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# Insight

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CDC is changing its name to  
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## Global development trends and challenges

### Background paper for our 2022-2026 Strategy

Insight is a series of practical and digestible lessons on the issues of private sector investment and development. The series is based on our experiences, knowledge and research and is aimed at investors, businesses, development professionals, and anyone with an interest in private sector development.

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## Executive summary

**Our mission is to solve the world’s biggest development challenges. We do so by investing patient, flexible capital to support private sector growth and innovation. To succeed in our mission, we must understand the long-term challenges that people face and are likely to face in the future. We need the answers to questions such as: *What is the geography of poverty? What will it take to meet climate commitments under the Paris Agreement?***

**The purpose of this background paper is to describe the development context in which we operate.**

Two global agreements made in 2015 define the “world’s biggest development challenges”. The United Nations Sustainable Development Goals (SDGs) represent a global consensus about what a better and sustainable future for all looks like – the blueprint for the world we want to see. The Paris Agreement put in place a commitment to limit global warming to “well below 2°C, preferably to 1.5°C” versus pre-industrial levels by 2050.

Our view is that meeting these global development challenges will require three things:

- Economies must grow to provide decent jobs and raise living standards for all;
- Economic activity must be transformed to become environmentally sustainable; and
- The benefits of growth must be shared across all sections of society.

We therefore see the role of private investment in development as helping to build economies that are productive, sustainable and inclusive. These are the three strategic development impact objectives that we have set for the 2022-26 period, and this paper will look at the development context through these three lenses. But we start by looking at where people live.

### Demographics

In terms of population, sub-Saharan Africa is the world’s fastest growing region. The population is expected to swell from one billion today to 1.7 billion by 2040, and to over four billion by 2100. South Asia’s population is projected to rise from 2.5 billion today to three billion in 2040, remaining roughly at that level to 2100.<sup>1</sup> India, one of our core markets, will likely overtake China as the world’s most populous country this decade.

<sup>1</sup> United Nations Population Data.

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Why does population growth matter? It means more jobs will be required to absorb new workers. In sub-Saharan Africa and South Asia, nearly 30 million new jobs will be needed each year to meet the growing number of young people joining the workforce.<sup>2</sup> If gainful employment can be found for this young population, there is the potential for a demographic dividend where gains in labour productivity translate into a larger overall impact on living standards. If decent jobs cannot be found, not only will more people likely fall into poverty, but risks of social turbulence and mass migratory flows will also be heightened. Ensuring the accelerating trend of urbanisation is met with commensurate growth in jobs, housing and social services will be crucial.

## Inclusion

The future of poverty will depend on the extent to which economic growth raises incomes across all sections of society. While much progress has been made in reducing the proportion of the global population living in extreme poverty (\$1.90/day), the number of people living below \$5.50 per person per day has stayed broadly flat over the past four decades. Taken together, this group accounts for roughly half the global population. In Africa, a rising population coupled with insufficient economic growth is expected to increase the number of people living below \$1.90 and \$5.50 per day in 2030 versus today's levels.<sup>3</sup> Encouragingly, the trend of declining extreme poverty in South Asia – despite the setback caused by COVID-19 – is expected to continue and extreme poverty should be effectively eliminated (<3 per cent) by 2030.

For those aged 20-40, extreme poverty is more prevalent among women than men. Women work longer hours, perform far more unpaid labour, participate less in labour markets, have less access to financial services and occupy fewer management and leadership positions. Women also face numerous social and political disadvantages. Gender equality is a worthwhile objective in its own right but ending discrimination would also raise economic efficiency.

The COVID-19 pandemic has been a major setback for economic inclusion. After years of reductions, more than 150 million additional people were pushed into extreme poverty in 2020.<sup>4</sup> The pandemic has increased food insecurity and caused earnings to fall and unemployment to rise.<sup>5</sup> Lockdowns have hit the healthcare and education sectors especially hard – exacerbating social inequalities by affecting women and younger populations disproportionately. The World Bank estimates that more than 90 per cent of all students had their education disrupted in 2020 (Azevedo et al., 2020). Vaccination rates remain very low across Africa and parts of South Asia.<sup>6</sup>

## Productivity

Boosting productivity so that economies can provide decent jobs and improved standards of living for all is the key to global development challenges. We know that low productivity economies must transform into higher productivity economies to deliver a decent life to all. Adding 'more of the same' jobs to a poorer economy with low productivity will not do enough to help an economy escape poverty. According to the World Bank, average output per worker today in South Asia and sub-Saharan Africa is five and six times less than that in wealthy economies.<sup>7</sup>



*The future of poverty will depend on the extent to which economic growth raises incomes across all sections of society.*

2 World Bank Blog: Now is the time to invest in South Asia's future (2019); IMF: The Future of Work in Sub-Saharan Africa (2018).

3 World Bank: Poverty and Shared Prosperity 2020: Reversals of Fortune (2020).

4 Brookings: The impact of COVID-19 on global extreme poverty (2020).

5 FAO: Policy Brief: The Impact of COVID-19 on Food Security and Nutrition (2020); ILO: World Employment and Social Outlook (2021).

6 WHO: Immunization Tracker Coverage (2021).

7 World Bank: Global Productivity: Trends, Drivers, and Policies (2021).

Low productivity means less economic value to share with employees in the form of higher real wages. It means lower availability and higher prices for basic goods. Retail prices for ten consumer goods – white rice, white flour, eggs, butter, and milk among them – are at least 24 per cent higher in African cities than in other main cities around the world.<sup>8</sup> Unproductive economies leave millions living without access to basic goods, such as decent housing, clean cooking fuels, sanitation, and electricity. Prices for economic inputs, such as cement and fertiliser, are also higher in poorer countries (Beirne and Kirchberger, 2020). The costs of transporting goods in Africa are up to five times higher than in wealthy countries (Atkin and Donaldson, 2015).

Weaker productivity is partly due to low levels of investment. There is roughly \$110,000 of installed private capital per person employed in the Organisation for Economic Co-operation and Development (OECD); \$6,800 in sub-Saharan Africa and \$10,600 in South Asia and \$33,000 in Southeast Asia.<sup>9</sup> This is a potential opportunity for investors – the private and social returns from combining capital with an abundant workforce, especially when starting from a low base, can be high. Low productivity is also a product of a lack of decent jobs. Indeed, the informal sector dominates the economies of Africa and South Asia, with around 70 to 90 per cent of the labour force employed in ‘non-wage work’, mostly in agriculture.<sup>10</sup> The difference in output per worker between the richest and poorest countries is 15 times larger in agriculture than in other sectors. Productivity improvements in agriculture are therefore an urgent development priority.

How might the future of work unfold in the developing world? Historically, the process of development has been characterised by the movement of workers out of agriculture and into manufacturing, and then services. But more recently, manufacturing employment has peaked sooner as countries develop, and the service sector has grown more rapidly. Digitalisation and automation are also poised to reshape the economies of Africa and South Asia, yet the precise impact is unknown. The digital economy offers firms ways to produce goods and services and, new possibilities for job creation, as well as greater access to domestic and global markets.<sup>11</sup> This could create new investment opportunities. However, the automation of routine tasks could also see businesses shedding workers.

## Sustainability

The looming climate crisis poses yet another titanic challenge. Unless swift action is taken, a warming planet will wreak irreversible damage to both ecosystems and economies. The poorest households in the poorest countries – those more reliant on agriculture and least able to invest in adaptation measures – are most vulnerable. Warming could push 132 million additional people into poverty by 2030.<sup>12</sup> Estimates suggest unmitigated climate change would reduce output per person in sub-Saharan Africa and South Asia by about 75 per cent by 2100.<sup>13</sup>

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» **Global warming could push 132 million additional people into poverty by 2030.**

8 World Bank: Breaking down barriers: unlocking Africa’s potential through vigorous competition policy (2016).

9 Population-weighted means. Private capital stock estimates from IMF FAD Investment and Capital Stock Dataset, 1960-2017 in 2011 constant dollars, persons employed data from PWT 10.

10 World Bank: The Long Shadow of Informality: Challenges and Policies (2021).

11 IMF: The Future of Work in Sub-Saharan Africa (2018).

12 World Bank Blog: COVID, climate change and poverty: Avoiding the worst impacts (2020).

13 Nature: Global non-linear effect of temperature on economic production (2015).

Responding to the climate emergency will be difficult. More than 800 million people across the world currently do not have access to electricity, most of whom live in sub-Saharan Africa and South Asia.<sup>14</sup> Reducing emissions while boosting electricity access is often referred to as the ‘twin challenge’ of the energy sector. What is clear is that, to reach and stay on a net-zero trajectory, there must be a massive shift to zero-carbon electricity as the foundation of the global economy, with electricity’s share of final energy demand growing from today’s 20 per cent to as much as 60-70 per cent by 2050.<sup>15</sup> Hydrogen and biomass will be needed to fill the remainder. Moreover, in almost all modelled scenarios, negative emissions technologies – such as carbon capture and storage – are crucial. The longer the world waits to drive steep reductions in emissions, the more negative emissions will be needed.

Delivering the SDGs and the Paris Agreement will not be easy. Based on current trajectories, we are not on track to hit either the SDGs or Paris, even before the pandemic.

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<sup>14</sup> IEA: SDG 7: Data and Projections Access to Electricity.

<sup>15</sup> Energy Transitions Commission: Making Clean Electrification Possible: 30 Years to Electrify the Global Economy (2021).



## Introduction

Our mission is to solve the world's biggest development challenges by investing patient, flexible capital to support private sector growth and innovation. The SDGs – a collection of 17 interlinked global goals – represent a global consensus about the world's biggest challenges. They were agreed in 2015 by the General Assembly of the United Nations (UN) and are meant to be achieved by 2030. Also in 2015, 196 countries came together to forge the landmark Paris Climate Accords (Paris). Its goal is to limit global warming to “well below 2°C, preferably to 1.5°C”, versus pre-industrial levels. To achieve this challenging objective, countries agreed to reach a global peak in greenhouse gases “as soon as possible” to achieve a “climate neutral”, or “net zero” world by mid-century. Taken together, the SDGs and Paris define the world's biggest development challenges. They are the world we want to see for a better and more sustainable future – for both people and the planet.

Six years – and one devastating pandemic – later, where are we toward achieving these goals? The short answer: we are off track for both. Even before COVID-19, the world was not on track to meet the SDGs by 2030.<sup>16</sup> While some gains have been made – the proportion of children and youth out of school had fallen; the prevalence of communicable diseases was declining; access to safe drinking water had improved; and the proportion of women in leadership roles was rising – a host of backward steps were taken too. The number of people suffering from food insecurity was on the rise, income inequalities both within and between the rich and developing worlds were growing, and environmental degradation and emissions soared. Across the board, change was still not happening at the pace or scale required. Around 600 million people were projected to be living in extreme \$1.90/day poverty in 2021 before COVID struck. That number has now been revised upwards by around 120 million. The goal of eliminating extreme poverty by 2030 will almost certainly be missed.

Progress on Paris was also lacklustre. Emissions in 2015 were roughly 50 billion tonnes. Emissions in 2019 had risen to 55 billion tonnes. Coronavirus lockdown drove emissions down sharply in 2020 – by nearly 7 per cent – but rebounded in 2021 as economies reopened. Of most concern, individual countries have also not pledged to reduce their emissions fast or deep enough. The UN recently published a progress report that concluded Nationally Determined Contributions (NDCs) were not on track to meet the Paris goals.<sup>17</sup> Based on current plans, emissions are expected to rise until 2030 and a devastating 2.7°C rise in mean global temperature is projected. Deforestation in the Amazon has accelerated and permafrost in Northern latitudes is melting, releasing vast amounts of carbon and methane into the atmosphere.

<sup>16</sup> Sustainable Development Report 2021.

<sup>17</sup> UN: Climate Commitments Not On Track to Meet Paris Agreement Goals” as NDC Synthesis Report (2021).

The pandemic has made achieving the twin targets more challenging. As of July 2021, the global recorded death toll from COVID had eclipsed four million and continues to climb. Health systems have been pushed to the brink. More than 1.6 billion students are out of school.<sup>18</sup> Across the globe, young people are being disproportionately affected, particularly in the world of work. Women and girls are facing new barriers and new threats, ranging from domestic violence to additional burdens of unpaid care work. A recent International Monetary Fund (IMF) report found that the public and private sectors must spend around 14 per cent of gross domestic product (GDP) additionally every year between now and 2030 to meet the SDGs (Benedek et al., 2021). This is roughly a fifth more than estimated before the pandemic.

The pandemic has also laid bare the limitations of global solidarity. Covax, a programme co-led by the World Health Organization (WHO) for fair global distribution of COVID-19 vaccines, has fallen short. The world's governments are still debating a more pro-poor allocation of Special Drawing Rights at the IMF. Meanwhile, many lower income countries face deteriorating public finances and rising debt burdens.

This is the dispiriting global development background against which we must execute our 2022-2026 strategy. This background paper starts by looking at where people live (across and within countries), and then turns to poverty trends and the state of global inclusion. It then looks at the underlying causes of poverty – including low productivity – and the final section tackles environmental sustainability. The good news is that there is no shortage of potential for patient and flexible investments in private enterprises to contribute towards solving these daunting development challenges.

<sup>18</sup> World Economic Forum: COVID-19 put 1.6 billion children out of school. Here's how to upgrade education post-pandemic (2020).



# 01

## Demographics

### 1.1 Population

One of the greatest development challenges is meeting the needs of rapidly growing populations. Population growth means more food, more jobs, more schools, more hospitals, and more infrastructure will be needed, especially in Africa and South Asia, and puts more pressure on scarce resources, such as agricultural land.

Today, roughly half of the world's population live in Africa and South Asia; by the end of the century the population of both regions is expected to have doubled while populations in the rest of the world will have shrunk. According to the UN's Population Prospects Division, CDC's geographical footprint today roughly cuts the globe in two: 3.9 billion people live in countries where we invest, and 3.9 billion people live outside our coverage (Figure 1).<sup>19</sup> That is set to change dramatically. By 2100, more than seven billion people will live within our geographic boundaries – with four billion in Africa and three billion in South Asia – while 3.7 billion will be outside it. Many of these people will be living in poverty. The future of poverty will be covered in more detail in Section 2.

» **Roughly half of the world's population live in Africa and South Asia.**

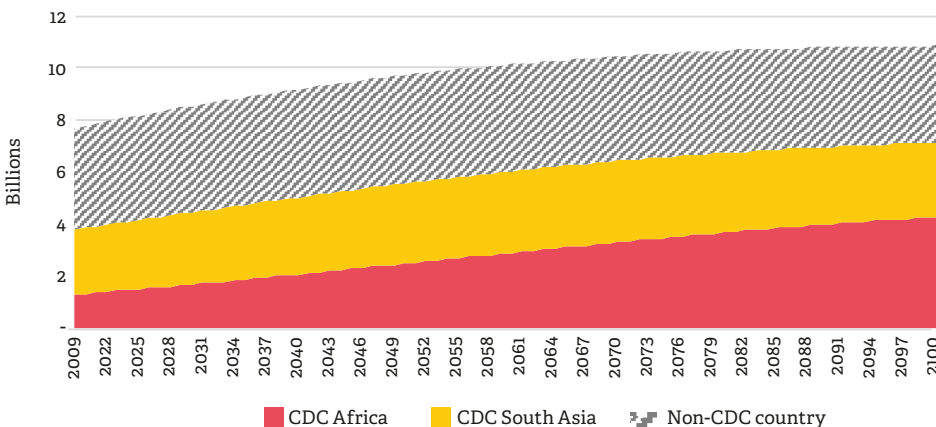


Figure 1: World population  
Source: Our World In Data (Gapminder, HYDE & UN)

<sup>19</sup> In the 2022-2026 period, we will expand into the Indo-Pacific region (Southeast Asia) for climate investing, but our core development focus remains in Africa and South Asia.



Most of the population growth will take place in Africa. The population of sub-Saharan Africa grew from 470 million in 1990 to one billion today. It is expected to reach 1.7 billion by 2040 and four billion by the end of the century. By the end of the century, Nigeria could surpass China in population.<sup>20</sup> South Asia is expected to grow, too, but not as swiftly. In India, long associated with swift population growth, birth-rates are falling toward the replacement rate of 2.1 children per family.<sup>21</sup> The UN estimates the population of Asia will rise from approximately 4.4 billion today to five billion in 2050. This contrasts with a shrinking European population.

