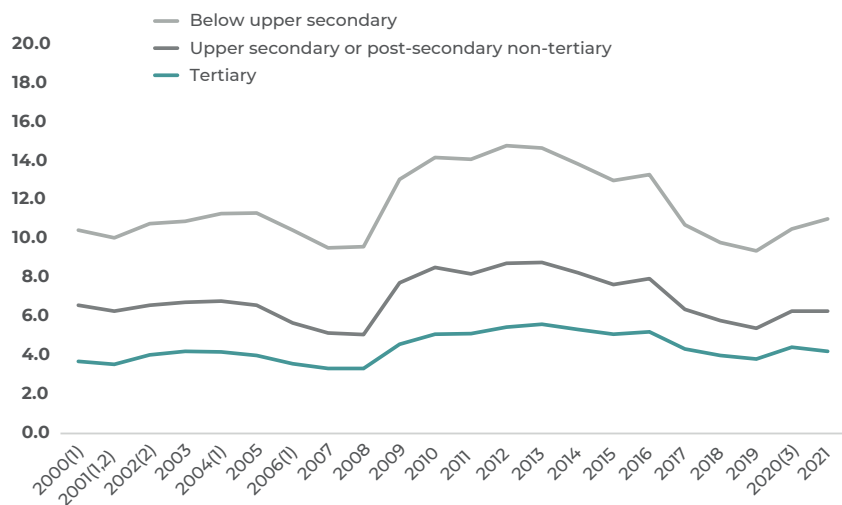
Percentage of unemployed 25-34 year-olds among 25-34 year-olds in the labour force, OECD average

Source: OECD (2022), Education at a Glance Database, <http://stats.oecd.org/> [Accessed 12/1/2023].

Note: Because of a lack of data for many years, the following countries are excluded from the OECD average: Austria, Chile, Colombia, France, Iceland, Japan, Lithuania, Luxembourg, Norway and Slovenia. There are the breaks in time series following methodological change in the ISCED classification with minor impact on the aggregate levels of educational attainment.

1: Missing data for Israel.  
2: Missing data for Finland.  
3: Missing data for Türkiye.

Information on data for Israel: <https://oe.cd/israel-disclaimer>

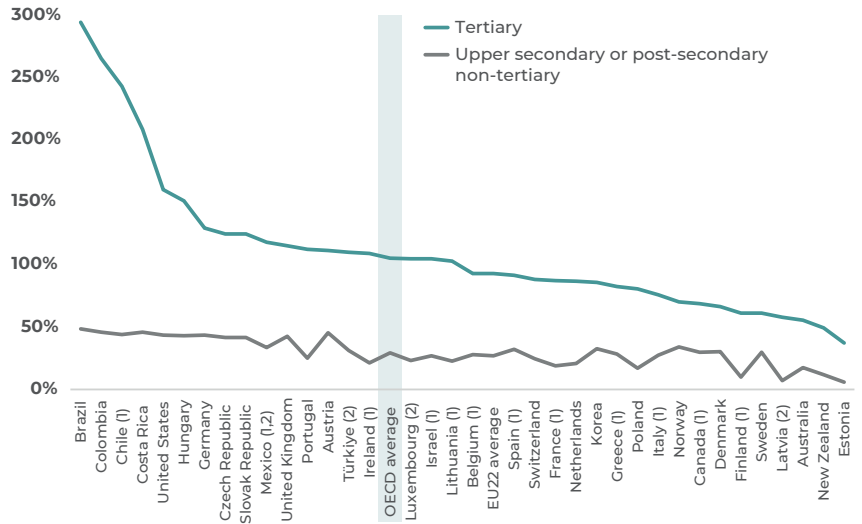




**Chart 85: Earnings premium of 25-64 year-olds, by educational attainment, 2020.**

2020 full- and part-time workers, in comparison to below upper secondary

Note: There are cross country differences in the inclusion/exclusion of zero and negative earners.  
 1. Year of reference differs from 2020  
 2. Earnings net of income tax. Source: OECD (2022), Education at a Glance Database, <http://stats.oecd.org/> [Accessed 12/1/2023].



If we look at the income people get when they are employed, which is shown in Chart 85, you can see what a difference an upper secondary let alone a tertiary education qualification makes. The scale on the vertical axis shows the percentage difference in people's income for each level of education.

It is noticeable that in those countries with lower overall attainment rates, it makes a huge difference because there is such a shortage of people with the qualifications required. In those countries, once they have people with skills at the level required, they can contribute to the creation of products and services whose value is set at a global level. Even for those countries where the increase in income is smaller, for those with a tertiary education it is still typically 50% or more higher than those without. The OECD provides a very helpful summary of the overall picture:

*On average across the OECD, full-time, full-year workers who attained short-cycle tertiary education earned 20% more than those with upper secondary attainment in 2020.*

*This earnings advantage increases to 44% among those who attained a bachelor's or equivalent qualification and to 88% among those with a master's or doctoral or equivalent degree.<sup>87</sup>*

An important feature of the relationship between education and income is that it gets stronger as people get older. You can see this in Chart 86. The OECD summarises the picture well:

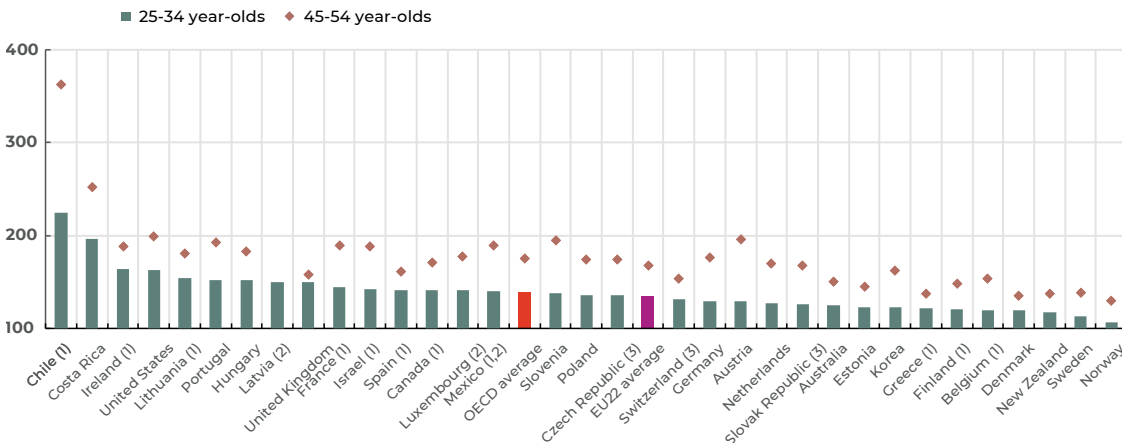
*The earnings advantage for attaining at least a bachelor's or equivalent degree increases with age, probably because of seniority at work. On average across OECD countries, 25-34 year-olds with at least a bachelor's or equivalent degree and working full-time and for the full year earn 39% more than their peers with upper secondary attainment, while 45-54 year-olds earn 75% more.<sup>88</sup>*

When you combine both the rates of employment and income picture, you can see what a difference a person's level of education makes. Given the OECD has tracked this data for a long time, they make an important observation: 'Tertiary attainment among 25-34 year-olds has increased over the past two decades, but there is no sign of this leading to a decline in its labour-market value.'