### 1.2 Working-age population

One of the most important needs for private investment is to create more decent jobs in Africa and South Asia, to keep up with the growing labour force. The median age in Europe is 42; 28 in South Asia and just 18 in Africa, respectively.<sup>22</sup> Nearly 30 million new jobs will be needed each year in sub-Saharan Africa and South Asia to meet the growing number of young people joining the workforce (roughly 18 million in sub-Saharan Africa and 11 million in South Asia).<sup>23</sup> If gainful employment can be found for this young population, there is the potential for a 'demographic dividend', namely when the working-age population is high, relative to dependants (children and retired) so any gains in labour productivity have a larger impact on overall welfare. In sub-Saharan Africa, 85 per cent of the population is working age, compared to 53 per cent in OECD member countries and South Asia. Section 3 (Productivity) expands on the future of work.

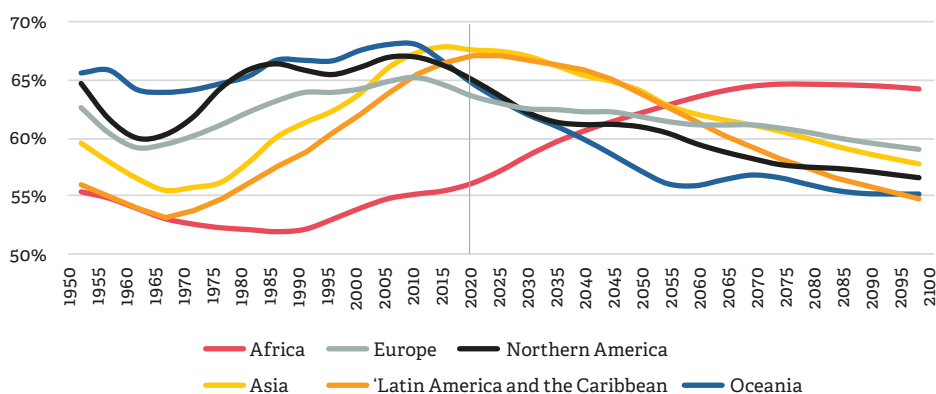


Figure 2: Share of population of working age  
Source: World Population Prospects, United Nations

### 1.3 Urban population

Building sustainable, liveable cities is a crucial element of responding to demographic trends. Africa is rapidly urbanising – at least 40 per cent of Africans now live in cities, and this is forecast to reach 58 per cent in 2050. By 2030, Africa will have nearly 90 cities with at least one million inhabitants.<sup>24</sup> In South Asia, the urbanisation rate is set to rise from 50 per cent today to 66 per cent in 2050 (Gollin, 2021).

Urbanisation is part of development. Cities are an engine of growth when the benefits of large numbers of people living together are greater than the costs of congestion. Agglomeration effects can create economies of scale and greater scope for specialisation (Collier et al., 2018; Duranton and Puga, 2003). However, cities in poor countries today are very densely populated relative to those in rich countries, with low-quality infrastructure and around 60 per cent of people living in slums (Lall, Henderson and Venables, 2021).

»  
At least 40 per cent of Africans now live in cities.

20 New York Times: Long Slide Looms for World Population, With Sweeping Ramifications (2021).

21 Economic Times of India: India's Population is Stabilising as Total Fertility Rates Decline Across States (2020).

22 See Our World In Data for more detail.

23 World Bank Blog: Now is the time to invest in South Asia's future (2019); IMF: The Future of Work in Sub-Saharan Africa (2018).

24 Brookings: Spotlighting opportunities for business in Africa and strategies to succeed in the world's next big growth market (2019).

Urbanisation is also part of the process of economic structural transformation. Rural-urban migration is pushed by productivity improvements in agriculture that release labour, and is pulled by productivity growth in the manufacturing and services sectors in urban centres. But in countries dependent on resource exports, urbanisation has become concentrated in 'consumption cities', with high employment in non-tradeable services, in contrast with industrialised 'production cities' (Jedwab and Vollrath, 2015).

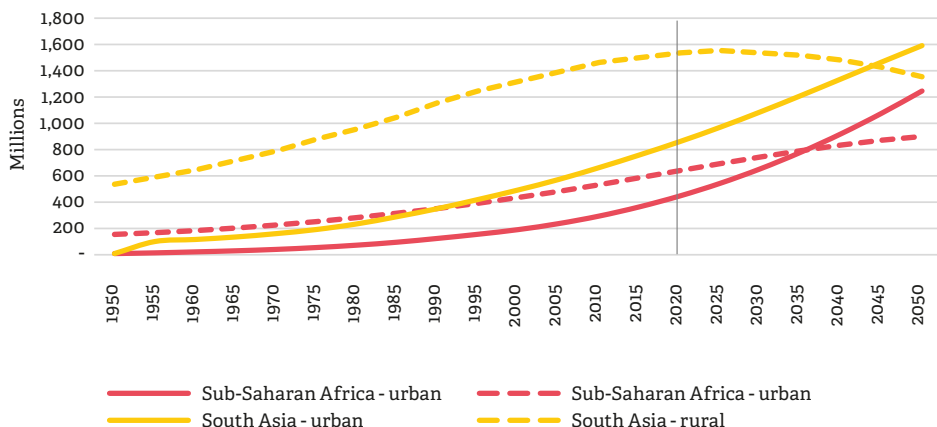


Figure 3: Rural/urban population  
Source: United Nations Department of Economic and Social Affairs

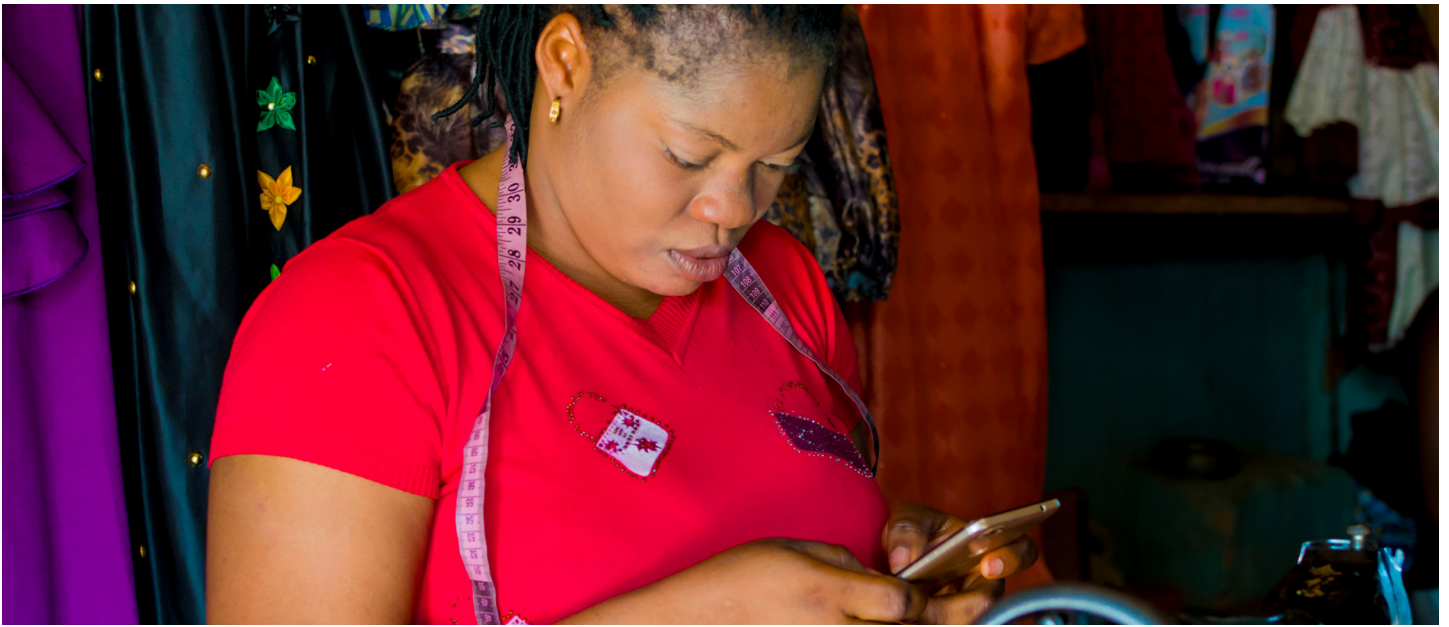
### Climate change and urbanisation

Climate change is likely to accelerate urbanisation. Studies have shown that more arid conditions accelerate migration to cities (Henderson et al., 2017). One study found that the urbanisation rate increases by 0.45 per cent with a reduction in rainfall of 1 per cent (Barrios et al., 2006). Formalisation of land markets, making coordinated infrastructure investments and improving urban transport, could help mitigate risks associated with high-speed urbanisation spurred by climatic and demographic shifts.

The environmentally harmful nature of carbon-intensive economies affects city dwellers in other ways too. There is an increasing body of evidence linking air pollution to cognitive performance and health. One US study (Herrnstad et al., 2020) even showed that violent crime rises when districts are downwind of air pollution from major highways. All 687 districts in India fail to meet WHO air quality standards for fine particulate matter. That is estimated to take five years off the life of the average Indian.<sup>25</sup> Within cities, poorer people will more often live close to sources of pollution, and be less able to shield themselves from polluted air. In rural areas, indoor cooking with solid fuels is the main problem, and is linked to deaths from strokes, heart diseases and cancer in adults, and pneumonia in children.<sup>26</sup> Cleaner industrial and domestic production is one of many areas where the productivity, sustainability and inclusivity intersect.

<sup>25</sup> Microeconomic Insights: More Precise Regulation can Lower Pollution in India (2020).

<sup>26</sup> WHO Factsheet: Household air pollution and health (2021).



## 02

### Inclusivity: the future of poverty

#### 2.1 Poverty today

First among equals, SDG 1 is to 'end poverty in all its forms everywhere'.<sup>27</sup> When the SDGs were agreed in 2015, the share of people living in extreme poverty, consuming less than purchasing power parity (PPP) of \$1.90 per day, had fallen from 36 per cent in 1990 to 10 per cent. But even before the pandemic, progress toward SDG 1 had slowed. The world was not on track to end extreme poverty by 2030. The 2019 global extreme poverty rate was 8.2 per cent. COVID-19 pushed the 2020 rate up to 9.1 per cent, and in 2021 the rate is expected to be around 8.9 per cent.

What does this mean in terms of the number of people living in poverty? Over the last three decades, extreme poverty numbers have fallen from around 1.9 billion in 1990 to 670 million in 2017 – a drop of approximately 1.2 billion. But almost all that decrease has come from Asia (both East Asia as well as South Asia). Roughly 950 million and 400 million people climbed out of extreme poverty in East and South Asia respectively over the last two decades. Poverty in the Middle East has ebbed and flowed with war, and is currently broadly flat relative to 1990 levels. Fewer people live in extreme poverty in Latin America: 66 million people in 1990, down to around 24 million currently.

Sub-Saharan Africa is a different story altogether. Population growth has resulted in the number of extremely poor people increasing by approximately 147 million since 1990. This is despite a reduction in the poverty rate from 55.7 per cent to 40.2 per cent over the same period. In 1990, sub-Saharan Africa comprised 15 per cent of the total number of people living in extreme poverty; in 2017 – the last year of official statistics – the region was responsible for 63 per cent of the global total. This highlights the urgent need to accelerate extreme poverty reduction in sub-Saharan Africa.



*Even before the COVID-19 pandemic, the world was not on track to end extreme poverty.*

<sup>27</sup> This is defined by reducing global extreme poverty to 3 per cent of the world's population.

The data behind poverty estimates relies on techniques for making comparisons over time and place, and can be contested. But similar trends are evident in more objectively measured concomitants of poverty, such as children's weights and heights.<sup>28</sup> Taking the percentage of children under five classified as 'stunted' as an example, South Asia started the century as the region with the highest rates by some margin, at 48 per cent of children, but by 2020 had converged on Africa and Southeast Asia, with around 28 per cent of children classified as stunted in all three regions.<sup>29</sup>

Extreme \$1.90/day poverty represents an incredibly low standard of living. Global progress measured at somewhat higher poverty lines tells a different story. The number of people living under \$5.50 per person per day today is roughly the same as it was three decades ago – around three billion (Figure 4). But rapid world population growth means that three billion represents roughly 40 per cent of today's population, versus nearly 70 per cent in the 1980s. While the number of people living under \$5.50 per day globally in 2030 is still expected to be just under three billion, this will represent 33 per cent of a larger global population in 2030. Sub-Saharan Africa and South Asia will account for most of these. The two regions accounted for around 40 per cent of people living under \$5.50 in 1980, versus just over 70 per cent today and nearly 80 per cent expected in 2030.

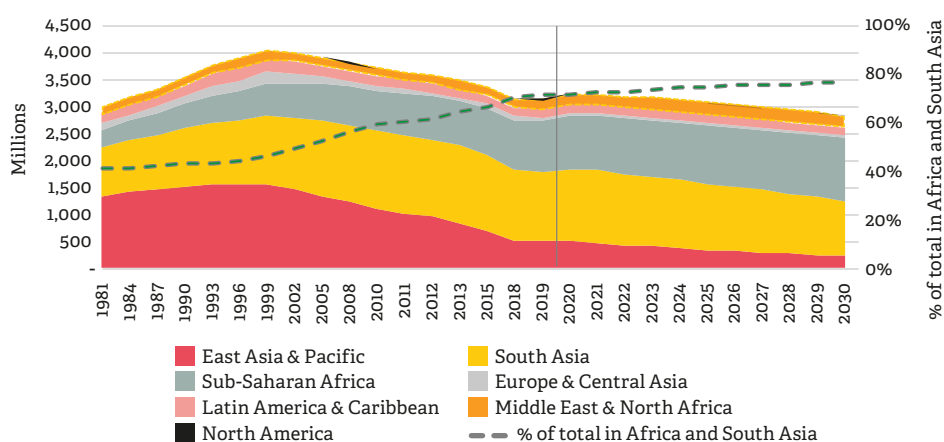


Figure 4: Global poverty trends and projections, \$5.50 per day  
Source: World Bank, PovcalNat (online analysis tool); Lakner et al. (2020).

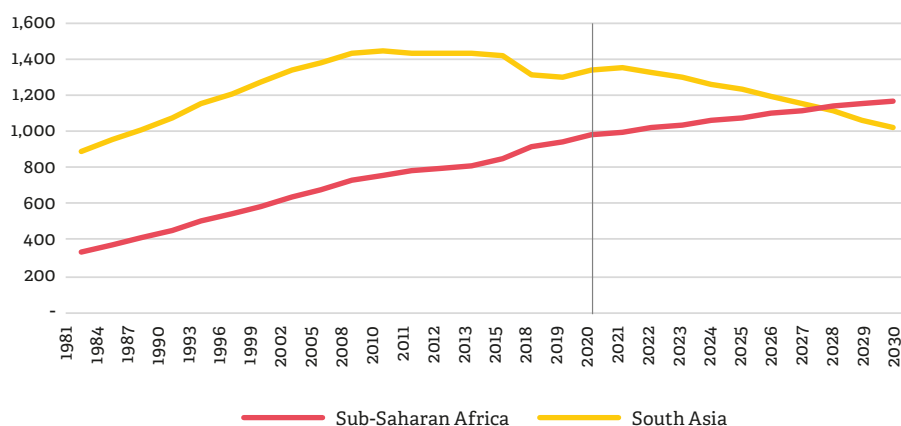


Figure 5: Number of poor in Africa and South Asia, \$5.50 per day  
Source: World Bank, PovcalNat (online analysis tool); Lakner et al. (2020).

<sup>28</sup> The WHO Global Health Observatory holds data on various child malnutrition estimates.

<sup>29</sup> A child is classified as stunted if their height is more than two standard deviations beneath the median for their age. Stunting makes children more susceptible to disease and infection, but also impairs their mental and physical development and results in substantially lower lifetime earnings on average.

How do the extreme poor spend their money? While most is spent on food, studies show that as incomes rise, people usually want to increase the quality, rather than quantity, of their food. Evidence suggests even for the extremely poor in India, for every 1 per cent increase in food expenditure, about half goes into purchasing more calories, and half goes into purchasing more nutritious (and presumably better tasting) calories (Banerjee and Duflo, 2007). In India, among grains, millets (jowar and bajra) are the best value, in terms of calories per rupee. But just two-thirds of the total spending among the extreme poor is on these grains, while another 20 per cent is on rice, which costs more than twice as much per calorie. A further 10 per cent is spent on wheat, which is 70 per cent more expensive. Furthermore, the extreme poor in India spend around 7 per cent of their total budget on sugar, which is both more expensive and less nutritious. (Deaton and Subramanian, 1996).

Arguably too much attention is paid to the \$1.90 extreme poverty line, which is far too low to represent a minimally acceptable standard of living.<sup>30</sup> The basic elements of what most people would regard as a decent standard of living, in terms of diet, accommodation and amenities, are found only at higher levels of income. Households living on closer to \$10 person per day tend to have access to electricity and latrines, unlike those living in extreme poverty (Banerjee and Duflo, 2007). Over 80 per cent of the households with daily per capita expenditures between \$6 and \$10 have televisions.

The website [gapminder.org](http://gapminder.org) provides further insights into the day-to-day lives of people around the world, living at various income levels. Here are some examples:

- Home of Win Ning Oon, Myanmar (\$64/month or \$2.10/day): Win is a 40-year-old rice farmer with three children, and lives in a rent-free single-room house, built with the help of friends and relatives. The toilet is outside the home and not shared with other households. Food costs absorb about 90 per cent of their income. The family collects rainwater on their plot to drink. They use wood for cooking. Every week, Win's wife, Musan, spends 14 hours collecting wood, 64 hours on home agricultural activities, and 21 hours doing housework. They hope one day they will be able to fulfil their dream of buying some land.
- Home of Mohamd Ali, Bangladesh (\$96 month or \$3.20/day): Mohamd is a 35-year-old truck driver with a wife and two children. He works 80 hours per week. The family lives in a rented, one-room house. Their home has electricity, but also frequent power outages; the toilet facility is shared among 200 other households. They spend nearly all of their disposable income on food. The drinking water source is outside at a five-minute distance from the house and costs up to 10 per cent of their income. They use firewood to light the kitchen stove.
- Home of Joseph Mbusya, Cameroon (\$174/month or \$5.80/day): Joseph is a 54-year-old mason who lives with his 21-year-old son, Adalbert. They live in a rented one-bedroom house, which has electricity but no indoor toilet or water facility. They use natural gas and occasionally wood for cooking in their kitchen and spend two hours every week fetching drinking water from a source which costs 10 per cent of their income. The family hardly saves any money since most is spent on buying food and paying rent. Their next big plan is to buy some shoes and plates. Their dream is to one day buy some land and a house.
- Home of Mabrouk Salhi, Tunisia (\$210/month or \$7.00/day): Mabrouk is a 52-year-old gardener; his wife, Jamila, owns a bakery. Together they work 87 hours per week to support their two children. The Salhi family lives in a two-bedroom home rent-free. The house has reliable electricity, running water, and the toilet is outside in their yard and not shared with other households. The family's food supplies cost them about 80 per cent of their income. They use natural gas for cooking in the kitchen. Safe drinking water is available inside the house. The next big thing they plan to buy is a new stove burner. They hope that one day they will be able to fulfil their dream of buying a house for their children.

<sup>30</sup> See Lant's Pritchett's Kapuscinski Lecture "Why \$1/day doesn't solve poverty". <https://kapuscinskilectures.eu/lectures/seduction-of-kinky-development/>

### 2.1.1 Fragility

Fragility is the combination of exposure to risk and insufficient coping capacity of both the state and communities to manage, absorb or mitigate those risks, according to the OECD. Fragility can lead to violence, the breakdown of institutions, mass movements of refugees, humanitarian crises, or other emergencies. Fragility and poverty are intertwined. Extreme poverty is highly concentrated in fragile countries, which were home to 460 million people living in extreme poverty in 2020, or 77 per cent of the worldwide total (OECD Fragility Report, 2020). The impacts of COVID are also concentrated in fragile countries, which comprise 23 per cent of the world's population but account for 43 per cent (26 million people) of those expected to enter extreme poverty due to COVID-19 (Lakner et al., 2020).

Excluding fragile states, the world is on track to meet the historic 2030 poverty goal. With fragility, the target appears out of reach (at current trajectories). Pathways out of poverty require stability. What are the solutions to acute fragility? First, domestic governments must rise to the challenge, improving governance, promoting peace, and bolstering healthcare and educational systems. International development cooperation could also focus more on countries like Nigeria and the Democratic Republic of Congo, which together account for 57 per cent of all poor people in fragile states (World Bank, 2020).

Private investment can also play a role in breaking the cycle of fragility. By creating jobs for all sectors of the population, including marginalised groups, the private sector can contribute to economic development that reaches all sections of society. In Colombia, for instance, GM Colmotores, the local subsidiary of General Motors, partnered with a non-governmental organisation to train and employ former paramilitary fighters (Oetzel et al., 2010). In the Philippines, Paglas Corporation and La Frutera, Inc. established a banana plantation in the 1990s that has created jobs for both Christians and Muslims, including ex-combatants (Williams, 2008). The private sector can also build the basic infrastructure – from energy to telecommunications – that restores connectivity to fragile states, helping businesses grow and pay taxes, which ultimately fund social services and recovery needs (IFC, 2019).

## 2.2 Poverty tomorrow

COVID-19 is expected to increase the number of people living in extreme poverty by as many as 150 million in 2020 and 2021. It is not clear how long COVID will continue to impede development. The latest World Bank estimates are for around 575 million people to still be living on under the \$1.90 per day threshold in 2030.

South Asia is expected to eliminate extreme poverty within the decade. Between 2009 and 2019, the number of people living in extreme poverty in South Asia fell by 72 per cent (227 million). Between 2020 and 2030, the total is set to fall by 90 per cent (130 million). This would result in just 15 million people in the region living in extreme poverty in 2030. South Asia – as a region – would have succeeded in achieving the SDG 1 target of having below 3 per cent of its population living in extreme poverty.

Sub-Saharan Africa, by contrast, is not expected to see the number of extreme poor fall this decade. The region is estimated to have approximately 680 million in extreme poverty today, and is set to plateau at around 480 million throughout the 2020s. Upside to these projections can be achieved through either faster economic growth, or decreased income inequality levels within African countries. The next section explores the role of inequality.



**Extreme poverty is highly concentrated in fragile countries.**

### 2.2.1 Inequality

Changes in inequality can have a more powerful short-run effect on poverty than growth. However, growth has been responsible for most historical poverty reduction because inequality has not fallen much whereas countries have grown (Bergstrom, 2020). Data remains unreliable although available sources suggest income inequality is very high in Africa, but has fallen slightly in recent years, whereas inequality is lower but rising in South Asia (Figure 7). Economists no longer believe inequality is the price that must be paid for growth. Although the relationship between inequality and growth has varied greatly across countries, if anything it looks like more equal economies are more stable and better able to sustain growth (Ostry et al., 2014).

The World Bank's latest poverty modelling shows how changes in inequality affect the number of poor. Examining the \$5.50/day level, for instance, reveals that a two percentage point improvement in the Gini coefficient – a statistic that captures how far a distribution is from perfect equality – while holding projected growth constant would leave around 2.5 billion people living below the \$5.50 threshold in 2030. But a two percentage point deterioration of the Gini coefficient would result in 3.4 billion people.

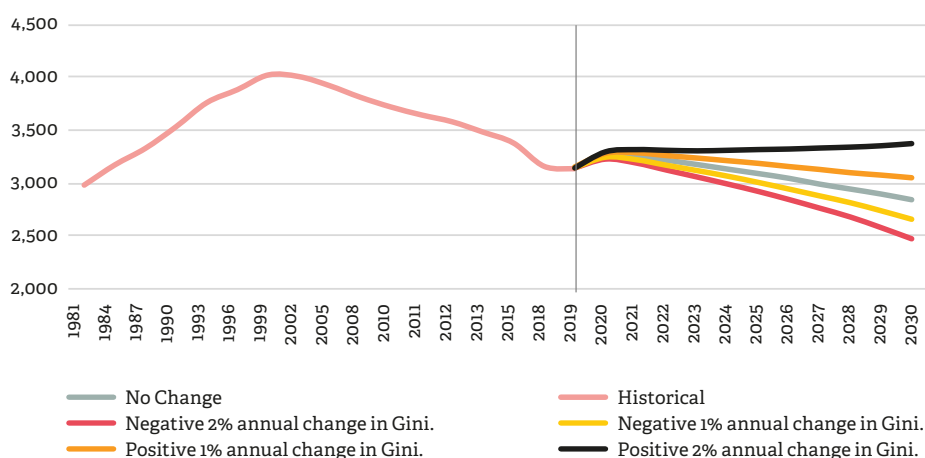


Figure 6: Global poverty projections inequality scenarios, \$5.50 per day

Source: Lakner et al. World Bank (2020); Projected Poverty rates measures at US\$5.50 per person per day



**Economists no longer believe inequality is the price that must be paid for growth.**

What drives income inequality? While hard to predict, research suggests that patterns of taxation and government spending, changes in terms of trade that affects different segments of the population differently (particularly farmers), changes in the competitiveness of markets, in demand for labour from different segments of the population and the impact of digitisation and automation, unionisation rates and labour market regulations, are all potential contributors. According to the World Inequality Report (2018), the main source of inequality has been high returns to capital combined with the unequal ownership of capital. The recent increase in inequality has been triggered by a surge in the value of private capital, alongside a decline in the value of public capital.<sup>31</sup> Wage inequality has also accelerated in recent years. According to the World Inequality Database, the share of national income received by the bottom 50 per cent of the population is below 10 per cent in sub-Saharan Africa and below 15 per cent in Southern Asia. The top 1 per cent of the population capture an enormous 20 per cent of national income (Figure 7). The trajectory of income inequality in India has been dramatic. The top 1 per cent now accounts for over 20 per cent of national income today versus just over 5 per cent in the 1980s (Figure 8). Several factors potentially contributed to this change in wage inequality, including technological disruption and globalisation.

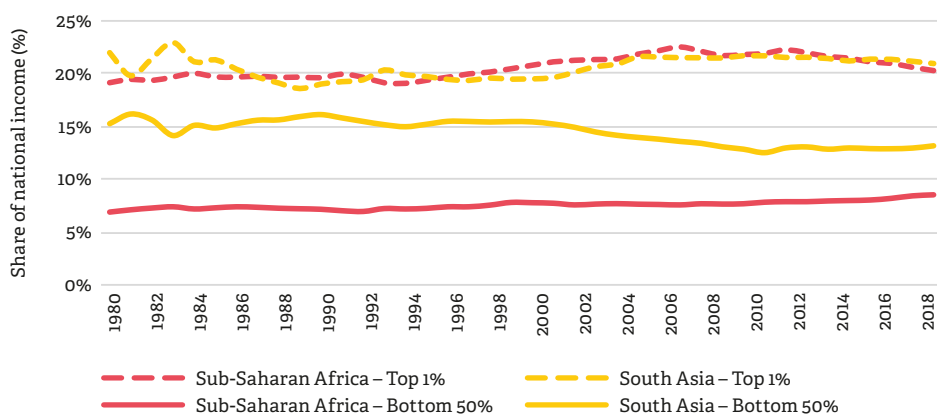


Figure 7: Income inequality – Africa and South Asia  
Source: World Inequality Database (WID)

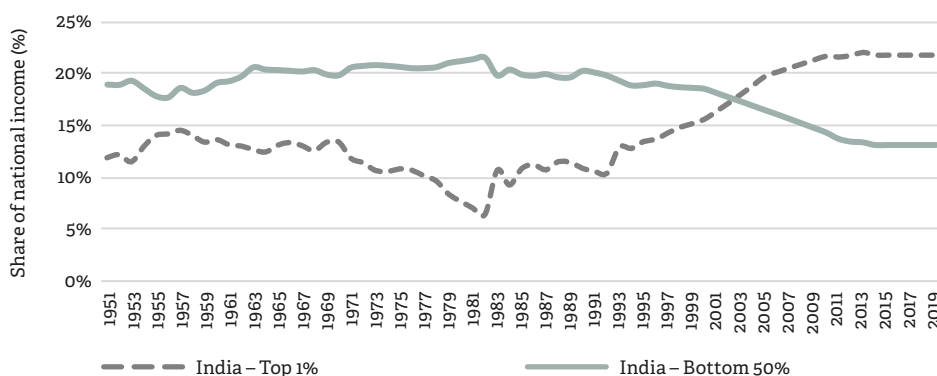


Figure 8: Income inequality – India  
Source: World Inequality Database (WID)

## 2.2.2 COVID and inequality

The pandemic has amplified inequality. The IMF estimates that the average Gini coefficient could increase by 2.6 percentage points for emerging markets and developing economies, eradicating equity improvements since 2008. The Gini coefficient is rising due to the ability of high-income workers to telework and reduce cash expenditures due to lockdowns. The impact of COVID-19 on household incomes in developing countries has been significant. One recent study found household living standards in rural Kenya fell 25 per cent last year, with declines in non-food expenditure (40 per cent) and food consumption (12.5 per cent), (International Growth Centre, 2020).

»  
**The pandemic has amplified inequality.**

31 World Inequality Report (2018).



Although Covid-19 containment measures were relatively less strict and eased sooner in many lower income countries than in other parts of the world, firms were hit harder. A World Bank rapid business survey in 38 countries (Aga and Maemir, 2021) found that pandemic induced contractions in sales and employment were significantly higher in sub-Saharan Africa than elsewhere. Firms were more likely to experience liquidity and cash flow problems, and more likely to close permanently. Many businesses in low-income economies would have entered the pandemic lacking access to credit and with barely adequate cash flows, and governments lacked the financial and organizational resources to provide the support to firms that wealthy countries deployed. When asked whether they adjusted or converted production in response to the pandemic, more firms in Africa said they had, than in other regions, however fewer were able to move production and sales online than in other regions.

Lockdowns have hit the service, medical and education sectors especially hard – exacerbating social inequalities by affecting women and younger populations disproportionately.<sup>32</sup> The World Bank estimates more than 90 per cent of all students had their education disrupted in 2020, with more than 40 per cent losing most of their school year. Children in rural areas lost an average of 1.1 years, or 13 months, particularly in the mathematics curriculum (Whizz Report, 2021). This impact of this is likely to persist throughout students' lives. Research has shown that an additional year of schooling is associated with a 10 per cent increase in wages (Montenegro and Patrinos, 2014). More than 1.5 million children experienced the death of a parent or grandparent due to the pandemic.<sup>33</sup>

### 2.2.3 Future of gender inequality

Women face countless challenges throughout the developing world. Women are also a source of economic potential if barriers can be removed.<sup>34</sup> Research has shown that disparities in health, education, and bargaining power within marriage tend to be larger in countries with low GDP per capita (Jayachandran, 2015). Around two-thirds of countries still lack laws against rape based on the principle of consent, and an estimated 245 million women are subjected to domestic violence each year. COVID-19-induced lockdowns have promoted a 30 per cent increase in cases of domestic violence in some countries (Beegle and Christiaensen, 2019). Globally, more than 750 million women and girls were married before the age of 18.<sup>35</sup>

Men earn more than women in essentially all societies (on average 20 per cent more).<sup>36</sup> But the relationship between gender wage gaps and equality is complicated – measured wage gaps tend to be smaller in poorer countries, where more women are excluded from the labour force (Olivetti and Petrongolo, 2008). Women are less present than men in the workforce across the developing world: female labour force participation rates in Africa and Southern Asia stand at around 60 per cent and 25 per cent respectively, versus 70 per cent and 80 per cent for men.<sup>37</sup> The low numbers in South Asia are driven by restrictive gender norms as well as rising female enrolment in formal education (delaying entry into the labour force).

Time-use surveys show that when paid and unpaid work are combined, women work longer hours overall than men. Women do more than three times as much unpaid care work as men. They are also more likely to be in precarious, part-time, and informal employment. Extreme poverty is more prevalent among women than men, particularly between the ages of 20 and 40. After 65, slightly more men are extremely poor (Munoz Boudet et al., 2018). Only 28 per cent of managerial positions are held by women. Almost half of countries still have laws that prevent women from working in certain jobs or industries. Fewer than 20 per cent of all agricultural landholders are women.

32 UK Foreign Commonwealth & Development Office Research Blog: Latest evidence on the indirect impacts of C19 (2021).

33 CDC: Children: The Hidden Pandemic (2021).

34 This section draws on UN Women Progress of the World's Women 2019-2020 and Progress on the Sustainable Development Goals the gender snapshot 2021.