**Chart 86: Relative earnings of adults with at least a bachelor's or equivalent degree, by age group (2020)**

In per cent, full-time full-year workers per age group; upper secondary education = 100

Note: There are cross-country differences in the inclusion/exclusion of zero and negative earners. See Definitions and Methodology sections for more information. 1. Year of reference differs from 2020. Refer to the source table for more details. 2. Earnings net of income tax. 3. Index 100 refers to the combined ISCED levels 3 and 4 in the ISCED 2011 classification. See the Reader's Guide for the list of ISCED levels. Countries are ranked in descending order of the relative earnings of 25-34 year-olds with at least a bachelor's or equivalent degree. Source: OECD (2022), Education at a Glance Database, <http://stats.oecd.org/>. See Source section for more information and Annex 3 for notes ([https://www.oecd.org/education/education-at-a-glance/EAG2022\\_X3-A.pdf](https://www.oecd.org/education/education-at-a-glance/EAG2022_X3-A.pdf)). Information on data for Israel: <https://oe.cd/israel-disclaimer>



Their observation only reinforces what a powerful lever to drive participation and reduce inequality it is if we can see all children complete upper secondary education and find ways to provide tertiary education to the greatest percentage of the adult population we can.

How we lift educational attainment is a country-by-country question, and so I won't seek to provide specific proposals other than to observe that one of the advantages of a global perspective, especially now that children around the world periodically take globally standardised tests, is there is much countries can learn from each other about how to improve educational attainment at all stages of life.

What is particularly important is that in the model of the long life we make much more systematic allowance for education for all. When we do that, it will help with the transition challenges of an otherwise declining workforce and lower levels of productivity.

If we have removed the disincentives to work after notional retirement, when people receive a pension or superannuation and people are freshly skilled and healthy, we can expect to see the average working life get longer. There will of course be some offsets from people who take time out of the paid workforce at points in life. More regular and on-demand education will be a powerful corrective against declines in productivity.

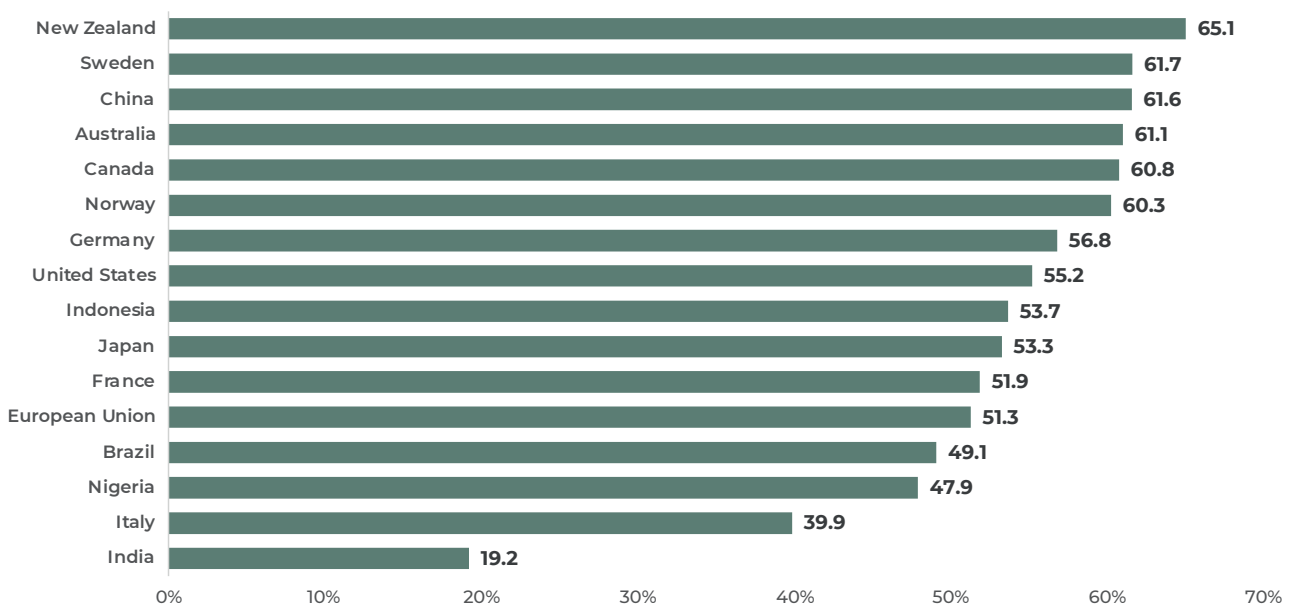
In addition to education, the other focus that is essential to both the inclusion agenda and to help our way through the demographic gate of the rapidly ageing population is to increase workforce participation. Globally, we need to look to a comprehensive change in the approach to participation.

Gender participation is the most helpful place to start because it represents the greatest opportunity to increase inclusion and the size of the workforce when it is under pressure from an ageing demographic. If we look at Chart 87, we can see the opportunity for some of the countries with ageing populations to reduce the impact of that ageing substantially if they increased female participation. Amongst developed countries, New Zealand sets the pace with over 65% participation. Close behind are clusters of advanced economies like Australia, most of the Scandinavian countries and Canada, which are currently achieving 60%. It is reasonable to think that other countries with developed economies could, in theory, get to that sort of level.

On that basis, in Europe there is a substantial opportunity where overall female participation rates are a little more than 50% and especially in places like Italy where the ageing population challenge is particularly severe, but participation rates are ~20% behind leading nations. Of course, there are longstanding cultural issues in some of these countries, but the prize is big enough to make them worth tackling. If we look to East Asia, Japan has a similar opportunity with a female participation rate of 53%, but like Italy, it has some significant cultural challenges to realise it. In China, which faces grave demographic challenges, the opportunity isn't as great with participation rates already at around 60%.

**Chart 87: Female labour force participation rates, 2021**

Note: All figures correspond to 'modelled ILO estimates' | Labour force participation rate is the proportion of the population ages 15 and older that is economically active. Source: International Labour Organization (via World Bank) | OurWorldInData.org/female-labor-supply



To achieve those higher participation rates, there are a range of measures needed but we do know those countries with properly paid parental leave and properly funded childcare do far better. We can see this general relationship in Chart 88, which shows a positive relationship between the family benefits as a percentage of GDP and female participation rates. It certainly doesn't explain everything, but it does suggest a broad policy direction for countries who need to lift their participation rates.

The other types of participation we need to work much harder to address are the elimination of the barriers that people with disabilities face and to create much more supportive work environments to harness the talents of neurodiverse people.

As we work to shift to a model of productive but not necessarily paid activities throughout life, with periods of education to upgrade skills and knowledge, we also need to increase our efforts to support healthy ageing. That is a project not just when people are old but also when they are younger and middle-aged. In those earlier stages of life, people need to care for their minds and bodies so they will continue to function well for as long as possible. We will need to reverse the rising rates of lifestyle conditions like obesity, which are creating multiple chronic diseases that reduce people's ability to participate in productive activity. There is also an urgent need to find solutions to dementia, which takes those later years away from people and their loved ones.