35 UNICEF: Ending Child Marriage: Progress and Prospects (2014).

36 ILO: Global Wage Report 2018-2019: What lies behind gender pay gaps (2018).

37 ILOSTAT database.

Fewer women have access to digital and financial services. In sub-Saharan Africa and South Asia, men are 50 per cent more likely to be online than women (Alliance for Affordable Internet, 2021). Women in developing economies are nine percentage points less likely than men to have a bank account (World Bank, Findex). A recent survey of African entrepreneurs found that all-male teams received 76 per cent of start-up financing.<sup>38</sup> Women receive fewer years of education in Africa and South Asia (Figure 9).

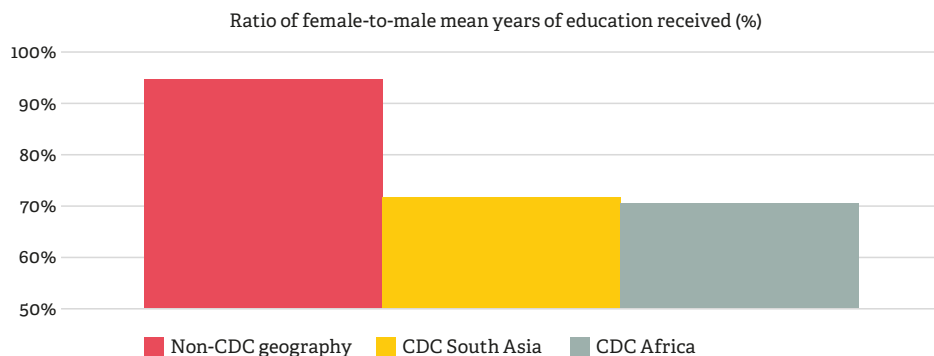


Figure 9: Girls are still being denied the education they deserve  
Source: UNESCO

Research suggests much can be done to improve women's lives. Studies show a positive correlation between more equal laws pertaining to women in the workforce and more equal labour market outcomes. This includes higher female labour force participation and a smaller wage gap between men and women (Hyland et al., 2020). UN Women estimate that over 150 million women and girls could emerge from poverty if governments implement strategies to improve access to education and family planning, and equalise wages and social transfers.

Inclusivity matters in its own right, but it also has a significant effect on efficiency and productivity (Hsieh et al., 2019). Sexism, racism and other forms of prejudice prevent jobs being allocated according to ability, resulting in talented leaders being overlooked and finance being denied to promising entrepreneurs. Removing barriers to entry for female entrepreneurs in India, for example, would:

- Increase the fraction of female-owned firms significantly (nine times);
- Increase the real wages of female relative to male workers; and
- Generate substantial aggregate productivity and welfare gains (ca. 7 per cent and 18 per cent respectively).

These large gains are due to reallocation, with low productivity male-owned firms that were previously sheltered from female competition ultimately replaced (Chiplunkar and Goldberg, 2021).

The future of gender equality is hard to predict. How will social norms evolve? Does economic development drive social norms, or vice-versa? Some countries have seen gender outcomes improve in response to changing patterns of economic activity. For example, in recent decades, thousands of jobs have been created for women in the Bangladesh garment industry. Evidence shows the sector has been responsible for improvements in women's education – both absolute and relative to boys – has increased the age of marriage and resulted in declining fertility (Heath and Mobarak, 2015). But gender equality has not yet been achieved. One recent study examined gender wage gaps in the Bangladeshi garment sector using data from 70 large export-oriented manufacturers. It found that men are paid about 8 per cent more than women (Woodruff and Menzel, 2019).

38 Gender Innovation Lab: In Search of Equity: Exploring Africa's Gender Gap in Start-up Financing (2021).



# 03

## Productivity: the future of work

The key to improving people's standard of living, and to creating more decent jobs, is economic growth. The key to growth is improved productivity. Average output per worker today in OECD member countries is six and five times higher, respectively, than in sub-Saharan Africa and South Asia, and 2.5 times higher than in Southeast Asia, as shown in Figure 10. Low productivity means less economic added value to share with employees in the form of higher real wages. Low productivity is partially explained by capital scarcity resulting from persistently low levels of investment. There is roughly \$110,000 of installed private capital per person employed in the OECD; \$6,800 in sub-Saharan Africa, \$10,600 in South Asia and \$33,000 in Southeast Asia.<sup>39</sup>

The picture is the same including public capital – there is roughly \$500,000 of total installed capital per person in the OECD; just \$47,000 in sub-Saharan Africa (excluding RSA), \$75,000 in South Asia, and \$150,000 in Southeast Asia (excluding China).<sup>40</sup> This is a potential opportunity for investors, and the private and social returns from combining capital with an abundant workforce, especially when starting from a low base, can be high. Estimates of the economic rate of return to additional private capital in Africa and South Asia are substantially above those elsewhere in the world.<sup>41</sup>

» *The key to improving people's standard of living, and to creating more decent jobs, is economic growth.*

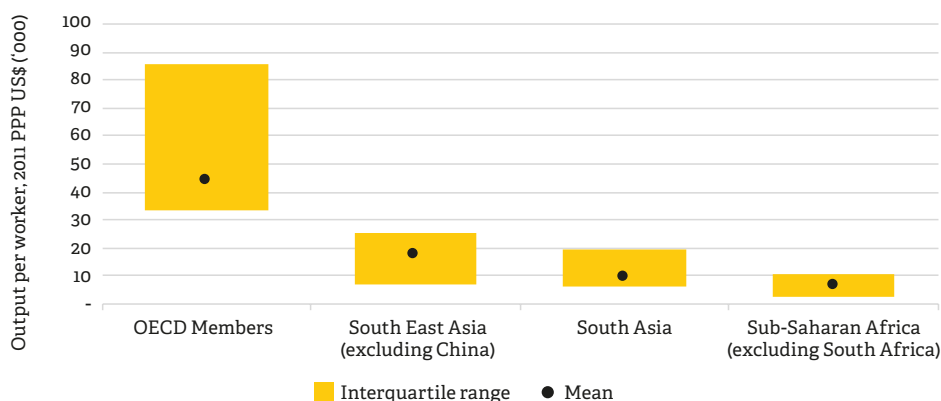


Figure 10: Large productivity gaps remain across regions  
Source: Source: Penn World Table; World Bank.

39 Population-weighted means. Private capital stock estimates from IMF FAD Investment and Capital Stock Dataset, 1960-2017 in 2011 constant dollars, persons employed data from PWT 10.

40 Source: Penn World Table v10, estimated capital stock per person employed in 2019 at constant national prices (2017 US\$), unweighted average across countries, authors' calculation. Note the units are not directly comparable with previously mentioned IMF private capital stock estimates.

41 Economica: The public and private marginal product of capital (2018).

Productivity growth has also been relatively slow in sub-Saharan Africa and, to a lesser extent, South Asia (whereas East Asia and Pacific has increased productivity rapidly). Figure 11 shows growth in value add per worker in the services and industrial sectors. In low income countries, productivity growth over the last five years (to 2018) was largely driven by investment and the estimated contribution of 'total factor productivity' (the efficiency with which inputs are combined to produce outputs) was negative, suggesting low rates of technological transfer from wealthy economies, and continued concentration in the agricultural and extractives sectors which has limited technological progress (Dieppe, 2021).

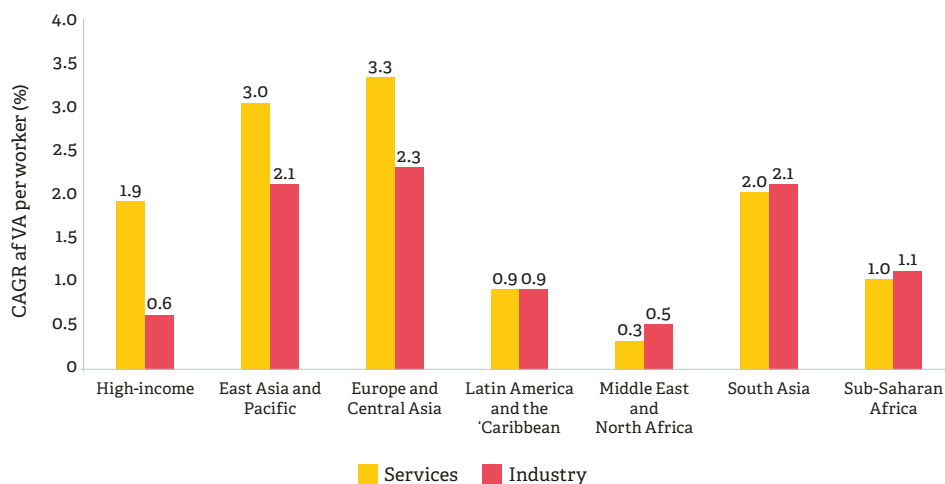


Figure 11: Labor Productivity Growth in Services Has Matched That in Manufacturing across LMICs in Many Regions since the 1990s, Typically Exceeding That of HICs

Source: Calculations based on World Development Indicators database.

As a result, income per person has hardly increased in Africa and only moderately in South Asia, whilst East Asia has partially converged towards the level of income in OECD member countries (Figure 12). The one-quarter of developing economies with the fastest productivity growth have reduced their extreme poverty rates by an average of more than one percentage point per year since 1981, whereas poverty rates have risen for those in the lowest quartile of productivity growth (Dieppe, 2021).

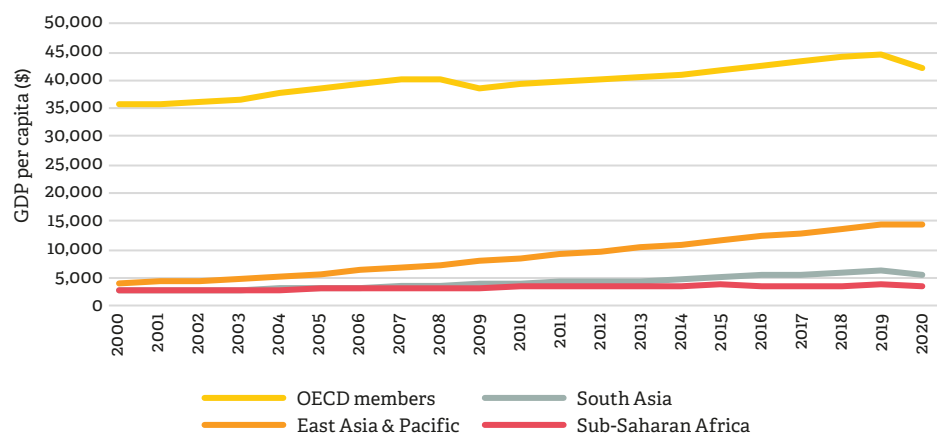


Figure 12: Income levels across regions

The relationship between productivity and wages is complicated. This is because the gains from higher productivity can be captured by managers and investors, rather than workers, but productivity effectively sets the ceiling on real wages. Between 2014 and 2019, low productivity growth in Africa was accompanied by falling wages, driven by two of its biggest economies, Egypt, and Nigeria (Figure 13).

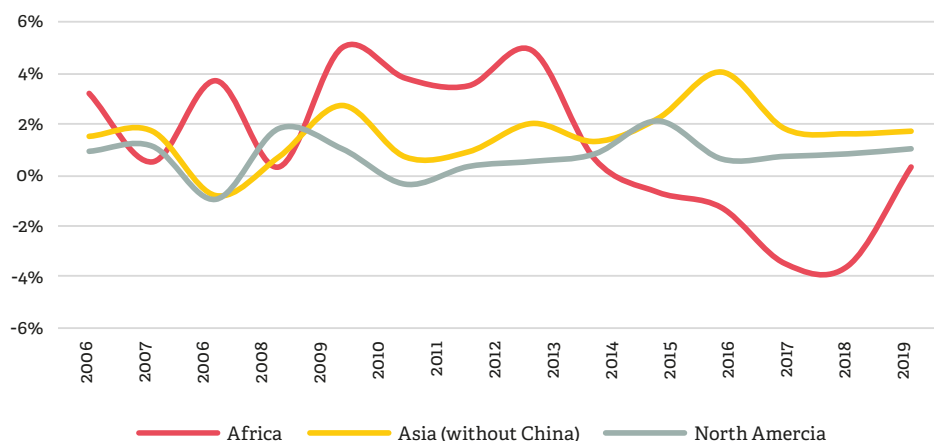


Figure 13: Real wage growth – Africa  
Source: ILO Global Wage Database

### 3.1 Impact of productivity on prices

Most African markets are characterised by a small number of large firms. In sub-Saharan Africa, cement costs on average 40 per cent more than in the United States (US), and is roughly twice as expensive as in East Asia, the Pacific and in South Asia (Kirchberger, 2020). Meat costs more in Ghana than in the US.<sup>42</sup> In Kenya, one mobile phone firm, Safaricom, holds 99 per cent of the market for mobile money through its m-Pesa service. The cost of transporting goods can be up to five times higher (per unit distance) in some sub-Saharan African countries than in the US.<sup>43</sup> Retail prices for ten consumer goods where global comparisons can be made – white rice, white flour, eggs, butter and milk among them – are at least 24 per cent higher in African cities than in other main cities around the world. The markets for these commodities are often controlled by two or three players. Cutting these prices could lift millions out of poverty.<sup>44</sup>

» **Most African markets are characterised by a small number of large firms.**

42 The Economist: Why Africa's poor pay high prices (2018).

43 International Growth Centre: Beyond borders: Making transport work for African trade (2017).

44 World Bank: Breaking Down Barriers: Unlocking Africa's Potential Through Vigorous Competition Policy (2016).

Low productivity also constrains access to basic resources. A mere 38 per cent of Africans, on average, have access to electricity, compared with 100 per cent among OECD members. Approximately 55 per cent of the population of sub-Saharan Africa lives in slums, compared with 6 per cent in advanced economies. Just 14 per cent of Africans have access to clean fuels for cooking, versus 98 per cent among OECD countries (Figure 14). The evidence shows that for many of the basic human needs – such as nutrition, basic health, and shelter – economic growth is by far the most important priority (Pritchett, 2021).

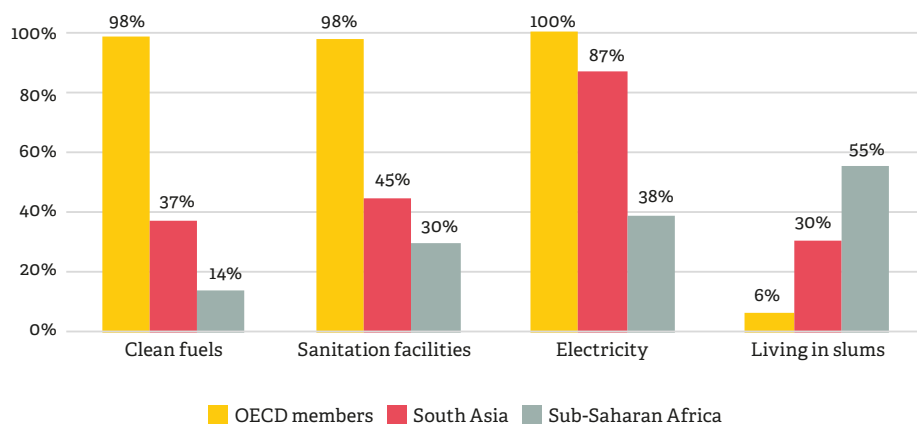


Figure 14: Share of population with access to basic resources  
Source: World Bank Development Indicators, 2015

### 3.2 Sectoral distribution of employment

Four features characterise African labour markets:

- 1) Informality;
- 2) Agriculture's dominance;
- 3) Low productivity and low-quality employment; and
- 4) Underemployment.<sup>45</sup>

In essence, Africans are working, they are working hard, but they are working poor. In sub-Saharan Africa, around 70 to 90 per cent of the labour force is employed in 'non-wage' or informal work. Of those jobs, approximately 80 per cent are in agriculture. In Africa, the bulk of people who do find waged employment work in short-term, casual jobs (Monga et al., 2019). As such, just 10 per cent of total employment is in permanent waged jobs in the private sector; another 10 per cent is in government jobs. Most of the formal private sector jobs in Africa are found in South Africa, Botswana and Egypt.

Within the formal economy in Africa, both labour productivity and wage growth have grown at a slower pace than in the 'rich' world (Gelb et al., 2017). Differences in productivity are not driven by work ethic. Average hours per adult are around 50 per cent higher in the world's poorest countries than in the richest (Bick et al., 2018).