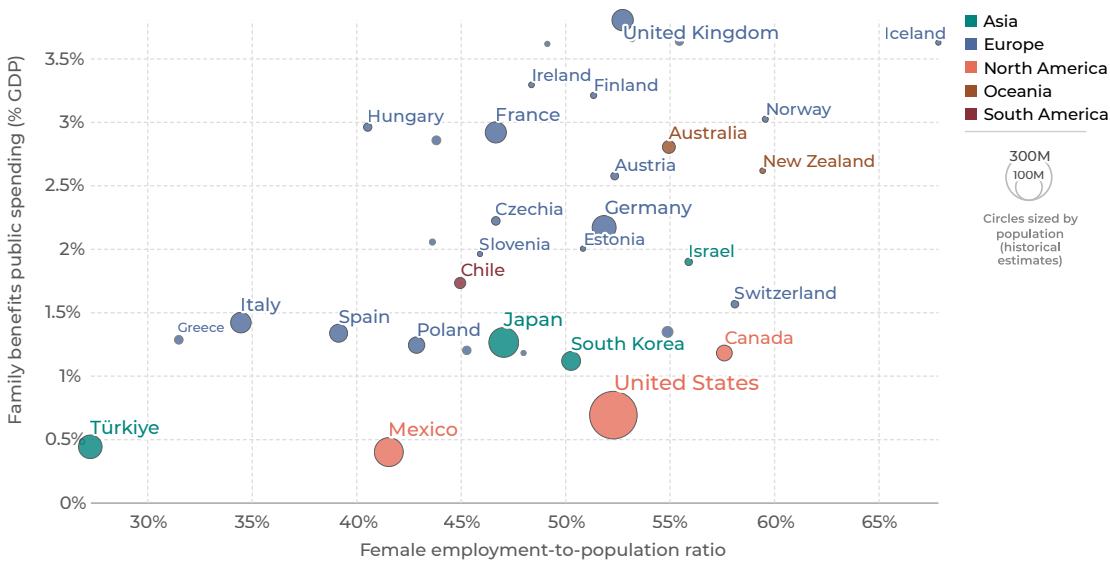
If we change our model of participation in these ways, it challenges us to evolve our models of community. We need to find better ways to enable people to age in their places and in their communities rather than to institutionalise them. Part of the agenda for regenerative cities is to do more to create the types of diverse communities of ages and incomes with public amenity, from parks to local retailers, more evenly spread across those urban spaces, so people can be supported by those in their communities to stay as members of them.

Those types of communities are important, not just for old people, but people at all stages of a less linear life. In these types of communities, what people need to manage life is local, which makes it far easier to navigate those stages of life when someone is not in paid employment.

As we progress towards this long and sustainable life model, it becomes clear that what we value in life is a lot more than economic outcomes. Even more than just valuing these other qualities, in this model we are now organising around them. What we need is a better way to do that. It is to that question which I now turn.

**Chart 88: Female employment vs. public spending on family benefits, 2015**

Notes: The horizontal axis shows female employment-to-population ratios. This measures the proportion of a country's female population (15+) that is employed. The vertical axis shows public spending on family benefits as share of GDP. Data source: OECD (2016); International Labour Organization (via World Bank) OurWorldInData.org/women-in-the-labor-force-determinants



## Idea 6: The well-being not GDP focused life and policy

At the start of this discussion, I highlighted that much of our focus would be on GDP per capita. That was because our global system has, in many ways, organised itself around it, and there was a reasonable correlation, at a very broad level, between some other important measures of human progress or what we might call ‘well-being’, so it was at least workable to use it to help us see the big picture.

We saw that there was a reasonable correlation between GDP per capita and life satisfaction and the United Nations Human Development Index, which covered health, education and living an adequate life.

### *Problems with GDP as a measure*

However, I also flagged that GDP was a very problematic measure. The very reason we have a range of alternatives, like the Human Development Index (HDI) is because this problem has been well recognised for a long time now. I should say it is a topic that has interested me since I was a graduate student, and one of the first articles I ever published was in an economics journal dealing with the sorts of alternative approaches that the Nobel Prize winning economist Amartya Sen was developing.<sup>89</sup> Given the transition we need to make, there are three broad issues to be addressed to measure what matters for the transition to a sustainable, inclusive, prosperous and stable world.

### *Issue 1: GDP is too narrow a measure of human life*

The first of these issues, which is already apparent, is that GDP is too narrow a measure. We introduced the HDI, but it is also too narrow a measure with its focus restricted to education, health and income. There are many other accounts of what constitutes human well-being that are far broader.<sup>90</sup> Amartya Sen’s own work, which talked in the language of human capabilities and functionings, and those who have built on it, like Martha Nussbaum, have pointed to a larger list. If we consider the widely used UN Sustainable Development Goals (SDGs), they implicitly have a much broader construct of human well-being. It certainly includes health and education but also ranges from access to food and water through to dignifying work and living peacefully with others.

An important feature of more inclusive concepts of development, like the SDGs, is that they don’t have hierarchy to them. Conceptually that is important because unlike GDP or concepts like utility, which economists often use, the SDGs recognise that there are distinctly different features of human life that are valuable. Having dignifying work is intrinsically important and distinctively valuable but so too is living peacefully and having access to clean water. Each are important in their own right and there is no common denominator we can use to rank one as more important than the other.

What this sort of broad and non-hierarchical approach that can’t be boiled down to some simple common denominator does is to frame the task to make human progress as one that requires work across a broad front of human development. Equally, because we can’t progress at the same speed on every goal, it provides us with a series of concepts to have both high-quality policy and political discussions about priorities. It opens up a much richer foundation for discussion about how we prioritise and allocate resources.

To give just one illustration: the SDGs for both Life on Land and Life in the Water. The approach requires us to give attention to both. How does a country decide which one to prioritise? Certainly, the state of each environment and how urgent action is to save species or restore critical ecosystem functioning could be a basis for a decision. A country could also decide that its culture and identity were more connected to the sea than the land, so it should prioritise care for its waters. Or, a country could see that its first peoples were deeply connected to the land and that it was integral to national priority to support them to care for the country first.





There isn't a single right answer. It is rather that the logic a community chooses to follow will, in part, reflect and certainly help constitute its identity, beliefs and values. When people consciously make decisions on that basis, then they strengthen their quality of community and create a form of political decision-making far better suited to the type of broad agenda for human development that we need.

To move forward on the question of more inclusive accounts, we need both debate and pragmatism. The broader ideas of what constitutes well-being have come from detailed and important interdisciplinary debates. Given the range of ideas that exist about human well-being, there is a lot of value in the continuation of debates to develop an ever-richer and more insightful account. While those debates continue, we need to use a set of broader measures based on the best available insights that we have.

### **Issue 2: GDP does not measure inclusion**

GDP per capita is an average measure and so it does not tell us about the distribution of income. The HDI is also a problem. Because, while the measures are broader, it also doesn't include any measure of inequality. Given our objective to create an inclusive economy and society, we certainly need a measure of inclusion as an integral part of any scheme that seeks to measure progress.

### **Issue 3: GDP doesn't measure whether progress is sustainable**

Perhaps the biggest problem with GDP per capita is that it is an income measure which does not adequately incorporate the harms done to create it. One of the reasons that our extraction to emissions model has only changed at the margins is that largely the harms to the environment involved to create GDP aren't part of how we calculate it. More broadly, our current approach does not seek even to systematically price all these harms, so that when people try to maximise their income, which contributes to GDP, whether at an individual, company or national level, they don't need to take them into account. While we don't systematically price these harms, there are some harms like pollution and greenhouse gases that are priced in some places. There are debates about how effective these pricing approaches are. At a minimum, what they represent is a recognition that we need to include the harms that are done to create income in any measures of progress.