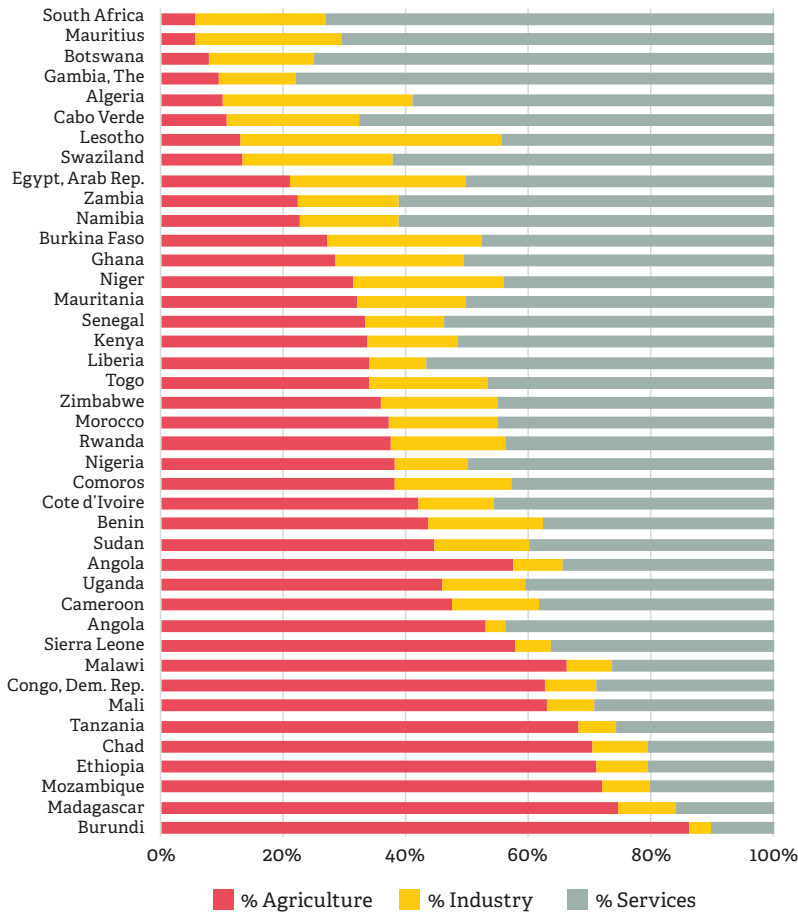
Today, when combining the informal and formal sectors, 53 per cent of the African labour force works in agriculture, 11 per cent in industry and 36 per cent in services. In South Asia, 42 per cent work in agriculture, 24 per cent in industry and 33 per cent in services.<sup>46</sup> Figure 15 shows the sectoral shares of employment for individual countries.

People move jobs frequently in developing countries – what economists refer to as labour market 'churn'. Evidence has shown that labour market flows – such as employment entry/exit rates, job-finding rates, job-to-job transition rates – are two to three times higher in the poorest countries than in the richest (Donavan et al., 2020). The study suggests this is primarily driven by high separation of workers with low tenure. Many people work more than one job at once, and there are seasonal movements in and out of agriculture.

<sup>45</sup> African Economic Outlook (2018).

<sup>46</sup> ILO, ILOSTAT database.

Sectoral Distribution of Employment in Africa



Sectoral Distribution of Employment in South Asia

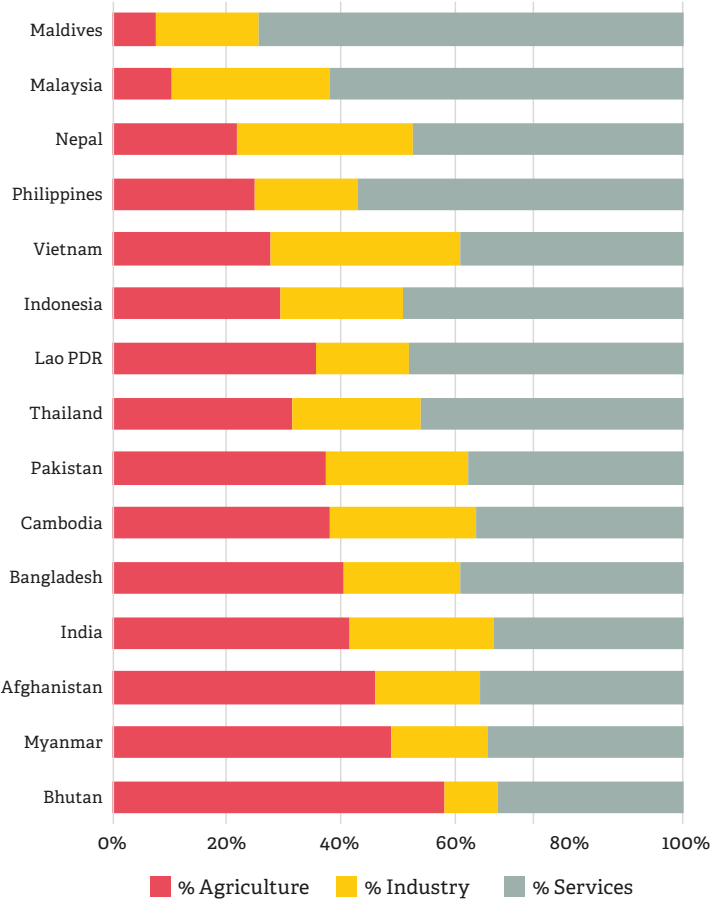


Figure 15: Sectoral employment – Africa and South Asia

### 3.3 Agriculture

Poor countries face what has been called the ‘food problem’: until they can produce enough food, labour is trapped in agriculture, and they cannot begin the process of modern growth (Eberhardt and Vollrath, 2018). Cross-country differences in agricultural labour productivity are far larger than in other sectors of the economy. The difference in output per worker between the richest and poorest countries is 15 times larger in agriculture than in other sectors (Caunedo and Keller, 2021). This is driven by widespread subsistence farming, sub-optimal crop selection, limited uptake of modern technology and fertilisers, and unfavourable climates (Adamopoulos and Restuccia, 2014, 2018; Caselli, 2005; Sinha and Xi, 2018). It is the combination of very low productivity in agriculture and its very high share in total employment that largely explains Africa’s low aggregate productivity versus other regions.

Agricultural productivity has increased continually in wealthy economies, but the rate of improvement has been slower in Africa. Figure 13 shows cereal yields across regions, highlighting that yields in sub-Saharan Africa have barely moved since 1960. This compares with a 2.5 times improvement in OECD countries and three times in South Asia (albeit from a lower base than OECD members). South Asia’s improvements were driven by the ‘Green Revolution’ of the 1960s and 1970s. This progress underscores the importance of continual adoption of technologies that drive incremental improvements.

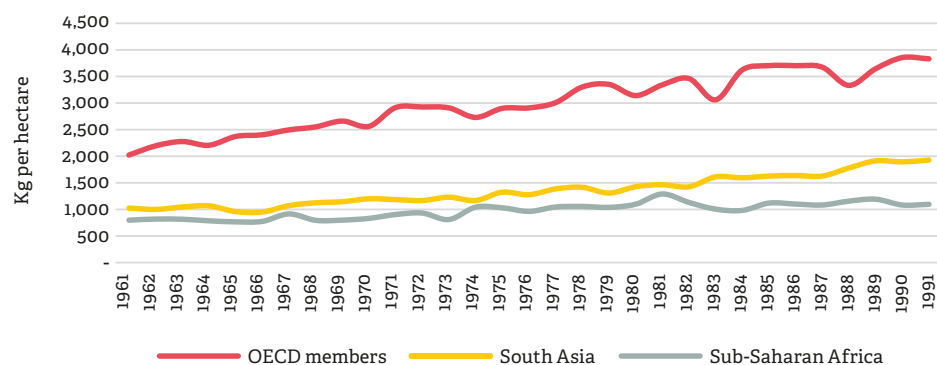


Figure 16: Cereal yields per hectare by region  
Source: Food and Agriculture Organization

Can South Asia’s Green Revolution be replicated in Africa? Research has shown that high-yielding crop varieties (HYVs) increased yields by 44 per cent between 1965 and 2010. This drove improvements in income and reduced population growth. One study suggests a ten-year delay of the Green Revolution would have cost 17 per cent of GDP per capita in 2010 and added 223 million people to the developing world population (Gollin et al., 2021).

Poorer countries employ lower-quality agricultural capital (farm machinery) than richer countries, but evidence suggests productivity gaps are also explained by the abilities of the individuals that work in agriculture. Lagakos and Waugh (2013) suggest that subsistence needs in low income countries force people who are relatively unproductive at farming to work in agriculture, implying that the productivity gap between rich and poor countries is smaller after adjusting for ability. But if workers do sort themselves into rural and urban occupations based on ability, then the gains from moving workers out of agriculture will be smaller than the sector-level productivity gap suggests. Hicks et al. (2017), who followed individuals over time in Kenya and Indonesia, found that gains from moving sector were much (80 per cent) smaller than the raw gap.

The relationship between farm size and productivity is complicated. Small farms tend to get more output per unit of land, but less output per farm worker (Gollin, 2019). Small firms make more use labour from unpaid family members (Foster and Rosenzweig, 2021). There is a lot of variation in measured productivity across farms in Africa, but Gollin and Udry (2019) find nearly all of that is explained by measurement error and unobserved differences in land quality, so that the potential gains from reallocating land to better farmers are probably not very large.



Helping smallholders raise their productivity, which may involve better quality inputs (including information) and better market access, can have a large immediate impact on poverty. But a country will not move from poverty to prosperity based on an economy dominated by tiny farms. Therefore, while attempts to introduce more modern capital-intensive methods at greater scale must be handled carefully (because they can harm local farmers), in the long run development will require fewer farmers each working more land. And while investment in agriculture is crucial, productivity gains in all sectors are needed because investment goods and intermediate inputs are produced in the non-agricultural sector (Boppart et al., 2019).

### 3.4 Productivity in other sectors

Sector productivity gaps vary in other sectors – finance and utilities tend to be closer to the level of productivity seen in advanced economies – while the productivity gap in manufacturing in Africa and South Asia is almost as great as agriculture (Figure 17).<sup>47</sup>

» *The productivity gap in manufacturing in Africa and South Asia is almost as great as agriculture.*

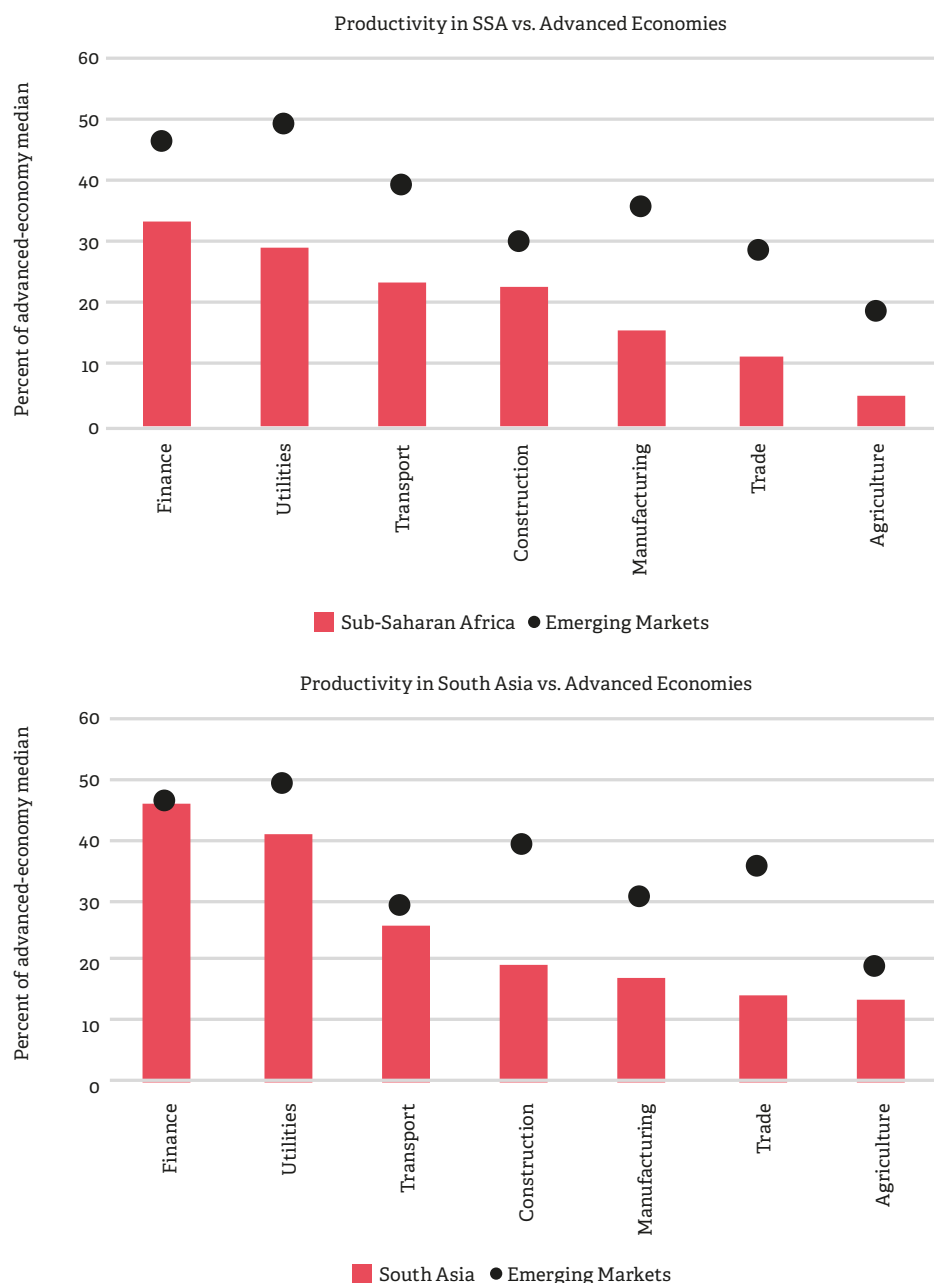


Figure 17: Productivity by sector vs. advanced economies  
 Source: Dieppe, Alistair, ed. 2021. *Global Productivity: Trends*. World Bank. Washington, DC.

<sup>47</sup> Dieppe, Alistair (ed) uses a group of 34 “advanced economies” which is largely OECD member countries, with a few other high income countries.

Overall productivity growth arises from a combination of within-sector productivity growth and the reallocation of labour between sectors. In low income countries, reallocation across sectors accounted for more than one-half of overall productivity growth between 1995 and 2017, but momentum was lost after the 2007-2009 financial crisis. The contribution of sectoral reallocation to productivity growth declined from 2.7 percentage points a year between 2003 and 2008 to 0.8 percentage points after 2013 (Dieppe, 2021). Because the services sector employs more people than manufacturing, in South Asia, the contribution to overall productivity of productivity increases *within* the services sector was more than double that of manufacturing, while in sub-Saharan Africa the gap was even larger (because manufacturing is even smaller there).

The relationship between productivity and job creation is complicated because sometimes investments that raise productivity result in job losses (Carter and Sedlacek, 2019). Yet decent jobs with good pay and conditions will not be possible without higher productivity. Companies often increase their productivity and expand employment at the same time, but not always. At the sector level, as sectors such as agriculture that employ many people lose workers, the overall pace of development will depend on whether those workers move into more productive jobs or into less productive informal services. Structural transformation involves workers reallocating from less-productive firms and sectors to more productive ones. The process of development involves growing the more productive formal sector and shrinking the informal. Some economists are concerned that structural change in Africa is moving too many workers into unproductive informal service sector jobs (Macmillan et al., 2014).

Much attention has been given to the idea of “premature deindustrialisation” (Rodrik, 2016) which observes that the share of employment in industry seems to be peaking earlier, as countries grow, than it did in the past. The question is whether the services sector can deliver productivity gains, if the traditional path of development – via rapid employment and productivity growth in manufacturing – is no longer available to poor countries. For almost 30 years (1991 to 2018), the industrial sector’s share of total employment across low- and middle-income countries has remained almost unchanged, at around 20 per cent, meaning that almost the entire decline in agricultural employment has been matched by growth in services sector employment (Nayyar et al., 2021).