While we try to create a sustainable future as we decouple the economy from the environment, transition to a net zero carbon economy and society, and engage in large-scale regeneration, we need to measure whether we are making progress with these tasks just as much as whether we are creating the income needed for our goal of prosperity.

## **Better measures**

How do we get better measures to guide our progress?

### **United Nations SDGs**

A good point to start the discussion is the SDGs because they are a set of measures that have global currency and are influential, not just at governmental levels but at sector, organisational and even individual levels around the globe.

As a set of goals, they do meet our test for a better measure than GDP. They are broad as we have highlighted. The reduction of inequality between and within countries is an explicit goal. They seek to improve the environmental sustainability of our progress. They address issues of climate and ecosystem protection and renewal on land and in the water. Together, they point the world in the direction of the sort of changes that are essential.

What has helped make them a valuable reference point for people who make policy is that they do come with specific and time-

bound targets. There are specific measures or 'indicators' as they call them that the world seeks to meet by 2030.

There will always be discussion about the merits of concrete measures. Any measures will have issues. One that stands out with the SDGs is that there is no measure that specifically protects indigenous people despite, as we shall see, the critical role their knowledge and stewardship can play to create a sustainable future.

Nevertheless, while we work to improve the measure, the question is whether a system of measurement with issues is better than no system at all. With eyes wide open about the issues, measures are indispensable. They facilitate debates about what the right focus should be for our resources and efforts, and what our level of ambition should be. Once the debates have happened, they help us prioritise.

They help with the alignment of effort and collaboration amongst everyone who agrees with them. They enable us to see whether we have made progress and to learn lessons about what works and what doesn't. Where those goals are shared, the opportunity to learn is even broader. We see that with the SDGs – the common framework of goals and measures facilitates countries, organisations and individuals to share knowledge about progress and challenges.

The SDGs are a particular instrument to harness global efforts. At least in theory, and to varying degrees in practice, all those countries that have signed up to them are committed to this framework. If we are to try to achieve the sorts of shifts for which this essay has argued, then we should support the framework in whatever ways we can.

Governments have already committed to align their policy efforts around them. Organisations can work individually and as a sector to help them focus their efforts. In my own university sector, I have seen them play a valuable role as an increasing number of universities around the world align their organisational strategies with the goals. This has been helped by the Times Higher Education organisation who created a ranking system to make progress transparent and to harness some of the competitive energies between universities to drive ambitious improvement objectives. The framework the goals have provided has certainly facilitated knowledge and practice exchange across the globe, including across the divides of developed and developing countries and the different regions of the world. Individuals can also consider how they align their individual choices with these collective efforts, much as we talked about in the section 'Live the sustainable life'.

### **OECD's Better Living Index**

The SDGs represent a necessary but not sufficient tool for the sorts of changes we need to make. It is a framework to track progress towards some very important goals rather than a system of measurement to support the full breadth of policy choices a country needs to make. For that latter task, a particularly robust and helpful approach is the OECD's Better Living Index.<sup>91</sup> This index is the product of exactly the kind of debate and pragmatism I highlighted earlier.

Central to the story of this index is the work of 'The Commission on the Measurement of Economic Performance and Social Progress', which was established in February 2008 by the President of the French Republic, Nicolas Sarkozy, who was dissatisfied with the measurement of social and economic progress. The Commission was led by three of the most distinguished economists of the time, Joseph Stiglitz (President of the Commission), Amartya Sen (Adviser) and Jean-Paul Fitoussi (Coordinator).<sup>92</sup> There were a number of conceptual features that make this an index highly suited to the sort of direction for which this essay has been arguing.

First, the Commission distinguished between current well-being measures and sustainability measures.<sup>93</sup> They recognised that sustainability measures need to consider the ‘stocks’ of natural assets and whether they were decreasing or increasing, not just yearly increases or decreases, but over the long run, so you could see the true state of nature. They explicitly called out that:

*The environmental aspects of sustainability deserve a separate follow-up based on a well-chosen set of physical indicators. In particular there is a need for a clear indicator of our proximity to dangerous levels of environmental damage (such as associated with climate change or the depletion of fishing stocks.)<sup>94</sup>*

Second, it was important to have broad measures of well-being (see Chart 89). The list they propose is more substantial than even the implicit list in the SDGs: i. Material living standards (income, consumption and wealth); ii. Health; iii. Education; iv. Personal activities including work; v. Political voice and governance; vi. Social

connections and relationships; vii. Environment (present and future conditions); viii. Insecurity, of an economic as well as a physical nature.<sup>95</sup>

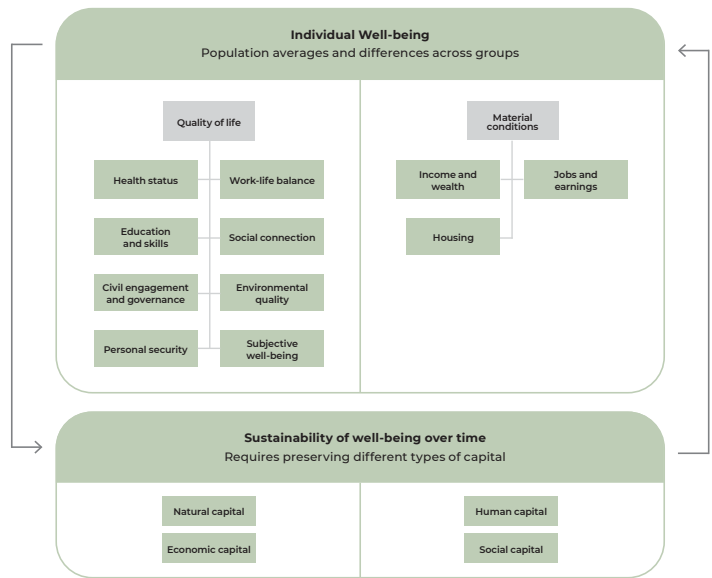
Third, it was important to consider both income and wealth.<sup>96</sup> We saw in the discussion of inequality just how important that is, if we are to address this challenge properly.

Fourth, distribution questions were critical.<sup>97</sup> Clearly, this is a key concern from the analysis in this essay if we are to improve inclusion.

Fifth, they emphasise the household perspective.<sup>98</sup> The reason for this is they argue ‘the available national accounts data shows that in a number of OECD countries real household income has grown quite differently from real GDP per capita, and typically at a lower rate.’ When we looked at the impact on the middle class of the era of the Revolution in Connectivity, we saw exactly this issue and how important it is to call specific attention to it.

**Chart 89: Plan Life and Policy around Well-being rather than GDP**

Source: Joseph Stiglitz, Amartya Sen and Jean-Paul Fitoussi, Report of The Commission on the Measurement of Economic Performance and Social Progress (2009), accessed January 28, 2023, <https://ec.europa.eu/eurostat/documents/813172/8131772/Stiglitz-Sen-Fitoussi-Commission-report.pdf>.