As Nayyar and co-authors put it, manufacturing was able to drive development because it offered economies of scale, access to international markets, innovation, and supply chain linkages with other sectors, combined with the ability to leverage relatively unskilled labour with capital. Although services are labour intensive, they often require simultaneous production and consumption that precludes accessing larger markets. Their more limited ability to use capital to improve labour productivity also limits both scale economies and incentives to innovate. But this traditional view is decreasingly valid. Technological advances mean some service-sector businesses are now tradable and can serve distant customers, within and across countries, and operate on a larger scale and exploit higher technology capital. As Figure 10 showed, productivity growth in services has equalled or exceeded productivity growth in manufacturing.

In lower income countries, most of the service sector jobs have been created in low-skill domestic services that exhibit lower productivity growth. The more dynamic elements of the service sector that share characteristics with manufacturing may require skills that are not yet widespread in the workforces of lower income countries. Higher productivity, modern, knowledge-intensive services (in finance, communication, and business) account for a smaller share of employment than other types of services, but there are some signs that poorer countries are managing to grow these modern services industries faster than others did in the past. Despite some undeniable barriers to large-scale employment in more dynamic services businesses in lower income countries, there is no doubt that the potential of the services sector to drive productivity growth is greater than it once was, thanks to the rise of the digital economy.

According to the analysis in Dieppe (2021), long-term productivity growth is driven by innovation, investment in physical capital, and human capital (health, education and skills). Porzio et al. (2021) found that nearly half of the global decline in agricultural employment in the 20<sup>th</sup> century was driven by better educated cohorts of workers entering the labour market. A supportive legal and institutional environment and macroeconomic stability are good for growth. The effects of some drivers on productivity growth have changed over time. Innovation, cross-border technology transfer, and expertise in producing complex and sophisticated exports have increased in importance, along with demographic factors. Despite remarkable improvements over the past 60 years in schooling and health outcomes, some gaps between advanced and developing economies have widened in areas such as tertiary education, financial development, and innovation.

### 3.5 Informality

The informal sector dominates the economies of the countries we invest in. The informal sector accounts for more than 70 per cent of employment (of which self-employment is more than half) but produces only a third of GDP in the developing world. In Africa, informal employment comprises 86 per cent of employment, according to the ILO. This compares to 16 per cent in advanced economies. In South Asia, informal work still accounts for 59 per cent of total employment. Developing Asia has made robust progress in moving its workforce from low-productivity, low-wage paying sectors such as agriculture toward higher productivity and higher wage-paying sectors, such as manufacturing and services (ILO). No other region has reduced its informal sector by more than South Asia since the 1990s, but the region still has further to go. More than half of India and more than a third of the workforces of Thailand, Indonesia and the Philippines are in informal agriculture.

Informal firms are, on average, much less productive than the formal sector because they employ less capital per worker, less-educated workers, and operate at smaller scale (Amaral and Quintin, 2006; Loayza, 2018). World Bank Enterprise Surveys show that formal firms regard competition from the informal sector as the third-biggest obstacle they face (after access to electricity and finance), and they are more problematic in Africa than in other developing regions (World Bank Informality Report, 2021). Large informal sectors are also associated with the faster spread of COVID-19 (Nguimkeu and Okou 2020, 2021).

What do jobs in the informal sector look like? It is possible to design government-provided social protection (unemployment insurance, sick pay, pensions, and so forth) to include workers in the informal economy, but frequently informal employment effectively excludes workers from welfare programmes. According to the ILO, contributory schemes are often not sufficiently adapted to the situation of informal workers and may render regulations inapplicable in practice. Non-contributory schemes frequently have low benefit levels. Labour laws provide formal sector workers with some measures of job security that the informal economy lacks, such as working time regulations, holidays, minimum wage and health and safety protections. Work in the informal economy is often characterised by small or undefined workplaces, unsafe and unhealthy working conditions, irregular incomes, and long working hours.

The line between the formal and informal sectors is often a very complex one. Sometimes formal businesses outsource and sub-contract to the informal sector, where there are little to no legal protections on minimum wage and no social security should something go wrong. In other cases, people work in jobs that may be formal but are either insecure – they may be covered by a contract but it may be very short-term or have no minimum amount of work per week – or have no opportunity for progression.

In advanced economies, reducing unemployment is sometimes a policy objective. But unemployment is a luxury most people in the poorest countries cannot afford. Surveys show the proportion of respondents in poorer countries who say they are not working is just 2.5 per cent (Feng et al., 2018). The priority is to replace precarious, low-quality jobs with decent jobs. Investment is a proximate cause of job creation, but research has pointed to deeper drivers of job creation where policy interventions can potentially help, including addressing the widening skills gap, integrating firms into the global economy through trade, improving firm capabilities, and supporting networks between firms (Page, 2015).



*The informal sector dominates the economies of the countries we invest in.*

### 3.6 Technology and employment

The 'Fourth Industrial Revolution' is now being used to describe breakthroughs in areas such as machine learning, artificial intelligence (AI), robotics, and 3-D printing. There is significant uncertainty over the extent to which these developments will displace jobs, and how their impact will differ across countries. Some economists argue digitisation is having less of an impact on productivity than earlier technological progress based on mechanisation, whereas others argue that – as production processes change slowly – radical new digital technologies will make a greater difference over time.

What could explain the lacklustre impact of new technologies on productivity? Turner (2018) suggests a combination of:

- The growing importance of 'zero marginal cost software' providing services at a very low cost, and are not adequately captured in measured productivity and GDP data;
- The rising importance of 'zero-sum activities' as societies get richer (such as tax accountants and marketing executives); and
- The proliferation of new low-productivity jobs – such as Uber and Deliveroo drivers – which are taken up by workers who have been unable to find work or have lost their jobs in increasingly automated sectors.

Acemoglu and Restrepo (2019) argue that technological progress changes which tasks can be automated, but also creates new tasks that employ people. The automation of tasks – 'displacement' – does not always deliver large productivity gains and can sometimes even be pursued by firms that see a competitive advantage, despite having a negative impact on productivity. They claim that before around 1990, 'technological unemployment' did not occur because displacement and new job creation (reinstatement) offset each other. But displacement has dominated more recently, and this in turn is responsible for the stagnant wages and higher inequality experienced by high income countries. Acemoglu is worried that the direction of technological change, displacing labour, is bad news for developing countries that already have a surplus labour problem. However, the direction of technological change is not fixed and could be influenced by policy. Acemoglu gives the example of the use of AI in education, which could be used to replace teachers, or to augment teachers and makes them more effective, and perhaps increase demand for them. Acemoglu warns that most investments in education technology seem to be trying to replace, rather than augment, teachers, and suggests policy interventions may be needed to change that.

Africa could be particularly vulnerable to automation, given the high concentration of routine jobs. One study found the share of workers at high risk of automation is 40 per cent among those with a lower secondary education, and above 50 per cent for those with primary or less education (Arntz, 2016). Yet digitisation could create alternative employment opportunities for those workers. New technologies may alter countries' comparative advantages and their industrialisation potential. African and South Asian businesses might exploit new modes of production and enjoy greater access to global markets. Ghodsi et al., (2020) found that robots are associated with higher employment at the industry level. A recent study in Indonesia found that digitalisation and robots increased not only manufacturing efficiency, but also boosted employment at the local level in development countries. But ultimately, the study concluded that the biggest gains from automation were captured by the firm's owners in the form of higher profits, while the share of labour in value-added decreased because of automation (Cali and Presidente, 2021).

Other studies have also found that automation has not yet sparked the 'polarisation' in the developing world that it has in advanced economies. A recent study concluded that occupational employment changes in developing countries did not feature a hollowing-out of middle-skill jobs (Caunedo et al., 2021). It shows a clear pattern that in advanced countries, both skilled agricultural and operators showed absolute declines in the number of workers from automation, while more advanced and elementary tasks increase. In developing countries, however, all professionals and elementary occupations grow at approximately the same rate (Maloney and Molina, 2016).



***Africa could be particularly vulnerable to automation, given the high concentration of routine jobs.***

As mentioned in Section 3.2, the effect of technological progress on the services sector will be crucial to the future of employment in lower income countries, where the hope is that workers in Africa and South Asia will be able to provide the services to Europe and the Americas, and Southeast Asia to Northeast Asia (Baldwin and Forslid, 2019). Digital platforms that can better match buyers with sellers should increase the volume of trade. Partial automation can increase output per worker, and aggregation of sole traders into larger platforms provides incentives for investment in innovation and intangible capital. Technologies such as voice recognition and machine translation are reducing language barriers. Software development and the creative industries have seen rapid growth in online freelance workers selling their services globally, but there are opportunities in less skilled occupations, for example, travel and accommodation platforms allow small services businesses to reach international markets (Nayyar et al., 2021).

More importantly, the infrastructure required to exploit these opportunities is only sporadically present across Africa and South Asia. Internet and mobile phone penetration remains the lowest in the world – less than half of the global average. Only a handful of countries, such as Kenya and Nigeria, have achieved internet penetration rates of close to 50 per cent. The cost of broadband is the highest in sub-Saharan Africa compared to other regions. Relatively few businesses use email or computerised business administration, such as for accounts, stock control and other duties.



# 04

## Sustainability: the future of climate change

The natural world is at a precarious juncture. It is already around 1.3°C warmer than it was at pre-industrial times, before the invention of the steam engine.<sup>48</sup> This doesn't leave much 'wiggle room' to hit the Paris Agreement's goal of limiting rising temperatures to 2°C (or preferably 1.5°C). The ten warmest years on record have all occurred since 2005, and seven of the ten have occurred since 2014.<sup>49</sup> Wildfires have increased more than fivefold since the 1970s.<sup>50</sup> The Arctic Sea ice is melting swiftly and could be gone by 2035.<sup>51</sup> The pace of change of our physical world is alarming. In Africa, there were three times as many droughts, and ten times as many floods, in the 2010–2019 period than there was in 1970–1979.<sup>52</sup> The best estimates suggest that unmitigated climate change would reduce output per person in sub-Saharan Africa, South Asia and Southeast Asia by about 75 per cent by 2100 (Burke, 2015).

Climate change is therefore one of the world's biggest development challenges. Global warming hits all regions and sectors of the economy, but has the most acute impact in poorer countries. Countries such as Bangladesh, for instance, have recently experienced cyclones and storm surges, driving more than 30 per cent of the country underwater. This has wiped out crops, levelled homes and disrupted hard-fought progress on poverty reduction.<sup>53</sup> Climate change has also exacerbated economic inequality between and within countries.<sup>54</sup>

» *Climate change is one of the world's biggest development challenges.*

48 World Meteorological Organization: The State of the Global Climate 2020.

49 National Oceanic and Atmospheric Administration: Climate Change: Global Temperature (2021).

50 The Atlantic: California's Wildfires Are 500 Percent Larger Due to Climate Change (2019).

51 National Geographic: Arctic summer sea ice could disappear as early as 2035 (2020).

52 Cited in the October 2021 edition of the World Bank's Africa Pulse report.

53 New York Times: A Quarter of Bangladesh Is Flooded. Millions Have Lost Everything (2021).

54 IMF: Long-Term Macroeconomic Effects of Climate Change: A Cross-Country Analysis (2019); PNAS: Global warming has increased global economic inequality (2019).

While all sections of the economy are affected by climate change, the impact on agriculture and food security is of particular concern. In poorer countries, the food and agriculture sector are more vulnerable to climate shocks due to three factors: 1) underlying agronomic practices, 2) lower ability to invest in adaptation measures and 3) the high proportion of the population that rely on agriculture for their livelihoods (Vermeulen et al., 2012). In northern regions, yields could go up, but in more tropical climates – such as in Africa and South Asia – the growing season could shrink, and millions of acres of land are expected to become substantially drier. Food prices, which represent the lion's share of the global poor's expenses, could rise sharply.

Biodiversity will also be impacted by climate change. According to research cited by the Intergovernmental Panel on Climate Change (IPCC), a rise of 2°C would cut the geographic range of vertebrates by 8 per cent, plants by 16 per cent, and insects by 18 per cent.<sup>55</sup> These impacts will flow through to the economic progress of impacted countries and communities.

What can be done about it? Two things: 1) adaptation and 2) mitigation.

- **Adaptation:** means attempting to minimise the impact of the changes that are already here, and that we know are coming. Examples include efforts to improve the lives of farmers in developing regions by introducing new, drought-resistant varieties of crops, or using natural vegetation to minimise flood risks.
- **Mitigation:** is about emissions – specifically, stopping the addition of greenhouse gases to the atmosphere. Mitigation can mean using new technologies and renewable energies, making older equipment more energy efficient, or changing management practices or consumer behaviour. It can be as complex as a plan for a new city, or as simple as improvements to a cook stove design. Efforts underway around the world range from high-tech subway systems to cycling paths and walkways.<sup>56</sup>

Adaptation and mitigation are needed to protect both the planet and people from global warming and environmental degradation. This section begins with an overview of the impacts of climate change and natural capital depletion. It then analyses the causes. Finally, it offers a blueprint for potential responses that the world must focus on to avert the worst impacts.

#### 4.1 The impacts

Recent studies suggest climate change has the potential to push 132 million additional people into poverty by 2030 (Reversal of Fortune report, Jafino et al., 2020). Countries closer to the equator will experience the worst physical damage from climate change (Hallegatte et al., 2016) and poorer countries are more vulnerable thanks to lower quality assets, a greater dependence of agriculture for livelihoods, and vulnerability to rising food prices. Climate change is estimated to have already reduced global agricultural productivity by about 21 per cent since 1961, a slowdown equivalent to losing the last seven years of productivity growth. The effect is substantially more severe (a reduction of 26-34 per cent) in warmer regions such as Africa and Latin America and the Caribbean (Ortiz-Bobea et al., 2021).

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» *Climate change has the potential to push 132 million additional people into poverty by 2030.*

<sup>55</sup> IPCC: Special Report: Global Warming of 1.5°C – Summary for Policymakers.

<sup>56</sup> UN Environmental Programme: mitigation definition.

Much damage in tropical latitudes will come from flooding. Nearly 600 million people who live on less than \$5.50 per day – mostly in South Asia and sub-Saharan Africa – are exposed to flooding (Figure 18). Higher temperatures are also expected to leave large areas of tropical zones effectively uninhabitable, where the combination of heat and humidity can be fatal (Xu et al., 2020; Zhang et al., 2021).

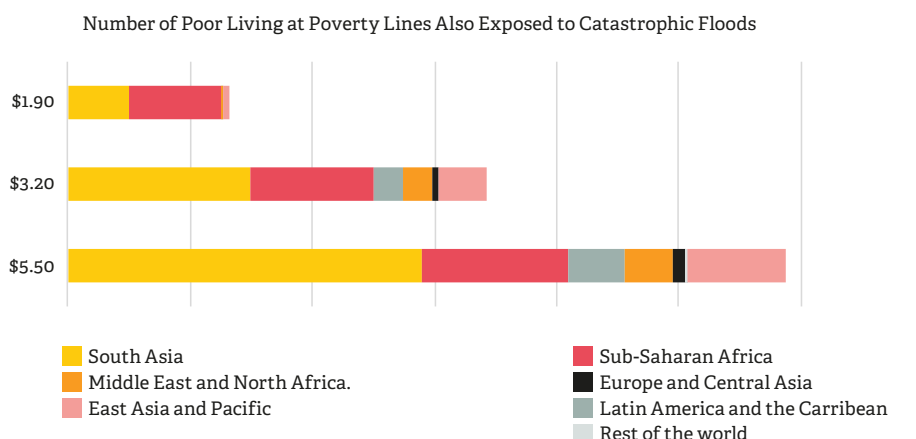


Figure 18: Number of poor exposed to flooding  
Source: Rentschler and Salhab, 2020

How do higher temperatures impact the lives of people? Three areas are: 1) human capital formation, 2) labour productivity, and 3) migration.

Warmer temperatures are associated with an increased risk of mortality, lower birth weight, and more child stunting (Banerjee and Maharaj, 2020). These, in turn, are predictive of worse health outcomes into adulthood (Almond et al., 2018). These effects could be direct, through physiology, or indirect, via adverse shocks to agricultural production, or the spread of infectious disease (Banerjee and Maharaj, 2020). Higher temperatures are also linked with inferior educational outcomes, both in the short and long term (Park 2020). The estimated effects appear larger in India than in higher-income contexts, such as the US (Garg et al., 2020).

Hotter temperatures also negatively impact labour productivity. One study examining the Indian manufacturing sector concluded that worker productivity on hot days declines by 2 to 4 per cent per degree Celsius. Sustained heat also prompted an increase in worker absenteeism (Somanathan et al., 2018). These affects are thought to be greater in outdoor, manual industries – such as agriculture – than in other sectors (Barrett et al., 2021). But higher temperatures also reduce productivity in the manufacturing and services sectors. For instance, one study found the sensitivity of manufacturing productivity to temperatures is so great that even minor cooling from fitting light-emitting diode (LED) lights in factories – which emit less heat – is associated with an average gain of \$2,880 in power consumption savings, and about \$7,500 in productivity gains (Adhvaryu et al., 2020). Singapore’s founding father, Lee Kuan Yew, famously attributed air conditioning as the secret to his country’s development success.<sup>57</sup>

Migration is another area where warmer temperatures have affected, and will continue to affect, peoples’ lives. Warmer temperatures could spark the flow of ‘climate refugees’, who are likely to relocate to towns and cities with jobs and social services to support them (Burke et al., 2015). Climate change, therefore, could lead to the flow of labour out of agriculture and from rural areas to cities, exacerbating urban congestion. One study predicted a potential 143 million internal, or domestic, ‘climate migrants’ by 2050 (Rigaud et al., 2018).

<sup>57</sup> Vox: Singapore’s founding father thought air conditioning was the secret to his country’s success (2015).



### 4.1.1 Natural capital depletion

Natural capital depletion also represents a threat to development objectives. The UK government's Dasgupta Review estimated that between 1992 and 2014, produced capital per person doubled and human capital per person increased by about 13 per cent globally; but the stock of natural capital per person declined by nearly 40 per cent, and the Review concluded that we are not on a sustainable path.<sup>58</sup> It also concluded that vital degraded ecosystems, such as coral reefs and tropical forests, are close to tipping into irreversible collapse.

Why does this matter? Nature matters in its own right, but it also sustains the economy. Low income countries cannot afford the risk of collapse in services provided by nature. A recent analysis from the World Bank found that the collapse of wild pollination, the provision of food from marine fisheries and timber from native forests, could see global GDP fall by \$2.7 trillion by 2030. Soil biodiversity, the foundation of agricultural productivity, has been lost to erosion, often exacerbated by deforestation, fertiliser-intensive farming, acidification and salinisation.<sup>59</sup>

Although renewable natural capital, such as land, makes up 5 per cent of wealth globally, it comprises 23 per cent of the wealth in low income countries. Nearly 80 per cent of the global population living in extreme poverty live in areas that greatly depend on biodiversity and ecosystem services for their livelihoods.<sup>60</sup> Economic vulnerability is driven by the reliance on pollinated crops and, in the case of sub-Saharan Africa, reliance on forest products, combined with a limited ability to switch to other production and consumption options that are less affected by the collapse of natural capital (World Bank, 2021). Southeast Asia could see rice yields fall in Indonesia, the Philippines, Thailand and Vietnam by as much as 50 per cent by 2100 from 1990 levels. Hotter weather will also push tropical diseases such as malaria and dengue fever northward to countries like Lao. Southeast Asia also has very large populations in low-lying coastal areas. Deforestation and wildfires are releasing huge volumes of greenhouse gases.<sup>61</sup>

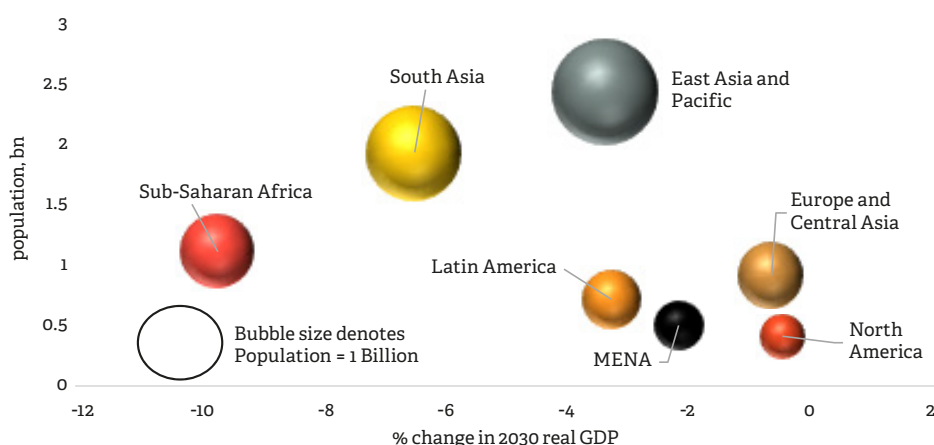


Figure 19: Impact of environmental harm on GDP  
Source: World Bank

### 4.2 The causes

The main gases responsible for global warming are carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), methane (CH<sub>4</sub>) and fluorinated gases. Currently, the concentration of CO<sub>2</sub> in the atmosphere is approximately 417 parts per million (ppm).<sup>62</sup> This suggests a 50 per cent rise in the concentration of atmosphere CO<sub>2</sub> relative to the pre-industrial age.<sup>63</sup> Methane concentrations have increased from 770 parts per billion (ppb) in the pre-industrial age to 1890 ppb currently.<sup>64</sup>

58 Final Report - The Economics of Biodiversity: The Dasgupta Review (2021).

59 FAO: State of knowledge of soil biodiversity – Status, challenges and potentialities (2020).

60 World Bank: Unlocking Nature-Smart Development: An Approach Paper on Biodiversity and Ecosystem Services (2021)

61 IMF Finance & Development: Boiling Point (2018).

62 Carbon Brief: Met Office: Atmospheric CO<sub>2</sub> now hitting 50% higher than pre-industrial levels (2021).

63 Pre-industrial atmospheric concentrations assumed to be 278ppm; Carbon Brief: Met Office: Atmospheric CO<sub>2</sub> now hitting 50% higher than pre-industrial levels (2021).

64 Methanelevels.org, visited 19th April 2021; assuming pre-industrial era began 1850.

Geographically, a handful of countries are responsible for a disproportionate amount of carbon emissions. China is currently responsible for 30 per cent of global carbon emissions, followed by the US (15 per cent), European Union (EU) (9 per cent), India (7 per cent), Russia (5 per cent) and Japan (4 per cent). The rest of the world accounts for just 30 per cent. This picture has changed dramatically, however, as China has developed. In 1950, China was responsible for just 1 per cent of global carbon emissions, while the US and the EU were responsible for 42 per cent and 21 per cent, respectively (Figure 19).

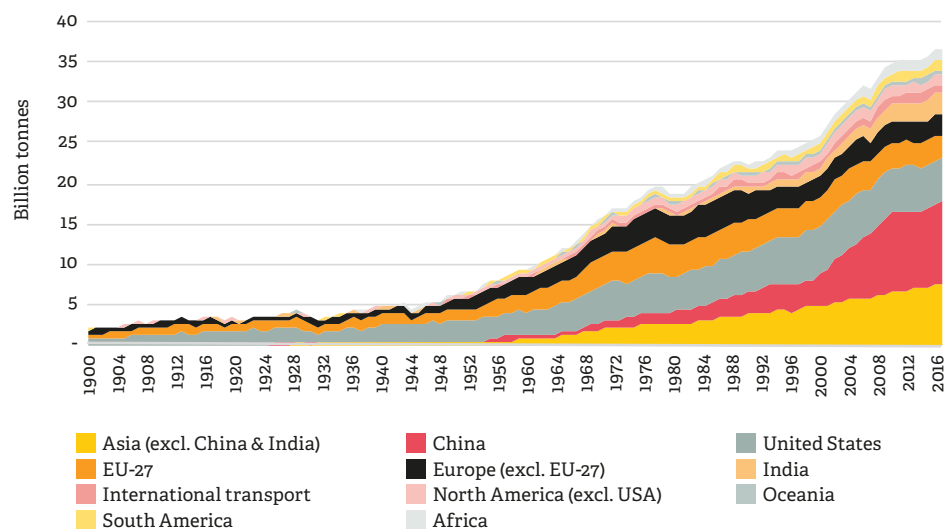


Figure 20: Emissions by country  
Source: Our World in Data; Global Carbon Project Database; Measures CO<sub>2</sub> emission from fossil fuels and cement production only - land use change is not included.

The energy sector dominates global greenhouse gas emissions. This includes electricity and heat production, transportation and building heating, and emits around 30 billion tonnes of carbon equivalent per year. In relative terms, this makes up about two-thirds of total emissions, up slightly from under 60 per cent in 1990 (Figure 20). Within that electricity and heating accounts for around 27 per cent, transportation is roughly 15 per cent, and building cooling and heating 7 per cent. After energy, the agriculture and land use sector is the next largest contributor at around 20 per cent of the global sum.

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The energy sector dominates global greenhouse gas emissions.

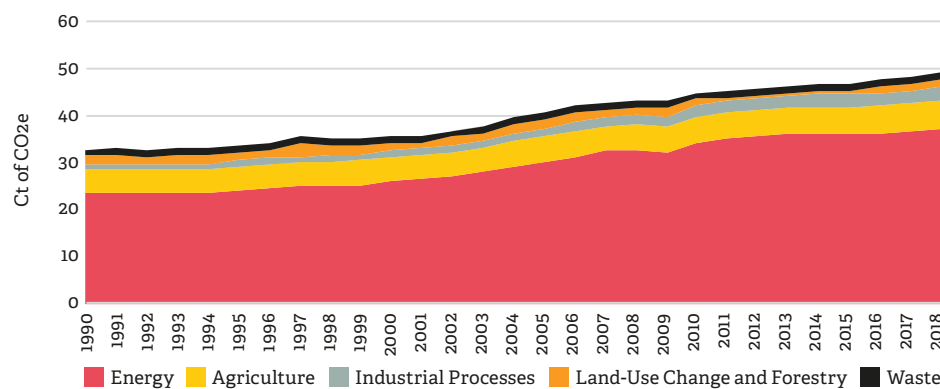


Figure 21: Emissions by sector. Source: World Resource Institute, CAIT

#### 4.2.1 Natural capital depletion

Since the 1970s, the human population has more than doubled, and global GDP has increased sixfold (World Bank). More than 75 per cent of the earth's non-ice land has been significantly altered by human activity. Roughly a quarter of ice-free land area is subject to human-induced degradation (IPCC, 2018). The world has lost over one million square kilometres of forests over the past three decades – an area larger than South Africa.<sup>65</sup> Around 15 billion trees are cut down every year with five billion planted in their place, a net loss of 10 billion trees annually.<sup>66</sup> Soil erosion from agricultural fields is estimated to be between 20 and 100 times higher than erosion from non-agriculture fields.

<sup>65</sup> World Bank Blog: Five forest figures for the International Day of Forests (2016).

<sup>66</sup> Tree Nation: How many trees are lost to deforestation every year? (2020).

The Amazon, home to 40 per cent of the world's remaining rainforest, is a case study in how quickly the environmental picture can darken. The entire rainforest used to absorb around two billion tonnes of CO<sub>2</sub> per year, around 5 per cent of total global carbon emissions. But recent evidence has shown that fires and land-clearing for beef and soy production mean the south-eastern Amazon – where deforestation is prevalent – now emits more CO<sub>2</sub> than it absorbs.<sup>67</sup>

Climate change accelerates land degradation. From 1961 to 2013, the annual area of drylands in drought has increased by about 1 per cent per year. In 2015, roughly 500 million people lived within areas which experienced desertification between the 1980s and 2000s. The highest numbers of people affected are in South and East Asia, Africa, and the Middle East.<sup>68</sup>

The number of vertebrate species has fallen by nearly 70 per cent since the 1970s (WWF, 2020). Nearly one million animal and plant species (of an estimated eight million total) are now threatened with extinction, and 14 of the 18 categories of ecosystem services have declined over the same period (IPBES, 2019). These trends threaten the wellbeing and development prospects of entire communities and economies, including those that need this natural capital the most – whether to grow out of poverty or remain resilient to natural and economic shocks.

### 4.3 The responses

Stabilising the world's climate will require decarbonisation at full speed. However, the task differs across the world, which the UN has codified in the term “common but differentiated responsibilities”. This acknowledges the disparity between developing and developed nations. Across emerging markets, the twin challenge is to both massively grow energy use while decarbonising. 800 million people across the world currently do not have access to electricity, including 600 million in sub-Saharan Africa and over 50 million in South Asia. Current average annual power consumption per person in sub-Saharan Africa (excluding South Africa) and South Asia is around 500 and 700 kilowatt hours (kWh) respectively. This is compared with around 13,000kWh in the US and 6,500kWh in Europe.

The disparity in current energy consumption, and future expected growth, has implications on Paris commitments across countries. In 2015, almost every country in the two regions pledged to strive for net zero carbon emissions by 2050. Even so, Paris recognises that “peaking will take longer for developing country Parties”. This implies that emissions from less-developed countries will rise over the medium term, before falling. While advanced economies are meant to take the lead in decarbonising faster and more aggressively, developing country signatories have pledged to “continue enhancing their mitigation efforts” and are encouraged to “move toward economy-wide targets over time in the light of different national circumstances”.<sup>69</sup> Action in developing countries is critical, given that economic and population growth mean that by 2050, emissions in Africa and Asia will grow in significance. Today, sub-Saharan Africa, home to more than one billion people, is responsible for just 0.6 per cent of cumulative global CO<sub>2</sub> emissions. South Asia's 2.5 billion is responsible for just 1.5 per cent of cumulative global emissions.

#### 4.3.1 Paris commitments

The ‘path to Paris’ is narrow under current emissions trajectories. To limit global warming to 1.5°C above pre-industrial levels, scenarios developed by the IPCC show emissions of greenhouse gases need to be reduced dramatically in the coming decades, and brought to zero by mid-century (Figure 21).<sup>70</sup> Figure 22 illustrates several IPCC-generated scenarios, which are segregated into either ‘limited or no overshoot’ (green) or ‘with a high overshoot’ (blue). ‘Overshoot’ refers to the need for negative emissions – such as natural sinks and carbon capture – the longer we delay action. The lower bounds depict the most aggressive scenarios and the upper bounds show the most conservative.

67 Nature Journal: Amazonia as a carbon source linked to deforestation and climate change (2021).

68 IPCC: Special Report: Global Warming of 1.5°C – Summary for Policymakers.

69 IPCC: Key Aspects of the Paris Agreement.

70 IPCC Sixth Assessment Report (2018).

These trajectories will undoubtedly be extremely challenging.<sup>71</sup> On our current trajectory, emissions stay flat out to 2050, falling only marginally as we approach the end of the century (Figure 22). This results in warming of approximately 2.9°C above pre-industrial levels. Under a scenario in which the pledges and targets that governments have made are delivered, including NDCs and some net-zero targets, the planet's warming would be limited to 2.4°C. This means that achieving 1.5°C requires all governments to dramatically increase their commitments from NDCs and net-zero pledges.