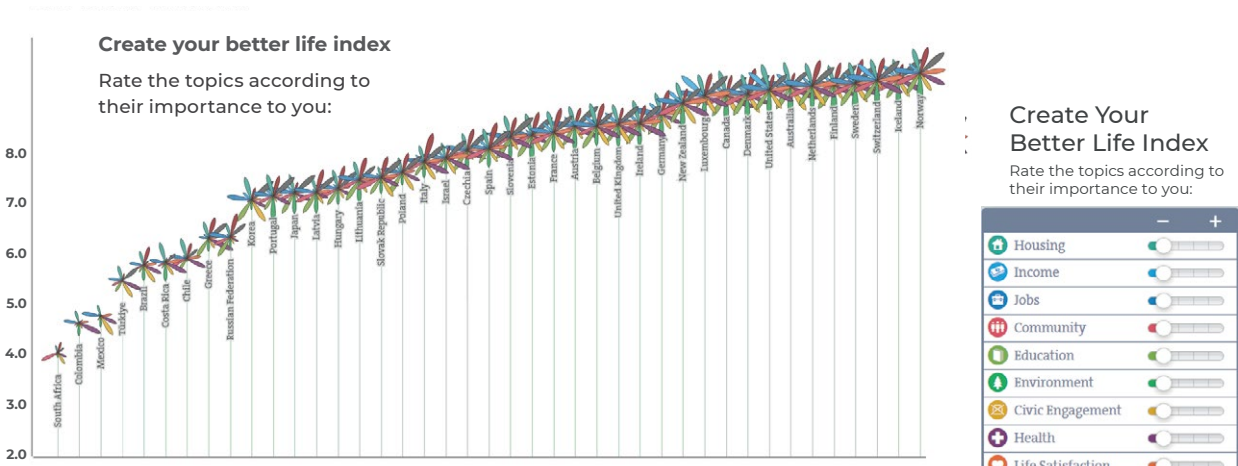


These ideas ultimately shaped the OECD’s Better Life Index, which was first published in 2011. In the Chart of the Conceptual Framework of the Index (see Chart 90), you can see how those features the Commission outlined were put into practice.

It is the conceptual features that are important to highlight because, as we have seen in the analysis in this essay, they represent enduring and global issues that any approach to measurement needs to take into account.

**Chart 90: OECD Better Life Index**

Source: <https://www.oecdbetterlifeindex.org/>



### **Tracking progress on our tasks to transform the global system**

Any country in the OECD that wants to put particular attention on the tasks to transform the global system, which I have outlined, can use the framework and data from the OECD Better Life

Index to do so. For non-OECD countries, much of the data can be obtained from other sources. Given the utility and robustness of this index, the OECD would do well to expand its tracking to all countries. It is important when we look at the Better Life material to consider the full dataset the OECD collects and categorises, rather than summary measures, which don't capture much of the necessary richness of the conceptual framework.

It is helpful to go through the tasks and the measures we could use, as they relate to the tasks outlined in this essay, from the full dataset.

#### **1. Decouple the economy from the environment**

In the Natural Capital section of the Better Life Index, there is a category of Biological Resources and Biodiversity which provides very useful data.

On the extraction side, we can use the Material Footprint Per Capita Data, and from the Soil Quality and Freshwater Resources section we can use the Gross Nitrogen Balance Data to track the impact on soil and for freshwater the rate of use of available water.

On the emissions side, we can use the Municipal Waste Recovery Rate Data and from the section on Climate Change the Per Capita Greenhouse Gas Emissions.

#### **2. Achieve regeneration at scale**

In the Natural Capital section of the Better Life Index there is a category of Biological Resources and Biodiversity. From this, we could use the measures for 'Stock of natural land cover' to track the regeneration targets of the Global Biodiversity Convention and we could use the 'Terrestrial Protected Areas' and 'Marine Protected Areas' to track the targets for protected areas.

#### **3. Transition our global population to a level that enables equitably distributed global prosperity within the limits of our planetary system**

In the section Natural Capital, there are a set of measures that cover the issues from extraction of non-renewable materials (eg material consumption per capita) and renewable ones (eg forest cover, biodiversity) through to emissions (greenhouse gas equivalent per capita). Careful science could be used to set targets for where the sustainable limits of the planetary system are for each of these measures.

#### **4. Create a genuinely inclusive economy**

In the Income and Wealth section, we can use the following measures: the comparison of the richest 20% and poorest 20% of the population, the percentage of people who live in relative income poverty, the percentage who would have difficulty making ends meet and the share of wealth owned by the wealthiest 10%. There is also a measure of how many people are in the top 10% of income earners compared to the lowest 10% of income earners. Very importantly, we can also look at inequality of not just income, but other sections provide data on inequality in relation to all of the other well-being measures, from health and education to the environment and civic engagement.

#### **5. Find new engines for productivity**

Productivity is the one area of weakness in the Better Life Index. There is not an explicit measure of it but that can easily be remedied. We can get that measure from elsewhere in the OECD statistics because it is data that they track.

#### **6. Create global resilience without compromising prosperity**

There are even some valuable measures to track resilience. The first is the 'average expected monetary loss associated with becoming and staying unemployed, as a share of previous earnings'. This would help track the sort of situation we saw of middle and lower socio-economic status workers who lose their job and are not able to find a new job that offers similar wages. The second is, 'share of employees who experienced... job demands exceeding that of job resources'. The third, is 'negative affect balance' – in other words, the balance of 'negative feelings (anger, sadness, worry) ... [and] positive feelings (enjoyment, laughing or smiling a lot, well-rested'. The fourth is, 'measures of trust in others and government'.

What these measures mean is that, in a major and mainstream monitoring program, we have most of the tracking tools already in place for most major economies to monitor our progress on the tasks to transform our global system.

## Idea 7: Transform our current thinking using indigenous knowledges

In Part 2 of this essay, we have looked at ideas and approaches to transform our current system to make it more sustainable, inclusive, prosperous and stable.

The need to see change at scale in a short time meant I applied four tests to select solutions that could meet that challenge. I asked, did the solution shift the organising ideas of our system, have maturity, had it gained sufficient practical traction, and was it complementary to the other ideas? But I flagged the need to explore an idea that is still in evolution, and has yet to gain substantial practical traction, because it offers the most profound opportunity to shift the organising ideas of our system. It is the idea that indigenous knowledges could deeply transform our current model, so that it becomes a truly sustainable one.

The reason to explore this idea is that, when we look around the world, we see that indigenous people have lived sustainability in a great diversity of ecosystems for millennia. Despite the fact that indigenous people have been calling attention to this opportunity for a long time, mainstream contemporary policy has only recently really started to understand and give prominence to the role of indigenous people in the sustainable stewardship of the environment.

It was only in 2019 that the Global assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services provided 'the first global-level assessment

to systematically consider evidence about the contributions of indigenous and local knowledge and practices, and issues concerning Indigenous Peoples and Local Communities'.<sup>99</sup>

That assessment revealed that, even in a world with significant external pressures on the environment, from introduced species to climate change, in the 25% of the globe that is still managed by indigenous people, nature has declined by 30% less and the rate of decline was similarly 30% less than in comparable areas.<sup>100</sup> As a result, in mapping the pathways to a sustainable future, it called for 'promoting education, knowledge generation and maintenance of different knowledge systems, including the sciences and indigenous and local knowledge regarding nature, conservation and its sustainable use'<sup>101</sup> and that:

*Recognising the knowledge, innovations and practices, institutions and values of Indigenous Peoples and Local Communities and their inclusion and participation in environmental governance often enhances their quality of life, as well as nature conservation, restoration and sustainable use, which is relevant to broader society.*<sup>102</sup>





Yet the report worryingly observes that 'appreciation of indigenous and local knowledge (ILK) for managing nature is rising yet, at the same time, these local knowledge systems continue to be degraded'.<sup>103</sup> Clearly, there is a pressing need to value and support indigenous communities, not just because it is intrinsically right to do so, but because they have knowledge that is invaluable to the world today.