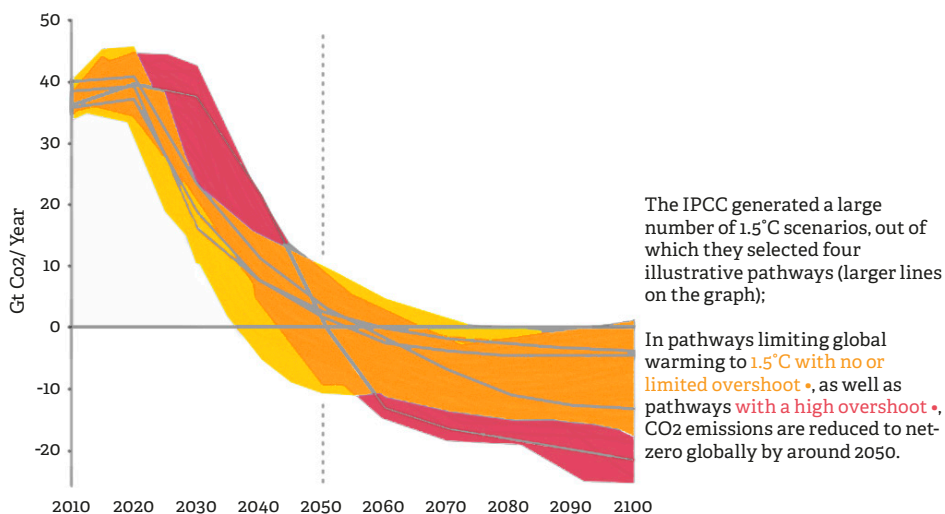


Figure 22: Pathways to net zero  
Source: IPCC (2018), *Global Warming of 1.5°C*

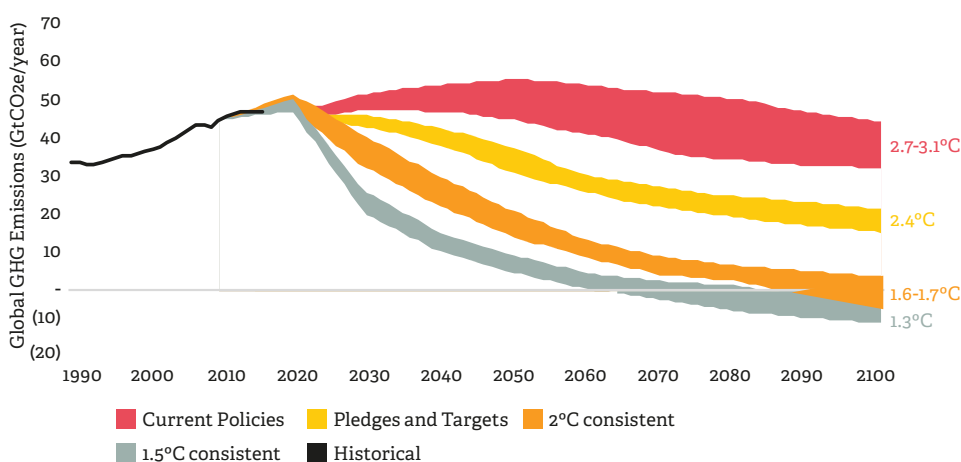


Figure 23: 2100 warming projections  
Source: Climate Action Tracker

#### 4.3.2 What does 'hitting 1.5°C' look like? The electric economy

There are many possible paths towards net zero. A world in which warming is limited to 1.5°C depends on technological innovation and cost declines; the willingness of consumers to adjust behaviour; the potential for international collaboration; and the availability of bioenergy. The International Energy Agency has said that oil and gas exploration projects must stop immediately if global warming is to be kept in check.<sup>72</sup>

First, there must be a massive shift to zero-carbon electricity as the foundation for the global economy. Direct electrification is the primary route to decarbonisation – it represents the cheapest and most energy-efficient solution in most applications. Total global electricity supply could rise from today's 27,000 terawatt hours (TWh) to between 2.5 to 5 times current levels (to 70,000 and 130,000 TWh) in the next 30 years. This includes electricity used to produce hydrogen.<sup>73</sup>

<sup>71</sup> Climate Action Tracker.

<sup>72</sup> IEA Net Zero by 2020: A Roadmap for the Global Energy Sector (2021).

<sup>73</sup> International Energy Agency; Energy Transitions Commission.

Accelerating clean electrification is a monumental challenge. Entire sectors of the global economy will need to be electrified, such as road transport and building heating. In aggregate, electricity's share of final energy demand could also grow from today's 20 per cent to over 60 per cent by 2050.

The challenge is to ensure that the electricity used is zero-carbon. Globally, wind and solar power generation comprise roughly 10 per cent of electricity generation.<sup>74</sup> This will need to grow to approximately 40 per cent of electricity generation by 2030 and over 75 per cent by 2050. At the same time, parallel deployments of other zero-carbon generation and transmissions networks to deliver zero-carbon power at scale need to be realised. Achieving power decarbonisation first – ahead of economy-wide decarbonisation – must be at the heart of all countries' paths to net zero.

### **What levers will be needed beyond electricity?**

Most forecasters estimate that electricity will make up only 60 per cent of final energy demand in 2050. What will make up the remaining balance of the future energy system? The two most crucial technologies are hydrogen and biomass. Hydrogen is expected to comprise a further 20 per cent of the total, with biomass and fossil alternatives (with carbon capture and storage) expected to account for the remainder. Carbon capture and storage is another key technology that virtually all net zero scenarios view as important to fulfilling the Paris Agreement.

The advantages of the emerging technologies are:

- **Hydrogen:** is an energy carrier whose energy density, storability and suitability for high-heat applications make it superior to electricity in some applications. Low- or zero-carbon hydrogen can be produced either through electrolysis of water using zero-carbon power (green hydrogen), or from natural gas using carbon capture and storage technology to handle the emissions (blue hydrogen). Hydrogen can, in turn, be used to produce hydrogen-based fuels, such as ammonia or synfuels. One of the challenges in scaling hydrogen is creating an extension transportation and storage system. It can be transported in pure form as compressed gas at high pressures, or in liquid form at ultra-cold temperatures. It can also be moved in the form of hydrogen vectors, such as ammonia or liquid organic hydrogen carriers (LOHCs). But in each case, conversion requires significant energy input and leads to energy loss. A potential alternative to transporting hydrogen may be to transport electricity from low-cost locations before transforming it to hydrogen closer to where it will be used.
- **Biomass:** or biogas/biofuels can meet a range of applications, including industrial heat, chemical feedstock, flexible thermal power supply and transport fuels. But the total scale of its use across all sectors must reflect the potential supply of truly sustainable biomass. Scaling biomass is challenging – there is a dearth of sustainable, low-emissions biomass due to high demand and competing uses of land. For instance, China has much more limited biomass per capita than the US.
- **Carbon Capture and Storage (CCS):** Alongside blue hydrogen solutions, CCS can also be applied to a variety of industrial processes (discussed below), or to thermal power plants that exist to provide flexible power supply within primarily zero-carbon power systems.

<sup>74</sup> IEA: World Energy Outlook (2020).

## What about the hard-to-decarbonise sectors?

Some sectors will be more challenging to decarbonise. The industries listed here are considered the most daunting, but still offer potential solutions to decarbonisation:

- **Shipping and aviation:** battery-based electrification and hydrogen will play a role in short-distance shipping and aviation routes. But the limited energy density of batteries will likely render battery-powered shipping or aviation unfeasible for long-distance journeys. Long-term decarbonisation of long-haul travel will likely require the use of liquid fuels that can be combusted within largely unchanged engines. This might be either low-carbon, sustainable bio-feedstocks (biofuels), or from a power-to-liquid production route, such as ammonia (in the case of shipping) and syngases (in the case of aviation).
- **Building heating:** residential and commercial heating accounts for a significant proportion of total energy demand in many cooler countries. Some of this is already electrified, but much of it is currently delivered via gas heating or even via coal-based distributed heating systems in countries such as China. Feasible routes to decarbonisation involve the use of electric heat pumps or resistive electric heating, or the combustion of hydrogen or bio-methane, using existing gas grids and district heating systems. Optimal solutions will vary by region, depending on resource availability and existing infrastructure. Better insulation of buildings is particularly important to reduce peak demand and make this fuel switch – in particular, electricity-based options – more manageable from an energy system perspective.
- **Heavy industry sectors:** in each of the crucial heavy industry sectors – steel, cement, chemicals, and aluminium – there are viable ways to remove both energy-based emissions and emissions resulting from the chemical processes involved. These will entail a mix of direct electrification, use of hydrogen, use of biomass (in a few regions with abundant supply of sustainable biomass), and carbon capture and storage in applications that guarantee long-term storage. By sector:
  - **Cement:** decarbonising cement is one of the biggest challenges to delivering a net zero economy. Emissions from the chemical process (as opposed to heating) make up roughly half of cement emissions and are particularly hard to avoid. However, carbon emissions from heat used in cement production could be eliminated through a combination of heat electrification and the use of hydrogen or biomass, as well as reducing chemical emissions by using new materials and processes. Demand management – such as materials-switching from cement to timber – as well as improvements in materials efficiency in building design, waste reduction and some materials circularity, will also help.
  - **Steel:** the steel decarbonisation process is already underway. Reducing emissions from the steel industry requires a combination of lessening demand and increasing the use of scrap-based (recycled) steel versus the current more carbon-intensive ore-based (primary) production. Zero-carbon ore-based production routes include a combination of hydrogen-fired kilns and renewable electricity for electric-arc methods.
  - **Plastics:** greenhouse gases are emitted during both the production process and the emissions from the decomposition at end-of-life. The chief pathway for decarbonising plastics throughout their lifecycle is based on four major routes: 1) a shift to a circular plastics economy, 2) the improvement of energy efficiency in the production process, 3) the decarbonisation of the production process – such as furnace electrification or electro-chemical processing techniques, and 4) a partial switch to renewable feedstock – such as biofuels and other biological products.

- Aluminium: technologies for decarbonising aluminium in the production process include more efficient smelters as well as ‘inert anode technology’, where the traditional carbon anodes are replaced in favour of inert materials. Additionally, emissions during the production process from purchased electricity toward zero-carbon power will also accelerate the sector’s decarbonisation drive. Carbon-free aluminium – produced by solar energy – is already being sold.<sup>75</sup>
- Agriculture: the food, forestry and land use sector is responsible for approximately 20 per cent of annual greenhouse gas emissions globally. A large proportion of these emissions – particularly methane – are derived from red meat or dairy production. An increased demand for land means deforestation also contributes to an increase in global carbon emissions. Technical developments in animal diet and breeding could mitigate this impact. But dramatic reductions in emissions will require a significant reduction of red meat consumption through changing diets – including plant-based meat substitutes – as well as lab-grown meat.<sup>76</sup> Vertical farming is another potential solution. It utilises indoor, stacking processes to optimise growing conditions while using less space and water. The US Department of Agriculture regards the technique as a potential answer to food shortages as populations increase.<sup>77</sup> Solar desalination plants could also help meet the gap between water demand and supply in the hotter climates as the impacts of global warming accelerate.<sup>78</sup>

### Investments required to deliver a net zero economy

Making a 1.5°C world a reality will require enormous investments. Financing the energy transition means redirecting existing capital toward new technologies as well as significantly boosting the overall level of investment. Annual investment in the energy sector today is about \$2 trillion per year. This will need to more than double, to \$5 trillion in the 2030s and over \$4 trillion through the 2040s (Figure 23).<sup>79</sup> Most of this spending will be allocated toward electricity generation, networks and electric end-user equipment, particularly in scaling up electricity transmission systems. The lion’s share of this capital is expected to come from private sources, with some assistance from public policies such as subsidies, loan guarantees and taxes. Direct government funding will also be called upon to accelerate innovation in emerging technologies.

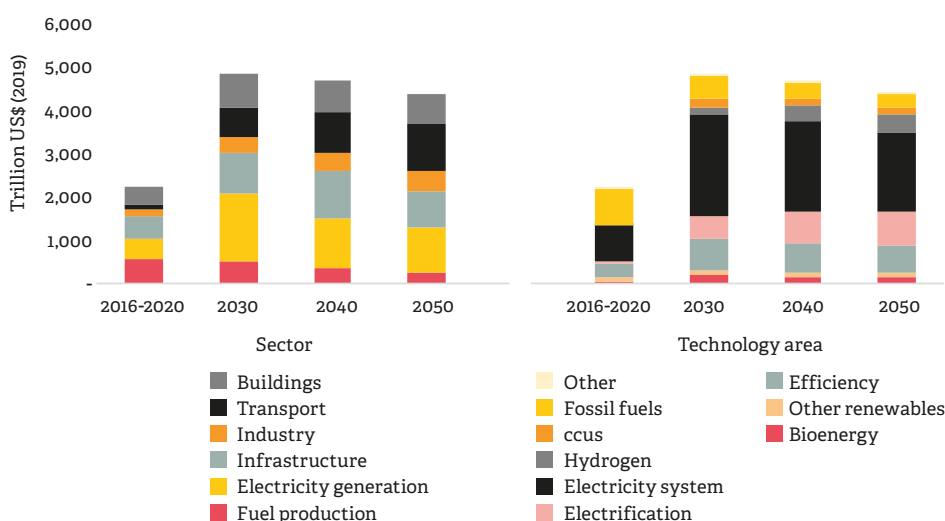


Figure 24: Investment needed for net zero  
Source: International Energy Agency (2021), Net Zero by 2050, IEA, Paris

75 Bloomberg: UAE News: Emirates Global Aluminium to Sell First Solar-made Aluminium (2021).  
76 The Guardian: Secrets and pies: the battle to get lab-grown meat on the menu (2021).  
77 US Department of Agriculture: Vertical Farming for the Future (2021).  
78 GreenBiz: Is a solar desalination breakthrough coming to the desert? (2020).  
79 IEA: Net Zero by 2050 (2021)

### 4.3.3 Natural capital depletion

Despite the many ways that biodiversity underpins the SDGs, ecosystem preservation continues to be perceived as a niche issue within a much broader development agenda. 'Mainstreaming' of nature into the development process will need to gain scale and speed. A recent World Bank report lays out a high-level blueprint for responding to natural capital degradation. The six steps are: 1) engage national and economic decision makers, 2) integrate nature-based solutions into sector investments, 3) enhance local benefits of conserving nature, 4) mobilise finance, 5) produce better metrics, and 6) leverage partnerships.<sup>80</sup>

Restoring nature is a crucial pillar of the response to climate change. A study by Roe et al. (2019) outlines how to achieve 1.5°C via the 'land sector'.<sup>81</sup> By segregating the required steps into themes, the analysis devised eight priority 'wedges' that depict the broad-based actions needed from the land-use sector to deliver net zero. Taken together, the portfolio of actions is estimated to deliver approximately 15 Gigatons of CO<sub>2</sub> reductions per year, roughly 30 per cent of total global greenhouse gas mitigation from all sectors. These are listed below:

- Stop deforestation: emissions from deforestation and land degradation must be halted, including conversion of coastal wetlands and peatland burning. Measures to deliver progress include conservation policies, REDD+, improved supply chain transparency, and cleaner cookstoves.
- Reduce emissions from agriculture: decreased emissions from methane and N<sub>2</sub>O from enteric fermentation, nutrient management, synthetic fertiliser, and manure management.
- Shift to plant-based diets: reduced production of emissions-intensive foods through public health policies, consumer campaigns, and the development of new foods via technology.
- Reduce food waste: from consumer campaigns, supply chain technology, private sector policies, improved food labelled and waste to biogas; food loss to be reduced via improved handling and storage, investment, and technology.
- Reforestation: including wetlands and peatlands, which would require investment from both the public and private sectors, and payments for sustainable forestry services.
- Improved forest management: via improving rotation lengths of plantations and biomass stocks, reduced-impact logging, improved plantations, forest fire management, certification, and the integration of agroforestry into agriculture and grazing lands.
- Enhanced soil carbon sequestration: erosion control, use of larger root plants, reduced tillage, cover cropping, restoration of degraded soils, and biochar amendments.
- Bio-energy carbon capture and storage (BECCS): R&D, investment, and deployment.



*'Mainstreaming' of nature into the development process will need to gain scale and speed.*

<sup>80</sup> World Bank: Unlocking Nature-Smart Development: An Approach Paper on Biodiversity and Ecosystem Services (2021).

<sup>81</sup> Nature Climate Change: Contribution of the land sector to a 1.5 °C world (2019).





# 05

## Conclusion

Achieving both the SDGs and commitments made under the Paris Agreement looks unlikely based on current trends. COVID-19 has pushed the SDGs further away. But the world cannot afford to be discouraged – the only option is for governments, firms and investors, and communities, to do what they can to accelerate progress.

There is no shortage of potential for investment to improve people's lives and support our planet's resilience. Population growth and urbanisation creates commercial opportunities and tighter integration of global markets – and a rising middle class with more spending power – will help drive progress (Signé, 2018). The phenomenon of premature industrialisation does not imply there is no potential for industrial development in Africa and South Asia. There will be opportunities to grow exports and create alternatives to China as the foundation of global supply chains. Many jobs can be created in export industries: Kenya's flower industry employs more than 70,000 people; horticulture in Ethiopia provides 180,000 jobs.<sup>82</sup> The new digital economy and proliferation of new 'industries without smokestacks' in the services sector have the potential to serve as 'development escalators' and create decent jobs on a scale needed to lift populations out of poverty. There will also be a growing marketplace of green growth opportunities. The pace of innovation in new green technologies gives reason for optimism, and provided these can be quickly implemented at scale, our chances of keeping global warming within acceptable limits will improve.

This paper has outlined the daunting nature and scale of the world's greatest development challenges. But everywhere we look we find examples of innovation and entrepreneurialism that are contributing towards meeting these challenges, in ways that patient and flexible public capital can meaningfully support.



*Achieving both the SDGs and commitments made under the Paris Agreement looks unlikely based on current trends.*



*There is no shortage of potential for investment to improve people's lives and support our planet's resilience.*

<sup>82</sup> The Economist: Many of Africa's economies are doing well (2020).

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