However, there is a deeper question about what makes their knowledge so effective at sustaining the environment even when it is under grave pressure. The answer lies in a very different understanding of the very character of reality itself. In western philosophy we talk about how we understand the nature of being as 'ontology'.

The current dominant understanding of ontology in western thought is what we call a 'substantive ontology' in which our understanding of reality begins with substances and their properties and then subsequently explores their relationships. For example, we understand the substance of a piece of wood by its properties like its colour, smell, strength, stress grade and shrinkage rate. This sort of thinking progresses to analyse chains and networks of causation, like how the environment in which this tree has grown has affected all these properties. This is a powerful way to understand the world and it has underpinned the evolution of western science and all the insights that has delivered. But it is also a form of thought where the priority given to the separateness of objects and things can easily lead to an instrumental approach where we focus on what something, including all of nature, can be used for. We slide into a value system where it is the use or function of something that determines its value. The trees are valuable because of the wood they provide for construction, fuel or pulp. Or, if the trees are left in the forest, they are valuable for what – in a very instrumental phrase – people call their 'ecosystem services'.

Indigenous knowledge systems are very different. While there is of course a vast complexity and sophistication of indigenous epistemologies or knowledge systems, indigenous people will talk about relationality being a central feature of their way of thinking. Anthropologist Deborah Bird Rose explains that central role relationships play when she observes:

*Persons achieve their maturity and integrity through relationships with people, animals, country and Dreaming; [and] places, trees, waterholes, Dreaming sites and other animals are also subjects [whose] being and becoming in the world exist in relation to other subjects, some of whom are human beings*<sup>104</sup>

In western philosophical terms we might talk about these systems having, as an integral element, a relational ontology in which it is relationships that define the nature of reality. If we return to the example of the tree, in a relational ontology the tree's nature will be defined by its relationships to some combination of stories, communities, creatures, ceremonies, laws and customs, individual people, and the wider environment of the forest itself.

The starting point to understand the nature of the tree are these relationships. Later, the properties of the tree, like its hardness and durability, can be understood. When you start by understanding the relationships, these properties have a very different context.

If through the lens of a substantive ontology we started with the fact that the tree has hard and durable wood, the natural question would be, 'what can we use this tree for?' If, through the lens of a relational ontology, we understood that this tree was integral to the identity of the community who lived with the tree and central to their stories, then the fact it had hard and durable wood might explain why it has endured so long as a central part of that community. Unlike a substantive ontology, the properties of the tree would not invite the thought that we should cut it down, but rather quite the opposite.

This kind of knowledge system radically breaks down the divide between people and nature. Every indigenous knowledge system will have its own characterisation. For First Nations people in Australia, they talk about the integral relationship between themselves and 'Country'. We can hear this clearly when Walbanga and Wadi Wadi woman Alison Page writes:

*In the Indigenous worldview, Country means a way of seeing the world. Everything is living. There is no separation between people and nature... Country has Dreaming, origins and a future. The term attempts to encapsulate a sophisticated spiritual connection that Indigenous people have with the land that extends beyond ecology and includes songs, stories, and kinship relationships.*<sup>105</sup>

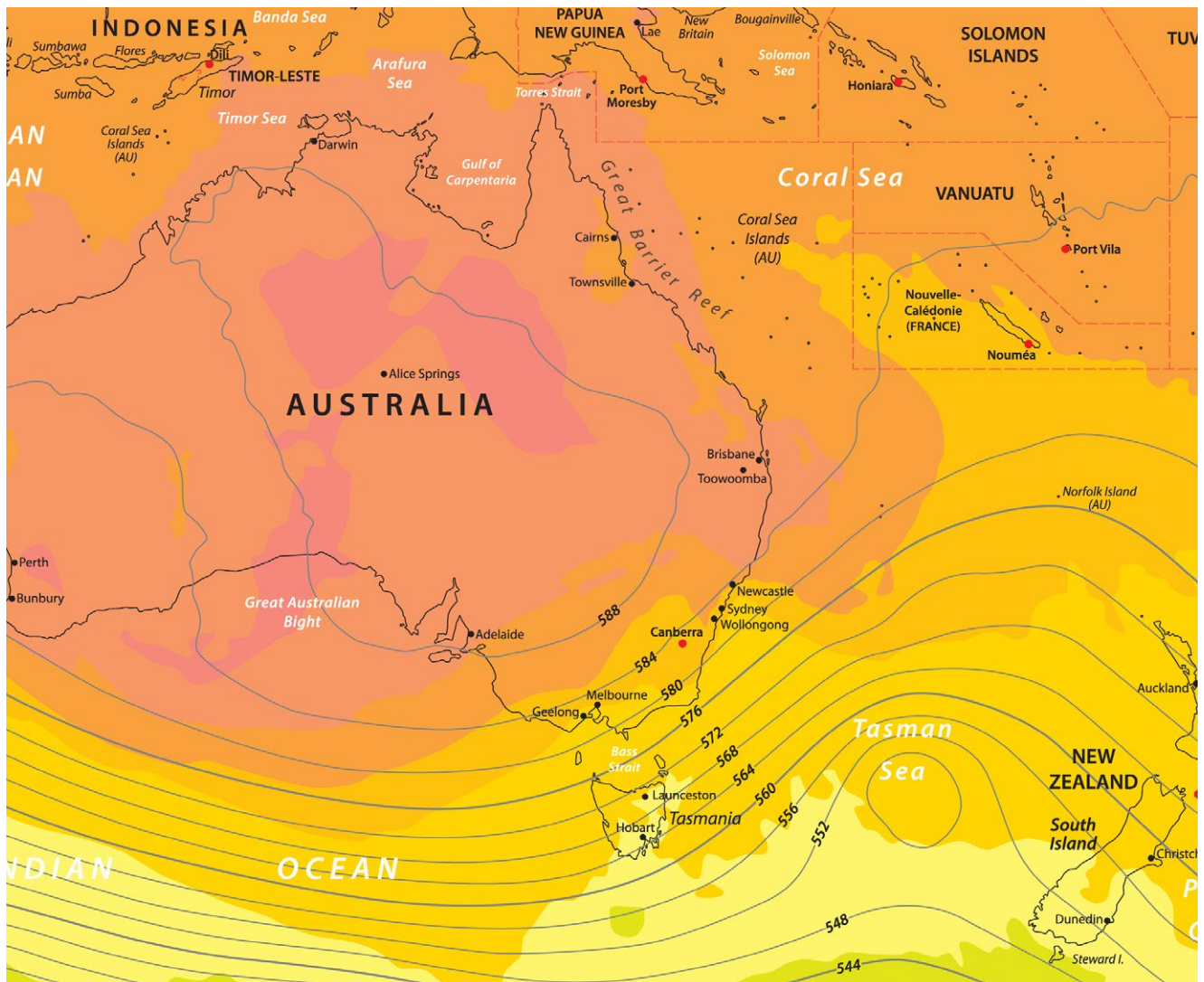
But it goes far behind the relationship between people and nature. It speaks to the relationship between people and community themselves through past, present and into the future, and to the whole understanding of reality. The implications of this sort of knowledge system are very profound and would require an entirely separate work approached very differently to unpack. It would be deeply conversational involving profound listening to indigenous people and reflection on what it could mean. There are many paths it could take. Perhaps the most promising would be one in which indigenous and non-indigenous people mapped out a new knowledge system that came from the fruits of their joint inquiry. This may be the knowledge system of the second half of the 21st Century.

The conversation would hopefully prompt the western non-indigenous participants to recognise that within their own tradition there are relational constructs they too can draw up, and not just those of more recent process philosophers and people interested in more relational ontologies, but resources deep in the western tradition of thought. The dominance of the substantive ontology is the result of key philosophical shifts that occurred in the late middle-ages when, led by theologian philosophers like Duns Scotus and William of Ockham, western thought came to give a priority to the will over being. As those shifts occurred, it cleared the way for a much stronger and freestanding substantive ontology, and with it a pathway to modern science and much modern thought more generally. There is so much richness from before this time that we can draw upon and streams of thinking that have continued into the modern age which we could call upon. This is not the place to unpack these possibilities but rather to flag that there is a depth of resources available which could assist in accelerating a rich and transformative investigation.

What gives hope is that there is a recognition that this sort of conversation has promise. In mainstream academic work there has been such growing interest in relational approaches to tackling sustainability issues that the question has been asked in an influential article, 'A relational turn for sustainability science?'<sup>106</sup> Building on that question, others have called attention to the work by indigenous people that offers vital resources for this 'relational turn', including in a very helpful article, 'Exploring Indigenous relationality to inform the relational turn in sustainability science'.<sup>107</sup> While indigenous people have for a very long time called attention to the value of their forms of knowledge for a sustainable future, the more that understanding enters mainstream academic, policy and political discourse, the more likely it is that it will lead to the sort of new thinking that the radical transformation I have mapped in this essay is going to need.

# **Part 3.**

## **Three Scenarios**



To understand how the future might turn out in the sort of situation we now face as a globe, what strategic thinkers call ‘scenario analysis’ is very helpful. We are not in a situation of a binary choice, where it could be one sort of future or another. Equally, the nature of the way our economy works and the physical limits of the planet mean there are plausible boundaries to the likely outcomes.

What this essay has argued is that we are at a crossroads moment for the planet. The Tailwind Years are over and the headwinds against progress have just started to strengthen. Equally, our model is unsustainable, but we haven’t passed the point of no return. We still have choice.

What we face are a range of ways the future could turn out. Each reflects a different sort of pattern that could emerge. When we construct a set of possible scenarios, no single one of them will be exactly how the world turns out. That is not the point of them. Rather, they help us to understand the nature of the way the world could unfold, and how we could influence which world we get. As time goes on, they also help us to see which way the world is heading.

When we look at the evidence presented so far in this essay, there are three plausible scenarios which I will call the Hostile Planet, the Middle Through and the New Relational Age.

## The Hostile Planet

The Hostile Planet is the world we get if we continue broadly on our current trajectory.

Let's start with the critical question of greenhouse gas emissions. As we saw earlier, a careful analysis of the likely impact of all the measures that countries are putting in place through to 2030 still has us on a trajectory to see the planet warm by over 2 degrees Celsius. This comes with enormous consequences for peoples around the planet, especially those in mid-latitudes where the impact will only further drive poverty and major disruption to lives.

If, with all our global efforts on greenhouse gases that is all we can achieve, then for the various other challenges around sustainability, inequality and instability, it is hard to think that we would do any better. The data we have seen on trends in all these areas is consistent with that story. Rates of water use, soil loss, forest and grassland destruction, meat consumption and waste creation all continue to rise in the developing world and in parts of the developed world, while inequality between people and places is rising everywhere.

Certainly, there are some important new commitments like the Biodiversity Framework and the High Seas Treaty. Earlier, I offered a hopeful perspective on them, but we can also take a pessimistic view. We have seen how long it takes for action on these sorts of commitments and how far short of aspirations we typically fall. In this scenario, these treaties end up like many international instruments. They are underwhelming in their impact and countries do little more than is in their self-interest anyway.

In this scenario, the more demanding changes in lifestyle like changes in diet, increased use of public and active transport, denser cities and smaller housing remain an 'elite' agenda, and end up becoming politicised, in the way the 15-minute city concept has, so there is no broad social consensus to support fundamental change. As a result, the agenda for bigger integrative ideas like regenerative cities founder.

At a broader scale, ideas like regenerative agriculture end up getting policy support in progressive jurisdictions like Europe but don't lead to the transformation of agricultural practice that is needed because it remains more profitable to use the exploitative models of farming that we have today. The transformation to a circular economy suffers a similar fate.

While championed at a policy level in Europe, other jurisdictions do not embrace it. European businesses, who are struggling with a domestic market under pressure from an ageing population and a highly competitive global market where protectionist measures continue, don't see the advantage or have an incentive to make the large investment and take the risks needed to reinvent their products and business systems.

The result of this picture is that by 2050, while people feel like we are trying, the planet we live on will suffer from ever-growing periods of extreme heat, significantly more destructive weather events, and biodiversity will have collapsed or be in peril in many places.

Water, natural resource scarcity and the quest for productive farming lands will fuel regional and international conflicts, especially in Africa and Asia. The world will be an even less stable place.

Inequality will be far worse. There will be some wealthy cities, especially in higher latitudes where people prosper, and there will certainly be some people who prosper in other places, but the gaps between those fortunate places and the people in the rest of the world will be very wide.

Because all the headwinds will have strengthened, we will see poor productivity growth. As a result, the world will struggle to find the wealth to tackle the issues it faces, which will only further compound the problems. The ageing countries of Europe and East Asia will struggle to sustain their standards of living. That in turn will fuel the sort of populist politics that only makes the problems worse and will lead to the weakening of regional groupings like the EU and their efforts to create progressive circular, low carbon and inclusive economies.

The growing populations in Africa will struggle to make progress. They will still largely follow the development model of western countries as a combination of climate issues, soil and water loss and political instability threaten the viability of some states. Populations on the move will seek refuge from climate change and instability. That will put sustained irregular migration pressure on Europe, Türkiye, the United States, Canada and Australia along with wealthy North Asian countries like South Korea, only further fuelling populist politics and instability.





## The Muddle Through

In this scenario, the world experiences sufficient disruptions – whether they are climate events like continued severe floods, storms, droughts and fires, or disruptions from other causes of instability like conflicts or infectious diseases – that a critical mass of countries do act.

These disruptions cause a level of harm in the United States, the European Union, China and India – the countries and regions with sufficient scale to change global outcomes – that they do commit to more serious measures, especially on the issues of climate and biodiversity.

As a result, we see substantial progress towards a zero-carbon energy system, but we don't make the 2030 targets and so it is a constant struggle through to 2050, with the planet heating up above 1.5 degrees Celsius. Severe weather events are common, infectious diseases are more widespread and there is significant climate-driven migration. The world is managing the situation, but it is an unstable and challenging time in many places.

On the biodiversity front, the developed world goes quite a long way to meet its targets to protect and regenerate land and sea, but the developing world, especially in Africa and Latin America, makes far less progress, as they clear land to grow the food for their rapidly growing and increasingly wealthy populations. In the oceans, it is a very mixed picture. The waters of developed countries are reasonably well protected, but many pelagic fish stocks are even more depleted, and fish stocks in the waters of many developing countries are severely damaged, many irreparably. With a stronger concern to protect natural assets like biodiversity, regenerative agricultural practices make progress in progressive, high-income jurisdictions like Europe, California and New Zealand but aren't implemented globally.

The efforts to create a more circular economy gain reasonable traction in Europe, which helps pull their supply chains in China, India and other parts of Asia along the same path. Those places see the benefits of a more circular model for their security and access to resources, so while pressure on resources and prices grow, it only serves to encourage further the circular approach. There is some hope.

A combination of the zero-carbon energy transition and some progress down the circular economy route helps to maintain some

momentum in productivity improvements, which in turn provide some of the funds in Europe and Asia to manage the energy transition, assist with the ageing population and improve some of the inequality and ageing issues through more lifelong education.

However, it is a very divided world with all of the tensions that brings. Although the developed countries and China have managed to make enough progress to avert the worst of climate change and to keep their model of development going, the result is they have also continued to progress at a faster rate than Africa, which, with its growing population, is a vast, still poor and struggling place. India is a picture of contrast, with challenges like Africa faces but also areas more akin to the developed world.

Nature is still under severe pressure. It is not just the very mixed picture on biodiversity that is at play, because the world is still well short of decoupling economic growth from the environment. Issues like water availability and soil fertility are heading towards serious crises in many places. In various regions in Asia, Africa and South America, these pressures fuel international instability, as disputes over access to river waters and aquifers intensify and boil over.

The world has muddled through to 2050 but it looks like a hard slog from here with less left to save, regeneration options badly compromised in many places, and the risks of human and natural disasters far higher.



## The New Relational Age

In the scenario of the New Relational Age, by the 2050s the planet and its people have come to live in a sustainable relationship grounded not just in social, economic and technological transformation but in the world being organised around new, more relational ways of thinking.

This scenario starts with the fact that, in the early 2020s, the world crossed a series of critical thresholds. It became cheaper to produce energy from the wind and sun than from fossil fuels. Fossil fuel prices remained high because of international tension with Russia and then in the Middle East, which contributed to the accelerated adoption of electric vehicles and a doubling of the retrofit rate for buildings to make them more sustainable. What particularly helped was that the lower cost of solar meant that it became a major source of new energy in Africa, India and places like Indonesia. A focus on building an energy system around renewables meant that, as the economies of these countries grew with their rapidly growing populations, economic growth substantially decoupled from greenhouse gas generation. That rapid expansion of renewable energy production and availability helped lift their economic growth and living standards, so we saw an earlier than previously anticipated demographic transition, meaning the world's population didn't grow nearly as rapidly.

Driven by both a commitment to sustainability but also the desire to be less exposed to global resource shocks, Europe accelerated the process to create a circular economy. The European insistence on circularity and zero carbon in its supply chains helped accelerate the change in Asia, where the benefits of reduced reliance on increasingly costly natural resources also encouraged further change.

On the biodiversity front, countries around the world who had already significantly increased their protected areas and engaged in major regenerative activity took seriously the targets set in the Kunming-Montreal Global Biodiversity Framework. The commitments and approach to providing financial support did assist the developing world, where the pressures were particularly acute. The role of indigenous people in governing and managing the environment was greatly expanded, and their knowledge and approaches have been widely adopted. While not all targets were met, the world was on a very different trajectory.

What also helped was real progress on reduced food waste, and while it took until well into the 2030s, global diets did start to change materially and meat consumption fell significantly, which reduced the pressures on forest and grassland clearance. After more than a decade of intensive research and development, regenerative agricultural practices started to become the norm so that by the 2040s the loss of soil, water and biodiversity was in reverse. The accelerated progress on the transition to a circular economy and zero-carbon system proved to be a good driver for

improved productivity rates in the developed and developing worlds. The demographic challenges of an ageing population in the developed world, and the need to slow population growth in the developing world, saw substantial increases in investment levels in education worldwide. That further fuelled productivity improvements, helped to reduce inequality and set the world on the path to a new model of a sustainable long life.

Seeing the advantages of this more sustainable way of life, people in cities around the world increasingly embraced the changes needed to become regenerative cities. This also supported them with the changes they were making to their lifestyles as they embraced active transport, smaller houses, and more local food production.

The move to a circular and regenerative economy brought new forms of skilled employment to developed countries. With increased levels of education, the negative impacts of globalisation on the middle class started to reverse as workers reskilled for these new jobs. The ageing population and shrinking workforce in many countries meant there was work for people well into their later years and upward pressure on real wages.

The reduced threats to connectivity meant that new trade arrangements with parts of the world with rapidly growing populations, like Africa, saw those countries benefit, just as others had 50 years earlier, and further accelerated global productivity growth. That trade also enabled the redistribution of materials around the planet, meaning they started to be more equitably shared.

By 2050, the world could see a clear pathway to a smaller population living within the limits of the planetary system, where inequality is consistently shrinking around the world. The total economy is actually starting to shrink and the planet is breathing a little easier. Income per capita is stable in the developed world but the broader set of well-being measures, which are now the focus of policymaking, see life constantly improving. In the developing world, income per capita has started to reach developed-world levels, and attention has also firmly shifted to improving personal and collective well-being.

Throughout this period, deep thinking and rich conversations with indigenous people have been occurring, and a relational approach to understanding the world has become increasingly mainstream, so that by 2050, it is widely embraced around the world. People can see that this kind of thinking underpins the sustainable way in which they are now living with the planet and with each other.





## Which future?

I think all three of these scenarios are plausible. The data I have presented in this essay could be used to support any of them. The question of which broad direction we actually head in, will, in no small measure be a matter for each and every one of us. To determine that future, everyone has a role to play.

Politicians and policymakers around the planet need to be courageous and put forward plans to drive the transition to circular and zero-carbon economies, protect and regenerate our natural world and disproportionately invest in education to tackle inequality, increase participation and raise productivity. In this essay, I set out what the big tasks are, what the actions are that we need to take, and why it is reasonable to believe that we will succeed.

Companies around the world need to align their strategies with the transformation required. They need to see circularity and zero carbon as critical and to look to ways that they can embed other targets from the SDGs or Better Living Index into their strategic and organisational agendas. They can all embrace their role in the major task of the transition and recognise that, as they do so, many of them will create significant commercial opportunities and lift productivity.

Universities and research institutions around the world need to harness their extraordinary capabilities to support the development of all the knowledge and innovation needed to make these transitions successful. They need to collaborate nationally and internationally, as a global community of scholars committed to the development of the knowledge needed to advance the common good of the planet. In their teaching

programs, they need to equip their students with the capabilities and perspectives required to develop and run a very different global system. As they teach, they need to make education as accessible as possible to fight inequality with the most powerful lever available – tertiary education.

Schools need to instil hope and skills in students of every age, so that they are equipped and motivated to help make these changes and especially to operate this new circular, zero-carbon and inclusive system. If the world makes the changes needed, then children born today and educated over the next 20-25 years will be the generation who are running the world. Perhaps they will be known as Generation R – the Relational Generation.

Non-government and advocacy organisations have a critical place in this, role modelling what the future can be like to make it easier for others to follow, and being a voice to help shift beliefs of individuals, corporations and government.

Whatever role institutions have, in the end, every person will need to make important choices and changes in how they live their life if we are to create this sustainable, inclusive, prosperous and more stable future.







# Appendices

## Notes & Chart list

# Appendix A

## Notes

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